

The artificial breeding of Rainbow Trout in Jonkershoek



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INTRODUCTION:

Rainbow trout (*Oncorhynchus mykiss*) are the most widely cultivated cold freshwater fish in the world and are cultured on every continent except Antarctica, with 2008 global production estimated at 576,289 metric tons and valued at \$2.39 billion. The trout sector has to a large extent pioneered aquaculture development in South Africa, and trout is currently the most commonly grown freshwater fish species in the region.

The Jonkershoek Hatchery is situated in the Jonkershoek Valley, just southeast of Stellenbosch (Western Cape) and on land occupied by Cape Nature. This hatchery (1893) has been primarily active in the production of trout for more than a century and although the focus has shifted from the production of trout by the provincial authorities (Cape Nature and others previously) for the augmentation of sports fisheries, the University of Stellenbosch today is doing research there and keeps the facilities active in the production of trout fingerlings for stocking.

BROODSTOCK CONDITIONING:

After selection, the broodstock is kept in earth ponds for conditioning. This is done 8-9 months before spawning. The diet caters for the changing nutritional requirements during maturation, incorporating high levels of protein and pigments such as astaxanthin which may be necessary for egg development. Stocking density is kept low (1-5kg/m³), with good water quality. Trout spawn on a decreasing photoperiod and lowering of the water temperature. This happens from the end of May to early June at Jonkershoek.

ARTIFICIAL SPAWNING:

At end of May the fish are taken from the ponds and classed into stages of maturation. The fish are classed every 7 days and stripped as soon as possible. Prior to assessment the broodstock are anaesthetized, using benzocaine or 2-phenoxy-ethanol. The handling then becomes easier, as well as the stripping of the females and males. In this way we also cause less stress and damage to the eggs.

The fish are lifted individually and inspected. The external appearance of the fish will give some indication of the readiness of the fish e.g. coloring, head shape, abdominal swelling and swollen papilla. A gentle massage on the belly should produce either eggs or milt. The vent and tail are dried off to remove excess water and benzocaine. Extreme care should be taken during stripping, because the broken eggs release albumin into the eggs preventing spermatozoa entering the micropyle of the egg and as a result fertilization rates decrease. The eggs are stripped from the female by applying gentle pressure to the underside of the abdomen, down towards the tail. Milt is then obtained from the male in the same way, and added to the same bowl. The vitality; spermatozoa count, movement and speed, of the sperm can be tested with an automatic system of sperm analysis with a computer software program. The sperm is mixed with the eggs by stirring gently with the soft end of a feather. The fertilized eggs are then transferred to the hatching house, where they are incubated in hatching trays immersed in cold, running water.

FERTILIZATION TESTING:

Fertilization rates may be tested after 7 days and 12 hours. The solution of water: methanol: glacial acetic acid in the ratio 1:1:1. At 7 days we can detect the neural (white) streak. A fertilization ratio of 90 – 100% is acceptable.

EGG ENUMERATION:

Handling of the eggs for measurement may be undertaken after water hardening. The average amount of eggs per liter is 10 000 eggs. This is an important production element, because we need to know how many eggs are produced for selling and management of the trout fingerlings. The next stage where we can move and handle eggs are in the eyed stage. After about 18 days the eyes become clearly visible as two tiny black-dots against the yellow background of the egg. This is the stage where the shocking procedure is undertaken, as well as the selling of the eyed ova. The eggs hatch out about 7 days later into small, helpless creatures called yolk-sac fry. Eggs are picked during the whole development stage, to prevent the occurrence and spreading of fungus. Treatment of the eggs with Chloramine-T also prevents the spreading of fungus.

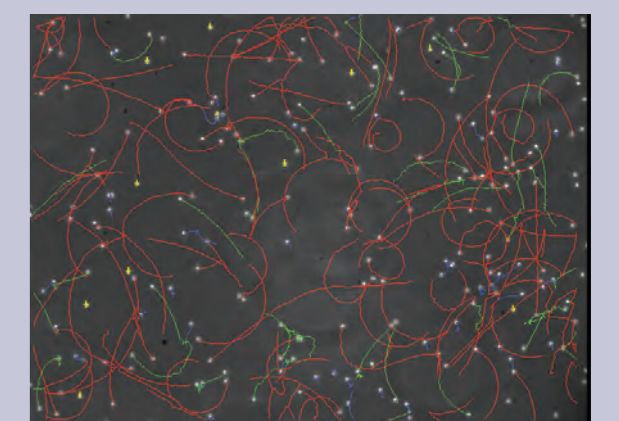
WATER REQUIREMENTS:

We use trays, which require about 3 – 5 l/min for each liter of eggs. A trough holding 7-8 trays may run at about 25 – 30 l/min. This is the most effective way of water usage, but it has the advantage of better management control. The water temperature revolves around 9 – 11.5 °C. The oxygen saturation is about 96% on average at the inflow and 88% at the outflow. Water goes through a sand filter to improve the quality and is only used once.

CONCLUSION:

Approximately 500 000 trout ova are hatched out in Jonkershoek during the rainfall season every year. The Jonkershoek Trout Hatchery is a working monument to the aquaculture industry in South Africa today as well as a significant monument to the country's steadily growing fly fishing community being the origin of most of this country's trout stocks. It has the potential to provide a supply stock of fish to many trout grow-out projects that are set to see hundreds of previously jobless people on their way to financial stability. This is a monument of major historical significance with a lot of potential to support the future trout farming development in the region.

Diagram from the automatic system of sperm analysis by computer.



- * Rapid progressive motility (type a)
- * Slow progressive motility (type b)
- * Non-progressive motility (type c)
- * Immotile



Prof. Gerhard Van der Horst busy with Sperm Cytomorphological study.



The stripping of eggs from a trout female.



The stripping of milt from a trout male.



Broodstock is placed back in freshwater to recover.



Anaesthetize of broodstock.



Classification of broodstock.



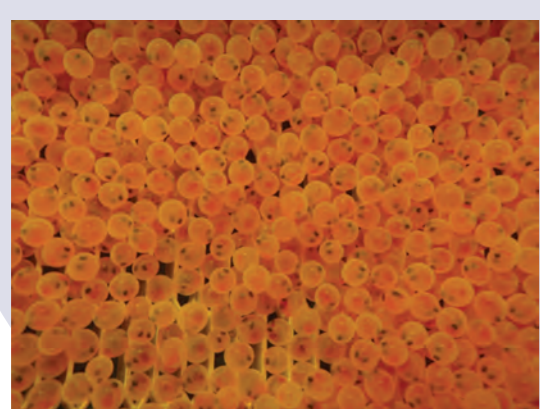
Rainbow trout fingerlings.



Picking of dead fry.



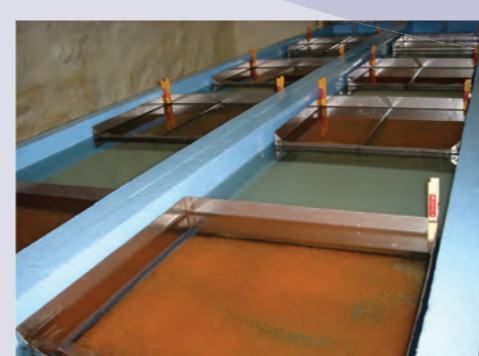
Yolk-sac fry.



Eyed eggs.



Picking of dead eggs.



Fertilized eggs in troughs.

Acclimatization of fertilized eggs to reach equilibrium.

