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Trout Production

Handling Eggs and Fry

Jeffrey M. Hinshaw*

In commercial production of trout and other salmonids in the United States, eggs are typically produced on broodfish farms which are separate from farms used for the production of fish for food or for stocking. The production of good quality, disease-free eggs is a specialized activity requiring a high degree of skill and management.

Most of the eggs used in the commercial production of trout in the southeastern U. S. are produced in the Pacific Northwest region. Trout eggs are usually shipped when they reach the "eyed" stage, which is over halfway through the incubation period.

Incubation time is temperature dependent: at 55°F, rainbow trout eggs will hatch approximately 3 weeks after fertilization, or within 4 to 7 days after received as "eyed" eggs.

Receiving and disinfecting eggs

Trout eggs will arrive at your farm "on ice." The first step is tempering, or gradually bringing them up to the incubation temperature of your hatchery. Then replace any water loss in the eggs from shipping. Tempering of the eggs should be done in a **clean** bucket or other hatchery container by adding the eggs to water which is the same temperature.

Temperature of the eggs can be increased to the hatchery water temperature over a 30 minute to 1 hour time period by adding small amounts of clean water from your hatchery. The eggs need to be gently stirred once or twice during the tempering process to insure adequate water circulation to all eggs. Discard or destroy all shipping containers to prevent possible contamination of the hatchery with disease organisms.

The eggs should have been disinfected by the supplier before shipping, but it is good practice to also disinfect them yourself. Disinfectants used for this procedure contain iodine (polyvinylpyrrolidone iodine), and should be administered as a 10-minute duration bath treatment at 100 parts per million (ppm) of free iodine. Typical iodophor disinfectants such as Argentyne or Betadine contain 1.0 percent (10,000 ppm) available iodine. A 100 ppm iodine concentration is equivalent to a 1:100 dilution of "jug strength" solution (use 380 milliliters or 12.8 fluid ounces per 10 gallons of water).

Others such as Wescodyne contain 1.6 percent or more available iodine and require more dilution. **Be sure of the strength of the compound you are using.** In poorly buffered (alkalinity <30 ppm) or acidic waters, you should add sodium bicarbonate at 0.05 percent (20 grams or 0.7 ounces per 10 gallons of water) to buffer the water before disinfecting. Gently mix eggs and disinfectant to assure that all egg surfaces are contacted. Rinse the eggs with clean water to remove iodine residues before putting them into incubators. The eggs may now be counted and placed into incubators for hatching.

Egg incubation

Three types of incubator systems are commonly used: **"California" trays, vertical tray** or **"Heath" incubators**, and **upwell incubators** (Figure 1). California trays are screened flat-bottomed trays which fit inside rearing troughs in series horizontally. Between each tray, a partition extending to bottom of the trough forces water through the eggs from below. Vertical tray incubators are essentially California trays which are arranged in stacks, having the advantage of requiring relatively little

* North Carolina State University

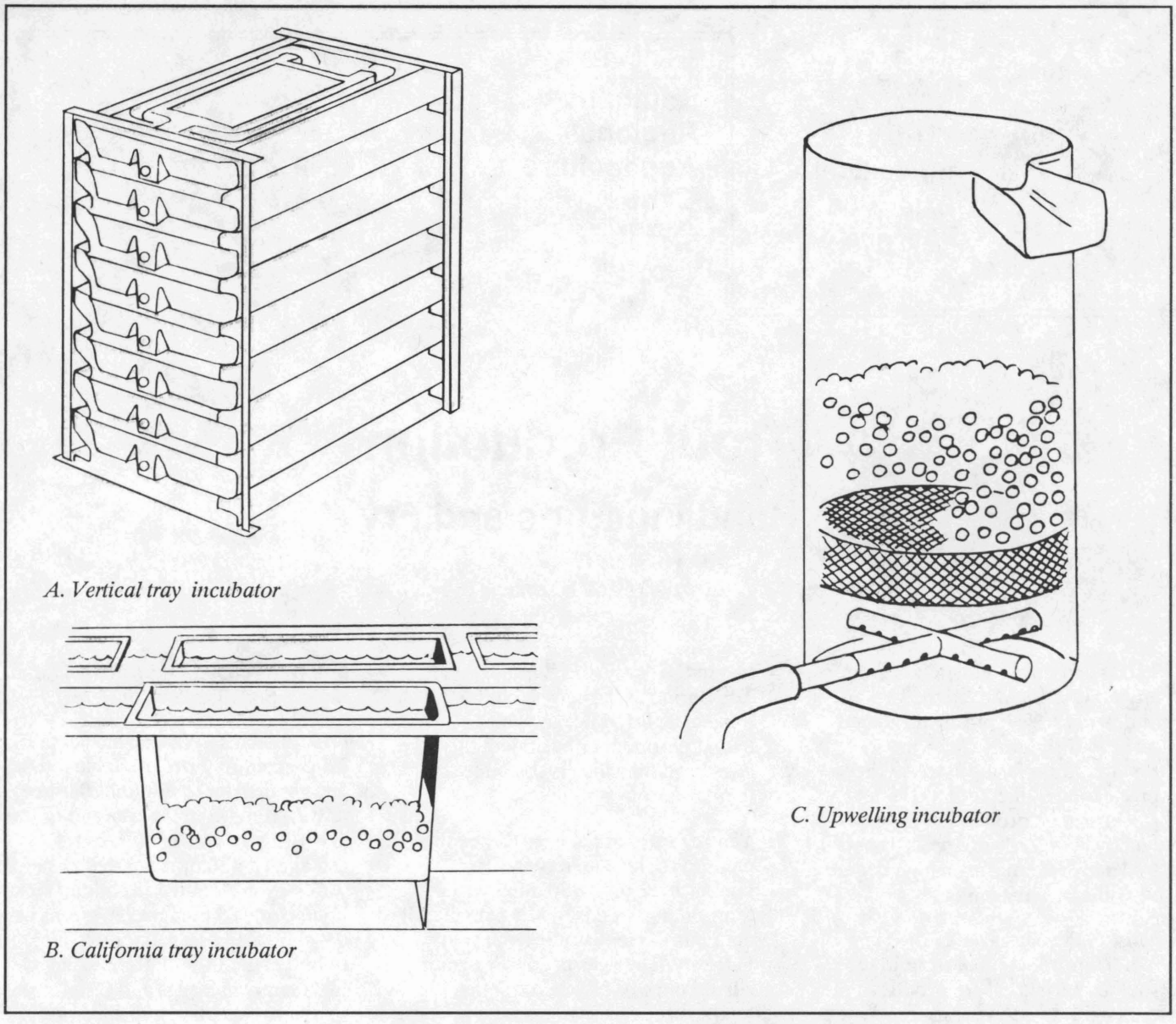

Figure 1. Types of incubator systems commonly used.

floor space to incubate large numbers of eggs. The water also is reaerated as it flows down through the stack. Upwelling incubators are commercially available in several different models, or can be easily constructed from PVC or other materials.

To prevent smothering, trout eggs should be placed no more than 2 layers deep in either California or vertical incubator trays. The recommended water flow in tray incubators is from 4 to 6 gallons per minute (gpm). Upwelling incubators maintain adequate circulation by using the water flow to partially suspend the eggs, but should contain no more than 2/3 of the total volume in eggs. The flow rate in upwelling units should be adjusted so that eggs are lifted approximately 50 percent of their static depth (i.e., if eggs are 6" deep with water off, they should be approximately 9" deep with water on). All types of egg incubating containers should be covered to protect developing embryos from direct light. To accomplish this when using vertical trays, do not put eggs in the top tray.

Eyed trout eggs purchased from a commercial supplier will usually contain only a very small percentage of dead eggs, and may not require treatment for fungus. However, if the eggs are more than 3 days from hatching, then dead eggs should be removed regularly to limit fungal infections. Siphoning off dead eggs is more effective than chemical treatment at controlling fungus, but can be very time consuming. If it becomes necessary to control fungus chemically, add formalin to the inflowing water to achieve a dilution of 1:600 (1667 ppm) for 15 minutes daily. This is equivalent to 95 milliliters formalin/gpm of water flow,

Table 1. Recommended feeding rates for small rainbow trout.

Fish Size (number/pound)	Feed Sizes	Feedings/Day	Amounts of Feed (% of fish weight/day, 55 to 65° F)
2500 - 2000	"Starter"	8	6.1 - 9.0
2000 - 800	#1 Granule	8	5.2 - 7.5
800 - 250	#2 Granule	6	5.1 - 7.2
250 - 100	#3 Granule	4	4.2 - 6.1
100 - 30	#4 Granule	3	3.2 - 4.9

or 3.2 fluid ounces formalin/gpm of flow. Trout eggs should not be treated with formalin within 24 hours of hatching, as they will concentrate the chemical inside the shell and will die. Once hatching begins, the eggs and sac fry should not be treated with any chemicals.

Handling sac fry

Hatching rate depends on water temperature, but will usually be completed within 2 to 4 days after commencing. Empty shells should not be allowed to accumulate in the incubating units. If the eggs are incubated separately from the rearing troughs, the sac fry should be transferred into troughs shortly after hatching is complete. Up to 30,000 fry can be stocked into a standard fry trough 10 feet long and 18 inches wide. The water level in the trough should be kept fairly shallow (3 to 4") until fry "swim up," approximately 2 weeks after hatching at 55°F. Any mortalities or deformed fish should be removed regularly.

When about 50 percent of fry "swim up," begin feeding with small amount starter mash on the surface three to four times daily, until active feeding has begun by most of the fish. Then, if possible, feed every 15 minutes, or, in any case, feed at least hourly at this stage. Automatic feeders usually are better and certainly are more convenient than feeding by hand. Feed "by eye" for about 2 to 3 weeks, or until fry are about 1/2" long (approximately 2,500/pound), then feed according to a published feeding chart. Feed for the fry should be formulated to contain approximately 50 percent protein and 12 to 15 percent fat. Be careful not to overfeed; excess feed must be removed from the troughs at least daily. Small paintbrushes or feathers work well for cleaning the rearing troughs.

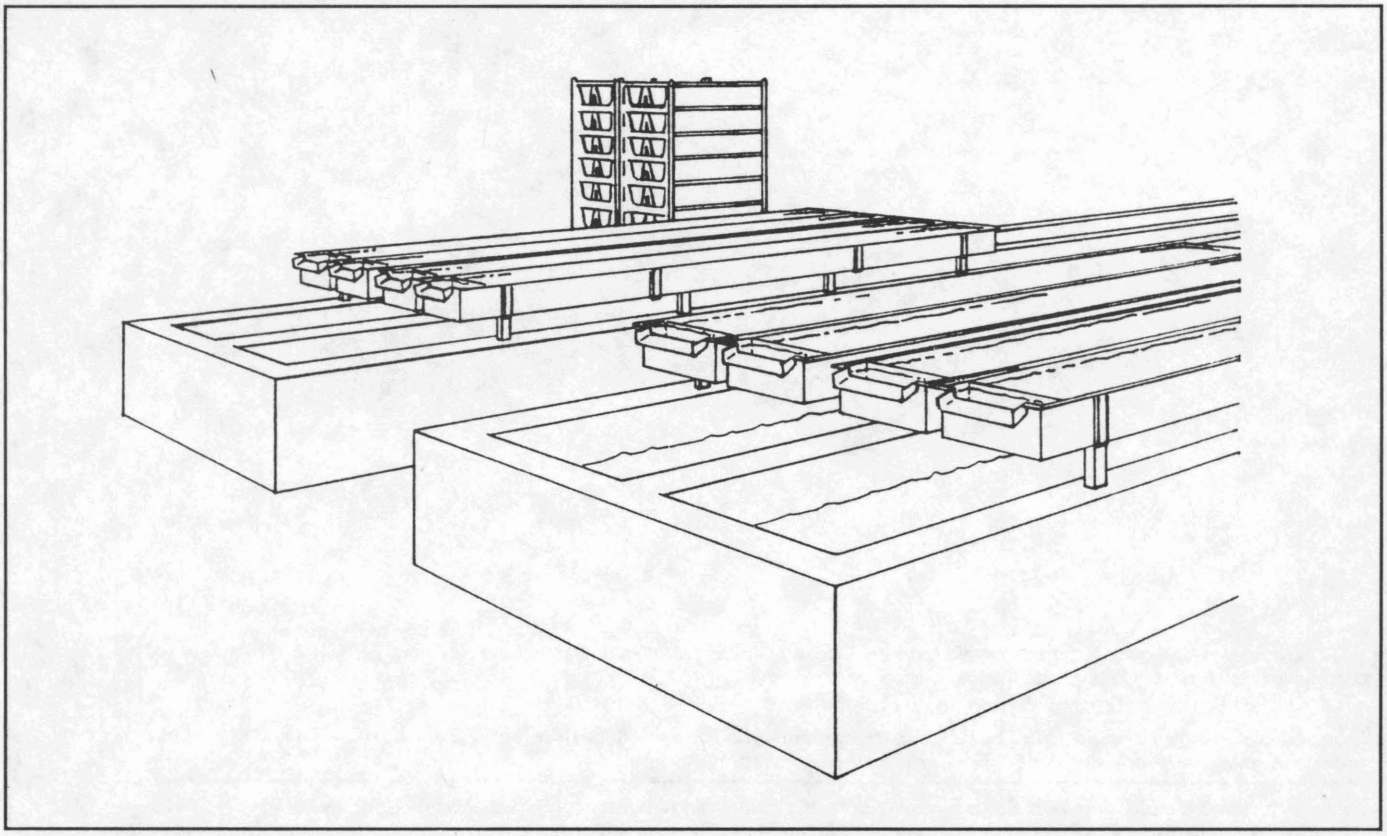

Figure 2. Typical small trout hatchery, with hatching trays, fry troughs and fingerling tanks

After the fry have been actively feeding for 2 weeks, sample count fry every week and adjust the feeding rate and feed size accordingly (Table 1). Adjust the fish densities in the troughs as necessary to prevent overcrowding. Monitoring of dissolved oxygen levels is a good way to help determine when splitting is necessary. Ideally, the oxygen level should not be allowed to be lower than 6 ppm. The fry will be ready to move into larger growout tanks when they grow to 200 to 250/pound. In areas where **Yersinia ruckeri**, the causative agent of enteric redmouth disease (ERM), has been detected, the fish should be vaccinated 7 to 10 days before moving into a production facility.

Hatchery sanitation

Restrict personnel traffic to reduce the possibility of disease being inadvertently brought into the hatchery. A disinfectant foot-bath just inside doorways is a good preventative measure. Do not move nets or other equipment from the hatchery. All equipment used in the hatchery should be reserved for hatchery use only. Clean and disinfect the hatchery and equipment regularly with a hypochlorite solution, or an approved quaternary ammonium disinfectant. Troughs and floors should also be disinfected between groups of fish. As an additional safeguard against the spread of disease microorganisms, keep the hatchery well ventilated to prevent condensation forming on walls or the ceiling.

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