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## Genomic Approaches to Identifying Sex-Determining Genes in Tilapia

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Key words: sex determination, tilapia, linkage map, microsatellite marker

### Abstract

Variation in sex determination mechanisms among the different tilapia species has been recognized for over 40 years. We have looked for associations between microsatellite DNA markers and sex in families from different species and strains of tilapia. We found that at least two different linkage groups are involved in sex determination in this group of fishes. In two species, *O. niloticus* and *T. zillii*, we found evidence for male heterogamety with a major sex-determining locus on linkage group 1 (LG1). In two other species, *O. aureus* (Israeli strain) and *O. karongae*, we found evidence for female heterogamety with a major locus for sex determination on LG3. In *O. aureus* (Egyptian strain) and in *O. mossambicus*, loci associated with sex determination were found on both LG1 and LG3, and a complex mechanism of sex determination was detected. Physical mapping by fluorescence *in situ* hybridization (FISH) suggests that LG3 corresponds to the largest chromosome pair, and that there is recombination suppression in the sex determination region. The sex-determining region in *O. niloticus* has been mapped to an 11cM region between markers *GM201* and *UNH995* on LG1. A BAC contig containing *UNH995* was identified and several BACs in the contig were end- or shotgun sequenced. BLAST analysis of these sequences identified *Tetraodon* chromosome 5 as the homolog of tilapia LG1. Additional SNP and microsatellite markers were developed from published cichlid ESTs and the order of these markers is consistent between tilapia and *Tetraodon*. We have narrowed the sex-determining region to a 2.6cM interval which corresponds to a 400 kb region of *Tetraodon* chr5. We are completing genetic and physical maps across this region in order to identify the gene(s) responsible for sex determination in this species.

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