**PROJECT TITLE:** How does anthropogenic change impact the effectiveness of camouflage?

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**Project keywords:** environmental change, turbidity, eutrophication, animal colouration, camouflage, crypsis, aquatic, fish, predator-prey interactions.

**Proposed start date:** between 19 June 2023 and 10 July 2023

**Project description**

The colours of animals have fascinated scientists for hundreds of years. Using colouration to avoid detection by predators, i.e. camouflage, is extremely common in both invertebrates and vertebrates, and in different kinds of habitats. Some studies have considered how the environment impacts the effectiveness of prey camouflage, such as the background the prey are viewed against or the lighting that illuminates the prey. What is unknown is how the changes to the natural world that are being caused by humans (i.e. anthropogenic environmental changes) can make camouflage more or less effective. While anthropogenic change involves various environmental variables (e.g. temperature, acoustic noise, acidification), increases in water turbidity is an obvious candidate for how environmental change may impact prey camouflage. Turbidity reduces visibility in water due to suspended particles scattering light and is increasing across the globe in coastal and freshwater habitats due sedimentation and eutrophication from more extreme weather events, agriculture, urbanisation, and mining. Using fish and other aquatic animals, there is a lot of research that examines how turbidity affects the interactions between predators and prey, but no tests of whether these effects depend on the colouration of the prey. Instead, most studies of camouflage have used bird predators where turbidity isn’t relevant, but many aquatic organisms are camouflaged, thus using aquatic animals is ideal to explore how changes to the environment may impact the effectiveness of animal colouration.

In this study, you will be conducting controlled laboratory experiments testing how water turbidity impacts the behaviour of predatory fish (three-spined sticklebacks, *Gasterosteus aculeatus*) when searching for bloodworm (chironomid larvae) prey on different backgrounds. By being placed on different backgrounds, i.e. white for high-contrast conspicuous prey and red for low-contrast camouflaged prey, the appearance of the prey can be manipulated without any perceived change in prey quality by the predators. A shift in preference so that prey on a cryptic background are attacked more or less often in turbid water will show that the effectiveness of camouflage is impacted by water turbidity, and indicate that evolutionary selection pressure for animal colouration is altered by environmental conditions. To achieve this aim, you will work with the supervisory team to design the experimental set up, procedure and data analysis. You will conduct all of the behavioural trials and extract the data from the videos, and then analyse the data. A basic understanding of statistical analyses as used in behavioural research and/or R would be desirable but not essential. Training will be given in how to design the experiment, handle bloodworm and live fish, manipulate and measure water turbidity, conduct the trials, extract the data and statistically analyse the data. We hope that the experiment will directly lead to a paper published in a scientific journal, without any additional experiments being required. This makes it very likely that you will be the first author of this paper, which will be extremely helpful in being awarded a funded PhD position.
Candidate requirements

A basic understanding of statistical analyses as used in behavioural research and/or R would be desirable but not essential.

Background readings and references

