'Armored' fish study helps strengthen Darwin's natural selection theory

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Shedding some genetically induced excess baggage may have helped a tiny fish thrive in freshwater and outsize its marine ancestors, according to a UBC study published today in *Science Express*.

Measuring three to 10 centimetres long, stickleback fish originated in the ocean but began populating freshwater lakes and streams following the last ice age. Over the past 20,000 years - a relatively short time span in evolutionary terms - freshwater sticklebacks have lost their bony lateral plates, or "armour," in these new environments.

"Scientists have identified a mutant form of a gene, or allele, that prohibits the growth of armour," says UBC Zoology PhD candidate Rowan Barrett. Found in fewer than one per cent of marine sticklebacks, this allele is very common in freshwater populations.

Barrett and co-authors UBC post-doctoral fellow Sean Rogers and Prof. Dolph Schluter set out to investigate whether the armour gene may have helped sticklebacks "invade" freshwater environments. They relocated 200 marine sticklebacks with the rare armour reduction allele to freshwater experimental ponds.

"By documenting the physical traits and genetic makeup of the offspring produced by these marine sticklebacks in freshwater, we were able to track how natural selection operates on this gene," says Rogers.

"We found a significant increase in the frequency of this allele in their offspring, evidence that natural selection favours reduced armour in freshwater," says Barrett.

Barrett and Rogers also found that offspring carrying the allele are significantly larger in size. "It leads us to believe that the genetic expression is also tied to increased growth rate," says Barrett.

"If the fish aren't expending resources growing bones - which may be significantly more difficult in freshwater due to its lack of ions - they can devote more energy to increasing biomass," says Barrett. "This in turn allows them to breed earlier and improves over-winter survival rate."

Celebrating its 150th anniversary this week, Darwin's first publication of his natural selection theory proposed that challenging environments would lead
to a struggle for existence, or "survival of the fittest." Since then, scientists have advanced the theory by contributing an understanding of how genes affect evolution.

"This study provides further evidence for Darwin's theory of natural selection by showing that environmental conditions can directly impact genes controlling physical traits that affect the survival of species," says Barrett.

Source: University of British Columbia