Ecologists suggest 'ecological energetics' for conservation

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Ecological energetics integrates information about species' physiological limits, such as metabolic cost of thermoregulation, digestion, growth, locomotion or reproduction, with biotic and abiotic ecological constraints of the environment in which it lives. Pictured: Banjo frog (Limnodynastes dorsalis) found in the Swan Coastal Plai. Credit: Neyomyrtus

A research group led by the University of Western Australia and Kings Park and Botanic Gardens is championing 'ecological energetics' as an essential tool for ecologists in understanding rapidly changing

ecosystems.

Traditionally considered a specialised domain of physiology, ecological energetics integrates information about species' physiological limits, such as metabolic cost of thermoregulation, digestion, growth, locomotion or reproduction, with biotic and abiotic ecological constraints of the environment in which it lives.

Dr Sean Tomlinson says although some tools to collect these data are well established, and the statistical sophistication required to analyse them is now well understood, their integration for hypothesis testing has been limited.

However, he sees great possibility for change.

"Recent advances in technology used to test model predictions in the natural environment are making ecological energetics more accessible, efficient and cheaper for ecologists," Dr Tomlinson says.

"These include mechanistic modelling approaches that provide more accurate and specific hypotheses for conservation activities than the correlative metabolic theory of ecology (MTE).

"While helpful on large-scale ecological and evolutionary patterns, MTE doesn't lend itself to individual organisms' ability to adapt to environmental change.

"One might reasonably argue that MTE predictions have little value in understanding why two similar-sized species, with similar metabolic rates, can respond differently to human disturbance or environmental change."

Dr Tomlinson says that the tools to test these predictions have

diversified as well, from the traditional, expensive stable isotope approaches like doubly-labelled water (DLW).

Instead of DLW, biotelemetry and radio-isotopic techniques such as Rubidium-86 turnover can be used to infer a Field Metabolic Rate, which provides the energetic requirements of an organism pursuing normal biological activity in an unrestrained natural environment.

This less correlative and more dynamic information can make for more accurate modelling for ecosystem restoration, ecosystem management, species relocation and species recovery.

As an example the researchers consider land restoration, which as well as ground cover requires other species such as pollinators for sustained ecological health.

"Since the disruption of the ecosystem changes both the biotic and abiotic environments, resulting in novel ecological niches, knowing the energy needs of animal pollinators and how they are likely to be affected by interaction is essential," Dr Tomlinson says.

"In an era of unprecedented global environmental challenges, ecological energetics opens up the tantalising prospect of a more predictive, mechanistic understanding of the drivers of threatened species decline, delivering process-based modelling approaches to natural resource management."

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