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**The physiological stress
response to amputation in
the eleven-armed sea star
(*Coscinasterias muricata*)**

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Anne Bailey Kim

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ABSTRACT

The eleven-armed sea star, *Coscinasterias muricata*, is subject to human-induced stressors, such as invasive fishing activities, that can cause limb loss (amputation), and heavy metal discharge into their habitat. The well-being and survival of a keystone predator such as *C. muricata* has important ecological implications as their presence influences community structure in the marine environment.

Understanding the stress physiology of an animal can provide insight into their overall health and survival. While the stress physiology of northern asteroid species (such as *Asterias rubens*) has been well documented, this has not been well studied with *C. muricata*. In this thesis, I was able to identify time-dependent changes in two physiological parameters (total coelomocyte count and dopamine levels in the coelomic fluid) in *C. muricata* subjected to amputation. There was a synchronous increase in both of these parameters 24 hours post amputation.

Dopamine in the coelomic fluid was measured by using high performance liquid chromatography (HPLC). I adapted a pre-existing method involving pre-column derivatisation and fluorescent detection, which was initially developed for the detection of dopamine in porcine muscle. However, this method requires further development as it could not detect dopamine to the same sensitivity as previously reported HPLC methods using electrochemical detection.

Lastly, the initial attempts at developing an *in vitro* cytotoxicity bioassay using *C. muricata* coelomocytes is described in detail. The initial aim of this experiment was to understand the effect of heavy metals on cellular parameters. However the experiment was hampered by unusually low cell counts in this species, which has not been previously reported. The knowledge gleaned from this study may provide the groundwork for future studies that use *C. muricata* coelomocytes for cytotoxicity testing or as a biomarker.

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