# Linking physiology and morphology with contest behaviour: is there a trade-off between skill and sensory ability?

**Project ID: 3667**

**Supervisory team**

**Lead supervisors:** Dr Sean Rands (University of Bristol) & Prof Mark Briffa (University of Plymouth)
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**Registered institution:** University of Bristol
**Host institutions:** University of Bristol/University of Plymouth



**Project description:** When we consider what attributes are necessary to win a fight, focus is usually given to differences in the physiology and morphology of the winner and loser, where larger individuals who have been able to invest more resources during development will be favoured. However, differences in behaviour are also important for determining who wins: as well as considering the length of a contest and how vigorously the winner fights, we could also consider the skill of the combatants. Skill encompasses a host of different abilities, such as the precision of actions, and the appropriateness and efficiency of actions taken, all of which are likely to be positively correlated with the sensory ability of the individual. There is therefore a trade-off here, between investing in enhanced sensory structures (enhancing skill) and physiological structures important in fighting (enhancing vigour and strength). In this project, we will explore this trade-off in investment between skill and vigour/strength in a suitable British crab species (most probably Carcinus maenas), through a mixture of behavioural and developmental experiments (based in Plymouth) and theoretical work (based in Bristol). The exact programme of study would be shaped to fit the student's interests, but is likely to include the following components:1. Characterising fighting skill and vigour in the study species. Behavioural contests will be staged, and winners and losers will be compared for various measures of their skill and vigour. We would expect winners to be more skilful than losers, particularly in their ability to target key areas of their opponent.2. Characterising covariance between skill and sensory capacity. We expect measures of skill to correlate with enhanced sensory ability, and will correlate measured success with measures of sensory ability including eye morphology and sensory hair density.3. Characterising developmental investment in skill and sensory capacity. If a trade-off exists in investment over development, it should be possible to explore this by manipulating the diet of individuals during their development, and assessing the impact on the growth of sensory structures.4. Exploring the evolution of the skill/vigour investment trade-off. The trade-off underpinning the previous three components will be explored using a mixture of economic and individual-based modelling, generating predictions that will feed into the experimental work.

**Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.**