A Practical Approach to Rainbow Trout (*Oncorhynchus mykiss*) Seed Production

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Abstract

Rainbow trout (*Oncorhynchus mykiss*) grows faster and has great disease resistance. Therefore this species has been preferred to culture for years. Fry production, feeding and management of broodstock are explained practically in order to increase profitability.

Key Words: rainbow trout, *Oncorhynchus mykiss*, seed production.

Introduction

Farming fish as a method of controlling their availability has been carried out for at least 3000 years in China and probably almost as long as this, in parts of the middle east. Trout has been farmed for over a hundred years in Europe and North America. Because all salmonids spawn in fresh water such as brown trout, rainbow trout and land locked salmon, they can complete their life in fresh water. It is generally agreed that their common ancestor was a fresh water fish.

The preferred trout species for culture is the rainbow trout, which grows faster in similar conditions and has a greater disease resistance.

Wild rainbow trout are typically spring - spawning fish. Individual females produce 2,000-10,000 (3-5 mm) eggs, which hatch after 4-7 weeks incubation. Optimum temperatures for growth are between 12 and 20°C, some mile fish may mature as 1 year old in contrast the slowest growing females may take 5-6 years to reach sexual maturity.

Because of its tolerance to relatively light water temperature and relatively low oxygen levels and its fast growth rate, the rainbow trout is the preferred species for the fresh water farming of the table fish.

Water

One of two factors will normally determine the initial farm plan.

Firstly the available water supply, and secondly the targeted the production figure. The figures for the available water should be based on the known lowest flow rates over as many years as possible. If enough water is available each unit, tanks or pond should be fed separately with water only being utilized once. The water must be as clean as possible throughout the year. Potential pollutants, upstream can include heavily fertilized farmland, factories etc.

Although large river sources may provide plenty of water they can also provide plenty of potential problems.

A small stream source removes most of the problems over water quality. A certain amount of pre-treatment and de gassing may be required but this can be carried out very cheaply and easily.

The pH should be above 7.0 (up to 8.2) for fast growth but care must be taken to avoid ammonia.

Broodstock and Spawning

The stocking density for broodstock is very much lower than that required for production fish. 8-10 kg/m^3 is considered a maximum during the non-spawning season. The ideal being as low as possible. Broodstock are fed at a much lower rate than production fish, approximately 0.6 kg per 100 kg of fish at 12-14°C, compared to rates of 1.8 kg per 100 kg.

Approximately one month prior to the start of the spawning season the potential broodstock must be hand sorted males and females being counted and separated. This is essential, as the males will fight if females arc present and damages each other.

A female will produce approximately 1,600-2,000 eggs per kg weight of fish The female broodstock is then hand sorted on a 7 day basis (minimum) in order to catch the eggs as soon as after ovulation as possible. Because the quality of the eggs deteriorates with time, with a increase in mortality in the hatchery.

Sorting should be quick and with the least possible stress. The fish being handled are gravid and in a very delicate state. Stress at this stage can result in poor hatch rates, low fertility, and mortality to broodstock.

After spawning fish should be placed gently into

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separate tanks. No live fish should be thrown into water.

The dry spawning technique is recommended for the highest fertility, where no water is allowed to drip into the bowls. If the fish have not been fed for a minimum of three days prior to spawning then the incidence of faeces fouling the eggs will be very low.

The generally accepted technique at spawning is to gently squeeze the ova from the body cavity into a container. 30 cm diameter bowl is perfectly adequate. Gently strokes exerting a minimum pressure on the belly of the female will allow the ova to flow out without any force being used. Damage to the internal organs can occur very easily if too much force is used, but it is equally important that no eggs are left in the belly of the fish. This will tend to degenerate and are a potential source of disease and probable death as the temperature of the water warms up in the spring. A happy medium has to be reached therefore and this is only achieved with practice.

There is available the option to anaesthetize the fish for spawning. Using such proprietary compounds as benzocaine, MS 222 etc. But note carefully the increase in effect with temperature. Aeration should always be added to an anaesthetic bath.

Some farmers prefer not to use such chemicals, aiming for more natural spawning. Other find that the ova production is higher from anaesthetized fish. Recovery time should not exceed 2-5 minutes and it is important to have a special recovery tank, heavily aerated, set up adjacent to the spawning area.

An acriflavin dip (2 min at 0.2 ppm) is often useful as a tonic to the skin of the fish after being stripped. The stripping of a female fish should not require more than 3-5 hand strokes. More than that and the flanks can be damaged.

Male milt should be added to the ova at the rate of 1 male then 3 females. 6 or 9 females per bowl. When the bowl is full the milt is gently stirred into the eggs and the bowl left to stand for 2 minutes.

When water is added after 2 minutes (about the same volume as taken up by the eggs) the sperm will swim vigorously for up to 90 seconds, after which time it can be assumed that fertilization is complete. It can be seen that if water is added too early (i.e. drops from the fish into the milt) the sperm will be activated too early for successful fertilization. Similarly with the eggs: if water is allowed to contaminate the bowl before the milt is added the eggs will start to take in the water and expand. This effectively seals the small hole through which the sperm enters to fertilize the nucleus- with poor fertility as an end result.

The fertilized eggs are then washed carefully to remove any excess milt, faeces or silt and measured carefully into the incubators in the hatchery.

The spent females can either be transferred to the recovery pond for broodstock rearing for the following season.

After spawning the eggs should be carefully measured into incubators, or trays. Water should never be added to eggs; eggs should be added very gently to water.

With a minimum water flow of 8-10 litres/minute/100,000 eggs at 10°C the eggs will "eye-up" at days 18. On days 21-25 they can be "shocked" and picked.

Shocking

This process involves a mechanical shock (the only time the eggs are dropped onto water from a height of approximately ½ metre) to kill any weak or infertile eggs. These eggs turn white due to the rupture of the inner membrane, which conveniently makes them easier for picking.

Hatchery

Egg-picking is essential for the successful hatch of the live eyed ova. Any dead eggs, which are not removed prior to hatching, are a source of disease and fungus. This white fungus can spread very rapidly and engulf neighbouring healthy ova. If no treatment is applied, a complete tray or incubator bad can be killed.

After the eggs been laid out in hatching trays it is important to adjust the water flow to allow a very gentle movements of eggs at this stage. This ensures an adequate supply of oxygen to the embryo and prevent eggs sticking to each other or to the tray. There are a variety of tray designs. Ideally, the tray should allow for an up flow of water through the eggs with an even flow across the whole tray. Added to this the yolk sac-fry, after hatching, should be able to drop through the tray to the trough. This reduces the cleaning and removal of dead eggs and cast shells from a mass of sac-fry in the bottom of the eggs tray.

On completion of hatching the trays can be lifted out and removed for cleaning and storage, leaving the sac-fry in residence.

At this stage the hatchery cycle can be assumed to have been completed and the first feeding phase to have begin.

First Feeding

Trout swim up to the surface after absorption of the yolk sac and can be observed when they are ready to begin feeding. it is normal to present small amounts of food after approximately 50% of a batch or on the surface.

Food sizes 0 and 1 should be made available at frequent intervals under a bow light regime, preferably over a "bong day" feeding regime i.e. artificial light for 20-hour periods followed by 4 hours of darkness.

Such fine food particles can lead to problems with bacterial gill disease or similar ailments unless the husbandry is maintained at a very high level. All un eaten food must be removed on a regular basis, the fly usually checked and any pin-heads removed; these are fly which have not adopted to artificial food.

Fry rearing through to fingerling should be carried out at an optimum flow rate. Flow rate must be adjusted to maintain the fish in a stationary in the water relative to the tank. By swimming against the current they increase their swimming muscles and therefore make table flesh.

The ideal tank or raceway should allow the fish to spread evenly through the water body with equal access to food. Health requirements dictate that the tanks are kept clean on regular basis.

Farmers have their own preferences for rearing systems, but whatever design is chosen, the fish should be forced to swim and feed at a constant rate. If fry are forced against the outflow screen then the flow should be reduced. In contrast, aimless swimming around the tank means that the fish are not being made to "work" hard enough.

One of the near-perfect tank systems for the early fry stages is the circular vortex tank. This is a self-cleaning tank, which requires minimal maintenance and easy control.

The grading and sorting of fish into their relevant size classes should be carried out as frequently as tank space will allow. Constant grading will produce a more even growth throughout a stock, which allows for a uniform product at the market end.