THE SCHOOL FOR FIELD STUDIES

Marsupials of Australia
SFS 3272

Syllabus
4 credits

The School for Field Studies (SFS)
Center for Rainforest Studies (CRS)
Queensland, Australia

www.fieldstudies.org

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from semester to semester.

COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;
- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;
- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that may present. In other words, the elephants are not always where we want them to be so flexibility is key.

Course Overview

This 4-week program will focus on the evolution, biogeography, ecology, behaviour and conservation of marsupials of Australia.

Australia is one of the most ancient continents on our planet with geological features dating back to more than 1.7 billon years. Its history was influenced by long periods of isolation from other land masses while uplifts and erosion of mountains, forming and disappearance of inland seas and cycles of fires, drought, cyclones and flooding shaped this land. This long history resulted in a unique diversity of plants and animals. Ancient forms of mammals, such as egg-laying monotremes and some small marsupials lived amongst Australia's dinosaurs about 110 million years ago and formed part of the ancient Gondwana fauna. After the extinction of the dinosaurs and when Australia finally broke away from Gondwana it took with it its unique array of mammals into isolation. Freed from the past dominating dinosaurs and finding themselves on a vast continent with no competing intruders, Australia's ancient marsupials could thrive and diversify. Marsupial 'hippos', 'rhinos' and 'tapirs' occupied the land while killer-kangaroos targeted the weakest of these herds of grazing marsupials.

The following period of cycling climate between icehouse phases with cold and dry conditions and greenhouse phases with warm and wet conditions pushed the existing species to become giants. Some of the species grew up to 3 meters and were hunted by Pleistocene Marsupial lions which were of the size of an African lion. Then, over the last 100,000 years 86% of Australia's megafauna became extinct, but many small-sized species (10 to 100kg survived to the present days.
As Australia continued to be a land of extremes with many habitats fluctuating between fires and floods, these surviving marsupials developed a range of adaptations to changing conditions. These include embryonic diapauses, fire-induced torpor and vasoconstriction.

With arrival of humans on the Australian continent, some 60,000 years ago, and the settlement of Europeans on this continent, conditions started to change again and many factors contribute to a rising extinction of marsupial species in Australia. Australia has a sad record of disappearing mammalian species with one to two extinctions of endemic land mammal species per decade (Woinarski et al. 2015).

Apart from habitat loss, habitat fragmentation and introduced predators are major threats to our current mammalian fauna. Marsupial species suffer particularly from introduced predators. Climate change amplifies many of these extinction causing factors with more extreme weather events, flooding and fires.

In this course you will understand the factors that resulted in the dominance of marsupials on the Australian continent and current factors that jeopardize their survival into the future.
You will become familiar with a wide array of marsupial species that inhabit different habitats of Australia today and which threats they are facing. Mitigating these threats requires knowledge of their ecology and behaviour, the application of sophisticated and preferably non-invasive field research methods and the introduction of effective conservation policies. This course will introduce you to some of these field research methods that Australian scientists are using to study marsupials and other mammalian species and to the current legislative and community-driven conservation tools.

You will gain practical field experiences by assessing factors that facilitate and inhibit the colonization of restored habitat by Australian mammals and particularly marsupials.

The course will mainly take place on the Atherton Tablelands in the Wet Tropics of Eastern Australian, an area with one of the highest proportions of endemic mammals in Australia. While you are living in a campus that is situated in rainforest habitat where you encounter Striped Possums and Bandicoots when doing spotlighting at night, you will also visit wet and dry sclerophyll forests to observe Gliders and will spend some days in Australia's savannahs to see large kangaroos. You will meet wildlife caretakers and learn from their work to rehabilitate tree-kangaroos and pademelons and will hear from indigenous people about their connection to Australia's unique wildlife species.

Learning Objectives

1. Gain in-depth knowledge about the evolution, taxonomy, physiology, ecology and behaviour of marsupial species of Australia
2. Learn how marsupials and other mammals of Australia have adapted to habitats that can fluctuate between extremes
3. Get insight into the threats that jeopardize the survival of many marsupial and mammalian species into the future
4. Develop an understanding on how Australian governmental and non-governmental entities work to mitigate these threats
5. Get familiar with some non-invasive field research techniques to study marsupial
6. Gain confidence in both independent and group work activities and public speaking.

Assessments

Assessment Item	Value (%)
Marsupial species talk	10
Conservation project group assignment	15
Species quiz	20
Short field research report	25
Final Exam	20
Participation	10
Total	100

Assessment descriptions

Marsupial species talk (10%)

You will be assigned a marsupial species and present information about its distribution, main habitat, its ecology and conservation issues in a three-minute talk (3MT). This is mainly a desktop work but requires you to use a diversity of resources.

Conservation project group assignment (15%)

In this group assignment you will deliver a comprehensive preparation of a conservation project. Based on a given conservation issue you will research options for conservation approaches that can contribute to the resolution of the conservation issue. You have to identify the best option and justify it by taking into account costs, partners, methodological aspects and effectiveness. Your group will present your ideas to the class and needs to be able to explain why this approach should be adopted.

Species Quiz (20%)

Your will be given a suite of marsupial species. You will get yourself familiar with some ecological parameters of each of these species such as the type of habitat it lives in, the ecological service it provides, its activity rhythm and conservation status. In a short quiz you will be tested on some of the species and their parameters.

Short Field Research Report (25%)

We will visit some restored habitats on the Atherton Tablelands and will collect data on the colonization of these habitats by mammals. You are required to prepare a short report outlining the importance of restored habitat for the conservation of one of the selected species, the field research site, the methods used and the results.

Final Exam (20%)

During the final exam you will be tested on material presented in lectures, field lectures and excursions. Answering questions will require critical and analytical thinking across the various teaching units.

Grade corrections in any of the above items should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

Grading Scheme

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 69.99%
A-	90.00 - 94.99%	B	83.00 - 85.99%	C	73.00 - 75.99%	F	0.00 - 59.99%
		B-	80.00 - 82.99%	C-	70.00 - 72.99%		

General Reminders

Plagiarism - Using the ideas and material of others without giving due credit, is cheating and will not be tolerated. A grade of zero will be assigned if anyone is caught cheating or aiding another person to cheat either actively or passively (e.g., allowing someone to look at your exam).

Deadlines - for written and oral assignments are instated to promote equity among students and to allow faculty ample time to review and return assignments before others are due. As such, deadlines are firm and extensions will only be considered under extenuating circumstances. If you believe that you have been prevented from completing your work on time for reasons beyond your control (e.g. illness), make sure that you discuss this with the relevant faculty member as soon as possible, and certainly before the assignment is due. Late assignments will incur a penalty proportional to the length of time that they are late. This means an assignment that is one day late when students were given two days to work on it will have 50% of total points removed from the grade awarded for that assignment, and an assignment that is 2 hours late when two full days (16 hrs) were allocated to work on it will have 12.5% of total points removed from the grade.

Course components

AS: Assignment**; L:** Lectures, **FL:** Field Lectures, **FEX:** Field Exercise, **FLAB:** Field Lab, **EX**: Exam, **REV:** Review, **GL:** Guest Lecture, **EXC**: Excursion

Code	*Titles of Lectures /Field Exercises*	*Time (hrs.)*	*Type*	*Readings (not all readings will be required)*
MA 1	**Course Overview** Introduction to the course components and the resources available to make the course successful and enjoyable.	1.0	L	Geyle, et al. (2018) Tyndale-Biscoe, (2005) Armati, P. J., et al. (2006) Ward, M., et al. (2021)
MA 2	**Evolution and Biogeography of Australian mammals** This lecture will dive into the geological history of the Australian continent, the origin of marsupials and factors that influenced the diversification of Australian marsupial and other mammalian species. Introduction to some of the ancient types of marsupials that inhabited the Australian landmass.	2.0	L	Johnson, D. (2004) Stephensons, P.J. (1989) Black, K.H., et al. (2012) Rule, S., et al. (2012) Archer, M., et al. (2002)
MA 3	**Physiology of marsupials** This lecture will define marsupials in their physiological uniqueness that makes them adaptable to the extreme and fluctuating conditions of Australian ecosystems.	1.0	L	Tyndale-Biscoe, C.H. (2005) Armati, P. J., et al. (2006) Gemmell, R. T., et al. (2002)
MA 4	**The diversity of marsupials** While marsupials have some features in common, they are quite diverse in other ways. Taxonomists have used various features to develop a classification system of marsupials and we will explore where all the different Australian marsupials fit it.	1.0	L	Menkhorst, P. and Knight, F. (2004) Cardillo, M., et al. (2004)
MA 5	**Marsupial Species Talk** You will be assigned a marsupial species and present information about its distribution, habitat, ecology, and conservation issues.	3.0	AS	
MA 6	**Marsupials in Indigenous connections to the Australian land** Representatives of the local Aboriginal tribe (mob) will tell you some stories that show their connections to the land and its wildlife	2.0	GL	Mulvaney, K. (2009)
MA 7	**Species Quiz**	0.5	AS	
MA 8	**Field Lab Course (three parts):** You will learn animal observation techniques and how to analyze observational data. You will be introduced to invasive and non-invasive field methods for Australian mammals, and you will become familiar with the technique of spotlighting.	4.0	FLAB	Henderson (2003) Lindenmayer, et al. (2001) Fuller, S., et al. (2015) Zemanova, M. A. (2020) Heise-Pavlov, et al. (2020)
MA 9	**Care for our mammalian wildlife** Mammals of the Atherton Tablelands often	2.0	GL	Guy, A. J. and P. Banks. (2012)

Code	Titles of Lectures /Field Exercises	Time (hrs.)	Type	Readings (not all readings will be required)
	fall victim to vehicle strikes and introduced predators. Visit wildlife caretakers to hear about their efforts to rehabilitate injured animals and prepare them for release.			Moseby, K. E., et al. (2012)
MA 10	**Marsupials in different environments** Marsupials have adapted to various and often very fluctuating environments of Australia, including living in deserts and coping with droughts and fire.	1.0	L	Stawski, C., et al. (2017) Jarman, P. J. (2010) Matthews, et al. (2017) Hing, S., et al. (2014)
MA 11	**Meeting marsupials in different habitats of the Atherton Tablelands** Observe marsupial species in an upland rainforest and see gliders emerging from their dens in wet sclerophyll forests of the Atherton Tablelands	4.0	FL; GL	
MA 12	**Marsupials in dry Australian environments** This excursion takes you to Australia's savanna country where we will meet various species of kangaroos and wallabies, and see traces of Australia's long geological history	7.0	EXC	Jarman, P., et al. (2010) Matthews, et al. (2017) Renfree, et al. (2017) Dawson, et al.. (2000)
MA 13	**Colonization of restored habitat by mammals** **Part 1: Restoration Principles** Introduction to various restoration methods and barriers to restoration **Part 2: Data collection** Collect data on the colonization of various restoration sites by mammals using non-invasive methods.	8.0	L; FEX	Kanowski, et al. (2003) Tucker, N.I. (2009) Goosem, S., (2013) Heise-Pavlov, et al. (2018) Lawes, et al. (2017) Svenning, J. C. (2020) Hale, R., et al. (2020)
MA 14	**Short Field Research Report** Prepare a short report outlining the importance of restored habitat for the conservation of one selected species, the field research sites we visited, methods used, and the results.	3.0	AS	
MA 15	**Brief introduction to scientific writing, statistical analyses and graph development** Analyze the collected field data and prepare a written report.	2.0	L	
MA 16	**Threats to marsupials: Part 1** **Habitat loss and fragmentation** Habitat loss and fragmentation have profound impacts on ecological communities and on populations of marsupials. Learn about the theory of fragmentation along with an example how fragmentation of the Atherton Tablelands affects marsupials and what can be done to mitigate these effects. In a corresponding field lecture, we will visit	4.0	L; GL; FL	Wintle, B. A., et al. (2019) Heise-Pavlov, S. and Gillanders, A. (2016) Villard, M. A. and Metzger, J. P. (2014)

Code	Titles of Lectures /Field Exercises	Time (hrs.)	Type	Readings (not all readings will be required)
	some of the fragments on the Tablelands and identify various effects of fragmentation on once continuous rainforest communities.			
MA 17	**Threats to marsupials: Part 2 Invasive Animal Species** We learn about the impacts of invasive species on Australia's marsupials and potential reasons of these impacts.	1.0	L	Harrison, D.A. and Congdon, B.C. (2002) Woinarski, J., et al. (2015) Heise-Pavlov S. (2021) Vernes, K., et al. (2001)
MA 18	**Threats to marsupials: Part 3 Climate change** Some of the marsupials that live in upland rainforest will soon be the first victims of rising temperatures due to climate change. You will be introduced to some predictions of climate changes in Australia, how these changes affect different habitats and how marsupials are particularly affected.	2.0	GL	Williams, et al. (2003) Wagner, B., et al. (2020) Meade, J., et al. (2018) Mella, V. S., et al. (2019)
MA 19	**Threats to marsupials: Part 4 Example: Lumholtz' tree-kangaroos** Discuss the impact of various threats to populations and health of the endemic Lumholtz' tree-kangaroo	1.5	L	Heise-Pavlov, S. (2017) Shima, A. L., et al. (2018) Heise-Pavlov S. and Procter-Gray E. (2020)
MA 20	**Conservation of Australia's mammals Part 1: The role of federal, state and local governments and their legislation** You will hear about some of Australia's conservation legislation and policies, their pro and cons and where Australia's conservation strategies are in comparison to other developed countries.	2.0	L	Woinarski, et al. (2016) Ziembicki, et al. (2015) Heise-Pavlov, S. (2019)
MA 21	**Conservation of Australia's mammals Part 2: The role of non-governmental and Action Groups** Non-governmental and Action Groups play an important role in habitat protection, habitat restoration, species recovery and advocacy. Two guest lectures will bring you examples of non-governmental conservation activities in our region and further away.	3.0	GL	Pasquini, L., et al. (2011) Fitzsimons, J. A. (2015) Kearney, S. G., et al. (2022)
MA 22	**Conservation project group assignment**: In this group assignment you will be allocated conservation issue for which your group will develop, justify, and present a cost-efficient and effective conservation activity	5.0	AS	Garnett, S., et al. (2018)
MA 23	**Exam Review**	1.0	REV	
MA 24	**Final Exam**	2.0	EX	
	TOTAL	**63.0**		

Reading List

Not all readings will be required. Required readings will be shared in advance of class sessions.

1. Geyle, H. M., J. C. Z. Woinarski, G. B. Baker, C. R. Dickman, G. Dutson, D. O. Fisher, H. Ford, M. Holdsworth, M. E. Jones, A. Kutt, S. Legge, I. Leiper, R. Loyn, B. P. Murphy, P. Menkhorst, A. E. Reside, E. G. Ritchie, F. E. Roberts, R. Tingley, and S. T. Garnett. (2018) Quantifying extinction risk and forecasting the number of impending Australian bird and mammal extinctions. Pacific Conservation Biology 24:157-167.

2. Tyndale-Biscoe, C.H., (2005) Life of marsupials. CSIRO Publishing (CRS Library MAM042)

3. Armati, P. J., Dickman, C. R., & Hume, I. D. (Eds.). (2006) Marsupials. Cambridge University Press. (Faculty office)

4. Ward, M., Barmand, S., Watson, J., & Williams, B. (2021) Australia faces environmental crisis. Science, 371(6534), 1115-1116.

5. Johnson, D. (2004) The Geology of Australia.- Cambridge University Press, 276pp. (Faculty office)

6. Stephensons, P.J. (1989) Rocks and Landscapes of the Cairns District.- Qld Dept. of Mines (CRS Library ECO081)

7. Black, K.H., Archer, M., Hand, S.J. and Godthelp, H. (2012) The rise of Australian marsupials: a synopsis of biostratigraphic, phylogenetic, palaeoecologic and palaeobiogeographic understanding. In Earth and life (pp. 983-1078). Springer, Dordrecht.

8. Rule, S., Brook, B. W., Haberle, S. G., Turney, C. S., Kershaw, A. P., and Johnson, C. N. (2012) The aftermath of megafaunal extinction: ecosystem transformation in Pleistocene Australia. Science, 335(6075), 1483-1486.

9. Archer, M., Brammal, J., Field, J., Hand, S. J., and Hook, C. (2002) The Evolution of Australia: 110 million years of change. Sydney: Australian Museum. (Faculty office)

10. Tyndale-Biscoe, C.H. (2005) Life of marsupials. Csiro Publishing (CRS Library MAM042)

11. Armati, P. J., Dickman, C. R., & Hume, I. D. (Eds.). (2006) Marsupials. Cambridge University Press. (Faculty office)

12. Gemmell, R. T., Veitch, C. and Nelson, J. (2002) Birth in marsupials. Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology, 131(4), 621-630.

13. Menkhorst, P. and Knight, F. (2004) Field guide to the mammals of Australia. Oxford University Press (CRS Library)

14. Wildlife of Tropical North Queensland; Cooktown to Mackay, Queensland Museum (2000) (CRS Library TRF 066)

15. Cardillo, M., Bininda-Emonds, O. R., Boakes, E. and Purvis, A. (2004) A species-level phylogenetic supertree of marsupials. Journal of Zoology, 264(1), 11-31.

16. Mulvaney, K. (2009) Dating the Dreaming: extinct fauna in the petroglyphs of the Pilbara region, Western Australia. Archaeology in Oceania, 44(S1), 40-48.

17. Henderson (2003) Practical Methods in Ecology; (CRS Library ECO075)

18. Lindenmayer, D. B., Cunningham, R. B., Donnelly, C. F., Incoll, R. D., Pope, M. L., Tribolet, C. R., ... and Welsh, A. H. (2001) How effective is spotlighting for detecting the greater glider (Petauroides volans)?. Wildlife Research, 28(1), 105-109.

19. Fuller, S., Axel, A. C., Tucker, D. and Gage, S. H. (2015) Connecting soundscape to landscape: Which acoustic index best describes landscape configuration?. Ecological Indicators, 58, 207-215.

20. Zemanova, M. A. (2020) Towards more compassionate wildlife research through the 3Rs principles: moving from invasive to non-invasive methods. Wildlife Biology, 2020(1).

21. Heise-Pavlov S., McGreevy, T.J. and Burchill, S. (2020) Using non-invasive techniques to study tree-kangaroos. In: Tree Kangaroos – Science and Conservation (eds Dabek, L., Valentine, P., Blessington, J., and Schwartz, K. R.) pp. 407-429. Elsevier, Academic Press.

22. Guy, A. J. and P. Banks. (2012) A survey of current rehabilitation practices for native mammals in eastern Australia. Australian Mammalogy 34:108 -118.

23. Moseby, K. E., A. Cameron, and H. A. Crisp. (2012) Can predator avoidance training improve reintroduction outcomes for the greater bilby in arid Australia? Animal Behaviour 83:1011-1021

24. Stawski, C., Nowack, J., Körtner, G. and Geiser, F. (2017) A new cue for torpor induction: charcoal, ash and smoke. Journal of Experimental Biology, 220(2), 220-226.

25. Jarman, P. J. and Evans, M. C. (2010) Circadian variation in resource quality: leaf water content and its relevance to eastern grey kangaroo Macropus giganteus and common wombat Vombatus ursinus. Austral Ecology, 35(2), 176-188.

26. Matthews, J. K., Stawski, C., Körtner, G., Parker, C. A. and Geiser, F. (2017) Torpor and basking after a severe wildfire: mammalian survival strategies in a scorched landscape. Journal of Comparative Physiology B, 187(2), 385-393.

27. Hing, S., Narayan, E., Thompson, R. C. and Godfrey, S. (2014) A review of factors influencing the stress response in Australian marsupials. Conservation Physiology, 2(1).

28. Jarman, P. and J. Evans, M. C. (2010) Circadian variation in resource quality: leaf water content and its relevance to eastern grey kangaroo Macropus giganteus and common wombat Vombatus ursinus. Austral Ecology, 35(2), 176-188.

29. Matthews, J. K., Stawski, C., Körtner, G., Parker, C. A. and Geiser, F. (2017) Torpor and basking after a severe wildfire: mammalian survival strategies in a scorched landscape. Journal of Comparative Physiology B, 187(2), 385-393.

30. Renfree, M. B.and Fenelon, J. C. (2017) The enigma of embryonic diapause. Development, 144(18), 3199-3210.

31. Dawson, T. J., Blaney, C. E., Munn, A. J., Krockenberger, A. and Maloney, S. K. (2000) Thermoregulation by kangaroos from mesic and arid habitats: influence of temperature on routes of heat loss in eastern grey kangaroos (Macropus giganteus) and red kangaroos (Macropus rufus). Physiological and Biochemical Zoology, 73(3), 374-381.

32. Kanowski, J., Catterall, C.P., Wardell-Johnson, G.W., Proctor, H. and Reis, T. (2003) Development of forest structure on cleared rainforest land in eastern Australia under different styles of reforestation. Forest Ecology and Management 183, 265-280. Wet Tropics Management Authority (2021) State of Wet Tropics 2020-2021 – Growing opportunities – landscape restoration for biodiversity and ecosystem recovery. Available from www.wettropics.gov.au

33. Tucker, N.I. and Simmons, T. (2009) Restoring a rainforest habitat linkage in north Queensland: Donaghy's Corridor. Ecological Management and Restoration 10(2): 98-112.

34. Goosem, S. and Tucker, N.I.J. (2013) Repairing the Rainforest (second edition). Wet Tropics Management Authority and Biotropica Australia Pty. Ltd. Cairns. (CRS Library)

35. Heise-Pavlov, S.; Rhinier, J. and Burchill, S. (2018) The use of a replanted riparian habitat by the Lumholtz's tree-kangaroo (Dendrolagus lumholtzi). - Ecological Management and Restoration 19: 76-80.

36. Lawes, M. J., Moore, A. M., Andersen, A. N., Preece, N. D. and Franklin, D. C. (2017) Ants as ecological indicators of rainforest restoration: Community convergence and the development of an Ant Forest Indicator Index in the Australian wet tropics. Ecology and evolution, 7(20), 8442-8455.

37. Svenning, J. C. (2020) Rewilding should be central to global restoration efforts. One Earth, 3(6), 657-660.

38. Hale, R., Blumstein, D. T., Mac Nally, R. and Swearer, S. E. (2020) Harnessing knowledge of animal behavior to improve habitat restoration outcomes. Ecosphere, 11(4), e03104.

39. Wintle, B. A., Kujala, H., Whitehead, A., Cameron, A., Veloz, S., Kukkala, A., ... and Bekessy, S. A. (2019) Global synthesis of conservation studies reveals the importance of small habitat patches for biodiversity. Proceedings of the National Academy of Sciences, 116(3), 909-914.

40. Heise-Pavlov, S. and Gillanders, A. (2016) Exploring the use of a fragmented landscape by a large arboreal marsupial using incidental sighting records from community members.- Pacific Conservation Biology 22: 386-398

41. Villard, M. A. and Metzger, J. P. (2014) Beyond the fragmentation debate: a conceptual model to predict when habitat configuration really matters. Journal of Applied Ecology, 51(2), 309-318.

42. Harrison, D.A. and Congdon, B.C. (2002) Wet Tropics Vertebrate Pest Risk Assessment Scheme.- CRC, Cairns, chapters 1.2.1; 2.1 and 2.2

43. Woinarski, J., A. A. Burbidge, and P. L. NHarrison. (2015) Ongoing unraveling of a continental fauna: decline and extinction of Australian mammals since European settlement. PNAS 112:4531-4540.

44. Heise-Pavlov S. and Bradley, A. (2021) When ancestry haunts – can evolutionary links to ancestors affect vulnerability of Australian prey to introduced predators. – Australian Mammalogy, 44(1) 98-108

45. Vernes, K., Dennis, A. and Winter, J. (2001) Mammalian Diet and Broad Hunting Strategy of the Dingo (Canis familiaris dingo) in the Wet Tropical Rain Forests of Northeastern Australia. Biotropica, 33(2), 339-345.

46. Williams, S. E., Bolitho, E. E. and Fox, S. (2003) Climate change in Australian tropical rainforests: an impending environmental catastrophe. Proceedings of the Royal Society of London. Series B: Biological Sciences, 270(1527), 1887-1892.

47. Wagner, B., Baker, P. J., Stewart, S. B., Lumsden, L. F., Nelson, J. L., Cripps, J. K., ... and Nitschke, C. R. (2020) Climate change drives habitat contraction of a nocturnal arboreal marsupial at its physiological limits. Ecosphere, 11(10), e03262.

48. Meade, J., VanDerWal, J., Storlie, C., Williams, S., Gourret, A., Krockenberger, A. and Welbergen, J. A. (2018) Substantial reduction in thermo-suitable microhabitat for a rainforest marsupial under climate change. Biology letters, 14(12), 20180189.

49. Mella, V. S., McArthur, C., Krockenberger, M. B., Frend, R. and Crowther, M. S. (2019) Needing a drink: rainfall and temperature drive the use of free water by a threatened arboreal folivore. PLoS One, 14(5), e0216964.

50. Heise-Pavlov, S. (2017) Current knowledge of the behavioural ecology of Lumholtz's tree-kangaroo (Dendrolagus lumholtzi). - Pacific Conservation Biology 23: 231-239.

51. Shima, A. L., Gillieson, D. S., Crowley, G. M., Dwyer, R. G., and Berger, L. (2018) Factors affecting the mortality of Lumholtz's tree-kangaroo (Dendrolagus lumholtzi) by vehicle strike. Wildlife Research, 45(6), 559-569.

52. Heise-Pavlov S. and Procter-Gray E. (2020) How an understanding of Lumholtz's Tree Kangaroo behavioral ecology can assist conservation. In: Tree Kangaroos – Science and Conservation (eds Dabek, L., Valentine, P., Blessington, J., and Schwartz, K. R.) pp. 85-107. Elsevier, Academic Press

53. Woinarski, J. C., S. T. Garnett, S. M. Legge, and D. B. Lindenmayer. (2016) The contribution of policy, law, management, research, and advocacy failings to the recent extinctions of three Australian vertebrate species. Conservation Biology 31:13-23.

54. Ziembicki, M. R., Woinarski, J. C., Webb, J. K., Vanderduys, E., Tuft, K., Smith, J., ...and Burbidge, A. A. (2015) Stemming the tide: progress towards resolving the causes of decline and implementing management responses for the disappearing mammal fauna of northern Australia. Therya, 6(1), 169-225.

55. The Australian Government's Threatened Species Strategy 2021–2031 DAWE 2021, Department of Agriculture, Water and the Environment, Canberra, April. CC BY 4.0. ISBN 978-1-76003-397-2; This publication is available at awe.gov.au/publications.

56. Heise-Pavlov, S. (2019) Improving the management of Australia's biodiversity through better synergy between private and public protected areas–a response to Australia's biodiversity loss. Pacific Conservation Biology, 26(1), 3-12.

57. Pasquini, L., Fitzsimons, J. A., Cowell, S., Brandon, K.and Wescott, G. (2011) The establishment of large private nature reserves by conservation NGOs: key factors for successful implementation. Oryx, 45(3), 373-380.

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