SRAC Publication No. 2400

Southern Regional Aquaculture Center

May 2004

Crawfish Production: Harvesting

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Freshwater crawfish of the genus *Procambarus* are a valuable aquaculture commodity in the southern U.S., with annual production of 30 to 50 million pounds and farm-gate values of $25 to 50 million. Crawfish are produced on more than 120,000 acres, with more than 90 percent of it in southern Louisiana. Unlike fishes, crawfish are not harvested by seining. Instead, crawfish are harvested with a passive system that uses baited traps.

Harvest begins as early as mid-November in the deep South and continues through April to June. If fall and winter production of juveniles is low, and in areas farther north, harvest seldom begins before March and often continues into late July.

Crawfish are harvested frequently during the season. They may be harvested from well-managed ponds 40 to 90 days per year. In the deep South, two-thirds of the crop is usually harvested from March through June when densities of marketable crawfish are highest and crawfish are most active.

Trapping is labor intensive and accounts for more than half of the total production expense. Bait and labor are the major costs (Table 1). Efficient harvesting is essential for crawfish farming profitability.

Factors influencing crawfish catch and harvest size

The crawfish catch from production ponds often varies 2- or 3-fold from day to day (Fig. 1). Catch is influenced by many factors, primarily water temperature and the density of marketable crawfish. Other factors are water quality, type and quantity of vegetative forage, weather, lunar phase, and crawfish reproduction, growth and molting patterns. Table 2 summarizes the major factors affecting crawfish catch.

Size at harvest is influenced more by environmental conditions than by genetics. Crowding reduces growth and can cause stunting. Crawfish are aggressive and territorial, so larger crawfish intimidate and out-compete smaller individuals. Crawfish should be harvested soon after they reach marketable size. This removes larger individuals from the population, reducing aggression and leaving space and food resources for undersized animals. The minimum marketable size for crawfish varies with season, abundance and price; however, consumers prefer a count of 23 individuals per pound and larger (i.e., 3 1/2 inches and larger). Large crawfish, 10 to 15 count per pound, usually command premium prices.

Table 1. Estimated production costs per acre for single-crop crawfish in southwest Louisiana.

Expense	$/Acre	% of Total
Harvest	**196**	**55**
Bait	105	30
Labor	75	21
Sacks	12	3
Fuel	4	1
Water management	**84**	**23**
Forage/fertilization/custom	**44**	**12**
Repair & maintenance	**18**	**5**
Interest on operating capital	**17**	**5**
TOTAL	**359**	**100**

Source: Projected costs and returns for crawfish and catfish production in Louisiana, 2003, A.E.A. Information Series No. 206, Department of Agricultural Economics and Agribusiness, LSU AgCenter, Baton Rouge, LA.

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Traps

For years, most crawfish traps were made of 3/4-inch, plastic-coated, hexagonal mesh wire (poultry wire), 19 or 20 gauge. This mesh retained crawfish of minimum marketable size—about 3 inches and longer (35 count per pound). Although these traps are still used, most new traps are made of 3/4-inch welded square mesh wire. The square mesh wire is more durable and retains smaller crawfish, thus increasing yield. The small crawfish can be a problem for buyers and processors, however.

The "pyramid trap," with three entrance funnels, has become the industry standard (Fig. 2). Optional cylindrical extensions, usually 6 inches long, can be added to increase the height of the trap for use in deeper water. A 6-inch-diameter plastic pipe (or extruded collar) is placed at the top of the trap to function as a handle and to prevent crawfish from escaping through the open top. Most traps are made from 24-inch-wide by 44-inch-long or 24-inch-wide by 54-inch-long wire. The overall dimensions of traps are about 17 inches wide at the base and, with a 6-inch extension, about 26 inches tall.

The inside diameter of entrance funnels is usually 1 3/4 to 2 inches. Because wind, waves and avian predators (herons and egrets) that perch on the plastic extensions can cause traps to topple, metal supporting rods (5/16 inch diameter) are often added for stability. Crawfish traps do not have bait protection containers as do crab or lobster traps because they reduce the catch.

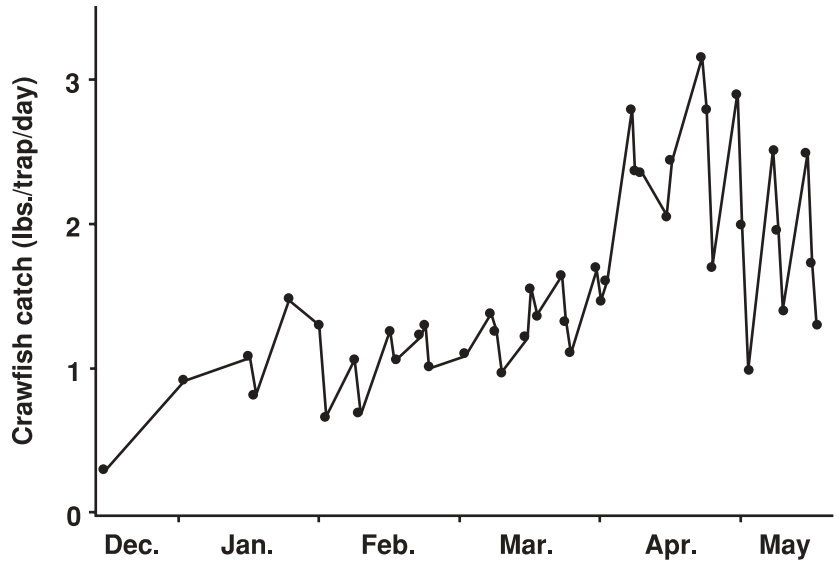


Figure 1. An example of the seasonal trend in crawfish catch from a Louisiana crawfish pond.

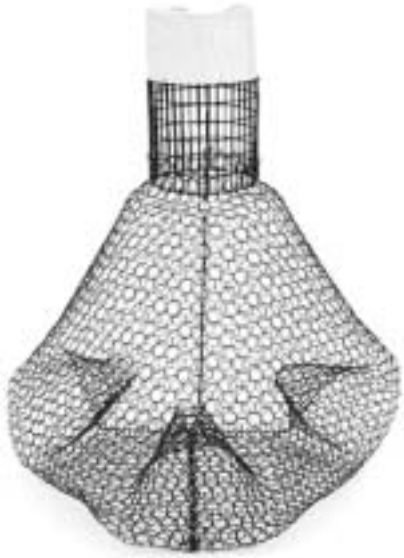
Baits

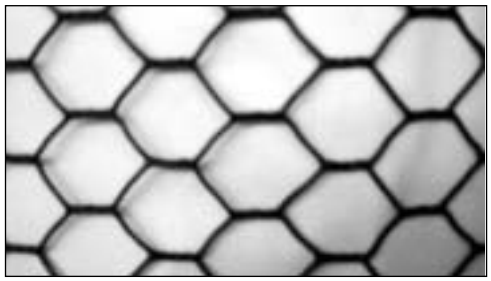
Traps must be baited to attract crawfish. Bait accounts for nearly one-third of total production cost. The cost of bait depends on the type used, amount used per trap, trap density, and trapping frequency. The two types of bait used are natural fish baits and formulated baits.

Fish baits are usually sold frozen in 80-pound or 100-pound boxes. Clupeid or sardine-like fishes, specifically gizzard shad and Gulf men-

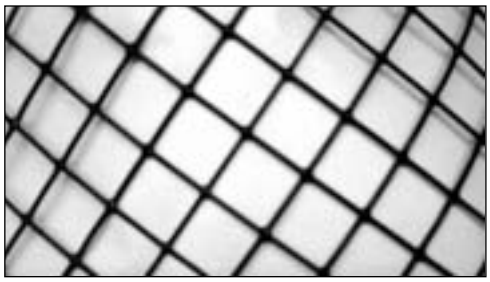
Table 2. Factors that influence daily and seasonal crawfish catch.

Factor	Catch decreases	Catch increases	Reason
Water temperature	Cooling	Warming	Regulates crawfish feeding activity
Crawfish density	Sparse	Abundant	Regulates standing stock of harvestable crawfish
Relative abundance of vegetation	Abundant	Sparse	Abundance of natural foods and bait attractants not easily dispersed
Short-duration rain showers and flowing water	—	Usually	Aids in attractant dispersal; reduced light stimulates crawfish movement
Mass molting	Usually	—	Crawfish cease feeding during pre-molt, molt and post-molt phase
Lunar phase	Full moon	—	Appears to influence molting
Cold fronts	Usually	—	Cool water decreases feeding activity
Harvesting intensity	Daily over several weeks	Intensive followed by "rest" period	Influences standing stock of harvestable crawfish





3/4-inch hexagonal mesh



3/4-inch square mesh

Figure 2. Pyramid crawfish trap. (photos, John Wozniak and W. R. McClain, LSU AgCenter).

haden or "pogy" (Fig. 3), are the most widely used natural baits in Louisiana where there are commercial fisheries for both species. They can be difficult to obtain in commercial quantities in other southern states. Herrings, common carp, suckers, and catfish and buffalofish heads are also used. Shad, menhaden and carp attract crawfish better than other natural fish baits. Beef pancreas ("beef melt"), commonly used by recreational trappers, is an effective attractant but too expensive for commercial use.

Formulated crawfish baits, often referred to as "artificial" or "manufactured" baits, were commercialized in the early 1980s and are produced by several feed companies. These cylindrical pellets contain mostly cereal grains, grain by-products, commercial flavoring agents, and a binder. They are usually 1/2 to 2 inches in diameter and 1 1/2 to 3 inches long (Fig. 3) and are sold in 50-pound bags. Some companies offer different formulations for use in cool or warm water.

The availability and price of fish baits are seasonal and they are more expensive than formulated baits. Large farms may have freezers or coolers for storing bait, but smaller farms require daily deliveries. The swimbladder of each fish must be punctured so it will sink, and it must be cut into efficient sizes. This labor adds to the cost. Formulated baits do not require refrigeration and are easier to handle.

Baiting strategies

Using efficient baiting strategies can reduce costs significantly. Shad and menhaden are more effective attractants than formulated baits when water temperature is less than 70 degrees F (Fig. 4). In Louisiana, fish baits are used almost exclusively during winter and early spring (November through March). Even though fish baits are more expensive, the average 2- to 3-fold increase in catch compensates for the additional cost.

When water temperature is higher than 70 to 75 degrees F and ponds become deficient in forage (late March to early April in south Louisiana), formulated baits are equally effective or more effective than fish baits and, thus, more cost-effective. When water temperature is 65 to 75 degrees F, using a combination of fish and formulated bait in approximately equal portions can increase catch as much as one-third over fish alone or formulated bait alone; however, the inconvenience of handling two baits at the same time should be considered.

Figure 3. Commonly used crawfish baits (top: gizzard shad; middle: menhaden or "pogy;" bottom: manufactured baits) (photo, Vernon Pfister, LSU AgCenter).

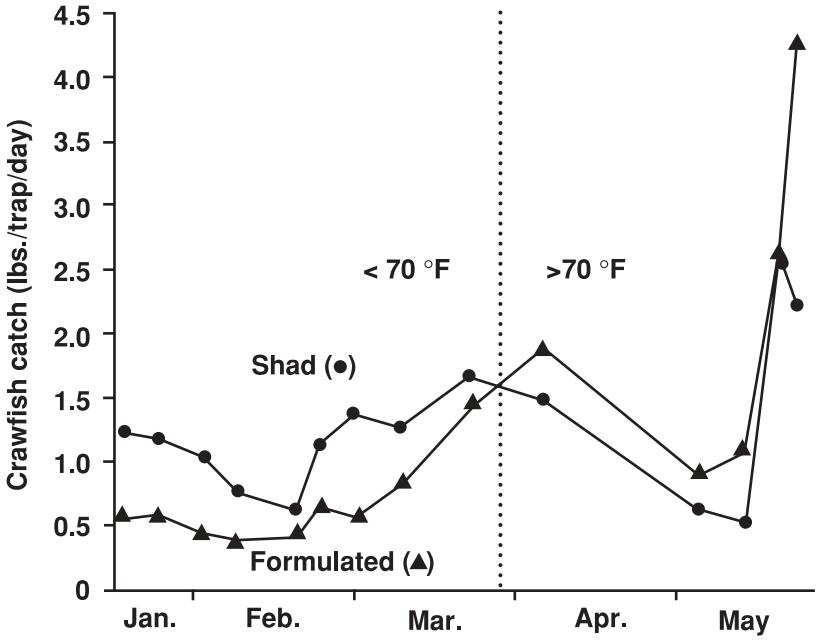


Figure 4. The effect of water temperature on the effectiveness of shad (●) and a formulated bait (▲).

During winter, when crawfish feeding is minimal and the crop of harvestable crawfish is relatively small, using 1/4 pound of bait per trap is sufficient. When water warms in the spring and the crop is near maximum levels, bait should be increased to about 1/3 pound per trap. Although it is not practical to weigh the bait going into each trap, the farmer can monitor bait use by keeping good records of the total quantity of bait used for the number of traps placed. For example, when using 1/3 pound of bait per trap per day, a 100-pound box of fish bait should be enough for 300 traps. If only 200 traps are baited, then using 100 pounds of bait would be too much and would reduce profit. A 50-pound bag of formulated bait is enough to bait 150 traps. The farmer should pay attention to the amount of bait remaining in the trap after a 24- or 48-hour soak. If a large amount remains, the bait amount can be reduced; if bait is rapidly consumed the farmer might consider increasing the amount of bait. Fresh bait should be used each trapping day, especially with fish baits. Bait residue should not be disposed of in the pond so that crawfish will move into freshly baited traps.

Trapping strategies

Traps are placed in rows so that harvesting can be done by boat (Fig. 5). The distance between traps depends on how many are used (Table 3). A spacing of 40 to 60 feet between traps and between rows is most common. Where annual yields of harvestable crawfish are expected to exceed 1,000 pounds per acre, there should be 20 to 24 pyramid traps per acre, baited and emptied three to four days per week. If buyers require daily delivery of crawfish, or if the price is high and the catch justifies the effort, crawfish can be harvested as often as five or six days per week. If there are several production ponds, harvesting can be rotated among them. Farmers often use a lower trap density of 12 to 15 per acre if there is a low standing crop of crawfish or if large areas must be trapped with limited labor.

Normally, traps are emptied 24 or 48 hours after baiting. The 48-hour soak time is generally used in late fall and winter when crawfish activity is slow and the standing crop of harvestable crawfish is low. On non-harvest days, unbaited traps need not be lifted from the water and emptied before baiting because no additional yield is obtained by removing these crawfish (often called "walk-ins") before baiting. To some extent, the average size of crawfish caught correlates with the time traps remain in the water. The shorter the trap set, the more small crawfish are caught. After the bait has been consumed or the attractants in the bait have dissipated, some smaller crawfish are able to escape through the entrance funnels. After several days of intense trapping, the average size of crawfish caught decreases as the standing crop of market-size crawfish decreases. If ponds with large crops of crawfish are not harvested often enough, forage will be deplet-

Figure 5. Spacing of pyramid traps in a commercial crawfish pond (photo, W. R. McClain, LSU AgCenter).

Table 3. Spacing between rows (in feet) and the distance between traps (in feet) to obtain a specified number of traps per acre.

Distance between rows	Distance between traps	Traps per acre
40	40	27
40	50	22
40	60	18
40	72	15
50	40	22
50	50	17
50	60	15
60	40	18
60	50	15
60	60	12

ed and crawfish will become more aggressive. This suppresses growth and, ultimately, reduces yield and profitability. Excessive trapping also can decrease harvest efficiency by removing crawfish before they have had time to grow to larger sizes.

Harvesting schedules and strategies sometimes must be adjusted to accommodate markets. Buyers may prefer to have crawfish delivered only on certain days, such as Thursday through Sunday, when demand is highest. Market demand for crawfish early in the season may allow for various sizes of crawfish to be sold with little problem; but when supplies are more abundant and buyers want only larger crawfish, trapping strategies may need to be adjusted, even at the expense of overall yield. Planning and good communication with potential buyers early in the season will allow a producer to respond to market preferences and improve his competitive position.

Harvesting machinery

Methods of emptying traps vary within the industry. Producers with ponds smaller than a few acres do not use motorized boats because of the added expense. If ponds are shallow, traps can be emptied by harvesters who walk along while pulling a small boat. One person can empty about 400 traps per day. Other trappers use a small, flat-bottom boat propelled with a push-pole or paddle. This method is no more efficient than walking.

In larger ponds, a motor boat adapted for shallow water is the most efficient harvesting equipment. One unit used widely in the crawfish industry is the Go-Devil®. Go-Devils® have 8- to 12-HP, air-cooled engines and long shafts with weedless propellers (Fig. 6). The boats have flat bottoms, are made from aluminum, and are typically 14 to 16 feet long and 4 to 6 feet wide. These boats travel down the lanes of traps while fishermen empty and re-bait each trap from one side of the boat without stopping at each trap. The boat usually requires two persons, one to empty and re-bait the traps and a second to steer. As many as 300 traps per hour can be emptied.

Many crawfish trappers prefer to use a rig designed specifically for harvesting crawfish (Fig. 7). This boat uses a 12- to 20-HP, air-cooled engine that operates a hydraulic pump and motor to propel a metal wheel that extends beyond the boat. Metal cleats are welded to the wheel, which is mounted either to the front to pull the boat forward, or to the rear to push the

Figure 6. A crawfish harvesting boat powered by a Go-Devil propulsion unit (photo, LSU AgCenter).

Figure 7. A crawfish harvesting boat powered by a forward-mounted hydraulic wheel (photo, LSU AgCenter).

Figure 8. An in-boat crawfish grader and sacks of crawfish (photos, W. R. McClain, LSU AgCenter).

boat in shallow water. The hydraulic steering can be operated with foot pedals, leaving the driver's hands free to empty and rebait traps. One person can handle about 150 to 200 traps per hour and up to 300 traps per hour can be emptied and baited with two persons.

Boats are equipped with sacking tables to consolidate harvested crawfish. Trap contents are emptied onto the sacking table, which usually has one to four loose mesh "vegetable" sacks temporarily attached. Each sack can hold 35 to 45 pounds of crawfish. Bait residue and other debris remain on the table to be discarded, while crawfish drop into the hanging sacks. More producers are using in-boat graders to cull less than market-size crawfish at the pond (Fig. 8). Larger crawfish remain on the grader and are sacked. Smaller crawfish are usually returned to the pond.

Future developments in crawfish harvesting

Present methods for harvesting crawfish are labor intensive and relatively inefficient. Harvesting gear and techniques need to be refined. For example, if existing traps were modified or new trap designs developed so that fewer marketable crawfish escape, the trapper could use fewer traps and harvest on fewer days to lower costs. Developing low-cost formulated baits that are effective in cold and cool water also would reduce harvesting costs. Devices for active harvesting without traps and baits have been investigated, and although some of these devices have shown promise they have not yet proved to be economical or free of technical problems. Active harvesting with nets or trawls would likely require significant changes in cultivation practices.

Also see SRAC Publication 240, "Crawfish Production: Production Economics, Pond Construction and Water Supply," and SRAC Publication 241, "Crawfish Production: Production Systems and Forages."

Crawfish Harvest Recommendations at a Glance

Three-funnel pyramid trap, 3/4-inch hex or square wire

20 to 24 traps / acre

Trap 3 to 4 days / week

24- or 48-hour trap soak time

40 to 90 trapping days per season

Use fish baits at <70 °F

Use formulated baits at >70 °F

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

The work reported in this publication was supported in part by the Southern Regional Aquaculture Center through Grant No. 2001-38500-10307 from the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service.