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Evaluating physiological responses of a kelp to environmental changes at its vulnerable equatorward range limit

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Understanding processes at species’ range limits is of paramount importance in an era of global change. For example, the boreal kelp Laminaria digitata, which dominates low intertidal and shallow subtidal rocky reefs in northwestern Europe, is declining in the equatorward portion of its range [3]. In this contribution, Migné and colleagues [2] focus on L. digitata near its southern range limit on the coast of France and use a variety of techniques to paint a complete picture of the physiological responses of the kelp to environmental changes. Importantly, and in contrast to earlier work on the species which focused on subtidal individuals (e.g. [1]), Migné et al. [2] describe responses not only in the most physiologically stressful portion of the species’ range but also in the most stressful portion of its local environment: the upper portion of its zone on the shoreline, where it is periodically exposed to aerial conditions and associated thermal and desiccation stresses.

The authors show that whereas L. digitata possesses mechanisms to protect it from irradiance stress at low tide, these mechanisms are not sufficient to prevent damage to photosynthetic pathways (e.g., reduction in optimal quantum yields of photosystem II). This species experiences severe heat stress associated with mid-day low tides during the summer, and the
cumulative damage associated with these stresses is likely associated with the range contraction that is currently underway. Given the important role that *L. digitata* plays as food and habitat for other organisms, its loss will have cascading impacts on community structure and ecosystem functioning. Understanding the mechanisms underlying these declines is essential to understanding the impacts of climate change on species, communities, and ecosystems.

**References**


**Appendix**

Reviews by two anonymous reviewers, DOI: 10.24072/pci.ecology.100010