

Annex A9

RESEARCH COLLABORATION OPPORTUNITY

Research Collaboration Opportunity Ref No.: RCO-CUGE-2019-01

Project Title: Habitat selection including the ecological significance of Singapore's forest mammals and their impacts to native flora seed dispersal.

1. Key Challenges and Objectives

- 1.1 Tropical forest mammals are generally understudied. Targeted ecological studies on the various species is very limited due to the lack of suitable technology and tools. These tools are required because many forest mammals have cryptic behaviour, are nocturnal, often shy and spend much time hidden amongst the dense cluttered tropical forest vegetation. Technological advancements over the past five years now open a suite of opportunities to better understand a species autecology.
- 1.2 A major impact to native forest biodiversity by species of forest mammals is thought to be exerted through predation and the ingestion of food such as the seeds of native flora as well as the defaecation of faecal matter containing viable and non-viable seeds. Vertebrates including mammals are thought to be dispersal agents for up to 90% of tropical plant species hence this makes animal-mediated seed dispersal an important factor for the long term survival of most tropical plants. The movement and home range of these forest mammal species is therefore of interest to better understand the footprint of coverage. Understanding this better could inform and potentially improve on intervention efforts through reforestation to restore forest landscapes and native plant replanting in the urban city landscape as well as for natural forest regeneration and recruitment.
- 1.3 We are seeking research proposals that will contribute to evidence-based management of the forest network in Singapore through two synergistic lines of inquiry. The first inquiry focuses on a multi-scaled approach to examining the habitat selection and ecological significance of understudied forest mammals. At the macro-scale, the investigation on the distribution and occupancy of terrestrial forest mammal species is sought. On the meso-scale, investigation is made on the movement ecology of terrestrial forest mammal species in the vicinity of the EcoLink@BKE. Habitat selection at the micro-scale would be through the documenting of diet items of terrestrial forest mammal species. The second inquiry is to investigate animal-mediated seed dispersal involving forest mammals and thus document the seed dispersers for various forest plants and the tracking of the movement and dispersal of seeds in a forest. There is much synergy between the two inquiries as the data collected is expected to greatly inform the findings of the other. In addition, there is a strong synergistic link between the proposal study

sites at Bukit Timah Nature Reserve, Central Catchment Nature Reserve and the connecting EcoLink@BKE.

1.4 Three examples of working hypotheses for this proposed research are:

- The biodiversity and occupancy of forest mammals will be lower in the disturbed forest types and will be higher in the pristine forest types.
- The biodiversity and occupancy of vertebrate seed dispersers will be lower in the disturbed forest types and will be higher in the pristine forest types.
- The dispersal abilities of terrestrial forest mammals are thought to be dependent on their functional traits. As an example, mammals with larger body mass are hypothesised to disperse seeds over a longer distance.

1.5 The proposed project should include (but not be limited to):

- (i) Investigations into the distribution and occupancy of terrestrial forest mammal species
- (ii) Investigations into the movement ecology of terrestrial forest mammal species in the vicinity of the EcoLink@BKE, and quantify movement rates of mammal species across the EcoLink@BKE.
- (iii) Documentation of the diet items of the terrestrial forest mammal species through techniques such as the genetic sequencing of faecal samples
- (iv) Identification of the seed dispersers for selected large-seeded plants
- (v) Tracking the movement and dispersal distance of seeds taken by vertebrates across the EcoLink@BKE

2. Minimum Project Deliverables

The deliverables described here represent the minimum outcomes arising from the proposed project. Additional relevant deliverables that are proposed will be favourably considered during project evaluation.

- (i) Distribution and occupancy of terrestrial forest mammals including Shrew-faced Ground Squirrel (*Rhinosciurus laticaudatus*), Lesser Mousedeer (*Tragulus kancil*), Malayan Porcupine (*Hystrix brachyuran*) and Common Treeshrew (*Tupaia glis*).
- (ii) Movement ecology and movement rates of mammals across the EcoLink@BKE
- (iii) Biodiversity list and relative frequencies of diet food items detected in faecal samples of various forest mammal species
- (iv) List of seed dispersers for the seeds of various forest plant species
- (v) Datasets for the movement and dispersal distance of seed taken by vertebrates across the EcoLink@BKE thereby enabling an evaluation (together with other relevant datasets) on the effectiveness of the EcoLink@BKE structure as an ecological corridor that connects two nature reserves.

- (vi) Progress reports at half yearly intervals with a final report at the end of the project.

3. Budget Limits

3.1 The proposed budget, including GST, cannot exceed \$850,000. Proposals that exceed this limit will not be considered. Please note that this amount is simply an indication of budget availability, not an estimate of expected project cost.

3.2 The project duration should also not exceed 2 years.

3.3 Please note that NParks' decision on the funding support to be awarded for the project is final.

4. Submission Instructions

Proposals for the Research Collaboration Opportunity as stated above must be submitted to Mr Lim Liang Jim at lim_liang_jim@nparks.gov.sg and Mr. James Gan at james_gan@nparks.gov.sg by 8th August 2019, 1200 hrs.

5. Enquiries

For transparency, all enquiries and associated clarifications will be published (without details on the identity of the person making the enquiry) on the Research Collaboration Opportunity page on the CUGE website. We regret that phone enquiries will not be entertained.

For enquiries, please contact Mr Lim Liang Jim at lim_liang_jim@nparks.gov.sg and Mr James Gan at james_gan@nparks.gov.sg for enquiries.