

## AQUACULTURE INFORMATION SERIES: NO. 8

### A METHOD OF CONTROLLING THE GROWTH RATE

Chefs and marketers have expressed three criteria for farm-raised fish - primarily rainbow trout, Pacific and Atlantic salmon, and channel catfish; namely, quality control, timeliness (availability) and portion control. In the majority of cases involving fish of questionable quality, the condition has been due to actions, or the lack thereof, by the distributor and not by either the producer or processor. However, the questions of timeliness of delivery into the market and portion control are attributable to the producers and processors.

The farmer annually producing 15-50 tons (30,000-100,000 lbs) of table-size (1.2-1.3 fish/lb) rainbow trout is faced with making some decisions, particularly if the annual production is divided fairly evenly on a monthly basis. For example, an annual round weight production of 72,000 pounds of 1.3 fish per pound annually means that there will be 6,000 pounds of fish shipped each month. That translates to 7,800 fish per month. The production time for these fish at this hypothetical farm is 12 months from eyed egg. The process begins with 10,000 eyed eggs (mortality is quite reasonable at this farm - good management, I reckon). This means that the farmer will have to order 10,000 eyed eggs each month - but usually does not because larger lots - say, 50,000 to 100,000 eyed eggs are more convenient and less expensive. So, what does our farmer do to ensure that there are 7,800 fish per month over a 5-10 month period?

The same problem faces another farmer producing the same number of fish but starting the production with fingerlings; i.e., 3-4" fish (40-50/lb). Such fish are not available the year around so larger numbers must be purchased and the final product-size be spread over several months. What does this farmer do to produce a 1.3/lb fish over this period?

The currently practiced method for either of our farmers to satisfy the needs of the situation is: First, the growth rates are slowed by reducing the amount of feed begin fed each day. Second, the groups are graded to a "fare thee well" to remove the proper size of fish. This practice has some attendant shortcomings, such as increased size variation of the fish, fin-nipping, fin-fraying and darkened bodies. These shortcomings are the result of certain fish getting more feed than their pond-mates and the chronic stress response by the entire population.

Basically, the stress response is a series of physiological changes occurring due to being exposed to either an external or internal stimulus which the animal perceives as a threat. This stimulus is called the stressor. On fish farms the major stressors are either short-term (handling, grading, and harvesting) or long term (overcrowding, high ammonia, low D.O., and solids). The response is divided into three stages: Alarm; Adaptation; and Exhaustion. The Alarm Stage is the immediate response to the stressor. It is characterized by a rapid decrease in circulating ascorbic acid and an increase in blood cortisol - both effects can markedly increase the susceptibility to activating a latent bacterial or viral infection. The Adaptation Stage is characterized by most of the blood values returning to near baseline levels, fin fraying, and general body darkening. The Exhaustion Stage is characterized by the fish being no longer able to maintain the status quo and literally "pooping out" physiologically. This fish can be seen on the tail screen in the morning as a slow-moving, dark, frayed fin fish. This response is contributory to virtually all the gill disease problems occurring during

the grow-out stage.

A better method of reducing the growth rate is to feed intermittently. That is, 7 days of feeding followed by 7 days of not feeding. This results in a 50% reduction in weight gain but not length gain. The latter is more under the influence of genetics than energy intake. The result of this is a much less size variation and fin-nipping. The fins and color are quite acceptable, provided the carrying capacities are not exceeded.

The main problem with the intermittent feeding program is to decide when to put the fish back on full feed to bring them to market-size and condition.

So, let us look at a typical hypothetical farm. The farmer wants to produce 1,000 1.3/lb Kamloops per week. This is 4,000 fish per month being processed. The water temperature is a constant "toasty" 15°C (59°F) which provides a growth rate potential of 1.2 mm/day (1.32' per 28 days). The best egg purchase deal is in 30,000 egg lots which can provide for 6 months of harvestable fish. So, what should our farmer do?

1. Incubate and hatch the eggs. Remember to get the egg shells out of the system as soon as possible to prevent one of the missed egg-transmitted pathogens from causing problems later on.
2. Get the fish on feed as quickly as possible. Remember that cleanliness is the most important act to perform at this stage.
3. When the fish are 100/lb (about 3"), remove 5,000 and place them into an appropriate deep tank or small raceway. These fish go on full-feeding regimen until they are at 1.3/lb.
4. The remaining 25,000 are put on the following feed regimen: 50% full-feeding level for 7 days and no feed for 7 days. Inventory the population at 14-day intervals after the 7 days off feed. This regimen practically "flat-lined" growth without being detrimental to the fish (Figures 1 and 2). Space required for this group of fish is about 300 ft<sup>3</sup> (one 5' x 20' x 3') with 115 gpm water inflow.
5. At monthly intervals remove 5,000 fish and put them on full-feeding until they are 1.3/lb.
6. The end result is 6 months of production of virtually the same sized fish with very little grading needed except at pond harvest, at which time the "tops" are removed each week for processing after depuration, if necessary.

Finally, closing out our scenario, the following production performance indicators should be monitored:

1. Length increase
2. Weight increase - individual and total
3. Size variation within the population
4. Feed conversion
5. Dress-out
6. Gross appearance
7. Taste and flesh quality

The bottom-line is - are you happy with your fish. If you are - great. If you are not - then something should be done. I have offered some ideas. Other people have other ideas. Gather them in, think them through, and go for

it.

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