

THE IMPACTS OF WARMING ON TROPICAL LOWLAND RAINFORESTS

CORLETT, Richard T., Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Yunnan 666303, CHINA

e-mail: rtcorlett@gmail.com

Before the end of this century, tropical rainforests will be subject to climatic conditions that have not existed anywhere on Earth for millions of years. Given their crucial role in preserving global biodiversity and in regulating carbon and water feedbacks in the global climate system, it is important that the likely impacts of anthropogenic climate change are understood. However, the recent literature shows a striking range of views on the vulnerability of tropical rainforests, from least to most concern among major ecosystems. Two main potential impacts are of concern with tropical rainforest: the relatively robust predictions of pantropical rising temperatures and the highly uncertain predictions of increasing drought frequency and intensity in some areas. I will focus mainly on the impact of rising temperatures, examines the evidence for and against high vulnerability, identifying key research needs for resolving current differences and suggesting ways of mitigating or adapting to potential impacts.

Optimistic views of the future of tropical rainforests generally rely on the fact that the absolute increases in temperature are expected to be less in the tropics than in other areas. Pessimists, in contrast, point out that these changes will be large relative to present variability, on daily, seasonal and longer timescales. Why would rainforest organisms retain expensive adaptations to high temperatures that they have not experienced in recent evolutionary time? Currently the evidence either way is weak. Some lowland tropical plant and animal species do seem to be approaching their thermal limits, but their representativeness, and their capacity to acclimate over longer timescales and to adapt over multiple generations is largely unknown.

We urgently need more information on the thermal tolerances of tropical lowland species, making use of both existing spatial and temporal variation in temperature, as proxies for future climate change, as well as controlled experiments on various scales. We also need rigorous, quantitative, long-term (multi-decadal) monitoring, so that impacts will be detected if and when they occur. In the meantime, while hoping for the best we need to prepare for the worst and start to plan future 'thermal refuges' for tropical lowland biodiversity, for example by extending existing protected areas to higher altitudes or latitudes wherever possible. Even where habitat continuity is preserved however, the 'velocity of climate change' is predicted to be so high in the tropical lowlands that only the most mobile of species will be able to keep up.