Study finds fish offspring grow best at same temperature as parents

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Sheepshead minnows

(PhysOrg.com) -- Fish parents can pre-condition their offspring to grow fastest at the temperature they experienced, according to research published in the February 2012 edition of Ecology Letters. This pre-conditioning, known as transgenerational plasticity (TGP), occurs whenever environmental cues experienced by either parent prior to fertilization changes how their offspring respond to the environment.

Dr. Stephan B. Munch, an Adjunct Associate Professor at the School of Marine and Atmospheric Sciences (SoMAS) at Stony Brook University and a member of the Early Life History Team at the Southwest Fisheries Science Center of the National Oceanic and Atmospheric Administration (NOAA), along with Santiago Salinas, a Ph.D. candidate from Stony Brook University, found what they believe to be the first evidence for thermal TGP in a vertebrate.

Munch and Salinas highlight TGP as another potential mechanism for rapid responses to climate shifts. “In light of global climate change, transgenerational effects of temperature may be incredibly important mechanisms for coping with altered thermal regimes,” said Dr. Munch.

In the experiment, the team collected several hundred adult sheepshead minnows from the Gulf Islands National Seashore in Gulf Breeze, Florida, and brought them to the fish facility at Stony Brook University in August 2009. To test for thermal TGP in growth, parents were held at several different temperatures and growth of their offspring was subsequently measured. After seven days of parental temperature exposure, offspring growth was the same for all parents. However, after 30-days of temperature exposure, offspring grew best at their parents’ temperature. The experiment was fully replicated and repeated, each time revealing the same result that offspring from high (34° Celsius) and low (24° Celsius) temperature parents grew best at high and low temperatures, respectively. “The differences in growth of the offspring, based on whether the parents had experienced that same temperature, were significant,” noted Salinas.

"There is very little known about transgenerational effects on physiology,” said Dr. Munch. “I think the most exciting part about the research is that, although there has been a lot of work on transgenerational effects on fish, this is the first demonstration of a transgenerational effect of temperature. From a practical point of view, if such effects occur in other species, aquaculture programs could potentially make large gains by manipulating the parental environment before breeding. There are good reasons to believe that these effects will occur in many species, but we've only just started looking.”

Provided by Stony Brook University