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FACT SHEET

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FARMING FRESHWATER SHRIMP

Robert W. Brick and James T. Davis*

Freshwater or river shrimp of the genus *Macrobrachium* are found in many streams and rivers in Texas. Native species are *Macrobrachium acanthurus, M. carcinus, M. ohione* and *M. olfersii*. In past years, these species have been trapped by fishermen for either bait or human food and some large river shrimp have been featured by restaurants as a menu specialty.

Interest has developed recently in raising freshwater shrimp for private use or for sale as a commercial commodity. Farmed shrimp can be used for human food, bait, the aquarium trade (as ornamentals or food for ornamental fish) and perhaps other purposes.

The species of freshwater shrimp which shows the greatest promise for survival and growth in farm ponds is *Macrobrachium rosenbergii*. This species, closely related to those in Texas, was imported from Asia to Hawaii during the 1960s. Basic farming techniques were developed in Hawaii and have been used from coast-to-coast in this country as well as around the world.

This publication describes the operating procedures for a small-scale freshwater shrimp farm in Texas and other areas with similar climate. If economical, the procedures can be adapted for larger-scale operations. In general, more extensive management than that recommended for an initial program will achieve greater economic efficiency.

Objectives

Although additional markets for freshwater shrimp may be developed in the future, present markets are limited. Rearing shrimp for human consumption may be a primary objective but do not overlook the bait and aquarium markets for juvenile shrimp. Various markets may be integrated to form a relatively comprehensive program. Such programs should evolve from simpler operations and in response to a demand for the particular type or size of shrimp.

*Assistant professor and Extension fisheries specialist, Texas A&M University System.

Ponds

Ponds continue to be basic "farming units" for aquaculture. Ponds for freshwater shrimp should have the same features as fish ponds — 1) good water-holding characteristics, 2) a dependable source of water, 3) flat bottoms sloping from a depth of 3 to 4 or 5 feet (when pond is full), 4) good drainage and 5) protection from flooding. While specific locations dictate the size and shape of a pond, rectangular ponds 2 to 3 acres or less in size are most convenient. Information on pond construction and management is available in Extension publication B-213 *Improve Your Farm Fish Pond*, B-1024 *Channel Catfish Farming and B-1311 Raising Minnows*.

Water

Surface-water from rivers, streams, reservoirs and irrigation canals, direct run-off from rain or groundwater from wells may be used in rearing shrimp. Each source has different advantages and disadvantages. Consult local authorities, especially those from the county Agricultural Extension Service or the Soil Conservation Service, as well as fish farm operators, for an evaluation of available sources of water. Use of surface water requires a permit from the Texas Water Control Board, Austin, Texas. Use of well-water is prohibited in certain areas.

Freshwater shrimp generally grow well in water suitable for freshwater fish. Shrimp have no known unique requirements for water quality. Although freshwater shrimp are able to survive in half-strength sea water (about 17 parts per thousand salinity), their growth is retarded above 7 or 8 ppt. Excessively soft water (below 50 parts per million), hard water (above 1000 ppm as calcium carbonate) or water with an unusually high level of magnesium (200 ppm or higher) may cause poor survival and growth. Specific information in this area is limited.

Shrimp are susceptible to pesticides. Do not use ponds subject to aerial sparaying or to runoff water containing pesticides.

Order a preliminary analysis of water from intended shrimp ponds. Such an analysis may be obtained from many commercial laboratories or from the Soils

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Testing Laboratory, Texas Agricultural Extension Service, College Station, Texas 77843 (or Agricultural Analytical Services).

Stocking Juvenile Shrimp

Adult freshwater shrimp will mate and spawn in ponds. The females carry 20,000 to 80,000 eggs attached to their tails. The eggs change from bright orange to brown in color as they develop. About 20 days after being spawned, the eggs hatch, releasing tiny larvae which swim up into the water.

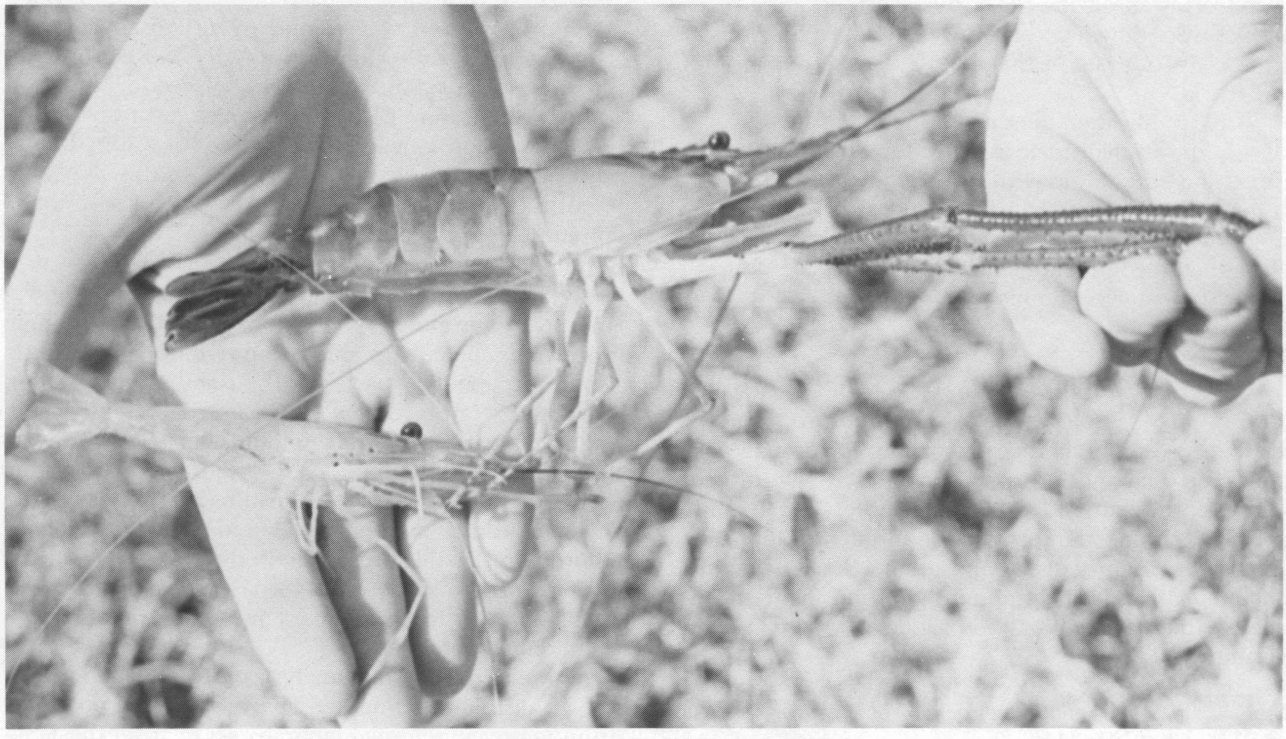
However, the larvae require brackish water and cannot complete their life-cycle in a freshwater pond. In nature, the larvae are swept with river water into estuaries where they develop in brackish water of 10 to 15 parts per thousand salinity. For aquaculture, juvenile shrimp for stocking ponds must be obtained from a hatchery. The only commercial hatchery in Texas is operated by CSCI, Inc., Box AK, Port Isabel, Texas 78578. The Weyerhaeuser Company, Homestead, Florida 33030 and Aquatic Farms, Inc., Box 1026, Kaneohe, Hawaii 96744 also produce juvenile shrimp. Please correspond with these companies for information concerning availability and prices of stock. Prices generally begin at about $25 to $50 for 1000 juvenile shrimp, but may go down as the quantity of the order increases. The shipping cost is often extra.

Stock juvenile shrimp at relatively low density (3 to 4 per square yard or 15,000 to 20,000 per acre) for initial programs. Juveniles obtained from a hatchery may be placed directly into freshwater. Transfer the shrimp from shipping bag to pond water slowly, to avoid shock from abrupt change of temperature. First, float the bags in the pond for 15 minutes to facilitate a gradual change of temperature. Then, mix pond water gradually with shipping water. The temperature of the pond water should be above 68 degrees F.

Fertilize the pond to support the growth of supplementary food for the small shrimp. The amount and kind of fertilizer varies with local soil and water characteristics. Apply fertilizers with a nitrogen-phosphorus-potassium ratio of 4-4-1 at a rate of 10 pounds of phosphorus per acre, 2 weeks before stocking. For example, 250 pounds of 4-4-1, 62 pounds of 16-16-4 and 50 pounds of 20-20-5, each contain 10 pounds of phosphorus. Two to three weeks after stocking, consider a second application at one-half the initial rate. An algal bloom of microscopic phytoplankton usually follows fertilization. That is followed by the growth of zooplankton — tiny swimming animals which serve as food for juvenile shrimp.

One or two days before stocking shrimp, check the pond for predaceous insect larvae. If present, eradicate them by pouring a 2 to 1 mixture of motor oil and diesel fuel onto the pond at a rate of about three or four quarts per acre. A surface film of oil should be maintained for at least five minutes to kill the insects. This technique is more effective on calm than on windy days.

This photograph of two shrimp from a production pond shows a mature male ready for harvest and a smaller shrimp which needs another 30 days to reach harvestable size.



Feeding

It is easier to feed and observe juvenile shrimp in a confined nursery area. However, do not use separate nursery ponds if harvesting would require seining. This is an inefficient process even with large shrimp. Alternative nursery-designs include a small partitioned area in the production pond or a separate nursery pond that drains into the main pond. Screens or nets could be used with the first design to hold the shrimp. Nursery ponds are beneficial, but not essential.

Whether juvenile shrimp are stocked into a nursery pond or directly into a grow-out pond, the extent of initial supplementary feeding depends on the presence of natural feeds — the mix of tiny plants and animals in the fertilized water. A range of supplemental feed of 5 to 10 pounds per acre is appropriate. For small shrimp, use a minnow or fry feed like that used with catfish or trout. Spread the feed over the pond since small shrimp must bump into their feed to find it. The feeding schedule and procedure should resemble that for minnows or other very small fish. Dividing a daily allotment into multiple feedings is better than a single feeding.

After four to six weeks, sample the pond (nursery or grow-out) to determine the growth and survival rate of the shrimp. This is usually a convenient time to transfer shrimp from a nursey area or pond to a production pond. Also change to a sinking-pellet type of feed at this time and feed late every afternoon or early evening at about 20 percent of the estimated total weight of shrimp in the pond. Catfish, minnow or trout feeds may be used. Occasional supplements with shrimp, or crayfish-waste meal is beneficial for the growth of the shrimp if it is available.

Continue sampling the pond (by seining or cast-netting) every 4 to 6 weeks, to estimate the weight of shrimp. This serves as the basis for calculating the amount of feed needed. Reduce the daily feeding from 20 percent to 15 percent of estimated weight after one month, then to 10 percent and 5 percent at monthly intervals. Hold feeding levels constant at 2 to 5 percent of the estimated weight of shrimp in the pond until harvest time. Always reduce or cease feeding when dissolved oxygen is critically low (2 ppm or less or when shrimp appear near the water surface or near the water intake in unusually large numbers).

Parasites and Diseases

Disease is not a major hindrance to farming freshwater shrimp. However, it does occur during or after periods of stress. Stress affects the shrimp's resistance to pathogens and to adverse water quality. Conditions which create stress include low levels of dissolved oxygen, water pollution, over-crowding and nutritional deficiencies. For review of this subject and suggested remedies, refer to publication TAMU-SG-77.605 *Crawfish and Freshwater Shrimp Diseases*.

Harvesting

Periodic culling or selective removal of large shrimp from early September to the final harvest helps the remaining shrimp grow faster. Seine the pond with a large-mesh net (1½ to 2½ inch stretched-mesh) every 2 to 3 weeks. Return small shrimp to the pond.

Completely draining a pond and straining the outflowing water through a bag net permits an easy final harvest. Otherwise, lower the water level and seine the pond to remove the shrimp. Some shrimp must be picked up by hand for a complete harvest.

Production

Total shrimp production is determined by the number and size of harvested shrimp; in other words, by survival and growth. In general, conditions which favor survival also promote growth. Through experience and reference to the suggested publications and resource persons, a shrimp farmer can gain the knowledge and skills needed for successful production.

Today, there are more than 200 acres of freshwater shrimp ponds in Hawaii, with additional ponds under construction. Annual production yields an average of about 3,000 pounds per acre of 6 to 8-count shrimp (number of whole shrimp per pound) or 12 to 16-count tails. However, Hawaii enjoys continuous or year-round farming. In Texas, the shrimp farming season lasts from May to October or as long as the water temperature stays consistently above 68 degrees F. Lower temperatures reduce the rate of growth and increase the possibility of mortality. Unlike native shrimp varieties, the imported tropical species cannot survive prolonged exposure to water temperatures of 50 degrees F or less.

Production from experimental ponds in Florida, South Carolina and Texas ranges from 100 to 1,500 pounds per acre per year of 10 to 30-count shrimp. While these figures serve as a general guide, production varies with different conditions and farming practices. Furthermore, the objectives of each operation determine the type and level of production expected.

In some situations, total production from a pond may be increased through polyculture — rearing two or more compatible organisms together. Combinations of shrimp and herbivorous fish such as tilapia or shrimp and catfish fingerlings are possible in Texas.

Preservation and Processing

Harvested shrimp may be stored or cooked and eaten immediately. Freezing is popular and effectively preserves shrimp. Head the shrimp first and freeze the tails in the shell. For more information, refer to Extension publication B-1242 *Freezing Fish and Shellfish*.

Shellfish Culture License

Any person or organization engaged in shellfish culture on private or leased property must obtain an annual license from the Texas Parks and Wildlife Department (TP&WD), Austin, Texas. The fee is $25.00. Also, permission must be granted by TP&WD for importing shellfish into this state from another state. Those interested in rearing shrimp should refer to *Texas Parks and Wildlife Laws* published by TP&WD. Section 962b, P.C. concerns shellfish culture and sections 978f through 5b, P.C. concern fish farming.

Additional Information

Studies of freshwater shrimp farming are conducted at the Aquaculture Research Center of the Texas Agricultural Experiment Station, College Station 77843, and the Stiles Farm Foundation in Thrall, Texas 76578. Information is also available from authors or persons named in the publications listed in this guide as well as from your county Extension agent and the local office of the Soil Conservation Service.

The following additional references for farming freshwater shrimp are available at most large libraries.

Books

Bardach, J.E., J.H. Ryther and W.O. McLarney. *Aquaculture: the Farming and Husbandry of Freshwater and Marine Organisms*, New York: J. Wiley and Sons, Inc., 1972.

Hanson, J.A. and H.L. Goodwin. *Shrimp and Prawn Farming in the Western Hemisphere*, Stroudsburg, Pennsylvania: Dowden, Hutchinson and Toss, Inc., 1977.

Stickney, R.R. *Principles of Warmwater Aquaculture*, New York: Wiley-Interscience, 1979.

Journals

Aquaculture, Elsevier Publishing Co.

Proceedings of the World Mariculture Society

The Commercial Fish Farmer and Aquaculture News and its successor, *Aquaculture Magazine;* Briggs Assoc., Box 2451, Little Rock, Arkansas.

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Proceedings of the Annual Fish Farming Conference; Texas Agricultural Extension Service, Dept. Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas.

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