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.)

	2016. 06, 01
Affiliation/Position	Universiti Sains Malaysia
Name	Evan Quah Seng Huat

1. Country/location of visit

Yakushima Island, Japan

2. Research project

Preliminary assessment of the species composition and variation in fig and fig wasp species on Yakushima Island, Japan.

3. Date (departing from/returning to Japan)

2016. 05. 21 – 2016. 05. 27 (7 days)

4. Main host researcher and affiliation

1. Professor Shiro Kohshima (Wildlife Research Center of Kyoto University)
2. Professor Goro Hanya (Primate Research Institute, Kyoto University)
3. Professor Takakazu Yumoto (Primate Research Institute, Kyoto University)
4. Professor Munehiro Okamoto (Primate Research Institute, Kyoto University)
5. Professor Takashi Hayakawa (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.

During this visit, I was assigned to the team that conducted research on the diversity of fig (*Ficus* sp.) found on Yakushima Island and their pollinator wasp species (Insecta, Hymenoptera). The figs have a very intimate mutualistic relationship with a very specific wasp species which they require for the pollination of their flowers within their syconia while the wasps require the figs for the development of their larvae. As such both species are codependent on each other for their life cycle. However, there are other species of non-pollinator or parasitic wasp that exploit the figs by laying their eggs within the syconia but do not pollinate the plant. Some parasitic wasps are hyperparasites that parasitize the larvae of the pollinating fig wasp. To complicate matters further, many of these pollinating and non-pollinating fig wasps species are morphologically very similar and usually require detailed examination by the expert to ascertain their species.

Thus, the aims of this project was to first examine the taxonomic relationship of the different fig species found on Yakushima Island as well as the taxonomic relationship of the different fig wasps species. Using molecular phylogenetic analyses back at the Primate Research Institute in Inuyama, we hope to confirm whether co-evolution has occurred between the different species of figs and their pollinator wasps. In addition, we wish to examine the phylogenetic relationships between pollinator and non-pollinator species of wasp.

While in the field in Yakushima, I along with my other team mates used this opportunity to collect the syconia from as many species of figs as possible. We then examined them to determine their stage of development and noted a number of variables such as their size, colour and hardness. Each syconium was then dissected to observe its stage of maturity and to collect any insects or their larvae observed. All fig wasps regardless of whether they were pollinators or non-pollinators were collected. Insect specimens were preserved in 100% ethanol and brought back to PRI at Inuyama for molecular analyses. Leaves of the different species of figs were also collected and dried in silica gel for subsequent molecular analyses at Inuyama as well.

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Through this experience, I learned a lot about the reproductive biology of the different species of figs which are very complex. Some species are monoecious while others are dioecious and they differ in their relationships with their pollinator wasps. We learned that in dioecious species where the figs have different male and female syconia, the wasps are only able to complete their life cycle in male syconia. If a female wasp were to pollinate a female syconium, then the fig will produce seeds but the wasp will not be able to hatch any offspring. In monoecious species on the other hand, there is only one type of syconia and both the wasp and the fig are able to produce the next generation within the same syconium. This is due to the different structures of the female flowers found within those syconia.

The wonderful experience I had at Yakushima would not have been possible without the dedicated efforts by our team of researchers. I am very grateful for the guidance that I got in the field from the many lecturers that accompanied us especially Professor Takakazu Yumoto, Professor Munehiro Okamoto and Professor Takashi Hayakawa. It was also a great experience for me to get the opportunity to work with researchers from other parts of the world such as India, Brazil, China and our host country Japan. Many of the participants of the field course come from different fields and I welcomed the opportunity to learn a little bit more about their work. Our team is currently analyzing the genetic sequences obtained from the fig and wasps samples collected from Yakuhima and will be presenting our findings at the 5th International Seminar on Biodiversity and Evolution: New Methodology for Wildlife Science.

Recording the data of the fig syconia collected in the field

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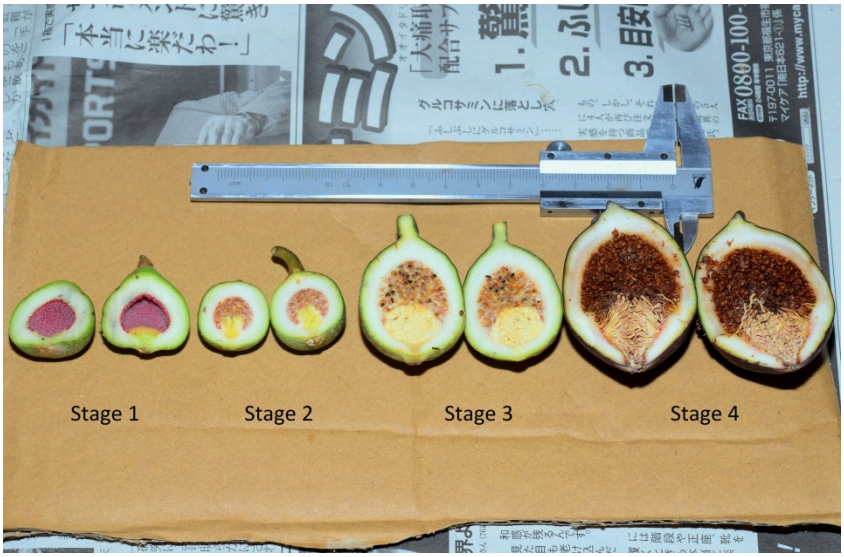
Examining collected fig syconia with teammates Lee Chung Kun & Anna Kawakita



Different stages of maturity in Oitabi (*Ficus pumila*).

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Size and colour variation in syconia of Gajumaru (*Ficus microcarpa*)

6. Others

During my spare time in the field at Yakushima I took the opportunity to pursue some of my own personal interest which is in herpetology. I was lucky enough to observe a few native species of reptiles and amphibians found on the island including the endemic Yakushima Island subspecies of brown frog, *Rana tagoi yakushimensis*. The chance to observe the herpetofauna and other wildlife found on the island gave me a new found perspective to compare the diversity of the species found in the tropics of Southeast Asia where I am from versus more temperate regions. It came as a surprise to me to learn that only five species of amphibians have been reported from an island as lush as Yakushima. They are *Bufo japonicus japonicus*, *Hyla japonica*, *Glandirana rugosa*, *Rana japonica* and *R. tagoi yakushimensis*. This is in stark contrast with an island such as Penang which is roughly of the same size but has close to 20 species of amphibians. This really illustrates that species diversity dwindles the further one moves from the equator. A similar pattern is reflected in the primates of Japan versus the more tropical regions of Asia where throughout the whole of Japan only one species is found, the Japanese macaque (*Macaca fuscata*) compared to some regions like Borneo for example where a dozen species can be found. However, not all my observations were about dissimilarities between different regions, I observed some similarities as well like in the plant Mamushigusa (*Arisaema* sp.) which was widespread on Yakushima and is very similar to the plants of the genus *Amorphophallus* that is found in my region. Both genera belong to the family Aracea and probably occupy the same niche in their respective regions. The examples above are but a few of the observations and notes I made of the wildlife on Yakushima Island that have helped me build a better picture about the biogeographic patterns of flora and fauna in the different regions.

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Yakushima Brown Frog (*Rana tagoi yakushimensis*)

Flower of Mamushigusa (*Arisaema* sp.)

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