and stochastic. Unless we make efforts to conserve these locally rare species, it is highly probable that local floristic diversity is much reduced under a construction work. Second point is important because aquatic ecosystem is largely independent of plant diversity and largely affected by physical and chemical factors. Third point is important to maintain landscape-level diversity including spatial relationship of forests and aquatic system.

Evolution of the Sex Chromosomes and the Sex-Determining Gene of Medaka

Mitsuru Sakaizumi

Department of Environmental Science, Faculty of Science, Niigata University

The medaka (*Oryzias latipes*), a small freshwater fish native to East Asia, has been used as an experimental animal to study sex chromosomes and sex determination. It has many advantages for this kind of research: a large genetic diversity within the species, inbred strains, wild populations, closely related wild species, and so on. To clone position ally the sex-determining gene, we generated a Y congenic strain to highlight the genetic differences between the X and Y chromosomes from two inbred strains. The congenic strain has a sex-determining region derived from the HNI (Northern population) Y chromosome on the genetic background of Hd-rR (Southern population). Using this strain, we constructed a genetic map of the sex chromosome and a BAC library. *DMY*, a Y specific DM-domain gene, was identified from a deletion analysis of a congenic XY female. Loss of function mutations of this gene derived from wild populations caused female development. A 117-kilobase genomic DNA fragment carrying *DMY* was sufficient to induce testis differentiation and subsequent male development. These results demonstrated that *DMY* is the sex-determining gene of medaka. This makes *DMY* the first sex-determining gene found in non-mammalian vertebrates. Fourteen species of the genus *Oryzias* have been identified to date. *Oryzias curvinotus* and *O. luzonensis* are the species pair most closely related to *O. latipes*. Although both species have male-heterogametic (XX-XY) system of sex determination, *DMY* was detected only in *O. curvinotus*. We identified several EST markers that linked to the sex of *O. luzonensis*. A genetic map of these ESTs showed that the sex chromosome of *O. luzonensis* was homologous to an autosome (linkage group 12) of *O. latipes*. This result suggests that *O. luzonensis* has another sex-determining gene from *DMY*. Furthermore, female heterogamety (ZZ-ZW system) has been found in a species of *Oryzias*. Diversity of sex chromosomes, sex-determining system, and probably the sex-determining gene suggests that *Oryzias* fishes can be a model system for the research on evolution of sex chromosomes and sex determination in vertebrates. We hope that new genes associated in sex determination and sex differentiation can be isolated from medakas in near future.

Pilot study 1: Biodiversity Inventory and Ecological Classification in a Model System of Organisms Depending on Oaks

Masanori J. Toda

Institute of Low Temperature Science, Hokkaido University, Sapporo, 060-0819

The recent mass extinction of biological species, caused by human activities, has resulted in serious deterioration of natural ecosystems. Ecosystems that lack their intrinsic complexity and functions cannot support diverse forms of life and will thus lead to further loss of biodiversity. This "degradation spiral" (or a positive feedback between loss of biodiversity and deterioration of ecosystem performances) will lead to the "crisis" of the biosphere. In order to avoid triggering the "ecosystem degradation spiral", biodiversity sciences should reveal various functions of diverse organisms in ecosystems and establish scientific bases for human societies to determine how and which biodiversity should be conserved. Theoretical and experimental studies have suggested that there are three kinds of biodiversity in relation to ecosystem functioning: (1) functional groups supporting various ecosystem functions, (2) alternative species contributing to ecosystem stability, and (3) redundant biodiversity. However, there is no study that has attempted to classify these elements of biodiversity in natural ecosystems.

Forest ecosystems harbor the richest biodiversity on the land, with trees as skeleton organisms producing a huge, three-dimensional structure above the ground and providing many other organisms with heterogeneous habitats within it. In addition, plants change the quality of their leaves to adapt to the heterogeneous environmental conditions above the ground and provide herbivores with diverse food resources. In turn, herbivory alters the leaf quality. The quality of litter provided from the above-ground space affects the fauna of soil animals and the