DIWPA: DIVERSITAS in the Western Pacific and Asia

DIWPA News Letter

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Message from DIWPA Chair

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1. Global Ecology Cooperation Academy at NIE

The National Institute of Ecology (NIE), South Korea, held the "Global Ecology Cooperation Academy (GECA)" from 29 October to 30 November 2018, for young researchers (postdoctoral fellows and doctoral students) interested in the international cooperation and globally collaborative research in areas of environment and ecology. The academy aims to broaden the participants' understanding of current issues and major trends in environment and ecology-related international agreements and organizations such as CBD, Ramsar and IPBES; to foster the younger researchers, fellows and students by providing them a wide range of special lectures from research institutes, international experts and academia.

From DIWPA, Prof. Hiromi Uno and I joined and cooperated in GECA on 29 and 30 November. On the first day, we gave two-hour talks: My topic is about the history of DIWPA and AP-BON, and Hiromi's is about international collaboration research and capacity building for stream ecology. On the second day, we evaluated presentations by young researchers. There were some groups of young researchers, and each group prepared a research/project plan which includes organization, materials & methods, budget and so on, and gave a presentation using PPT. After listening the presentations, we were impressed very much with those young researchers' high standard.

A commemorative photo after Global Ecology Cooperation Academy at NIE.

GECA in 2018 was a tentative one. However, it will be held every year, and NIE wants to collaborate with CER and DIWPA for sustainable development of GECA.

2. IFBC 2019 will be held in Indonesia

DIWPA has chosen Bogor, Indonesia as the venue for International Field Biology Course (IFBC) in 2019. This is proposed by Dr. Luki Subehi who is a member of DIWPA at Research Center for Limnology (RCL), Indonesia Institute of Sciences (LIPI).

International Conference on Tropical Limnology (TROPLIMNO 2019) is going to be held from 27 to 30 August 2019 at International Conference Centre, Bogor University of Agriculture, Indonesia. More information can be found on their website: https://www.troplimno2019.or.id/

RCL, LIPI is responsible for the organization of the conference. Dr. Subehi has been expressing strong interest in hosting IFBC in Indonesia for years and successfully garnered consensus to hold IFBC during TROPLIMNO 2019 after deep and serious discussions with RCL members and other colleagues of TROPLIMNO.

Dr. Subehi and I have discussed via/through e-mails and in person at World Lake Conference, Tsukuba in mid-October 2018. We scheduled DIWPA IFBC to be held in Bogor on 27 August 2019, the first day of TROPLIMNO 2019. Prof. Hiromi Uno, a stream ecologist at Center for Ecological Research (CER), Kyoto University, will attend the conference as an expert from DIWPA, and she will lead IFBC 2019. TROPLIMNO hopes to invite DIWPA members. For more details, please visit the website of TROPLIMNO above.

Thank you for your understanding and we hope to have many participants for IFBC and TROPLIMNO 2019.

Capacity building and network strengthening among young scientists in Pacific and Asian regions

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Fig. 1. Participants of IFBC 2018 in front of Kiso Biological Station

I attended the 2018 International Field Biology Course (IFBC) on the invitation of DIVERSITAS in the Western Pacific and Asia (DIWPA) as a young researcher (**Fig. 1**). Working on the limnology, particularly water quality monitoring and freshwater fish communities, I have always wanted to study the lake ecology in other tropical and temperate countries. The IFBC that was held in Kiso-Fukushima, Nagano, Japan from 9-15 August 2018 had offered me this opportunity to be one of the participants. Based at Kiso Biological Station, the participants learned about the fundamental ecological studies on periphytic algae, benthic invertebrates, freshwater fish as well as data analyses. The knowledge I have gained here is very interesting and beneficial that should be applied in academic and scientific research either practically or theoretically. The course comprised field work and discussion among young scientists and professors. The main objective of this training is to build capacity and strengthen network among young scientists from diverse academic backgrounds and disciplines. In addition, this training is aimed to help participants to learn different techniques/methods provided by Japanese academia, and subsequently to disseminate the newly learned methods to the future generation. As a young scientist, it will always be my passion to work in the field and enhance my knowledge and skills related to my research interest.

Although my background is more focusing on the lake (lentic) studies, I have no limitation to any other types of ecosystems, especially in stream (lotic), as it is also connected to the lake water system. In Malaysia, I have been involved in a number of research projects related to ecology and biodiversity. Moreover, I was also involved in some voluntary projects in environmental conservation. I enjoy doing intensive field works and working with researchers, conservationists and local communities. As the incumbent secretary of Southeast Asian Limnological Network (SEALNet), it is my aim to continually promote and develop research collaboration, training and knowledge exchanges on tropical limnology within the scope of Southern Asian region.

When I reached Seta on 9 August, the Director of CER (Center for Ecological Research), Kyoto

Fig. 2. The laboratory at Centre for Ecological Research (CER), Kyoto University

University, Prof. Shin-ichi Nakano; who is an expert in limnetic environments, welcomed me and Ms. Tuah Nanda Merlia Wulandar, a participant from Indonesia. He personally showed both of us several laboratories and facilities at CER. The labs are fully equipped with sophisticated machinery (**Fig. 2**). He also introduced us to Associate Prof. Hiromi Uno; who is specialized in species interactions in natural landscape, Prof. Keisuke Koba; who is specialized in ecosystems and isotope ecology, and other researchers and employees at CER.

On the following day, several participants were gathered in front of the hotel. There were six participants including four students and two teachers (senseis). We departed to Kiso-Fukushima after self-introductions. The journey from Seta took approximately five hours by car. We passed through several bridges and tunnels. It should be noted that these constructions showed the efforts made to conserve the surrounding forest areas. I was excited to see the natural environment and the panoramic landscape along the journey. Although it was my third visit to Japan, I had mostly seen the 'concrete jungle' with outstanding skyscrapers in my previous ventures at Osaka and Saga cities.

We reached Kiso Biological Station around 2:30 p.m.. Located approximately 800 meters above sea level (a.s.l.), this station is furnished with dormitory, small laboratory, discussion room, dining room, kitchen, bathroom, washroom and washing machine. Before we started our research works at Kiso River, Prof. Nakano requested permission from the authorities to conduct research and collect samples from the river. With a length of 229km, Kiso River consists of stream and riparian forest ecosystems. Associate Prof. Yoshikuni Hodoki; who is an expert on microbial ecology and phycology, joined us that night. After a short briefing about our itinerary by Prof. Nakano, I was asked to give a presentation about my university and my research projects. I enjoyed sharing my knowledge and exposure regarding my project and some information on the biodiversity of Malaysia, Indonesia, Myanmar and Vietnam which I have experienced. Then, we had a good rest while listening to the sound of flowing river.

The next morning, we went to Kiso River after packing our lunch. Although I am familiarized with stream ecology and biodiversity, the techniques/methods of the samples collection here were slightly different than that I have been using back in Malaysia. At first, Uno-sensei briefed us how to take physical parameter readings such as temperature, dissolved oxygen and pH by using different probes. She also taught us the measurement of river flow. It was my first time to measure the river flow. Subsequently, we hiked up to Akashio-sawa waterfall. The water from this waterfall is flowing into Kiso River. Afterward, Uno-sensei taught us how to use densitometer; the instrument to estimate forest canopy density. As an expert in aquatic invertebrate studies, she also taught us how to collect aquatic insects. The collection of aquatic insects was a new subject for me as I have never taken a course on the terrestrial and aquatic insects during my undergraduate studies. I was excited to learn the new technique to collect larval and adult aquatic insects from the river by using emergence trap and Surber net. In the laboratory, we learned to identify the aquatic insect species by referring to the identification book with the help by Uno-sensei (**Fig. 3**).

For the fish sampling, the specimens were caught by using fish rods. Mr. Kazuho Funakawa

Fig. 3. Sorting aquatic insect samples for stable isotope analysis

and Mr. Naoki Yui helped to catch the fish specimens from upstream. The species caught were Iwana (white-spotted char *Salvelinus leucomaenis*), Amago (cherry salmon *Oncorhynchus masou*) and Aburahaya (amur minnow *Rhynchocypris lagowskii*). We learned to take out the gut content without dissecting the fish. This technique was carried out by using water pump. The fish were then released into their original habitat.

Hodoki-sensei instructed the methods for algae sampling. We sampled the epiphytic algae from the rock surface by using 6cm x 6cm quadrate (**Fig. 4**). In the laboratory, Prof. Nakano taught us how to measure the concentration of chlorophyll *a* in the water. He showed us step by step to carry out the dilution method and the calculation of chlorophyll *a* concentration in 36cm^2 quadrate area (**Fig. 5**).

We also were given hands on experience as we had to conduct our own research project at Kiso River. We presented our proposals to Nakano, Uno and Hodoko-senseis and they provided some comments and suggestions. We were given two days to complete the sampling and laboratory analyses before presenting our findings on the following day. For this task, I was grouped with the other participants from Indonesia and Japan as we had a similar interest. We decided to conduct the study on the river flow and its correlation with physical parameters and algal density. After the proposal presentation, I joined the other two members; Uno-sensei and Ms. Christmas de Guzman who wanted to look for salamanders. Christmas is a Filipino scientist and working as a Programme officer for Asia-Pacific Network (APN) in Kobe, Japan. This was my first time hiking across the waterfall during the night to catch salamanders. While hiking, we had a chance to catch fish by using net. We managed to get almost 10 individual fishes and one salamander that night.

Fig. 4. Collecting epiphytic algae from the rock surface at Akashio-sawa waterfall

Fig. 5. Explanation by Prof. Nakano on chlorophyll *a* analysis

The next morning, after preparing the equipment for our sampling, we went to Kiso River at 10:00 a.m. and started our research immediately. The sampling was challenging, especially when we had to take the measurements in the middle of the river that have speed currents and cold water, and we also carried the bulky probes from one station to another. However, it never turned down our courage to carry out the research. After completed two stations, we had to stop due to heavy rain. Then we had our packed lunch and continued the sampling. The research took two days to be completed including laboratory analysis for the measurement of chlorophyll *a* concentration. At night, I keyed-in the data and conducted several statistical analyses before preparing the presentation slides (**Fig. 6**).

On the seventh day, we presented our findings. It was a really good discussion among us especially when we had teachers who are experts in each field. I was amazed by others' presentations. Even though some of them are just undergraduate students, they managed to carry out the two-day

project and present the findings successfully. After the presentation, we had leisure time at night. It was a fascinating experience as we joined the traditional dance, Bon-Odori, with the local people. The dance was membered by old folks. The lyric of the song was based on the beauty of nature, showing that they really appreciate the nature they have (**Fig. 7**). Kiso is indeed one of the most beautiful villages in Japan. On our back to the research center, we passed by a mini hot spring and soaked our feet to feel fresh. It was really relief after the long and tiring days of field and laboratory works.

I am very grateful to be involved in this course alongside experts and young scientists from Kyoto University and other institutions who work on diverse fields and disciplines. Collaborating with them, and being part of this training really give me a memorable experience. Their way of working and thinking are just different. They worked until midnight and started very early in the morning. Indeed, this is a good Japanese work ethic that should be emulated. During the training, I appreciated the teachers (Nakano, Uno, Hodoki and Koba-senseis) for their countless support and invaluable suggestions, from the beginning until the end of the training. I also thanked the other participants who are very supportive; Naoki, Nanda, Seniya, Chris, Urara, Hanaka and Kazuho.

From this training, I have gained a plenty of new knowledge on the biodiversity, basic ecological sampling procedures as well as full guidance on laboratory techniques and analyses. My experience in Kiso River made me more passionate and excited to explore my interest in conducting research in this field. In addition, I managed to learn the differences in sampling and laboratory techniques between Japanese and Malaysian academia. I wish to introduce these new techniques to several of my lecturers and colleagues who are working in this field.

For the time being, I have just finished my Ph.D. study at Universiti Sains Malaysia (USM) under the supervision of Emeritus Professor Mashhor Mansor, and I am looking forward to collaborating and contributing more to the lake research especially in management and conservation. Hereby, I would like to take this opportunity to thank all the staff and participants who were involved in this training. Finally, I would like to express my deepest gratitude to DIWPA for the sponsorship.

Fig. 6. Compiling data from Akashio-sawa waterfall

Fig. 7. Japanese traditional dance, Bon-Odori

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The Experimental nursery of Sapporo experimental forests in Hokkaido University

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Introduction

In the southwestern part of Hokkaido University Campus, there is a Sapporo experimental nursery (43°06′N, 141°20′E) near Forest Research Station of Field Science Center for Northern Biosphere and Faculty of Agriculture. The area of this nursery is approximately 3.4 ha and this is situated in the center of Sapporo city. Total amount of precipitation is about 1,003 mm per year, and average temperature is 8.5 °C. Snow-free period is from mid-April to mid-November. Many plants including softwoods, hardwoods, shrubs and many horticultural plants are planted in this area and we enjoy the seasonal change of the phenology in these plants.

This nursery plays important roles not only for various forest researches but also for educational programs for students including high schools in Japan and overseas (http://www.fsc.hokudai.ac.jp/home_en/station_en/sapporo-experimental-forest/) (Koike *et al.* 2019). In particular, this nursery is an important stronghold for filed manipulation experiments using forest tree seedlings, because this nursery is located in the transition zone between a cool temperate forest and a boreal forest, sensitive to environmental changes (e.g. Sakhalin fir; Pretzsch *et al.* 2017). Here I introduce some major experiments using this nursery.

A Free Air CO_2 Enrichment (FACE) Project

Because trees are long-lived organisms, they are affected by environmental change. Greenhouse gases such as carbon dioxide and ozone are possible to induce not only global warming but also changes in forest dynamics. Therefore it is necessary to clarify the response of forest trees under global environmental change using filed manipulation experiments.

The Free Air CO_2 Enrichment (FACE) system was established in 2003 to clarify the effects of elevated CO_2 on tree physiology and biomass (Project leader: Prof. T. Koike) (**Fig. 1**). This system included three control sites and three FACE sites. Each site was a circular plot, 6.5 m in diameter and 5.0 m in height. Fertile brown forest soil was provided in half of each site, and infertile immature volcanic ash soil was provided in the other half (Eguchi *et al.* 2005a, b, 2008a, b). The CO_2 concentration inside the FACE sites was maintained at around 500 μmol mol^{-1} (predicted CO_2 concentration in 2040), corresponding to ambient plus 1,300 μmol mol^{-1} (Takagi *et al.* 2004).

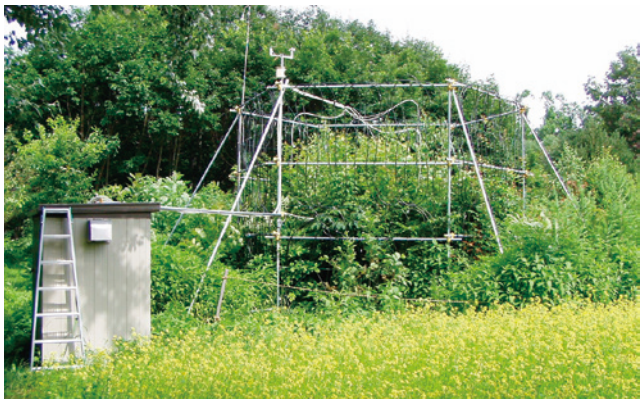

Fig. 1. The overall view of a FACE system. CO_2 gas was supplied from a special tubing system (Eguchi *et al.* 2005b).

In the first term (2003-2008), 2 year-old seedlings of 12 deciduous tree species were planted in each site and all saplings except beech were harvested after five years. In this project, we revealed the effect of elevated CO_2 on photosynthetic traits and wood formation in

saplings (Eguchi *et al.* 2005a, b, 2008a, b, Koike *et al.* 2015, 2018, Watanabe *et al.* 2014 and Watanabe *et al.* 2010, 2016). We predicted change in vessel size associated with changes in transpiration under elevated CO_2, but our results showed no changes in vessel size under elevated CO_2 (Watanabe *et al.* 2010, 2016).

In the second term (2008-2013), hybrid larch F_1 (*Larix gmelinii* var. *japonica* × *L. kaempferi*) seedlings and seedlings of three kinds of birch species (*Betula platyphylla* var. *japonica, B. maximowicziana, B. ermanii*) were planted and the changes in tree growth, physiological traits and Leaf Area Index (LAI) were analyzed (Watanabe *et al.* 2013 and Hara *et al.* 2014). These studies revealed that elevated CO_2 enhances growth of hybrid larch F_1 and LAI of birch seedlings and suggest the possibility that elevated CO_2 affects forest dynamics. For beech, we dug out whole plants and found an essential role of fine root in relation to edaphic condition (Agathokleous *et al.* 2016).

This system has been used as a free air controlled ozone enrichment (O_3-FACE) system from 2014. Together with the open-top chamber, field manipulation experiments has been done to clarify the effect of elevated CO_2 and/or elevated ozone on photosynthetic traits, tree growth, symbiotic micro-organisms and defensive traits of leaves (Hoshika *et al.* 2012 and Wang *et al.* 2015).

Defoliation treatment

Recently, the insect defoliation has frequently occurred in Hokkaido. The defoliation during growing season would affect the growth of forest trees. To clarify the response of forest trees to defoliation, the defoliation treatments have been done. About 400 pots (*Larix kaempferi* seedlings & *Betula maximowicziana* seedlings) were placed in the nursery and these seedlings were artificially defoliated in summer (**Fig. 2**). Now the effect of defoliation on the growth of forest trees, physiological traits and xylem formation has gradually become clear.

Fig. 2. About 400 potted seedlings for defoliation experiments.

Furthermore, hybrid larch F_1 saplings were also defoliated artificially assuming the larch sawfly feeding and change in tree growth under defoliation has become clear.

Biotic environments in the nursery

Although this nursery is located in the center of Sapporo city, we can see various kinds of insects, birds and animals in this area. During the first FACE experiments, we found some nests when we harvested tree saplings. In the second FACE experiment, we prevented the birds from making the nests.

Many herbivorous insects, such as leaf beetles, feed the leaves of saplings grown in the FACE system (**Fig. 3**). We have observed the defensive traits of tree leaves under elevated CO_2 concentration and elevated ozone concentration using the leaf beetles (Sakikawa *et al.* 2016 and Agathokleous *et al.* 2019).

Fig. 3. Leaf beetles (*Agelastica coerulea*) feeding on Japanese white birch leaves.

Fig. 4. Walnut seedling grown in larch pot.

Furthermore, some Hokkaido squirrels (*Sciurus vulgaris orientis*) live in this nursery. They harvested walnuts grown in the nursery and buried them in our pots in autumn. As the result, some walnut seedlings appeared in some larch pots in the next spring (**Fig. 4**)!

Conclusion

We can access easily to this nursery from Sapporo City and we can use this nursery for a long term. We can carry out various kinds of experiments about forest trees in this nursery. When you have a chance to come to Hokkaido University campus, please visit the Sapporo experimental nursery.

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