

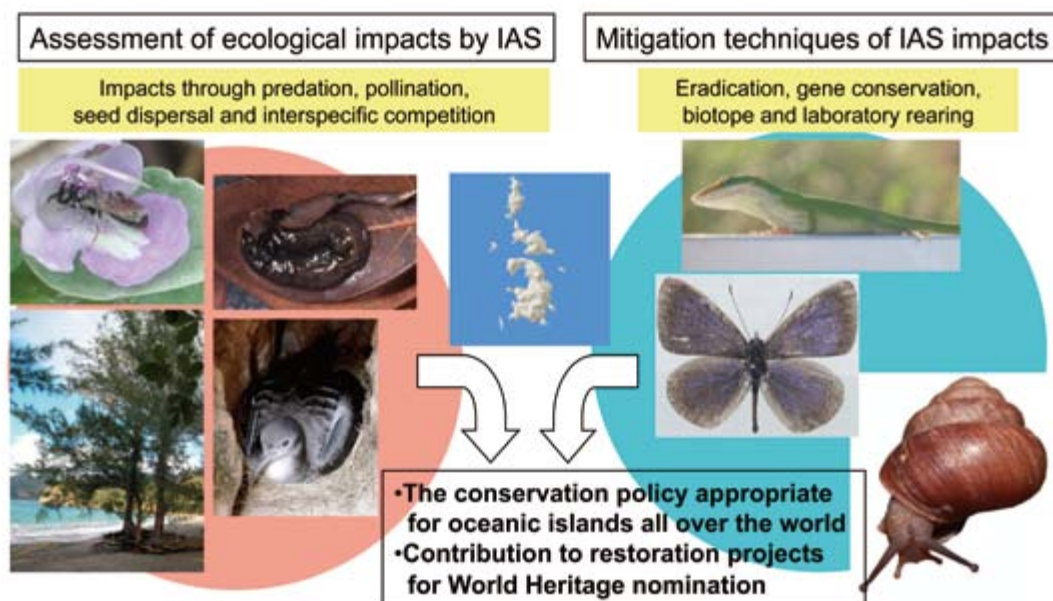
Impacts of Invasive Alien Species on Biodiversity and Fragile Ecosystems in the Oceanic Ogasawara (Bonin) Islands (FY2005-2009)

Principal Investigator : **Isamu OKOCHI**, Forestry and Forest Products Research Institute (FFPRI) <F-051>

FFPRI, Tokyo Metropolitan University, Tohoku University, Kanagawa Prefectural Museum of Natural History, Japan Wildlife Research Center, Institute of Boninology

The objective of the project is to develop techniques for mitigating invasive alien species by studying their impacts on biodiversity in Ogasawara, where invasive species are thought to destroy native fauna and flora, as has happened in other oceanic islands including the Galapagos Islands. While an oceanic island may become a treasure trove of endemic organisms resulting from evolutionary processes without disturbance thanks to isolation from continents since the dawn of time, the island ecosystem is fragile for the same reason. Invasive alien species

affect the entire ecosystem in Ogasawara through predation, interspecific competition, pollination and seed dispersal. By studying the mechanism of impact and techniques for eradicating invasive species and by proposing mitigation techniques focusing on gene conservation and rearing methods, we expect to contribute to policies for conserving ecosystems in Pacific oceanic islands. We also aim to contribute to restoration projects in the Ogasawaras for World Heritage nomination.



Targets (IAS):
 Pollinator (*Anolis carolinensis* predate endemic pollinators)
 Interspecific competition (invasive alien plants)
 Seed dispersal agents (*Zosterops japonicus*)
 Predator1 (cats predate seabirds)
 Predator2 (*Platydemus manokwari* predate endemic land snails)

Targets:
 for eradication: *Anolis carolinensis*
 for laboratory rearing and biotope: Endemic insects
 for gene conservation and laboratory rearing: Endemic land snails

Sustainable Management of Tropical Production Forests with the Economic Incentives of Carbon Sequestration and Biodiversity Conservation

(FY2007-2009)

Principal Investigator : **Kanehiro KITAYAMA**, Kyoto University

<F-071>

Kyoto University, Forestry and Forest Products Research Institute, Tokyo University of Agriculture, Kochi University

A vast area of production forests, which are designated for permanent commercial timber production, exists in the Southeast Asian equatorial tropics. These production also forests function as the reservoir of endangered wildlife. A sustainable forest management that is harmonized with conservation is sought. We investigate the improved manage-

ment effects of reduced-impact logging in conservation and carbon sequestration in Sabah, Malaysia. If improved effects are legitimately evaluated, these will become additional economic incentives so that the sustainable forest management is better adopted in a wider area.

Developing a Sustainable Program for the Recovery of Wild Japanese Crested Ibis and Public Consensus Strategy

(FY2007-2009)

Principal Investigator : **Yukihiro SHIMATANI**, Kyushu University

<F-072>

Kyushu University, The University of Tokyo, Niigata University, Saitama University, Yamashina Institute for Ornithology, Tokyo Institute of Technology

The captive propagation effort for the Japanese crested ibis (*Nipponia nippon*) on Sado was done experimental release in 2008, aiming at colonization of 60 captive-bred birds in the wild by 2015. The goals of this study are to develop a naturally valid and socially feasible and sustainable program for

restoring the wild Japanese crested ibis and to allow the program to be accepted by the local society. This study will be conducted as collaboration between natural and social scientists addressing both restoration design and the social process to reach public consensus on the restoration program.

Soil Biodiversity and Ecosystem Functioning

(FY2007-2009)

Principal Investigator : **Nobuhiro KANEKO**, Yokohama National University

<F-073>

Yokohama National University, Hokkaido University, Ibaraki University, Kyoto University, Shizuoka University

Soils play a multi-functional role in providing essential ecosystem services such as mediating global nutrient and water cycles, water purification, primary production, carbon sequestration and buffering environmental disasters. Many of these ecosystem functions are probably sustained by a diverse soil biological community; however, there is a lack of evidence to support this argument. We will study the relationship between soil biodiversity and

ecosystem functioning in soils and propose that the conservation of soil biodiversity is essential to maintaining soil quality. We revealed that some earthworm species exploit aged soil carbon, and microbial community structure has been affected by gut passage. Casts become water stable aggregate and showed high methane decomposition, and carbon sequestration. Thus microbial and faunal diversity can be linked to nutrient cycling.

The Study for Assessment and Control of Ecological Risks Caused by Invasive Alien Parasites

(FY2008-2010)

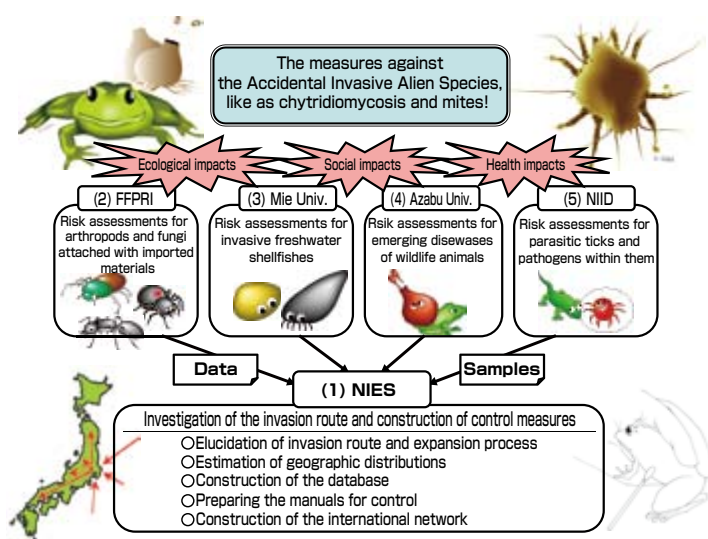
Principal Investigator : **Koichi GOKA**, National Institute for Environmental Studies (NIES)

<F-081>

NIES, Forestry and Forest Products Research Institute, Mie University, Azabu University, National Institute of Infectious Diseases

In this study we aim to reveal the present status of the accidental invasion of alien species like as ants and chytrid fungus. And we will assess the ecological and health risks of the accidentally introduced species through accumulation of their biological information. We will investigate their invasion route and estimate the process of their distribution expansion based on not only ecological aspects but also socio-economical aspects. From these results we will devise actual control and quarantine systems.

Furthermore we will work in cooperation with the institutes of Asian countries for constructing international-network for control of accidental invasive alien species. Finally this study will provide the scientific bases for reinforcement of law and quarantine systems against the accidental alien species which will increase more and more accompanied with the advance of globalization of economy and global climatic changes.



Conservation Strategy Based on Regional Reef Connectivity and Environmental Load Assessment in SEA-WP Region

(FY2008-2010)

Principal Investigator : **Kazuo NADAOKA**, Tokyo Institute of Technology

<F-082>

Tokyo Institute of Technology, Japan Agency for Marine-Earth Science and Technology, Fisheries Research Agency

The South East Asia and West Pacific (SEA-WP) region is a significant reservoir of the world's richest marine biodiversity, but is deteriorating in its coastal ecosystems due to various environmental threats. For providing a proper conservation strategy, this study aims at clarifying regional reef connec-

tivity in SEA-WP region and thereby identifying important candidate areas to be properly managed as Marine Protected Areas (MPAs), based on numerical simulations on larval dispersal, molecular biological analysis on meta-population dynamics and others.

Study on Progress of Ocean Acidification and its Effect on Structure and Function of Microbial Community

(FY2008-2010)

Principal Investigator : **Takeo HAMA**, University of Tsukuba

<F-083>

University of Tsukuba, Meteorological Research Institute, Japan Hydrographic Association

Ocean has been absorbing about half of CO₂ emitted to atmosphere by combustion of fossil fuel. The concentration of CO₂ in the ocean is increasing year by year as well as atmospheric CO₂, suggesting that ocean acidification is proceeding steadily. In the present study, we will develop a new analytical instrument to measure the acidity of seawater with high accuracy and build up database on the ocean

acidification by combining the numerous data that have been reported so far. The effect of ocean acidification on the structure and function of marine microbial community also will be evaluated. The results of our study will be likely reflected in the environmental policy to reduce the emission of anthropogenic CO₂.

Impact Assessment of Global Warming on the Circulation and Ecosystem of Large Lakes

(FY2008-2010)

Principal Investigator : **Toshi NAGATA**, The University of Tokyo

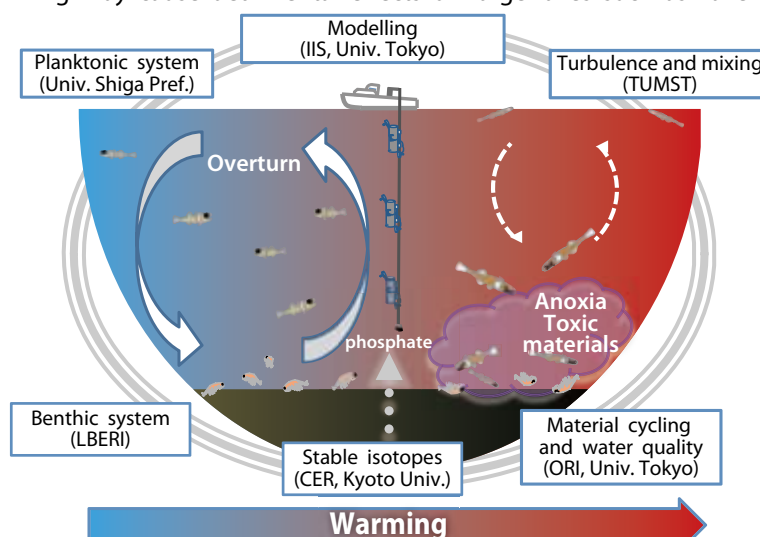
<Fa-084>

The University of Tokyo, Tokyo University of Marine Science and Technology, Lake Biwa Environmental Research Institute, The University of Shiga Prefecture, Kyoto University

Lake Biwa, the largest lake in Japan, is known as a hotspot of freshwater biodiversity. Global warming now threatens the lake's ecosystem. Reduced vertical mixing due to warming may reduce the oxygen supply to deeper layers, which in turn may result in the extinction of benthic fauna and deterioration of

water quality. The present study is aimed at constructing an ecosystem model of Lake Biwa to improve our ability to predict changes, in coming decades, of ecosystem processes. The obtained results are expected to aid in developing effective measures for adaptation and mitigation.

Warming may cause detrimental effects on large lakes such as Lake Biwa



In order to take effective measures for adaptation, it is urgently needed to improve our ability to predict changes in Lake Biwa.

Biodiversity Conservation Based on Ubiquitous Genotyping of Critically Endangered Plant Species (FY2009-2011)

Principal Investigator : **Yuji ISAGI**, Kyoto University

<F-091>

Kyoto University, Tohoku University, Kumamoto University, Hokkaido University

In this research, we aim to obtain general understanding of biological/genetic characteristics of endangered plant species, and establish rational methods to conserve biodiversity based on the genetic analysis for all remnant individuals of critically endangered plant species (15 angiosperms and

5 pteridophytes) and mathematical analysis. The results of this study will directly contribute to the conservation measures of endangered species and the establishment of new approach for biodiversity conservation.

Current Situation of Biodiversity Crisis in the Forest-Alpine Ecotone and its Mechanism under Global Change (FY2009-2011)

Principal Investigator : **Gaku KUDO**, Hokkaido University

<F-092>

Hokkaido University, Rakuno Gakuen University, Tohoku University, Shinshu University

Mountain region containing many endemic species is a hotspot of biodiversity and most vulnerable ecosystem by global warming. We aim to quantify recent vegetation change, clarify the mechanism, and predict global change impact on mountain ecosystem. We census vegetation change at landscape level, clarify the formation pattern of species diver-

sity, and assess the function maintaining species diversity in mountain ecosystem. We also test the relationship between species diversity and genetic diversity of alpine plants. We try to construct the research protocol for the assessment of global change impact, and present the ecosystem conservation and management policy in the changing world.

Ecophysiology, Phylogeography and Environmental Sociology on Water Blooms of the Globally Distributed Cyanobacterium *Microcystis Aeruginosa* (FY2009-2011)

Principal Investigator : **Shin-ichi NAKANO**, Kyoto University

<F-093>

Kyoto University, University of Tsukuba, Fukui Prefectural University

Blooms of freshwater cyanobacterium, *Microcystis aeruginosa*, are a serious symptom of eutrophication and have harmful effects on lake ecology and human beings. We aim to elucidate transport, growth and genetic diversity of the cyanobacterium, together with the dynamics of its toxic strains, using large experimental systems and the most

sophisticated molecular biological/ecological techniques. We also clarify the relationship between *Microcystis* blooms and human activities conducted around the lakes with the blooms. The present study will contribute the success in the Millennium Development Goals, ODA, demonstrating the raison d'être of the Japanese Government.

Assessment and Reinforcement of Natural and Social Capital for Biodiversity Restoration in Rice Paddy Ecosystems (FY2009-2011)

Principal Investigator : **Yoshihiro NATSUHARA**, Kyoto University

<F-094>

Kyoto University, Tokushima University, Lake Biwa Museum, Ehime University, Shiga University

Paddy fields are important for biodiversity. Safe, biodiversity-conscious agriculture has ecological benefits such as increasing the population of natural enemies, but the ecological mechanisms vary in different locations. We analyze biological and social data to clarify such local characteristics. Using these findings and experiments, we will develop methods

to enhance the biodiversity of rice paddy areas. Simultaneously, we will conduct rural surveys to clarify the conditions that allow biodiversity-conscious agriculture, and offer efficient assistance for local actions. Understanding such communal decision-making systems will contribute to solving global environmental issues.

Investigation on the Risk of Emerging Infectious Diseases for Threatened Birds by Migratory Birds

(FY2009-2011)

Principal Investigator : **Takashi KUWANA**, National Institute for Environmental Studies (NIES) <F-095>

NIES, The University of Tokyo, Core Corporation, University of the Ryukyus

For the prediction of the invasion of emerging infectious diseases and the avoidance of it, the infection routes of West Nile virus (WNV) will be predicted and the risk for endangered birds are also evaluated by the epidemiological survey. The routes of infection of WNV in snipes and plovers that migrate from Siberia to Australia and New Zealand

via Japan will be investigated. Furthermore, fatality rates of each endangered bird species are evaluated by the infection experiments in vitro using established culture system. In conclusion, concentrative sufficient measures against WNV can be taken by the results of the present study.

Desertification Control and Restoration of Ecosystem Services in Grassland Regions of North-East Asia

(FY2007-2009)

Principal Investigator : **Toshiya OKURO**, The University of Tokyo <G-071>

The University of Tokyo, National Institute for Environmental Studies, Okayama University

This study aims to provide a guideline for the ecosystem restoration and the sustainable resource use in the rangelands of North-East Asia. We will provide the scientific evidences of that to where, and which combination of counter-measures can provide the most effective restoration and sustainable land management. This can contribute

directly to the decertified land as the concrete prescription for desertification, to United Nations Convention to Combat Desertification, and UN Convention on Biological Diversity. Last year we clarified that effects on ecosystem restoration differed among different revegetation measures by long-term field experiments.

Sustainable Societies and Policies for their Implementation

Strategic Policy Scenario Design for Sustainable Urban and Industrial System Based on the Integrated Environmental Flux Assessment for Water, Resource and Energy Circulation (FY2007-2009)

Principal Investigator : **Tsuyoshi FUJITA**, National Institute for Environmental Studies (NIES) <H-071>

NIES, National Institute of Advanced Industrial Science and Technology, Keio University

This study aims to develop an evaluation system to quantitatively assess environmental flux considering spatiotemporal distribution of water, resources, energy and GHG emission resulting from urban and industrial activities, which could be utilized to evaluate present situation and the potential of ecosystem services under the constraints and interactions with

urban and industrial activities. The prototype of integrated environmental flux assessment system was developed in collaboration with municipal government and policy scenarios were tentatively evaluated to maximize the urban contribution for global environmental improvement.

Strategies for Sustainable National and Urban Spatial Configuration

(FY2007-2009)

Principal Investigator : **Yoshitsugu HAYASHI**, Nagoya University

<H-072>>

Nagoya University, Kagawa University, Utsunomiya University

This study aims at exploring a new national and urban planning concept and relevant policy measures to realize financially and socially sustainable national and urban areas in Japan, with consideration of mitigation of global warming and adaptation to climate change. A systematic framework for the evaluation of national and urban sustainability is developed by integrating the models for estimating

greenhouse gas from human activities, quality of life in residential areas, cost for maintaining built-up areas within land use and transport planning scopes. Appropriate sustainable structure of national and urban areas, and relevant policy implementations corresponding to post-Kyoto protocol are proposed to reduce GHG emissions and to deal with likely effects of climate change.