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## Development of tilapia broodstocks producing all-male progeny on a commercial scale

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**E** flective farming of tilapia requires all-male culture, characterized by uniformity and high growth rate. Hybrids between males of *O. aureus* (Oa) and females of *O. niloticus* (On) produce all-male offspring, but there is a behavioral reproductive barrier between the two species that prevents mass production. We showed that in repeated crosses between Oa and On, few female "responders" that have On alleles at their sex determination sites on LGs 1, 3 and 22 are attracted to the Oa male nests; and thus resulting in mass fry of males (Fig 1). However, without selection for the alleles underlying this interaction, the parental stock loses its capability of interspecies communication along several generations. Hypothesizing that marker-assisted selection for female responders would allow sustainable broodstocks, we applied Genotyping-By-Sequencing using Illumina HiSeq platform, to DNA samples of 22 and 47 responding and non-responding females, respectively. Sequence reads were mapped onto the On genome (Release 103) using mrsFAST-Ultra, and alleles were called by the GenomeAnalysisTK module (GATK3). Following flirtation, 5019 informative SNPs were used in a genome-wide-association study, which after accounting for multiple comparisons, pointed to candidate loci for female responsiveness on LGs 9 and 14 (p<0.001). To further validate this finding, the sample was genotyped for 2 and 3 microsatellite markers located near these loci, respectively. Using haplotype analysis based on these microsatellite alleles, we independently determined the pedigree structure and confirmed the association of distinct haplotypes with the female-responsiveness trait (p<0.001). The LG14 haplotype spanned a cluster of olfactory receptors, in which a gene coding for a V2r-like vomeronasal receptor was expressed in tilapia ovary. An allele of the microsatellite marker located within this gene 3'-untranslated-region was highly associated (p=1.2×10<sup>4</sup>) with this trait suggesting that genes orthologous to receptors that stimulate sexual

## Biography

Andrey Shirak has his expertise in animal genetics; detection and investigation of mechanisms underlying the inheritance of categorical and quantitative traits; and implementation of scientific finding in the improvement of animal production. His hypothesis is that overcoming the behavioral barrier between different tilapia species is a key step for mass production of all-male tilapia, through manipulation of sex determination by species hybridization. Following 8 years of experimentation, his hypotheses gain support from the actual determination and localization of the genetic loci that are involved in sex determination and in reproductive communication, including the discovery of male-specific AMH duplication. The Chief Scientist (Israeli ministry of agriculture) and ISF (Israeli Science Foundation) have supported the present study over this period, allowing implementation of knowledge from different disciplines of genomics, and aquaculture in development of intensive technology for tilapia production.

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