

149th RIHN Seminar

Observation, analysis and theory in ecology
for next generations

-What we have achieved in global environment studies-

(大スケールでの生物多様性・生態系を持続的に維持するには)

<http://www.chikyu.ac.jp/publicity/events/rihn-seminars/no149.html>

Date : 1st (Wed.), November 13 : 00 - 18 : 00

Venue : RIHN, Lecture Room

Organizers : Reiichiro Ishii, Shigeo Yachi, Tohru Nakashizuka

Co-organized by Center for Ecological Research

12:00 – Registration

13:00 – 13:10 Opening remarks

Invited speaker

13:10 – 13:50

Michel LOREAU (Center for Biodiversity Theory and Modeling)

Linking biodiversity, ecosystems, and people across scales: challenges for ecology and sustainability

13:50 – 14:20

Tohru NAKASHIZUKA (RIHN)

Regional assessment on ecosystem services by using biodiversity data

14:20 – 14:50

Kanehiro KITAYAMA (Graduate School of Agriculture, Kyoto University)

The index of tree-species composition for spatiotemporally evaluating the degradation of tropical rain-forest ecosystems

14:50 – 15:00 Break

15:00 – 15:30

Shoko SAKAI (CER, Kyoto University)

Fifty years of forests in rural villages revealed by land-cover maps and social surveys in Borneo

15:30 – 16:00

Reiichiro ISHII (RIHN)

Vegetation-Human interaction models based on field observation in Mongolia

16:00 – 16:30

Ichiro TAYASU (RIHN)

Use of multi-elemental isotopes in ecological and environmental research

16:30 – 17:00

Toshifumi MINAMOTO (Graduate School of Human Development and Environment, Kobe University)

Development of distribution survey method for macro-organisms using environmental DNA

17:00 – 17:10 Break

17:10 – 17:50

Comments and Discussion

17:50 – 18:00

Closing address

18:15 –

Welcome party (RIHN dining room)

〔開催趣旨〕

生物多様性・生態系サービスの地球規模での劣化減少は、地球研でも多くのプロジェクトが取り組んできた重大な地球環境問題です。本ワークショップでは、この問題に関連して進められてきた様々な地域の生態系での最新の研究を紹介し、今後ますます重要になる、地域から地球規模まで幅広い空間スケールにまたがる生物多様性・生態系サービスの持続的管理の問題について議論をします。

話題提供者は、理論生態学と DIVERSITAS 議長などを通じて生物多様性と生態系の問題に取り組んでこられた Michel Loreau 氏（招待）、生態学を基盤に多様な方法とフィールドで研究にとりくんでこられた皆さんです。

生態系・生物多様性の現状やメカニズムをどういう方法で把握するか？また、社会の文脈の中でどういう方法で持続的な管理につなげればよいか？について、多様な時間空間スケールとステークホルダーに留意しながら、自由に意見交換したいと思います。

「地球研と生態学」

地球研では、これまで多くの生態学者が、生態系と生物多様性に関連する地球環境問題に対して 6 つのプロジェクトに参画しながらとりくんできました。科学・学問としての生態学は、生物多様性と生態系に関する知見や視点はもちろん、人間社会も含めた環境変動の観測や分析にその研究手法を拡張させ、多分野の研究者との共同研究をつうじて地球環境学研究に貢献してきたということが出来ます。

このワークショップでは、生物多様性・生態系を対象としたこれまでの地球研プロジェクトの取り組みと成果も多く取り上げながら、今後より広い地球環境学の課題に対して、生態学や生態系科学は他の学問分野と連携しどのように貢献できるかについて議論する機会にもなります。これまで生態学に馴染みのなかった方にも、この分野について理解を深めていただくよい機会になるかと思えます。

みなさん、ふるってご参加、ご議論ください。

Michel LOREAU

Centre for Biodiversity Theory and Modelling
Theoretical and Experimental Ecology Station
UMR 5321 CNRS & Paul Sabatier University
09200 Moulis, France
michel.loreau@cnrs.fr

Linking biodiversity, ecosystems, and people across scales: challenges for ecology and sustainability

生物多様性・生態系と人々をスケールを超えてリンクする：
生態学と持続可能性の課題

An important current challenge is to understand and predict anthropogenic changes in biodiversity and their feedbacks on people through ecosystem services as these feedbacks play a critical role in the sustainability of coupled social-ecological systems. The influence and dependence of people on biodiversity, however, have mainly been studied separately and at contrasting scales of space and time. New ecological theory is needed to link these relationships across scales. This theory shows that biodiversity loss substantially diminishes many ecosystem services by altering ecosystem functioning and stability, especially at the large temporal and spatial scales that are most relevant for policy and conservation. The influence and dependence of people on biodiversity also generate an important if poorly understood feedback loop between humans and nature. New models of social-ecological systems emphasize the role of feedbacks and scales in human-nature interactions and the importance of foresight for the sustainability of human societies. They call for the development of integrative management approaches that account for the coupled dynamics of human populations, biodiversity and ecosystems across multiple spatial and temporal scales.

REFERENCES

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**Tohru NAKASHIZUKA^{1) 2)}, Masahiro AIBA²⁾, and Hiroko
KUROKAWA³⁾**

¹⁾ *Research Institute for Humanity and Nature*

²⁾ *Graduate School of Life Sciences, Tohoku University*

³⁾ *Forestry and Forest Products Research Institute*

toron@chikyu.ac.jp

Regional assessment on ecosystem services by using biodiversity data

生物多様性データを用いた生態系サービスの広域アセスメント

Ecosystem services should be evaluated or quantified to attain sustainable use of ecosystems. We have been developing methods to quantify forest ecosystem services by combining databases on tree functional types and forest structure. Also, combining habitat models of key species with land-use or land cover data, some services on biological regulation could be estimated. Some new methods to estimate cultural services are also introduced. These quantifications could be applied in nationwide, or some in regional scales, and may be contribute to develop better way of decision making.

Kanehiro KITAYAMA

Graduate School of Agriculture, Kyoto University

kanehiro@kais.kyoto-u.ac.jp

The index of tree-species composition for spatiotemporally evaluating the degradation of tropical rain-forest ecosystems

熱帯林生態系の劣化度を時空間評価するための樹木群集組成指標

Biodiversity safeguard is increasingly sought for achieving sustainable land-uses. The management of tropical rain forests where logging is practiced is not an exception. A practical method to quantitatively verify the impacts of responsible forest management on biodiversity safeguard is increasingly sought by foresters. Ecologists are charged to develop a robust, sensitive and easily applicable index to diagnose the ecosystem health/degradation of tropical rain forests. I and co-workers have developed such an index using tree species composition and an algorithm to map the index over an extensive area using Landsat satellite data. We applied the algorithm to seven forests in Borneo, where selective logging was being implemented, and mapped tree-species composition index over the entire area of each unit. Derived maps could elucidate the spatiotemporal patterns of forest degradation/intactness and reflect the management regimes on the ground. Our methods are useful for verifying the management impacts on biodiversity safeguard. I will introduce the ecological principles of our method.

Shoko SAKAI

Center for Ecological Research, Kyoto University

shokosakai@ecology.kyoto-u.ac.jp

Fifty years of forests in rural villages revealed by land-cover maps and social surveys in Borneo

土地被覆図と社会学調査から明らかにするボルネオの村落の森林の50年

Tropical forests close to people's homes have important roles, which are different from those in remote areas. However, the former have received less international attention because of lower biomass and biodiversity than the latter. In this study, we assessed 50-year forest cover changes in 90 rural villages in Sarawak, Borneo, based on land-cover maps of four different time periods. We also explored drivers of these changes using random forest models incorporating different environmental and social factors. We found a rapid polarization in the forest-cover rates among the villages and loss of land-cover heterogeneity within the villages. This may reflect the decrease and increase of effects of the village and external drivers, respectively, on the forest cover during the period.

Reiichiro ISHII

Research Institute for Humanity and Nature

r.ishii@chikyu.ac.jp

Vegetation-Human interaction models based on field observation in Mongolia

野外調査に基づくモンゴル草原の人間と植生の相互作用モデル

In this workshop the findings about the human-vegetation relationship from two models will be introduced developed for Mongolian vegetation change in the RIHN-project “Collapse and restoration of Ecosystem Networks under human activities”, one of which is for forest-grassland transition zone and the other for grassland degradation. Both models are incorporating multiple external drivers (i.e., climate change and livestock grazing pressure) and by making scenarios by altering them, the future vegetation could be projected. The results show that even though each driver is not strengthened largely the synergetic effects might drive the vegetation beyond the tipping point to reach the irreversible state.

Ichiro TAYASU

Research Institute for Humanity and Nature

ichiro.tayas@chikyu.ac.jp

Use of multi-elemental isotopes in ecological and environmental research

生態学と環境学の研究における多元素同位体の利用

Human activities have influenced on global environment. However, the effects are variable from sites to sites and appropriate methods are required for detecting the differences. Isotopic signature has been used for studying material flow and its dynamics. Here, I present recent applications of ecological and environmental research using isotope ratios. Especially, I focus on the use of multi-elemental isotopes, which deepens the understanding of ecosystems. Stable isotope ratios of light elements, namely C, N, S, O, H, have been traditionally used in ecological research. Some natural abundances of radioisotopes, such as ^3H and ^{14}C , are used to infer time scale of the element. Stable isotope ratios of heavy elements, such as Sr, Nd, Pb, are informative in understanding geological-biological relationships. I will discuss the use of these parameters in the research of environmental issues.

Toshifumi MINAMOTO

Graduate School of Human Development and Environment, Kobe University

minamoto@people.kobe-u.ac.jp

Development of distribution survey method for macro-organisms using environmental DNA

環境DNAを用いた生物分布調査法の開発

Novel distribution survey methods for macro-organisms using environmental DNA (eDNA) have been rapidly developed in this decade. Environmental DNA of macro-organisms is believed to be released to surrounding environments via egestions, secretions, excretions, exfoliation, etc., and the eDNA distribution reflects distribution of the organism. Environmental DNA analysis enables species-specific detection, biomass or abundance estimation, and multi-species analysis based on metabarcoding. In this presentation, as a leading researcher on eDNA analysis, I will introduce the basics of this next-generation distribution survey method and discuss on the applicability of it on future ecological studies.