

2-1-2013

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Recommended Citation

Hodgson, Andrew; Black, A. Ross; and Hull, Ryan, "Sensory Exploitation And Indicator Models May Explain Red Pelvic Spines In The Brook Stickleback, *Culaea Inconstans*" (2013). *Biology Faculty Publications*. Paper 9.
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Sensory exploitation and indicator models may explain red pelvic spines in the brook stickleback, *Culaea inconstans*

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ABSTRACT

Background: Sensory bias models explaining the evolution of sexually selected traits predict that trait preferences evolve as an artifact of a pre-existing preference for certain components of the environment such as specifically coloured prey. Indicator models, in contrast, predict that sexually selected traits indicate mate condition. We investigate the potential for sensory exploitation and condition indication models to explain the evolution of what appears to be a recently evolved sexually selected trait.

Question: Did red pelvic spine coloration in male Turnbull National Wildlife Refuge (TNWR) brook stickleback (*Culaea inconstans*) evolve to exploit a pre-existing sensory bias for red prey, thus helping males draw females to the nest? Or, did it evolve as an intersexual signal indicating male condition to females?

Methods: We recorded the frequency of red pelvic spine coloration in males versus females and in breeding versus non-breeding males. We measured the condition factor of males with and without red coloration on their pelvic spines. We presented fish with a paired choice between a red versus an orange, yellow, green, blue, or purple bead, and recorded the proportion of bites at each colour.

Results: Red coloration was significantly more common in males than in females and in males during the breeding season than outside the breeding season. Males with strongly red pelvic spines have a significantly higher mean condition factor than those with plain spines. TNWR brook stickleback prefer red to other colours in a predation context.

Conclusions: Our results suggest that TNWR brook stickleback red pelvic spine coloration is a secondary sexual character that may exploit a pre-existing sensory bias for red prey while also indicating condition to females.

Keywords: brook stickleback, *Culaea inconstans*, prey selection, sensory bias, sensory exploitation, sexual selection.



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