JSPS FELLOWSHIP FOR RESEARCH IN JAPAN

RESEARCH REPORT

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NEW APPROACHES FOR CONTROL AND ERADICATION OF INVASIVE PREDATORS TO PROTECT NATIVE BIODIVERSITY

OUTLINE OF ACADEMIC DISCUSSIONS

I had meetings and discussions with a wide range of researchers in invasive alien species research and management, but with a primary focus on management of invasive raccoons and mongoose, and the development of fertility control as a new management tool. Professor Ikeda (Hokkaido University) and Dr Asano (Gifu University) accompanied me for all discussions and field trips. I gave five formal lectures/presentations during my fellowship (listed in Table 1), both as a means of information exchange and to facilitate discussion. These included presentations about Landcare Research as a research organization and its research on management and eradication of invasive mammals, and a presentation about recent changes invasive species policy and management in the New Zealand Ministry for Primary Industries.

Japan Ministry of the Environment

Discussions were held on invasive alien species control with senior officials from the Ministry of the Environment in Head office, Tokyo, and in offices in Amami and Naha City, Okinawa. Ministry officials also attended my various presentations and accompanied me on field inspections. In addition to particular invasive mammals of concern to Japan, discussions also covered recent changes in the New Zealand Biosecurity system, the systems for minimising risks of new invasive species, the importance of pathway analysis, and preventing re-invasion of areas subject to successful pest control.

Raccoon eradiation and control

Raccoons are of concern both because of their damage to agricultural crops and because of their impacts on native biodiversity. Extensive discussions were held with Professor Ikeda and his post-graduate student, Mr Suzuki, about their current research into raccoon eradication in Hokkaido. A field visit was made to observe a new kind of raccoon trap developed by Professor Ikeda and currently being tested in the field. This nest-box trap does not require baiting and exploits the change in behaviour of raccoons as they seek shelter in the colder weather. Although much research has been done on nest box use of possums in New Zealand and Australia, the potential of nest boxes as traps has not been assessed there. One major issue with raccoon control in Japan is the difficulty of detecting raccoons at low density. New approaches to detection of pests at low density developed in New Zealand were discussed in my presentation. More systematic use of local people as observers, using specifically developed cell-phone apps, is an approach for pest detection that is gaining increasing use globally and could be applied for raccoon management.

Mongoose eradication and widespread predator control

My visit to Amami-Oshima was hosted by Dr Fumio Yamada (Forestry and Forest Products Research Institute and Chair of the Mammal Society of Japan, Special Committee of the

Conservation and management), Dr S Abe, Biodiversity Center of Japan, Ministry of the Environment and K Kitaura, Research Scientist, Japan Wildlife Research Center, Amami Oshima. I was able to inspect both the extensive mongoose trapping and detection networks, to see the mongoose detector dogs at work, and the overall plan for eradication. I was very impressed with the success of the eradication since my visit in 2008 and the very organized and systematic approach being undertaken. I discussed the use of toxins, particularly diphacinone, with Dr T Jogahara, Dept of Zoology, Okayama University of Science, who is leading the research on their development for use on mongoose. I also discussed recent research on rodent repellents, and their possible application to reducing non-target risks from mongoose trapping. Several techniques used in New Zealand for predator control were identified in discussions as being potentially useful for mongoose eradication and, since my return to New Zealand, information on these has been provided to Japanese researchers. Research on Amami on reducing non-target risks of trapping and hair-trap monitoring suggested possible new approaches applicable in New Zealand.

My visit to Yambaru, Okinawa, was hosted by Dr Asano and Mr K Nakata, Ministry of the Environment. I was able to inspect the now completed original mongoose fence, a joint initiative of the Mongoose eradication project and the local prefecture government, and the new stage 2 fence installed as part of the new buffer system to reducing immigration from the uncontrolled areas to the south of Yambaru. I was very impressed by the systematic approach to design and operation of the mongoose trapping effort and the use of data to optimise ongoing trapping efforts. I discussed pest fencing programmes in New Zealand, and highlighted issue for mongoose eradication with current 'gaps' in the fence for roads, rivers and gates for access to private land, which might be addressed by local trapping buffers. Monitoring of progress, surveillance and detection of mongoose at very low density, and increased use of data to guide eradication efforts were key issues discussed. I discussed with Mr Nakata his trials to evaluate a self-resetting trap for mongoose, and provided him with results from our recent research on their cost-effectiveness.

While in Naha City, I had discussions with N Sakaguchi, Director Wildlife Conservation, and K Ono, Assistant Director Wildlife Conservation, Ministry of the Environment, about the mongoose eradication projects and general issues about management of invasive predators.

Fertility control

While at Yambaru, I was able to observe the captive mongoose facility, and discuss the experimental trials being undertaken by Dr Asano and Mr Naotoshi on vaccination of mongoose with the mongoose ZPC vaccine. Further detailed discussions on progress to date with fertility control for mongoose and raccoons were held during my visit to Gifu University, and arrangements were made for ongoing discussions about experimental methodology and trial results using Skype.

Other invasive alien mammal pests

Taiwanese macaques in Wakayama prefecture are of concern because of hybridization with Japanese macaques. I had a brief meeting with Dr Kei Shirei (Wildlife Management Office Inc.) who updated me with his excellent progress with eradication of Taiwanese macaques, and the use of fertility control as part of that programme.

Coypu are becoming an increasing problem in parts of Japan, especially on Honshu, because of the damage they cause to crops and to banks of waterways and dams. My visit to Kyoto was hosted by nutria expert, Dr O Murakami, former Professor, Doshisha University, and M Tatara, Deputy Division Director, Wildlife Division, Ministry of the Environment, Kinki Regional Environment Office. We examined areas where nutria were causing damage to crops, and discussed additional control methods that could be used, such as floating traps, drowning traps, temporary fencing of crops, and trained nutria detection dogs.

Sika deer have reached very high numbers, especially in Hokkaido, and feral pigs are also a significant problem. The potential use of existing GnRH and PZP vaccines for fertility control of deer were discussed, as well as the use of deer repellents. New methods of pig control using specially designed bait stations for poisoning were also discussed.

The issues of wildlife as vectors of human or livestock disease were discussed with Professor T Yanai, Gifu University, particularly bovine tuberculosis. Recent publications on wildlife and Tb in New Zealand were provided to Professor Yanai.

International Wildlife Management Congress, Sapporo, July 2015

I held discussions with number of Japanese researchers about possible contributions of New Zealand researchers to various symposia and workshops being considered for inclusion in the conference programme.

IMPRESSIONS AND THOUGHTS ON PRESENT STATE OF INVASIVE SPECIES IN JAPAN

Management of invasive mammals in Japan has progressed significantly since my previous visit in 2008. The social and cultural constraints on management technologies in Japan continue to limit the extent to which direct transfer of pest management technologies from New Zealand and other countries can occur. This has resulted in a somewhat different research focus in Japan than in countries like, New Zealand, Australia, the USA and the UK, where much emphasis is placed on development of baits and toxins for pest management.

Areas where there are opportunities for Japan to advantage of recent developments in invasive species research and management are risk assessment; prioritisation systems; and

surveillance, detection and statistical approaches to proof of freedom from pests and diseases. Currently, shortage of funding appears to be the main factor limiting invasive species research and management.

OTHER COMMENTS

The JSPS fellowship programme is an excellent mechanism for promoting and strengthening scientific collaborations between Japan and New Zealand. The many discussions I had with Japanese scientists and my visits to research projects in the field were excellent opportunities for information exchange, and I found the open and honest discussions very valuable. Professor Ikeda, my principal host, and Dr Asano had prepared an excellent schedule of meetings, visits and discussions for me, and their accompaniment on my visits was very helpful and enjoyable.

I have learned a great deal about management of invasive species in Japan that is of value to New Zealand in its attempts to manage invasive species. Professor Ikeda, Dr Asano and I will continue to work closely together to identify future opportunities for collaborative research projects. I would like to thank the Society sincerely for the fellowship opportunity.

Table 1. List of formal lectures

Date	Place	Formal Lectures
17 October	Ministry for the Environment, Tokyo	• Invasive Species in New Zealand Policy and Management
20 October	Amami Wildlife Conservation Centre, Amami-Oshima	• Management of Pest Wildlife in New Zealand
23 October	Ministry for the Environment, Naha City, Okinawa	• Management of Pest Wildlife in New Zealand
27 October	Hokkaido University (open lecture)	• Management of Invasive Mammals in New Zealand
29 October	Gifu University (open lecture)	• Invasive Mammal Control & Eradication in New Zealand

Table 2. List of Contacts on Invasive Species Eradication and Management

Ministry of the Environment, Tokyo	T Sekine, Director, Wildlife Division R Tatsuta, Deputy Director, Alien Species & GMO Control Section, Wildlife Division M Morikawa, Technical Official, Wildlife Division S Tanigaki, Technical officer, Wildlife Division H Yasunari, Technical Officer, Wildlife Division
Amami Island	Dr F Yamada, FFPRI, Laboratory of Wildlife Ecology Dr T Jogahara, Dept of Zoology, Okayama University of Science Dr S Abe, Biodiversity Center of Japan, Ministry of the Environment K Kitaura, Research Scientist, Japan Wildlife Research Center, Amami Oshima Miss M Kimura, Amami Wildlife Center, Ministry of the Environment Dr M Yokota, Laboratory of Ecology & Systematics, University of Ryukyus K Shionosaki, Landscape Ecology & Planning, Kyoto University
Okinawa/Yambaru	Dr M Asano, Gifu University K Naotoshi, Gifu University N Sakaguchi, Director Wildlife Conservation, Ministry of the Environment Naha K Ono, Assistant Director Wildlife Conservation, Ministry of the Environment Naha Y Ichimoto, Ranger, Ministry of the Environment K Nakata, Ministry of the Environment C Oyakawa, Alien Species Management, Nansei Environmental Laboratory Co Ltd Y Asari, Alien Species Management, Nansei Environmental Laboratory Co Ltd E Moghaddas, US Air Force, Environmental section
Hokkaido University	Prof T Ikeda, Dept of Regional Science, Graduate School of Letters T Suzuki, Dept of Regional Science, Graduate School of Letters Dr I Tanaka, Dept of Regional Science, Graduate School of Letters
Gifu University	Dr M Asano, Gifu University

	K Naotoshi, Gifu University Prof T Yanai, Gifu University
Kyoto	Dr O Murakami, former Professor, Doshisha University M Tatara, Deputy Division Director, Wildlife Division, Ministry of the Environment, Kinki Regional Environment Office

Table 3. List of Fellowship Activities

Ministry of the Environment, Tokyo	• General discussion about invasive species issues in Japan and NZ • 60 min presentation on recent changes in invasive species policy and management in the NZ Ministry for Primary Industries
Amami Island	• Field trips to observe mongoose trapping and use of specially trained mongoose detector dogs fitted with GPS collars • Inspection of recent improvements to mongoose traps to minimise by-catch • Inspection of various new designs of passive detection devices for mongoose • Discussion about progress with eradication, possible future use of toxins (PAPP, diphacinone) as part of eradication programme, and overall strategy for eradication • 60 min presentation to about 50 Mongoose Busters and Ministry of the Environment staff on Management of Invasive Mammals in New Zealand • 60 min presentation by Dr T Jogahara (Dept of Zoology, Okayama University of Science) on recent trials evaluating toxins for mongoose control and changes in trap design to minimise non-target catches • 30 min presentation by Miss Kimura giving overview of mongoose eradication program, progress to date and improvements in native animal numbers with reduction in mongoose
Okinawa/Yambaru	• Inspected captive mongoose housing facility – animals used for trials of toxins and fertility control agents, and assessing self-resetting traps • Observed handling, marking, measuring and bleeding of mongoose in fertility control trial • Met with mongoose busters and observed the mongoose detector dogs • With Mr Nagata, Ministry of the Environment, I inspected the original coast to coast mongoose exclusion fence and the new Stage 2 fence and trapping buffer zone. Observed damage to both fences from recent typhoon, and problems to original fence where closer mesh used to exclude invasive snakes • Visited captive breeding facility for endangered Okinawa rail (Ministry of the Environment) • 60 min open presentation to Ministry of the Environment staff and others on Managing Invasive Mammals in New Zealand • 30 min presentation by Dr Asano (Gifu University) on research into mongoose fertility control • General discussions with Ministry of

	Environment staff about dealing with reinvasion in Yambaru mongoose eradication project
Hokkaido University	• General discussions about invasive species issues in NZ and Japan • Field trip to inspect trial of new raccoon trap based on unbaited nest box • 60 min presentation from T Suzuki, Dept of Regional Science, Graduate School of Letters about PhD project on • 60 min presentation from Prof T Ikeda about trial of new raccoon trap and collaboration with prefectures to undertake and monitor raccoon control to protect hatching turtles • 60 min open presentation to Hokkaido University on Management of Invasive Species in New Zealand
Gifu University	• 60 min open presentation on Wildlife Management in New Zealand to Gifu University staff and students • Discussions with Dr Asano and Mr Naotoshi about research on fertility control for mongoose and raccoons • Discussion with Prof T Yanai about wildlife disease issues in Japan and NZ • Evening spotlighting to observe high numbers of sika deer and wild boar on farmland adjacent to urban areas
Kyoto	• Discussion on nutria problems, their spread and control methods • Inspection of sites of public nutria feeding and damage to crops of local farmers