PERFORMANCE OF TRIPLOID ATLANTIC SALMON (*SALMO SALAR*) UNDER COMMERCIAL REARING CONDITIONS

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Introduction

Although there are many similarities between triploid and diploid fish, basic differences exist and conflicting results in terms of performance have been obtained in salmonids and other species. Growth has been shown to be poorer (O'Flynn et al., 1997), equal to (Galbreath and Thorgaard, 1995), or even better (Oppedal et al., 2003) than diploid siblings. Triploids are also often associated with greater morphological deformities, an attribute potentially detrimental to functional physiology and harvest quality. The aim of this study was to compare performances of diploids and triploids siblings in commercial rearing conditions.

Materials and Methods

On 22 October 2008, eggs from 62 females and milt from 8 males of the Aquagen strain was collected at Marine Harvest Norway (MHN) Tveitevågen. The brood fish had been reared under an advanced photoperiod regime to advance spawning and were treated with Ovaplant before collection of eggs and milt. The eggs from nine of the females were evaluated to have poor quality based on a visual evaluation and were discarded. The eggs from the remaining 53 females were divided into four equal portions (A, B, C and D) after which all portions belonging to the same letter were mixed. This gave four groups of eggs which all consisted of the same mix from 53 females. These groups were divided into smaller batches and each batch was fertilized with milt from three of the 8 males. New combinations of milt from three males were chosen for each fertilization. Two of the groups (C and D) were incubated directly after fertilization. The other two groups (A and B) were pressurized in batches of 1.8 liter, 300 h.ºC (hour*degrees ºC) post fertilization and incubated.
The eggs were shocked and fungus removed on 3 December. On 10 December the eggs were sorted. The egg quality was poor and both diploids and triploids had low fertilization. The remaining eyed eggs were mixed to give one triploid and one diploid group and were transported to MHN hatchery Fister Smolt in Rogaland County on 8 January 2009 (Table 1).

Table 1. Overview over the egg production

	dºC	**Date**	**A**	**B**	**C**	**D**
			Triploid	Triploid	Diploid	Diploid
Fertilized	0	22 Oct 08	205.000	205.000	205.000	205.000
Sorted		10 Dec 08	86.800	163.300	160.400	153.600
To Fister	389	08 Jan 09	208.000		256.000	

The fish were graded in July 2009 (removal of fish below 11 gr.), and were vaccinated in September. Regular photoperiod control was used, with 24 hrs light from week 38 (September 14th), in order to produce S0 smolt ready for seawater (SW) transfer the following autumn. In October, 140,000 triploid and 125,000 diploid were remaining. Both groups were fed high P-diets during the last 5 weeks in freshwater (FW) (0.9 % available P), to reduce risks of spinal deformities.

Results

Growth performance in the triploid group throughout the FW phase was good. At time of transfer to SW (late October 2209), the triploid fish were circa 30 % larger compared to diploid controls. Similar mortalities during the FW phase were observed in the two groups. A quality control of 100 fish per group performed in October did not reveal any significant differences regarding outer appearance or inner abnormalities, but there was a suspicion of a higher prevalence of vertebral deformities in the triploid group. Also, a higher prevalence of shortened opercula was seen in this group (3 versus 13 %).

On October 21st, 110,000 triploid smolts (mean weight of 115 gr.) and 95,000 diploid controls (86 gr.) were transferred by well-boat to MHN site Lindvik, Hjelmeland, in the county of Rogaland. Each group was kept discrete in one cage. Three days later, appr. 30,000 triploid and diploid fish were transferred to IMR research site Solheim, Matre, by use of well boat. The fish were distributed into 6 cages.

Growth performance at site Lindvik (per April 2010) has been comparable between ploidies, the triploid fish still being close to 30 % larger than the diploid group. Low mortalities have been seen in both groups. On March 23rd, a quality and health control was performed in the farm. Vertebral deformities were similar and low in both groups (n=150/group inspected). An increased prevalence of cataracts were seen in the triploid fish (30%), compared to the diploids (3%). However, the changes were mild and of no significance to vision or performance. A significant higher percentage of fish in the triploid group showed "winter wounds" and fin rot.

At Solheim, diploids (SGR 1.26 ± 0.02%) grew significantly faster than triploids (SGR 1.11± 0.01%) during the first 120 days in seawater (trip: 503 g, dip: 453 g). Furthermore, a visual examination and palpation of 600 fish per ploidy (200 per cage) 120 days after sea transfer, revealed a significantly higher prevalence of vertebral (trip: 7.1 ± 0.8%, dip: 0.7 ± 0.2%) and lower jaw deformities (trip: 3.1 ± 0.9%, dip: 0%), and equal levels of shorten operculum (trip: 6.2 ± 1.0%, dip: 6.5 ± 0.2%). Measurement of red blood-cell diameter from 90 fish per ploidy (30 per cage) at this stage showed that the triploidization had been 100% successful.

Discussion

The results from the commercial freshwater and sea water sites are so far promising, with respect to general performance and mortality. However, the data from the commercial sea water site are weakened due to lack of replicated cages. Deformity assessment at research site Solheim showed differences between ploidies with triploids having higher rates of vertebral deformities. The absence of deformities at the commercial site might be related to the examination method (no palpation), or to the somewhat lower growth at this site, compared to the research site. A higher prevalence of cataracts were found amongst commercial reared triploids, compared to the diploid fish, however of low severity, not affecting the vision of the fish. Updated results of growth performance, health and quality will be presented at the conference.

Acknowledgements

This work was funded by an EC FP7 project (Salmotrip, project 222115).

References

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