

Project title: Investigation of activity patterns, respiratory rates and body temperature of the Goodfellow’s Tree Kangaroo in tropical climates

Name of applicant: Joey Song, Hafizuddin

**Mandai Precinct Research Collaboration Proposal**

**About WRS**

Wildlife Reserves Singapore Pte Ltd (“**WRS**”) is the parent company of award-winning attractions Jurong Bird Park, Night Safari, Singapore Zoo and the River Safari (collectively, the “**WRS Parks**”). The WRS 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.

WRS 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, WRS 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 WRS 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, WRS’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 WRS 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 WRS animal collection and through which, a direct in-situ or ex-situ link can be accomplished.***

**How to apply:**

Submit a softcopy proposal to Dr Nathaniel Ng (Manager, Mandai Nature) at [nathaniel.ng@mandai.org.sg](mailto:nathaniel.ng@mandai.org.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.

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

WRS may request for additional information from any applicant.

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| **Part I – Overview** | |
| **a. Title of project:** Respiratory rate of tree kangaroos in relation to temperature and humidity | |
| **b. Project location:** Tree Kangaroo Exhibits at Australasia | |
| **c. Personal data** | |
| Name in full  Song Xinru Joey  Muhd Hafizuddin | Institutional affiliation  Mandai Nature Reserve |
| Nationality  Singaporean | Contact Information (email address, telephone number)  Joey: 90082773  Hafiz: 94501283 |
| Expected duration of project (with start and end dates):  Data collection: 8 Jun 2022 – 8 August 2022  *If you are a WRS staff member, please go to Part II.*  *If you are not a WRS staff member, go to Part III.* | |

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| **Part II – For WRS staff members only** |
| **Have you obtained permission from your supervisor?** Yes/No  **Name and designation of supervisor:**  Razak Jaffar; Assistant Curator  *Please go to Part IV* |

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| **Part III – For non-WRS applicants** |
| *Is this your first time applying to WRS for research collaboration?*  *Yes/No [if the answer is “No”, please go to Part IV]*  *If this is your first time applying to WRS 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 WRS)* |

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| **Part IV – Project details** |
| **a. Summary of proposed project:** *At least 300 words*  To measure respiratory rate of the Goodfellow’s Tree Kangaroo in the Singapore Zoo collection relative to temperature and humidity of the environment. |
| **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 determine if the respiratory rate and body temperature of these animals is correlated to environmental factors such as temperature and humidity.  To determine if there is a difference in respiratory rate and temperature for animals of different ages.  To determine the baseline respiratory rate of this species relative to the activity level.  To determine activity level and spatial use of the exhibit in relation to the environmental parameters.  **Method:**  Current sample size is 2 animals, 2 males; one of the males is relatively young (born Feb 2020) while the other male is 8 years of age. They are also housed in two different areas; the adult male is housed in an outdoor exhibit with an indoor sheltered den area, while the young male is housed in an indoor exhibit.  Activity and spatial use are recorded in 15second intervals over a period of 20mins (total of 80 intervals per session), with 5 sessions throughout the day from 0900h to 1500h with the help of the ZooMonitor app. Activity is observed using a pre-determined ethogram. Spatial use is observed by plotting the location of the animal on the exhibit map, noting its elevation in the exhibit (4 levels of elevation pre-determined for each exhibit) and shade use is also noted (whether the animal is in the sun/shade) for the outdoor exhibit.  Respiratory rate will be taken every hour after the 20min behavioural observation periods. It will be determined by manual count, 3 times in 10s blocks and the average is taken of the three counts and will be multiplied by 6 to give the respiratory rate per minute.  Temperature of the animal is taken using a Non-contact Forehead Infrared Thermometer every hour. Readings will be taken at different areas (Forehead, Forearms, Back, Scrotum), both the Body Temperature and Surface Temperature is noted to see if there is a significant difference.  Ambient temperature and humidity parameters will also be recorded using the Exoterra Combometer that measures temperature and humidity inside the exhibit where the animals are.  **Expected results:**  Respiratory rate will increase with increasing temperature and/or humidity.  Respiratory rate will vary depending on the activity of the animal.  Animals are likely to be less active with increasing temperature and humidity.  Animals will use shaded areas more (outdoor exhibit) and areas that are exposed to more wind from the fan/ outside the exhibit area more (indoor exhibit).  Temperature of the animal will increase with increasing ambient temperature.  **Conservation Outputs:**  There is not much information on basic biology of the Goodfellow’s Tree Kangaroo, in particular with regard to respiratory rate. This study would give us a better understanding of this species and is likely to contribute the improvement in management of this species. |
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| **Part V: Nature of proposal** *(Please tick in the box and fill in the required sections below)* |
| **Research Project Funding** (WRS staff projects only): Complete **Section A** below |
| **Research collaboration involving WRS 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?** |
| **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 WRS be acknowledged:**  *i.e. logo placement, publication, co-authorship, signage at project site etc.*  **b. What materials can be provided to WRS to communicate on project activities and results:**  *i.e. scientific publication, education materials, posters, presentation to WRS 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*  There is not much information on basic biology of the Goodfellow’s Tree Kangaroo, in particular with regard to respiratory rate. This species is found in mountainous rainforests in the wild and its climate is significantly different from that in Singapore which is more of a tropical rainforest. This study would be a precedent to record the respiratory rate of this species and would be baseline data that can contribute to the basic biological information on this species. This study could also better advise the environmental conditions in the current housing areas, considering the differences in the wild habitat and current one, and this could significantly improve their welfare if we are able to better match the wild conditions. Furthermore, the data could also facilitate the basic assessment of the animal’s health condition, to detect if there are any abnormalities before further examination. We are hoping this could be the start of further studies of this species in other institutions to form a better understanding of this species so that we are able to improve the management of this species worldwide. |

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| **Section A: Research Project Funding (for staff projects only)** |
| **Budget information** |
| **Total budget needed for project:** |
| **Amount requested from WRS:** |
| **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 WRS**  ***Example:***   |  |  |  | | --- | --- | --- | | ***Item*** | ***Quantity*** | ***Cost*** | |  |  |  | |  |  |  | |  |  |  | |  |  |  | | ***Total*** |  |  | |

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| **Section B: Research collaboration involving WRS’s collection or visitors** |
| *Please be very specific with regards to what is needed from WRS (i.e. equipment, manpower, facilities, quantities, access to collaterals, frequencies etc.)* |

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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 WRS: |  | | 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 WRS: |  | |

*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 WRS 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 WRS’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. WRS 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 WRS request. 5. WRS 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 WRS collection, WRS 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 WRS’ 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. WRS must have acknowledgement of receipt of all funds.   **3. Data and material ownership**   1. Any materials that are provided by WRS 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 WRS’s request, the research collaborator will return any materials provided by WRS which have not already been used up or discarded. If permission is granted by WRS 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 WRS. 2. Each collaborator receiving samples from WRS 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 WRS premises and/or Singapore. 3. Unless otherwise stipulated in the approved project proposal or memorandum of understanding, WRS holds joint ownership of all research data generated or obtained from WRS resources (including collection animals, materials, manpower, laboratory equipment and resources etc.). 4. WRS must be notified and consulted for permission before any data or information derived from WRS 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 WRS resources, WRS 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. WRS 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 WRS, WRS reserves the right to negotiate with the applicants on how to best proceed without compromising scientific integrity as well as professional relationships between WRS, 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 WRS 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 WRS 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 WRS 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 WRS. Co-authorship of any WRS staff for papers to be published in peer-reviewed journals (if appropriate), will be reviewed and agreed at the discretion of WRS’ 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 WRS 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 WRS 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 WRS, 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 WRS to use, archive, preserve and disseminate the study. 9. The researcher is to notify WRS 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 WRS and/or the percentage in the proceeds of the commercial exploitation which WRS is to be entitled to.   **5. General**   * 1. WRS 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, WRS 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. WRS reserves the right to amend these conditions at its absolute discretion. Any change will be notified in writing to the researcher and/or on WRS’ 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. WRS 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 WRS’ 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, WRS shall at the earliest opportunity discuss with you its concerns with a view to address the best interests of WRS.   5. In the event that more than 10% of the samples in a research project comes from WRS, the option to contribute to the publication as an author must be offered to at least one WRS staff member.   **6. Collection of Personal Data**   * 1. WRS and/or its subsidiaries, affiliated and associated companies recognize the importance of an individual privacy and Personal Data. WRS’ data protection policy found on WRS’ website ("**Data Protection Policy**") outlines how WRS 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 WRS, you agree and consent for WRS collecting, using, disclosing and sharing amongst ourselves your Personal Data, and disclosing such Personal Data to the WRS' 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.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 wrs.dpo@wrs.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 wrs.dpo@wrs.com.sg.   **Acceptance of conditions of assistance from WRS**  I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, having requested assistance from the Wildlife Reserves Singapore Pte Ltd (WRS) for a research project as set out in this application documents, have read and accept the conditions for provision of assistance from WRS, and agree to comply with them.  Signature:    Name:  Date: |

Temperature at least 6data points for each individual.

Get the data logger to determine the temperature range.

Humidity according to the temp range.

ExoTerra to validate.