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Vulnerability of *Euastacus* to Climate Change

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Research Summary

There are major challenges to improving the ecological integrity of freshwater ecosystems across the globe, and climate change will potentially exacerbate many existing problems (Dudgeon et al., 2006; Rosenzweig et al., 2008; Pittock & Finlayson, 2011). Changes in species phenology (Hassall et al., 2007), distribution (Daufresne et al., 2004; Hickling et al., 2005) and assemblage structure (Flenner & Sahlén, 2008; Chessman, 2009; Daufresne et al., 2009) of freshwater species have already been recorded, consistent with being responses to recent climatic change. To meet the challenge of improving or maintaining the ecological integrity of rivers we must consider climate change effects (Palmer et al., 2009; Turak et al., 2011). Acting before significant ecological change occurs will increase the likelihood of success and reduce the risk of inefficient resource allocation (Heller & Zavaleta, 2009).

Many crayfish are threatened by loss of habitat, either as a result of river regulation, or indirectly via terrestrial development. However, in the future climate change may alter their environment substantially and compromise the ability of populations to persist in previously favourable habitat. This project will focus on modelling the environmental distribution of crayfish species in eastern Australia, with a particular focus on species of Euastacus. The environmental factors that determine a species distribution, including climate, are then used to determine the likelihood of suitable environmental conditions in the wider landscape, and then into the future as climate changes. Based on this information we can begin to evaluate the level of threat posed by climate change in the future. If a significant proportion of a species range becomes climatically unsuitable then it will be at greater risk of extinction.

In combination with other datasets on freshwater insects and fish the changes in distribution will be used to assess the consequences for protected area design and management. Eastern Australia is one of the global freshwater bioregions and the most heavily populated in Australia. Many species are expected to shift their ranges with climate change across latitudinal gradients and this presents a challenge to conservation within protected areas. Therefore, we will be using prioritisation software to identify those areas most important to achieving representation of species across time and least overlap with human landuse. Furthermore, the separate datasets will be used to compare the consequences of various assumptions about connectivity.

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