

# Multidisciplinary Studies of Biodiversity at Kyoto University

Noriyuki Satoh

Department of Zoology, Graduate School of Science, Kyoto University

Sakyo-ku, Kyoto 606-8502, Japan

Tel: 075-753-4081, E-mail: satoh@ascidian.zool.kyoto-u.ac.jp

As one of the 21st Century COE programs, School of Biological Science, Primate Research Institute, and Center for Ecological Research have initiated the “Formation of a strategic base for the multidisciplinary biodiversity study” . This project aims to promote world-class research by unifying field research with new developments in molecular biology, to construct a basic academic discipline of “Biodiversity Science” , and implement postgraduate education under a unified system of macroscopic and microscopic biology. In other words, this program is aiming to raise the standard of its field biology research, an area where the university has a long research tradition, as well as the level of its molecular biology research, an area that has seen remarkable progress in recent years, and to bring these disciplines together to foster a world-class level of research and education.

The strategic base for biodiversity research project is broken down into four research areas: (1) Molecular Basis of Diversity, (2) Biological Structures of Diversity, (3) Ecosystem Structures of Diversity, and (4) Diversity and the Evolution of Humans. A total of 23 Principal Investigators and more than 30 Research Fellows and Postdocs are involved in this program.

We run a number of programs aimed at up-and-coming researchers. For example, every year we gather students from all over Japan to participate in fieldwork on Yakushima island. Yakushima is a World Heritage Site and a veritable treasure trove of wildlife, where students are taught sample collection and analysis methods. Overseas as well, we are working on training young researchers, through research aimed at realizing sustainable forest management and the preservation of biodiversity in the tropical rainforests of Borneo and Malaysia. Studies of the chimpanzees and gorillas that inhabit African tropical forests in the Congo and Tanzania are also conducting.

Some four years on from the start of the project, a great many research outcomes have been achieved in each of these areas. For example, as one of Molecular Basis of Diversity, we are now in collaboration with other labs in the world, we are now conducting developmental genomic study of the origin and evolution of chordates. Chordates consist of three major groups, urochordates, cephalochordates and vertebrates. Chordates share several characteristic features including the midline organ notochord and dorsal hollow neural tube, and they are thought to have evolved from a common ancestor at least 520 million years ago.

We have studied the mechanisms of the evolution of chordates by performing studies of evolutionary developmental biology and developmental genomics. The results of our studies suggest that cephalochordates retain features basic to the chordate common ancestor and thus are likely to have evolved first from the ancestor. Vertebrates appear to have evolved by retaining these basic features, whereas urochordates seem to have diverged extensively for adaptation to their lifestyle as filter feeders.

Research is also being undertaken that builds on Kyoto University's long tradition in field biology. One example is the research being carried out into changes in the ecosystem of Japan's largest lake, Biwa-ko. This research is seeking to uncover the effect that humans have had on the lake's ecosystem through the measurement of nitrogen isotopes in biological specimens of fish and plankton collected in Biwa-ko and preserved by Kyoto University's laboratory nearby over some ninety years. A study of changes in a lake ecosystem of this caliber spanning a ninety-year period is unprecedented anywhere in the world.

Our strategic base for biodiversity research project is attempting to promote an understanding of biodiversity from various perspectives—both through fieldwork and in laboratory settings, both on the individual organism level and on the molecular cell level, and through the study of both plants and animals.

## **CV**

### **Satoh, Noriyuki**

Satoh Noriyuki is Professor of Department of Zoology, Graduate School of Science, Kyoto University. He received his PhD from the University of Tokyo in 1974. He is the President Elect of the Zoological Society of Japan. He has established a marine invertebrate chordate, *Ciona intestinalis*, as an emerging model system in the field of developmental genomics, by decoding its genome sequence and introducing various molecular techniques into this system. He is an Editor of *Development, Genes and Evolution*, and editorial board members of several journals including *Development*. He was awarded Alexander Kowalevsky Medal for his enormous contribution to the field of evolutionary developmental biology (2005).