



MASCULINIZATION IN RAINBOW TROUT CARRYING THE *MAL* MUTATION IS TEMPERATURE SENSITIVE

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Introduction:

Sex determination in rainbow trout is mainly genetic with a XY male heterogametic system. However, a maleness mutation (*mal*) was discovered in an all female (XX) rainbow trout population obtained by endomitotic gynogenesis [1]. Some of these XX fish can display functional masculinization features of their gonads with various phenotypes such as: a full masculinization of both gonads, a left-right asymmetry of masculinization or intersexual gonads [1,2]. Interestingly, preliminary experiments on these *mal*-carrying populations suggested that masculinization could be sensitive to water temperature. Therefore, we investigated under controlled conditions whether low or high temperature applied after hatching during the sex differentiation period could affect the masculinization of different *mal*-carrying progenies.

Methods:

Oocytes from four different *mal*-carrying females were fertilized with sperm from one XX *mal*-carrying male (sex inverted by the *mal* mutation) and these eggs were kept separately at 10°C until hatching when these were mixed (100 individuals from each progeny) before the application of the different temperature treatments. These temperature treatments started from hatching (30 days post-fertilization) for different periods in order to compensate the temperature effects on development: 6 months at 8°C, 3 months at 12°C, and 2 months at 18°C. For each temperature condition both left and right gonads were sampled between 9 to 12 months post-fertilization for histological processing in order to analyze the sex ratio. Furthermore, in order to assign each fish to its family, a fin clip was sampled and stored in 90% ethanol before microsatellite genotyping.

Results and Discussion:

Overall, our results demonstrate that the highest temperature treatment (18°C) produced a significant and higher proportion of masculinized animals (28.9% at

18°C, 15.2% at 12°C and 16.2% at 8°C). Interestingly the masculinization effect was even more pronounced in one of the four families studied in which the 18°C treatment induced a two fold increase of masculinization (72%) compared with the 8°C (33%) and the 12°C (37%). These family differences could be explained by a "genetic parental effect" as previously described in Atlantic silverside [3], Nile tilapia [4] and rainbow trout [5]. In agreement with previous observations in intersexual *mal*-carrying animals [2], the right gonad was shown to be more frequently masculinized in animals at 8°C and 12°C. However, at the 18°C this left-right asymmetry of masculinization was no more detectable.

Conclusion:

These results demonstrate that masculinization in *mal*-carrying rainbow trout is dependant on female genotype and is responsive to high temperature.

References:

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