KIKO TECHNOLOGY AQUACULTURE NURSERY TRIAL 2012

TRAFALGAR TROUT FISHERIES, UNITED KIONGDOM

Date of Visit: April 13 2012

Kiko Coordinator: Peter Reeves, John Reeves, Julian Lee

Client Contacts: Darren Butterworth - Fisheries Manager

Barford Fish Farm, Downton, Salisbury Wilthshire SP5 3 QF, UK

Phone 44 01725 510448

Objective: to increase fisheries performance in UK's largest trout hatchery and trout grower.

Beta Trial:

One Tritan cartridge supplied to Darren on April 13 to conduct beta trial in the larvae to fry to juvenile (called fingerlings) phase of growth.

The Beta will be conducted in a tank holding 40,000 fry (Peter may wish to check EXACT DOSAGE location)

Start Date: perhaps April 13 2012

End Date: 3 months phase, 17 July 2012

Background:

Trafalgar Fisheries operates a number of hatchery and trout full length growth farms, including:

- The two main sites are Barford fish farm and Fordham Bridge (sic… Peter fill in proper names)
- 6 sites for the fry phase of growth
- Another affiliated or contracted 4-5 hatcheries sites all within a 100 mile radius
- Barford has over 89 outdoor ponds to grow Fingerlings to full grown trout, which range from 400 grams to 1.5 kg size.
- NATURAL Spawning period for trout: November to January

- For this KIKO Trial the eggs / larvae are sourced from Denmark and a day old.

Trout Operations:

- Spawning phase which are either imported eggs (larvae) or locally spawned
- Larvae to fry phase (0.5 inch): this phase is when the SAC or Yoke falls off from the larvae within 2-3 weeks indicating the FRY phase
- The FRY TO FINGERLING phase (from half inch FRY to Fingerlings or Juvenile phase): At this phase the growth cycle about 3 months grown to 5 grams weight approx. with water temperatures about 10 deg C.
- Then Fingerlings are grown to 400 gram to 1,500 gram trout in outdoor / mud bottom ponds

It appears the AMMONIA discharge problems are not as severe or cause-for-alarm as opposed to the NITROGEN Gas contamination (due to water flowing over natural limestone)

Trout Production Volume:

- 1500 metric tons per annum, including 200 mt for re-stocking ponds
- The 89 ponds alone cultivate 350 tons of trout,
- 500 grams = 1 trout or 2 trout per kg @ 1000 kg = one metric ton / therefore 3 million trout produced
- Species include rainbow trout / golden trout / brown trout

Water Intake and Quality:

- This farm has been operating for 40 years at this site.
- Water comes in from two tributaries flowing into upper and lower trout growth ponds
- Water is drawn and passed through limestone rocks and hence likely to be high hardness (i.e. High calcium, magnesium and sodium) and at pH levels ranging from 7.0 to 7.8. the water temperature seldom varies from its 10 deg C intake during summer or winter months.
- The water intake is fast flowing to simulate natural streams, flowing at about 3800 liters per minute a fast flowing stream
- However in this area of Southwest UK, there is a tendency that underground water streams contain a HIGH LEVEL of NITROGEN which are not conducive to fries / fingerlings / full trout
- Hence water is passed through aeration towers (looks like a cooling spray tower) and NITROGEN being a gas is released to atmosphere. The single tower we observed at Barford was full of moss (a form of algae) and about 10 meters height.

- One objective of KIKO is to accelerate the removal of NITROGEN / either at this aeration point of contact or perhaps in other sites such as the larvae to fry hatcheries OR the fry to fingerlings hatcheries OR the Fingerlings to Trout ponds
- Also noticed an abundance of algae in the END of the INTAKE FREE Flowing water ditches

Water Intake diagram:

- Peter MAP out the water flow schematic later:
- Tributary to upper ponds (89) into two streams and overflow back to the tributary again.
- Each pond about 3-4 meters x 0.4 meters x depth of 0.2-0.3 meters
- Most ponds have rapid flow to simulate natural environmental conditions

KIKO BETA TRIAL OBJECTIVES:

Primary Benefits:

1) Increase production YIELDS.

2) Lower MORTALITY RATE: (currently 30% overall mortality includes the larvae to fingerlings phase and the fingerlings to growth phase)

NOTE mortality includes nitrogen effects / cannibalism as stronger trout eat smaller ones / predators such as birds in the growth ponds

3) Optimize FEED CONVERSION (Note: current feed conversion is 1.1 - 1.3 kg Feed per 1.0 kg trout

a. Feed costs increased 60% in the last 2 years

b. Feeds are high protein fish meals including soy, fish oils, vitamins et al

Secondary Benefits:

4) Check for increased OIL (omega 3 oils)
(NOTE: Darren states he can look at a trout and by its muscle blocks determine whether the trout has more oils which are Omega 3s and hence supermarkets MAY place a HIGHER Purchasing value to this type of trout

5) Check for COLOR pigmentation
(NOTE: in other fish like Koi / Tilapia / the color pigmentation is certainly “brighter” and more distinct).

6) Check for more UNIFORM trout size especially at the Fingerlings phase
(NOTE: a uniform trout size means less cannibalism- the Darwinian theory of “the strongest survive”)

7) Check for OFF TASTE perhaps due to Ammonia presence in trout or the Nitrogen intake.

8) KIKO can be added Directly to INTAKE water source JUST PRIOR TO NITROGEN aeration towers in order to assist in the SEPARATION PROCESS. We did not spend enough time on this sector, but Kiko will accelerate NITROGEN removal and a lab TEST BEFORE AND AFTER the immersion of Kiko can be easily measured by chemical analysis

9) In the same thought pattern, AMMONIA by product wastes from the trout does not seem to be problematic due to the fast flowing streams of water (3800 liters per minutes), but its effects upon reduced mortality can be isolated in the next phase of Kiko beta trials. AMMONIA for many fishery ponds has been the Number one problems leading to HIGH mortality.

TRIAL PARAMETERS AND BENCHMARK CHART:

PHASE	TIME	SIZE	VOLUME	MORTALITY
Spawning				
Larvae to Fry	2-3 weeks	0.5 inch	40,000	
Fry to Fingerling	3 months	3 inch		30%

Fingerlings will take 6-12 months to grow out for market-ready trout.

RESULTS:

- Kiko treated fingerlings survival rate improved over 35%.
- Kiko replicates on average grew faster by 31 to 35% against Control
- Kiko fingerlings also weighed 36% heavier than the Control.
- Kiko fingerlings are livelier, more vibrant, darker color, larger in uniform size.

Denser density & darker fingerlings are in Kiko treated tank on the RIGHT

Kiko fingerlings are more vibrant, darker color, uniform & larger in size

END FIELD NOTES:

Julian Lee

19 July 2012