

Project title: Getting insights into browse preferences with Asian and African tortoises at Tortoise Shell-ter

Name of applicant: Sarah Chin, Lim Jia Yan and Jonathan Hong

**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 [hsiangling.lee@MWG.com.sg](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:** Getting insights into browse preferences with Asian and African tortoises at Tortoise Shell-ter | |
| **b. Project location:** Reptile Garden, Tortoise Shell-ter | |
| **c. Personal data** | |
| Name in full  Sarah Chin (Animal Care Officer)  Lim Jia Yan (Junior Keeper)  Jonathan Hong (Keeper) | Institutional affiliation |
| Nationality  Singaporean | Contact Information (email address, telephone number)  sarah.chin@mandai.com  jiayan.lim@mandai.com  jonathan.hong@mandai.com |
| Expected duration of project (with start and end dates):  June 2022 – May 2023:   * Data collection: June to August 2022 (3 months) * Data analysis: September to December 2022 (4 months) * Write up: January to May 2023 (5 months)   *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  **Name and designation of supervisor:**  Kumaran Sesshe  Assistant Curator (Herpetology)  *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** |
| **a. Summary of proposed project:** *At least 300 words*  The majority of zoos are faced with similar sets of challenges when designing nutritionally sound diets for browsing herbivore species within their captive collection. These challenges include having browsing material through the year (particularly in temperate climates), providing the appropriate amount of browse to captive animals, harvesting (or purchasing) reasonably appropriate amount of browse, assessing the safety of a particular browse species and offering nutritionally and structurally similar content to what the browsers would be consuming from wild plants. Additionally, very little research has been performed to elucidate the nutritional and chemical components of browse species while even less is known on how such components (and their combinations) could influence the behavioural and activity repertoire of browsers (or browsing animals).  As part of a larger research project, this component aims to better understand the impacts of providing a range of browses to captive tortoises. Current husbandry and management measures related to the provision of such browse diets within our collection is limited (i.e., only cut hay is provided) even in the presence of more natural solutions. There has also been concern on the health of the animals (i.e., loose stools) when grazing opportunities through browse is restricted or reduced. As a result, the herpetology staff have resorted manually cutting hay into bite-size portions and mixing it into the animals’ routine diets to induce appetence. To date, the consumption of browses, outside of hay, remains relatively unexplored even though anecdotal feedback and observations (Hong. J. and J.Y. Lim, personal communication, 2022) have already shown relative promise in such dietary adjustments.  This study aims to discuss and implement evidence-backed enhancements to the diets of specific chelonians in Reptile Garden. With the introduction of three Asian browse species during the course of this study, we can examine 1) if there is a browse preference amongst the tortoises from two different geographical regions (i.e. Asia and Africa), 2) how the weekly provision of browse combinations affect the activity levels of the studied individuals, and 3) if the provision of different browses influences their weekly faecal scores.  Hence, the study will be conducted for a period of 10 weeks at Tortoise Shell-ter (TS) for where the studied individuals are housed. In the first six weeks – a weekly randomised browse pairing will be studied to determine the browse preference in the chelonians. In weeks 7–9, further observations will be done on the most preferred (MP) and least preferred (LP) browse. Additionally, the faecal score and behaviour of the chelonians will also be recorded to determine an influence from the provided browses.  Concluding the study, we should find out if there is a significant browse preference in the chelonians and if such an inclusion incurs a positive change in the faecal score and activity levels of the studied animals. Moving on, we will be able to provide our animals with more suitable alternatives to cut hay which not only 1) improve the time required for food preparation husbandry, but also 2) nutritionally viable and biologically relevant dietary provisions for better chelonian welfare. |
| **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.*  **Goals and Objectives**:   * To study browse preference in four species of tortoises from two different geographical regions and how different browse species (originating from Southeast Asia) influence activity budgets of tortoises, * To introduce browse consumption opportunities and improve captive diets in specific tortoise species housed in TS and * Improve husbandry management and workflow processes while enhancing captive animal welfare.   **Materials and methods**  Study species  Four different tortoise species, originating from different geographical regions, will be assessed in this project (see Table 1). All species are currently housed in TS, Reptile Gardens.  Table 1: Details of chelonian species examined in this project.   |  |  | | --- | --- | | **Tortoise groups** | **Region** | | 2.2 Burmese Star Tortoise *(Geochelone platynota)* | Southeast Asia | | 1.2 Indian Star Tortoise *(Geochelone elegans)* | Southern Asia | | 1.2 Leopard Tortoise *(Stigmochelys pardalis)* | Southern Africa | | 1.1 Ploughshare Tortoise *(Astrochelys yniphora)* | Southern Africa |   Browse species  Four representative browse species, including cut hay, will be used to examine the browse preferences in tortoises (see Table 2). The nutritional composition and chemical factors of these intended browse species have been examined and will be used to better understand with dietary preferences.  Table 2: A summary detailing the browse species selected for this project   |  |  | | --- | --- | | **Scientific name** | **Common name and legend key** | | *Mangifera indica* | Mango; Mg | | *Averrhoa carambola* | Starfruit; Sf | | *Garcinia mangostana* | Mangosteen; Ms | | *Poa sp.* | Hay |   Diet  Throughout this study, the tortoises will remain on their normal diet consisting mainly of vegetables and a high fibre pellet (Mazuri® Tortoise LS Diet). Daily, for a period of two days prior to each weekly examination (i.e., the preceding weekend), the tortoise groups will be presented with samples of the intended browse combination (Table 2), in the morning, to acclimate them to both the intended browse species and the methods employed during the study.  Research Objectives  *1.) Browse preference*  Focal sampling of the studied species will be conducted from 0900 – 1100 h before the animals are provided with their routine diets. For this study, a randomly selected individual will be observed for 15/20 min through instantaneous sampling (comprising of 20 s intervals). Specifically, the observer will be collecting information on browse preferences through 1) order and 2) counts of bite of each browse species (within each combination). To examine all browse combinations, six weeks of observational data will be collected (weeks 2—7; see Table 4). For this component, approximately 1 kg of the studied browse (Table 2), as arranged with the Nutrition team, will be provided per combination per studied tortoise species (Table 1). All browses, including hay, will be presented to the animals whole and without human manipulation (i.e., natural, uncut). As much as possible, the browses in the intended combination will be equi-distantly presented to the studied animal.  Pair-wise ranked preferences are then calculated between all browse species through both bite order (i.e., preferred over non-preferred) and total bite counts (i.e., relative browse preference). Subsequently, Principal Components Analysis will be conducted to examine the main nutrition / chemical factor(s) that best explains the ranked preference (i.e., by order and/or counts) between each studied browse species (*n* = 4; Table 2). Information pertaining to the nutritional composition of the selected browse species will be derived from outcomes of the previously established nutritional lab analyses (Chou P. H., personal communication, 2022)  Table 3. The intended browse combination stemming from the four browse species examining browse preferences with captive tortoises housed in Tortoise Shellter.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **Hay** | **Mango** | **Starfruit** | **Mangosteen** | | **Hay** |  | Ma-Hay | Sf-Hay | Ms-Hay | | **Mango** |  |  | Sf-Ma | Ms-Ma | | **Starfruit** |  |  |  | Ms-Sf | | **Mangosteen** |  |  |  |  |   Table 4: A schedule detailing the browse combination across 6 weeks, and a weekly pair-wise comparison (with replications) of most preferred (MP) and least preferred (LP) browse species. Baseline (BL) behavioural and fecal data will be collected in week 7.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Mon** | **Tue** | **Wed** | **Thu** | **Fri** | | **1** | BL | BL | BL | BL | BL | | **2** | Ma-Hay | Ma-Hay | Ma-Hay | Ma-Hay | Ma-Hay | | **3** | Sf-Hay | Sf-Hay | Sf-Hay | Sf-Hay | Sf-Hay | | **4** | Ms-Ma | Ms-Ma | Ms-Ma | Ms-Ma | Ms-Ma | | **5** | Ms-Hay | Ms-Hay | Ms-Hay | Ms-Hay | Ms-Hay | | **6** | Ms-Sf | Ms-Sf | Ms-Sf | Ms-Sf | Ms-Sf | | **7** | Sf-Ma | Sf-Ma | Sf-Ma | Sf-Ma | Sf-Ma | | **8** | BL | BL | BL | BL | BL | | **9** | MP | MP | MP | MP | MP | | **10** | LP | LP | LP | LP | LP |   *2.) Influence on behaviour and activity*  To interpret the influence of most-preferred (MP) or least-preferred (LP) browse species on the tortoises’ activity levels, scan / focal and instantaneous / continuous sampling will be conducted to measure the corresponding behaviours mapped out in Table 5. Here, activity budget and behaviour diversity indices (i.e., Shannon’s H-index; see Brereton 2020) will be calculated from outputs of the intended ethogram (Table 5) before correlations to energetic-related nutrition / chemical factors (e.g., Protein%) are drawn. In addition, comparisons of H-index between MP and LP browse types will also be done through simple (non-)parametric statistical tests (e.g., t-tests, Kruskal-Wallis). The data collection period for this will run from weeks 8—10. As analysis,  To consider the environmental influence on in-appetance and inactivity, ambient humidity and temperature will also be collected throughout the study. These parameters are recorded as TS can be regarded as a semi-outdoor exhibit where changes in temperature and humidity levels in the external environment are likely to affect the parameters (i.e., humidity and temperature) within the exhibit. It is likely that these changes can influence the activity and feeding behaviours of these studied animals.  In addition, the observer will also be recording visitor flux at TS which is defined as the movement of humans in an area per minute. This is because adverse visitor-related behaviours (i.e. noise levels, vibration, knocking of glass) may directly influence the activity and behaviour of the chelonians (e.g., stereotypy, restlessness, shy away by hiding in corners). More importantly, this study overlaps with the school holiday period (i.e., June) where visitorship is typically greater than usual and such effects have not yet been examined for the chelonians in our collection. Here, visitor flux is simply calculated as number of visitors crossing a focal site (i.e., front of exhibit) per minute (see Bhattacharjee et al. 2020).  Table 5. Proposed ethogram for monitoring the behavioral repertoire of African and Asian tortoises in Tortoise Shell-ter, Reptile Garden.   |  |  | | --- | --- | | **Behaviors** | **Group** | | Sleeping | Non-active | | Resting | Non-active | | Walking | Active | | Walking to browse | Active | | Smelling browse | Active | | Eating Browse (Hanging leaves) | Active | | Eating Browse (Planted grass) | Active | | Eating Browse (Exhibit) | Active | | Drinking/Soaking | Active | | Defecating | Active | | Courtship | Active | | Mating | Active | | Aggressive Interaction | Active | | Non-aggressive Interaction | Active | | Others | N/A |   *3.) Influence on health parameters (i.e., faecal scores and body weight)*  As part of the section’s daily husbandry, the daily faecal scores and weekly body weight of each studied tortoise will also be documented across the study duration. Any changes in faecal scores (averaged across weeks) and body weight will be reported and comparisons between MP and LP browse types will be discussed.  *4.) Enhancements towards husbandry management and processes*  The man-hours required in the routine preparation of cut hay will be recorded and improvements between the two feeding presentations will be qualitatively compared and discussed.  **Projected results and outputs:**   * Identified browse species that can improve the repertoire of browses offered to these animals, in addition to hay. The importance of these browses was decided with consideration to addressing feeding preferences, nutritional value, health (i.e., faecal scores, body weight) as well as encouraging positive changes in behavioural and activity patterns. * Improvements to animal husbandry and management procedures (i.e., food preparation) from the reduction of manpower hours required for preparing hay (i.e., cutting to bite-sized portions).   **Literature cited:**   1. Brereton, J. E. Directions in animal enclosure use studies. *Journal of Zoo and Aquarium Research* **8**, 1–9 (2020). 2. Bhattacharjee D, Sarkar R, Sau S, Bhadra A. 2020 Sociability of Indian free-ranging dogs (*Canis lupus familiaris*) varies with human movement in urban areas. *Journal of Comparative Psychology* (doi:10.1037/com0000241) |
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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 |
| **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?**  The timing for routine diets are moved two hours ahead of schedule to accommodate the project (i.e., observations) but this is unlikely to compromise the animal’s welfare (Hong. J. and J.Y. Lim, personal communication, 2022). |
| **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.**  NA |
| **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.**  NA |

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| **Part VII: Acknowledgment and communication** |
| **a. How will MWG be acknowledged: Logo placement, publication.**  *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: Scientific publication, presentation to MWG staff.**  *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 focuses on 1) the introduction of browse species into the diets our current collection at TS, 2) understanding species-specific preferences for the examined browse species and 3) the improvements in activity and behavioural repertoire when preferred browses are included. Not only does the introduction of such browse species provides for a greater variety of nutrients (aside from the food they receive on a daily basis); it also creates an opportunity for a more naturalistic approach to feeding our animals. This can be beneficial for animal welfare because we are simulating natural feeding opportunities for these animals that spend most of their time in the wild grazing. By moving towards the direction of naturalistic food presentation, we can encourage a nutritionally balanced diet through browses, which is essential for a good standard of health and mental well-being for our animals in captivity.  For many years, our animals have typically been provided with vegetables and commercial pellets with the addition of cut hay mixed with green vegetables (which are highly palatable) to increase their intake of fibre. This is to ensure healthy digestion and promote bowel movement. As our tortoises originate from habitats that include grasslands, provision of hay in their daily diet can allow them to forage throughout the day like how they would in the wild. Unfortunately, our tortoises prefer the consumption of vegetables over hay and are unlikely to forage solely on hay. Additionally, due to the scarce availability of resources (e.g., knowledge, availability) on natural browse materials for animals in our collection, the variety of food being offered can be limited. There could be dietary and nutritional implication to such a feeding preference (i.e., a lack of necessary nutrients) which could give rise to long-term detriments in the animals’ health.  Ideally, we would want to rely on an evidence-backed solution to providing an optimal and naturalistic diet for our animals in captivity. For instance, the provision of browse, instead of cut vegetables, into the captive animal’s environment could encourage and simulate foraging behaviours like those observed in the wild. Current husbandry measures (in TS) are lacking in terms of naturalistic food presentation as the studied animas’ routine diet is typically presented on a tray in a single location which is unlikely to encourage foraging. This is likely to affect the animal’s activity level which may lead to future health issues associated with stereotypical and sedentary movement patterns. Hence, the provision of the browse accompanied with a varied feed presentation may mimic the environment in the wild and hopefully promote a set of natural behaviour which can enrich their health and mental well-being, which is a step towards improving the animal welfare in our collection.  Lastly, the information obtained from this study can be used to help other zoological institutions identify browses that their animals would consume and benefit from. This would not only improve the welfare of the animals from within our collection but also of those from around the world. |

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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.)*  WNC – To assist with ensuring the sufficient provision of the agreed-upon weekly browse combination during the course of the project.  AC/ACI – Provision of manpower assistance (e.g., interns) data collection and additional guidance for data analysis and interpretation. |

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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, Lim Jia Yan , 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: |