



Tropentag, September 14-16, 2010, Zurich

“World Food System —  
A Contribution from Europe”

## Detection of Non-additive Genetic Effects on Temperature Dependent Sex Determination in Nile Tilapia (*Oreochromis niloticus*)

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### Abstract

Sex determination in Nile tilapia is governed by major and minor genetic factors as well as temperature. The temperature dependent sex ratio is heritable and selection lines giving high and low proportions of males had been produced. Here, the effect of male and female breeders on temperature dependent sex ratios in *O. niloticus* is investigated using these selection lines and crosses of clonal lines. First, the response to temperature treatment (36°C/10 days) of clonal line crosses (XX × ΔXX) was tested. Second, clonal crosses were mated to temperature treated males (XX × XY/ΔXX) from progeny groups of the high line (> 90% males by temperature treatment). Third, diallels within the 1<sup>st</sup> and 2<sup>nd</sup> generation of selection between the low- (< 60% males) and the high-line were conducted. For the 1<sup>st</sup> generation 24 matings between the low-line as sires and high-line as dams (LH) and 27 reciprocal crosses (HL) were done. For the 2<sup>nd</sup> generation 11 LH matings and 8 HL matings were generated. All matings were conducted by artificial fertilisation. Ten days post fertilisation batches were divided in a control (28°C) and a treatment group (36°C). The temperature treatment lasted for ten days. There was no effect of temperature treatment on sex ratios of the clonal crosses. Both, temperature treatment and controls yielded sex ratios of 0% males. Even when clonal crosses were mated to high temperature sensitive males (XX × XY/ΔXX), male ratios in temperature treated progeny groups were unexpected low (XX × XY: no deviation from 1:1; XX × ΔXX: 0–15.9% males). The diallel crosses achieved similar results. The low-line exhibited a stronger negative effect on male ratio in the diallel crosses when it was used as the maternal line. Within the 1<sup>st</sup> generation HL matings produced significantly less males on average than LH matings. This effect was also visible in diallel crosses within the 2<sup>nd</sup> generation of selection. Therefore, these experiments show that non-additive genetic effects act on temperature dependent sex ratios. Maternal insensitivity to temperature dependent sex determination has a strong influence on the temperature susceptibility of the progenies.

**Keywords:** Diallel, Nile tilapia, sex determination, temperature