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附录

现代生态学研究中的重点和热点论题

(根据第三届现代生态学讲座应邀学术报告人讨论会结果整理而成)

Appendix

List of Key Research Topics in Ecology

(Based on the discussion session for the invited speakers at the 3rd ISOME in Beijing Normal University, June 6, 2005)

1. Molecular and evolutionary ecology

- 1) Genetic consequences of climatic and environmental changes
- 2) Ecological adaptation and speciation – the effect of ecological factors on genotype and phenotype
- 3) Ecological genomics
- 4) Phylogeography – use DNA markers to study processes and patterns of geographical variation
- 5) Relationship of genetic diversity to species diversity and community stability
- 6) Life history evolution – functional groups, life-history trade-offs, implications to species coexistence, sex allocation
- 7) Phenotypic plasticity

2. Ecophysiology

- 8) Physiological adaptation and responses to extreme environments / in stressed environments
- 9) Physiological responses and adaptation to global change
- 10) Scaling of ecophysiological processes (including allometric scaling)
- 11) Resource allocation, plant defense, and reproductive strategies (closely related to chemical ecology)

3. Population Ecology

- 12) Population dynamics in heterogeneous environments (including metapopulation dynamics and metapopulation genetics)
- 13) Role of dispersal in population dynamics and distribution
- 14) Causes and mechanisms of population regulation
- 15) Survival of small populations (demographic, genetic, and environmental stochasticities, as well as disasters)
- 16) Population ecology of clonal organisms
- 17) Interface between population and ecosystem ecology

4. Community Ecology

- 18) Maintenance mechanisms of species diversity
- 19) Neutral theory and species-area relationship
- 20) Food web structure and trophic interactions
- 21) Community phenological responses to environmental changes (in relation to global change, urbanization, etc.)
- 22) Community organization and dynamics
- 23) Species interactions
- 24) Relationship between local and regional patterns/processes

5. Ecosystem Ecology

- 25) Biodiversity and ecosystem functioning
- 26) Ecosystem responses and feedbacks to global changes (e.g., climate change and land use change; emphasizing multiple stressors/factors)
- 27) Ecosystem responses to local and regional-scale disturbances (including natural and anthropogenic disturbances, such as fires, grazing, nutrient enrichment, pest outbreaks, flooding, hydrological alterations)
- 28) Ecological stoichiometry and elemental interactions

6. Landscape Ecology

- 29) Relationship between spatial pattern and ecological processes (particularly population and ecosystem processes)
- 30) Land use and land cover change and its ecological consequences (including urbanization, urban/wilderness interface, etc.)
- 31) Disturbance and patch dynamics
- 32) Landscape fragmentation and its effects on biodiversity and ecosystem functioning
- 33) Scaling – transferring information across space, time, and organizational levels
- 34) Ecosystem/landscape management
- 35) Integration between ecology and landscape planning, design, and architecture
- 36) Transdisciplinary studies of landscape sustainability

7. Global Change and Ecological Responses

- 37) Global C, N, and hydrological cycles
- 38) Human dimensions in global change (land use and land cover, decision/policy making, socioeconomic processes, human-induced disturbances, etc.)
- 39) Field manipulative ecosystem experiments (soil warming, FACE, etc.)
- 40) Multiple-scale monitoring/observing systems
- 41) Thresholds, nonlinearity, and uncertainty in global change research

8. Biological Invasions

- 42) Invasion mechanisms, processes, and prediction
- 43) Methods, management, and policy for controlling and eradicating biological invasion
- 44) Transcontinental exchange of species
- 45) Impacts of biological invasion

9. Conservation Biology (Pattern, dynamics, mechanisms, and conservation of biodiversity)

- 46) Spatial pattern, mechanisms, and conservation strategy of biodiversity
- 47) Biodiversity and global change
- 48) Impacts of major geological events on biodiversity
- 49) Mechanisms and conservation strategies of threatened species
- 50) Role of biodiversity in ecological restoration and rehabilitation
- 51) Monitoring and information systems of biodiversity

10. Restoration ecology

- 52) Assembly rules and restored ecosystem organization
- 53) Spatial heterogeneity and restored ecosystem development
- 54) Environmental stochasticity and ecological restoration design and evaluation
- 55) Thresholds and nonlinearity in ecosystem degradation and restoration
- 56) Development and study of reference ecosystems (along a gradient of disturbance for a specific ecosystem type)
- 57) Whole-ecosystem experimental studies of ecological restoration

11. Ecosystem Services and Valuation

- 58) Processes and underlying mechanisms that generate ecosystem services
- 59) Quantification and identification of ecosystem services
- 60) Spatial variability and dynamics of ecosystem services
- 61) Relationship of ecosystem services to human activities and welfare
- 62) Valuation methodologies and approaches

13. Other topics of special concern

- 63) Methodology, field design, and statistical analysis of large-scale ecological experiments (some methodologies do exist, but their applications have rarely used or misused)
- 64) Database networking and sharing
- 65) Long-term ecological monitoring and research
- 66) Outbreaks of epidemic and infectious species
- 67) Impacts of grand engineering projects (hydroelectric dams, etc.) on biodiversity
- 68) Ecological risk assessment
- 69) Tree of life – Molecular phylogenetics