Symposium Program of International Day for Biological Diversity

[Biodiversity and Global Warming]

22 May, 2007　(Tuesday) 13:00~17:30
In Waseda University, Ibuka hall
Co-organized by Forestry and Forest Products Research Institute (FFPRI) and Waseda University Environmental Research Institute
Supported by Ministry of the Environment and Forestry Agency

13:00~
Opening remarks: President of FFPRI

13:30~14:15
Forest Sinks and Biodiversity: Mitsuo Matsumoto (FFPRI)

14:15~15:00
Changes of butterfly assemblages following reforestation in a degraded land and its relevance to environmental impacts of afforestation and reforestation-clean development mechanism: Kazuma Matsumoto, Kiyoshi Nakamuta (FFPRI) and Woro A. Noerdjito (LIPI)

15:00~15:15 Break

15:15~16:00
Effects of global warming on the phenology of birds and plants: Hiroyoshi Higuchi (Tokyo University)

16:00~16:45
Structure of alpine ecosystem and global change impacts: Gaku Kudo (Hokkaido University)

16:45~17:15
Panel Discussion　Organizers: Kenji Fukuyama(FFPR) & Yasushi Morikawa (Waseda university)

[ABSTRACTS]

Forest Sinks and Biodiversity

Mitsuo Matsumoto
(Head of Climate Change Office, Forestry and Forest Products Research Institute)

The IPCC Fourth Assessment Report (AR4) is epoch-making because it shows not only the present situation of climate change and a projection for the future, but also examines the impacts of climate change and mitigation options with economic mitigation potential. For ecosystems, it is shocking that approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5°C. In the forestry sector, the main message is that forest-related mitigation activities can considerably reduce emissions from sources and increase CO2 removal by sinks at low cost, and can be designed to create synergies with adaptation and sustainable development.

Forests have multiple functions including conservation and maintenance of biological diversity, productive capacity, forest health, soil and water resources, global carbon cycles and multiple socio-economic benefits. These functions have both trade-offs and synergistic relationships with each other. While the enhancement of forest sinks such as with large plantations may impact biodiversity (trade-off), reducing deforestation and forest management would be significant mitigation options that could support biodiversity (synergy). It is important to develop methods to evaluate and harmonize the multiple functions for forests and the global environment.

Changes of butterfly assemblages following reforestation in a degraded land and its relevance to environmental impacts of afforestation and reforestation-clean development mechanism

Kazuma Matsumoto (Tama Forest Science Garden, FFPRI), Kiyoshi Nakamuta (FFPRI) and Woro A. Noerdjito (LIPI, Indonesia)

Project participants of A/R-CDM are requested to document the analysis of the environmental impacts, including impacts on biodiversity and natural ecosystems, and impacts outside the project boundary of the proposed A/R CDM project activity. However, available information for forecasting effects of A/R-CDM project on biodiversity are very limited in the tropics, due to lack of biodiversity studies from non-forest areas, such as *Imperata* grasslands resulting from forest degradation, and plantation forest areas, although biodiversity in the primary or old growth forests and, more recently, disturbed forests have been attracting much more attention. We, therefore, conducted a series of survey of butterfly assemblages in a reforestation area, "the Japan-Indonesia Friendship Forest", and adjoining grassland at Sekaroh, Lombok, Indonesia, to know the effect of plantation on biodiversity in a degraded land.

More forest species were recorded in the reforested area than in the grassland, indicating that forest species had increased following reforestation. Most forest species found in the reforestation area were, however, widely distributed species. It was also indicated that species diversity or species richness would not decrease by the reforestation. Some grassland species were found only in the grassland area, suggesting that reforestation would eliminate grassland species. All grassland species found in the study area were, however, not endangered but common and widely distributed in the Asian and/or Australian or throughout old world tropics. These widely distributed species are supposedly highly able to colonize into grasslands appeared by deforestation, and thus grassland species occurring in deforested grasslands are not endangered species but common widely distributed species only. Accordingly, it can be concluded that, as far as in deforested areas, reforestation can improve forest fauna and does not have an adverse affect on the biodiversity.

In case, any significant negative impact of A/R-CDM project is considered, an environmental impact assessment has to be done and the results have to be described in the project design document (PDD). For those who are willing to do a small scale A/R-CDM project, it would not be practical to conduct an environmental assessment when the negative impact would be significant. It is therefore more practical not to select the situation where such a negative impact is probable. Places of the following characteristics are not recommended as a site of a small scale A/R-CDM.

1) The present vegetation of the site is primary one.
2) The IUCN Red List of Threatened Species lives in the site.

3) Endangered or rare species listed by the host country lives in the site.

Tree species of the following characteristics are not recommended to plant in a small scale A/R-CDM.

1) Exotic species which have never been introduced to a host country.
2) Invasive species which are likely to disperse or naturalize in a host country once introduced.
3) Species which have serious insect pests that prevent a grown-up of the plantation forest, such as a combination of Meliacenae trees-Mahogany shoot borer (*Hypsipyla* spp.), teak-teak beehole borer (*Xyleutes ceramica*), etc. .

Effects of global warming on the phenology of birds and plants

Hiroyoshi Higuchi
(School of Agriculture and Life Sciences, The University of Tokyo)

With the advance of global warming, phenological changes are emerging in plants and animals around us. The changes include earlier blossoming of cherries, earlier singing of bush warblers, and expansion in the ranges of southern butterfly species. What is the real present state of such phenological events? From when, in which species, and to what extent have the events been emerging? In this presentation, I will review relevant studies and introduce my own recent results, focusing on birds and plants.

- Breeding season of birds

In England, 20 of 65 bird species showed advances in egg-laying dates by an average of nine days in the 25 years between 1971 and 1997 (Crick *et al*., 1997). In Germany, the egg-laying date of pied flycatchers shifted to about four days earlier in the 26 years between 1970 and 1995 (Winkel & Hudde, 1997). In North America, the egg-laying date of Mexican jays advanced about ten days in the 28 years between 1971 and 1998 (Brown *et al*., 1999). In Japan, the egg-laying date of red-cheeked starlings advanced about 15 days in the 28 years between 1978 and 2005 (Koike *et al*., 2006). These facts suggest that a common factor, *i.e*. global warming, is the prevailing factor in the breeding season becoming earlier in different bird groups in different countries around the world. In fact, the annual or spring temperature has risen significantly in many of the areas with earlier egg-laying dates of birds. There is a tendency for the egg-laying date to become earlier in years with higher temperatures.

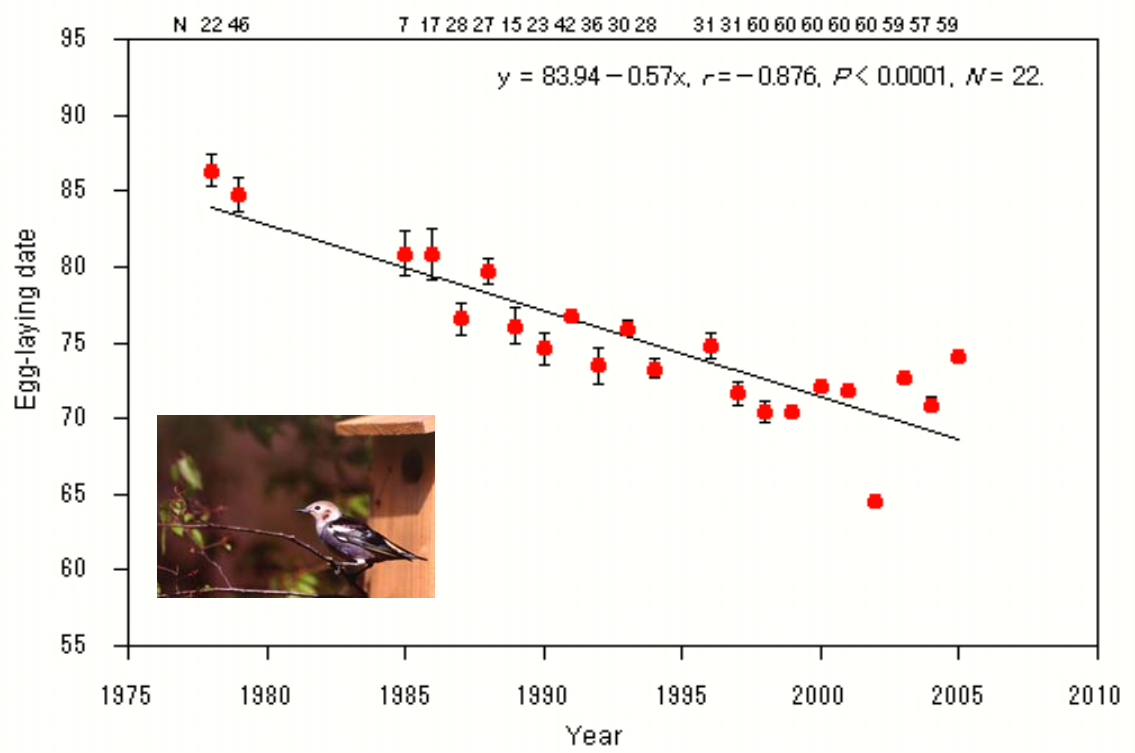
- Flowering times of plants

There are also many cases of earlier flowering and leaving dates of plants. In 542 plant species studied in Europe from 1971-2000, 78% of the flowering, leaving, and fruiting records became earlier (Menzel *et al*., 2006). Spring/summer events advanced an average of 2.5 days during the past ten years, in a manner related to the temperature rise, becoming an average of 2.5 days earlier for each temperature increase of 1ºC. In Japan, flowering and other phenological events are becoming earlier in many plants such as apricot and cherries. The blooming date of Someiyoshino cherries in Niigata City advanced by eight days during the past 28 years from 1978 (Koike *et al*., 2006). In Japan as a whole, there is a tendency for the blooming time to become earlier in areas with higher temperature rises.

- Mismatch of phenology among different groups

Responses to warming differ among different species and groups even when they live in the same area. For example, there is a difference by a factor of two in temperature responses between cherries and red-cheeked starlings in Niigata City as mentioned above. Such differences may cause serious mismatches in ecological interrelations such as predator-prey, parasitic, pollinating and seed dispersal events. In many parts of Europe, mismatches are found to different extents between the breeding season of pied flycatchers and the emergence

of caterpillars as food (Both *et al.*, 2006). As a consequence, the pied flycatcher population has been declining more drastically in areas with greater mismatches. If global warming continues in the future, mismatches will increase in different ecosystems throughout the world.



Changes in the annual first egg-laying date of red-cheeked starlings *Sturnus philippensis* (1 March = day 1). The value for each year is the mean ± s.e. The numbers across the top of the figure indicate sample sizes. The value of x in the regression equation is transformed based on 1978=0. Koike *et al.*, (2006): *Global Environmental Research*, 10:167-174.

Structure of alpine ecosystem and global change impacts

Gaku Kudo
(Graduate School of Environmental Earth Science, Hokkaido University)

Alpine ecosystems are distributed as small fragments in the top parts of high mountains in Japan. It is believed that alpine ecosystems are most sensitive to global warming. Alpine plant communities are composed of many endemic species and arctic elements, and characterized as a very unique group in the terrestrial ecosystems. Global warming is supposed to decrease the area of alpine regions and to change the structure of alpine ecosystems. To predict the global change impacts on alpine ecosystems precisely, understanding of structure and function of alpine ecosystems are crucial. Alpine ecosystem is maintained by the diverse patterns of snow distribution at regional scale. Existence of snowmelt gradients contributes the creation and maintenance of biodiversity in alpine ecosystems.

Basic habitat types of alpine ecosystem are fellfield and snowbed. Fellfield is located in places with little snow cover due to strong wind in which plants are exposed to harsh weather conditions, but growing season length is relatively long. In contrast, plants in snowbed are protected from strong wind and freezing temperature during the winter due to thick snow cover, but growing season is extremely short due to late snowmelt. Individual alpine plants choose the growing habitats between the two extreme conditions. Therefore, the existence of snowmelt gradients contributes to maintain the diverse species composition within area. Flowering season of individual plants are strongly influenced by the snowmelt time. Alpine plant communities show complicated flowering patterns along the snowmelt gradient. This diverse flowering occurrence throughout the summer may support insect communities using floral nectar and pollen as food resources, i.e. flower visitors. Furthermore, spatial variations in flowering schedules may cause directional gene flow via pollination among populations along snowmelt gradients. Long-term census revealed that the snowmelt time has been accelerated from year to year. Modification of snowmelt patterns should disturb distribution patterns of alpine plants, plant-pollinator interactions and spatial genetic structures of plant populations, resulting in the decreasing biodiversity and ecological functioning of alpine ecosystems. Establishment of long-term monitoring sites in alpine regions is highly required to detect global change impacts on alpine ecosystems.

[Report of Satellite event]

"Exotic species may collapse Japanese endemic fauna; Let's learn about them"

10 June, 2007
In Tsukuba Seibu Hall, Tsukuba
Organized by FFPRI
Supported by Ministry of the Environment and Forestry Agency

Event 1: Are cool lucanid beetles going to invade Japan? by Koichi Goka (National Institute of Environmental Studies)

Japanese have looked favorably upon lucanid beetles for centuries, probably because they are good decomposers in forests near rural hamlets (so called "satoyama" in Japanese), are attractive (particularly males), and may have migrated to Japan with the earliest settlers, which suggests a long familiarity. However, because of deforestation and/or land use changes, the number of wild beetles has been decreasing. In addition, since 1999, when the Japanese government lifted a ban on the imports of lucanid and dynastine beetles, the number of officially imported beetles has increased every year, reaching over one million in 5 years. Although Japanese are able to enjoy exotic beetles as pets, some problems have arisen: 1) smuggling from some countries, 2) decimation of populations in their original habitats due to excessive collection, and 3) genetic contamination resulting from the intermixing of released exotic species with Japanese native species. Additionally, smaller (maybe invisible) organisms have been introduced accidentally with imported lucanid beetles. As a result of Dr. Goka's talk, participants learned about the importance of conserving Japanese biological diversity, and about the immense responsibilities associated with owning exotic pets.

Event 2: Learn about invasive alien species with the card game "Pinch-kun" by Fumio Yamada (FFPRI) et al.

Small islands isolated from the mainland tend to have endemic species living in fragile ecosystems. The Amami rabbit (Amami-no-kurousagi in Japanese), *Pentalagus fanessi*, is a primitive rabbit that only occurs in Tokunoshima and Amami islands, where its only natural enemy used to be the habu snake. However, several decades ago, the small Asian mongoose was introduced in order to control habu snakes, but it soon became a serious predator of the endemic rabbit in the Amami Islands. A project team called "mongoose busters" has been organized there and has worked to eradicate the mongoose. Meanwhile, in order to call people's attention to the importance of conserving native biodiversity and eradicating and mitigating invasive alien species, Dr Yamada, in collaboration with WWF Japan and others, developed a card game that allows players to learn about alien species which have already invaded Japan.

Event 3: The green anole is threatening insect fauna in the Ogasawara Islands, by NMaomi Nakagawa (Japan Wildlife Research Center)

The Ogasawara (Bonin) Islands are typical oceanic islands isolated far from the mainland, and are hot spots for problems involving invasive alien species. The lizard, *Anolis carolinensis* has been observed for 20 years in Chichijima and Hahajima islands, and was probably introduced accidentally with cargo and/or as a pet. While the lizard was expanding its distribution, entomologists recognized a drastic decline of insect numbers in the islands. Most of this decline was strongly suspected to be the result of predation by the lizard because at the time the decline began, only small, diurnal insects that were palatable to the lizard disappeared. Research scientists have warned that pollination that is particularly dependent on endemic small pollinators may cease if urgent measures are not taken. In order to eradicate the lizard, JWLRC have been conducting a research project to determine the numbers, roots of expansion, and life history strategy of the lizard. JWLRC and other collaborators have recently developed a trap for local eradication.

Ms. Nakagawa's audience was fascinated by the beauty and preciousness of the Ogasawara Islands. They also learned a lot about how scientists, local residents and the national government have collaborated to mitigate the impact of invasive alien species there.