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**Exploring Behavioral and Functional Responses of Crayfish to Noxious Stimuli: Implications for Pain Perception**

Decapod crustaceans are important models for biochemical, physiological and ecological research due to their complex biological characteristics and ease of use. Despite their advantageous characteristics, which include advanced circulatory hormones, immune systems, ease of culture, suitable size, unique characteristics, handling tolerance, high fertility, short generation time and adaptability to diverse environmental and nutritional conditions, there is still a historical perception that these organisms are not sentient and therefore incapable of experiencing pain.

In scientific terms, pain, defined as an unpleasant sensory and emotional encounter associated with actual or potential tissue damage, remains a topic of debate in crustaceans. A common argument is that their responses to noxious stimuli are merely nociceptive reflexes, without any real experience of pain. However, the primary function of pain is to modulate behavior to potentially alleviate the reduction in fitness caused by injury. Pain may stimulate the animal to aid healing and recovery by protecting or attending to the injury. It should enhance the animal's ability to avoid or minimize future exposure to noxious stimuli. This could include learning to avoid risk and reducing risk taking. Anxiety, manifested as increased sensitivity to certain stimuli and risk aversion following tissue damage, could be beneficial, particularly as injured animals may become targets for predators. There may be changes in motivation to use resources. In addition, pain may lead to the abandonment of vital resources, but the cost of abandoning a resource should be weighed against the benefit of avoiding pain. In essence, pain is expected to significantly influence behavior and resource use to help the animal cope with damage and ensure subsequent survival.

Therefore, in this study we aim to assess the behavioral and functional response of adult male signal crayfish (*Pacifastacus leniusculus*) when exposed to different noxious stimuli. These stimuli will include control conditions (normal water), chemical exposure (acetic acid) and physical stimulation (pinching) applied simultaneously to the antenna and antennules. Chironomid larvae will be used as food. Animals receiving these treatments will be video-recorded for 10 min using digital recording systems. Parameters such as activity levels, distance travelled, threat displays, tail movements, antenna responses, grooming behavior, guarding of affected areas, time spent near food and any deviations from normal behavior will be analyzed using Ethovision XT 13.0 software. In addition, food consumption will be quantified by counting the number of chironomid larvae remaining at the end of the study. The data collected will be subjected to rigorous analysis using advanced statistical methods in R software to compare the responses elicited by the different stimuli.