



DIWPA: DIVERSITAS in the Western Pacific and Asia

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Message from the Chairperson Shin-ichi Nakano

The 9th EAFES International Congress organized by the East Asian Federation of Ecological Societies (EAFES) was held in Hohhot, China from July 10 to 13, 2021. The congress was conducted in a hybrid way, on-site and online. Because of COVID-19 spreading, the participants attended the congress on-site from China, and online from foreign countries. EAFES is an organization, where ecological societies of China, Japan, and Korea collaboratively established a federation to promote ecological science in East Asia. The three Ecological Societies take turns organizing the joint meeting (EAFES Congress) at least once in 2 years. In this time, EAFES Hohhot was hosted by Ecological Society of China (ESC) and the Inner Mongolia Academy of Agricultural and Animal Husbandry Sciences. I have been attending all the congresses in charge of EAFES Secretary General since 2015. The theme of the congress in 2021, is “Harmonizing People and Nature for Better Asia”, which focuses on harmonious and sustainable development among people, nature, and society in the context of Asia development.

According to EAFES’s rule, EAFES presidency is elected in the host society for EAFES Congress. Since the last EAFES Congress was held in Nagoya, Japan, the

president of Ecological Society of Japan (ESJ) also took on the post of EAFES presidency. This time, EAFES presidency has been successfully transferred from Prof. Takakazu Yumoto (Kyoto Univ.), the president of ESJ, to Prof. Ouyang Zhiyun (Chinese Academy of Science), ESC president.

According to the report by ESC, EAFES Hohhot consisted of 8 parallel sessions with 450 registered participants from 9 countries (China, South Korea, Japan, Mongolia, France, Pakistan, Russia, Sri Lanka and Thailand). The number of abstracts was 249 (Chinese 150, foreign 99) including of 136 oral presentations (Chinese 84, foreign 52) and 82 posters (Chinese 42, foreign 40). I organized the session “S-05: Future collaboration in aquatic ecology to be initiated by East Asian leadership”, with Dr. Sung Ryong Kang (National Institute of Ecology, South Korea), Dr. Qin Boqiang (Nanjing Institute of Geography & Limnology, Chinese Academy of Sciences, China, and Dr. Song Lirong (Institute of Hydrobiology, Chinese Academy of



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Sciences, China). Our session consisted of 19 oral presentations and 6 posters. Those oral presentations were dominated by young researchers such as graduate students, and we had hot and fruitful discussions. In addition, there were 8 plenary talks, and all of them were so excellent and impressive. Thus, we finished EAFES Hohhot with great success, and I would like to express my greatest and deepest thanks to ESC and the Inner Mongolia Academy of Agricultural and Animal Husbandry Sciences.

The next EAFES Congress is going to be held in 2023, in Jeju Island, South Korea. We expect on-site congress in 2023, encouraging possible participants not only from the three countries but from all over the world. Therefore, we shall get together in Jeju to enjoy science and international friendship, and this will foster the next generation in science of ecology and biodiversity. Through EAFES, we would like to facilitate information exchange among international researchers for further development in ecological and biodiversity research all over the world.



EAFES Hohhot Congress on-site



Message

from the Secretary General

Atsushi Ishida

In Japan, we are still in COVID-19 pandemic. Although the vaccination has started from medical doctors, healthcare workers and senior citizen, the rate of immunization is not yet high in Japan. However, we can go to research sites within Japan. Now I am in the Ogasawara (Bonin) Islands with my students and the colleagues of my research project. The islands are located approximately 1,000 km south of Tokyo, listed in the World Natural Heritage sites since June in 2011. Many endemic species are living in the islands, because of oceanic islands. The early summer is one of the best seasons surrounding beautiful sea and sky with deep blue. Today we can inform the other good news. A part of Ryukyu Islands (Iriomote Island, the north of Okinawa Island, Tokunoshima Island and Anami Island) is newly listed in the World Natural Heritage sites from July in 2021. This is the 5th World Natural Heritage site in Japan. Rich beautiful nature with many endemic species remains in the Ryukyu Islands. The anthropogenic history of the Ryukyu islands is far older than that of the Ogasawara Islands. We can thus look unique culture in the Ryukyu Islands. In the next volume of DIWPA Newsletter I will try to invite a report from the researchers of Ryukyu Islands, to inform more detailed nature in the area of Ryukyu Islands.





Nakodo-jima, an oceanic island of Ogasawara Islands, in the northern Pacific

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Introduction

Nakodo-jima (27°37'–27°38'N, 142°10'–142°11'E, 1.37 km² in area) is a subtropical oceanic island belonging to the Ogasawara Islands, in the northern Pacific (Fig. 1). The mean precipitation and annual temperature on Chichi-jima, the largest island in the islands, were 1,014 mm and 23.4 °C, respectively, during 1995–2020 (Japan Meteorological Agency, Tokyo, Japan).

Ogasawara Islands have unique ecosystems containing many endemic species, which is the characteristic of oceanic islands (Shimizu 2003). Therefore, the islands were certified as a World Natural Heritage by UNESCO in 2011. On the other hand, loss of biodiversity and alternation of native ecosystems have been caused by several invasive species (Kawakami 2010). For conservation and

restoration of the island ecosystems, controls and managements of some invasive species have been conducted (Sato 2019).

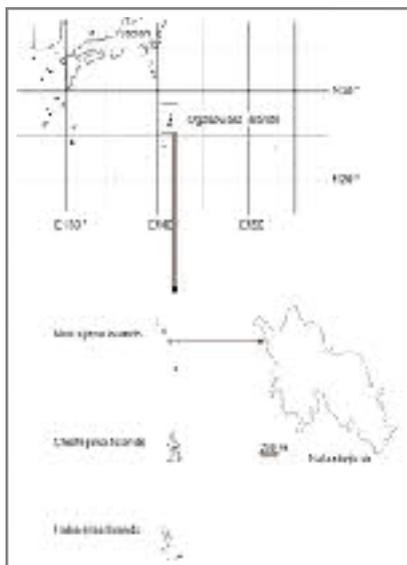


Fig. 1 Location of Nakodo-jima in the Ogasawara Islands

History of ecosystem degradation by disturbances of feral goats

Ecosystems of Nakodo-jima had been disturbed by goat (*Capra hircus*), which is one of the most invasive mammals in the world, especially in oceanic islands (Loope *et al.* 1988). It is assumed that people introduced domestic goats as livestock into Nakodo-jima since 1912 (Shimizu 1993). The goats became naturalized on Nakodo-jima when all people left from the island after 1945 (Japan Wildlife Research Center 1992).

It is likely that Nakodo-jima was covered with native forests before the introduction of goats (Shimizu 1993). Details of the species composition of the forests in Nakodojima before goat introduction are not clear, but the forests remaining after goat eradication would be similar to the forests present before the introduction (Shimizu 1993). The native forests are dominated by *Pisonia umbellifera*, *Pandanus boninensis*, *Livistona chinensis*, *Neisosperma nakaianum* and *Ardisia sieboldii*.

The number of feral goats had drastically increased since 1945, and the number in 1991 was approximately 500 (317/km²) (Japan Wildlife Research Center 1992). Feral goats in the islands caused vegetation degradation. Goats destroyed native vegetation, which led about 90% of the original forest to shift into grassland and bare ground. Goats grazed seedlings of trees and shrubs, which prevented the regeneration of native forests after the death of canopy trees (Shimizu 1993). As a

result, forests shifted to grasslands. Thereafter, grazing and trampling of the goats to herbaceous species resulted in loss of vegetation cover in some of the grasslands and exposure of surface soils (Fig. 2a). The exposure of surface soils resulted in the erosion (Fig. 2b). The eroded soil flowed into the

sea (Fig. 2c), which affected the coastal communities such as coral and fishes (Japan Wildlife Research Center 2002).

Changes of ecosystems after eradication of feral goats

For the first step of restoration of the island ecosystems, all goats on the island were eradicated between 1997 and 1999 (Japan Wildlife Research Center 2002). After goat eradication, vegetation, especially grassland vegetation, recovered. According to aerial photographs in 1991, 2003 and 2012, areas of grassland increased and those of bare ground decreased after goat eradication (Osawa *et al.* 2016), which would be likely to releases from grazing and trampling by feral goats.

In some areas of the grasslands, an invasive shrub, *Leucaena leucocephala*, aggressively invaded after the eradication (Fig. 3, Hata *et al.* 2010a; Osawa *et al.* 2016), which may be related to releases from herbivory of goats. *L. leucocephala* can prevent subsequent establishment of native tree species by limiting seed germination and seedling growth (Hata *et al.* 2010b). Therefore, it is likely that there would be no replacement of native trees of mid- or late-successional species in the forests dominated by *L. leucocephala*, which is also observed in other islands in Ogasawara Islands (Yoshida and Oka 2000). For effective control of *L. leucocephala*, it is necessary to set priorities by classifying target areas based on propagule supply and habit suitability of *L. leucocephala* (Osawa *et al.* 2020).

On the other hand, vegetation recovery did not occur at some sites even after goat eradication. The substantial variation in extent of vegetation recovery within the island indicated that degraded vegetation does not always recover, even after goat eradication.

The soil erosion would prevent vegetation recovery after goat eradication through limitation of

Fig. 2 Alternation of ecosystems in Nakodo-jima disturbed by feral goats.



(a) By grazing and trampling of goats, forests shifted to grasslands, and grasslands shifted to bare ground



(b) Exposure of surface soil with loss of vegetation cover caused soil erosion



(c) Eroded soils followed into sea

primary production with alternation of soil chemical properties (Hata *et al.* 2019). Deeper soil horizons with exposure of the loss of surface soil often have extremely low nutrient levels and pH on the island (Hiradate *et al.* 2015). The soils with low nutrients can limit plant growth because of deficiency of nutrients. Also, the soils with low pH can cause immobilization of labile and inorganic phosphorus in soils, which is unavailable for plants (Bardgett 2005). Therefore, it is necessary for ecosystem restoration to prevent further erosion of the surface soil by anthropogenic efforts such sandbag dams. In addition, facilitation plant establishment on eroded soil via fertilizer application, and seed and transplant should be also necessary.

Fig. 3 Forests dominated by *L. leucocephala* in Nakodo-jima



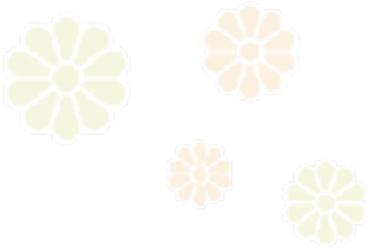
(a) 2003



(b) 2005

References

- Bardgett R. 2005. The biology of soil: a community and ecosystem approach. Oxford University Press, Oxford, UK.
- Hata K., Suzuki J.I. and Kachi N. 2010a. Fine-scale spatial distribution of seedling establishment of the invasive plant, *Leucaena leucocephala*, on an oceanic island after feral goat extermination. *Weed Research* 50: 472–480.
- Hata K., Suzuki J.I. and Kachi N. 2010b. Effects of an alien shrub species, *Leucaena leucocephala*, on establishment of native mid-successional tree species after disturbance in the national park in the Chichijima island, a subtropical oceanic island. *In Restoring the Oceanic Island Ecosystem* (Kawakami K. and Okochi I. Eds.), PP103-110. Springer, Tokyo.
- Hata K., Osawa T., Hiradate S. and Kachi N. 2019. Soil erosion alters soil chemical properties and limits grassland plant establishment on an oceanic island even after goat eradication. *Restoration Ecology* 27: 333–342.
- Hiradate S., Morita S., Hata K., Osawa T., Sugai K. and Kachi N. 2015. Effects of soil erosion and seabird activities on chemical properties of surface soils on an oceanic island in Ogasawara Islands, Japan. *Catena* 133: 495–502.
- Japan Wildlife Research Center. 1992. Report on the urgent research about damage of feral goats on plants and animals in the Ogasawara Islands. Japan Wildlife Research Center, Tokyo, Japan. (In Japanese)
- Japan Wildlife Research Center. 2002. Report on the research of vegetation recovery in the Ogasawara National Park. Ogasawara branch of Tokyo Metropolitan Government, Tokyo, Japan. (in Japanese)
- Kawakami K. 2010. What's the Bonin Islands? *In Restoring the Oceanic Island Ecosystem* (Kawakami K. and Okochi I. Eds.), PP3-7. Springer, Tokyo.
- Loope L.L., Hamman O. and Stone C.P. 1988. Comparative conservation biology of oceanic archipelagoes. *Bioscience* 38: 272–282.
- Osawa T., Hata K. and Kachi N. 2016. Eradication of feral goats enhances expansion of the invasive shrub *Leucaena leucocephala* on Nakoudo-jima, an oceanic island. *Weed Research* 56: 168–178.
- Osawa T., Akasaka M. and Kachi N. 2020. Facilitation of management plan development via spatial classification of areas invaded by alien invasive plant. *Biological Invasions* 21: 2067–2080.
- Sato N. 2019. Recent control of invasive alien animals in the Bonin Islands. *Global Environmental Research* 23: 9–19.
- Shimizu Y. 1993. Vegetation of Mukojima Island Group in the Bonin Ogasawara Islands with reference to the ecology of *Ardisia* dominant forest and the influence of feral goats. *Komazawa Geography* 29: 9–58 (In Japanese)
- Shimizu Y. 2003. The nature of Ogasawara and its conservation. *Global Environmental Research* 7: 3–14.
- Yoshida K. and Oka S. 2000. Impact of biological invasion of *Leucaena leucocephala* on successional pathway and species diversity of secondary forest on Hahajima Island, Ogasawara (Bonin) Island, northwestern Pacific. *Japanese Journal of Ecology* 50: 111–119. (in Japanese with English abstract)



from DIWPA Office

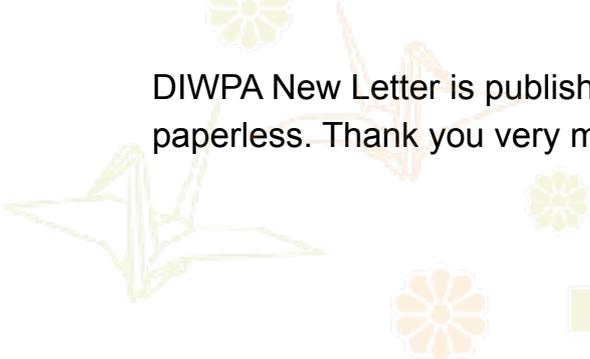
Due to concerns over the spread of Coronavirus, we regretfully announce the cancellation of 2021 DIWPA IFBC. We believe that 2022 DIWPA IFBC will be held.



DIWPA website has been redesigned.

Enjoy our new website!

<https://diwpa.ecology.kyoto-u.ac.jp>



DIWPA New Letter is published in PDF format only on our website to promote paperless. Thank you very much for your understanding.



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