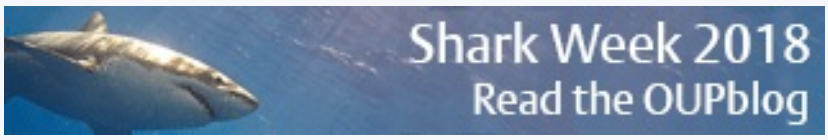

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What is conservation physiology? Perspectives on an increasingly integrated and essential science

Steven J. Cooke ✉, Lawren Sack, Craig E. Franklin, Anthony P. Farrell, John Beardall, Martin Wikelski, Steven L. Chown

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Abstract

Globally, ecosystems and their constituent flora and fauna face the localized and broad-scale influence of human activities. Conservation practitioners and environmental managers struggle to identify and mitigate threats, reverse species declines, restore degraded ecosystems, and manage natural resources sustainably. Scientific research and evidence are increasingly regarded as the foundation for new regulations, conservation actions, and management interventions. Conservation biologists and managers have traditionally focused on the characteristics (e.g. abundance, structure, trends) of populations, species, communities, and ecosystems, and simple indicators of the responses to environmental perturbations and other human activities. However, an understanding of the specific mechanisms underlying conservation problems is becoming increasingly important for decision-making, in part because physiological tools and knowledge are especially useful for developing cause-and-effect relationships, and for identifying the optimal range of habitats and stressor thresholds for different organisms. When physiological knowledge is incorporated into ecological models, it can improve predictions of organism responses to environmental change and provide tools to support management decisions. Without such knowledge, we may be left with simple associations. ‘Conservation physiology’ has been defined previously with a focus on vertebrates, but here we redefine the concept universally, for application to the diversity of taxa from microbes to plants, to animals, and to natural resources. We also consider ‘physiology’ in the broadest possible

terms; i.e. how an organism functions, and any associated mechanisms, from development to bioenergetics, to environmental interactions, through to fitness. Moreover, we consider conservation physiology to include a wide range of applications beyond assisting imperiled populations, and include, for example, the eradication of invasive species, refinement of resource management strategies to minimize impacts, and evaluation of restoration plans. This concept of conservation physiology emphasizes the basis, importance, and ecological relevance of physiological diversity at a variety of scales. Real advances in conservation and resource management require integration and inter-disciplinarity. Conservation physiology and its suite of tools and concepts is a key part of the evidence base needed to address pressing environmental challenges.

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