2013 年度日本生態学会関東支部会・公開シンポジウム

「環境変動下の生物多様性と生態系機能」
"Biodiversity and ecosystem functioning under environmental change"

日時：2013 年 5 月 21 日　15:30-18:30
会場：東京大学農学部 7 号館 B 棟 2 階　231／232 号室
参加費：無料
日本語解説あり・事前申し込み不要

企画者：森 章、古川拓哉（横浜国立大学環境情報研究院）、佐々木雄大（東京大学新領域創成科学研究科）

15:30-15:45 概要説明（日本語）
15:45-16:15 Dr. Yu Yoshihara (Tohoku University, Japan)
「放牧地における植物や動物の種数の増加は生態系サービスを向上する（Increasing the number of species richness of plant and animal in grazed lands improves pastoral ecosystem services）」
16:15-17:15 Dr. Yongfei Bai **(**Chinese Academy of Sciences, China)
「気候変動に対する草地生態系の応答：モンゴル高原における実証研究（Responses of grassland ecosystems to climate change: Evidence from Mongolia Plateau）」
17:15-18:15 Dr. Forest Isbell (University of Minnesota, USA)
「植物多様性が変化した要因とその結果：多様性－機能性の長期観測より（Causes and consequences of changes in plant diversity）」
18:15-18:30 総合討論（日本語・英語）

詳細：生態学会関東地区会 web ページ URL：http://www.esj-k.jp/

問い合わせ先：森　章（横浜国立大学環境情報研究院／日本生態学会関東支部会）
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Increasing the number of species richness of plant and animal in grazed lands improves pastoral ecosystem services

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Summary: The contribution of biodiversity to the stability of various functions and services provided by ecosystems is well acknowledged. However, farmers engaged in intensive agriculture, tend not to recognize the contribution of biodiversity to their agro-economic pursuits. Scientists therefore need to produce clearer evidence to demonstrate to farmers the benefits of biodiversity in agro-ecosystems. I will introduce ongoing theoretical and experimental researches that are relationship between species diversity of plant or animal and ecological functions and ecosystem services in Japanese and Mongolian grazed lands. I showed that increasing the number of plant and animal species in a pasture improves the multiple ecosystem services. The results presented here provide a framework for guiding such experiments as a means to inform the debate over the advantages of maintaining greater biodiversity in intensive pastures.

関連出版物：**Yoshihara et al. (2010) Oecologia, Yoshihara et al. (2009) Journal of Arid Environments**

Responses of Grassland Ecosystems to Climate Change: Evidence from Mongolia Plateau

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Summary: Grassland, which is the largest terrestrial biome and accounts for about 34% of the total global terrestrial organic carbon storage, has been experiencing rapid shifts in composition, structure, and functioning driven primarily by global climate change and human disturbances. Such changes in particular can induce shifts in the dominance of two distinct photosynthetic pathways, C3 and C4 metabolism, which differ in the mode of initial CO_2 fixation. It has been forecasted that the effects of climatic warming together with elevated CO_2 will lead to a widespread expansion of C3 species in C3/C4 mixed grasslands because of the stronger effect of

elevated CO_2. This striking prediction, however, has been challenged on several grounds. To address this critical issue, here we report on the patterns and drivers of changes in plant community composition and C3/C4 abundance in the Inner Mongolia grassland. First, at the local scale, the relative abundance of the original dominant species *Leymus chinensis* (C3 rhizomatous grass) declined substantially while drought-tolerant species *Stipa grandis* (C3 bunchgrass) and *Cleistogenes squarrosa* (C4 bunchgrass) increased after 2000 based on a 32-year study (1980-2011). Second, at the regional scale, C4 abundance in topsoil was significantly lower than in present vegetation (-10%), suggesting a spread of C4 plants toward northern latitudes (about 1°) and higher altitudes. Third, the spatiotemporal changes in C3/C4 abundance and plant community composition were mainly triggered by increasing temperature, which overrode the effect of rising CO_2 concentrations. Our findings have important implications for predicting and mitigating the impacts of climate change on plant structure and ecosystem functioning of the Inner Mongolia grassland and beyond.

関連出版物：**Bai et al. (2012) Journal of Applied Ecology, Bai et al. (2004) Nature**

Causes and consequences of changes in plant diversity

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Summary: Although nutrient enrichment frequently decreases biodiversity, it remains unclear whether such biodiversity losses are readily reversible, or are critical transitions between alternative low- and high-diversity stable states that could be difficult to reverse. In a long-term field experiment, we found that the low biodiversity state persisted two decades after cessation of nutrient enrichment, suggesting that this change in community structure was a regime shift to an alternative stable state of low-diversity. How much will these non-random species losses under chronic nutrient enrichment alter ecosystem functioning? We found that although nutrient enrichment initially increased productivity, it also led to losses of plant species that substantially eroded productivity over time. In a separate study, we found that different sets of species promoted ecosystem functioning during different years, at different places, and under different global change scenarios. Together, these results suggest that changes in biodiversity can be abrupt and persistent, and may mediate the long-term impacts of some global environmental changes on ecosystem functioning and services.

関連出版物：**Isbell et al. (2013) Ecology Letters, Isbell et al. (2011) Nature**