AQUACULTURE update

Number: 81

Editor: C. Clarke

Pacific Biological Station

September 28, 1998

Seawater growth of Atlantic salmon in SEA System™ floating bag

The SEA System™ was developed by Future SEA Technologies Inc. (formerly Future SEA Farms Inc.) to create a controlled environment for salmon farming. The flexible enclosure is supplied with pumped water that can be drawn from a chosen depth to control quality, current speed and temperature. An initial test of the technology was conducted successfully with coho salmon in 1997 (see Aquaculture Update #79). A subsequent trial was conducted at the Department of Fisheries & Oceans Experimental Mariculture Facility in Departure Bay BC to investigate the production of Atlantic salmon in the bag system in comparison with a conventional netpen.

In late January 1998, Atlantic salmon smolts from a commercial hatchery were stocked into a single bag and an adjacent netpen. Table 1 summarizes the conditions in the test.

Table 1. Bag and netpen starting conditions.

	Bag	Netpen
Volume	875 m^3	324 m^3
Stocking number	9819	1203
Fish mean weight	57.1 g	57.2 g
Condition factor	1.15	1.14
Stock density	0.64 kg/m^3	0.21 kg/m^3

Both groups were fed to satiation on a commercial diet by the same personnel. Fish were measured at approximate bi-monthly intervals until the study was terminated in late July 1998.

Environmental conditions were similar in the bag and the netpen (Table 2), although mean water temperatures in the bag were 2 to 3 degrees lower than in the netpen during May and June.

Table 2. Overall means for environmental conditions.

	Bag	Netpen
Temperature (5 m)	10.6ºC	11.2ºC
Salinity (5 m)	29.4 ppt	29.1 ppt
Dissolved oxygen	8.6 ppm	9.6 ppm
Secchi visibility	9.2 m	8.8 m

Resulting growth in the two systems showed that the fish from the bag were significantly larger than the netpen cohorts at the first sampling, indistinguishable at the second sampling, and significantly larger again when the study was ended in July 1998 (Figure 1).

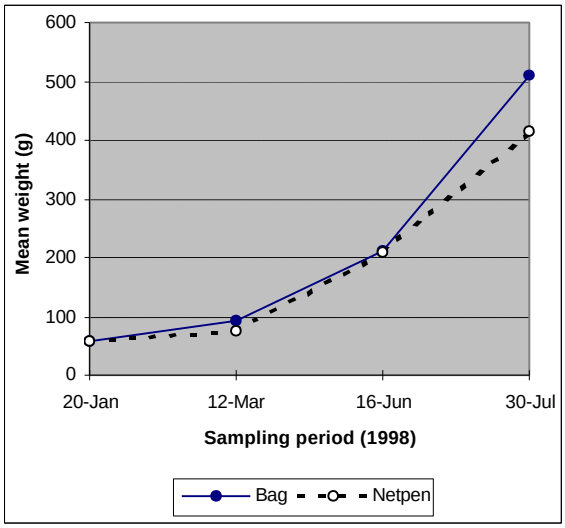

Figure 1. Average weights during the test.

Feed conversion rates (FCR, simple amount fed divided by change in biomass, not adjusted for mortality) were initially poor in the netpen but improved as the spring progressed (Figure 2).

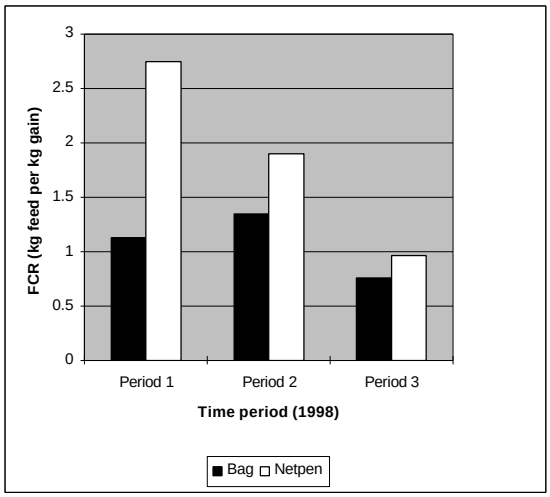

Figure 2. Feed conversion rates during the test.

FCR in the bag showed better results from the outset and remained superior throughout the study despite persistent mortality.

Smolt quality problems were experienced from the outset of the study, and both groups were medicated for furunculosis and mouthrot. Despite this, both groups grew steadily, the performance of the fish in the bag surpassing that recorded for the netpen (Tables 3, 4).

Table 3. Performance summary at end of test.

	Bag	Netpen
FCR (simple economic)	0.99:1	1.44:1
Total mortality	25.0%	35.1%
Fish mean weight	510.0 g	414.5 g
Fish weight gain	452.9 g	357.2 g
Fish condition factor	1.44	1.33
Accumulated Thermal Units (ATU)	2050	2178
Specific Growth Rate	1.15%/day	1.04%/day
Growth Coefficient	2.02	1.65
Stock density	4.28 kg/m^3	0.97 kg/m^3

Table 4. Test results in bag as percentage of netpen performance.

FCR	31.2% lower
Mortality	28.2% lower
Mean weight	23.1% higher
Fish weight gain	26.8% higher
Condition factor	8.3% higher
ATU	5.9% lower
Specific Growth Rate	10.6% higher
Growth Coefficient	22.4% higher
Stock density	341.2% higher

The fish in the bag grew better as shown by lower mortality, more efficient food conversion and higher specific growth rate. Calculation of the thermal growth coefficient, which takes into account fish size and water temperature (Iwama & Tautz 1981), confirmed that growth was faster for the fish in the bag.

For more information, contact:

Henrik Kreiberg (250-756-7019)
Pacific Biological Station
Nanaimo BC V9R 5K6
Canada
email: kreibergh@dfo-mpo.gc.ca

Valma Brenton-Davie (250-751-2200)
Future SEA Technologies Inc.
2231-G McGarrigle Road
Nanaimo BC V9S 4M5
email: vbrenton@island.net

Note: expanded data summaries by 2-week intervals (environmental) or growth-sampling periods (3) with means, sample sizes and standard deviations are available on request.

References

Iwama, G.K. and A.F. Tautz. 1981. A simple growth model for salmonids in hatcheries. Can. J. Fish. Aquat. Sci. 38:649-656.