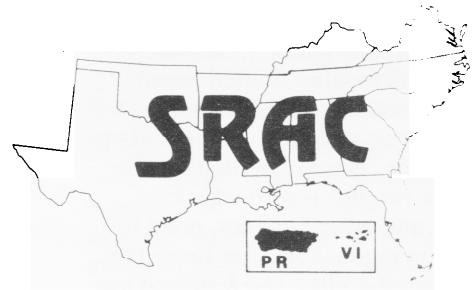


Southern Regional Aquaculture Center



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Red Drum

Production of Fingerlings and Stockers

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Production of fingerling and stocker red drum is normally practiced by hatchery producers. At the same time, these are completely different operations and require different areas, practices and expertise. Usually the larvae are secured at an age of about 3 days, and one of two methods of production is used. Only pond culture production methods are presented here. Indoor culture of fingerlings is not economically feasible but is being considered as a method of carrying head-started fish overwinter.

Movement of larvae to fingerling ponds

Larvae are normally shipped in standard plastic fish shipping bags with styrofoam lined cardboard boxes. For short trips of less than 6 hours, 100,000 larvae are hauled per bag. Oxygen is added to the bags. Apparently larvae are very sensitive to gas supersaturation of the water and overpressures caused by high altitude flights.

Standard practices are used to acclimate the larvae to the water at receiving ponds. The shipper needs to know the salinity and temperature of the receiving water. Then arrangements can be made to begin the acclimation process prior to shipment. When bags arrive at the receiving site, they should be removed from the shipping containers without opening the plastic bags. At this time it is best to examine the larvae and estimate what percentage are alive. This will help to preclude arguments with the shipper on "live delivery."

The average producer cannot accurately determine the number of larvae in the shipping bags. This can be accomplished by some consultants and facilities with the necessary equipment. Otherwise it is based on mutual trust between the shipper and the buyer. When the larvae are loaded they are "counted" by taking 2 or 3 samples from the hatching containers, counting the fish in each sample, and then adding the quantity of water and fish to achieve the 100,000 for the hauling container.

Prestocking pond preparation for larvae

Ponds used for production of fingerlings from larval red drum usually are from 1/2 acre to 2 acres in size and 3 to 4 feet deep with a catch basin. Optimum salinity for these ponds seems to be about 30 ppt, but favorable results have been obtained with waters from 10 to 45 ppt. Preferred temperatures are 75°F or above, but some success has occurred between 65° and 85°F.

Successful pond production of fingerlings depends primarily on suitable densities of live food of the proper size at all times. Most producers believe that the more dense the food supply – the more larvae that will survive to harvest. No prepared feeds such as those used in the catfish and trout industry are available for red drum larvae. Research is being conducted in this area, and feeds may be available in the future.

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Red drum larvae feed primarily on zooplankton (Figure 1). Because of their small mouths, limited mobility and restricted eyesight, they will feed only on selected plankters of optimum size. This means that for the average producer, without microscopes and other facilities, pond fertilization regimes are very important. If the pond is filled and fertilized too early, plankters that are too large for the larvae to eat will result. In addition, large numbers of predacious insects will develop in the pond. Delayed pond filling may mean no food or too little food is available.

Normally, ponds are treated with both inorganic and organic fertilizers. The amounts to use will vary with location, salinity, temperature, time of year, nutrient content of water source and previous fertilizer treatments. The recommended rates are only guidelines and should be modified based on the experience of the pond manager at a specific location to obtain optimum plankton populations.

Feeding procedures

The following are recommended procedures for preparing ponds for larval red drum:

1. Begin filling the pond not more than 14 days prior to expected delivery date of larvae. If more than 20 days elapse between commencement of filling and stocking, the pond should be drained and refilled.
2. At about 10 days prior to stocking, add 4 quarts of phosphoric acid and 10 quarts of liquid ammonium nitrate (33 percent N) per acre-foot of the filled pond. Three pounds of urea may be substituted for the 10 quarts of ammonium nitrate if desired. Add 250 pounds of cottonseed meal per acre.
3. Finish filling the pond by 7 days prior to stocking. Add the same amount of phosphoric acid, urea and cottonseed meal as above.

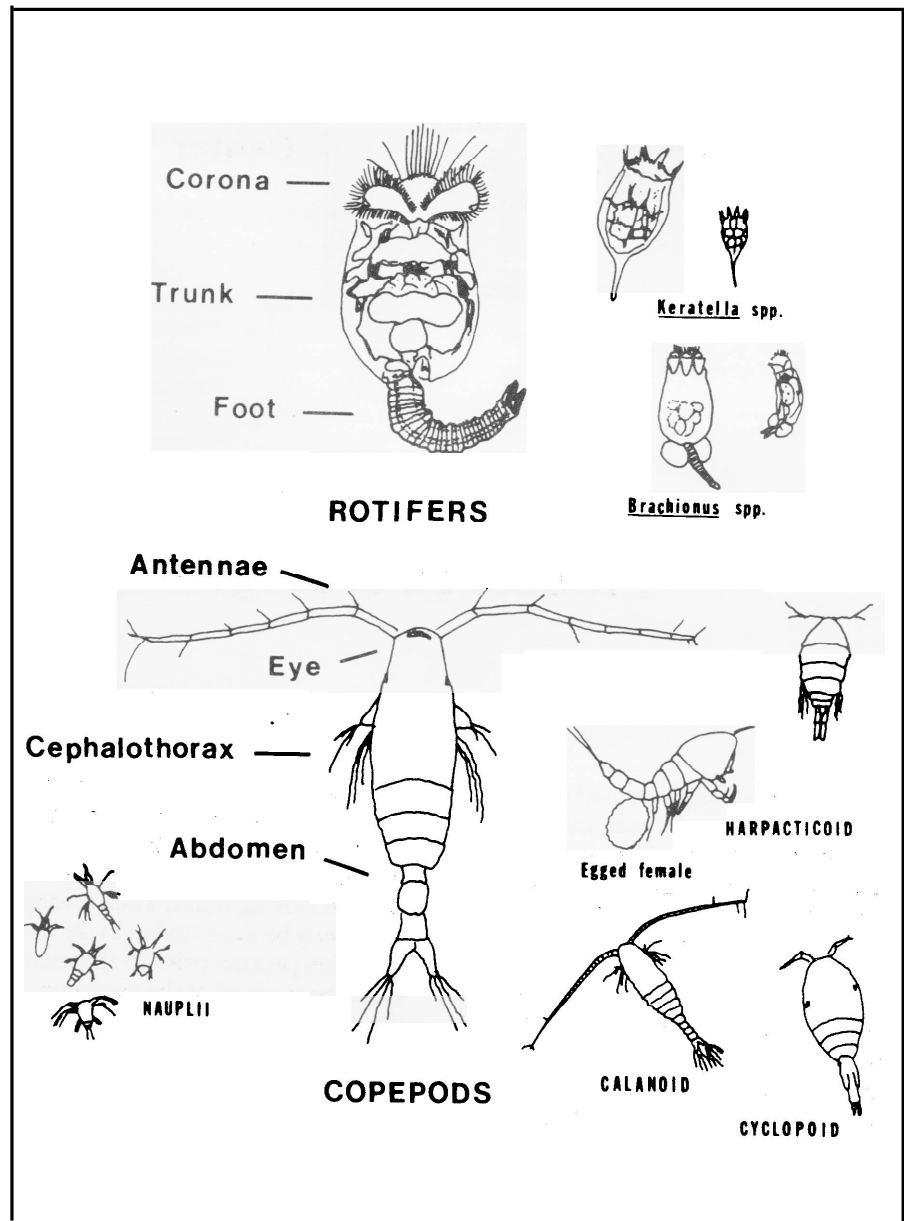


Figure 1. Distinguishing characteristics of rotifers and copepods, the two domain zooplankton groups in saltwater rearing ponds (not to scale).

4. Stock 300,000 larvae per acre. Expect to harvest 60 percent of those stocked.
5. After stocking, add additional fertilizer as previously recommended at 5-day intervals until the 20th day.
6. On the 20th day after stocking, begin feeding a high quality fish feed (40 to 50 percent protein) in meal form at the rate of 10 pounds per acre per day, divided into 2 equal feedings.
7. On the 26th day begin to switch the fish from the meal feed to a small floating crumble (#1 size) by substituting 10 percent crumbles for 10 percent of the meal. On succeeding days substitute an additional 10 percent until 100 percent crumbles are being fed by the 35th day. If fish are moved during this 10-day

Table 1. Suggestions for feeding red drum.

Feeding size (inches)	Feed type ¹	Protein level (%)	Feeding rate ² (%)
1 to 3	#2 crumble	45	5
3 to 6	#3 crumble or 3/32- to 1/8-inch sinking or floating pellet	45	5
6 to 8	3/32- to 1/4-inch sinking or floating pellet	35 to 45	4
8 to harvest	3/32' to 1/4-inch sinking or floating pellet	32 to 38	3

¹Recommended feed for small fish (1 or 2 inches) is a feed containing high levels of animal protein, such as a salmon feed. Other feeds containing high levels of animal protein can be used. Larger fish (6 inches or more) maybe fed a pelleted feed that contains lower amounts of fish meal; that is, a feed formulated for redfish, a trout feed, or a high-quality catfish feed.

²Daily feeding rate based on percentage of body weight of standing crop.

period, do not change the percentage of meal/crumbles for at least 7 days thereafter.

- Plan to move the fingerlings from the pond no later than the 30th day after stocking. Fish should be about 1 inch in length.

Feeding suggestions are shown in Table 1.

Harvesting and hauling

Before fingerlings are moved they should be taken off feed for at least 1 day and 2 days are preferable. Most fingerlings are moved by draining the pond into the holding basins discussed in SRAC Publication No. 321, *Red Drum – Site Selection and Pond Construction*. Seining of the fish is possible if less than a total harvest is desirable. In these instances, seines and nets should be treated with a recommended net preservative, but care should be taken that the nets are not overly stiff. The usual care must be taken to not over-

crowd the fish and to provide well oxygenated water and conduct seining operations early in the day. Because red drum are very sensitive to visual stimuli, some producers harvest fish prior to sunrise or at twilight. Success of this method is still open to question. The difficulty of workers operating in reduced light conditions may make this impractical.

Fingerling fish normally are moved in standard fish hauling tanks with oxygen supplied to each compartment. Normally agitators and/or aerators are not used for moving fish less than 3 inches in length. Smaller fish tend to be drawn against the sides of such equipment and subsequently die. In addition, salt water tends to corrode such equipment very rapidly.

Water quality is a major concern in hauling fingerlings and stockers. The water should be clean and free from organic debris. About 10 ppt salinity is the preferred level for haul-

ing, but 5 to 25 ppt has been used successfully. Water should be hard (preferably over 300 ppm) and slightly alkaline (pH 7.5 to 8.5).

Temperature of the water while hauling is critical. Normally fish are hauled at 68° to 70°F. Water temperatures below 60°F are to be avoided, and water temperatures above 80°F unduly stress the fish. Normally oxygen levels in the hauling tanks are held above saturation levels while fish are being loaded. Due to the high levels of stress involved in moving, fish utilize oxygen at very high rates. As soon as the fish become acclimated to their new surroundings, dissolved oxygen levels should be allowed to return to near saturation levels.

When red drum are harvested from a pond during the warmer months and loaded directly onto a truck, the water temperature in the hauling tank should approximate pond water temperature. Immediately after loading, the water temperature in the hauling tank should be reduced to about 70°F. This usually is accomplished with ice. One-half pound of ice per gallon of water reduces the water temperature about 10°F. If more than a 10°F change is required, allow at least 30 minutes for each 10°F change. Upon arrival at the stocking site, acclimate the fish to the water slowly allowing at least 1 hour per 10 degree change in water temperature, or 1 hour per one unit change in pH or 1 hour per 10 ppt change in salinity.

Loading rates for hauling tanks are still not well understood. Based on limited information and data collected from experience with other species, it is recommended that for an 8-hour haul, 1-inch fish should not be loaded at more than 0.2 pounds per gallon of water and 6-inch fish at not more than 0.4 pounds per gallon of water. Loading rates can be increased for shorter hauling times. The use of antibiotics and anesthetics is probably helpful in hauling red drum, but amounts are subject to several factors. The use of an anti-foaming material is

recommended for all hauling of red drum.

Growout of fingerlings to stockers

Because red drum do not survive sudden temperature drops and die during the winter in most states, the growout of fingerlings (1-to 2-inch) to stocker fish of 8 to 10 inches is a necessity. Stocking fish at this size allows them to reach marketable size in one growing season. This involves overwintering the fish indoors or using some type of thermal refuge. Neither of these is well understood or practiced at this time. Procedures for indoor culture are expensive but possible. For more information on indoor closed system culture, growers

should consult other SRAC publications on this subject. The use of thermal refuges is being studied in at least three locations, but practical and economical procedures are not yet available.

Where available the use of heated water effluents from power plants and other industrial discharges should be investigated. These have the most "waste" heat available, and some companies have expressed interest in such uses.

Economics

Because of the limited number of fingerling and stocker producers, detailed economic data is not available. The price of fingerlings is de-

pendent on the supply available (due in part to season of the year), and the perception of food fish producers as to the economics of the market for fresh or frozen fish.

Over the past few years the price for 1-inch fingerlings has varied from \$0.07 to \$0.40 each. Eight to 10-inch stockers have varied from \$0.80 to \$1.50 each. Larger orders normally command a more favorable price, particularly if orders are placed well in advance.

Until significant numbers of red drum are available for sale as food sized fish, the economics of fingerling and stocker production will remain an unknown.

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