

Research Activity Report
Supported by “Leading Graduate Program in Primatology and Wildlife Science”
(Please be sure to submit this report after the trip that supported by PWS.)

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Affiliation/Position	Center for Ecological Sciences, Indian Institute of Science/ PhD student
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1. Country/location of visit
Japan/ Yakushima Island
2. Research project
Yakushima Field Science Course: “Comparative study on the digestibility of Japanese Macaque (<i>Macaca fuscata</i>) based on the altitudinal gradient”
3. Date (departing from/returning to Japan)
2016. 05. 21 – 2016. 05. 27 (7 days)
4. Main host researcher and affiliation
Prof. Goro Hanya, Associate Professor, Primate Research Institute, Kyoto University (KUPRI) Prof. Kazunari Ushida, Professor, Kyoto Prefectural University Dr. Akiko Sawada, Primate Research Institute, Kyoto University
5. Progress and results of your research/activity (You can attach extra pages if needed)
Please insert one or more pictures (to be publicly released). Below each picture, please provide a brief description.
<p>In the diverse ecosystem, when there are complex interplays happening between the species and resources and most of the studies are being focused on the community level; the role of microbes in defining the behaviors and ecology of the species is often given less priority. Many of these microbes are very important in not only understanding the ecology, but also the landscapes, changing behaviors and other physiological context. Hence, to understand how the gut microbes can play a major role in defining the digestibility, we formed “the monkey” team of seven students under the supervision of Prof. Hanya, Prof. Ushida and Dr. Akiko. The study was designed to assess the digestibility in the Japanese Macaque. We set our major objective to assess the altitudinal variation in the digestibility of the gut microbes in the free-ranging Japanese macaque in the Yakushima Island. The study was conducted in the field and in the lab. The field protocol, majorly, included:</p> <ol style="list-style-type: none"> a. Following the troops of the macaque. b. Identifying their sex and age. c. Upon defecation, the fresh fecal samples were collected for RNA analysis (of the bacterial community) and for digestibility assessment. d. Some of the opportunistic samples were collected as well. <p>The study site being very diverse in the altitudes and vegetation type- we divided our study site into two zones, highland and lowland, based on the altitudinal gradient. The previous studies showed that forage preferences in the Japanese macaques were found to be different in different altitudes in the Yakushima island. Keeping all these in backdrop, we started the sampling.</p> <p>To enhance the sampling efforts, we divided our team into two and below-mentioned division of labor was used:</p>

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- a. The team-A focused on highland and the team-B focused on lowland sampling.
- b. The members in each team were switched- so that each member could observe the change in the altitudinal gradients in the Yakushima.

Despite of the difficulties in tracking the troops and also sampling during the rainfall in the highland, we collected 26 samples in the time-span of a week. To maximize our work efficiency, we divided our working day into first half where we collected samples and the second half of the day where we analyzed the collected samples.

The lab-protocol majorly included the processing of samples. The processing included mixing of the samples, weighing, adding carbon-dioxide to create a suitable environment for anaerobic microbes, incubating, centrifuging, filtering, drying and final weighing. Three broad parameters were used to understand the digestibility; pH, gas production and change in substrate volumes. Beside this, we also used two different substrates for enhancing the bacterial activities.

We found the really interesting patterns in terms of pH and gas production. The digestibility (pH and gas production) in highland individuals was comparatively higher than the lowland individuals. It indicates many ecological (forage preferences, etc.) and physiological (variation in the gut-fauna, etc.) contexts. We also found that the bacterial activities were high when the leaves were used as the substrate than the cellulose.

Personal learning and observations:

This course has given me a concept of incorporating the microbes in understanding the physiology and I plan to use this technique to address many physiological contexts in free-ranging Asian elephants. My aim of joining this course has helped me a lot by giving me a wide arena to think about the possible research problems. Beside understanding the scientific rationale behind the digestibility in *Macaca fuscata* and conducting the research to answer our broad question, I learnt many things that shall aid me in attaining the academic perfection and broadening my scientific understanding:

- The general field aptitude in the different landscape and on different species entirely diverse from the one I am working on; gave me the broad perspective of understanding the physiology, ecology and behaviors of primates.
- Opportunistic behavioral observations during sample-collection helped me in understanding the intense grooming behavior and other behaviors associated to grooming in the Japanese macaques.
- Close proximity to human shown by some of the troops of free-ranging Japanese macaque was really captivating to me.
- The rich floral and faunal diversity of the highland and lowland parts of the Yakushima island triggered a lot of curiosity in me related to the evolution and speciation.
- The team of hard-working supervisors and their patience to answer all of my queries inspired me a lot.
- Working in a team of very talented colleagues and the understanding we projected towards each other-fueled up the enthusiasm in me despite of our hectic schedules.
- Culture and disciplines shown by each student in the field station have left a remarkable impression on me. I must say that it's an exemplary pact shown by them which is worth projecting to other students in different countries.

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- On the top, the scientific discourse I had with Prof. Ushida during our highland sampling and Prof. Hanya has left me with lots of questions that I would like to address in my future work on free-ranging Asian elephants.
- Meeting with researchers working in the diverse spectrum of ecology aided me in knowing different researches done on different species and understanding the global context of conservation.

Appendix



Fig 1: Google map showing the study site- the Yakushima island



Fig 2: Observing troops of Japanese macaques in the lowland (along with Prof. Hanya and Prof. Ushida)
These troops were habituated to human presence.

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Fig 3. Lowland landscape with a troop of grooming macaques



Fig 4. Highland landscape

Fig 5. Fecal

Sample processing

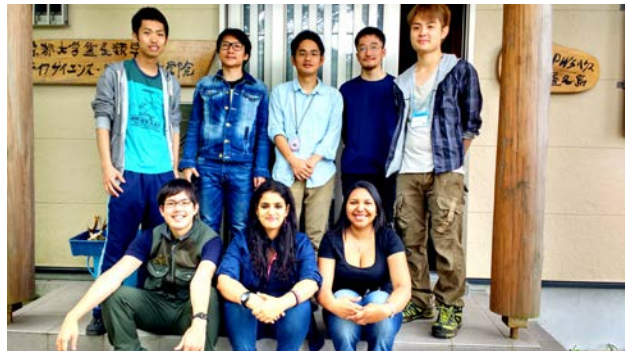


Fig 6. Team members during data analysis

Fig 7. “Monkey” team along with Prof. Hanya

6. Others

I would like to pay my deep debt of gratitude to Prof. Goro Hanya, Prof. Kazunari Ushida and Akiko Sawada for training us in understanding the digestibility and giving me a wonderful chance to discuss my doubts. The wonderful team mates without whom this research would not have succeeded- Otsuka, Mabuchi, Kota, Liu, Gisele and Akito- I would like to acknowledge them. This course has changed my perspective and taught me a lot. I would like to thank all the members who joined this course and made our course period worth remembering for. My sincere thanks to PWS program, Prof. Shiro Kohshima, Shuta-san and other WRC members for giving this wonderful opportunity.