

Project title: The potential for enriched feeding in a mixed species aviary

Name of applicant: Kelly Chew

**Mandai Precinct Research Collaboration Proposal**

**About MWG**

Mandai Wildlife Group (“**MWG**”) is the parent company of award-winning attractions Jurong Bird Park, Night Safari, Singapore Zoo and the River Wonders (collectively, the “**MWG Parks**”). The MWG Parks strive to be world-class leisure attractions, providing excellent exhibits of animals presented in their natural environment for the purposes of conservation, research, education and recreation.

MWG is proud to partner with many local and international institutions including scientific institutions, universities, government bodies, non-government organisations, other zoological institutions as well as nature interest groups. Through such evidence-based collaborations, MWG has contributed key scientific knowledge that is relevant to wildlife and wildlife conservation and management within Singapore, the Southeast Asian region and beyond.

Research at MWG must benefit either Mandai’s Living Collection (benefit the husbandry, health and care of the collection), Outreach and Education (research that is largely social science-based regarding visitor attitudes towards conservation and sustainable lifestyles, communication of conservation goals and environmental education) or Conservation Research, Wildlife Welfare and Care (any research that can support ex-situ or in-situ conservation). Within each of these three domains, there are a number of subjects that a specific research project may fall into:

(1) Mandai’s Living Collection Research (Animal Welfare & Care)

* Behaviour
* Nutrition
* Physical health
* Physical environment
* Mental welfare

(2) Mandai’s Conservation, Wildlife Welfare and Care Research

* Conservation-linked breeding
* Conservation translocations (including rescue, rehabilitation and release)
* Conservation genetics and biomaterials management (e.g. biosurveillance)
* Sustainability and environmental monitoring and management
* Mandai habitat enhancement and management

(3) Outreach and Education

* Visitor experience
* Human animal interactions
* Behaviour change

**In order to grow knowledge in these areas of interest, MWG’s aims are:**

* To conduct research that can help develop better tools and strategies for the management of captive wildlife populations and that will benefit conservation strategy planning for species in their native habitats;
* To conduct research that contributes information on local wildlife, and thus guide conservation or management strategies in Singapore
* To collaborate with like-minded organisations such as other zoological institutions, non-governmental organisations, government agencies, academic institutions and nature interest groups to ensure the best possible conservation outcomes for the species or environment of concern;
* To build local and regional conservation capacity and knowledge, as well as facilitate information-sharing initiatives through the publication of scientific reports and conference presentations

**In your proposal please ensure the following (where appropriate) are addressed:**

1. Project is relevant to MWG research objectives;
2. Project is feasible, scientifically valid and has high probability of success;
3. Project has conservation impact;
4. Project does not compromise animal welfare
5. Project funding is well-justified (if applicable)
6. Project contributes to capacity-building, education, and outreach, and takes into account human considerations;
7. Other considerations that you think might be relevant.

***Preference is given to projects related to species found in Singapore, Southeast Asian region, as well as those represented in the MWG animal collection and through which, a direct in-situ or ex-situ link can be accomplished.***

**How to apply:**

Submit a softcopy proposal to Vanessa Lee (Research Panel Secretariat) at [vanessa.lee@mandai.com](mailto:hsiangling.lee@wrs.com.sg) following the format outlined.

**Instructions:**

1. The applicant should fill out this form including all of the applicable appendices;
2. The applicant must read and sign off on Annex 1 of this document;
3. The applicant must provide all the required supporting documents (e.g. curriculum vitae, applicable permits);
4. The application should be typewritten in English in 12pt Courier or Times New Roman font;
5. Please strictly follow the instructions on the minimum word count and/or number of pages; and
6. For progress or final reports please use Appendix.

MWG reserves the right to disregard applications that do not conform to the above instructions or such other instructions which may be given by MWG from time to time.

MWG may request for additional information from any applicant.

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| **Part I – Overview** | |
| **a. Title of project:** The potential for enriched feeding in a mixed species aviary | |
| **b. Project location:** Fragile Forest | |
| **c. Personal data** | |
| Name in full  Kelly Chew (Animal Care Officer)\*  Jenne Tok (ACI; Research volunteer) | Institutional affiliation  MWG |
| Nationality  Singaporean | Contact Information (email address, telephone number)  Kelly.chewci@mandai.com |
| Expected duration of project (with start and end dates):  August 2022 – 2023  *If you are a MWG staff member, please go to Part II.*  *If you are not a MWG staff member, go to Part III.* | |

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| **Part II – For MWG staff members only** |
| **Have you obtained permission from your supervisor?** Yes/~~No~~  **Name and designation of supervisor:**  Kumaran Sesshe, Assistant Curator  *Please go to Part IV* |

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| **Part III – For non-MWG applicants** |
| *Is this your first time applying to MWG for research collaboration?*  *Yes/No [if the answer is “No”, please go to Part IV]*  *If this is your first time applying to MWG for research collaboration, we will require you to provide the following:*   * *curriculum vitae – including institution affiliation and list of academic publications* * *two referees and their contact details*  |  |  | | --- | --- | | Referee #1 | | | Name | Institution | | E-mail address | Contact number | | Referee #2 | | | Name | Institution | | E-mail address | Contact number |   *For student applicants, also kindly provide:*   * ***proof of affiliation*** *in the form of an* ***endorsed letter*** *from your educational or research institution* * ***curriculum vitae of the Principal Investigator/Supervisor*** *(if he/she has not formerly successfully applied for research funding/collaboration with MWG)* |

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| **Part IV – Project details** |
| 1. **Summary of proposed project:**   This pilot study is part of the ongoing effort to enhance the living spaces of the collection at the Fragile Forest aviary by providing them with opportunities to display natural physical and social behaviours. The findings from this study will provide us with useful information as to how we can better implement the Behavioural Management Framework (BMF) into the daily work routine for aviaries and accomplish our behavioural objectives.  The theory of contrafreeloading (CFL) suggests that animals in captive situations, when given the option, would willingly spend time and effort to obtain food even when the same resource is freely available. In large free-flight, mixed species aviaries, such as the Fragile Forest, due to the natural foliage and space available, the environment itself has many avenues of stimulus. However, food presentation in these settings is usually kept rudimentary for the sake of ease of handling and sanitation. The implications of having a simplistic feeding method becomes even more so amplified when coupled with less complex, smaller living spaces, such as dens or back-of-house facilities, where the opportunities for expression of natural behaviours are more limited. If CFL does indeed exist, enrichment feeders can be used as a viable and functional alternative that encourages for natural foraging behaviours for animals in captive conditions.  The aim of this study will be to assess the implementation of enrichment devices as an alternative feeding method for mixed species aviaries. Properties pertaining to CFL (e.g., duration and/or frequency of foraging behaviour) will be used to measure the efficacy of usage of the devices from the various species that reside in the Fragile Forest aviary. This study will also be replicated for the group of ring-tailed lemurs during the days that they are kept back-of-house (BOH) to observe for any differences in behaviours and interactions towards the devices when there is a change in the complexity and size of the environment. Furthermore, it would allow us to assess the effectiveness of feeding devices for BOH use. Contrafreeloading will be compared across four different feeding devices in the two different captive environments. The total duration and number of individuals interacting with four different devices over a three-hour period will be used to ascertain the preference for feeding devices over plated food. The four types of devices are to encourage different interactions and behaviours. |
| **b. Details of project:** *3-5 pages (excl. pictures) stating* *Goals and Objectives, Methods, Expected results and conservation out-puts. To clearly address the support criteria above.*  Free-flight, mixed species exhibits are an increasingly popular way for zoos to display their collection as it offers several advantages, such as being an effective use of space, allowing for greater flexibility of species display and management, and enhancing overall guest experience. From a welfare perspective, free-flight aviaries provide most species with ample room and opportunities for natural interactions – such as engaging in feeding and social behaviours. However, maintaining exhibits of such scale and complexity are filled with challenges that are dependent on factors such as, species dynamics, population size, size of aviary and the current husbandry practices.  With the husbandry practices and routines considered, a single feeding method or strategy is usually implemented for the entire aviary as it is the most operationally sustainable. This means that animals in captivity are often fed highly prepared diets (e.g., peeled fruit or vegetables in small chunks) which are usually presented to them in a simplistic manner (Swaisgood & Shepherdson, 2006) either on trays or on plates. These methods discourage the expression of natural feeding behaviours such as acquisition, processing, and foraging (Young, 2007). Therefore, it is important to review potential methods that can further enhance current food presentation strategies and to optimise on creating a fully enriched environment for the animals.  For this proposed project, our aim is to conduct a series of comparisons to observe the feeding behaviours of animals towards different forms of food presentation. This study will utilise the theory of CFL as the basis for methodology to see if it exists in the Fragile Forest Exhibit, which is a mixed species, free flight aviary that houses more than 90 birds from 21 different species and over 40 mammals from 7 different species. One of the main species that we will be focusing on will be the ring-tailed lemurs. As they are currently part of a diet management programme, we would also like to investigate if CFL exists for them in a different setting and the potential for enriched feeders to be utilized as a management tool for ‘back-of-house’ environments. This study will help us determine if specific feeding devices are effective in 1) increasing the amount of time spent foraging and 2) increasing the amount of exhibit usage by the various species. It will serve as the baseline for incorporating feeding devices as part of the daily food presentation to enhance all aspects of a captive animal’s environment.  Proposed methodology  *Study site and subjects*  The Fragile Forest Biodome is an enclosed walk-through exhibit which houses a collection of mixed species that includes reptiles, primates, small mammals, avian and fish species. This exhibit was chosen for this study due to its environmental complexity, size and composition of species housed. As the collection is made up of more than class of animals which are ecologically disparate, we found it would yield useful data to investigate the feeding behaviours and interactions towards not just the devices but within other species as well.  Presently, the animals in the exhibit are fed twice a day (morning and afternoon). The diet provided is separated into two main types: arboreal and ground. The arboreal feeders are placed at 6 elevated huts and the ground food is provided at 4 separate sites. Arboreal feeders are categorised into two types of diets: primate/parrot and softbill birds. There are three different types of diets provided for the ground feeders: duck, ground birds, mousedeer. The duck diet consists of leafy vegetables, pulse mix (barley, lentils, peas, green bean) and chicken breeder pellets. The ground bird food includes, a fruit salad consisting of four different fruits (banana, apple, pear, papaya), insectivore pate, pulse mix and Versale-Laga T16 pellets. Water is also provided *ad libitum* on the ground.  *Overview*  A series of experiments will be conducted to investigate the usage of enrichment devices as feeders in the aviary amongst different species at different feeding locations and the usage of said devices when implemented in a den (i.e., back of house) shared by a group of ring-tailed lemurs. Based on the results from CFL experiments, we would be able to explore four main factors: spatial and temporal feeding relationships; amount of interaction time based on the different devices; number and type of species interaction; preference of food presentation (i.e., device versus plate). Additionally, any specific interspecies behaviours related to accessing or interacting with the proposed devices will also be recorded. Other environmental variables will also be recorded such as the weather condition and time of day (morning versus afternoon). For this study, interaction will be defined as a direct interaction with an object by the animal, of which the focus of the animal is on the object that may result in direct manipulation.  An instantaneous scan sampling method with 20 second intervals will be used to record the number of species interacting with the devices. To keep with the existing feeding schedule and frequencies of the aviary, experiments will be carried out twice a day from 0900—1200 h and 1330—1630 h (i.e., morning and afternoon periods). The experiments will be carried out at the four main feeding locations in the biodome, dubbed as – Entrance, Emergency Exit, Service Door, and Exit. As for the Back-of-House experiments conducted with the group of male ring-tailed lemurs (n = 6), we will also follow their existing managed routine; experiments will run on 0900—1200 h and 1330—1630 h for two days every week. To cover all locations in the aviary and to minimise the influence of the observer’s presence on the animal’s behaviours during the experiment, camera traps will be used to collect observational data.  A sample of the proposed overall timing and schedule:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **Mon** | **Tue** | **Wed** | **Thu** | **Fri** | | **0800-0830** |  |  |  |  |  | | **0830-0900** |  |  |  |  |  | | **0900-0930** | Lemurs BOH Device 1 | Lemurs BOH  Device 2 | BIODOME  All Devices | BIODOME  All Devices | BIODOME  All Devices | | **0930-1000** | | **1000-1030** | | **1030-1100** | | **1100-1130** | | **1130-1200** | | **1200-1230** |  |  |  |  |  | | **1230-1300** |  |  |  |  |  | | **1300-1330** |  |  |  |  |  | | **1330-1400** | Lemurs BOH Device 1 | Lemurs BOH  Device 2 | BIODOME  All Devices | BIODOME  All Devices | BIODOME  All Devices | | **1400-1430** | | **1430-1500** | | **1500-1530** | | **1530-1600** | | **1600-1630** | | **1630-1700** |  |  |  |  |  |     The device used for the lemur’s study will be randomised by day and the devices used in the biodome will be randomly rotated amongst the four feeding locations.  *Device design*  Feeding enrichments used in captivity are very diverse in design and generally aim to encourage one or more aspects of natural feeding behaviour. As the feed used in this study is obtained as a pre-mix from the zoo kitchen, whole natural food items that encourage processing behaviour (i.e., duration and frequency) prior to consumption were not explored. Instead, the four proposed enrichment devices are designed to encourage foraging behaviour (e.g., searching, probing, device manipulation and the retrieval of food from concealed areas). These behaviours should result in an increase in feeding time, which reduces inactivity and boredom while preventing the possible development of undesirable behaviour (e.g., stereotypy; Honess & Marin, 2006).  In addition, a set of criteria adapted from Hare et al., 2003 were considered during the selection for enrichment devices:   1. Each device must be fairly different from each other (i.e., encourage different interactions and behaviour) 2. Fairly affordable 3. Easy to clean and maintain, and set-up. 4. Long-lasting (e.g., waterproof) 5. Able to hold food within without it falling out immediately 6. Majority of species able to interact with enrichment 7. Safe for animals, keepers and guests   In general, lemurs tend to be less curious and quick to learn as compared to other non-human primates. This in conjunction with their decreased hand dexterity, resulting in the quick exclusion of overly complex enrichment commonly used for other primates (Sauther et al., 1999). Enrichment devices used in past studies on lemurs were pooled and these included: stuffed balls, Kong toys, smears, wire boxes, bamboo feeders (Browning & Moro, 2006; Fernandez & Timberlake, 2019; Maloney et al., 2010). Prior research has also suggested that hanging devices were effective in increasing foraging and natural foraging postures in lemurs (Britt, 1998). The selection of enrichment devices in zoos are often made with heavy emphasis on keeper opinion and anecdotal reports of previous successes (Fernandez & Timberlake, 2019). Thus, this study combined both keeper experience and prior research to obtain 4 diverse devices that were thought to elicit the greatest interaction and response from multiple species (Figure 1).   1. Puzzle box – wooden opaque box with holes large enough for lemur hands and arms but not their heads 2. Puzzle ball – plastic ball with irregularly shaped holes hung 15cm above ground with holes too small for lemurs to reach into 3. Pipe Feeder – Opaque PVC pipe with 2 holes and open ends hung 15cm above ground 4. Net basket – plastic meshed basket with 2x2cm holes hung 15cm above ground   A picture containing tree, outdoor, plant, trunk  Description automatically generated  Figure 1: The corresponding enrichment devices used in this study.  *Measures Against Potential Welfare Risk*  We have taken into consideration potential risks to the welfare of the animals that may occur during this study and the necessary preventive measures. The schedule of this study will follow the current feeding schedule and frequency of the animals in the biodome and in the den. In addition, we will be monitoring the weight of the primates on a weekly basis to ensure there is no sudden reduction in weights. To further ensure that the study or introduction of the devices do not lead to any negative and stress related behaviours, we will be monitoring their behaviours in the den consecutively throughout the study period.  References  Britt, A. (1998). Encouraging Natural Feeding Behavior in Captive-Bred Black and White Ruffed Lemurs (Varecia variegata variegata). Zoo Biology, 17, 379–392. https://doi.org/10.1002/(SICI)1098-2361(1998)17:5  Browning, H., & Moro, L. (2006). A multi-sensory enrichment program for ring-tailed lemurs (Lemur catta) at Auckland Zoo, including a novel feeding device. Proceedings of the 1st Australasian Regional Environmental Enrichment Conference, 42–47. https://doi.org/10.13140/RG.2.2.10908.92809  Fernandez, E. J., & Timberlake, W. (2019). Selecting and Testing Environmental Enrichment in Lemurs. Frontiers in Psychology, 10, 2119. https://doi.org/10.3389/FPSYG.2019.02119  Hare, V. J., Ripsky, D., Battershill, R., Bacon, K., Hawk, K., & Swaisgood, R. R. (2003). Giant panda enrichment: Meeting everyone’ needs. Zoo Biology, 22(4), 401–416. https://doi.org/10.1002/ZOO.10109  Honess, P. E., & Marin, C. M. (2006). Enrichment and aggression in primates. Neuroscience & Biobehavioral Reviews, 30(3), 413–436. https://doi.org/10.1016/J.NEUBIOREV.2005.05.002  Maloney, M. A., Meiers, S. T., White, J., & Romano, M. A. (2010). Effects of Three Food Enrichment Items on the Behavior of Black Lemurs (Eulemur macaco macaco) and Ringtail Lemurs (Lemur catta) at the Henson Robinson Zoo, Springfield, Illinois. 9(2), 111–127. https://doi.org/10.1207/S15327604JAWS0902\_2  Sauther, M. L., Sussman, R. W., & Gould, L. (1999). The Socioecology of the Ringtailed Lemur: Thirty-Five Years of Research. Evolutionary Anthropology, 8(4), 120–132. https://doi.org/10.1002/(SICI)1520-6505(1999)8:4  Swaisgood, R., & Shepherdson, D. (2006). Environmental enrichment as a strategy for mitigating stereotypies in zoo animals: a literature review and meta-analysis. Stereotypic animal behaviour: fundamentals and applications to welfare, 256–285. https://doi.org/10.1079/9780851990040.0256  Young, R. J. (2007). Environmental Enrichment for Captive Animals. Environmental Enrichment for Captive Animals, 1–228. https://doi.org/10.1002/9780470751046 |

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| **Part V: Nature of proposal** *(Please tick in the box and fill in the required sections below)* |
| **Research Project Funding** (MWG staff projects only): Complete **Section A** below |
| X  **Research collaboration involving MWG collection or visitors:** Complete **Section B** below |
| **Biomaterial Samples:** Complete **Section C** below. *Note: Biomaterial requests must be submitted a minimum of 3 months in advance.* |
| **Others:** Please explain here |

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| **Part VI: Ethical considerations and permits** |
| **How will this project affect the welfare of any live animal(s) or human(s), and how will these effects be mitigated?**  There will be no changes to the daily routine and diets of the animals involved. Therefore, the impact to welfare will be minimal, if at all. Possible improvements to the animal’s welfare housed in the biodome or BOH might occur. |
| **Has the project been assessed and approved by your institution’s human or animal ethics board (e.g. institutional IACUC, AAALAC, AWEC)? Please submit copies of any such letters of approval.** |
| **Does your project require any other permits from local and/or international authorities/agencies? What permits are these, and have you obtained them? Please submit copies of any such permits.** |

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| **Part VII: Acknowledgment and communication** |
| **a. How will MWG be acknowledged:**  *i.e. logo placement, publication, co-authorship, signage at project site etc.*  **b. What materials can be provided to MWG to communicate on project activities and results:**  *i.e. scientific publication, education materials, posters, presentation to MWG staff or public etc.* |

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| **Part VIII: Conservation and research impact** |
| *Describe in not more than 500 words the direct impact this project has on the enhancement of health, and welfare of wildlife species under human care and/or the improvement of the long-term survivability of wildlife species in their native habitats*  This project will impact the welfare of the involved wildlife species positively. Should the results of the project be as hypothesised, we can implement the usage of enrichment devices as an alternative to typical feeding plates in a mixed species aviary. Even if the results do not conclude with our initial hypothesis it will be taken as an opportunity for the animal care team to further develop upon the method/framework.  By offering the animals with a more complex food presentation, it would allow them to engage in natural feeding and foraging behaviours which they may not have been able to display under human care. Although the environment of a mixed species aviary presents itself with greater opportunities for the animals to interact with the natural elements of the space, food presentation is often an aspect that is limited by husbandry practices (i.e. feasibility, sanitation, sustainability). Likewise, feeding in dens is often kept to a simplistic presentation – mostly for sanitation purposes.  The results of the project will serve as the direction in which animal care can take for Behavioural Management Framework (BMF) in free-flight aviaries and in BOH spaces. |

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| **Section A: Research Project Funding (for staff projects only)** |
| **Budget information** |
| **Total budget needed for project:** |
| **Amount requested from MWG:** |
| **Are you seeking funding or collaboration from any other organization or institution for this project? If so, please declare it here:** |
| **Itemized budget and justification for funds requested from MWG**  ***Example:***   |  |  |  | | --- | --- | --- | | ***Item*** | ***Quantity*** | ***Cost*** | |  |  |  | |  |  |  | |  |  |  | |  |  |  | | ***Total*** |  |  | |

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| **Section B: Research collaboration involving MWG’s collection or visitors** |
| *Please be very specific with regards to what is needed from MWG (i.e. equipment, manpower, facilities, quantities, access to collaterals, frequencies etc.)*  Equipment: 4 camera traps, 4 enrichment devices (as listed in appendix ii)  Manpower: 1 observer (intern), 1 keeper to assist observer where needed  Facilities: Fragile Forest Biodome, Back-of-House (BOH) Den  Access: Observer will have full access to the Biodome aviary, however, access to BOH dens will be provided by the keeper on duty.  Frequency: Monday to Friday, 0900-1200 and 1330-1630 |

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| **Section C: Biomaterial request** |
| *Note: Requests for biomaterials collection needs to be submitted a minimum of 3 months in advance.*  **Sample details**   |  |  | | --- | --- | | Sample type: |  | | Quantity: |  | | Frequency of collection: |  | | Collection timeline: |  | | Expected outcome: |  | | Potential commercial application: |  |   **Collection protocol**   |  |  | | --- | --- | | Extraction/collection method: |  | | Specialized equipment/tools required: |  | | Storage containers/buffers: |  | | Storage condition/maximum storage duration: |  | | Please state whether equipment/tools/storage containers/buffers will be provided by or requested from MWG: |  | | Delivery/pickup method: |  |   **Shipment protocol (if applicable)**   |  |  | | --- | --- | | Package type: |  | | Packaging medium: |  | | Shipping medium: |  | | Please state whether shipment costs will be covered by or requested from MWG: |  | |

*For administrative purposes:*

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| **Research Panel Member** | **Approval (Signature OR Email)** |
| Dr. Shangzhe Xie, Assistant Vice President, CRV |  |
| Dr. Nathaniel Ng, Manager, Mandai Nature |  |

*For financial support approval:*

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| **Project funded** | **Research Panel Member** | **Approval (Signature OR Email)** |
| ~~Yes~~  / No | Dr. Sonja Luz, Vice President, CRV |  |

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| **Annex I: Terms and conditions of Conservation & Research Assistance**/ **Applicant Declaration**  *(Any assistance by MWG extended to the recipient shall be governed by the following terms and conditions)* |
| **1. Proposal approval procedure**   1. All incoming research proposals will be circulated to MWG’s Research Advisory Panel and Heads of Department (where necessary) for review. 2. As such, applicants should still expect minimum waiting times of two months for proposals that do not require funding, and three months for proposals that request for funding. Additionally, longer waiting times can be expected if there are revisions.   **2. Use of funds or other forms of assistance**   1. Monetary funds or other forms of aid must be used for the agreed purpose only as described in the project proposal. 2. MWG does not provide support of institutional indirect costs such as overhead component and GST (goods and services tax). 3. Funds must be managed by the researcher or project manager named in the proposal. 4. Detailed accounts must be kept and made available for inspection at MWG request. 5. MWG must be notified of any changes in funding requirements, staff and equipment, length of study, scope of the project etc. 6. The researcher or project manager must provide adequate contact details at all times. 7. If biomaterials are requested from animals from the MWG collection, MWG reserves the right and discretion to control or decide on how the results are being shared publicly. In the event of any public sharing or publication plan in relation to such samples, the party wishes to publish or share publicly, shall notify and seek MWG’ prior written consent. 8. Funds will be made available via direct transfer (from one bank account to another). 9. Funds will be transferred progressively at pre-agreed intervals. 10. MWG must have acknowledgement of receipt of all funds.   **3. Data and material ownership**   1. Any materials that are provided by MWG to research collaborators for use in an approved research project:    * 1. may be used by the recipient solely to perform the activities assigned to the recipient party as stipulated in the project proposal;      2. may be used only by the project’s Principal Investigator or individuals under his or her authority;      3. may not be sold or otherwise transferred or provided to any third party;      4. may not be used for any other purpose, including without limitation to provide any service, or for any research or collaboration other than the project; and      5. except as may be expressly set forth in the project proposal, may not be re-used (in the case of consumable materials), disassembled, reverse-engineered, decompiled, reverse-assembled, and/or separated/extracted /isolated from other components with which it was transferred, or analyzed to determine the methods of operation or to reveal proprietary properties.      6. Upon MWG’s request, the research collaborator will return any materials provided by MWG which have not already been used up or discarded. If permission is granted by MWG for the collaborator(s) to discard any used or non-used samples, this must be done in accordance to the relevant prevailing legislation on disposal (e.g. biomaterial waste disposal guidelines).      7. In the event that a collaborator desires to amend the project resulting in a need to violate any of the above stipulations, the collaborator is required to submit a Project Amendment Form and obtain approval from MWG. 2. Each collaborator receiving samples from MWG agrees that it will obtain all necessary approvals, permissions, and funds sufficient for their use of such samples in the project, and the eventual release, dissemination, and publication of project results. This includes having all applicable permits or permissions indicating compliance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as well as the necessary government authority permissions required for the transport of the requested Materials out of MWG premises and/or Singapore. 3. Unless otherwise stipulated in the approved project proposal or memorandum of understanding, MWG holds joint ownership of all research data generated or obtained from MWG resources (including collection animals, materials, manpower, laboratory equipment and resources etc.). 4. MWG must be notified and consulted for permission before any data or information derived from MWG resources is disseminated or used in any commercial or non-commercial way. 5. For all potential publications and/or disclosures of research results or information obtained through use of MWG resources, MWG must be furnished with copies in advance of the public disclosure or the submission of any proposed publication to a journal, editor, or other third party. MWG shall, within fifteen (15) working days of receipt of the proposed publication or public disclosure, notify the collaborator in writing of its objections. 6. In the unlikely event of objections from MWG, MWG reserves the right to negotiate with the applicants on how to best proceed without compromising scientific integrity as well as professional relationships between MWG, the applicants, and any other third party which may be affected by the publication/disclosure. 7. For published research, subject to the rights of the publisher, each party may reproduce and use any publication or other public disclosure for marketing and other academic and commercial purposes after publication.   **4. Progress reports and use of results**   1. Updates and current results of the project are to be sent to MWG every six (6) months (from the commencement of project) for the entire duration of the project (for progress reports please use the format provided in the appendix). 2. For MWG staff applicants, these reports can be in the form of a written report, presentation, or poster, as decided by the applicant, his/her supervisor, and the associated Liaison from the Research Advisory Panel. 3. A copy of the final manuscript is to be made available to MWG for retention (for final report please use the format provided in the appendix). 4. The publication of all reports, articles, etc. relating to the funded project must include acknowledgement of funding or aid, partial or in full, by MWG. Co-authorship of any MWG staff for papers to be published in peer-reviewed journals (if appropriate), will be reviewed and agreed at the discretion of MWG’ Management including Head of Conservation & Research. 5. The results of the study or project may be made available to the public, international zoo and/or scientific community. 6. The final manuscript may be made available to the public through the MWG website or other medium with due acknowledgement to the researcher. 7. The researcher or project representative may be requested to give one or more presentations to MWG and/or members of relevant community. 8. Unless stated otherwise and subject always to clause 3.8 below, the ownership of the works, and responsibility for its identification, protection and management vests with the researcher. The researcher hereby grants to MWG, an irrevocable, non-exclusive, royalty-free right and license in all countries of the world and in perpetuity, to use, adapt and/or exploit the works for any purpose and in any way it sees fit including enabling MWG to use, archive, preserve and disseminate the study. 9. The researcher is to notify MWG of any commercial exploitation arising from the results of the funded project, in which case, a different set of conditions may be subjected, including without limitation conditions setting out joint ownership of Intellectual Property Rights between the researcher and MWG and/or the percentage in the proceeds of the commercial exploitation which MWG is to be entitled to.   **5. General**   * 1. MWG may cease funding immediately without further obligation in the event any of the conditions herein have not been complied with or remedied within thirty (30) calendar days of being requested to do so. If termination of funding occurs, MWG reserves the right to recover funds in part or full and/or all rights in any works created by the researcher as a result of the funding.   2. MWG reserves the right to amend these conditions at its absolute discretion. Any change will be notified in writing to the researcher and/or on MWG’ website.   3. These conditions shall be governed by the laws of Singapore. All disputes or differences relating to the assistance and these conditions will be subject to the exclusive jurisdiction of the courts of Singapore.   4. MWG reserves the right to immediately terminate any agreement that it may have with you at any point in time in the event that you, your organisation(s) and/or any other person, programme or initiative connected to you or your organisation(s) becomes associated with any media reports (traditional, social or otherwise) that may unfavourably impact MWG’ reputation by its association with you, your organisation(s) and/or any other person, programme or initiative connected to you or your organisation(s). Prior to serving termination notice, MWG shall at the earliest opportunity discuss with you its concerns with a view to address the best interests of MWG.   5. In the event that more than 10% of the samples in a research project comes from MWG, the option to contribute to the publication as an author must be offered to at least one MWG staff member.   **6. Collection of Personal Data**   * 1. MWG and/or its subsidiaries, affiliated and associated companies recognize the importance of an individual privacy and Personal Data. MWG’ data protection policy found on MWG’ website ("**Data Protection Policy**") outlines how MWG manages the Personal Data which is subject to Personal Data Protection Act 2012 in Singapore (the “**Act**”). By submitting information to us, communicating with us, or signing up for any products and/or services offered by MWG, you agree and consent for MWG collecting, using, disclosing and sharing amongst ourselves your Personal Data, and disclosing such Personal Data to the MWG' related corporations, indirect parent companies, authorised service providers and relevant third parties in the manner set forth in the Data Protection Policy. For more information, please refer to our Data Protection Policy at [http://www.MWG.com.sg/policies-data-protection.html](http://www.wrs.com.sg/policies-data-protection.html).   2. “**Personal Data**” shall bear the meaning given to it by the Act.   3. We may collect, use and disclose your Personal Data for any or all of the following purposes:      1. performing obligations in the course of or in connection with our provision of the goods and/or services requested by you;      2. verifying your identity;      3. responding to, handling, and processing queries, requests, applications, complaints, and feedback from you;      4. managing your relationship with us;      5. processing payment or credit transactions;      6. complying with any applicable laws, regulations, codes of practice, guidelines, or rules, or to assist in law enforcement and investigations conducted by any governmental and/or regulatory authority;      7. any other purpose for which you have provided the information;      8. transmitting to any unaffiliated third parties including our third-party service providers and agents, and relevant governmental and/or regulatory authorities, whether in Singapore or abroad, for the aforementioned purposes; and      9. any other incidental purposes related to or in connection with the above.   4. Withdrawing your consent      1. The consent that you provide for the collection, use and disclosure of your Personal Data will remain valid until such time it is being withdrawn by you in writing. You may withdraw consent and request us to stop using and/or disclosing your Personal Data for any or all of the purposes listed above by submitting your request in writing or via email to our Data Protection Officer at MWG.dpo@MWG.com.sg.      2. Upon receipt of your written request to withdraw your consent, we may require reasonable time (depending on the complexity of the request and its impact on our relationship with you) for your request to be processed and for us to notify you of the consequences of us acceding to the same, including any legal consequences which may affect your rights and liabilities to us. In general, we shall seek to process your request within fifteen (15) business days of receiving it.      3. Whilst we respect your decision to withdraw your consent and have every intention to honour your decision, please note that depending on the nature and scope of your request, we may not be in a position to continue providing our goods and/or services to you and we shall, in such circumstances, notify you before completing the processing of your request. Should you decide to cancel your withdrawal of consent, please inform us in writing within five (5) business days of our notification.   5. Our reliance on you      1. We generally rely on Personal Data provided by you. In order to ensure that your Personal Data is current, complete and accurate, please update us if there are changes to your Personal Data by informing our Data Protection Officer in writing or via email at MWG.dpo@MWG.com.sg.   **Acceptance of conditions of assistance from MWG**  I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, having requested assistance from the Mandai Wildlife Group Pte Ltd (MWG) for a research project as set out in this application documents, have read and accept the conditions for provision of assistance from MWG, and agree to comply with them.  Signature:    Name:  Date: |