SRAC Publication No. 483

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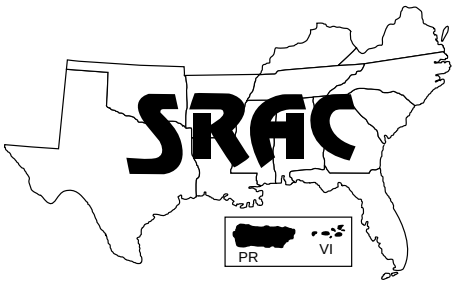

July 1996

Biology and Life History of Freshwater Prawns

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Commercial production of the Malaysian Prawn (*Macrobrachium rosenbergii*) has periodically been the subject of research and commercial enterprise in the United States. Although other species of *Macrobrachium* are indigenous to the southern U.S., they do not reach sizes that are considered desirable in the food-fish market, and thus have minimal potential other than for bait purposes.

Basic production techniques for *M. rosenbergii* were developed in the late 1950s in Malaysia, and in Hawaii and Israel during the last three decades. During the 1970s and early 1980s, the states of South Carolina, Florida, Texas and Louisiana conducted research into basic production techniques, as well as marketing, processing and hatchery procedures. In 1984, Mississippi State University started an extensive research program to develop and evaluate management practices that would ultimately establish commercial production techniques for freshwater prawns.

Prior to 1989, it appeared that culture of freshwater prawns, although biologically feasible in the southern U.S., was not economically feasible. However, during the past 6 years, new management practices have dramatically increased the potential for economic success of prawn culture in the southern U.S. Research efforts have been complemented by demonstration projects designed to evaluate methods under large-scale, commercial-type conditions.

Freshwater prawns, like all crustaceans, have a hard outer skeleton or shell that must be shed regularly in order for growth to occur. The process of shedding the shell is called "molting," and weight and size increase occur principally soon after each molt. Because of these periodic molts, growth occurs in distinct increments, rather than continuously.

Breeding

Females generally become reproductively mature before 6 months of age. Mating can occur only between hard-shelled males and soft-shelled females, i.e., females who have just completed a premating or prenuptial molt. The male deposits sperm into a gelatinous mass that is held underneath the body of the female, between her fourth pair of walking legs. Eggs are laid within a few hours after mating and are fertilized by the sperm contained in the gelatinous mass attached to the outside of the female's body. The female then transfers the fertilized eggs to the underside of the abdominal (tail) region, into a "brood chamber," where they are kept aerated and cleaned by movement of the abdominal swimming appendages (pleopods). Eggs remain attached to the abdomen until they hatch.

The number of eggs produced at each spawn is directly proportional to the size of the female. As long as water temperature exceeds 70°F, multiple spawns per female can occur annually. Females carrying eggs are termed "berried females." The bright-yellow to orange color of newly spawned eggs gradually changes to orange, then brown, and finally gray about 2 to 3 days before hatching. At a temperature of 82°F, the eggs hatch approximately 20 to 21 days after spawning. Newly hatched freshwater prawns enter into a larval phase of growth and metamorphosis.

Larvae

After hatching, larvae are released and swim upside down and tail first. The larvae cannot survive in freshwater beyond approximately 48 hours and thus survive best in brackish water with salinities of 9 to 19 parts per thousand (ppt). As larvae grow they become aggres-

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sive sight feeders and feed almost continuously, primarily on small zooplankton, worms, and larval stages of other aquatic invertebrates. Larvae undergo 11 molts, each representing a different stage of metamorphosis. Following the last molt, larvae transform into postlarvae.

Transformation from newly hatched larvae to postlarvae requires 15 to 40 days, depending upon food quantity and quality, temperature, and a variety of other water quality variables. Optimum temperatures for growth are about 28 to 31ºC.

Postlarvae

After metamorphosis to postlarvae, the prawns resemble miniature adult prawns, about 7 to 10 mm (0.3 to 0.4 inch) long and weighing 6 to 9 mg (50,000 to 76,000 per pound). The prawns behaviorally change from living suspended in the water column to principally bottom dwelling, crawling individuals. When they do swim, they move like adults with the dorsal (back) side uppermost and in a head-forward direction.

Postlarvae can tolerate a range of salinities and migrate to freshwater upon transformation. In addition to the types of food they ate as larvae, larger pieces of animal and plant materials will be ingested. The diet includes larval and adult insects, algae, mollusks, worms, fish, and feces of fish and other animals. At high densities, or under conditions of food limitations, prawns become cannibalistic.

Postlarvae are translucent and may have a light-orange-pink head. As they change to the juvenile stage, they take on the bluish to brownish color of the adult stage. Postlarvae are juveniles, but through common usage the term juvenile is reserved for the freshwater prawn between postlarvae and adults; however, no standard definition for the juvenile stage exists.

Adult

Older juveniles and adults usually have a distinctive blue-green color, although sometimes they may take on a brownish hue. Color is usually the result of the quality and type of diet. Adult males are larger than the females, and the sexes are easily distinguishable. The second walking legs or claws (chela) and the head region of males are larger than those of the females (Figure 1).

The base of the fifth or last pair of walking legs (periopods) of males is expanded inward to form a flap or clear “bubble” that covers the opening (gonopore) through which sperm are released. The walking legs of males are set close together in nearly parallel lines, with little open space between them, which helps distinguish immature males from females. A wide gap exists between the last pair of walking legs in females, and they have a genital opening at the base of the third pair of walking legs.

Three types of males have been identified, based upon external characteristics. Blue-claw (BC) males are easily distinguishable and are characterized by long, spiny blue claws. Two other classes of non-blue-claw males exist, orange claw (OC) and strong orange claw (SOC) males. The transformational sequence is from OC to SOC to BC males. Smaller OC males (< 10g) grow slowly but are more reproductively mature than are other OC males. BC and some of the smaller OC males are the most reproductively active and successful at mating. The BC is the most succesful at mating and maintains a territory associated with a group of females that are ready for mating. The BC male protects them during the vulnerable period just before and after molting. Small OC males eventually grow and transform to SOC males before becoming BC males. BC males undergo an extended period of non-molting. As the BC male ages, reproductive capacity is lost. Eventually, the BC male will either die or molt and

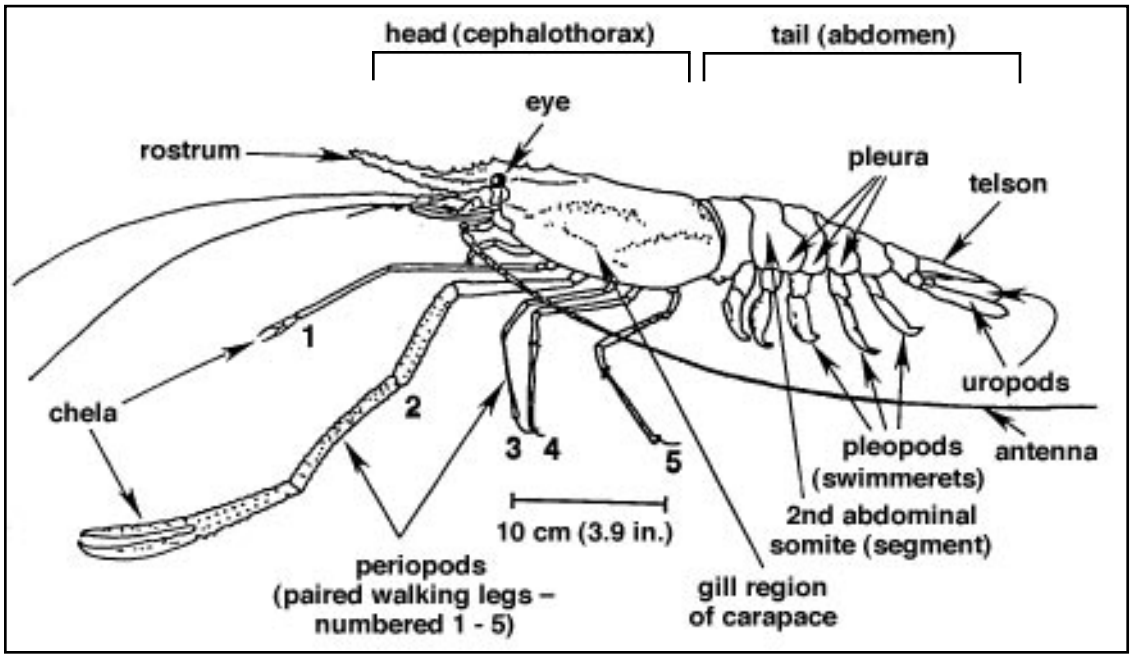

Figure 1. External anatomy of the freshwater prawn.

return to a growth phase. Later, its reproductive capacity is regained as it again becomes a BC male.

Management practices

There are three phases of culture of the freshwater prawn - hatchery, nursery and pond growout. For detailed information on the pond grow-out phase, refer to SRAC Publication #484, *Production of Freshwater Prawns in Ponds.*

If you are contemplating starting a freshwater shrimp production enterprise, forego, initially at least, the hatchery phase and possibly the nursery phase by purchasing juveniles from a supplier. As production increases and you are successful at pond growout of the animals, you should begin plans to develop a nursery, and possibly a hatchery. There are a limited number of juvenile prawn suppliers, but increased demands will eventually lead to a need for more enterprises that deal exclusively in the production and sale of seed stock.

The work reported in this publication was supported in part by the Southern Regional Aquaculture Center through Grant No. 89-38500-4516 from the United States Department of Agriculture.