Coastal Fisheries Institute
and Louisiana Sea Grant College Program
Center for Wetland Resources
Louisiana State University
Baton Rouge, Louisiana 70803-7503

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THE POTENTIAL FOR A STONE CRAB (*Menippe mercenaria*) COMMERCIAL FISHERY IN BARATARIA BAY, LOUISIANA

by

Jerald Horst
Louisiana Cooperative Extension Service
1825 Bonnie Ann Drive
Marrero, LA 70072

David Bankston
Louisiana Cooperative Extension Service
Louisiana State University
Baton Rouge, LA 70803

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INTRODUCTION

Since the late 1970s, commercial blue crab (Callinectes sapidus) fishermen in coastal Louisiana have noticed a steadily increasing by-catch of stone crabs (Menippe mercenaria) in their blue crab pots. Although the stone crab is found from North Carolina southward through the Gulf of Mexico to the Yucatan Peninsula, only southern Florida presently has a viable commercial fishery for stone crabs.

In Florida, the commercial stone crab fishery has become valuable. Consumption of, and demand for, stone crab claws has increased outside of Florida and prices have risen sharply (over $5.00 per pound for large claws in the spring of 1985). In contrast, blue-crab dockside prices have fluctuated in recent years, although production costs have increased. This lack of steady income from blue crab fishing and the current economic depression in the shrimp industry illustrate the importance of alternative, high-value fisheries.

Three areas along Louisiana's coast were identified as possibly having commercially harvestable quantities of stone crabs: lower Barataria Bay, Breton and Chandeleur sounds, and Calcasieu Lake. In all three areas, stone crabs have turned up regularly in the blue crab by-catch. Shrimp trawlers who snagged "ghost traps" (lost blue crab traps frequently heavily covered with marine growths) in their nets have reported as many as two dozen live stone crabs per trap.

Although the Breton-Chandeleur Sound area exhibited the greatest potential of the three areas for a commercial stone crab fishery (based upon by-catch from the blue crab fishery), the lower Barataria Bay area was selected for this exploratory fishing effort because the investigators were more familiar with this area and the project cooperator, an experienced ex-stone crab fisherman from Florida, was located on Grand Isle at the lower end of Barataria Bay.

METHODS

Description of Gear

Fishing was conducted with standard wooden Florida-style stone crab pots (Figure 1) built of cypress and pine lumber with a concrete floor and a PVC pipe entrance funnel 4 in. in diameter (see Appendix for construction details). Each pot was 16 in. square and 11 in. high and rigged with a bridle, 20 to 30 ft of rope, and two 6-in. styrofoam floats.

Bait was hung with a wire from a small nail driven into one of the topmost slats of the pot. A variety of baits were tested, including whole mackerel and mullet, salted cowhides, and red and black drum heads. The pots were checked once a week. Drum heads proved early in the study to be the most effective bait and were always used when available.

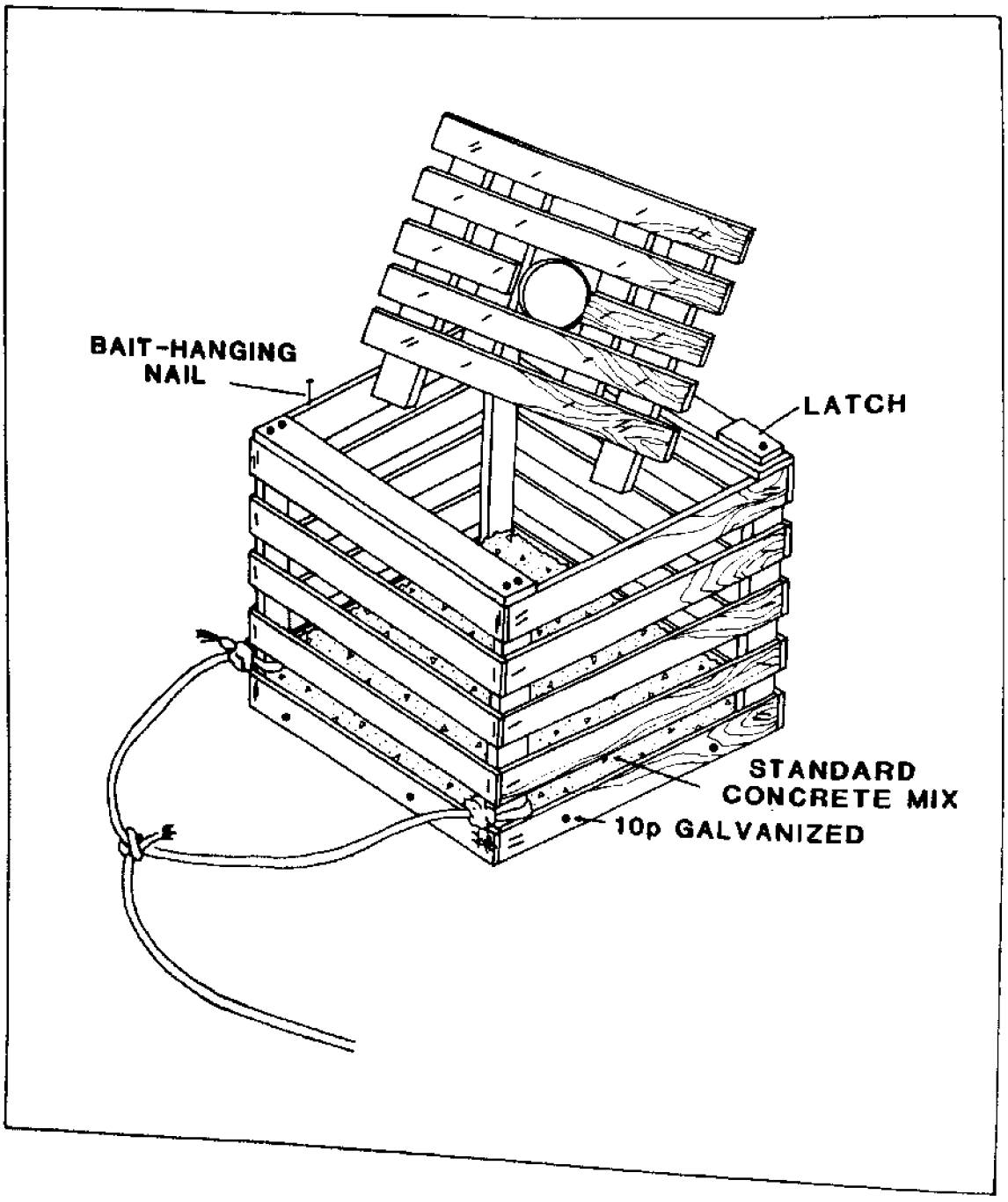

Figure 1. Stone crab pot.

Fishing Techniques

During a 10-week period, from March into May 1985, 300 stone crab pots were fished. The pots were usually emptied and rebaited once a week. Data recorded for each pot set included bottom type, depth of water, soak time, bait type, bottom water temperature, and stone and blue crab catch. Each stone crab was sexed and the propodus (see Figure 2) of each claw measured. Also noted were the occurrence of regenerated claws and "handedness." Stone crabs have a large crusher claw and a smaller pincer claw; "handedness" simply refers to whether the crusher is the right or left claw. Claws were removed from the crabs by firmly grasping them and twisting them downward and inward. Properly removed claws should break cleanly from the crab and not tear out any flesh from the crab's body. Claws removed in this way will not kill the crab, which will grow new claws and continue to reproduce. All claws with a propodus length of 38 mm (1½ in.) or larger were removed from the stone crabs and measured. Many crabs were smaller than this, which often allowed them to escape from the pots, making an accurate count impossible.

Lower Barataria Bay, a high-salinity estuary, has many different bottom types and depths (Figure 3). The sites for fishing the pots were selected to cover as many different bottom types and depths as possible. A description of the fishing stations is given below. The length of time each station was fished during the study is shown in Figure 4.

Station A. Shallow (2-5 ft) edge of a deepwater channel in Bayou Rigaud. Soft bottom. Channel carries heavy vessel traffic.

Station B. Open water, moderate depths (5-7 ft) near or on the edge of an oyster reef. Mixed but moderately firm bottom.

Station C. Open bay, moderate depths (6-10 ft) near and on the edge of an oyster reef. Pots moved after two weeks because of objections from an oyster fisherman.

Station D. Open bay, moderate depths (5-9 ft), near an oyster reef. Firm bottom. Pots moved after two weeks because of objections from an oyster fisherman.

Station E. Open bay, moderate depths (5-9 ft), near an oyster reef, medium to soft bottom. Pots moved after two weeks because of objections from an oyster fisherman.

Station F. Open bay, shallow to moderate depths (3-9 ft), hard sand bottom. Pots moved after two weeks because of objections from an oyster fisherman.

Station G. In Bayou Fifi out into the open bay. Moderate to deep water (5-14 ft), moderately firm bottom.

Station H. In Bayou Fifi out into the open bay. Moderate to deep water (6-14 ft), moderately firm bottom.

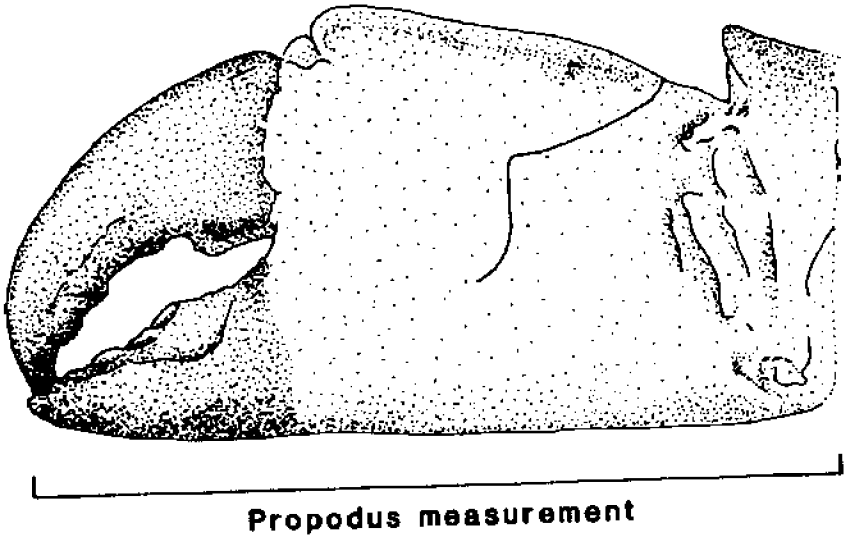

Figure 2. Stone crab propodus (claw).

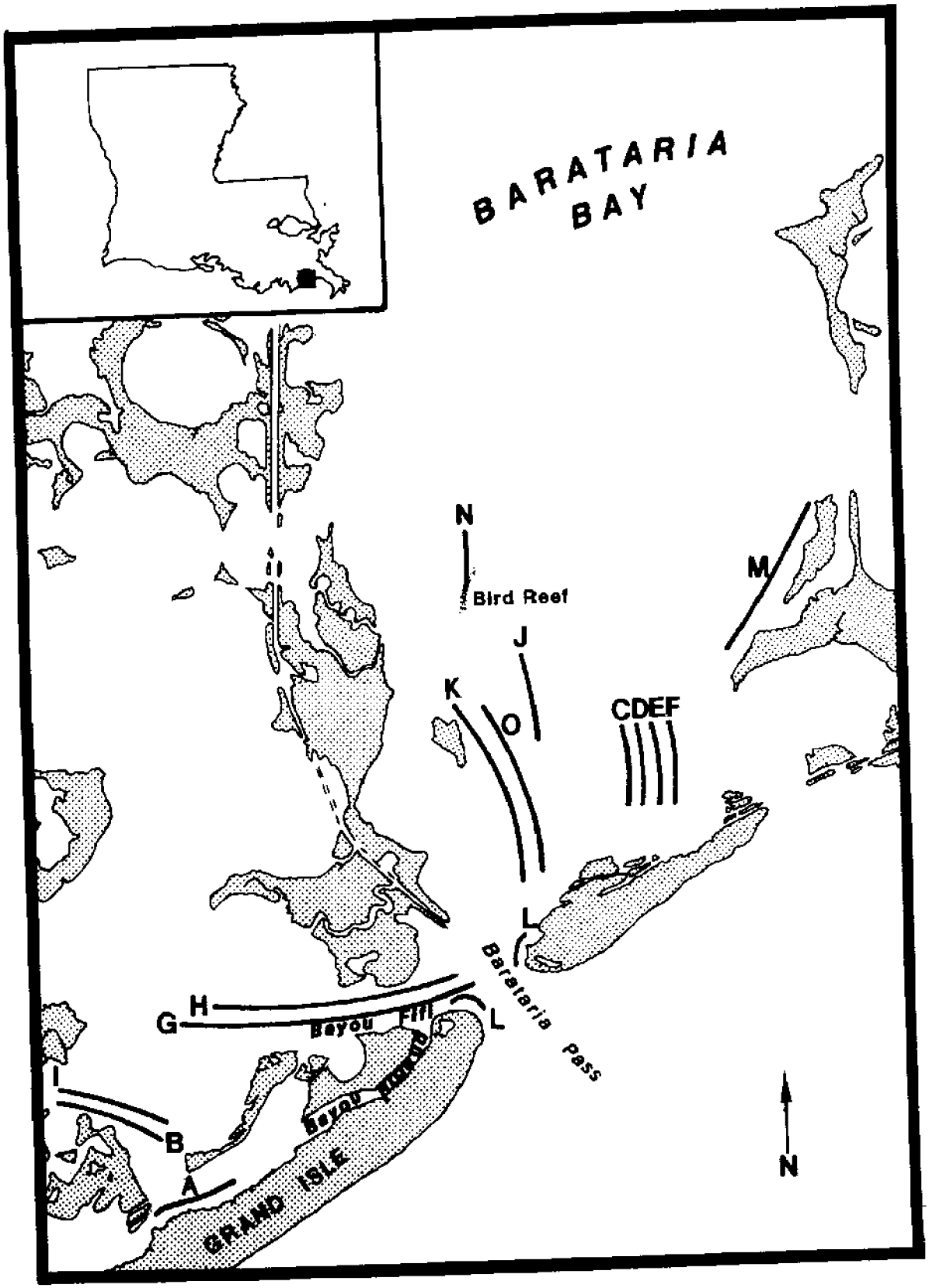

Figure 3. Map of the study area and pulling stations.

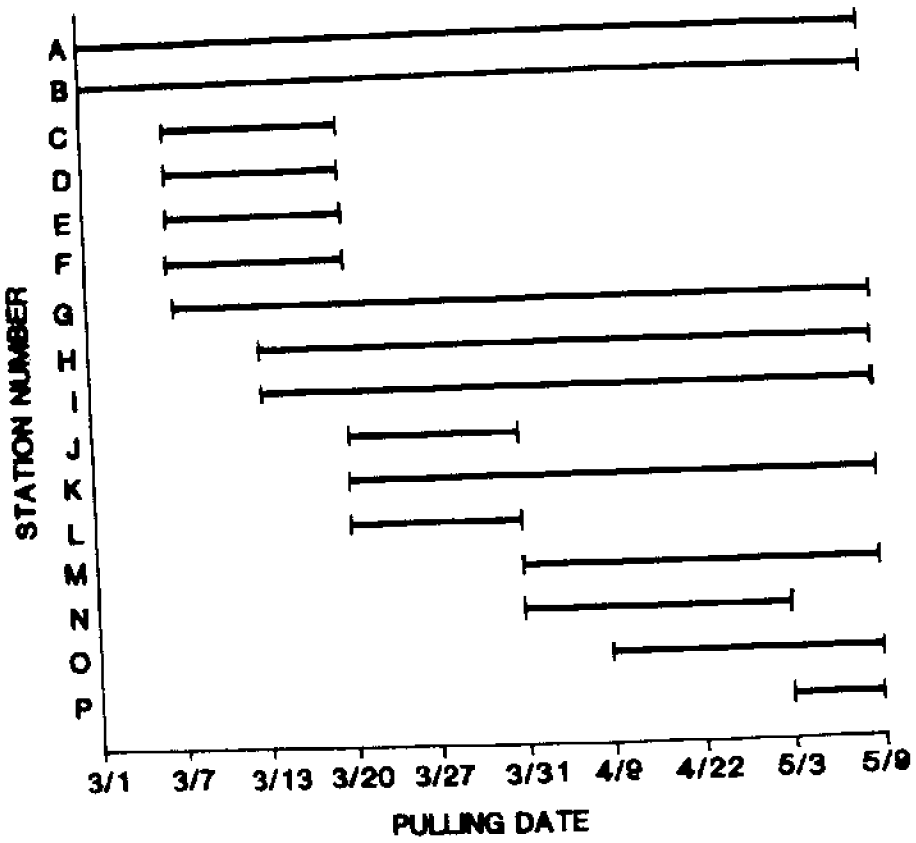

Figure 4. Stone crab trap fishing period for each station in Barataria Bay, Louisiana, 1985.

Station I. Open water, moderate depths (5-7 ft), mixed but moderately firm bottom.

Station J. Open bay, deep (8-14+ ft) with soft bottom. Pots moved after two pullings.

Station K. Open bay but across the channel, moderate to deep (5-14+ ft), very mixed bottom, from an oyster reef area on one end to soft mud on the other.

Station L. Immediately inside Barataria Pass on either side, shallow to moderate depths (4-8 ft), hard sand bottom. Traps removed after two weeks because of burial in sand.

Station M. Open bay near island. Moderate depths (5-8 ft), firm bottom, on the edge of an oyster reef.

Station N. One end on natural shell reef (Bird Reef) dropping off into soft bay bottom, shallow to moderate depth (4-9 ft).

Station O. Open bay across channel, deep (7-14+ ft), moderately firm, mixed to firm sand bottom.

RESULTS AND DISCUSSION

During the study, the catches of 2,193 pots produced 959 stone crabs and a total of 1,603 claws (Table 1). Of the crabs caught, 79 were clawless (assumed to be mostly recaptures), and 157 had only one claw. By-catch consisted almost entirely of blue crabs (2,512), oyster drills (Urosalpinx cinerea), and a few sea catfish (Arius felis). Many of the blue crabs were either in the soft-shell stage or near shedding.

The wooden pots used in this study appeared to catch several times more stone crabs than did wire blue crab pots fished during the same period in the same waters by other fishermen. We ran our pots an average of once a week. Three times, however, selected pot lines were checked after three days, the crabs counted (but not removed), and the pots returned to the water. Since the stone crab catch did not increase with additional soak time in any of these pots, the bait apparently draws crabs for only three days at most. Evidence of cannibalism was also noticed in the traps containing many stone crabs left in the water a week or more; the crabs began to feed on each other after they ran out of bait.

Currently, Florida, the only commercial producer of stone crab claws in the United States, has a legal minimum claw (propodus) length of 2-3/4 in. (70 mm). All claws marketed from Florida are considered medium or large. In the marketplace, claws weighing 3 oz or more are considered large. Of the claws harvested during this study, 60.6% were small, 28.1% were medium, and 11.3% were large. Premium prices are paid for larger claws, although the current shortage of claws has narrowed the price difference between sizes, and small claws are also in demand.

Table 1. Number and percentage composition of claw sizes in the exploratory commercial harvest of stone crabs in Barataria Bay, Louisiana.

Claw size	Number	Percentage of total catch (%)
Small claws		
Pincers	670	41.8
Crushers	302	18.8
Total	972	60.6
Medium claws		
Pincers	131	8.2
Crushers	319	19.9
Total	450	28.1
Large claws		
Pincers	1	< 0.1
Crushers	180	11.3
Total	181	11.3
Total, all sizes	1,603	

Although this study is by no means conclusive, some relationship apparently exists between rate of catch and bottom types and water depth. We found that the stone crab catch increased as water depth increased (Table 2). Catches averaging over one crab per trap occurred at all depths 11 ft and deeper (Figures 5 and 6 also show this trend). Stations A, B, I, and M (Figure 5) were entirely in shallow water (less than 10 ft). Stations G, H, K, and O (Figure 6) were deepwater sets in which many or most of the pots were fished in water deeper than 10 ft.

The deepwater stations did show a general drop in catch rate during the last two weeks of the study. At the same time, the shallow-water stations showed an upward trend in catch rate. This may indicate that the stone crabs were moving into shallower waters. Overfishing did not cause the decline in catch in the deepwater stations because, after removal of their claws, all crabs were returned to the same station area where they were caught. The catch of both claw-bearing and declawed animals declined. Survival of declawed crabs appeared to be quite good; 8% of the total catch over the study period was clawless crabs. These declawed, recaptured crabs were lively and most exhibited limb buds ("rubber legs").

Bottom type did not seem to affect the catch rate of stone crabs as much as did depth of water (Table 3). Bottoms composed of or containing oysters or shells did appear to produce better catches.

The majority of crabs of both sexes were right-handed. Handedness for the total catch and for each sex was as follows:

	Right-handed	Left-handed
Total catch	76.0%	24.0%
Females	73.7%	26.3%
Males	79.9%	20.1%

The sex ratio of stone crabs captured in this effort was 65% female, 35% male. No change in the sex ratio was noted during the course of the study.

The beginning of the stone crab spawning period occurred during the study (Table 4). By the end of April, almost half of the females were carrying an external egg mass (sponge).

Louisiana's inshore coastal waters could possibly support at least a marginal commercial fishery for stone crabs. This assessment is based on two observations.

1. During this study, the catch rate was 1 to 1½ stone crabs per pot per run in the areas of highest production (Table 2). An average of 4 oz of salable claws were taken from each animal during this study. At the claw price of $4.50/lb (assuming prices remain what they were in the spring of 1985), this would produce a gross revenue of $1.12 to $1.68 per trap, or $336 to $504 per 300-trap string, per run.

Table 2. Stone crab catch in relation to water depth in Barataria Bay, Louisiana.

Depth range (ft)	Number of pots fished	% of total pots fished	Number of crabs caught	% of crabs caught	Average number of crabs caught per pot
2-3	5	0.2	1	0.1	0.20
3-4	39	1.9	4	0.4	0.10
4-5	142	7.0	32	3.4	0.23
5-6	309	15.3	65	6.9	0.21
6-7	472	23.4	77	8.2	0.16
8-9	320	15.8	167	17.8	0.52
9-10	109	5.4	85	9.1	0.78
10-11	42	2.1	31	3.3	0.74
11-12	30	1.5	34	3.6	1.13
12-13	27	1.3	39	4.2	1.44
13-14	27	1.3	46	4.9	1.70
14-15	15	0.7	19	2.0	1.27
Over 15	102	5.0	156	16.7	1.53

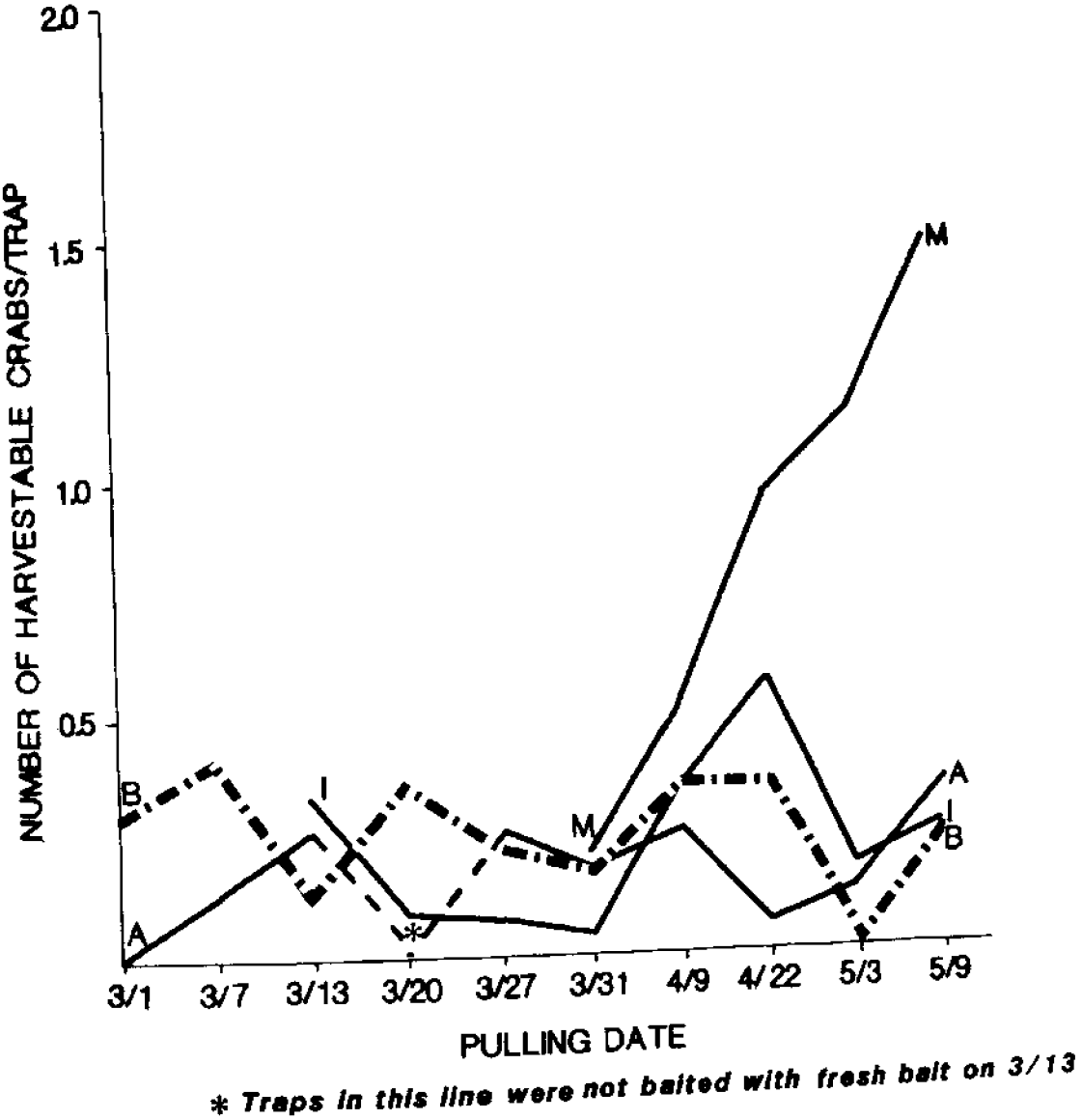

Figure 5. Stone crab catch in shallow-water stations of Barataria Bay, Louisiana, in 1985.

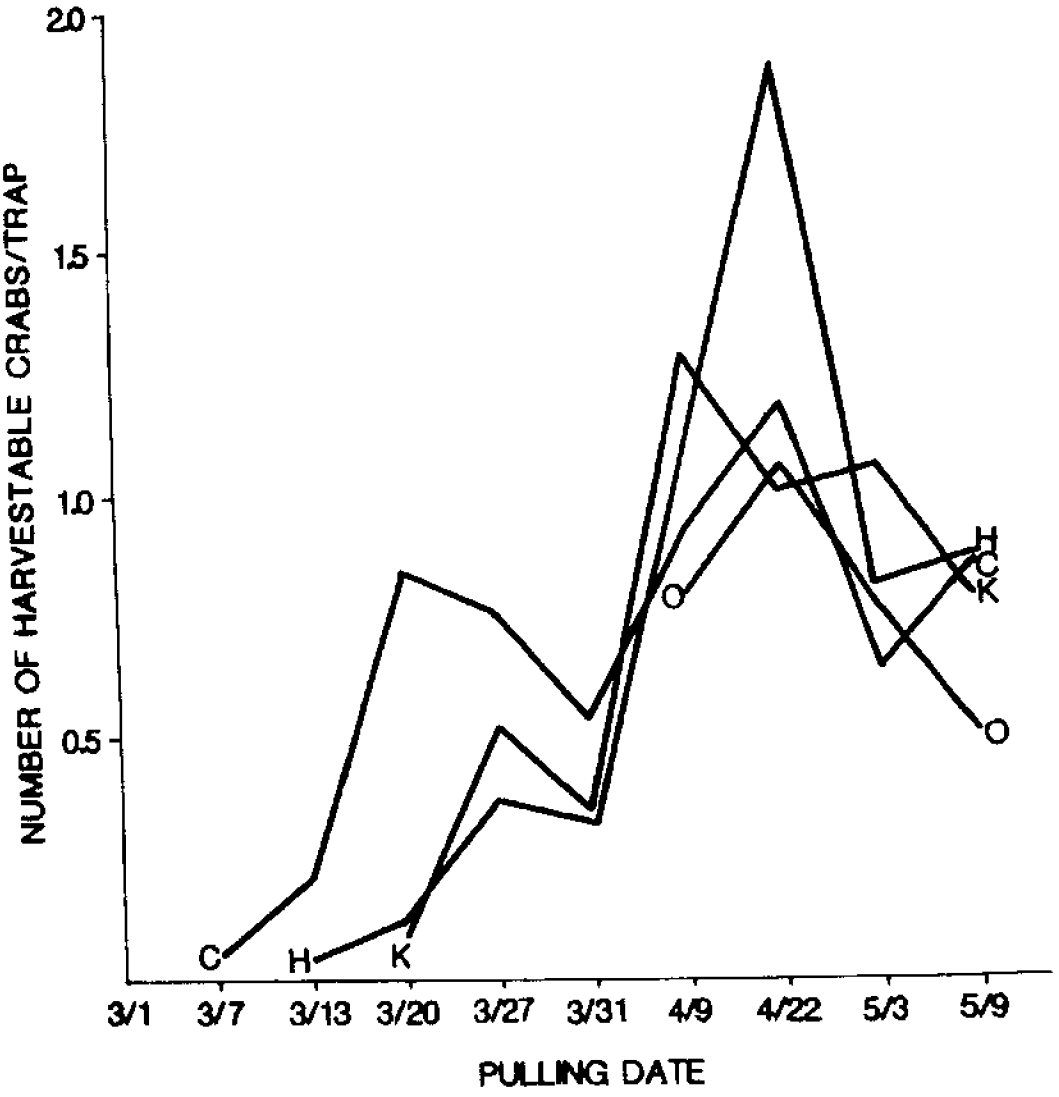

Figure 6. Stone crab catch in deepwater stations of Barataria Bay, Louisiana, 1985.

Table 3. Stone crab catch by bottom type in Barataria Bay, Louisiana.

Bottom type	No. of pots	Total crab catch	Average crab catch per pot
Mud	415	99	0.24
Mud and shell/oysters	69	27	0.39
Clay	506	212	0.41
Sand	455	196	0.43
Sand and shell/oysters	65	28	0.43
Shell	110	58	0.52
Clay and shell/oysters	224	139	0.62
Oyster reef	54	36	0.67

Table 4. Total female stone crabs caught, number of ovigerous (egg-bearing) females, and the percentage of total females caught that were ovigerous, by date, during the study in Barataria Bay, Louisiana.

Pulling date	Total females caught (no.)	Ovigerous females (no.)	% of total females ovigerous
3/01/85	4	0	0
3/07/85	17	0	0
3/13/85	19	0	0
3/20/85	34	0	0
3/27/85	70	0	0
3/31/85	40	1	2.5
4/09/85	114	5	4.4
4/22/85	139	64	46.0
5/03/85	95	52	54.7
5/09/85	90	40	44.4

2. According to reports by commercial fishermen, the stone crab by-catch in blue crab pots is much better in the marshes and bays east of the Mississippi River than in Barataria Bay. At certain times of the year, the by-catch of stone crabs is as high as two to three per blue crab pot. This certainly indicates that a commercially harvestable population of stone crabs may exist in this area.

Until more research and commercial fishing effort is directed at the stone crab, however, this potential fishery must be considered marginal in spite of the salable blue crab by-catch.

RECOMMENDATIONS

1. For stone crab fishing, wooden stone crab pots should be used rather than wire blue crab pots as they appear to be more efficient.

2. Fish heads are apparently the best bait. The pots used in this study did not have a bait box. The bait was wired onto a nail on one side of the pot. The fish heads were tough enough to last under these circumstances. As an alternative, a wire bait box may be placed in one corner of the pot to protect softer baits from the crabs' claws.

3. Fishing effort in the spring should be concentrated in deeper waters. The stone crab catch was several times higher in deeper waters than in shallower waters. Stone crabs may migrate to shallower waters as the season progresses. However, this study did not extend far enough into the year to verify this.

4. The pots should be run at intervals of no more than two to three days. Although the crab catch may not decline (marketable size crabs cannot crawl out of this pot) after three days, a longer interval allows more opportunity for theft of the catch, and a larger catch can be obtained with several baitings per week.

5. Stone crab claws may be broken from the crabs as they are removed from the traps, or the whole crabs may be held until the end of the run. Either way, the claws should be kept in a shaded area away from the wind and sun. The claws <u>cannot</u> be iced or frozen until after they have been boiled. If the claws are iced or frozen before cooking, the meat will stick to the shell, and the claws will be worth little or nothing. The boiling period is 8 minutes, and the claws may be refrigerated, iced, or frozen after boiling.

6. New wooden stone crab pots will catch more crabs after a two-week soak period. They can be fished during the soak period, but the catch may not be as large.

7. Considering the high demand and high prices for stone crab claws, blue crab fishermen should keep and sell them. At current prices, each stone crab caught is worth approximately one dollar. At the very least, this will help pay for expenses incurred in a normal blue crab fishing operation.

APPENDIX:

COST AND CONSTRUCTION

OF

STONE CRAB POTS

COST OF CONSTRUCTION

Unlike those for blue crabs, stone crab pots cannot be bought ready to fish in Louisiana, but must be built by the fisherman. The cost of materials for one stone crab pot, including 20 ft of rope and one 6-in. float, was $8.00 in May 1985.

POT CONSTRUCTION

The materials needed for construction of a single stone crab pot are listed below. All pine strips are 1 x 2 in., and all cypress lathes are ¼ x 1½ in.

26 cypress lathes	16 in. long
2 cypress lathes	6 in. long
2 cypress lathes	3 in. long
4 pine strips	11 in. long
2 pine strips	14 in. long
2 pine strips	12 in. long
1 4-in. diameter PVC pipe	3½ in. long
8 hot dip galvanized nails	10d common
10 hot dip galvanized nails	3d common
staples and air staple gun	
concrete (one yard per 175 pots)	
30 in. of ¼-in. rope	

The use of "jigs" (forms mounted on a solid work table) makes construction of stone crab pots much easier. The jig holds the 1-x-2-in. pine strips at the right spacing so that the lathes can be stapled in place quickly. A jig for the sides of the stone crab pot is shown in the lower part of step 1 in Figure 1A.

After setting up the jig, the first step is to lay two 11-in. pine strips in the jig. With an air-powered staple gun, staple five of the 16-in. lathes in place across the strips, spacing them evenly. This will produce one side of the trap (step 1, Figure 1A).

Repeat these steps to produce another side. Tack the two sides together (step 2, Figure 1A) with two more 16-in. lathes using 3d nails or staples. Lay the trap on its side, and staple five more evenly spaced lathes on each of the two open sides. You should now have a bottomless and topless trap (step 3, Figure 1A). After drilling two small holes in each of the four bottom lathes, drive 10d nails all the way in until the head is flush with the wood. These nails will hold the concrete floor in place. After placing the trap frame on a sheet of plastic, pour just enough concrete into the bottom to cover the nails completely (step 4, Figure 1A). Do not pour too much concrete in, or the trap will be heavy and hard to handle. Allow the concrete to dry completely before handling.

The lid is also constructed with a jig (step 5, Figure 1A). Put the two 14-in. pine strips in the outer grooves of the jig and the two 12-in.

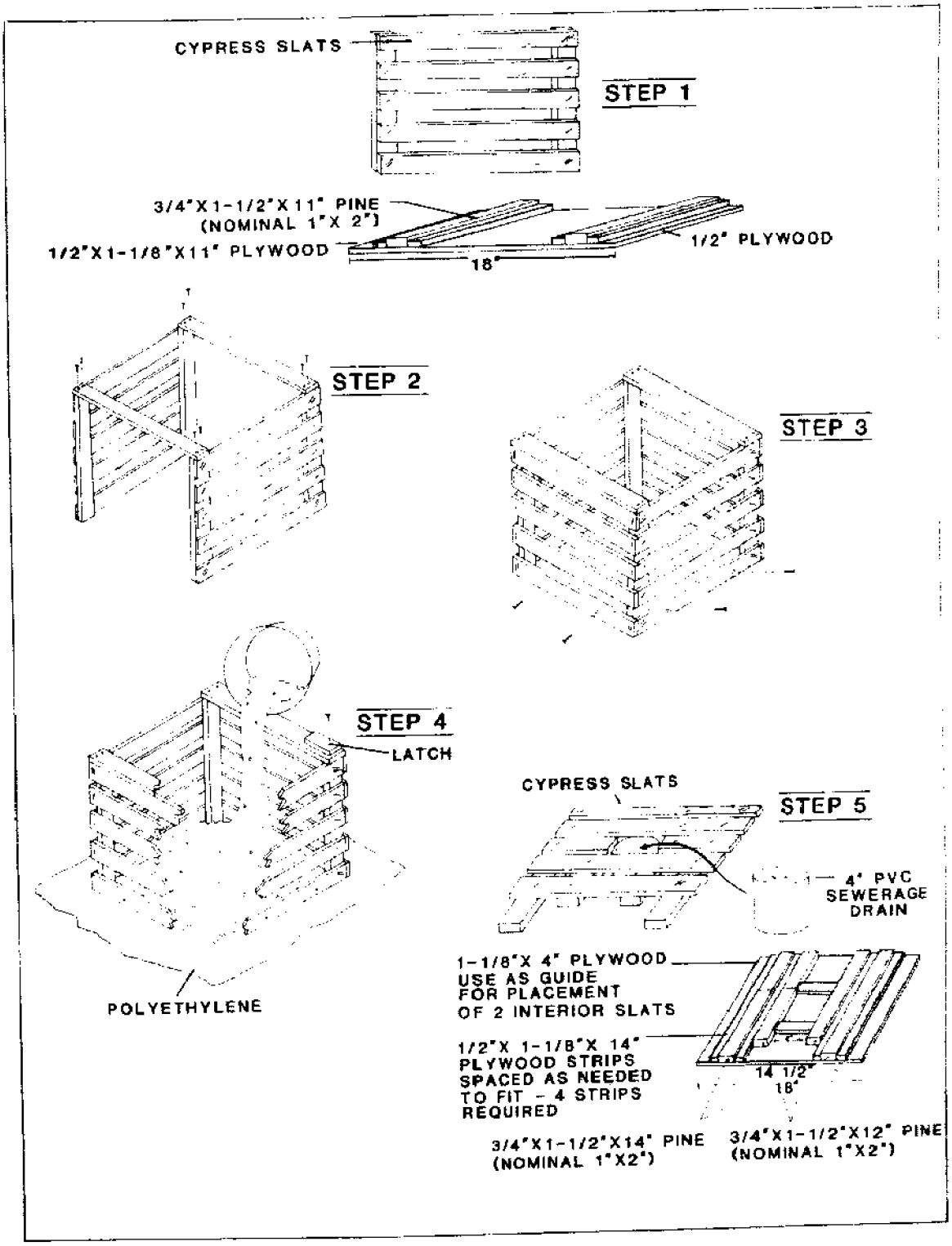

Figure 1A. Stone crab pot construction.

pine strips in the inner groves; staple four 16-in. and two 6-in. lathes in place, as shown in step 5.

Drill two holes opposite each other in the PVC pipe, ¼ in. from the edge. Through these holes, nail the PVC pipe to the inner pine strips. This completes the lid.

Nail the two 3-in. lathes on the corners of the trap as latches (Figure 1A), and tie a 30-in. piece of nylon or polypropylene rope on the lower corners for a bridle. The trap is now ready for the buoy and buoy line.

In Florida, stone crab traps frequently are dipped in a mixture made up largely of used motor oil to prevent marine borers from damaging the trap. This was not done during this study.

It is a good idea to carry along a supply of extra lathes and nails because the traps are often damaged in the process of setting them and pulling them in.

NOTES: