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Eawag Seminar Invitation

A short-lived African Fish Sheds Light on the Genomic Basis of Life History Trait Evolution

Speaker **Dr. Dario Riccardo Valenzano**
Max Planck Institute for Biology of Ageing, Germany

When **October 14, 11.00 – 12.00 a.m.**

Where **Forum Chriesbach C20, Eawag Dübendorf**

Abstract "The Valenzano Lab investigates the evolutionary genetic basis of vertebrate lifespan and ageing. Our main model system is the African turquoise killifish(Nothobranchius furzeri) — the shortest lived vertebrate species bred in captivity, characterized by rapid ageing. We use a combination of experimental approaches, which include genetic mapping, comparative genomics, population genetics, fish transgenesis and computer simulations.

We research the genetic mechanisms involved in vertebrate survival and ageing under laboratory and natural conditions. We are broadly interested in genome evolution and we use genetic crosses between different fish strains to map the genomic regions associated with several traits, including male colour and sex (Valenzano et al., 2009). After sequencing and assembling the turquoise killifish genome, we mapped the genetic architecture of the differences in captive survival between different strains of this species (Valenzano et al., 2015). We investigate whether the genomic regions that regulate adult survival and ageing in the turquoise killifish 1) play a role in ageing and survival in other species and 2) are under natural selection in wild killifish populations. Using a combination of population genetics and computer simulations (Šajina and Valenzano, 2016), we study how the genomic regions controlling different life history traits evolve under specific ecological conditions.

Working on an extremely short-lived vertebrate, with a captive median lifespan of less than four months, we can rapidly investigate the changes occurring in different organs and systems throughout the ageing process. Studying a short-lived organism equipped with both an innate and an adaptive immune system, using a high-throughput sequencing approach, we specifically investigate 1) the changes occurring during ageing in the B-cells immunoglobulin repertoire and 2) how age-related changes in the intestinal microbiota composition affect ageing and survival in a vertebrate.

We take advantage of the short life cycle of the turquoise killifish, which is less than two months in captivity, to rapidly generate transgenic fish lines (Valenzano et al., 2011; Harel et al., 2015) and test the effects of several genetic alterations on vertebrate ageing and lifespan.

We are developing the African turquoise killifish as a novel experimental short-lived vertebrate model organims (Kim et al., 2016) to fill the gap between experimentally short-lived invertebrates — C. elegans and Drosophila — and longer-lived vertebrate model organisms — mice, rats, zebrafish and marmosets.