

专论与综述

宏观生态过程的代谢调控研究进展

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摘要 宏观(生态学)和微观(分子生物学)生命科学的交汇犹如两翼的联动将带动生命科学再次腾飞。综述了由宏观生态过程和代谢的个体大小依赖的定量规律为核心的代谢生态学相关研究进展。在综合分析最新动态和我们研究心得的基础上,建立了植物有效资源与耦合的光、水分和化学营养元素间关系的立方体模型,明确提出了生态过程(或代谢)速率是环境资源、现有生物量(反应器)和分子系统三要素相互作用结果的规律,并预测作为宏观生态过程与微观生物学的交汇点,代谢生态学的发展有可能带动生命科学的整合和进一步腾飞。

关键词 [生态过程;](#) [新陈代谢;](#) [分子系统;](#) [大小依赖;](#) [资源](#)

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The advance of metabolic regulation studies for macroscopical ecology processes

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Abstract Metabolic theory shows the link between size of individual organisms, and the stoichiometric dependence of the metabolic rate of organisms on temperature by using first principles derived from physics, chemistry, and biology. Based on the further development of metabolic theory, the effects of temperature on quantitative relationships between the exchange of matter and energy, or the rate of those, and size of organisms can be predicted. Many ecological structure and phenomena may be explained by metabolic theory. Therefore, macroscopic ecological processes and microcosmic biology are directly integrated by the regulating theory of metabolism. The paper has summarized recent developments in metabolic ecology which take macroscopic ecological process and the quantitative law of the size dependence of metabolism as their focus. We explicitly present the rule that the rate of ecological processes (or metabolism) depend on resources, stand biomass (i.e. size of the 'reactor'), the molecular system and their interaction. And we have developed a cubic sketch model of the coupling relationship between the efficiency of plant use of resources, and light, water and chemical elements. We predict that the development of metabolic ecology as the meeting point of macroscopic ecological processes and microcosmic biology will drive integration and further advances in the life sciences.

Key words [ecological process;](#) [metabolism;](#) [molecular system;](#) [size dependence;](#) [resources](#)

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