

Effects of perceived predation risk and social environment on the development of three-spined stickleback (*Gasterosteus aculeatus*) morphology

ABSTRACT

Phenotypically plastic changes in response to variation in perceived predation risk are widespread, but little is known about if and how social environment modulates induced responses to predation risk. We investigated the influence of perceived predation risk (i.e. chemical cues from a predator) and social environment (i.e. one, two or 20 individuals reared together) on three-spined stickleback (*Gasterosteus aculeatus*) morphology in a factorial common garden experiment. We found that exposure to chemical cues from potential predators did not influence growth or body condition or induce more robust morphological defences (i.e. lateral plate numbers and dorsal spine lengths). However, sticklebacks exposed to predator cues developed longer caudal peduncles and larger eyes as compared with fish from the control treatment. As these responses may improve sticklebacks' ability to avoid piscine predation, they might be adaptive. Social environment/density also influenced expression of some traits, but these effects were independent of predation-risk treatment effects. In general, these results suggest that apart from the classic morphological defence structures, which appear mostly constitutive, three-spined sticklebacks are capable of expressing potentially adaptive morphological responses to chemical cues from potential predators.

Keyword: Armour; Caudal peduncle; Eye size; Inducible defences; Lateral plates; Phenotypic plasticity