Experiencing Biodiversity and Evolutionary Research in Japan: PhD - Exchange with Kyoto University Global Center of Excellence Program

Living in Kiel you probably wouldn't chose Yakushima, the wettest place in Japan, for a tropical holiday. But this is where six young scientists from Kiel headed in July 2010, on invitation of the Kyoto University Global Center of Excellence (COE) for Biodiversity Research to participate in a field and laboratory course and an international Symposium.

The Global COE program aims to train young scientists with complementary skills in fieldwork and up-to-date molecular biological techniques, in order to communicate the fundamental methods needed to study the diversity, ecology and behavior of various wild animals, plants, and fungi. A group of German PhD candidates were invited to join the field training course on Yakushima in 2010, an exchange initiated by leading scientists Thomas Bosch and Kiyokazu Agata from Kiel and Kyoto respectively.

Coming from disciplines as diverse as Economics, Mathematics and Biology they hit the road for this unique island situated about 60 kilometres south of the Japanese mainland. Yakushima, a UNESCO World Heritage site is renowned for its cedar forest with trees dating back to over 1000 years and for its endemic flora and fauna that makes it an unrivalled place for research on biodiversity and evolution.

On arrival the group met up with their new collegues, 18 students from the COE project and started work immediately. They were divided between three groups of Japanese and German students concentrating on different topics.

Marine biologist Alexandra Sophie Roy's team focussed on the adaptation of two Rhododendron species to the island's alpine environment. Most of the 46 endemic plant species of Yakushima comprise either hardy aquatic plants or alpine dwarfs. In previous courses, different mechanisms of dwarfism had been detected, depending on the species studied. The group analysed morphological and ecological characters of these plants. As Alexandra found out, binational collaboration was effortless: "As I was the only German guest on this team, my integration was complete. We spent a great amount of time together which was always very easy." An experience shared by the Germans working in the other two groups.

Group two studied the inter-species relationship between Japanese Macaque and Sika Deer. In a commensual relationship, Sika Deer follow groups of macaques, eating leaves and fruit they drop down from the trees. The job of this group was to estimate the density of deer and the proportion of deer foraging with macaque groups. They collected deer feces to later analyze their diet by sequencing the plant DNA. "We were able to observe the Macaques within spitting distance. And as they descend to the streets at noon to louse each other, they are quite easy to follow." zoologist Sebastian Fraune found out.

The third group studied the effect of forest disturbance on fungal diversity in the soil. Even on Yakushima, much of the pristine forest has

Figure 1
Field work was followed up by laboratory studies.

Figure 2
Scientists from Kiel and Kyoto exploring the Yakushima rain forest. Picture: *Alexandra-Sophie Roy*

Figure 3
At lunchtime, the Japanese macaques meet on the streets of Yakushima to louse each other. Picture: *Sebastian Fraune*

given way to artificial conifer plantations, considerably deteriorating the biodiversity. During the field course, students compared the fungal diversity in natural and secondary forest and conifer plantations by taking soil samples to later sequence fungal DNA in the lab. Collecting samples, Kiel students got in touch with the nastier aspects of fieldwork: "The damp underbrush is home to all kinds of bloodsuckers that single-mindedly find their way to every uncovered patch of skin. Sometimes you first notice them when they drop down, gorged and dripping blood on your skin", Sören Franzenburg learned from experience.

But working together was only part of the project. Living together in the traditional Tatami rooms of an old meteorological station brought the Germans into close contact with the Japanese and their culture that for all of them turned out to be "mostly effortless, relaxed and simply enjoyable."

After one week of field work all went back to Kyoto to analyze the samples in the genomic lab and discuss their results. Together with their Japanese colleagues, they learned and applied state-of-the-art techniques to purify DNA from deer and monkey faeces, fungi and the other samples they had collected. This short introduction to the concepts and implementation of DNA fingerprinting, amplification of DNA sequences and sequencing of DNA fragments was a unique experience especially for Max Stöven, who had an academic background in economics.

A highlight of the trip was an international symposium that zoologist Max Brück experienced as "the most sudden change of lifestyle one can imagine: Going from living on a sub-tropical island with pouring rain, high humidity, crawling through the underbrush, struggling with huge spiders and other kind of creepy crawlers to a modern accommodation in a historical, sun-drenched city where we had the opportunity to dress up and present our work at an international conference."

In the end all agreed that in addition to the scientific exposure, they had an enriching experience and built friendships that will last.

Figure 4
Wataru Shinohora and Alexandra-Sophie Roy analyzing their data. Picture: *Max Brück*

The PhD exchange, initiated by zoologist and vice president of the CAU Prof. Thomas Bosch is part of a larger cooperation between Kiel and Kyoto in the field of biodiversity research. In 2011 a group of Japanese PhDs will be hosted by the "Future Ocean" Cluster in Kiel.

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