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Terrestrial Biodiversity and Ecosystems

Life-History Evolution: Diagnosis of Warming-Induced Effects on Individuals and Populations

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Venue: Auditorium, 1st Floor
Interdisciplinary Research Building
跨領域科技研究大樓 1 樓演講廳
Host: Dr. Mao-Ning Tuanmu 端木茂甯助研究員

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Abstract

Climate warming will reduce biodiversity, impairing the ecosystem services and sustainability of biological resources. However, the mechanisms through which warming causes population declines remain unassessed. As organismal life-history variation represents differential strategies for optimizing population growth under disturbances, the warming effects on life histories and population growth should be non-uniform across the life-history continuum. We test this hypothesis based on a model calibrated with empirical temperature and life-history data for 332 Indo-Pacific fishes, which show diverse inter- and intraspecific life-history patterns. Our results showed that rising temperature induces differential rates of changes in life histories among species: i.e., species with faster life cycles exhibit greater increases in growth and mortality rates but greater decreases in age at maturation compared to those with slower life cycles. Further, while increases in growth and mortality lead to reduced adult size, which may decrease fecundity, decreased age at maturation can compensate for the loss of net reproduction. Accounting for these life-history responses, our model reveals divergent changes of population growth rates among species per 1 C warming, with greater propensity of population declines for the species with faster life cycles compared to those with slow life cycles. Together, these results demonstrate that life-history traits provide insight into population responses under warming. Such life-history implications may extend beyond fish, offering a theoretical basis for assessing and mitigating warming impacts on biodiversity.