



Baitfish

Feeds and Feeding Practices

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Natural food

Success in raising the baitfish fry depends on the management of natural food so that it is available when the fry are ready to eat. The production of natural food is achieved with the application of organic and/or inorganic fertilizer. Fertilization establishes a "bloom" of microscopic plants and animals (plankton) which is the natural food; it also shades out aquatic weeds. This bloom should be abundant enough so that a Secchi disc (Fig. 1) can be faintly seen at 10 inches (an aluminum plate on a stick can be substituted). If the pond begins to clear, more fertilizer should be applied. If the water in a nearby pond contains a suitable bloom, there is a double advantage to practice bloom "seeding." Water pumped over the levee is more desirable and less expensive than water pumped from a well. The water should be carefully screened to prevent the transfer of fish. Water transfer should not be considered if the fish in the adjoining pond are infected with diseases or parasites.

Establishing and maintaining a bloom in early spring is sometimes difficult. If the bloom dies following cold weather, or if aquatic weeds prevent a bloom from developing by using the food nutrients, the young fish will starve or become vulnerable to disease.

Before or while the pond is filling, add finely ground limestone if the analysis of the soil indicates the need. The amount would be near the amount recommended for field crops in the area. Producers on large minnow farms generally use inorganic fertilizer but smaller acreages can benefit greatly in better fertilization with less expense by using a combination

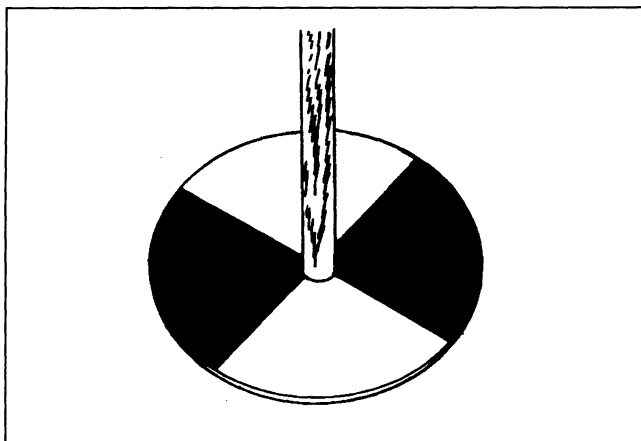
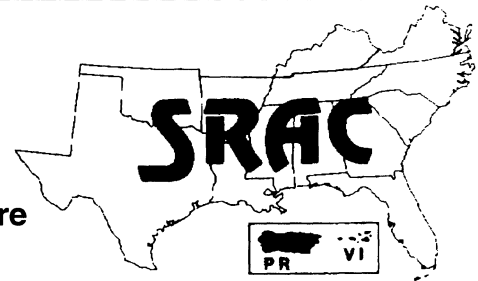


Fig. 1. Secchi disc.

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of organic and inorganic fertilizer. Some organic materials to consider are barnyard or poultry manures, dried hay, and meals high in nitrogen such as cottonseed or soybean meals. Apply manures at rates of 400 to 1,000 pounds per surface acre along with 100 pounds of an inorganic fertilizer such as 16-20-0 or 10-20-0 per surface acre. In acid soils, nitrate of soda and super-phosphate are used; and in alkaline soils, ammonium phosphate is used. Spraying liquid fertilizers on the water surface has several advantages. This method allows more of the phosphorus to be available for pond organisms, rather than tying it up in the bottom soil. When inorganic fertilizer is used alone, about 200 pounds of 16-20-0 per application per acre is required to produce a bloom.

Starter feed

It is generally accepted that production can be doubled with artificial feeding. The fry of golden shiners, fathead minnows, and goldfish require a starter feed. Nutrient requirements for these fish are basically the same—with some differences to be pointed out later in this paper.

Minnow starter feeds are normally higher in protein than grower feeds and tend to be more complete in nutrients, especially vitamins. The starter feed for all three baitfish species should be ground flour-fine. This may require hammer nulling twice. Fry feed is made into a slurry and is fed on all sides of the pond to ensure that all fish receive food.

If the bloom is lost in rearing ponds while the fish are fry, feeding about every 2 hours for four or five feedings to ensure fry survival is necessary. Feed starter feed on all sides of the pond for about 3 weeks. Initially fish are overfed. The excess feed serves as fertilizer and natural food organisms are produced.

Formula for Starter Feed Calculated Protein 38%	
<i>Ingredients</i>	<i>Pounds</i>
Soybean flour	600
Fish flour	375
Dried skim milk	375
Rice bran	400
Distiller solubles	200
Bonemeal	25
Mineralized salt	20
Vitamin premix	5
Total	2,000

Grower feed

After 3 weeks, change to grower feed. The grower ration is a more coarsely ground feed and has a lower protein content. Grower feed can be fed dry by broadcasting from one side, downwind.

Commercially formulated grower feeds for golden shiners, fathead minnows and goldfish are similar.

When feed is formulated to be used as meal, extra animal fat should be added to hold the nutrients and to make the meal float; for pelleted feed, the fat is not added.

Research indicates that heat-treated full fat soybeans are a promising ingredient for minnow diets. The soybeans are heat-treated for 4 minutes at 375° to 400° F to destroy growth inhibitors. Whole soybeans contain 38 percent protein and 18 percent fat. The fats add essential fatty acids to a diet and serve as an energy source instead of proteins. No additional fat is needed for floating.

Formula for Grower Feed Typical Feed for Minnows	
Meat scraps	5-15%
Fish meal	5-10%
Feather meal	5-10%
Soybean meal	5-15%
Cottonseed meal	5-15%
Wheat middlings	5-15%
Alfalfa meal	0-5%
Rice bran	20-40%
Vitamins and minerals	0-5%

Feeding golden shiners

Golden shiners will consume varying amounts of food depending on their size, the amount of natural food in the pond, and pond water quality.

Extensive culture- The water is fertilized until a Secchi disc can be seen at 8 to 9 inches. This bloom should be

maintained until the fish reach about 1 inch in length and before hot weather. At this time the bloom should be allowed to recede to a Secchi disc reading of 14 inches. This is done by adding fresh water and reducing the amount of fertilizer. The 14-inch reading should be maintained.

Intensive culture- If fry come to the surface and eat when a small amount of feed is thrown in the pond, they can be fed normally. Ponds should be checked at the downwind edge 2 hours after feeding to see if all the feed has been consumed. If there is feed left, the amount of feed should be reduced. The leftover feed will start to decay and may lower water quality. When shiners stop feeding, the problem is usually low oxygen, pesticide contamination, disease, weather conditions, or abundant natural bloom.

If faster growth is desired, shiners can be fed more than once a day. As shiners grow, their amount of feed can be increased every few days. Heavily stocked shiner ponds with an adequate water supply can be given at least 40 pounds of feed per acre per day, resulting in production levels of 600 to 800 pounds per acre.

If the feed formula is changed considerably, the old and new should be blended together for a few days. Shiners detect ingredient changes and sometimes ignore new formulas.

Feeding fathead minnows

Fathead minnows are raised in both extensive and intensive culture operations. Each culture method requires different feeding techniques.

Extensive culture- Is the same as that previously described for golden shiners.

Intensive culture- Start the young fish with starter feed in fertilized ponds which contain up to 25,000 broodfish. To ensure that the young fish are getting adequate amounts of feed, some producers feed both starter feed for fry and grower feed for the broodfish. Transfer the young from the brooder pond to recently filled, fertilized ponds, and feed starter feed on all sides of the pond until fish are about 3/4 inch in length. At this length, change the feed to pelleted grower feed. To make the change so the minnows will accept the new ration, blend four parts pellets with one part starter feed. This blend should be continued until you determine by observation that the minnows are eating the pellets. When this is achieved, the feed can be changed to a full ration of pellets. The minnows cannot swallow the pellets, but they nibble on them until all are consumed. Place the feed in little piles near the shore on all sides of the pond. After 2 hours, check to see if all the feed has been eaten. If feed remains after this period of time, reduce the amount. Generally, production levels will vary from 350 to 1,200 pounds of fish per acre. More often production levels of 500 to 800 pounds per acre are achieved. Auburn University reports that more pounds of fathead minnows can be raised feeding pellets rather than using crumbles or meal.

Feeding goldfish

Feed goldfish extensively with natural food produced by heavy fertilization or intensively with fertilization and feed. Ponds that are fertilized will produce 900 to 1,000 pounds per acre. Fertilizer and feed with good fish cultural practices can produce yields of 3,000 pounds or more of goldfish per acre.

Extensive culture- For extensive ponds, the water is fertilized until one can see a Secchi disc at 5 to 7 inches. After the fish grow to about 1 inch long and before the hot weather begins, clear the water by pumping in fresh water or by allowing the bloom to recede to a Secchi disc reading of 10 inches by not adding more fertilizer. If an adjoining pond has water rich in zooplankton, bloom "seeding" can be practiced here.

Intensive culture- Fertilization of intensive goldfish ponds is the same as previously described for golden shiner ponds. Production of fertilized ponds may be increased with supplemental feeding using golden shiner diets. Goldfish production per acre can be increased to more than a million fry by changing the basic golden shiner starter feed formula. The suggested change is to add 5 to 10 percent commercial grade egg yolk in place of some other ingredient such as

feather meal. This helps ensure survival of fry. Fry survival can also be improved by feeding more than once each day.

After the fish are feeding well and are about 1 inch in length, gradually change from starter meal to grower pellets. This change can be accomplished by blending starter meal with grower pellets as previously described in the section on feeding fathead minnows. Some producers use a feed with about 30 percent protein, but good results can be obtained by using a larger quantity of less expensive feed with a lower protein content. Goldfish should be fed an amount they can consume in 2 to 3 hours. When using high-feeding rates, use common sense. To avoid an oxygen depletion, reduce feeding amounts if the dissolved oxygen is low, if the air temperature is 100° F or higher, or if the sky is cloudy.

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For more information about aquaculture in Oklahoma, see our OSU county Extension agent or contact Marley D. Beem, Area Extension Aquaculture Specialist, Box 1378, 1630 E. Beverly, Ada, OK 74820 (phone: 405-332-4100).

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