讲座摘要

Physiological Study of Climate Change: Can we Predict “Winners” and “Losers”?

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Changes in body temperature affect all aspects of an organism’s physiology (function) including metabolic rate, ability to obtain oxygen, and capacities for movement, reproduction and growth. Therefore, climate change—global warming—poses serious threats to ectothermic species, those organisms whose body temperatures change asenvironmental temperature rises or falls. Physiological studies have numerous contributions to make to our understanding of effects of climate change on individual species and entire ecosystems. Mechanistic analyses can identify physiological systems that set thermal optima and thermal tolerance limits and can elucidate how these optima and limits differ among species. Through this type of comparative physiological analysis it may be possible to make predictions about which species will succeed and which species will fail in a warming world, “winners” and “losers,” respectively. This lecture will focus on two ecosystems: rocky intertidal habitats where large changes in temperature are common, and cold, thermally stable waters of the Southern Ocean in Antarctica. Comparisons of congeneric species (species belonging to a common genus but adapted to different temperatures) of intertidal and subtidal marine ectotherms show that the most heat-adapted species may be threatened the most by further increases in habitat temperature, a seemingly paradoxical finding that also applies to terrestrial ectotherms. Antarctic marine ectotherms are especially threatened by warming because, during their long evolutionary histories at stable, cold temperatures near the freezing point of seawater, these species have lost numerous genes that are needed for function at higher temperatures, including genes for oxygen-transport proteins and for regulating the heat-shock response. These physiological studies thus suggest that both polar and tropical ecosystems are especially threatened by global warming.

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研究兴趣:

1. 主要围绕生物对环境的适应性，努力探索环境因素尤其是温度和干旱等危害，如何程度不同地影响生物体，及反之生物体对这些干扰如何做出反映。
2. 蛋白质是其研究工作中的主要系统。通过蛋白质序列（主要是结构）的适应性变化，记录酶和结构性蛋白质的重要功能性和结构性性状的保留如何得以实现。对蛋白质的研究在模仿蛋白质所存在的细胞内溶解状态中进行。
3. 野外研究关注现实世界中温度对蛋白质系统的影响。如环境温度变化如何影响海洋生物的纬度和深度分布。并通过生理调查，如：心脏的功能等，研究分子水平上热效应的影响。
4. 使用DNA微阵列（基因芯片）技术，监测环境变化（氧气、盐度和温度）引起的基因表达的改变。

代表性论文

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