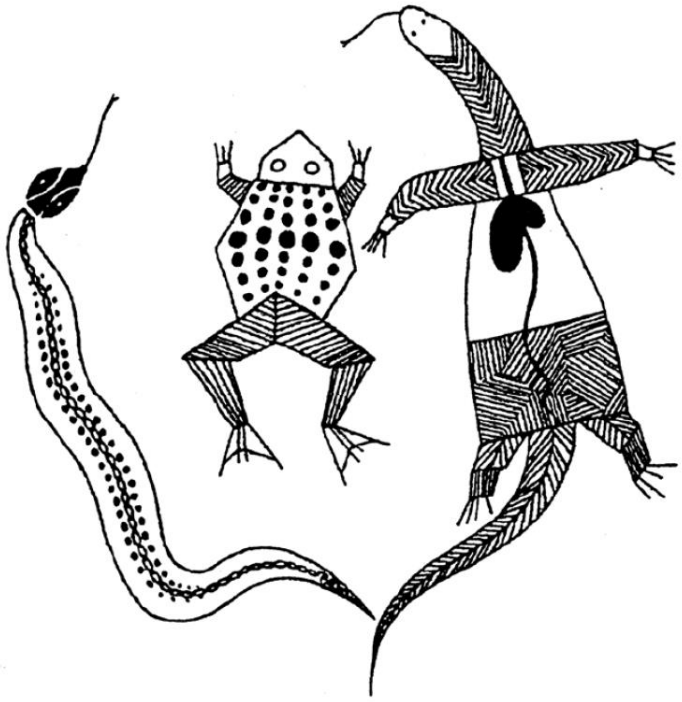
THE AUSTRALIAN SOCIETY OF HERPETOLOGISTS INCORPORATED



NEWSLETTER 55

[Draft 17/10/2021]

THE AUSTRALIAN SOCIETY OF HERPETOLOGISTS

INCORPORATED

Contents

History of Office Bearers

Formation Committee (April 1964):- MJ Littlejohn (Convenor); State Reps IR Straughan (Qld), FJ Mitchell (SA), HG Cogger (NSW), G Storr (WA), RE Barwick (ACT), JW Warren (Vic), AK Lee (Editor).

First AGM (23 August 1965):- President MJ Littlejohn, Vice-President NG Stephenson, Secretary- Treasurer AA Martin, Asst Secretary-Treasurer KJ Wilson, Ordinary Members FJ Mitchell and IR Straughan, Editor AK Lee.

PRESIDENT:- MJ Littlejohn (1965-69); AK Lee (1969-70); HG Cogger (1971-73); J de Bavay (1974); H Heatwole (1975-76); GC Grigg (1976-77); MJ Tyler (1978-79); GF Watson (1979-81); AA Martin (1981- 82); RS Seymour (1982-83); R Shine (1983-84); GC Grigg (1984-86); J Coventry (1986-87); RE Barwick (1987-88); J Covacevich (1988-91); M Davies (1991-92); R Shine (1992-94); A Georges (1994- 96); D Roberts (1996-98); M Bull (1998-99); R Swain (1999-01); S Downes (2001- 03); J Melville (2004-05); J -M Hero (2005-06); P Doughty (2006-07); M Thompson (2007-09); M Hutchinson (2009-10); L Schwarzkopf (2010-11); F Lemckert (2011-13); S Keogh (2013-14); J Sumner (2014-15); E Wapstra (2015- 16); N Mitchell (2016-17); A Amey (2017-18); G Shea (2018-2019); G Gillespie (2019-)

VICE-PRESIDENT:- NG Stephenson (1965-67); RE Barwick (1967-69); HG Cogger (1969-70); MJ Littlejohn (1971-72); MJ Tyler (1973); HG Cogger (1974); J de Bavay (1975-76); H Heatwole (1976-77); GC Grigg (1977-79); MJ Tyler (1979-80); GF Watson (1981-82); AA Martin (1982-83); RS Seymour (1983- 84); R Shine (1984-86); GC Grigg (1986-87); J Coventry (1987-88); RE Barwick (1988-91); J Covacevich (1991-92); M Davies (1992-94); R Shine (1994-6); A Georges (1996- 98); D Roberts (1998-99); M Bull (99-2001); R Swain (2001-03); S Downes (2004-05); J Melville (2005-06); J-M Hero (2006-07); P Doughty (2007-09); M Thompson (2009-10); M Hutchinson (2010-11); L Schwarzkopf (2011-13) F Lemckert (2013-14); S Keogh (2014-15); J Sumner (2015-16); E Wapstra (2016-17); N Mitchell (2017-18); A Amey (2018-2019); G Shea (2019);

SECRETARY/TREASURER:- AA Martin (1965-67); GF Watson (1967-72); LA Moffatt (1973-75); J Caughley (1975-76); RWG Jenkins (1976-77); M Davies (1978-83); G Courtice (1983-87); J Wombey(19-99); S Keogh (19-2003); N Mitchell (2004-05); E. Wapstra (2005-08); G Shea (2008-10) ;B Phillips (2010-13); C Hoskin (2014-16); J Sumner (2016-2019); S Zozaya (2019-)

ASST SECRETARY/TREASURER:- KJ Wilson (1965-69); JJ Loftus-Hills (1969-70); DF Gartside (1971-72); J Barker (1973-75); R Longmore (1976-77); T Burton (1978-83); A White (1983-86); E Bugledich (1986-90); A Georges (1990-94); T Burton (1994-

01); Ian Scott (2001-03); M Kearney (2004-05); N Clemann (2005-08); F Lemckert (2008-10); E Mulder (2010-)

ORDINARY MEMBERS:- FJ Mitchell (1965-67); IR Straughan (1965-67); HG Cogger (1967); JL Hickman(1969-70); NG Stephenson (1969-70); PA Rawlinson (1971-72); MJ Tyler (1971-72); J de Bavay (1973-74); MJ Littlejohn (1973-74); H Heatwole (1974-75); R Winokur (1975-76); RS Seymour (1975-76); R Humphries (1976-77); MJ Littlejohn (1976-77); RS Seymour (1978-80); AA Martin (1978-80); R Humphries (1980-82); A E Greer (1980-81); R Longmore (1981-83); D King (1982); B Firth (1983-84); J Coventry(1984-86); R Shine (1986-88); G Czechura (1988-90); RWG Jenkins (1990-91); K Christian (1991-92); M Thompson (1992-94), K McDonald (1994-95); L Schwarzkopf (1995-98); M Anstis (1995-98); R Alford(1998-99); N Fitzsimmons (1998-99); C James (1999-01); S Hudson (1999-01); P Horner (2001-05); G Gillespie (2001-05); P Harlow (2005-09); N.Doak (2005-09); D Edwards (2009-10); E Mulder (2009-10); L Valentine (2010-13); M Greenlees (2010-13); K Umbers (2013-17); L Plenderleith (2014-17); J Riley (2017-2019); K Klop-toker (2019-); Simon Clulow (2019-)

EDITOR:- AK Lee (1965-67); AA Martin (1967-73); GC Grigg (1973-76); JD Roberts (1976-82); L Taplin (1982-84); R Longmore (1984-99); JM Hero (1999-07); DS Bower (2007-)

PUBLIC OFFICER:- R Longmore (1983-07).; S Keogh (2008-13); M Pepper (2013-)

HONORARY MEMBERS:- JA Moore (1969-02); MJ Littlejohn (1982); HG Cogger (1996); J Wombey (1999); R Longmore (1999); M Tyler (2010-20); M Davies (2010); A Martin (2010); GF Watson (2010); J Legler; G Grigg;

COAT-OF-ARMS Design:- GF Watson.

ISSN: 0725 9972

President:
Dr Graeme Gillespie
Flora and Fauna Division
Department of Environment and Natural Resources
Northern Territory Government
PO Box 496, Palmerston, NT 0831
graeme.gillespie@nt.gov.au

Vice-President:
Dr Glenn Shea
School of Veterinary Science
University of Sydney
Sydney
NSW 2006
glenn.shea@sydney.edu.au

Secretary:
Dr Eridani Mulder
Wongalara Wildlife Sanctuary
Australian Wildlife Conservancy
Katherine, NT 0852
Australia
secretaryash@gmail.com

Treasurer:
Dr Stephen Zozaya
Division of Ecology and Evolution
Australian National University
Canberra
ACT, 0200, Australia
Stephen.ZozayaIV@anu.edu.au

Public Officer:
Dr Mitzy Pepper
Research School of Biology
Australian National University
Canberra
ACT 0200, Australia
mitzy.pepper@anu.edu.au

Ordinary Member 1:
Dr Simon Clulow
Centre for Conservation Ecology and Genomics, Institute for Applied Ecology
University of Canberra
Bruce,
ACT 0206, Australia
Simon.Clulow@canberra.edu.au

Ordinary Member 2:
Dr Kaya Klop-toker
Conservation Biology Research Group
University of Newcastle
Callaghan,
NSW 2308
kaya.klop-toker@newcastle.edu.au

Editor:
Dr Deborah Bower
School of Environmental and Rural Science
University of New England,
Armidale,
NSW 2350, Australia
deborah.bower@une.edu.au

Please direct all membership enquiries to the Treasurer, Stephen Zozaya. Membership forms can be filled out at the ASH web site. Newsletter feedback can be given to Deb Bower. All other enquiries should be directed to the Secretary, Eridani Mulder.

Website

http://www.australiansocietyofherpetologists.org/

Membership form

http://www.australiansocietyofherpetologists.org/new-members/

Twitter @AusSocHerp

https://twitter.com/aussocherp

Facebook

https://www.facebook.com/groups/111636675556016/

Letter from the editor

It has been a long time since I've seen many of my herpetologist colleagues and I must confess to missing our more regular catch-ups. The executive of ASH recently met to discuss the most effective ways to continue to connect during the pandemic, the prospect of an entire cohort of students that do not know the joys of a traditional ASH conference is cruel indeed. We are working hard to find creative ways to bring you an ASH meeting as soon as logistically feasible. At the moment, dreams of South Australia in winter of 2022 are looking possible. Although I'm devastated that my chameleon bikini will not be debuting at the Bachelor ASH in the NT, I am pleased at the prospect for herpetological hugs none-the-less. Hope to see you there.

Back leg's first,
Deb Bower

International

France

OULALAB, CNRS

On the Australian front, Damian Lettoof (Curtin Uni) is in the final stages of his PhD and has so far done an excellent job at deciphering the interplays between wetland pollution and Tiger snake health in WA. Most of his papers are accepted first try. Some people are gifted! Well done Damo.

Speaking of Tiger snakes, an epigenetic project in collaboration with Dr Vicky Thomson (DECRA) is still alive, pending new funding.

In France, Constant Perry was recently awarded PhD funding and will join our Podarcis/Iberolacerta team very shortly to work of colonisation dynamics, extirpation in the face of climate change and elevation related hypoxia (INTERREG POCTEFA ADAPYR European Project - co-supervised by Dr Eric Gangloff).

Publications

Feiner N, de Souza-Lima S, Jorge F, Naem S, Aubret F, Uller T and Nadler SA 2020. Vertical transmission of a nematode from female lizards to the brains of their offspring. The American Naturalist,195.5 (2020): 918-926.

de Carvalho Augusto R, Minoda A, Rey O, Cosseau C, Chaparro C, Vidal-Dupiol J, Allienne JF, Duval D, Pinaud S, TÖnges S, Andriantsoa R, Luquet E, Aubret F, Sow MD, David P, Thomson V, Federico D, Joly D, Gomes Lima M, Danchin E & Grunau C 2020. Chromatin structure changes in Daphnia populations upon exposure to environmental cues-or-The discovery of Wolterecks " Matrix". bioRxiv, 824789. doi: https://doi.org/10.1101/824789

Lettoof D, von Takach Dukai B, Bateman PW, Gagnon M & Aubret F. 2020. Investigating the role of urbanisation, wetlands and climatic conditions in nematode parasitism in a large Australian elapid snake. International Journal for Parasitology: Parasites and Wildlife, 11, 32-39.

Lettoof D, Bateman P, Aubret F & Gagnon MM 2020. The broad-scale analysis of contaminants (heavy metals, organochlorine pesticides and polycyclic aromatic hydrocarbons) in wetlands along an urban gradient, and the use of a high trophic snake as a bioindicator. Archives of Environmental Contamination and Toxicology, 1-15.

Dupoué A, Sorlin M, Richard M, Le GalliardJF, Lourdais O, Clobert J*, Aubret F* 2020. Mother-offspring conflict for water is mitigated in the oviparous form of the bimodal lizard Zootoca vivipara. Biological Journal of the Linnean Society. 129(4), 888-900. * shared last authorship.

Souchet J, Gangloff EJ, Micheli G, Bossu C, Trochet A, Bertrand R, Clobert J, Calvez O, Martinez-Silvestre A, Darnet E, Le Chevalier H, Guillaume O, Mossoll-Torres M, Barthe L, Pottier G, Philippe H & Aubret F. 2020. High-elevation hypoxia impacts perinatal physiology and performance in a potential montane colonizer. Integrative Zoology, In press.

Feiner N & Aubret F 2020. NATRIX NATRIX (Grass snake). Parasites. Herpetological Review, In press.

Lucati F, Poignet M, MirÓ A, Trochet A, Aubret F, Barthe L, Bertrand R, Buchaca T, Calvez O, Caner J, Darnet E, DenoÃ«l M, Guillaume O, Le Chevalier H, MartÃnez-Silvestre A, Mossoll-Torres M, O'Brien D, Osorio V, Pottier G, Richard M, SabÁs I, Souchet J, TomÃ s J & Ventura M. 2020. Linking phylogeographic history and contemporary dispersal dynamics:Multiple glacial refugia and restricted but effective present-day gene flow shape the genetic structure of an endemic newt from the Pyrenees. Molecular Ecology, 29(15):2904-2921..

Abalos J, PÉrez i de Lanuza G, BartolomÉ A, Liehrmann O, Laakkonen H, Aubret F, Uller T, Carazo P, Font E. 2020. Don't judge a lizard by its colour: no evidence for differential socio-sexual behaviour and space use in the colour morphs of the European common wall lizard (Podarcis muralis). Ecology and Evolution, In press.

Aubret F, Kouyoumdjian L, Gangloff EJ. 2020. IBEROLACERTA BONNALI (Pyrenean Rock Lizard). Fishing hook swallowed. Herpetological Review, In press.

Lettoof D, Cornelis J, Harvey-Hall J & Aubret F. 2020. NOTECHIS SCUTATUS OCCIDENTALIS (Western Tiger Snake). Diet. Herpetological Review, In press.

Souchet J, Bossu C, Darnet E, Le Chevalier H, Poignet M, Trochet A, Bertrand R, Calvez O, Martinez-Silvestre A, Mossoll-Torres M, Guillaume O, Clobert J, Barthe L, Pottier G, Philippe H, Gangloff EJ & Aubret F. 2020. High temperatures limit developmental resilience to high-elevation hypoxia in the snake Natrix Maura (Squamata: Colubridae). The Biological Journal of the Linnean Society, In press.

Lettoof DC, Aubret F, Spilsbury F, Bateman PW, Haberfield J, Vos J & Gagnon MM. 2020. Baseline plasma biochemistry profile of wild Western tiger snakes (*Notechis scutatus occidentalis*) before and after captivity. Journal of Wildlife Diseases, In press.

DupouÉ A, Trochet A, Richard M, Sorlin M, TeuliÃ¨re Quillet J, VallÉ C, Rault C, Berroneau M, Berroneau M, Lourdais O, Blaimont P, Bertrand R, Guillon M, Pottier G, Calvez O, Guillaume O, Le Chevalier H, Souchet J, Le Galliard JF, Clobert J # & Aubret F #. 2020 Genetic and demographic trends from rear to leading edge are explained by climate and forest cover in a cold adapted ectotherm. 2020 Diversity and Distributions, In press. # shared senior authorship.

Bertrand R, Aubret F, Grenouillet G, RibÉron A and Blanchet S. 2020. Comment on ‘Forest microclimate dynamics drive plant responses to warming’. Science 370 (6520): DOI: 10.1126/science.abd3850.

Lettoof DC, Rankenburg K, McDonald BJ, Evans NJ, Bateman PW, Aubret F& Gagnon M 2020 Snake scales record environmental metal contamination. Environmental Pollution, In press.

de Carvalho Augusto R, Cosseau C, Chaparro C, Vidal-Dupiol J, Allienne JF, Duval D, Pinaud S, Tönges S, Andriantsoa R, Luquet E, Aubret F, Sow MD, David P, Thomson V, Joly D, Gomes Lima M, Federico D, Danchin E, Minoda A & Grunau C. 2020. A simple ATAC-seq protocol for population epigenetics. Wellcome Open Research, 5(121): 121.

MartÃnez-Silvestre A, Trochet A, Calvez O, Poignet M, Le Chevalier H, Souchet J, Darnet E, Guillaume O, Aubret F, Bertrand R, Mossoll-Torres M, Lucati F; TomÃ s J; O’Brien D; MirÓ A, Ventura M, Barthe L, Pottier G, Marschang RE & Bosch J 2020. Presence of the Fungus *Batrachochytrium dendrobatidis*, but not *Batrachochytrium salamandrivorans*, in Wild Pyrenean Brook Newts (*Calotriton asper*) in Spain and France. Herpetological Review 51(4): 738-743.

Gangloff EJ, SpearsS, Kouyoumdjian L, Pettit C & Aubret F 2021 Does hyperoxia restrict Pyrenean rock lizards *Iberolacerta bonnali* to high elevations? Diversity 13(5): 200.

Abalos J, PÉrez i de Lanuza G, BartolomÉ A, Aubret F, Uller T & Font E 2021 Viability, behavior, and color expression in the offspring of matings between common wall lizard *Podarcis muralis* color morphs. Current Zoology 2021: 1-15. doi: 10.1093/cz/zoab039

Yang W, Feiner N, Salvi D, Laakkonen H, Jablonski D, Pinho C, Sacchi R, Zuffi MAL, Scali S, Plavos K, Pafilis P, Schulte U, Aubret F, Badiane A, Carazo P, Perez I de Lanuza G, While GM & Uller T 2021. Population genomics of wall lizards reflects the dynamic history of the Mediterranean Basin. bioRxiv.

United States

Rose Upton

In November 2020 I handed in my PhD thesis titled "Development of sperm cryopreservation and assisted reproductive technologies for the conservation of threatened Australian tree frogs" at The University of Newcastle (Supervisory team: John Clulow, Simon Clulow, Michael Mahony).

Since then I have moved to Baton Rouge, Louisiana in the United States to begin my postdoc. I am working under Dr. Terrence Tiersch at the Aquatic Germplasm and Genetic Resources Center on a project aiming to develop and improve germplasm repository capabilities for several aquatic biomedical model stock centers. I will be working with *Ambystoma mexicanum* and *Xenopus laevis* to develop generalisable and scalable cryopreservation pathways for these organisms. I look forward to applying the skills and knowledge from this position to conservation in future.

I am also continuing work on existing projects with the University of Newcastle, Taronga Conservation Society and other collaborators and look forward to returning to Australia in coming years to resume conservation related projects.

Upton, R., Clulow, S., Calatayud, N. E., Colyvas, K., Seeto, R. G. Y., Wong, L. A. M., â€¦ Clulow, J. (2021). Generation of reproductively mature offspring from the endangered green and golden bell frog *Litoria aurea* using cryopreserved spermatozoa. Reproduction, Fertility and Development, 33, 562-572. DOI: 10.1071/RD20296

Australian Capital Territory

University of Canberra

Simon Clulow

Simon Clulow has moved down the road to the nation's capital to take up a Senior Research Fellowship at the University of Canberra. He thanks Martin Whiting for a wonderful three years at Macquarie University during his MQ Fellowship. While needing to adjust to the cold and wondering how on Earth any herps survive here, he continues his wide-ranging research from chytrid studies in threatened frogs, to ecosystem roles of deep-nesting monitor lizards and the cane toad invasion with Sean Doody, frog ecology and conservation in Australia and New Guinea with Deb Bower, and developing assisted reproductive technologies across a wide range of frog and reptile taxa.

Despite significant COVID-related setbacks, several students have managed to complete. These include Masters students James Madden (frog and tadpole cognition, with Martin Whiting and Culum Brown), Stephanie Deering (cognition and aggregation behaviour in magnificent tree frogs, with Martin Whiting) and Kari Soennichsen (spatial ecology in perentie, with Martin Whiting and Sean Doody), and PhD students Rose Upton and Lachlan Campbell (developing assisted reproductive technologies in frogs and reptiles respectively). Steph and Kari seem to be unperturbed by their experiences as Masters students and have signed up with Simon to undertake PhDs at UC starting 2022, albeit with Steph switching to study bird and mammal behaviour. Adopted PhD student Anthony Waddle continues his work on chytrid studies in bell frogs (with Rick Shine) and Grant Webster continues to study the ecology of Mahony's toadlet (with Deb Bower). Liam Agnew has begun a Masters project investigating learning around anti-predator defence behaviour (led by Martin Whiting) and Leah Carr is studying bushfire impacts on threatened stream frogs for her Honours (led by Deb Bower).

Simon has given up predicting if he will ever be allowed to leave campus (or home) again, but is hoping to make it over to Bolivia, San Diego and Florida in 2022 for a range of interesting frog and reptile projects - watch this space (but not too closely).

Book Chapters

Klop-Toker K., Callen, A., King, J. P., Beranek, C., Lenga, D., Valdez, J., Clulow, S., Pizzatto, L., Stockwell, M., Clulow, J. & Mahony, M. (2021). Reintroduction of green and golden bell frogs into created habitats on Kooragang Island, Australia. In Soorae, P. S. (ed) Global conservation translocation perspectives: 2021. Case studies from around the globe. IUCN SSC Conservation Translocation Specialist Group: Gland, Switzerland. Pp. 70-75.

Strand, J., Fraser, B., Houck, M. & Clulow, S. (In Press). Biobanking Amphibian Cell Lines and Conservation Applications. In Silla, A., Kouba, A. & Heatwole, H. (eds) Reproductive Technologies and Biobanking as Tools for the Conservation of Amphibians. CSIRO Publishing: Melbourne, Australia.

Clulow, J., Upton, R. & Clulow, S. (In Press). Cryopreservation of amphibian genomes: targeting the Holy Grail, cryopreservation of maternal haploid and embryonic diploid genomes. In Silla, A., Kouba, A. & Heatwole, H. (eds) Reproductive Technologies and Biobanking as Tools for the Conservation of Amphibians. CSIRO Publishing: Melbourne, Australia.

Bower, D., Somaweera, R., Clemann, N., Crowe-Riddell, J M., Clulow, S., Greenlees, M., Howard, K., Kuchling, G., McKnight, D., Melville, J., Schaffer, J., Schwarzkopf, L., Streeting, L., Vanderduys, E., Zdenek, C. & Spielman, D. (In Press). Chapter 26: Reptiles. In: Smith, B., Waudby, H., Alberthsen, C. & Hampton, J. O. (eds) Wildlife research in Australia: a practical guide. CSIRO Publishing: Melbourne, Australia.

Refereed Journal Articles

Doody, J. S., McHenry, C., Rhind, D., Gray, C. & Clulow, S. (In Press). Impacts of invasive cane toads on an endangered marsupial predator and its prey. Endangered Species Research.

Klop-Toker, K., Valdez, J., Stockwell, M., Fardell, L., Clulow, S., Clulow, J. & Mahony, M. (In Press). Improving breed-and-release programmes in the face of a threatening pathogen, *Batrachochytrium dendrobatidis*. Aquatic Conservation: Marine and Freshwater Ecosystems.

Lamichhaney, S., Catullo, R., Keogh, J. S., Clulow, S., Edwards, S. E. & Ezaz, T. (2021). A bird-like genome from a frog: mechanisms of genome size reduction in the ornate burrowing frog, *Platyplectrum ornatum*. Proceedings of the National Academy of Sciences, USA, 118(11): e2011649118.

Doody, J. S., Soennichsen, K., James, H., McHenry, C. & Clulow, S. (2021). Ecosystem engineering in deep-nesting monitor lizards. Ecology, 102(4): e03271.

Gould, J., Clulow, J., Rippon, P., Doody, J. S. & Clulow, S. (2021). Complex trade-offs in oviposition site selection in a cannibalistic frog. Animal Behaviour, 175: 75-86.

Gallagher, R., Butt, N., Carthey, A., Tulloch, A., Bland, L., Clulow, S., Newsome, T., Dudaniec, R., & Adams, V. (2021). A guide to using species trait data in conservation. One Earth, 4(7): 927-936.

Howell, L., Frankham, R., Rodger, J., Witt, R., Clulow, S., Upton, R. & Clulow, J. (2021). Integrating biobanking minimises inbreeding and produces significant cost benefits for a threatened frog captive breeding program. Conservation Letters, 14(2): e12776.

Campbell, L., Clulow, J., Howe, B., Upton, R., Doody, J. S. & Clulow, S. (2021). Efficacy of short-term cold storage prior to cryopreservation of sperm in a threatened lizard. Reproduction, Fertility and Development, 33: 555-561.

Upton, R., Clulow, S., Calatayud, N., Colyvas, K., Seeto, R., Wong, L., Mahony, M. & Clulow, J. (2021). Generation of reproductively mature offspring of the endangered green and golden bell frog (*Litoria aurea*) using cryopreserved sperm. Reproduction, Fertility and Development, 33: 562-572.

Gould, J., Clulow, J. & Clulow, S. (2021). Using citizen science in the photo-identification of adult individuals of an amphibian based on two facial skin features. Peer J, 9: e11190.

Meyer, N., Balkenhol, N., Dutta, T., Hofman, M., Meyer, J-Y., Ritchie, E., Alley, C., Beranek, C., Bugir, C., Callen, A., Clulow, S., Cove, M., Klop-Toker, K., Lopez, O., Mahony, M., Scanlon, R., Sharma, S., Shute, E., Upton, R., Campbell, L., Guibault, E., Griffin, A., HernÁndez-PÉrez, E., Howell, L., King, J. P., Lenga, D., O'Donoghue, P., Seeto, R., Witt, R. & Hayward, M. (2021). Beyond species counts for assessing, valuing, and conserving biodiversity - a comment on Wallach et al. Conservation Biology, 35(1): 369-372.

Gould, J., Valdez, J., Clulow, J. & Clulow, S. (2021). Left high and dry: froth nesting allows eggs of the anuran amphibian to complete embryogenesis in the absence of free-standing water. Copeia, 109(2): 537-544.

Howell, L., Mawson, P., Frankham, R., Rodger, J., Upton, R., Witt, R., Calatayud, N., Clulow, S., & Clulow, J. (2021). Integrating biobanking could produce significant cost benefits and minimise inbreeding for Australian amphibian captive breeding programmes. Reproduction, Fertility & Development, 33: 573-587.

Geyle, H., Hoskin, C., Bower, D., Catullo, R., Clulow, S., Driessen, M., Daniels, K., Garnett, S., Gilbert, D., Heard, G., Hero, J-M., Hines, H., Hoffman, E., Hollis, G., Hunter, D., Lemckert, F., Mahony, M., Marantelli, G., McDonald, K., Mitchell, N., Newell, D., Roberts, D., Scheele, B., Scroggie, M., Vanderdys, E., Wassens, S., West, M., Woinarski, J. & Gillespie, G. (In Press). Red hot frogs: identifying the Australian frogs most at risk of extinction. Pacific Conservation Biology.

Doody, J. S., McGlashan, J., Fryer, H., Coleman, L., James, H., Soennichsen, K., Rhind, D. & Clulow, S. (2020). Plasticity in nest site choice behaviour in response to hydric conditions in a reptile. Scientific Reports, 10: 16048.

Klop-Toker, K., Clulow, S., Shuttleworth, C. & Hayward, M. (2020). Are novel ecosystems the only novelty of rewilding? Restoration Ecology, 28(6): 1318-1320.

Bower, D; Jennings, C; Webb, R; Amepou, Y; Schwarzkopf, L; Berger, L; Alford, R; Georges, A; McKnight, D; Carr L; Nason, D & **Clulow, S. (2020). Disease surveillance of the amphibian chytrid fungus *Batrachochytrium dendrobatidis* in Papua New Guinea. Conservation Science and Practice, 2: e256. (joint first authors)

Campbell, L., Upton, R., Doody, J. S., Nixon, B., Clulow, J. & Clulow, S. (2020). A model protocol for the cryopreservation and recovery of motile lizard sperm using the phosphodiesterase inhibitor caffeine. Conservation Physiology, 8: coaa044.

Burstal, J., Clulow, S., Colyvas, K., Kark, S. & Griffin, A (2020). Radiotracking invasive spread: Are common mynas more active and exploratory on the invasion front? Biological Invasions, 22: 2525-2543.

Enloe, C., Bartek, B., Doody, J. S., Gray, C., Kimes, K., Clulow, S., Deering, S., Fryer, H., Soennichsen, K. & Fryer, H. (2020). Antaresia childrenii (Children's python) diet. Herpetological Review, 51(2): 339.

Gray, C., Doody, J. S., Kimes, K., Enloe, C., Bartek, B., Clulow, S., Deering, S., Webster, G., Soennichsen, K. & Fryer, H. (2020). *Dendrelaphus punctulatus* (common tree snake) predation or scavenging. Herpetological Review, 51(2): 348.

University of Canberra

Team Pogona

Our team is coming to the end of a four-year phase of major research program on sex in dragons. This means saying goodbye to some of our most productive members of the team, PhD students as they transition to new stages in their careers. Meghan Castelli has completed her PhD on "Sex and stress: Is stress both a mediator and a consequence of sex reversal in the dragon", Duminda Dissanayake has submitted on "Sex reversal in the alpine skink *Bassiana duperreyi* - response to natural environment" and Sarah Whiteley is about to submit on "Thermal influences on sex determination and differentiation in two Australian dragon lizards". Meghan has joined Celine Frere in USQ to work on the water dragon, Dumie has moved to JCSMR at ANU, and Sarah transitions to a postdoc with Team Pogona. Kris Wild and Phil Pearson are continuing their research on the ecological and behavioural aspects of sex reversal in the dragon, and are expected to submit soon. Matt Young is continuing part-time on his work on the pig-nosed turtle with some outstanding results emerging on their phylogeography and dramatic variation in genetic diversity across their range. Other turtle work continues (slowly) on the phylogeography of Australasian chelids. The AusARG genome initiative of BPA will soon deliver some outstanding genome assemblies for *Pogona vitticeps*, *Bassiana duperreyi*, *Emydura macquarii*, *Chelodina expansa*, and *Chelodina longicollis* through our team. Genomes of gaggle (head-bobble) of agamid lizards is being sequenced and assembled through a collaboration between BGI and Nanjing University. Work on the dartR package for streamlining the analysis of SNP data at the population level has got a boost with funding from the ACT Priority Investment Program and CSIRO that has allowed us

to appoint a full-time developer in Luis Minjaro. Carla Eisemberg, Ricky J Spencer, Deb Bower and Arthur Georges, for their sins, have been commissioned by the Commonwealth to review the EPBC Act listings for freshwater turtles.

Castelli, M., Georges, A. and Holleley, C.E. 2021. Corticosterone does not have a role in temperature sex reversal in the central bearded dragon (*Pogona vitticeps*). Journal of Experimental Zoology 335:301-310. https://doi.org/10.1002/jez.2441.

Castelli, M., Georges, A., Cherryh, C., Rosauer, D., Sarre, S.D., Contador-Kelsall, I. and Holleley, C.E. 2021. Evolving thermal thresholds may explain the distribution of temperature sex reversal in an Australian dragon lizard (*Pogona vitticeps*). Diversity and Distributions 27:427-438 [doi:10.1111/ddi.13203]

Dissanayake, D., Holleley, C.E., Deakin, J. and Georges, A. 2021. High altitude increases the risk of Y chromosome loss in Alpine skink populations with sex reversal. Heredity 126:805-816

Dissanayake, D.S., Holleley, C.E. and Georges, A. 2021. Skewed sex ratios in an alpine lizard: understanding the effects of natural nest temperature on sex reversal in the eastern three-lined skink. [in review, submitted, 7-Jun-21]

Dissanayake, D.S.B., Holleley, C.E., Sumner, J., Melville, J. and Georges, A. 2021. Lineage diversity within a widespread endemic Australian skink to better inform conservation in response to regional-scale disturbance. [in review, submitted, 29-Mar-21]

Georges, A., Holleley, C.E. and Marshall Graves, J.A. 2021. Concerning the article by Ehl et al. - false premise leads to false conclusions. Sexual Development, doi: 10.1159/000514195

Madsen, T., Loman, J., Stille, B. Ujvari, B., Olsson, M., Gruber, B., Georges, A. and Klaassen, M. 2021. Polyandry and non-random fertilisation enhance and maintain genetic diversity. [in review, submitted, 25-Mar-21]

Melville, J., Chapple, D.G., Keogh, J.S., Sumner, J., Amey, A., Bowles, P., Brennan, I.G., Couper, P., Donnellan, S.C., Doughty, P., Edwards, D.L., Ellis, R.J., Esquerre, D., Fenker, J., Gardner, M.G., Georges, A., Haines, M.L., Hoskin, C.J., Hutchinson, M., Moritz, C., Nankivell, J., Oliver, P., Pavón-Vázquez C.J., Pepper, M., Rabosky, D.L., Sanders, K., Shea, G., Singhal, S., Wilmer, J.W., Tingley, R. 2021. A return-on-investment approach for prioritization of rigorous taxonomic research needed to inform responses to the biodiversity crisis PLoS Biology 19:e3001210.

Rovatsos, M., Gamble, A., Nielsen, S., Georges, A., Ezaz, T. and Kratochvil, L. 2021. Do male and female heterogamety really differ in expression regulation? Lack of global dosage balance in pygopodid geckos. Philosophical Transactions of the Royal Society 376B: 20200102.

Schwanz, L.E. and Georges, A. 2021. Sexual development and the environment: Conclusions from 40 years of theory. Sexual Development DOI: 10.1159/000515221

Talamantes-Becerra, B., Catling, J. and Georges, A. 2021. omicR: a tool to facilitate BLASTn alignments for sequence data. SofwareX 14:100702. https://doi.org/10.1016/j.softx.2021.100702

Unmack, P.J., Adams, M., Hammer, M.P., Johnson, J.B., Gruber, B., Gilles, A., Young, M. and Georges, A. 2021. Plotting for change: an analytic framework to aid decisions on which lineages are candidate species in phylogenomic species discovery. Biological Journal of the Linnean Society, in press.

Waters, P.D., Patel, H.R.,Ruiz-Herrera, A.,Ãlvarez-González, L., Lister, N.C.,Simakov, O., Ezaz, T., Kaur, P., Frere, C., GrÃ¼tzner, F., Georges, A. and Marshall Graves, J.A. 2021. Microchromosomes are building blocks of bird, reptile and mammal chromosomes. [advanced view -- https://www.biorxiv.org/content/10.1101/2021.07.06.451394v1.full.pdf]

Whiteley, S., Georges, A., Weisbecker, V., Schwanz, L.E., and Holleley, C.E. 2021. Ovotestes suggest cryptic genetic influence in a reptile model for temperature dependent sex determination. Proceedings of the Royal Society of London, Series B. 288:20202819 [https://doi.org/10.1098/rspb.2020.3010]

Whiteley, S.L., Castelli, M.A., Dissanayake, D.S.B., Holleley, C.E. and Georges, A. 2021. Temperature induced sex reversal in reptiles: Prevalence, discovery, and evolutionary implications. Sexual Development, https://doi.org/10.1159/000515687.

Whiteley, S.L., Holleley, C.E., Blackburn, J., Deveson, I.W., Wagner, S., Graves, J.A.M., Georges, A. 2021. Two transcriptionally distinct pathways drive female development in a reptile with genetic sex determination and temperature induced sex reversal. PLoS Genetics 17:e1009465

Xiuwen Zhang, Z., Wagner, X., Deakin, J.E., Holleley, C.E., Matsubara, K., Deveson, I.W., Li, Z., Wang, C., O'Meally, D., Edwards, M., Patel, H.R., Ezaz, T., Marshall Graves, J.A. and Georges, A. 2021. Sex-specific splicing of Z and W-borne alleles of candidate sex determining gene nr5a1 in the dragon lizard suggests control by sex chromosome conformation. [in review, submitted 7-Jul-21]

van Dyke, J., Thompson, M., Burridge, C., Castelli, M., Clulow, S., Dissanayake, D., Dong, C., Doody, J., Edwards, D., Ezaz, T., Friesen, C., Gardner, M., Georges, A., Higgie, M., Hill, P., Holleley, C., Hoops, D., Hoskin, C., Merry, D., Riley, J., Wapstra, E., While, G., Whiteley, S., Whiting, M., Zozaya, S., Whittington, C. 2021. Australian lizards are outstanding models for reproductive biology research. Australian Journal of Zoology, in press.

Alam, S.M.I., Altmanová, M., Prasongmaneerut, T., Georges, A., Sarre, S.D., Nielsen, S.V., Gamble,T., Srikulnath, K., Rovatsos, M., Kratochval, L. and Ezaz, T. 2020. Cross-species BAC mapping highlights conservation of chromosome synteny across dragon lizards (Squamata: Agamidae) Genes 11, 698.

Alam, S.M.I., Sarre, S.D., Georges, A. and Ezaz, T. 2020. Karyotype characterisation of two Australian dragon lizards (Squamata: Agamidae: Amphibolurinae) reveals subtle chromosomal rearrangements between related species with similar karyotypes, Cytogenetic and Genome Research, https://doi.org/10.1159/000511344.

Bower, D.S., Jennings, C.K., Webb, R.J., Amepou, Y., Schwarzkopf, L., Berger, L., Alford, R.A., Georges, A., McKnight, D.T., Carr, L., Nason, D. and Clulow, S. 2020. Disease surveillance of the amphibian chytrid fungus *Batrachochytrium dendrobatidis* in Papua New Guinea. Conservation Science and Practice 2:e256. https://doi.org/10.1111/csp2.256.

Cao, R., Somaweera, R., Brittain, K., Fitzsimmons, N., Georges, A. and Gongora, J. 2020. Genetic structure and diversity of Australian freshwater crocodiles (*Crocodylus johnstoni*) from the Kimberley, Western Australia. Conservation Genetics 21:421-429.

Capraro, A., O'Meally, D., Waters, S.A, Patel, H.R., Georges, A., and Waters, P.D. 2020. MicroRNA dynamics during hibernation of the Australian central bearded dragon (*Pogona vitticeps*). Scientific Reports 10:17854, doi.org/10.1038/s41598-020-73706-9

Castelli, M., Whiteley, S., Georges, A. and Holleley, C.E. 2020. Cellular calcium and redox regulation: The mediator of vertebrate environmental sex determination? Biological Reviews 95:680-695.

Chessman, B.C., McGilvray, G., Rumming, S., Jones, H.A., Petrov, K., Fielder, D.P., Spencer, R-J and Georges, A. 2020. On a razor's edge: status and prospects of the critically endangered Bellinger River snapping turtle, Myuchelys georgesi. Aquatic Conservation 30:586-600.

Cornejo-Páramo, P., Martãnez-Pacheco, M.L., Lira-Noriega, A., Dissanayake, D.S.B., Acosta, A., Ramãrez-Suástegui, C., Mendez-de-la-Cruz, F.R., SzÉkely, T., Urrutia, A.O., Georges, A., Cortez, D. 2020. Viviparous reptile regarded to have temperature-dependent sex determination has old XY chromosomes. Genome Biology and Evolution 12:924-930.

Dissanayake, D.S.B., Holleley, C.E., Hill, L., O'Meally, D., Deakin, J. and Georges, A. 2020. Identification of Y chromosome markers in the eastern three-lined skink (*Bassiana duperreyi*) using in-silico whole genome subtraction. BMC Genomics 21:667.

Jones, M.E.H., Pistevos, J.C.A., Cooper, N.H., Lappin, A.K., Georges, A., Hutchinson, M.N. and Holleley, C.E. 2020. Reproductive phenotype predicts adult bite-force performance in sex-reversed dragons. Journal of Experimental Zoology A 333:252-263. [pdf]

Madsen, T.. Loman, J., Anderberg, L., Anderbert, H., Georges, A. and Ujvari, B. 2020. Genetic rescue restores long-term population viability. Current Biology 30:R1283-R1300

Schwanz, L.E., Georges, A., Holleley, C.E. and Sarre, S.D. 2020. Climate change, sex reversal and lability of sex determining mechanisms Journal of Evolutionary Biology 33:270-281.

Shea, G., Thomson, S. and Georges, A. 2020. The identity of *Chelodina oblonga* Gray 1841 (Chelonia: Chelidae) reassessed. Zootaxa 4779:419-437.

Stanford, C.B., Iverson, J.B., Rhodin, A.G.J., van Dijk, P.P., Mittermeier, R.A., Kuchling, G., Berry, K.H., Bertolero, A., Bjorndal, K.A., Blanck, T.E.G., Buhlmann, K.A., Burke, R.L., Congdon, J.D., Diagne, T., Edwards, T., Eisemberg, C.C., Ennen, J.R., Forero-Medina, G., Frankel, M., Fritz, U, Gallego-GarcÄ±Â´a, N., Georges, A., Gibbons, J.W., Gong, S., Goode, E.V., Shi, T.S, Hoang, H., Hofmeyr, M.D., Horne, B.D., Hudson, R., Juvik, J.O., Kiester, R.A., Koval, P., Le, M., Lindeman, P.V., Lovich, J.E., Luiselli, L., McCormack, T.E.M., Meyer, G.A., PaÂ´ ez, V.P., Platt, K., Platt, S.G., Pritchard, P.C.H., Quinn, H.R., Roosenburg, W.M., Seminoff, J.A., Shaffer, H.B., Spencer, R., van Dyke, J.U., Vogt, R.C. and Walde, A.D. 2020. Turtles and tortoises are in trouble. Current Biology 30:R721-R735.

The Australian National University

The Keogh Lab

Departed but not forgotten:

Carlos Pavon (PhD student). Carlos handed in his PhD on the evolution of goannas a few months ago and just officially got the word that he has passed with flying colours. He has already published some outstanding papers, including one in Systematic Biology that explores the complex history of the Komodo Dragon and its relatives. Carlos recently left to start a postdoc at the City University of New York (CUNY) working on the phylogenomics of Mexican lizards. We'll miss him and hope to see him back in Oz one day.

The current lab:

Scott Keogh. After nine years of higher admin duties, I'm finally off the hook as of March 2021. I'm very happy to be back in a normal research and teaching role and getting stuck back into science and working with the great people in my lab. We continue to work our way through huge phylogenomic scale projects on the major Australian herp clades with lots of collaborators and then use these phylogenies to address interesting macroevolutionary problems. The lab also has broadened out a bit to include new PhD students working on big phylogenomic and taxonomic problems in Australian insects in collaboration with the Australian National Insect Collection across the street. Bank Paphatmethin from Thailand finished his Masters with us last year and is now doing a PhD, and Ying Luo started a PhD with us this year - both are working on moths.

Mitzy Pepper (Postdoc). Our big review paper on the arid zone was published in the Journal of Biogeography earlier this year. It got lots of attention, made the cover and I wrote a blog post for the journal about it (see here: https://journalofbiogeographynews.org/2021/05/10/life-in-the-dead-heart-of-australia/). Presently I am coordinating phylogenomic sequencing for every lineage of Australian Diplodactylid gecko as part of the Australian Amphibian & Reptile Genomics (AusARG) initiative, as well as collating tissue samples from Australian museums for the ABRS taxonomy grant I currently hold to sort out the taxonomy of some arid zone geckos. COVID is having a big impact on our ability to achieve this, but we are hopeful that soon border restrictions will be relaxed a little and we can tissue dive like Olympic champions and get everything ready for sequencing!

Ian Brennan (Postdoc). Ian is always working hard juggling multiple amazing projects relating to phylogenomics and macroevolution. But right now he is taking some important time off at home to juggle a baby instead! He and his partner Zoe welcomed little Olive in August.

Damien Esquerré (Postdoc). I am finishing my second year as a postdoc. I have been working through different projects on phylogenomics, phylogeography and evolution of pythons, liolaemid lizards, and even for the first time frogs! My latest papers have focused on redefining the species boundaries and understanding

the phylogeography of pythons like Antaresia and Leiopython. I have just published the longest and largest project I have led so far: the largest phylogeny of Liolaemus, South America's craziest lizard radiation. I have also been busy working as a wildlife photography instructor and tour leader taking participants to places like Borneo and Costa Rica, but now restricted to domestic trips like Cape York.

Putter Tiatragul (PhD Student): I'm starting my third year of my PhD research on Australian blind snakes. Fortunately, I was able to squeeze in three museum visits before the spread of the delta variant of COVID-19 forced lockdown across big cities in Australia. I'd express my utmost gratitude to the curators/staff at the museums I was able to visit including: Patrick Couper and Andrew Amey at the QM; Gavin Daily at the MAGNT, and Jodi Rowley and Dane Trembath at the AM. I'm currently working on inferring an updated phylogeny for Anilios as part of the AusARG initiative and digitising photographs/radiographs I took of blind snakes at the museums. Hopefully by the end of the year (and next ASH) I can present some results to you all!

Keogh Lab Published or in press for 2020/21

Esquerré D, JS Keogh, D Demangel, M Morando, LJ Avila, JW Sites Jr.,F Ferri-Yaez, AD Leaché. Rapid radiation and rampant reticulation: Phylogenomics of South American Liolaemus lizards. Systematic Biology, In Press.

Melville J, DG Chapple, JS Keogh, J Sumner, A Amey, Phil Bowles, IG Brennan, P Couper, S Donellan, P Doughty, D Edwards, RJ Ellis, D Esquerré, J Fenker, M Gardner, A Georges, M Haines, CJ Hoskin, M Hutchinson, C Moritz, J Nankivell, P Oliver, CJ Pavon-Vazquez, M Pepper, DL Rabosky, K Sanders, G Shea, S Singhal, J Worthington Wilmer, R Tingley. 2021. A return-on-investment approach for prioritisation of rigorous taxonomic research needed to inform responses to the biodiversity crisis. Plos Biology 19(6): e3001210.

Esquerré D, SC Donnellan, CJ Pavon-Vazquez, J Fenker, JS Keogh. 2021. Phylogeography, historical demography and systematics of the world's smallest pythons (Pythonidae, Antaresia). Molecular Phylogenetic and Evolution, In Press.

Lamichhaney, S, R Catullo, JS Keogh, S Clulow, SV Edwards, T Ezaz. 2021. A bird-like genome from a frog: Mechanisms of genome size reduction in the ornate burrowing frog, *Platyplectrum ornatum*. Proceedings of the National Academy of Sciences USA 118: e2011649118, In Press.

Pavon-Vazquez, C, IG Brennan, JS Keogh. 2021. An integrative approach to detect hybridisation sheds light on the evolution of Earth's largest lizards. Systematic Biology 70:877-890.

Pepper, M, JS Keogh. 2021. Life in the â€˜dead heart' of Australia: How the geohistory of the deserts shaped genetic diversity of arid zone lizards. Journal of Biogeography 48:716-746.

Noble, DWA, F Kar, S Nakagawa, JS Keogh, MJ Whiting. 2021. Sexual selection on performance traits in an Australian lizard with alternative reproductive tactics. Journal of Evolutionary Biology 34:451-464.

Kelleher, SR, AJ Silla, BC Scheele, JS Keogh, DA Hunter, JA Endler, PG Byrne. 2021. Disease influences male advertisement and mating outcomes in an endangered amphibian. Animal Behaviour 173:145-157.

Natusch, DJD, D Esquerré, JA Lyons, A Hamidy, AR Lemmon, EM Lemmon, A Riyanto, JS Keogh, SC Donnellan. 2021. Phylogenomics, biogeography and taxonomic revision of New Guinean pythons (Pythonidae, Leiopython) harvested for international trade. Molecular Phylogenetics and Evolution, In Press.

DG Chapple, +98 additional co-authors including JS Keogh, Shai Meiri. 2021. Conservation status of the world's skinks (Scincidae): Taxonomic and geographic patterns of extinction risk. Biological Conservation, In Press.

Byrne, PG, JS Keogh, D O'Brien, JD Gaitan-Espitia, D'Obrien, AJ Silla. 2021. Evidence that genetic compatibility underpins female mate choice in a monandrous amphibian. Evolution 75:529-541.

Brennan, IG. AR Lemmon, EM Lemmon, DM Portik, V Weijola, L Welton, SC Donnellan, JS Keogh. 2021. Phylogenomics of monitor lizards and the role of competition in dictating body size disparity. Systematic Biology 70:120-132.

Hime, PM, AR Lemmon, EM Moriarty Lemmon, E Scott-Prendini, JM Brown, RC Thomson, JD Kratovil, BP Noonan, RA Pyron, PLV Peloso, ML Kortyna, JS Keogh, SC Donnellan, RL Mueller, CJ Raxworthy, K Kunte, R Santiago, S Das, N Gaitonde, DM Green, J Labisko, J Che, DW Weisrock. 2021. Phylogenomics uncovers ancient gene tree discordance in the amphibian tree of life. Systematic Biology 70:49-66.

Eastwood, JA, P Doughty, MN Hutchinson, M Pepper. 2020. Revision of *Lucasium stenodactylus* (Boulenger, 1896; Squamata: Diplodactylidae), with the resurrection of *L. woodwardi* (Fry, 1914) and the description of a new species from south-central Australia. Records of the Western Australian Museum 35:063-086.

Geyle, HM, R Tingley, AP Amey, H Cogger, PJ Couper, M Cowan, MD Craig, P Doughty, DA Driscoll, RJ Ellis, JP Emery, A Fenner, MG Gardner, ST Garnett., GR Gillespie, MJ Greenlees, CJ Hoskin, JS Keogh, R Lloyd, J Melville, PJ McDonald, DR Michael, NJ Mitchell, C Sanderson, GM Shea, J Sumner, E Wapstra, JCZ Woinarski, D Chapple. 2020. Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology 27: 3-12. Check out the great interview on this by Dave Chapple. And also the great summary in The Conversation.

Maryan, B, IG Brennan, MN Hutchinson, LS Geidans. 2020. What's under the hood? Phylogeny and taxonomy of the snake genera Parasuta Worrell and Suta Worrell (Squamata: Elapidae), with a description of a new species from the Pilbara, Western Australia. Zootaxa 4778:1-47.

Vidal-Garcia, M, L Bandara, JS Keogh. 2020. ShapeRotator: Standardised Rigid Rotations of Articulated Three-Dimensional Structures. R package version 0.1.0. https://CRAN.R-project.org/package=ShapeRotator.

Novikova, PY, IG Brennan, W Booker, M Mahony, P Doughty, AR Lemmon, EM Lemmon, JD Roberts, L Yant, Y Van de Peer, JS Keogh, SC Donnellan. 2020. Polyploidy breaks speciation barriers in Australian burrowing frogs Neobatrachus. PLOS Genetics. https://doi.org/10.1371/journal.pgen.1008769

EsquerrÉ D, SC Donnellan, IG Brennan, AR Lemmon, EM Lemmon, H Zaher, F Grazziotin, JS Keogh. 2020. Phylogenomics, biogeography and morphometrics reveal rapid phenotypic evolution in pythons after crossing Wallace's line. Systematic Biology 69:1039-1051.

Skeels, A, D EsquerrÉ & M Cardillo. 2020. Alternative pathways to diversity across ecologically distinct lizard radiations. Global Ecology and Biodiversity, 29: 454-469.

Burbrink, FT, FG Grazziotin, RA Pyron, D Cundall, SC Donnellan, F Irish, JS Keogh, F Kraus, RW Murphy, B Noonan, S Ruane, CJ Raxworthy, AR Lemmon, EC Moriarty Lemmon, H Zaher. 2020. Interrogating genomic-scale data for Squamata (lizards, snakes, and amphisbaenians) shows no support for key traditional morphological relationships. Systematic Biology 69:502-520.

Natusch, DJD, D EsquerrÉ, JA Lyons, A Hamidy, AR Lemmon, EM Lemmon, A Riyanto, JS Keogh, SC Donnellan. Species delimitation and systematics of the green pythons (*Morelia viridis* complex) of Melanesia and Australia. 2020. Molecular Phylogenetics and Evolution 142:106640.

EsquerrÉ, D, D Ramirez-Ã• lvarez, C Pavon-Vazquez, J Troncoso-Palacios, CF GarÃn, JS Keogh, AD LeachÉ. 2019. Speciation across mountains: phylogenomics, species delimitation and taxonomy of the Liolaemus leopardinus clade (Squamata, Liolaemidae). Molecular Phylogenetics and Evolution 139:106524.

Australian National University

Moritz group

Stephen recently moved from the herp-diverse tropics to frigid Canberra, where he is now doing a postdoc investigating phenotypic predictors of introgression in Heteronotia and Gehyra geckos. He likes Canberra, but is nevertheless grateful for the absurd amount of tropical fieldwork he still gets to do.

Van Dyke, J.U., Thompson, M.B., Burridge, C.P., Castelli, M.A., Clulow, S., Dissanayake, D.S.B., Dong, C.M., Doody, J.S., Edwards, D.L., Ezaz, T., Friesen, C.R., Gardner, M.G., Georges, A., Higgie, M., Hill, P.L., Holleley, C.E., Hoops, D., Hoskin, C.J., Merry, D.L., Riley, J.L., Wapstra, E., While, G.M., Whiteley, S.L., Whiting, M., Zozaya, S.M. & Whittington, C.M. (accepted) Australian lizards are outstanding models for reproductive biology research. Australian Journal of Zoology.

Riedel, J., Zozaya, S.M., Hoskin, C.J. & Schwarzkopf, L. (2021) Parallel evolution of toepads in rock-dwelling lineages of a terrestrial gecko (*Heteronotia binoei*, Gekkota; Gekkonidae). Zoological Journal of the Linnean Society. zlaa167.

Vanderduys, E., Hoskin, C.J., Kutt, A.S., Wright, J.M., & Zozaya, S.M. (2020) Beauty in the eye of the beholder: a new species of gecko (Diplodactylidae: Lucasium) from inland north Queensland, Australia. Zootaxa. 4877(2): 291-310.

New South Wales

Australian Museum Herpetology & UNSW Sydney

https://australianmuseum.net.au/learn/collections/natural-science/herpetology/

The focus of the Australian Museum/UNSW Sydney lab remains amphibian and reptile conservation biology in Australia, SE Asia and the Pacific. However, unsurprisingly our travel (even into the Museum!) has been somewhat reduced since the last update. Despite this, we have conducted fieldwork throughout NSW, plus in the Northern Territory, Queensland, Victoria and Tasmania.

The biggest project in the AM Herpetology team remains FrogID (frogid.net.au), which has now put over 400,000 records of 204 species of frogs on the map since launching in November 2017. Please keep submitting calls - and keeping them in mind for helping your projects.

Jodi Rowley Curator, AM & UNSW Sydney) remains focused on the scientific outcomes of FrogID, frog systematics and taxonomy (esp. in Australasia), drivers of amphibian declines, and otherwise gathering information to inform conservation management.

Dane Trembath (Collections Technical Officer, AM) is always hard at work emptying freezers, identifying reptiles, and sneaking in some herpetological research! He has also recently returned from a Bush Blitz Expedition to Groote Eylandt in the Northern Territory.

Tom Parkin (Research Assistant) joined the Australian Museum in mid 2020 and has been working to resolve the taxonomy of a few challenging eastern Australian frog groups. In collaboration with Newcastle Uni, he has also coordinated surveys on the New England Tablelands to help determine the impact of the 2019/20 bushfires on two threatened frog species: *Litoria subglandulosa* and *Mixophyes balbus*. Despite the frog focus, he has recently co-authored two papers on urban snake ecology and the impacts of translocation using data collected while working as a government-contracted snake catcher in Darwin.

Chris Portway (Technical Officer, AM) has been working in a new role inventorying and digitising the AM's Herpetology collection. He has also been in the lab working on several projects detecting chytrid fungus using qPCR.

Nadiah Roslan (Project Coordinator: FrogID) joined the AM this past year, working as the 'glue' that holds the FrogID project together. From coordinating social media presence, digital app updates, and community engagement, Nadiah has worked with a cross-divisional team at AM to ensure FrogID continues as a leading citizen science project.

Tim Cutajar (PhD Student, AM, UNSW Sydney & University of Copenhagen and Research Assistant) is continuing his work with invertebrate-derived DNA. Having confirmed it as potentially useful for increasing detectability of rare or elusive frog species, he is now devoting his PhD to continue developing iDNA frog detection techniques and test their effectiveness against more established methods. In addition to iDNA work, Tim is working on an analysis of the conservation status of Southeast Asia's amphibians after wrapping up that region's part of the second Global Amphibian Assessment with Jodi Rowley, Harry Leung and Chris Portway. Tim has also almost completed an update on the distributions of Australia's frogs, which should be out soon.

Gracie Liu (PhD Candidate, AM & UNSW Sydney; FrogID Validator; Research Assistant) is continuing her PhD research into the effects of habitat modification on frogs. The first paper stemming from this research has now been published in Global Change Biology. It quantified the effects of anthropogenic habitat modification on 87 Australian frog species using over 126,000 FrogID observations and found that as many as 70 percent of the species examined were intolerant of habitat modification. Gracie has co-authored another paper on the effects of urbanisation on frog diversity across various spatial scales and is now looking into whether frog breeding phenology and calling behaviours are affected by habitat modification. She has also been gathering data on Booroolong frog and stony creek frog movements, genetics and chytrid prevalence and will be analysing these soon. Besides working on her PhD, Gracie has spent many hours validating frog calls for FrogID and has been involved in FrogID outreach.

Maureen Thompson (PhD Student, AM & UNSW Sydney and FrogID Validator) completed her manuscript using the FrogID data to look at meteorological factors most closely related to frog calling across the continent. She is working on a manuscript summarizing the response to a FrogID participant questionnaire on motivations, behaviour, and how those relate to willingness to optimize data collection.

Britt Mitchell (PhD Candidate, AM & UNSW Sydney; FrogID Validator) is now one year into her PhD and won 'best species science talk' at the UNSW annual postgraduate review forum. She is currently writing up her research focusing on the impact of the 2019/2020 bushfires on frog species across the continent and what the next steps are for conservation post-fire. Additionally, she has begun research into identifying what habitat in urban areas supports the greatest diversity of threatened frog species, as to help inform local government urban planning. She has published another paper on how urbanisation affects frogs locally, regionally, and across the continent with co-authors Corey Callaghan, Gracie Liu, Alistair Poore, and Jodi Rowley. Other than research, Britt has been validating frog calls for FrogID and has been involved in various outreach initiatives for FrogID, including a community BioBlitz in the Shellharbour region.

Jordann Crawford-Ash (Research Assistant & FrogID Validator, AM) has published two research papers from her previous honours research (UNSW &AM) this year, with co-author Jodi Rowley. The first was an investigation into the dynamics of the amphibian chytrid fungus infection in three frog species in Sydney. The second was a first look at the use of photo identification to identify individuals of the Blue Mountains Tree Frog, *Litoria citropa,* using their unique body markings. Jordann has additionally collaborated with Lisa Schwanz and Tegan Gale (UNSW) to co-author a paper on transgenerational plasticity in the Jacky Dragon, *Amphibolurus muricatus* that was published late last year. Jordann is still busy validating FrogID calls, and along with Chris Portway and other lab members she is investigating the presence of the amphibian chytrid fungus in our museum collections through swabbing historical specimens.

Chi Phan (FrogID Validator, AM) has been validating records for FrogID.

Ben Parkin (Research Assistant and FrogID validator) joined the museum in 2020 and has been assisting with fieldwork on a handful of projects, including collaborative surveys with Newcastle Uni aiming to assess the impact of the 2019/20 bushfires on *Litoria subglandulosa* and *Mixophyes balbus* in the New England Tablelands. Away from the field, Ben has been busy validating frog calls with the FrogID team.

Andrew Trevor-Jones (FrogID Validator) has been spending his time, especially in lockdown, validating records for FrogID.

Alana de Laive (Research Assistant and FrogID validator) joined the AM team this past year and has been busy validating records for FrogID, particularly those in the NT.

Philip Topham (FrogID validator and Research Assistant) joined the museum in 2020 and has been validating records for FrogID and assisted with fieldwork surveying the New England Tablelands for *Mixophyes balbus* and *Litoria subglandulosa* to help assess post-fire impacts.

Grace Gillard (Honours student, AM & UNSW Sydney) joined the AM as an Honours student in early 2021. She has been going "bonkers" listening to thousands of banjo frog calls in an effort to determine the extent to which habitat does (or does not) influence geographic variation in banjo frog calls. She is currently working on finishing up her analysis and writing her thesis.

Jessica Elliott-Tate (Honours student, AM & UNSW Sydney) has just started her honours project. The project using FrogID data is examining the variation in advertisement calls within Whistling Frogs. At the present moment, she is currently listening to and analysing the frog calls.

Glenn Shea (Research Associate) has largely been limited to completing manuscripts that haven't needed access to specimens to check details, as Covid has restricted access to specimens in museum collections locally, in other states and internationally. Luckily, there have been several large collaborative projects that have either been largely literature-based or have used only subsets of existing data, while other part-written mss. are on hold pending access to critical specimens (one day, borders and institutions will open again for more than a few days…..). He has recently completed and submitted several manuscripts dealing with nomenclatural issues in skinks, including family-level and genus-level problems. Waiting in the wings are descriptions of new *Eugongylus*, *Emoia*, *Sphenomorphus* and *Anilios* species, and more manuscripts dealing with skink nomenclature and conservation. Hannah Steel, a DVM student at the University of Sydney, completed her third-year research project in 2020 on morphological systematics of the *Glaphyromorphus crassicaudus* complex, although Covid limited access to specimens, and Glenn has spent the first part of 2021 gathering the data from missing collections in several lightning visits to Canberra, Perth and the Australian Museum to allow that project to be written up for publication. In 2022, Glenn will be supervising two more DVM3 students, Pradyumna Sathishkumaar and Xinlin Dong, looking at ontogeny and species diversity of skull morphology in *Tribolonotus* species.

Marion Anstis (Research Associate) is collaborating with the lab on frog systematics and taxonomy and in the search for the Peppered Tree Frog (*Litoria piperata*). Earlier this year before Covid restrictions struck again, she has been tackling the unidentified tadpoles in the Museum collection, and when that is done and restrictions eventually lift, she will try to help out with unidentified frogs.

Frank Lemckert continues to work as a research associate (or whatever is the preferred title) with the Australian Museum, fitting in studies of frogs amongst his consulting commitments with Eco Logical Australia (Frank thanks Eco Logical Australia for their ongoing support in continuing his research involvements with other institutions). He has been able to continue with monitoring *Litoria aurea* populations around Lake Meroo as part of the NSW Saving our Species program, which was especially important this year after the fires of 2019/20 burnt large parts of the study area. *L. aurea* are still present across the study area despite severe burning of many areas of forest and coastal swamps. There was less evidence of breeding, but lots of adult females were seen that should breed after the next rainfall event. One possible loser has been the *Limnodynastes peronii* which was super abundant in the area five years ago, but was rarely seen during the recent surveys. Frank has also been drawn into the world of taxonomy through collaboration with Mike Mahony and Steve Donnellan to produce two papers, one describing a new species of Heath Frog and the other a sub-species of Giant Burrowing Frog. Both identify important new taxa, splitting the ranges of current species, and leading to higher threat classifications that will no doubt give food for thought to regulators. Frank continues his involvement with assessing the status and management actions required for Australia frogs through his involvement with the Red Hot Frogs project overseen by Hayley Geyle and Graeme Gillespie. This has brought together the minds of some of Australia's best and brightest to plan for

the future of our frogs. And they even let Frank be involved. The NSW Biodiversity Assessment Method (BAM) survey guidelines for threatened NSW frogs is now available for managing frogs under the NSW Biodiversity Conservation Act (2016) and Frank has been working on draft guidelines for the survey of threatened NSW reptiles. He has also provided input into the Habitat Protection chapter and Communication and Education chapter of the Amphibian Conservation Action Plan that is being updated. Finally, Frank has been reliving old memories as part of a process to develop a fauna monitoring for forested areas of NSW being completed by the NSW Government. Frank has assisted so far by going through old data sets to complete analyses of trends in populations of frogs and provide a baseline of populations of reptiles and frogs dating back more than 25 years. This complex work is stretching his floppy mind more than a bit, but if it can get up and running the program will provide a great resource to understand broad changes in distributions of populations and lay the platform for more detailed understandings of how species respond to a range of forest disturbances. And the project may be using FrogID as part of its program, forming further synergies with the AM. Watch this space.

Chris Jolly (Research Associate) joined the Australian Museum as a Research Associate in early 2021 and has been working on unresolved cryptic species complexes amongst northern Australian reptiles. He is in the final stages of preparing a *Field Guide to the Reptiles of the Northern Territory.* He has recently published his first Australian Museum affiliated paper on the enlarged touch receptors in the male turtle-headed sea snake (*Emydocephalus annulatus*), which likely evolved to overcome the challenges imposed by an aquatic sex life.

Renee Catullo (Research Associate) began a position at University of Western Australia and now has to write one of these updates for her own lab. Check it out there! She still has a lot of projects with the Australian Museum though, both herps and mammals. Renee also took the FrogID validator quiz and aced it, but no one has asked her to be a validator yet.

Harry Leung, Vic Patterson, Cam Candy, and Mark FIsher (FrogID Validators/Research Assistants) are busy herping, dreaming of herping and/or validating frog calls.

Hal Cogger (John Evans Memorial Fellow), Ross Sadlier (Senior Fellow) haven't been in as much as we'd like due to COVID, but have remained productive, and a few other team members seem to have headed for the hills and didn't have access to the internet to give us an update (COVID will do that).

Research group publications in 2020-21

Alabai, M., Esau, T., Kekeubata, E., Esau, D., Waneagea, J., Lobotalau, L., Alick, J., Silas, J., Solome, L., Waneagea, J., Mousisi, K., Cutajar, T.P., Portway, C.D., MacLaren, D.J., & Rowley, J.J.L. (2020). Apparent absence of the amphibian chytrid fungus (Batrachochytrium dendrobatidis) in frogs in Malaita Province, Solomon Islands. Pacific Conservation Biology. https://doi.org/10.1071/PC20047

Bernstein J.M., Jackman T.R., Sadlier R.A., Wang Y. and Bauer A.M., 2021. A novel dataset to identify the endemic herpetofauna of the New Caledonian hotspot with DNA barcodes. Pacific Conservation Biology - https://doi.org/10.1071/PC20055

Bolitho, L.J., Rowley, J.J.L., Hines, H.B., & Newell, D. (2021). Occupancy modelling reveals a highly restricted and fragmented distribution in a threatened montane frog (*Philoria kundagungan*) in subtropical Australian rainforests. Australian Journal of Zoology. 67(4) 231-240.

Callaghan, C.T. & Rowley, J.J.L. (2020). A continental assessment of diurnality in frog calling behaviour. Austral Ecology. https://doi.org/10.1111/aec.12959

Callaghan, C.T., Liu, G., Mitchell, B.A., Poore, A.G.B. & Rowley, J.J.L. (2021). Urbanization negatively impacts frog diversity at continental, regional, and local scales. Basic and Applied Ecology 54: 64–74.

Callaghan, C.T., Poore, A.G.B., Mesaglio, T., Moles, A.T., Nakagawa, S., Roberts, C. Rowley, J.J.L., Vergés, A., Wilshire, J.H., Cornwell, W.K. (2020). Three frontiers for the future of biodiversity research using citizen science data. BioScience, biaa133.

Chapple, D.G., Roll, U., Böhm, M., Aguilar, R., Amey, A.P., Austin, C.C., Baling, M., Barley, A.J., Bates, M.F., Bauer, A.M., Blackburn, D.G., Bowles, P., Brown, R.M., Chandramouli, S.R., Chirio, L., Cogger, H., Colli, G.R., Conradie, W., Couper, P.J., Cowan, M.A., Craig, M.D., Das, I., Datta-Roy, A., Dickman, C.R., Ellis, R.J., Fenner, A.L., Ford, S., Ganesh, S.R., Gardner, M.G., Geissler, P., Gillespie, G.R., Glaw, F., Greenlees, M.J., Griffith, O.W., Grismer, L.L., Haines, M.L., Harris, D.J., Hedges, S.B., Hitchmough, R.A., Hoskin, C.J., Hutchinson, M.N., Ineich, I., Janssen, J., Johnston, G.R., Karin, B.J., Keogh, J.S., Kraus, F., Lebreton, M., Lymberakis, P., Masroor, R., Mcdonald, P.J., Mecke, S., Melville, J., Melzer, S., Michael, D.R., Miralles, A.,

Mitchell, N.J., Nelson, N.J., Nguyen, T.Q., Nogueira, C.D., Ota, H., Pafilis, P., Pauwels, O.S.G., Perera, A., Pincheira-Donoso, D., Reed, R.N., Ribeiro-Júnior, M.A., Riley, J.L., Rocha, S., Rutherford, P.L., Sadlier, R.A., Shacham, B., Shea, G.M., Shine, R., Slavenko, A., Stow, A., Sumner, J., Tallowin, O.J.S., Teale, R., Torres-Carvajal, O., Trape, J.-F., Uetz, P., Ukuwela, K.D.B., Valentine, L., Van Dyke, J.U., Van Winkel, D., Vasconcelos, R., Vences, M., Wagner, P., Wapstra, E., While, G.M., Whiting, M.J., Whittington, C.M., Wilson, S., Ziegler, T., Tingley, R. & Meiri, S. (2021). Conservation status of the world's skinks (Scincidae): taxonomic and geographic patterns in extinction risk. Biological Conservation 257: 109101.

Choquette, R.E., Angulo, A., Bishop, P.J., Phan, C.T.B., Rowley, J.J.L. (2020). The internet-based Southeast Asia amphibian pet trade. TRAFFIC Bulletin 32(2): 68-76.

Cogger. H.G. (2020). SnakeID. An Identic Lucid/Fact Sheet Fusion app. for the identification of Australian snakes. Published for both Android and ios operating systems through their respective App Stores.

Cornelis, J., Parkin, T. & Bateman, P.W. (2021). Killing them softly: a review on snake translocation and an Australian case study. Herpetological Journal, 31(3).

Crawford-Ash, J., & Rowley, J. J. (2021). Bad neighbours: amphibian chytrid fungus *Batrachochytrium dendrobatidis* infection dynamics in three co-occurring frog species of southern Sydney, Australia. *Diseases of Aquatic Organisms*, *143*, 101-108.

Crawford-Ash, J., & Rowley, J. J. (2021). Photo identification of individual Blue Mountains Tree Frogs (*Litoria citropa*). *Herpetology Notes*, *14*, 803-808.

Crowe-Riddell, J.M., Jolly, C.J., Goiran, C. & Sanders, K.L. (2021). The sex life aquatic: sexually dimorphic scale mechanoreceptors and tactile courtship in a sea snake *Emydocephalus annulatus* (Elapidae: Hydrophiinae). Biological Journal of the Linnean Society. blab069, https://doi.org/10.1093/biolinnean/blab069

de Laive, A.H., Schembri, B. & Jolly, C.J. (2021). Novel habitat associations and seasonality in threatened Mitchell's water monitors (*Varanus mitchelli*): Implications for conservation. Austral Ecology. https://doi.org/10.1111/aec.13029

Denzer, W., Cogger, H. and Böhme, W (2020). *Lacerta varia* – and then there were four: multiple use of the same species name for various lizards (Squamata: Lacertidae, Teiidae, Varanidae). Salamandra 56(4): 355–361

Emery, J-P, Mitchell, N.J., Cogger, H., Agius, A., Andrew, P., Arnall, S., Detto, T., Driscoll, D.A., Flakus, S., Green, P., Harlow, P., McFadden, M., Pink, C., Retallick, K., Rose, K., Sleeth, M., Tiernan, B., Valentine, L.E. & Woinarski, J.Z. (2021) The lost lizards of Christmas Island: A retrospective assessment of factors driving the collapse of a native reptile community. Conservation Science and Practice. ;3:e358 DOI: 10.1111/csp2.358

Geyle, H.M., Tingley, R., Amey, A.P, Cogger, H., Couper, P.J., Cowan, M., Craig, M.D., Doughty, P., Driscoll, D.A., Ellis, R.J, Emery, J.-P., Fenner, A., Gardner, M.G., Garnett, S.T., Gillespie, G.R., Greenlees, M.J., Hoskin, C.J., Keogh, J.S., Lloyd, R., Melville, J., Mcdonald, P.J., Michael, D.R., Mitchell, N.J., Sanderson, C., Shea, G.M., Sumner, J., Wapstra, E., Woinarski, J.C.Z. & Chapple, D.G. (2021) Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology 27(1): 3–12.

Hyman, I. T., Ahyong, S. T., Köhler, F., McEvey, S. F., Milledge, G., Reid, C. A. M. & Rowley, J. J. L. (2020). Impacts of the 2019–2020 bushfires on New South Wales biodiversity: a rapid assessment of distribution data for selected invertebrate taxa. Technical Reports of the Australian Museum 32: 1–17.

Kaiser, H., Thomson, S.A. & Shea, G.M. (2020) *Nawaran* Esquerré, Donnellan, Brennan, Lemmon, Lemmon, Zaher, Grazziotin & Keogh, 2020 is an invalid junior synonym of *Nyctophilopython* Wells & Wellington, 1985 (Squamata, Pythonidae): simple priority without *Zoobank* pre-registration. Bionomina 20: 47–54.

Liu, G., Rowley, J.J.L., Kingsford, R.T. & Callaghan, C.T. (2021). Species' traits drive amphibian tolerance to anthropogenic habitat modification. Global Change Biology 27(13): 3120–3132.

Liu, G., Cain, K. and Schwanz, L. (2020). Maternal temperature, corticosterone, and body condition as mediators of maternal effects in jacky dragons (*Amphibolurus muricatus*). Physiological and Biochemical Zoology, 93(6): 434-449.

Meiri, S., Avila, L., Bauer, A.M., Chapple, D.G., Das, I., Doan, T.M., Doughty, P., Ellis, R., Grismer, L., Kraus, F., Morando, M., Oliver, P., Pincheira-Donoso, D., Ribeiro-Junior, M.A., Shea, G., Torres-Carvajal, O.,

Slavenko, A. & Roll, U. (2020). The global diversity and distribution of lizard clutch sizes. Global Ecology and Biogeography 29(9): 1515–1530.

Melville, J., Chapple, D.G., Keogh, J.S., Sumner, J., Amey, A., Bowles, P., Brennan, I.G., Couper, P., Donnellan, S.C., Doughty, P., Edwards, D.L, Ellis, R.J., Esquerré, D., Fenker, J., Gardner, M.G., Georges, A., Haines, M.L., Hoskin, C.J., Hutchinson, M., Moritz, C., Nankivell, J., Oliver, P., Pavón-Vázquez, C.J., Pepper, M., Rabosky, D.L., Sanders, K., Shea, G., Singhal, S., Worthington Wilmer, J. & Tingley, R. (2021) A return-on-investment approach for prioritization of rigorous taxonomic research needed to inform responses to the biodiversity crisis. PLoS Biology 19(6): e3001210.

Nguyen, L. T., Tapley, B., Cutajar, T., Nguyen, C.T., Portway, C., Harding, L., Luong, H.V. & Rowley, J.J.L. (2020). A description of the tadpole of the Critically Endangered Botsford's leaf-litter frog (*Leptobrachella botsfordi*) with comments on the distribution and conservation status of the species. Zootaxa 4860: 293–300.

Parkin, T., Jolly, C.J., De Laive, A., & Von Takach, B. (2021). Snakes on an urban plain: Temporal patterns of snake activity and human–snake conflict in Darwin, Australia. Austral Ecology 46(3): 449–462.

Portway, C.D., Cutajar, T.P. & Rowley, J.J.L. (2020) Survey for amphibian chytrid fungus infection in the enigmatic Green-thighed Frog (*Litoria brevipalmata*). Herpetological Review 51(2): 252–253.

Portway, C.D., Cutajar, T.P., King, A. & Rowley, J.J.L. (2020) First evidence of the amphibian chytrid fungus likely driving dramatic frog community changes on the New England Tablelands of Eastern Australia. Herpetological Review. 51 (2), 247-251.

Rivera-Correa, M., Baldo, D., Candioti, F.V., Orrico, V.G.D., Blackburn, D.C., Castroviejo-Fisher, A., Chan, K.O., Gambale, P.G., Gower, D.J., Quah, E.S.H., Rowley, J.J.L., Twomey, E., & Vences, M. (2021). Amphibians in Zootaxa: 20 years documenting the global diversity of frogs, salamanders, and caecilians. Zootaxa 4979: 57–69.

Rowley, J.J.L., Callaghan, C. T. & Cornwell, W. K. (2020). Widespread short-term persistence of frog species after the 2019-2020 bushfires in eastern Australia revealed by citizen science. Conservation Science and Practice. e287.

Rowley, J.J.L., Le, D.T.T., Hoang, H.D., Cao, T.T. & Dau, V.Q. (2020). A new species of phytotelm breeding frog (Anura: Rhacophoridae) from the Central Highlands of Vietnam. Zootaxa. 4779 (3): 341–354.

Sadlier R.A., Bauer A.M., Wood R.L. Jr., and Jackman T.R., 2020. Massif Speciation Events in New Caledonian Lizards: Diversification in the genus Marmorosphax (Scincidae) tracks isolation on the islands ultramafic surfaces. Proceedings of the California Academy of Sciences Series 4, 66 (16): 353-379.

Schwanz, L. E., Crawford-Ash, J., & Gale, T. (2020). Context dependence of transgenerational plasticity: the influence of parental temperature depends on offspring environment and sex. *Oecologia*, *194*(3), 391-401.

Shea, G., Thomson, S. & Georges, A. (2020). The identity of *Chelodina oblonga* Gray 1841 (Testudines: Chelidae) reassessed. Zootaxa 4779(3): 419–437.

Shea, G.M. (2020). Book Review: Dragon Lizards of Australia: Evolution, Ecology and a Comprehensive Field Guide. Herpetological Review 51(3): 633–635.

Shea, G.M. (2021). Dr. John Mair, Captain Collet Barker, and the discovery of the Australian Keelback, *Tropidonophis mairii* (Serpentes, Colubridae). Bibliotheca Herpetologica 15(3): 18–28.

Shea, G.M. & Allison, A. (2021). A new species of *Sphenomorphus* (Squamata: Scincidae) from Mount Kaindi, Morobe Province, Papua New Guinea. Pp. 49–60 in, Biodiversity, biogeography and nature conservation in Wallacea and New Guinea Vol. 4. Entomological Society of Latvia, Riga.

Shea, G.M. & Rosado, J. (2021). *Mochlus mabuiiformis* (Loveridge, 1935) Mabuya-like Writhing Skink. Reduction in maximum size. African Herp News 75: 33–35.

Stuart, B. L. & Rowley,J.J.L (2020). A new Leptobrachella (Anura: Megophryidae) from the Cardamom Mountains of Cambodia. Zootaxa 4834 (4): 556–572.

Stuart, B. L., Schoen, S.N., Nelson, E.E.M, Maher, H., Neang, T., Rowley, J.J.L., McLeod, D.S. (2020). A new fanged frog in the Limnonectes kuhlii complex (Anura: Dicroglossidae) from northeastern Cambodia. Zootaxa 4894 (3): 451–473.

Stuart, B.L., Som, H.E., Neang, T., Hoang, H.D., Le, D.T.T., Dau, V.Q., Potter, K., & Rowley, J.J.L. (2020). Integrative taxonomic analysis reveals a new species of Leptobrachium (Anura: Megophryidae) from northeastern Cambodia and central Vietnam. Journal of Natural History. DOI: 10.1080/00222933.2020.1756498

Tapley, B., Cutajar, T., Nguyen. L.T., Portway, C., Mahony, S., Nguyen, C.T., Harding, L., Luong, H.V. & Rowley, J.J.L. (2021). A new potentially endangered species of *Megophrys* from Mount Ky Quan San, northwest Vietnam. Journal of Natural History 54: 2543–2575.

Tapley, B., Jervis, P., Nguyen, L.T., Portway, C., Nguyen, C.T., Luong, H.V., Kane, D., Brookes, L., Perkins, M.W., Ghosh, P., Wierzbicki, C., Shelton, J., Fisher, M.C. & Rowley, J.J.L. (2020). Prevalence of *Batrachochytrium dendrobatidis* Detected in Amphibians from Vietnam's Highest Mountains. Herpetological Review. 51(4), 726–732.

Tapley, B., Nguyen, L.T., Cutajar, T., Nguyen, C.T., Portway, C., Van Luong, H., and Rowley, J.J.L. (2020). The tadpoles of five Megophrys Horned frogs (Amphibia: Megophryidae) from the Hoang Lien Range, Vietnam. Zootaxa, 4845 (1): 35–52.

Tapley, B., Nguyen, L.T., Cutajar, T., Nguyen, C.T., Portway, C., Van Luong, H. & Rowley, J.J.L. (2020). The tadpoles of five *Megophrys* horned frogs (Amphibia: Megophryidae) from the Hoang Lien Range, Vietnam. Zootaxa 4845(1): 35–52.

Tapley, B., Nguyen, L.T., Nguyen, C.T., Hoang, G.T. & Cutajar, T.P. (2021) Oviposition sites of the Hoang Lien Horned Frog, *Megophrys hoanglienensis* (Tapley et al., 2018). Herpetology Notes 14: 937–939.

Tapley, B., Nguyen, L.T., Portway, C., Cutajar, T., Nguyen, C.T., Van Luong, H., Kane, D., Harding, L. & Rowley, J.J.L. (2020) A point endemic no more; a range extension for *Oreolalax sterlingae* (Nguyen et al., 2013) in Bat Xat District, Lao Cai Province, northern Vietnam. Herpetology Notes 13: 497–500.

Vera Candioti, F., dos Santos Dias, P. H., Rowley, J. J. L., Hertwig, S., Haas, A., & Altig, R. (2021) Anatomical features of the phytotelma dwelling, egg-eating, fanged tadpoles of *Rhacophorus vampyrus* (Anura: Rhacophoridae). Journal of Morphology. 2021;1–10.

Weaver, S., Callaghan, C., & Rowley, J. J. L. (2020). Anuran accents: continental-scale citizen science data reveal spatial and temporal patterns of call variability. Ecology and Evolution. https://doi.org/10.1002/ece3.6833

University of Newcastle

Conservation Science Research Group

Despite the University of Newcastle's "Frog Lab" morphing into the Conservation Science Research Group by joining with a bunch of mammal and bird folk, we still have a strong amphibian presence. Some big news from the frog team is the "retirement" of Prof Michael Mahony in late 2020. This retirement marked the "end" of a long and productive reign as co-leader of the Frog Lab. However, Mike's retirement also coincided with the establishment of a large post-fire research grant for which Mike is managing a diverse collaboration covering five institutional partners and nine frog species (hence the quotations mark around "retirement"). Therefore, we are fortunate that Mike is still very active within our group – although we are doing our best to give him a well-deserved break so he can do things like continue to publish new species descriptions (e.g. the 2020 description of the southern heath frog, *Litoria watsoni,* and the sub-species *Heleioporus flavopunctatus* just released). Other poignant news from our group includes the up-coming "retirement" of A. Prof. John Clulow – the other co-leader of the Frog Lab – at the end of this year. However, with the continuation of several established projects, we hold no illusions that John will really be going anywhere!

Although our leadership is slowly changing, we are all systems go on the research front. In rather exciting news, we received funding to undertake on-ground conservation actions for Littlejohn's tree frog, *Litoria littlejohni,* and the giant burrowing frog, *Heleioporus australiacus*. These actions will include the creation of new breeding ponds, reinforcement translocations, biobanking sperm, and establishing captive breeding colonies. As part of this project, we have formed a partnership with Aussie Ark to bolster our captive breeding and translocation capabilities, and are looking forward to working with a great group of conservationists. In September, we will welcome PhD candidate, Nadine Nolan, to the team to focus on factors influencing pond colonisation, and Darcie Brett who will begin an honours looking at refining sperm cryopreservation techniques for these species.

We have reached the half-way mark in our project looking at factors driving frog declines in protected habitats, led by Dr Alex Callen. Along with Masters students, Oliver Kelly and Rudi Weigner, and honours student Nina Herbertson, they have been making good progress establishing citizen science teams to assist with data collection in remote areas of the Blue Mountains, and have begun working with UoN chemists to investigate how changes in water chemistry caused by fire may be affecting the vulnerable New England tree frog, *Litoria subglandulosa* and stuttering frog, *Mixophyes balbus*.

PhD students, Samantha Wallace and Sarah Stock, who have been investigating the impact of longwall coal mining on Littlejohn's tree frog, are making good progress in their theses. Along with post-doctoral researcher, Dr Kaya Klop-Toker, they are set to publish their findings on Littlejohn's tree frog breeding habitat requirements, population genetic structure, and interactions between mining and chytridiomycosis, respectively, in the coming months. Furthermore, honours student Lucy Gill is getting to the interesting end of her project understanding the calling phenology of Littlejohn's tree frog. Watch this space!

This year has also seen the start of PhD candidates, Lynne Matthews and Samantha Sanders. Lynne is investigating site selection by green and golden bell frogs, *Litoria aurea*, living within compensatory habitats and how this influences chytrid infection, while Samantha is looking at the influence of salt on chytrid infection loads within coastal systems that have periods of sea-water inundation. PhD candidate Dean Lenga, who has been looking at the movement of green and golden bell frogs across compensatory habitat, is set to complete his thesis by the end of the year.

We are thrilled to announce the completion of several PhDs (those of you looking for skilled and talented post-docs, keep reading)! Lachlan Campbell and John Gould were each awarded their doctorates within the last year. Lachlan Campbell's project looked at optimising sperm cryopreservation techniques for goannas affected by cane toads in the Top End. John's thesis investigated the mating system of the unique Fletcher's frog. Since completion, Lachy has been working hard in a full-time lab tech role, and John has been busy publishing his amazing field observations on slug predation, underwater beetle walking habits, and the use of colouration for frog recapture studies. Rose Upton, Chad Beranek and Lachlan Howell also had their PhD theses accepted this year. Rose's project focused on optimising assisted reproductive technologies for frogs, including sperm cryopreservation and IVF. She is now implementing these skills in her new post-doctoral position at Louisiana State University AgCenter in Baton Rouge, Louisiana! Chad's project focused on changes in *L. aurea* population abundance driven by compensatory habitat, and Lachlan's project explored the feasibility, genetic benefits, and cost-effectiveness of integrating cryopreservation and biobanking of sperm in captive breeding colonies of amphibians (spoiler alert – biobanking has loads of benefits and is cost-effective!). We're super proud of the huge achievements made by each of these researchers – proving that even a global pandemic can't hold a good herper down!

Research group publications in 2020-21

Beranek, C.T., Maynard, C., McHenry, C., Clulow, J., and Mahony, M. (2021) Identifying a limiting factor in the population dynamics of a threatened amphibian: The influence of extended female maturation on operational sex ratio. Austral Ecology, In press.

Beranek, C.T., Mahony, S., and Scott, S. (2021) A significant range extension for the Western Soil-Crevice Skink *Proablepharus reginae* (Glauert 1960) and an updated reptile species list of Cape Range, Western Australia. Australian Zoologist, In press.

Beranek, C.T., Maynard, C., McHenry, C., Clulow, J., and Mahony, M. (2021) Rapid population increase of the threatened Australian amphibian *Litoria aurea* in response to wetlands constructed as a refuge from chytrid-induced disease and introduced fish. Journal of Environmental Management 291, 112638.

Beranek, C.T., Xu, G., Clulow, J., and Mahony, M. (2021) Preliminary evidence for a two-for-one deal: Wetland restoration for a threatened frog may benefit a threatened bat. Ecological Management & Restoration 22(1), 32-39.

Campbell, L., Clulow, J., Howe, B., Upton, R. M. O., Doody, S., Clulow, S. (2021). Efficacy of short-term cold storage prior to cryopreservation of spermatozoa in a threatened lizard. Reproduction, Fertility and Development, 555–561

Howell, L. G., Mawson, P. R., Frankham, R.. Rodger, J. C., Upton, R. M. O., Witt, R. R., Calatayud, N. E., Clulow, S., Clulow, J. (2021) Integrating biobanking could produce significant cost benefits and minimise inbreeding for Australian amphibian captive breeding programs. Reproduction, Fertility and Development, 573–587

Howell, L. G., Frankham, R.. Rodger, J. C., Witt, R. R., Clulow, S., Upton, R. M. O., Clulow, J. (2021). Integrating biobanking minimises inbreeding and produces significant cost benefits for a threatened frog captive breeding programme. Conservation Letters, vol. 14(2), 1-9

Klop-Toker, K., Wallace, S., Stock, S., Mahony, M., Hayward, M. The decline of Australian heath frogs and summary of threats. *In* Berryman, R., & Carol, G. (eds) Imperiled: The Encyclopedia of Conservation. Elsiver. In Press

Klop-Toker, K., Valdez, J., Stockwell, M., Fardell, L., Clulow, S., Clulow, J., Mahony, M. (2021). Improving breed-and-release programmes in the face of a threatening pathogen, *Batrachochytrium dendrobatidis*. *Aquatic Conservation*, In Press.

Klop-Toker, K., Callen, A., King, J., Beranek, C., Lenga, D., Valdez, J. W., Clulow, S., Pizzatto, L., Stockwell, M. P., Clulow, J., Mahony, M. J. (2021) Reintroduction of green and golden bell frogs into created habitats on Kooragang Island, Australia. *In* Soorae, P. S. (ed) Global Re-introduction Perspectives: 2020. IUCN/SSC Conservation Translocation Specialist Group.

Mahony, M., Moses, B., Mahony, S. V., Lemckert, F. L., & Donnellan, S. (2020). A new species of frog in the *Litoria ewingii* species group (Anura: Pelodryadidae) from south-eastern Australia. *Zootaxa* 4858(2).

Mahony. M. J., Penman, T., Bertozzi, T., Lemckert, F., Bilney, R., Donnellan, S. C. (2021). Taxonomic revision of south-eastern Australian giant burrowing frogs (Anura: Limnodynastidae: Heleioporus Gray). *Zootaxa*, *5016*(4), 451-489.

Upton, R. M. O., Clulow, S., Calatayud, N. E., Colyvas, K., Seeto, R. G. Y., Wong, L. A. M., Mahony, M. J., Clulow, J. (2021) Generation of reproductively mature offspring from the endangered green and golden bell frog Litoria aurea using cryopreserved spermatozoa. Reproduction, Fertility and Development. 562–572

University of New England

Reptile Ecology and Environmental Disturbance lab

We are very excited to write our inaugural ASH update for the Reptile Ecology and Environmental Disturbance Lab! The last year has been filled with highs and lows as a result of the COVID-19 pandemic, but the REED lab arose out of the ashes of 2020! Throughout 2020, Eric was working as a postdoc with Lin Schwarzkopf in the VertEco Lab, where he called home for the last 7 years. However, in late 2020, he was awarded a lecturership at the University of New England and the opportunity to start his own lab, where his research continues to investigate disturbance ecology, reptile ecology and conservation, and the impacts of landscape change on wildlife communities. Eric was awarded the coveted Mike Bull Award from the Nature Foundation to investigate nocturnal basking behaviours in freshwater turtles. Rosie Kidman joined the lab as an Honours student who will follow up on the nocturnal basking ecology project by examining the thermal ecology of basking turtles in collaboration with Don McKnight and Lin Schwarzkopf at JCU. In partnership with the LAZER lab (Deb Bower) at UNE, Eric is head-starting 2000 hatchling endangered bell's turtles to offset mortality by feral fox predation, and testing the effects of inundation by floodwaters on nest survival. Brad Traynor has joined the lab as a MSc student to assess the thermal ecology and potential threats of climatic change on southern angle-headed dragons in the temperate rainforests of New England under the guidance of Darryl Houston and herp legend Hal Heatwole.

McKnight, D.T., W. Wirth, L. Schwarzkopf, and E.J., Nordberg. 2021. Leech removal is not the primary driver of basking behavior in freshwater turtles. Ecology and Evolution. DOI: 10.1002/ece3.7876

Nordberg, E.J. and V. Cobb. 2021. Small nature preserves do not adequately support large-ranging snakes: movement ecology and site fidelity in a fragmented rural landscape. Global Ecology and Conservation 28(August 2021) e01715.

Nordberg, E.J., R. Denny, L. Schwarzkopf. 2021. An invasive species is more active, but not bolder than a native: geckos as a model system. Animal Behaviour 177:215-222.

Pillai, R., E.J. Nordberg, J. Riedel, and L. Schwarzkopf. 2020. Geckos cling best to, and prefer to use, rough surfaces. Frontiers in Zoology 17(32) 1-12.

Nordberg, E.J. and D.T. McKnight. 2020. Nocturnal basking behavior in a freshwater turtle. Ecology 101(7): e03048.

Riedel, J.1, E.J. Nordberg1, and L. Schwarzkopf. 2020. Ecological niche and microhabitat use of Australian geckos. Israel Journal of Ecology and Evolution 66(3-4) 209-222.

Pillai, R., E.J. Nordberg, J. Riedel, and L. Schwarzkopf. 2020. Non-linear variation in clinging performance with surface roughness in geckos. Ecology and Evolution 10:2597-2607.

Fushida, A., R. Pillai, J. Riedel, E.J. Nordberg, and L. Schwarzkopf. 2020. Can geckos increase shedding rate to remove fouling? Herpetologica 76(1):22-26.

Status and Threats of Afrotropical Amphibians. Amphibian Biology, Volume II, Part 7. Status of Conservation and Decline of Amphibians: Eastern Hemisphere. Eds: Harold Heatwole and Mark-Oliver Rodel. Chimaira Publishing.

University of New England

Lab of Applied Ecology and Ecological Restoration

www.lazer-une.com

Deb Bower is stoked that Eric has come to UNE and we are plotting for herpetological domination. Meanwhile, Hal Heatwole is a regular at our Super-lab meetings and Deb can't quite believe her luck.

LAZER includes the frog club with remote based PhD student Grant Webster, on a joint project with Mahony's toadlet with Simon Clulow; and Kyia Eveleigh studying the defence behaviour of frogs in the tablelands. In addition, Masters student Razzaq Sarker recently received minor corrections on his thesis researching the response of floodplain frogs to environmental flows. Honours student Leah Carr spent four months in the field measuring the response of threatened frogs to fire in the New England NP region and is busy writing up. Kimberley Miller is towards the end of her Masters on the attitudes of Australia's to frogs and reptiles.

The turtle research continues including the achievements of PhD student Lou Streeting in the Turtles Forever project on the Conservation of Bell's turtles. The project led by Martin Dillon from Local Land Services is attempting to release 2000 hatchlings into the wild this spring. Deb has also joined James Van Dyke, Ricky Spencer and Mike Thompson in an ARC linkage and a citizen science project on freshwater turtles. Download TurtleSAT! We are looking for students, so if you are interested in any degree type – get in touch.

Masters student Trish Flores continues to explore how rats might interact with Christmas Island Blue-tailed skinks. Jigme Wangyal finished a field guide on Reptiles of Bhutan and continues his PhD, which keeps changing thanks to COVID fun but includes bioclimatic modelling of Bhutanese reptiles.

Wetland work continues including research into farm dams and Upland Lagoons– a threatened ecological community in the New England Tablelands (with Dr Manu Saunders and Prof John Hunter). Masters student Gillian Backhouse has been busy categorising hydrology of these dynamic lagoons, Carmen Laidlaw is heading into the field to look at terrestrial insects, and Angela Symonds is finding out how people feel about them. Deb enjoys the highland copperheads and red-bellies that hang out during field work.

In other news, Deb was excited to have her children's story accepted for publication in 'The School Magazine', a publication that goes out to school children nationally. 'Daisy the Dragon' tells the story of a thorny devil and her first day at a new school. After Daisy's identity is questioned because she cannot fly or breathe fire, her class visits the natural history museum and learns about the diversity of dragons in Australia and all of their amazing adaptations. When Daisy demonstrates her very own superpower, her class discover she is indeed the coolest dragon of all. Deb was also promoted to level C, led the Reptiles chapter for CSIRO's new

publication on Wildlife Research in Australia: Practical and Applied Methods, and joined Arthur Georges and team for the Commonwealth's Species Expert Assessment Plan for freshwater turtles.

Publications

Bower, D.S; Jennings, Charlotte K; Webb, Rebecca J; Amepou, Yolarnie; Schwarzkopf, Lin; Berger, Lee; Alford, Ross A; Georges, Arthur; McKnight, Donald T; Carr, Leah; (2020) Disease surveillance of the amphibian chytrid fungus *Batrachochytrium dendrobatidis* in Papua New Guinea. Conservation science and practice e256

Brinkhoff, J, et al. (In Press) Remote sensing to characterize inundation and vegetation dynamics of upland lagoons. Ecosphere.

Geyle, H. M., et al. (2021). Red hot frogs: identifying the Australian frogs most at risk of extinction. Pacific Conservation Biology.

Hall J, Bender H, Parrish K, Taylor D, Spark P, Streeting L, Rose K. 2020. Squamous Cell Carcinoma in Two Wild Bell's Turtles (*Myuchelys bellii*). Journal of Wildlife Diseases.

Hampton-Smith, M., et al. (2021). A review of the current global status of blast fishing: Causes, implications and solutions." Biological Conservation 262: 109307.

Indraswari K, Bower DS, Tucker D, Schwarzkopf L, Towsey M, Roe P. 2020. Assessing the value of acoustic indices to distinguish species and quantify activity: A case study using frogs. Freshwater Biology 65:142-152.

McKnight, D. Carr, L. J., Bower, D. S., Schwarzkopf, L., Alford, R. A., Zenger, K.R., (In Press) Infection dynamics, dispersal, and adaptation: Understanding the lack of recovery in a remnant frog population following a disease outbreak. Heredity

Saunders, M., Bower, D.S., Mika, S., Hunter, J. (2020) Condition thresholds in Australia's threatened ecological community listings hinder conservation of dynamic ecosystems. Pacific Conservation Biology.

Simões, B.F., Gower, D.J., Rasmussen, A.R., Sarker, M.A., Fry, G.C., Casewell, N.R., Harrison, R.A., Hart, N.S., Partridge, J.C., Hunt, D.M. and Chang, B.S., 2020. Spectral Diversification and Trans-Species Allelic Polymorphism during the Land-to-Sea Transition in Snakes. Current Biology.

Wangyal J., Bower, D. S., et al. (2020) New Herpetofaunal Records from the Kingdom of Bhutan Obtained through Citizen Science. Herpetological Review 51(4), 790–798

Bower, D.S., Somaweera, R., Clemann, N., Crowe-Riddell, J.M., Clulow, S., Greenlees, M.J., Howard, K., Kuchling, G., McKnight, D.T., Melville, J., Schaffer, J., Schwarzkopf, L., Spielman, D., Streeting, L., Vanderduys, E., Zdenek, C.N (in press) Reptiles. In: Wildlife Research in Australia: Practical and Applied Methods (Eds BP Smith, HP Waudby, C Alberthsen, and JO Hampton). CSIRO Publishing: Melbourne, Australia.

Flint, N., King, A.J., Wooden, I., Serena, M., Healy, S., Bower, D.S., Morgan, D.L., Hardie, S.A., Raadik, T., Roberts D.T., Ocock. J., Research methods for freshwater animals. Research methods for freshwater animals. In: Wildlife Research in Australia: Practical and Applied Methods (Eds BP Smith, HP Waudby, C Alberthsen, and JO Hampton). CSIRO Publishing: Melbourne, Australia.

Morrant, DS, Turner, JM, Jensen, MA, Hansen NA, Bower DS, Körtner G, Meek P, Pestell AJL, Rismiller PD, Waudby HP, Amos C (in press). Wildlife tracking methods. In: Wildlife Research in Australia: Practical and Applied Methods (Eds BP Smith, HP Waudby, C Alberthsen, and JO Hampton). CSIRO Publishing: Melbourne, Australia.

Waudby HP, Burns PA, Jensen MA, Hampton JO, Hunter H, McKnight DT, Pestell AJL, Bengsen AJ, Bower D, Coulson G, Heard G, de Laive A, Jolly CJ, Hale S, Fancourt BA, Kelleher SR, Petit S, Behrendorff L, Lumsden LF, McGregor M (in press). Wildlife marking methods. In: Wildlife Research in Australia: Practical and Applied Methods (Eds BP Smith, HP Waudby, C Alberthsen, and JO Hampton). CSIRO Publishing: Melbourne, Australia.

Waudby HP, Turner JM, Coulson G, Taggart D, Watson D, Bengsen AJ, Meek PD, Bower DS, Thompson S, Lumsden L, Hampton JO, Death C, Thompson G, Finlayson G, Hamilton DG, Petit S, Dunlop J, Bentley J, Vanderuys E, Ballard GA, Morrant DS (in press). Wildlife capture methods. In: Wildlife Research in Australia: Practical and Applied Methods (Eds BP Smith, HP Waudby, C Alberthsen, and JO Hampton). CSIRO Publishing: Melbourne, Australia.

University of Sydney

Whittington/Thompson Lab

The lab is continuing its research on the evolution of viviparity and other aspects of the physiology of reproduction under the guidance of Camilla Whittington, while Mike Thompson is enjoying life on his farm in South Australia and continues to co-supervise students via Skype and email. Camilla and collaborators Catherine Grueber (USyd) and Scott Edwards (Harvard) received an ARC Discovery Grant to study transitional forms of pregnancy in Australian skinks. From South Australia, Mike has focussed locally on turtle research. Together with James Van Dyke (La Trobe), Ricky Spencer (WSU) and Deb Bower (UNE), he is part of a successful ARC Linkage grant, and a National Citizen Science grant to study turtles, mainly in south-eastern Australia. The grants include an impressive range of partner organisations in NSW, Vic, ACT and SA. Aims include establishing methods to enhance the survival of turtle eggs to hatching, engaging community groups to manage recruitment of hatchling turtles, updating and improving TurtleSAT, and measuring long-term survival of turtle hatchlings.

Despite the ravages of covid shutdowns, work in the lab has continued as much as possible. We were very lucky to be able to do some limited fieldwork over the last summer, in between lockdowns, which meant we could progress some of our projects. Camilla and Chris Friesen (University of Wollongong) embarked on a tour of SA and NSW to catch painted dragons and skinks for multiple projects, somehow narrowly missing border lockdowns and bringing back enough data to keep the lab busy for a while. Claudia Santori has graduated with her PhD focused on turtle conservation, supervised by Mike, Camilla, Ricky, and Van! Charles Foster (postdoc) continued his work on Australian skinks and has been busy analysing a huge amount of placental transcriptome data from a range of skinks as part of an ARC-funded project with Camilla, Mike and Van studying vertebrate placental function. Charles recently moved to UNSW to apply his bioinformatics expertise to the evolutionary genomics of covid-19, but we are assured that he misses lizards! Mitchell Hodgson (postdoc) has just joined the lab, and will be bringing his dragon thermal physiology expertise to bear on questions around viviparity evolution in Australian skinks. Stephanie Liang is continuing her work with *Saiphos equalis* for her PhD, after completing her Honours with us last year. She has been very successful in gaining funding for her project via the Australian Museum's Peter Rankin Trust Fund, and the Linnean Society of NSW. Deirdre Merry (continuing PhD, University of Tasmania; primary supervisor Geoff While) continues to study the mechanisms underlying parturition in Egernia group skinks and has been successful in gaining funding for her project via a Holsworth Wildlife Research Endowment. Deirdre usually spends several weeks at a time at USyd carrying out her molecular work, but covid has totalled her travel plans several times now, so she has become very adept at finding plan B's. Jessica Dudley (postdoc), who was working on projects mostly focused on seahorse reproduction, has moved to Oliver Griffith's lab at Macquarie to study marsupial reproduction. Several other students in the lab are studying non-herps, but addressing similar questions about the evolution of viviparity, including Alice Buddle (shark viviparity, PhD 2021), who recently completed her PhD and now continues with us as a research assistant, and Zoe Skalkos (seahorse pregnancy, current PhD student). The very glittery Jacquie Herbert continues to impart her vast store of lizard-catching wisdom to each new member of the lab.

Santori C, Spencer R, Thompson M, Whittington C, Van Dyke J (2021) Hatchling short-necked turtles (*Emydura macquarii*) select aquatic vegetation habitats, but not after one month in captivity. Aquatic Ecology, doi: 10.1007/s10452-020-09813-6

Santori C, Spencer R, Thompson M, Whittington C, Van Dyke J (2021) Changes in participant behaviour and attitudes are associated with knowledge and skills gained by using a turtle conservation citizen science app. In press, People and Nature, doi: https://doi.org/10.1002/pan3.10184

Buddle A, Van Dyke J, Thompson M, Simpfendorfer C, Murphy C, Dowland S, Whittington C (2021). Structure of the paraplacenta and the yolk sac placenta of the viviparous Australian sharpnose shark, *Rhizoprionodon taylori*. Placenta, 108:11-22

Foster C, Thompson M, Van Dyke J, Brandley M, Whittington C. (2020). Emergence of an evolutionary innovation: Gene expression differences associated with the transition between oviparity and viviparity. Molecular Ecology, 29(7): 1315-1327

Paul J, Kemsley J (co-first author), Butler T, Jorge J, Thompson M, Smith R, Whittington C (2020). A comparison of uterine contractile responsiveness to arginine vasopressin in oviparous and viviparous lizards. Journal of Comparative Physiology B, 190(1): 49-62.

Santori C, Spencer R, Thompson M, Whittington C, Burd T, Currie S, Finter T, Van Dyke, J (2020). Scavenging by threatened turtles regulates freshwater ecosystem health during fish kills. Scientific Reports, 10:14383

Whittington C, Friesen C. (2020). The evolution and physiology of male pregnancy in syngnathid fishes. Biological Reviews. doi: 10.1111/brv.12607 95 (5): 1252-1272

Skalkos Z, Van Dyke J, Whittington C. (2020). Paternal nutrient provisioning during male pregnancy in *Hippocampus abdominalis*. Journal of Comparative Physiology B, 190 (5): 547-556

Laird M, Hansen L, McAllan B, Murphy C, Thompson M. (2020) Uterine epithelial remodelling during pregnancy in the marsupial *Monodelphis domestica* (Didelphidae): Implications for mammalian placental evolution. Journal of Anatomy, 236:6, 1126-1136

Buddle A, Otway N, Van Dyke J, Thompson M, Murphy C, Dowland S, Simpfendorfer C, Ellis M, Whittington C. (2020) Structural changes to the uterus of the dwarf ornate wobbegong shark (*Orectolobus ornatus*) during pregnancy. Journal of Morphology, doi:10.1002/jmor.21109

Khan S, Whittington C, Thompson M, Byrne M (2020). Temporal pattern of offspring release and degree of parental investment in two viviparous asterinid sea stars with an overview of matrotrophy and offspring size variation in echinoderms that care for their offspring. Invertebrate Reproduction and Development, 64:4, 249-261, doi: 10.1080/07924259.2020.1764117

University of Wollongong

Friesen Lab of Evolutionary Ecology and Physiology

We had two great First Class Honours students finish in 2020-21:

- Daniel Ritchie: Geographic variation in thermal physiological traits: the role of thermal stress on telomere length in a polymorphic ectothermâ€•
- Sandra Chatham: Geographic variation and sexual selection in a polymorphic agamid.

Despite COVID we managed to take an epic fieldtrip through South Australia documenting the phenotypic diversity of painted dragon lizards spring 2020 (fingers crossed we can do it again spring 2021!).

Along with Dan Noble at ANU, we won an ARC DP in the 2021 round!

Dr Friesen won a UOW Prioritising Emerging Research Leaders Fellowship.

https://www.christopherfriesen.net/

Friesen CR, MR Wilson, N Rollings*, J Sudyka, M Giraudeau, CM Whittington, and M Olsson. 2021. Exercise training has morph-specific effects on telomere, body condition and growth dynamics in a color-polymorphic lizard. Journal of Experimental Biology

Friesen CR, RT Mason, EJ Uhrig. 2021. Postcopulatory sexual selection as a driver of sex- and population-specific kidneys mass in garter snakes? Biological Journal of the Linnean Society

Friesen CR, AF Kahrl, M Olsson. 2020. Sperm competition in squamate reptiles. Special Issue 50 years of sperm competition in Philosophical Transactions of the Royal Society B

Friesen CR, DWA Noble, M Olsson. 2020. The role of oxidative stress in postcopulatory selection. Special Issue 50 years of sperm competition in Philosophical Transactions of the Royal Society B

Kar F*, S Nakagawa, CR Friesen, D Nobel. 2021. Individual variation in thermal plasticity and its impact on mass-scaling. Okios

Friesen CR, N Rollings*, M Wilson, CM Whittington, R Shine, M Olsson. 2020. Covariation in superoxide, sperm telomere length and velocity in a polymorphic reptile. Behavioral Ecology and Sociobiology.

Lindsay WR, CR Friesen, C Sihlbom, J BergstrÖm, E Berger, M Wilson, M Olsson. 2020. Vitellogenin offsets oxidative costs of reproduction in female painted dragon lizards. Journal of Experimental Biology.

Whittington CM, CR Friesen. 2020. The evolution of male viviparity from egg-brooding in syngnathid fishes. Biological Reviews.

Rollings N*, HL Waye, RW Krohmer, EJ Uhrig, RT Mason, M Olsson, CM Whittington, CR Friesen. 2020. Sperm telomere length correlates with blood telomeres and body size in red-sided garter snakes, *Thamnophis sirtalis parietalis*. Journal of Zoology * student co-author

Macquarie University

Shine Lab

Rick Shine is still working part-time at Macquarie Uni, and still enjoying it, although COVID lockdowns have reduced opportunities for the collegial discussions that were such a hallmark of Rick's first year there in 2019. Rick is also Emeritus at Sydney Uni, although the lockdown has meant that he rarely gets there. The group is still organised by Melanie Elphick, who has run the lab (initially at University of Sydney) for more than 20 years. ARC grants support two postdocs, Georgia Ward-Fear and Greg Brown, who work in the tropics. A third longtime cane toad NSW-based postdoc, ASH legend Matt Greenlees, has now moved on to other opportunities.

Unable to splash around in tropical reef shallows for sea snakes because of COVID restrictions, Rick has spent most of his time staring at a computer screen. With some time to spare, he managed to convince a few of his recently-graduated Ph D students to work with him on publishing a few more chapters from their theses. So thanks Uditha Wijethunga, Sam McCann, Georgia Kosmala, Cam Hudson, and watch out, Dan Natusch! You can run, but you can't hide!

Rick's ex-postdocs also continue to produce a steady stream of papers from the Great Toad Frenzy conducted under Rick's ARC Laureate Fellowship. Simon Ducatez has landed an academic position in Tahiti, yes, it sounds tough, and he and Jayna DeVore are launching into French Polynesian research in between grinding out some amazing stories about the Australian cane toad invasion. Michael Crossland continues to molest innocent tadpoles to clarify the lives of these mysterious little animals, but as a collaborator rather than as a postdoc. Rick's genetics collaborator Lee Ann Rollins (Uni of NSW) has an increasingly large bunch of students peering into the mechanistic basis of the dramatic evolutionary shifts that toad have accomplished during their Australian invasion. Having co-written several papers with Lee Ann on topics like epigenetics, viromes and microbiomes, Rick's next challenge is to work out what those words mean.

Rick also decided to use the COVID-induced quiet time to write up the results from his 20-year mark-recapture project on sea snakes (*Emydocephalus annulatus*, plus a few Hydrophis and Aipysurus) in New Caledonia. Working with collaborators Claire Goiran and Vinay Udyawer, the numbers are being crunched and the papers are flowing out as smoothly as a sea snake sliding between coral bommies.

Melanie Elphick is now in her 3rd year with Rick at Macquarie University as Senior Research Coordinator, and also maintains an Honorary Affiliation at USYD where she has been spending time painstakingly going through old samples and equipment, cleaning out freezers etc. to vacate the many fieldstores and animal house rooms the lab group once occupied. With most of the USYD work finished Mel has been able to spend more time at MQ, strengthening relationships with her new colleagues and learning how to navigate the ever-changing digitalization of administrative tasks. When she is not tackling admin, Mel's favourite job is assisting with manuscript preparation. With Rick at the helm there is always a steady flow of formatting, figure production, copyediting and proofreading to do!

Greg Brown, the planet's longest-running postdoc (now over 20 years with Rick and Mel) continues to enjoy the wild social whorl of Middle Point Research Station, outside Humpty Doo, which in turn is outside Darwin. With the reduction in the size of Rick's group, Greg is now free to spend even less time conversing with fellow human beings, and more time chatting with superior creatures like cane toads and snakes. His major project involves an ARC-funded study to look at coevolution of toads and their lungworm parasites. Never in the field of science has any human being raised so many cane toads, in so many different experimental conditions.

Georgia Ward-Fear commutes between Tasmania and Broome, running our large ARC-funded collaborative project on buffering native predators against cane toads by teaching them that the warty little newcomers are poisonous. In May this year Georgia relocated to the Kimberley to prevent more COVID disruption to the research (and decrease uni paperwork!) and is currently engaging with multiple indigenous groups on Country, helping them prepare for the oncoming invasion with conservation works.

Georgia was the primary supervisor for Honours student Abhi Aiyer's project on freshwater crocodile responses to toads (through Uni of Sydney). The in-situ taste aversion protocol they developed will hopefully help to buffer vulnerable populations from predicted impacts as the toad frontline continues to travel westward into the Kimberley. Abhi had a wonderful time being initiated into the world of herpetology and has developed a passionate love for both toads and freshies lurking deeper underwater. Abhi's project is now informing DBCA management strategies planned for the late dry season this year. Georgia is currently deep in the data analysis phase of her postdoc, but emerges to do bouts of fieldwork, some collaborative written works, guest lectures via Zoom and outreach as part of her role as a Superstar of STEM. Georgia was also recently named a NSW Young Tall Poppy.

Matt Greenlees has managed to pick up a bit of consulting work - some involving cane toads, some involving geckos - so all satisfactorily herpetological. At the same time he remains optimistic (why stop now) about continuing in academia at some point in the not too distant future. Otherwise, it's all lockdown and cocktails!

Lachlan Pettit, Ricks' 62nd (and last) Uni of Sydney postgraduate student, co-supervised by Georgia and Matt Crowther, has submitted his thesis and obtained his degree. Lachlan drove enormous distances to compare goanna populations before and after the arrival of cane toads. On the day that Lachlan submitted his thesis, the goannas of eastern and northern Australia breathed a large collective sigh of release. It's difficult to relax when all those hidden cameras are catching your every move.

Two Macquarie Uni students in the Masters Research program have worked on cane toad projects in northeastern NSW, co-supervised by Rick and Matt Greenlees. Lincoln Macgregor mapped the toad's invasion through that area, showing an overall slow rate of expansion and frequent retractions, apparently driven by variable weather conditions. Shannon Kaiser radio-tracked toads through recently-burnt and unburnt areas to look at how the 2019-20 mega-bushfires affected toad biology. He also dissected an absurdly large number of toads to explore impacts of the fires on issues such as toad sizes, condition and diet.

Ironically for someone who has spent so much time at ASH conferences extolling the superiority of reptiles over amphibians, Rick has been drawn ever further into the dark world of frog ecology. He and Simon Clulow (who has since moved from Macquarie to the University of Canberra) somehow managed to lure/seduce/kidnap Ph D student Anthony Waddle, from the University of Melbourne, to conduct a study on Green and Golden Bell Frogs - and in particular, how to render frogs less vulnerable to chytrid fungus. The work has gone well but when the COVID lockdown hit, and student volunteers were banned from campus, Rick had to step up and take on the role of Anthony's assistant to keep the trials running. Thousands of swabs later, Rick still can't shake the feeling that the damn frogs are laughing at him.

Ward-Fear, G., G. B. Pauly, J. E. Vendetti, and R. Shine. 2020. Authorship: protocols should include citizen scientists. Nature 578:363.

Baeckens, S., S. Blomberg, and R. Shine. 2020. Inclusive science: ditch archaic terms. Nature 580:185.

Clarke, G. S., C. M. Hudson, and R. Shine. 2020. Encounters between freshwater crocodiles and invasive cane toads in north-western Australia: does context determine impact? Australian Zoologist 41:94-101.

Nankivell, J. H., C. Goiran, M. Hourston, R. Shine, A. R. Rasmussen, V. A. Thomson, and K. L. Sanders. 2020. A new species of turtle-headed sea snake (Emydocephalus: Elapidae) endemic to Western Australia. Zootaxa 4758:141-156.

Ward-Fear, G., G. B. Pauly, J. E. Vendetti, and R. Shine. 2020. Authorship protocols must change to credit citizen scientists. Trends in Ecology and Evolution 35:187-190.

Meiri, S., A. Feldman, R. Schwarz, and R. Shine. 2020. Viviparity does not affect the numbers and sizes of reptile offspring. Journal of Animal Ecology 89:360-369.

Cayuela, H., A. Valenzuela-Sanchez, L. Teulier, Ã• . MartÃnez-Solano, J. LÉna, J. MerilÃ¤, E. Muths, R. Shine, L. Quay, M. DenoÃ«l, J. Clobert, and B. R. Schmidt. 2020. Determinants and consequences of dispersal in vertebrates with complex life cycles: a review of pond-breeding amphibians. Quarterly Review of Biology 95:1-36.

Baird, T. A., T. D. Baird, and R. Shine. 2020. War and Peace: plasticity of aggression and the social context of displays in male Australian Water Dragons. Evolutionary Ecology 34:73-88.

DeVore, J. L., R. Shine, and S. Ducatez. 2020. Urbanization and translocation disrupt the relationship between host density and parasite abundance. Journal of Animal Ecology 89:1122-1133.

Natusch, D., J. Lyons, Mumpuni, A. Riyanto, and R. Shine. 2020. Harvest effects on blood pythons (Python brongersmai) in North Sumatra. Journal of Wildlife Management 84:249-255.

Hudson, C. M., M. Vidal-GarcÃa, T. G. Murray, and R. Shine. 2020. The accelerating anuran: evolution of locomotor performance in cane toads (Rhinella marina, Bufonidae) at an invasion front. Proceedings of the Royal Society B 287:20201964.

Kelehear, C., and R. Shine. 2020. Tradeoffs between dispersal and reproduction at an invasion front of cane toads in tropical Australia. Scientific Reports 10:486.

Goiran, C., and R. Shine. 2020. The ability of damselfish to distinguish between dangerous and harmless snakes. Scientific Reports 10:1377.

Shine, R., and S. Spawls. 2020. An ecological analysis of snakes captured by C.J.P. Ionides in eastern Africa in the mid-1900s. Scientific Reports 10:5096.

Goiran, C., G. P. Brown, and R. Shine. 2020. Niche partitioning within a population of sea snakes is constrained by ambient thermal homogeneity and small prey size. Biological Journal of the Linnean Society 129:644-651.

Pike, D. A., E. A. Roznick, J. K. Webb, and R. Shine. 2020. Life history and ecology of the Elegant Snake-eyed Skink *Cryptoblepharus pulcher* in southeastern Australia. Australian Journal of Zoology 67:51-58.

Ward-Fear, G., G. P. Brown, and R. Shine. 2020. Within-population variation in dietary traits: implications for vulnerability and impact of imperilled keystone predators. Ecosphere 11:e03136.

McCann, S., M. Crossland, and R. Shine. 2020. Exposure of cane toad hatchlings to older conspecifics suppresses chemosensory food tracking behaviour and increases risk of predation post-exposure. PLoS One 15:e0233653.

Pettit, L., S. Ducatez, J. L. DeVore, G. Ward-Fear, and R. Shine. 2020. Diurnal activity in cane toads (Rhinella marina) is geographically widespread. Scientific Reports 10:5723.

Pike, D. A., E. A. Roznick, J. K. Webb, and R. Shine. 2020. Life history of the coppertail skink (*Ctenotus taeniolatus*) in southeastern Australia. Herpetological Conservation and Biology 15:409-415.

Greenlees, M., G. P. Brown, and R. Shine. 2020. Pest control by the public: impact of hand-collecting on the abundance and demography of cane toads (*Rhinella marina*) at their southern invasion front in Australia. Global Ecology and Conservation 23:e01120.

Friesen, C., N. Rollings, M. Wilson, C. Whittington, R. Shine, and M. Olsson. 2020. Covariation in superoxide, sperm telomere length and sperm velocity in a polymorphic reptile. Behavioral Ecology and Sociobiology 74:74.

Murphy, K. M., R. S. Radder, R. Shine, and D. A. Warner. 2020. Lizard embryos prioritize post-hatching energy reserves over increased hatchling body size during development. Physiological and Biochemical Zoology 93:339-346.

Shine, R., T. G. Shine, G. P. Brown, and C. Goiran. 2020. Life history traits of the sea snake *Emydocephalus annulatus*, based on a 17-yr study. Coral Reefs 39:1407-1414.

Sarma, R. R., R. J. Edwards, O. L. Crino, H. J. F. Eyck, P. D. Waters, M. R. Crossland, R. Shine, and L. A. Rollins. 2020. Do epigenetic changes drive corticosterone responses to alarm cues in larvae of an invasive amphibian? Integrative and Comparative Biology 60:1481-1494.

Rivory, P., G. Brown, C. Shilton, R. Shine, and J. Å lapeta. 2020. Apparent lack of spill-over of parasites from an invasive anuran: PCR detects Entamoeba in cane toads (*Rhinella marina*) but not in sympatric Australian native frogs. International Journal for Parasitology: Parasites and Wildlife 12:207-213.

Goiran, C., G. P. Brown, and R. Shine. 2020. The behaviour of sea snakes (*Emydocephalus annulatus*) shifts with the tides. Scientific Reports 10:11346.

McCann, S, M. Crossland, M. Greenlees, and R. Shine. 2020. Field trials of chemical suppression of embryonic cane toads (*Rhinella marina*) by older conspecifics. Ecology and Evolution 10:10177-10185.

Kosmala, G., G. P. Brown, and R. Shine. 2020. Colonisation history affects heating rates of invasive cane toads. Scientific Reports 10:12553.

Kosmala, G., G. P. Brown, and R. Shine. 2020. Thin-skinned invaders: Geographic variation in the structure of the skin among populations of cane toads (*Rhinella marina*). Biological Journal of the Linnean Society 131:611-621.

Kosmala, G., G. P. Brown, and R. Shine. 2020. Laid-back invaders: cane toads (*Rhinella marina*) down-regulate their stress responses as they colonize a harsh climate. Global Ecology and Conservation 24:e01248.

Kosmala, G., G. P. Brown, R. Shine, and K. Christian. 2020. Skin resistance to water gain and loss has changed in cane toads (*Rhinella marina*) during their Australian invasion. Ecology and Evolution 10:13071-13079.

Shine, R., G. Ward-Fear, and G. P. Brown. 2020. A famous failure: why were cane toads an ineffective biocontrol in Australia? Conservation Science and Practice 2:e296.

Udyawer, V., C. Goiran, O. Chateau, and R. Shine. 2020. Swim with the tide: tactics to maximise prey detection by a specialist predator, the greater sea snake (*Hydrophis major*). PLoS One 15:e0239920.

Ward-Fear, G., G. P. Brown, and R. Shine. 2020. Predators learning to avoid toxic prey: a study on individual variation among free-ranging lizards. Behaviour 157:1153-1172.

Pettit, L., G. Ward-Fear, and R. Shine. 2020. To coexist with a toxic invader, choose your meals carefully. Scientific Reports 10:21866.

Shine, R. 2021. Foreword. Pages **-** in Strategies for Conservation Success in Herpetology (S. C. Walls and K. M. O'Donnell, eds.), Society for the Study of Amphibians and Reptiles, Herpetological Conservation Series 4.

Shine, R. 2021. Never work on a species that is smarter than you are. Pages **-** in Crump, M. (ed.), Tales from the Field, Cornell Univ. Press, Ithaca, NY.

Natusch, D., J. Lyons, and R. Shine. 2021. Rainforest pythons flexibly adjust foraging ecology to exploit seasonal concentrations of prey. Journal of Zoology 313:114-123.

DeVore, J. L., M. Crossland, and R. Shine. 2021. Tradeoffs affect the adaptive value of plasticity: Stronger cannibal-induced defenses incur greater costs in toad larvae. Ecological Monographs 91:e01426.

Shine, R., Udyawer, V., and C. Goiran. 2021. Antipredator tactics: a kin-selection benefit for defensive spines in coral catfish? Oikos 130:240-247.

Natusch, D., J. Lyons, L-A. Mears, and R. Shine. 2021. Biting off more than you can chew: attempted predation on a human by a giant snake (*Simalia amethistina*). Austral Ecology 46:159-162.

Pettit, L., G. Ward-Fear, and R. Shine. 2021. A biological invasion impacts ecosystem services: cane toads change the rate of scavenging and the suite of scavengers. Ecosphere12:e03488.

Pettit, L., G. P. Brown, G. Ward-Fear, and R. Shine. 2021. Anthropogenically modified habitats favour bigger and bolder lizards. Ecology and Evolution 11:1586-1597.

Hudson, C. M., G. P. Brown, R. A. Blennerhasset, and R. Shine. 2021. Variation in size and shape of toxin glands among cane toads from native-range and invasive populations. Scientific Reports 11:936.

Mayer, M., R. Shine, and G. P. Brown. 2021. Rapid divergence of parasite infectivity and host resistance during a biological invasion. Biological Journal of the Linnean Society 132:861-871.

Bonnet, X., F. Brischoux, M. Briand, and R. Shine. 2021. Plasticity matches phenotype to local conditions despite genetic homogeneity across 13 snake populations. Proceedings of the Royal Society B 288:20202916.

Udyawer, V., C. Goiran, and R. Shine. 2021. Peaceful coexistence between people and deadly wildlife: why are recreational users of the ocean so rarely bitten by sea snakes? People and Nature 3:335-346.

Pomeroy, J., G. P. Brown, G. J. W. Webb, and R. Shine. 2021. The fauna fights back: invasive Cane Toads killed by native centipedes in tropical Australia. Australian Zoologist, in press.

Sarma, R. R., M. R. Crossland, H. J. F. Eyck, J. L. DeVore, R. J. Edwards, M. Cocomazzo, J. Zhou, G. P. Brown, R. Shine, and L. A. Rollins. 2021. Intergenerational effects of manipulating DNA methylation in the early life of an iconic invader. Philosophical Transactions of the Royal Society (London) B 376:20200125.

Pettit, L., G. Ward-Fear, and R. Shine. 2021. Invasion of cane toads (*Rhinella marina*) affects the problem-solving performance of vulnerable predators (monitor lizards, *Varanus varius*). Behavioral Ecology and Sociobiology 75:39.

Brischoux, F., H. B. Lillywhite, R. Shine, and D. Pinaud. 2021. Osmoregulatory ability predicts geographic range size in marine amniotes. Proceedings of the Royal Society (London) B 288:20203191.

Natusch, D. J. N., P. W. Aust, and R. Shine. 2021. The perils of flawed science in wildlife trade literature. Conservation Biology, in press.

Christian, K., R. Shine, K. A. Day, M. Kaestli, K. Gibb, C. M. Shilton, and G. P. Brown. 2021. First line of defence: skin microbiota may protect anurans from infective larval lungworms. International Journal for Parasitology: Parasites and Wildlife 14:185-189.

Pettit, L., R. Somaweera, S. Kaiser, G. Ward-Fear, and R. Shine. 2021. The impact of invasive toads (Bufonidae) on monitor lizards (Varanidae): an overview and prospectus. Quarterly Review of Biology 96:105-125.

Ducatez, S., and R. Shine. 2021. Can simultaneously operating threats predict extinction risk in vertebrates? Conservation Letters, in press.

Chapple, D. G. and 96 other authors. 2021. Conservation status of the world's skinks (Scincidae): taxonomic and geographic patterns in extinction risk. Biological Conservation 257:109101.

Brown, G. P., J. Hemphill, and R. Shine. 2021. The uneasy coexistence between carpet pythons and cane toads. Australian Zoologist 41:214-219.

Crossland, M. R., A. A. Salim, R. J. Capon, and R. Shine. 2021. Chemical cues that attract cannibalistic cane toad (*Rhinella marina*) larvae to vulnerable embryos. Scientific Reports, in press.

Somaweera, R., V. Udyawer, M. Guinea, D. Ceccarelli, R. H. Clarke, M. Glover, M. Hourston, J. Keesing, A. R. Rasmussen, K. Sanders, R. Shine, D. Thomson, and B. Webber. 2021. Pinpointing drivers of extirpation in sea snakes: a synthesis of evidence from Ashmore Reef. Frontiers in Marine Science, in press.

Baird, T. A., T. D. Baird, and R. Shine. 2021. Small breeding season home ranges and egg-laying migrations in urban female water dragons (*Intellagama lesueurii*). Journal of Herpetology, in press.

McGregor, L. F., M. Greenlees, M. DeBruyn, and R. Shine. 2021. An invasion in slow motion: the spread of invasive cane toads (*Rhinella marina*) into cooler climates in southern Australia. Biological Invasions, in press.

DeVore, J. L., R. Shine, and S. Ducatez. 2021. Spatial ecology of cane toads (*Rhinella marina*) in their native range: a radiotelemetric study from French Guiana. Scientific Reports, in press.

Mayer, M., J. Schlippe, R. Shine, and G. P. Brown. 2021. Host defence or parasite cue: skin secretions mediate interactions between amphibians and their parasites. Ecology Letters: in press.

Ward-Fear, G., G. P. Brown, D. Pearson, and R. Shine. 2021. Untangling the influence of biotic and abiotic factors on habitat selection by a tropical rodent. Scientific Reports, in press.

Baird, T. A., T. D. Baird, and R. Shine. 2021. *Intellagama lesueurii* (Eastern Water Dragon). Warning display. Herpetological Review, in press.

Pettit, L., M. S. Crowther, G. Ward-Fear, and R. Shine. 2021. Divergent long-term impacts of lethally toxic cane toads (*Rhinella marina*) on two species of apex predators (monitor lizards, Varanus spp.). PLOS ONE, in press.

DeVore, J. L., M. R. Crossland, R. Shine, and S. Ducatez. 2021. The evolution of targeted cannibalism and cannibal-induced defenses in invasive populations of cane toads. Proceedings of the National Academy of Science (USA), in press.

Lynch, T. P., R. A. Alford, and R. Shine. 2021. Mistaken identity may explain why male sea snakes (*Aipysurus laevis*, Elapidae, Hydrophiinae) 'attack' scuba divers. Scientific Reports, in press.

Natusch, D. J. N., P. W. Aust, and R. Shine. 2021. Pitfalls in evaluating the sustainability of wildlife trade: reply to Sosnowski and Petrossian and Edwards et al. Conservation Biology, in press.

Russo, A. G., E. F. Harding, G. J. H. Yan, D. Selechnik, S. Ducatez, J. L. DeVore, J. Zhou, R. R. Sarma, Y. P. Lee, M. F. Richardson, R. Shine, L. A. Rollins and P. A. White. 2021. Distinct virome patterns of the invasive cane toad (*Rhinella marina*) across its native and introduced ranges. Frontiers in Microbiology, in press.

Okamiya, H., M. Tagami, M. Crossland and O. Kishida. Are toxic effects of alien species affected by their prey? Evaluation by bioassay with captive-bred toad embryos and a vulnerable predator. Hydrobiologia, in press.

Okamiya, H., Y. Inoue, K. Takai, M.R. Crossland and O. Kishida. Native frogs (*Rana pirica*) do not respond adaptively to alien toads (*Bufo japonicus formosus*) 100 years after introduction. Ecological Research, in press.

Geyle, H., Tingley, R., Amey, A.P., Cogger, H., Couper, P., Cowan, M., Craig, M.D., Doughty, P., Driscoll, D.A., Greenlees, M.J., Chapple, D. 2020. Reptiles on the brink: identifying the Australian terrestrial snakes and lizard species most at risk of extinction. Pacific Conservation Biology: doi.org/10.1071/PC20033

Chapple, D.G., Roll, U., BÖhm, M., Aguilar, R., Amey, A.P., Austin, C.C., Baling, M., Barley, A.J., Bates, M.F., Bauer, A.M., Blackburn, D.G.,Greenlees, M.J.,Whiting, M.J., Whittington, C.M., Wilson, S., Ziegler, T. Tingley, R. and Meiri, S. 2021. Conservation status of the world's skinks (Scincidae): Taxonomic and geographic patterns in extinction risk. Biological Conservation: 257, p.109101.

Bower, D.S., R. Somaweera, N. Clemann, J M. Crowe-Riddell, S. Clulow, M. Greenlees, K. Howard, G. Kuchling, D. T. McKnight, J. Melville,, J. Schaffer,, L. Schwarzkopf, L. Streeting, E. Vanderduys, C. N. Zdenek (forthcoming: est. 2021). Chapter 22: Reptiles. In: Ethical wildlife research in Australia (Eds B. Smith, H. Waudby, C. Alberthsen). CSIRO Publishing: Melbourne, Australia.

University of Wollongong

Evolution and Assisted Reproduction Lab (EARL)

EARL (Byrne & Silla Lab) continues to study the evolution of gametes and mating systems, conservation behaviour, captive nutrition, genetic management of threatened species and the development of assisted reproductive technologies. We are currently looking for PhD students to join the team. Dr Silla is looking to award a PhD scholarship aligned with her recent DECRA project success, applications for the project 'Using Evolutionary Theory to Fast-track the Development of Protocols for the Hormonal Induction of Gamete-Release and Cold Storage of Sperm' close soon! In addition to the above scholarship, we are also seeking interest from students to apply for scholarships to commence projects 'Refining Sperm Cryopreservation Protocols for the Conservation of Australian Anurans' and 'Investigating how Parental Genetic Quality and Genetic Incompatibility Affects Fertilisation Success and Offspring Viability'. Students will be supervised by Dr Aimee Silla and A/Prof Phillip Byrne from the University of Wollongong and Dr Justine O'Brien from Taronga Conservation Society Australia.

To find out more visit: https://evolution-assistedreproduction.com/opportunities/

Congratulations to Dr Shannon Kelleher who was recently awarded her PhD with a special commendation. Shannon's PhD research investigated individual behavioural variation and intersexual selection in the critically endangered corroboree frog (supervisors; Phillip Byrne, Aimee Silla and David Hunter). EARL welcomed PhD student Sara Walton and honours students Zara Anastas and Ian Boole to the team this year. Sara will focus on understanding the proximate mechanisms underpinning behaviour to improve captive management and reintroduction of threatened frogs. Zara is investigating salinity-induced plasticity in sperm motility activation in *Crinia signifera*. Ian's research will focus on the effect of chytrid on reproductive behaviour in Red-crowned toadlets.

Silla, A.J., Calatayud, N.E., and Trudeau, V.L. (2021). Amphibian reproductive technologies: approaches and welfare considerations. Conservation Physiology, 9 (1), coab011

Silla, A.J and Byrne, P.G. (2021). Hormone-induced ovulation and artificial fertilisation in four terrestrial-breeding anurans. Reproduction, Fertility and Development 33: 615-618

Kelleher, S.R., Scheele, B.C., Silla, A.J., Keogh, S.K., Hunter, D.A., Endler, J.A., Byrne, P.G. (2021). Disease influences male advertisement and mating outcomes in a critically endangered amphibian. Animal Behaviour 173: 145-157

O'Brien, D., Silla, A.J., Forsythe, P., Byrne, P.G. (2021). Sex differences in response to environmental breeding cues in an amphibian. Behaviour 158:397-426

Byrne, P.G., Keogh, J.S., O'Brien, D., Espitia, J. D. and Silla, A.J. (2021). Evidence that genetic compatibility underpins female mate choice in a monandrous amphibian. Evolution 75: 529-541

Butterworth, N.J., White, T.E., Byrne, P.G., Wallman, J.F. (2021). Love at first flight: wing interference patterns are species-specific and sexually dimorphic in blowflies. Journal of Evolutionary Biology 34: 558- 570

Silla, A.J., Roberts, J.D., Byrne, P.G. (2020). The effect of injection and topical application of hCG and GnRH agonist to induce sperm-release in the roseate frog, *Geocrinia rosea*. Conservation Physiology 8 (1), coaa104

O'Brien, Silla, A.J., Byrne, P.G. (2020). Nest-site selection in a terrestrial breeding frog: interrelationships between nest moisture, pH and male advertisement. Animal Behaviour, 169:57-64

Gilbert, D.J., Magrath, M.J.L., Byrne, P.G. (2020). Warmer temperature and provision of natural substrate enable earlier metamorphosis in the critically endangered Baw Baw frog. Conservation Physiology 8: coaa030

McInerney, E., Silla A.J., Byrne, P.G. (2020). Do carotenoids improve the escape-response performance of southern corroboree frog larvae? Behaviour 1 (aop), 1-20

Byrne, P.G., and Silla, A.J. (2020). An experimental test of the genetic consequences of population augmentation in an amphibian. Conservation Science and Practice e194

McInerney, E., Byrne, P.G. and Silla A.J. (2020). Carotenoid supplementation affects the post-hibernation performance of southern corroboree frogs. Behaviour 1 (aop), 1-22

Umbers, K.D.L., Riley, J.L., Kelly, MB.J., Taylor-Dalton, G., Lawrence, J.P., Byrne, P.B. (2020). Educating the enemy: Harnessing learned avoidance behaviour in wild predators to increase survival of reintroduced southern corroboree frogs. Conservation Science and Practice 2: p.e 139

Butterworth, N.J., Wallman, J.F., Drijfhout, F.P., Johnston, N.P., Keller, P., Byrne, P.G. (2020). The evolution of sexually dimorphic cuticular hydrocarbons in blowflies. Journal of Evolutionary Biology 33: 1468- 1486

Butterworth, N.J., Drijfhout, F.P., Byrne, P.G., Keller, Wallman, J.F. (2020). Major transitions in cuticular hydrocarbon expression coincide with sexual maturity in a blowfly. Journal of Chemical Ecology 46: 610-618

In press

Silla, A.J., Kouba, A.J. (2021). Integrating reproductive technologies into the conservation toolbox for the recovery of amphibian species. IN Silla AJ, Kouba AJ, Heatwole H (Eds) Reproductive Technologies and Biobanking as Tools for the Conservation of Amphibians. CSIRO, Melbourne, Australia.

Silla, A.J., Langhorne, C.J. (2021). Protocols for hormone-induced spermiation, and the cold storage, activation, and assessment of amphibian sperm. IN Silla AJ, Kouba AJ, Heatwole H (Eds) Reproductive Technologies and Biobanking as Tools for the Conservation of Amphibians. CSIRO, Melbourne, Australia.

Byrne, P.G., Silla, A.J. (2021). Genetic management of threatened amphibians; using artificial fertilisation (AF) technologies to facilitate genetic rescue and assisted gene flow. IN Silla AJ, Kouba AJ, Heatwole H (Eds) Reproductive Technologies and Biobanking as Tools for the Conservation of Amphibians. CSIRO, Melbourne, Australia.

Queensland

The University of Queensland, Australia

David Booth

My lab is winding down as I have officially retired from UQ. I still am co-supervising two students with sea turtle related projects:

PhD Student Melissa Stain, Project title: The importance of rainfall at nesting beaches in modulating hatchling sex-ratios, and determining sex-ratios at breeding grounds of sea turtle populations in the Asia-Pacific.

Honours student Larissa Young, Project title: Can one-off seawater irrigation produce male marine turtle hatchlings?

Caitlin Elizabeth Smith, C.E, Booth, D.T., Crosby , A., Miller, J.D., Melissa Nancy Staines, M.N., Versace, H. , and Hof, C. (2021). Trialling seawater irrigation to combat the high nest temperature feminisation of green turtle (*Chelonia mydas*) hatchlings. Marine Ecology Progress Series 667: 177-190.

Onate-Casado J., Booth, D.T., Vandercamere, K., Sakhalkar, S.P., and Rusil, M.U. (2021). Offshore Dispersal and Predation of Sea Turtle Hatchlings I: A Study of Hawksbill Turtles at Chagar Hutang Turtle Sanctuary, Malaysia. Ichthyology & Herpetology 109: 180-187.

Lei, J., Yusof, N.S.B., Wu, N.C., Zhang, Z., and Booth, D.T. (2021). The Burrowing Ecology of a Tropical Lizard (*Leiolepis belliana*). Herpetologica, 77: 37-44.

Reboul, I., Booth D., and Rulsi U. (2021). Artificial and natural shade: Implications for green turtle (*Chelonia mydas*) rookery management. Ocean and Coastal Management 204: https://doi.org/10.1016/j.ocecoaman.2021.105521

Laloë, J.-O., Tedeschi, J.N., Booth, D.T., Bell, I., Dunstan, A. Reina, R.D., Hays, G.C. (2020). Extreme rainfall events and cooling of sea turtle clutches: Implications in the face of climate warming. Ecology and Evolution. Doi: 10.1002/ece3.7076.

Lei, J., Booth, D.T., Rusli, M.U., Zhang, Z. (2020). Spatial ecology of Asian water monitors adjacent to a sea turtle nesting beach. Zoological Science 38:

Booth, D.T., Archibald-Binge, A., Limpus, C.J. (2020). The effect of respiratory gases and incubation temperature on early stage embryonic development in sea turtles. PLoS ONE 15(12):e0233580. Doi: https://doi.org/10.1371/journal.pone.0233580.

Staines, M.N., Booth, D.T., Hof, C. A. M, and Hays, G.C. (2020). Impact of heavy rainfall events and shading on the temperature of sea turtle nests. Marine Biology 167:190. Doi: https://doi.org/10.1007/s00227-020-03800-z

Booth, D.T., Dunstan, A., Bell, I., Reina, R., and Tedeschi J. (2020). Low male production at the world's largest green turtle rookery. Marine Ecology Progress Series 653: 181-190. Doi: https://doi.org/10.3354/meps13500.

Rusil, M.U., Chen, G-N, Booth, D.T., and Lei. J. (2020). Diet preference and activity of Asian water monitor at Chagar Hutang turtle sanctuary. Journal of Sustainability Science and Management 15:61-67. Doi: http://doi.org/10.46754/jssm.2020.08.005

Read, T.C., Petit, M., Magnan, M., and Booth, D. (2020). Going back to the roots: finding a strategy for the management of nesting loggerhead sea turtles in New Caledonia. Australian Journal of Zoology, 66: 394-400.

Coffee, O.I., Booth, D.T., Thia, J.A., and Limpus, C.J. (2020). When isotopes fail: importance of satellite telemetry and multi-site validation when estimating the foraging grounds of migratory species. Marine Ecology Progress Series 633: 197-206. doi: https://doi.org/10.3354/meps13179

The University of Queensland

Venom Evolution Lab

Research Areas: Venom evolution, toxinology, venom functional activity, antivenom and inhibitor efficacy.

Recent Awards:

- 2021 ABC Top 5 Science award, Dr Christina Zdenek
- Evolutionary models and biodiscovery tools from neurotoxic snake venoms
- (2021-2023) ARC Discovery Projects
- Replacing the use of animals for the study of the alpha-5 subunit of nicotinic acetylcholine receptors and to probe the drug potential of novel ligands for colitis and anti-smoking
- (2020-2021) The MAWA Trust An integrated, multi-node bio-layer interferometry facility
- (2020) ARC Linkage Infrastructure, Equipment and Facilities
- Functional evolution and therapeutic potential of snake venom coagulotoxins
- (2019-2022) ARC Discovery Projects

Media interest:

TV: ABC Catalyst episode about venom (available on iView): Dr Bryan Fry and Dr Christina Zdenek; Discovery Channel gig (not aired yet): Dr Bryan Fry and Dr Christina Zdenek

Twitter: Venom Evolution Lab @UQVenomLab

New people to the laboratory:

- Winter Project Students
- Jiaojiao Liu (Fiona)
- Holly Morecroft
- Oliver Horton

Honours Student

- Lee Jones

PhD Students

- Uthpala Chandrasekara
- Lachlan Bourke

Recent graduations:

- Jordan Debono
- Daniel Dashevsky

Dobson, J.S., Harris, R.J., Zdenek, C.N., Huynh, T., Hodgson, W.C., Bosmans, F., Fourmy, R., Violette, A., Fry, B.G., 2021. The Dragon's Paralysing Spell: Evidence of Sodium and Calcium Ion Channel Binding Neurotoxins in Helodermatid and Varanid Lizard Venoms. Toxins (Basel). 1-15.

Rodrigues, C.B.B., Zdenek, C.N., Serino-Silva, C., Morais-Zani, K.D., Grego, K.F., BÉnard-Valle, M., Neri-Castro, E., AlagÓn, A., Tanaka-Azevedo, A.M., Fry, B.G., 2021. BoaγPLI from boa constrictor blood is a broad-spectrum inhibitor of venom PLA2 pathophysiological actions. J. Chem. Ecol.

Bittencourt Rodrigues, Caroline Fabri, Zdenek, Christina N., Bourke, Lachlan A., Seneci, Lorenzo, Chowdhury, Abhinandan, Freitas-de-Sousa, Luciana Aparecida, de Alcantara Menezes, Frederico, Moura-da-Silva, Ana Maria, Tanaka-Azevedo, Anita Mitico and Fry, Bryan G. (2021). Clinical implications of ontogenetic differences in the coagulotoxic activity of *Bothrops jararacussu* venoms. Toxicology Letters, 348, 59-72.

Seneci, Lorenzo, Zdenek, Christina N., Bourke, Lachlan A., Cochran, Chip, SÁnchez, Elda E., Neri-Castro, Edgar, BÉnard-Valle, Melisa, AlagÓn, Alejandro, Frank, Nathaniel and Fry, Bryan G. (2021). A symphony of

destruction: dynamic differential fibrinogenolytic toxicity by rattlesnake (Crotalus and Sistrurus) venoms. Comparative Biochemistry and Physiology Part - C: Toxicology and Pharmacology, 245 109034, 109034.

op den Brouw, Bianca, Ghezellou, Parviz, Casewell, Nicholas R., Ali, Syed Abid, Fathinia, Behzad, Fry, Bryan G., Bos, Mettine H.A. and Ikonomopoulou, Maria P. (2021). Pharmacological characterisation of Pseudocerastes and Eristicophis viper venoms reveal anticancer (melanoma) properties and a potentially novel mode of fibrinogenolysis. International Journal of Molecular Sciences, 22 (13) 6896, 1-17. doi: 10.3390/ijms22136896

Chowdhury, Abhinandan, Zdenek, Christina N., Lewin, Matthew R., Carter, Rebecca, Jagar, TomaÅ¾, Ostanek, Erika, Harjen, Hannah, Aldridge, Matt, Soria, Raul, Haw, Grace and Fry, Bryan G. (2021). Venom-induced blood disturbances by palearctic viperid snakes, and their relative neutralization by antivenoms and enzyme-inhibitors. Frontiers in Immunology, 12 688802, 688802.

Walker, Andrew A., Robinson, Samuel D., Paluzzi, Jean-Paul V., Merritt, David J., Nixon, Samantha A., Schroeder, Christina I., Jin, Jiayi, Goudarzi, Mohaddeseh Hedayati, Kotze, Andrew C., Dekan, Zoltan, Sombke, Andy, Alewood, Paul F., Fry, Bryan G., Epstein, Marc E., Vetter, Irina and King, Glenn F. (2021). Production, composition, and mode of action of the painful defensive venom produced by a limacodid caterpillar, *Doratifera vulnerans*. Proceedings of the National Academy of Sciences of the United States of America, 118 (18) 2023815118, e2023815118.

Chowdhury, Abhinandan, Zdenek, Christina N., Dobson, James S., Bourke, Lachlan A., Soria, Raul and Fry, Bryan G. (2021). Clinical implications of differential procoagulant toxicity of the palearctic viperid genus Macrovipera, and the relative neutralization efficacy of antivenoms and enzyme inhibitors. Toxicology Letters, 340, 77-88.

Harris, Richard J., Youngman, Nicholas J., Chan, Weili, Bosmans, Frank, Cheney, Karen L. and Fry, Bryan G. (2021). Getting stoned: Characterisation of the coagulotoxic and neurotoxic effects of reef stonefish (*Synanceia verrucosa*) venom. Toxicology Letters, 346, 16-22.

Jones, Lee, Harris, Richard J. and Fry, Bryan G. (2021). Not Goanna Get Me: Mutations in the Savannah Monitor Lizard (*Varanus exanthematicus*) nicotinic acetylcholine receptor confer reduced susceptibility to sympatric cobra venoms. Neurotoxicity Research, 39 (4), 1116-1122.

Seneci, Lorenzo, Zdenek, Christina N., Chowdhury, Abhinandan, Rodrigues, Caroline F. B., Neri-Castro, Edgar, Benard-Valle, Melisa, Alagon, Alejandro and Fry, Bryan G. (2021). A clot twist: extreme variation in coagulotoxicity mechanisms in Mexican neotropical rattlesnake venoms. Frontiers in Immunology, 12 612846, 612846.

Moral-Sanz, Javier, Fernandez-Rojo, Manuel A., Potriquet, Jeremy, Mukhopadhyay, Pamela, Brust, Andreas, Wilhelm, Patrick, Smallwood, Taylor B., Clark, Richard J., Fry, Bryan G., Alewood, Paul F., Waddell, Nicola, Miles, John J., Mulvenna, Jason P. and Ikonomopoulou, Maria P. (2021). ERK and mTORC1 inhibitors enhance the anti-cancer capacity of the octpep-1 venom-derived peptide in melanoma BRAF(V600E) mutations. Toxins, 13 (2) 146, 1-19.

Dashevsky, Daniel, Rokyta, Darin, Frank, Nathaniel, Nouwens, Amanda and Fry, Bryan G. (2021). Electric blue: molecular evolution of three-finger toxins in the long-glanded coral snake species *Calliophis bivirgatus*. Toxins, 13 (2) 124, 1-16.

op den Brouw, Bianca, Coimbra, Francisco C. P., Bourke, Lachlan A., Huynh, Tam Minh, Vlecken, Danielle H. W., Ghezellou, Parviz, Visser, Jeroen C., Dobson, James S., Fernandez-Rojo, Manuel A., Ikonomopoulou, Maria P., Casewell, Nicholas R., Ali, Syed A., Fathinia, Behzad, Hodgson, Wayne C. and Fry, Bryan G. (2021). Extensive variation in the activities of Pseudocerastes and Eristicophis viper venoms suggests divergent envenoming strategies are used for prey capture. Toxins, 13 (2), 1-21.

Dashevsky, Daniel, Benard-Valle, Melisa, Neri-Castro, Edgar, Youngman, Nicholas J., Zdenek, Christina N., Alagon, Alejandro, Portes-Junior, Jose A., Frank, Nathaniel and Fry, Bryan G. (2021). Anticoagulant Micrurus venoms: targets and neutralization. Toxicology Letters, 337, 91-97.

Youngman, Nicholas J., Chowdhury, Abhinandan, Zdenek, Christina N., Coster, Kristian, Sundman, Eric, Braun, Ralph and Fry, Bryan G. (2021). Utilising venom activity to infer dietary composition of the Kenyan horned viper (*Bitis worthingtoni*). Comparative Biochemistry and Physiology Part C: Toxicology and Pharmacology, 240 108921, 108921.

Bourke, Lachlan A., Zdenek, Christina N., Neri-Castro, Edgar, BÉnard-Valle, Melisa, AlagÓn, Alejandro, GutiÉrrez, JosÉ MarÃa, Sanchez, Eladio F., Aldridge, Matt and Fry, Bryan G. (2021). Pan-American lancehead pit-vipers: coagulotoxic venom effects and antivenom neutralisation of *Bothrops asper* and *B. atrox* geographical variants. Toxins, 13 (2) 78, 1-18.

Harris, Richard J. and Fry, Bryan G. (2021). Electrostatic resistance to alpha-neurotoxins conferred by charge reversal mutations in nicotinic acetylcholine receptors. Proceedings of the Royal Society B: Biological Sciences, 288 (1942) 2703, 20202703.

Youngman, Nicholas J., Harris, Richard J., Huynh, Tam M., Coster, Kristian, Sundman, Eric, Braun, Ralph, Naude, Arno, Hodgson, Wayne C. and Fry, Bryan G. (2021). Widespread and differential neurotoxicity in venoms from the Bitis genus of viperid snakes. Neurotoxicity Research, 39 (3), 697-704.

Rodrigues, Caroline Fabri Bittencourt, Zdenek, Christina N., Serino-Silva, Caroline, de Morais-Zani, Karen, Grego, Kathleen Fernandes, BÉnard-Valle, Melisa, Neri-Castro, Edgar, AlagÓn, Alejandro, Tanaka-Azevedo, Anita Mitico and Fry, Bryan Grieg (2021). BoaÎ³PLI from boa constrictor blood is a broad-spectrum inhibitor of venom PLA2 pathophysiological actions. Journal of Chemical Ecology.

Sousa, Leijiane F., Bernardoni, Juliana L., Zdenek, Christina N., Dobson, James, Coimbra, Francisco, Gillett, Amber, Lopes-Ferreira, MÃ´nica, Moura-da-Silva, A.M. and Fry, Bryan G. (2020). Differential coagulotoxicity of metalloprotease isoforms from *Bothrops neuwiedi* snake venom and consequent variations in antivenom efficacy. Toxicology Letters, 333, 211-221.

Harris, Richard J., Youngman, Nicholas J., Zdenek, Christina N., Huynh, Tam M., Nouwens, Amanda, Hodgson, Wayne C., Harrich, David, Dunstan, Nathan, Portes-Junior, JosÉ A. and Fry, Bryan G. (2020). Assessing the binding of venoms from aquatic elapids to the nicotinic acetylcholine receptor orthosteric site of different prey models. International Journal of Molecular Sciences, 21 (19) 7377, 1-13.

Khan, Muzaffar A., Dashevsky, Daniel, Kerkkamp, Harald, KordiÅ¡, DuÅ¡an, de Bakker, Merijn A. G., Wouters, Roel, van Thiel, Jory, op den Brouw, Bianca, Vonk, Freek, Kini, R. Manjunatha, Nazir, Jawad, Fry, Bryan G. and Richardson, Michael K. (2020). Widespread evolution of molecular resistance to snake venom? - neurotoxins in vertebrates. Toxins, 12 (10) 638, 638.

Zdenek, Christina N., Llinas, Joshua, Dobson, James, Allen, Luke, Dunstan, Nathan, Sousa, Leijiane F., Moura da Silva, Ana M. and Fry, Bryan G. (2020). Pets in peril: the relative susceptibility of cats and dogs to procoagulant snake venoms. Comparative Biochemistry and Physiology. Part C: Toxicology and Pharmacology, 236 108769, 108769.

Youngman, Nicholas J., Walker, Andrew, Naude, Arno, Coster, Kristian, Sundman, Eric and Fry, Bryan G. (2020). Varespladib (LY315920) neutralises phospholipase A2 mediated prothrombinase-inhibition induced by Bitis snake venoms. Comparative Biochemistry and Physiology Part - C: Toxicology and Pharmacology, 236 108818, 108818.

Herzig, Volker, Sunagar, Kartik, Wilson, David T. R., Pineda, Sandy S., Israel, Mathilde R., Dutertre, Sebastien, McFarland, Brianna Sollod, Undheim, Eivind A. B., Hodgson, Wayne C., Alewood, Paul F., Lewis, Richard J., Bosmans, Frank, Vetter, Irina, King, Glenn F. and Fry, Bryan G. (2020). Australian funnel-web spiders evolved human-lethal δ- hexatoxins for defense against vertebrate predators. Proceedings of the National Academy of Sciences, 117 (40), 24920-24928.

Harris, Richard J., Zdenek, Christina N., Nouwens, Amanda, Sweeney, Charlotte, Dunstan, Nathan and Fry, Bryan G. (2020). A symmetry or asymmetry: functional and compositional comparison of venom from the left and right glands of the Indochinese spitting cobra (*Naja siamensis*). Toxicon: X, 7 100050, 100050.

Bourke, Lachlan A., Youngman, Nicholas J., Zdenek, Christina N., op den Brouw, Bianca, Violette, Aude, Fourmy, Rudy and Fry, Bryan G. (2020). *Trimeresurus albolabris* snakebite treatment implications arising from

ontogenetic venom comparisons of anticoagulant function, and antivenom efficacy. Toxicology Letters, 327, 2-8.

Harris, Richard J., Zdenek, Christina N., Debono, Jordan, Harrich, David and Fry, Bryan G. (2020). Evolutionary interpretations of nicotinic acetylcholine receptor targeting venom effects by a clade of Asian viperidae snakes. Neurotoxicity Research, 38 (2), 312-318.

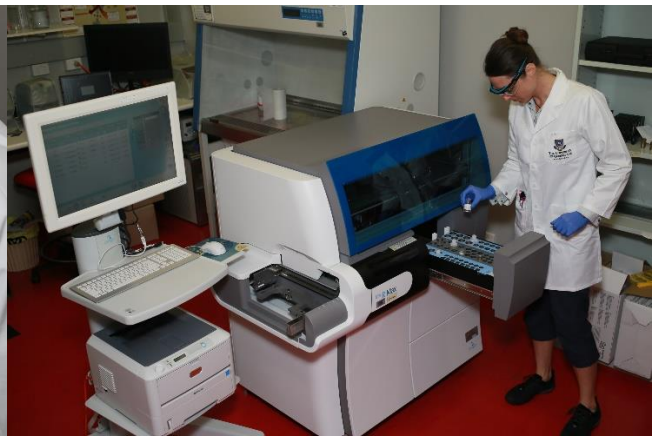
Zdenek, Christina N., Youngman, Nicholas J., Hay, Chris, Dobson, James, Dunstan, Nathan, Allen, Luke, Milanovic, Leontina and Fry, Bryan G. (2020). Anticoagulant toxicity of black snake (Elapidae: Pseudechis) venoms: Potency, mechanisms, and antivenom efficacy. Toxicology Letters, 330, 176-184.

Harris, Richard J., Zdenek, Christina N., Harrich, David, Frank, Nathaniel and Fry, Bryan G. (2020). An appetite for destruction: detecting prey-selective binding of α-neurotoxins in the venom of Afro-Asian elapids. Toxins, 12 (3) 205, 205.

Grashof, Dwin, Zdenek, Christina N., Dobson, James S., Youngman, Nicholas J., Coimbra, Francisco, Benard-Valle, Melisa, Alagon, Alejandro and Fry, Bryan G. (2020). A web of coagulotoxicity: failure of antivenom to neutralize the destructive (non-clotting) fibrinogenolytic activity of Loxosceles and Sicarius spider venoms. Toxins, 12 (2) toxins12020091, 91.

Scheib, Holger, Nekaris, K. Anne-Isola, Rode-Margono, Johanna, Ragnarsson, Lotten, Baumann, Kate, Dobson, James S., Wirdateti, Wirdateti, Nouwens, Amanda, Nijman, Vincent, Martelli, Paolo, Ma, Rui, Lewis, Richard J., Kwok, Hang Fai and Fry, Bryan Grieg (2020). The toxicological intersection between allergen and toxin: a structural comparison of the cat dander allergenic protein Fel d1 and the slow loris brachial gland secretion protein. Toxins, 12 (2) toxins12020086, 86.

Debono, Jordan, Dashevsky, Daniel, Nouwens, Amanda and Fry, Bryan G. (2020). The sweet side of venom: glycosylated prothrombin activating metalloproteases from *Dispholidus typus* (boomslang) and *Thelotornis mossambicanus* (twig snake). Comparative Biochemistry and Physiology Part C: Toxicology and Pharmacology, 227 108625, 108625.



James Cook University

Vertebrate Ecology Lab

Lin Schwarzkopf - Lin has been working busily with post-doc Slade Allen-Ankins and PhD student Sheryn Brodie to wade their way through a LOT of frog calls and find ways to analyse the data using either automated methods, or methods biologists can use easily. At the same time, she has been advising post-doc Don McKnight and PhD student Sebastian Hoefer as they organise and carry out the extensive ground-truthing biodiversity studies funded by an ARC DP and attached to the Australian Acoustic Observatory. She also spends her time discussing gecko toe forces with PhD student Rishab Pillai and Galapagos tortoises with PhD

student Kyana Pike. Wytamma Wirth has completed his PhD on turtle ranavirus. Lin is happy to have recently renewed discussions with ex-PhD student Ben Muller, who is now working to reduce the numbers of Asian Black Spined toads in Madagascar. The project, intended to provide research to help prevent the incursions of ABST into Australia becoming established populations, is funded by the Center for Invasive Species Studies, and involves Prof Miki (Mirza) Kusrini (ex Alford Lab) and was testing trapping methods in Indonesia until the severe COVID-19 outbreak there turned Bogor University into a hospital - a stark reminder of what the rest of the world is enduring. In not-strictly herpetological news, the Acoustic Observatory is now pumping out loads of data and we have a new honours student joining us to work on bird calls. Cat Kelly is just completing her PhD on invasive deer, and Juan Mula Laguna has completed his PhD on black-throated finches.

Ross Alford is continuing to enjoy his retirement and a bit of editorial work. He is a regular at the Vertebrate Ecology Lab Lizard Lunch where he continues to interact with students. He is also finishing off some publications, including collaborations with Rick Shine and some students from long ago.

Eric Nordberg is now a lecturer at UNE where he continues to work with Deb Bower and Don on freshwater turtles. We occasionally miss him, but he continues to be a mentor to a lot of students at the lab.

Post-docs

Slade Allen-Ankins - Slade has been working on analysing acoustic recordings of frog communities to determine how species partition the acoustic niche. He has also set up the FrogSong Zooniverse project to allow volunteers to help us collect data on the calling patterns of various frog species at different Australian Acoustic Observatory (A2O) sites as well as obtain calls for developing automated recognisers. Additionally, he has also been deploying and maintaining recorders at various A2O sites in North Queensland. He is currently working on acoustic recordings to support the biodiversity surveys conducted at A2O sites.

Donald McKnight is working on the Australian Acoustic Observatory (A2O) project. Along with Sebastian Hoefer, he is comparing the results of traditional on-the-ground survey methods with the data that can be obtained from automated recording units. He is also studying the basking ecology of freshwater turtles (with Rosie Kidman and Eric Nordberg), and collaborating on turtle conservation research in Australia and Belize.

PhDs

Kyana Pike has been taming unruly data into a more well-behaved analysis for the third chapter of her PhD on giant tortoises and their interaction with farmland. She has also been keeping busy with the graduate student group ROAM (Researchers of Animal Movement) that she co-founded with fellow PhD student Emily Webster, another movement ecology nerd.

Sebastian Hoefer is working on the Australian Acoustic Observatory project (A2O) together with Donald McKnight and Slade Allen-Ankins. He just returned from the first round of field work recording the vertebrate biodiversity at six sites across Queensland and New South Wales. By comparing biodiversity assessments using traditional methods to those made using only acoustic recorders he aims to understand how well acoustic monitoring represents the overall terrestrial vertebrate biodiversity. Even though it was late in the season he got plenty of herpetofaunal action as he recorded 767 individuals of 71 unique species of reptiles and 1701 individuals of 23 species of amphibians. Apart from the joys of counting supraciliaries and determining whether plantar scales are ‘cobblestone-like’ or ‘pointed’ to key out members of Cryptoblepharus, he encountered various fascinating species including *Brachyurophis campbelli*, *Notaden melanoscaphus* and *Notaden bennettii*. Sebastian is also collaborating on snake research and conservation efforts in The Bahamas.

Sheryn Brodie recently published a methods paper on using acoustic indices in machine learning algorithms to detect chorusing frog species in long sound recordings. She has finished collecting data on the chorusing of several frog communities using a handy method of visualising long recordings, and so far has found that the chorusing of native frog species is highly synchronised among different sites.

Rishab is chipping away at finding out what makes Diplodactylid geckos stick (literally) in Australian habitats. He is now a confirmed PhD candidate and prepping for a Queensland-wide field season to commence the

bulk of sampling for his PhD, before heading off to adventure in the NT. He has been working on some new techniques to measure morphology of gecko toes and is spending the Townsville *winter* doing lab work.

McKnight, D.T., Wirth, W., Schwarzkopf, L. and Nordberg, E.J., 2021. Leech removal is not the primary driver of basking behavior in a freshwater turtle. Ecology and Evolution.

Pike, K.N., Blake, S., Cabrera, F., Gordon, I.J. and Schwarzkopf, L., Body size, sex and high philopatry influence the use of agricultural land by Galapagos giant tortoises. Oryx, pp.1-10.

Roe, P., Eichinski, P., Fuller, R.A., McDonald, P., Schwarzkopf, L., Towsey, M., Truskinger, A.M., Tucker, D. and Watson, D.M., The Australian Acoustic Observatory. Methods in Ecology and Evolution.

Nordberg, E., Denny, R. and Schwarzkopf, L., 2021. Testing measures of boldness and exploratory activity in native versus invasive species: geckos as a model system. Animal Behaviour, 177, pp.215-222.

Kelly, C.L., Schwarzkopf, L., Gordon, I.J. and Hirsch, B., 2021. Population growth lags in introduced species. Ecology and Evolution, 11(9), pp.4577-4587.

Brodie, S., Yasumiba, K., Towsey, M., Roe, P. and Schwarzkopf, L., 2021. Acoustic monitoring reveals year-round calling by invasive toads in tropical Australia. Bioacoustics, 30(2), pp.125-141

Brodie, S., Allen-Ankins, S., Towsey, M., Roe, P. and Schwarzkopf, L., 2020. Automated species identification of frog choruses in environmental recordings using acoustic indices. Ecological Indicators, 119, p.106852.

Riedel, J., Zozaya, S.M., Hoskin, C.J. and Schwarzkopf, L., 2021. Parallel evolution of toepads in rock-dwelling lineages of a terrestrial gecko (Gekkota: Gekkonidae: *Heteronotia binoei*). Zoological Journal of the Linnean Society.

Riedel, J., Zozaya, S.M., Hoskin, C.J. and Schwarzkopf, L., 2021. Parallel evolution of toepads in rock-dwelling lineages of a terrestrial gecko (Gekkota: Gekkonidae: *Heteronotia binoei*). Zoological Journal of the Linnean Society.

Riedel, J., Vucko, M.J., Blomberg, S.P. and Schwarzkopf, L., 2020. Skin hydrophobicity as an adaptation for selfâ€• cleaning in geckos. Ecology and evolution, 10(11), pp.4640-4651.

Pillai, R., Nordberg, E., Riedel, J. and Schwarzkopf, L., 2020. Nonlinear variation in clinging performance with surface roughness in geckos. Ecology and evolution, 10(5), pp.2597-2607

Nordberg, E., Denny, R. and Schwarzkopf, L., 2021. Testing measures of boldness and exploratory activity in native versus invasive species: geckos as a model system. Animal Behaviour, 177, pp.215-222

Fushida, A., Riedel, J., Nordberg, E.J., Pillai, R. and Schwarzkopf, L., 2020. Can geckos increase shedding rate to remove fouling?. Herpetologica, 76(1), pp.22-26.

Pillai, R., Nordberg, E., Riedel, J. and Schwarzkopf, L., 2020. Geckos cling best to, and prefer to use, rough surfaces. Frontiers in zoology, 17(1), pp.1-12"

The Bean Lab

Believing that perhaps not ALL life finds a way, Stewart Macdonald has found himself indispensable to the fitness of his resident curlew family. After four years with CSIRO (When you gotta go, you gotta go), Dr Macdonald is taking a sabbatical, on ... hold onto your butts... Magnetic Island in North Queensland. He is following his hopes and dreams of combining tech with ecology to improve and create apps for biologists. That's the illusion. The reality has been trying to finish and submit manuscripts, streaming CurlewCam, and a snorkelling obsession.

Of course, you didn't ask for reality and this update was actually written by Deb Bower - the clever girl (we can discuss sexism in survival situations when I get back).** *After careful consideration, Stewart has decided to endorse this update.*

South Australia

Lab of Evolutionary Genetics and Sociality (LEGS)

Flinders University

An exciting cohort of budding herpetologists completed their honours projects this year and we look forward to their future papers and careers. These students include Sarah Barker, who along with A/Prof Mike Gardner and A/Prof Greg Johnston researched the Gidgee skinks, *Egernia stokesii*, and found that maybe gidgees are not as social in sites with harsher conditions. Sophie Hammond, who along with Mike and Dr. Bob Sharrad, investigated what happens to attachment and engorgement rates of larvae of the two parapatric tick species, when exposed to sleepy lizards, *Tiliqua rugosa*, from either side of the boundary - hmmm it seems the southern ticks doesn't engorge as well on lizards from the other side. Sophie's project was almost thwarted by the disastrous snake mite, which required a lot of trouble shooting by her and Gerrut Norval, current PhD and resident acarologist.

A further honours graduate is Aaron De Koning, who along with Mike, postdoc in the lab Amy Slender and Steve Cooper from the SA Museum conducted a phylogeographic study of T. rugosa using SNPs as genetic markers in order to determine the impact of the three main biogeographic barriers of southern Australia and to assess the genetic validity of the three mainland *T. rugosa* subspecies, the subspecies were supported; however, a population south of the Murray River is a potential new subspecies. Kendall Whittaker, with Mike and Amy, researched the genetic mate choice in her study species, the Pygmy Bluetongue (PBT), *Tiliqua adelaidensis*, her approach involved analysing the allelic diversity of the MHC class I and II gene, which have been linked to odour based individual recognition, and found females like diversity! At least at class II.

These honours students were helped immensely, and some are currently being co supervised, by the extremely talented Dr. Jess Clayton. Jess will be leaving Adelaide for Brisbane. Over her time in Adelaide, from the beginning of her PhD with Mike Bull - to her position of RA, Jess helped many students achieve their goals and conducting sleepy lizard surveys, PBT and gidgee skink field work. She leaves us with an incredible legacy; the organisation of the current PBT translocation, and much like her beloved skink she is moving on to different pastures.

The endangered PBT translocation work is being continued because of the 1st of two ARC grants that the lab, led by Mike G, were able to achieve this past year! This linkage project grant will be funding the project which aims to understand how to best start new populations, by providing the first empirical test in terrestrial vertebrates of using mixed source populations; and uncovering regions of the genome important for considering in translocations. The 2nd grant is for a Discovery project, employing Dr Amy Slender, to investigate the hypothesis that parasites drive population divergence through an interaction with immune response genes in the sleepy lizard which will provide novel insights into the speciation process.

Thanks to these grants we welcome two new PhD candidates this year, Molly Stuart who completed her honours in the LEGS lab and will be looking further into elucidating the MHC gene in the sleepy lizards and Ruby McKenna, who joins us from WA will be looking into the sleepy lizard's ticks and their parapatry with an exciting new bacterial related hypothesis. The ARC grants have allowed for the potential for other keen PhD candidate to join the LEGS lab, as we say goodbye to an Dr. Bonnie Derne who successfully graduated this year! Bonnie's PhD explored the relationship between the PBT and its symbionts- two microparasite species and its gut bacteria, in a translocation context. She will be taking on a post doctorate position in Hawaii looking further into parasites. Dr Tara Daniell also completed her PhD studies on what makes a good PBT 'translocator'. Three PhD students are still working hard on closing their theses and moving on from field work, and those long lab days, and into the office; Carmel Maher, Robert O'Reilly, Gerrut Norval, and a while back we also welcomed Simon Bull (yes Mike Bull's son) who is doing rather a different study on data reproducibility using the sleepy lizard long term data.

The lab looks forward to the year ahead with this spring being the 40th year of the long-term sleepy lizard survey!

Pearson, S.K., Johnston, G.R., Bull, C. M., Fenner, A.L., Gardner M.G. (2020) Fine-scale genetic structuring in a group living lizard, gidgee skink (*Egernia stokesii*) Austral Ecology 45 (4), 435-443. (Mike Bull special issue).

Derne, B., Halliday R.B. Weinstein, P., Hutchinson, M., Bull, C.M. Gardner M.G. (2019) Parasite in peril? A new species of mite in the genus Ophiomegistus (Banks) (Acari: Paramegistidae) on an endangered host, the

pygmy blue tongue lizard *Tiliqua adelaidensis* (Peters) (Squamata: Scincidae). Austral Ecology 44:420-432. (Mike Bull special issue).

Clive, L., Hutchinson, M., Gardner M.G, Bull, C.M. (2019) Preliminary studies on the effects of population augmentation on conspecifics or co-occurring lizard species in a native grassland community Austral Ecology Accepted 24 December 2018. (Mike Bull special issue).

Ansari T.H., Cooper, S.J.B., Schwarz, M.P., Ebrahimi, M., Dolman, G., Reinberger, L., Saint, K., Donnellan, S., Bull, C.M., Gardner, M.G. (2019) Plio-Pleistocene diversification and biogeographic barriers in southern Australia reflected in the phylogeography of a widespread and common lizard species. Molecular Phylogenetics and Evolution 133: 107-119.

Botterill-James, T., Munch, K., Halliwell, B., Chapple, D.G., Gardner, M.G., Wapstra, E. and While, G.M. (2019) Low food availability during gestation enhances offspring post-natal growth, but reduces survival, in a viviparous lizard viviparous. Oecologia 189: 611-620.

Norval, G., Gardner, M.G. (2019) The natural history of the sleepy lizard (*Tiliqua rugosa*) - insight from chance observations and long-term research on a common Australian skink species. Austral Ecology 45 (4), 410-417 (Mike Bull special issue).

Norval, G., Ross, K.E., Sharrad, R.D., Gardner, M.G. Taking stock: a review of the known parasites of the sleepy lizard, *Tiliqua rugosa* (Gray, 1825), a common lizard endemic to Australia. Transactions of the Royal Society of South Australia 143 (2), 216-234 (https://doi.org/10.1080/03721426.2019.1595946).

Clayton, J., Bull, C.M., Hutchinson, M., Fenner, A., Gardner, M.G. (2020) Co-occupancy of spider engineered burrows within a grassland community changes temporally. Austral Ecology 45, 454-459 (Mike Bull special issue).

Atkins, Z.S. Amor M. D., Clemann N., Chapple D. G., While G. M., Gardner M. G., Haines M. L., Harrisson K. A., Schroder M., Robert K. A.(2019) Allopatric divergence drives the genetic structuring of an endangered alpine endemic lizard with a sky island distribution. Animal Conservation Accepted 11 April 2019.

Senior, A.F., Atkins, Z.S., Clemann, N., Gardner, M.G. Schroder, M., While, G.W., Wong, B.M., Chapple, D.G. (2019) Variation in Thermal Biology of Three Closely Related Lizard Species Along an Elevation Gradient. Biological Journal of the Linnean Society 127, 278-91. https://doi.org/10.1093/biolinnean/blz046.

Thompson S.A., Pearson S.K., While G.M., Chapple D.G. & Gardner M.G. (2020) Scat on the doorstep: Refuge choice in a group-living lizard is influenced by the presence of scat piles. Austral Ecology 45, 426-434 (Mike Bull special issue).

Payne E., Sinn D. L., Spiegel O., Leu S. T., Wohlfeil C., Godfrey S. S., Gardner M. & Sih A. (2020) Consistent individual differences in ecto-parasitism of a long-lived lizard host. Oikos 129, 1061-71.

Staines M., Bradford T., Graves S.R., Bull S. & Gardner M.G. (2020) Proposing a new hypothesis: Rickettsia spp. as a mechanism maintaining parapatry between two Australian reptile tick species. Austral Ecology 45, 488-492 (Mike Bull special issue).

Daniell T.L., Baring R., Hutchinson M.N., Ainsley P. & Gardner M.G. (2020) Translocation for conservation: Neonates are less suitable than adults. Austral Ecology 45, 468-477 (Mike Bull special issue).

Wohlfeil, C.K., Godfrey, S.S., Leu, S.T., Clayton, J., Gardner, M.G. (2020) Spatial proximity and asynchronous refuge sharing networks both explain patterns of tick genetic relatedness among lizards, but in different years. Austral Ecology 45, 493-501. (Mike Bull special issue).

Barr, J., Somaweera, R., Godfrey, S., Gardner, M.G., Bateman, P. (2020) When one tail isn't enough: Abnormal caudal regeneration in Lepidosaurs and its potential ecological impacts. Biological Reviews 95 (5), 1479-1496.

Drummond, E.M., Senior, A.F., Hamilton, K., Gardner, M.G., While, G.M., Chapple, D.G. (2020) Temporal variation in thermal plasticity in a free-ranging subalpine lizard. Journal of Thermal Biology 91, 102623.

Brown, A., Wooster, E., Norval, G., Gardner, M.G., Ueland, M. (2020) The attempted predation of a sand goanna (*Varanus gouldii*) by a juvenile red fox (*Vulpes vulpes*) Austral Ecology, 45 (7), 1025-1028.

Colombelli-NÉgrel, D., Slender, A., Bradford, T., Bertozzi, T., Graf, S., Gardner, M.G. (2020) Subtle genetic clustering among South Australian colonies of little penguins (*Eudyptula minor*). Conservation Genetics. 21, 747-756.

Geyle, H. M., Tingley, R., Amy, A., Cogger, H., Couper, P., Cowan, M., Craig, M., Doughty, P., Driscoll, D., Ellis, R., Emery, J-P., Fenner, A., Gardner, M.G., Garnett, S., Gillespie, G., Greenless, M., Hoskin, C., Keogh, S., Lloyd, R., Melville, J., McDonald, P., Michael, D., Mitchell, N., Sanderson, C., Shea, G., Sumner, J., Wapstra, E., Woinarski, J., Chapple, D. (2021) Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology. 27, 3-12. https://doi.org/10.1071/PC20033

Ansari M. H., Ebrahimi M., Fattahi M. R., Gardner M. G., Safarpour A. R., Faghihi M. A. & Lankarani K. B. (2020) Viral metagenomic analysis of fecal samples reveals an enteric virome signature in irritable bowel syndrome. BMC Microbiology 20, 1-12.

Masila N.M., Ross K.E., Gardner M.G. & Whiley H. (2020) Zoonotic and Public Health Implications of Campylobacter Species and Squamates (Lizards, Snakes and Amphisbaenians). Pathogens 9, 799.

Norval, G., Sharrad, R.D., Gardner M.G. (2020) Three instances of reptile ticks parasitising humans Acarologia 60 (3), 607-611.

Norval, G., Halliday, B., Sih, A., Sharrad, R.D., Gardner M.G. (2020) Occurrence of the introduced snake mite, *Ophionyssus natricis* (Gervais, 1844), in the wild in Australia. Acarologia 60 (3), 559-565

Norval G., Sharrad R. D., Ross K. E. & Gardner M. G. (2021) An instance of parasitism on a human by a nymph of the kangaroo soft tick, *Ornithodoros gurneyi* Warburton, 1926 (Acari: Argasidae) in South Australia. Ticks and Tick-borne Diseases 12, 101632.

Hamilton K., Goulet C. T., Drummond E. M., Senior A. F., Schroder M., Gardner M. G., While G. M. & Chapple D. G. (2021) Decline in lizard species diversity, abundance and ectoparasite load across an elevational gradient in the Australian alps. Austral Ecology 46, 8-19.

Payne E., Sinn D. L., Spiegel O., Leu S. T., Gardner M. G., Godfrey S. S., Wohlfeil C. & Sih A. (2021) Consistent after all: Behavioural repeatability in a long-lived lizard across a six-year field study. Anim. Behav. 174, 263-277.

Senior, A.F., Chapple, D.G., Atkins, Z.S., Clemann, N., Gardner, M.G., While, G.M., Wong, B.M. (2021) Agonistic behavioural asymmetry in two species of montane lizard that exhibit elevational replacement. Landscape Ecology 36, 863-876.

Daniell, T., Hutchinson, M., Ainsley, P., Gardner, M.G. (2021) Recognition of reptile predator scent is innate in an endangered lizard species. Australian Journal of Zoology (Online Early Open Access https://doi.org/10.1071/ZO20064).

Chapple D. G., Roll U., BÖhm M., Aguilar R., Amey A. P., Austin C. C., Baling M., Barley A. J., Bates M. F., Bauer A. M., Blackburn D. G., Bowles P., Brown R. M., Chandramouli S. R., Chirio L., Cogger H., Colli G. R., Conradie W., Couper P. J., Cowan M. A., Craig M. D., Das I., Datta-Roy A., Dickman C. R., Ellis R. J., Fenner A. L., Ford S., Ganesh S. R., Gardner M. G., Geissler P., Gillespie G. R., Glaw F., Greenlees M. J., Griffith O. W., Grismer L. L., Haines M. L., Harris D. J., Hedges S. B., Hitchmough R. A., Hoskin C. J., Hutchinson M. N., Ineich I., Janssen J., Johnston G. R., Karin B. R., Keogh J. S., Kraus F., LeBreton M., Lymberakis P., Masroor R., McDonald P. J., Mecke S., Melville J., Melzer S., Michael D. R., Miralles A., Mitchell N. J., Nelson N. J., Nguyen T. Q., de Campos Nogueira C., Ota H., Pafilis P., Pauwels O. S. G., Perera A., Pincheira-Donoso D., Reed R. N., Ribeiro-JÃºnior M. A., Riley J. L., Rocha S., Rutherford P. L., Sadlier R. A., Shacham B., Shea G. M., Shine R., Slavenko A., Stow A., Sumner J., Tallowin O. J. S., Teale R., Torres-Carvajal O., Trape J.-F., Uetz P., Ukuwela K. D. B., Valentine L., Van Dyke J. U., van Winkel D., Vasconcelos R., Vences M., Wagner P., Wapstra E., While G. M., Whiting M. J., Whittington C. M., Wilson S., Ziegler T., Tingley R. & Meiri S.

(2021) Conservation status of the world's skinks (Scincidae): Taxonomic and geographic patterns in extinction risk. Biol. Conserv. 257, 109101.

Bousjein, N.S., Gardner, M.G., Schwarz, M.P. (2021) Demographic stability of the Australian temperate exoneurine bees (Hymenoptera: Apidae) through the Last Glacial Maximum. Austral Entomology https://doi.org/10.1111/aen.12539.

Norval G., Sharrad R. D., & Gardner M. G. (2021) Additional instances of snake mite (*Ophionyssus natricis*) parasitism on sleepy lizards (*Tiliqua rugosa*) in South Australia. Transactions of the Royal Society of South Australia (TRSS): https://doi.org/10.1080/03721426.2021.1934629.

Norval G., Bursey C. R., Goldberg S. R., Sharrad R. D., Ross K. E. & Gardner M. G. (2021) New host and locality records for gastrointestinal helminths of five reptile species from the Mid North region of South Australia. Transactions of the Royal Society of South Australia, 1-15.

Norval, G., Gardner, M.G. (2018) Predation by an eastern brownsnake, *Pseudonaja textilis* (Dumeril, Bibron, & Dumeril 1854), on a mallee black-backed snake, *Parasuta nigriceps* (Gunther 1863). IRCF Reptiles & Amphibians 25 (2), 134-136.

Norval, G., Clayton, J., Sharrad, R.D., Gardner M.G. (2018) Notes on the stomach contents of a juvenile sleepy lizard, Tiliqua rugosa (Gray, 1825), killed by an eastern brown snake, *Pseudonaja textilis* (Dumeril, Bibron & DumÉril, 1854. IRCF Reptiles & Amphibians 25 (3), 200-203.

Norval, G., Sharrad, R.D., Gardner M.G. Two instances in South Australia of Sleepy Lizards, *Tiliqua rugosa* (Gray 1825), feeding on plant species not previously recorded as part of this lizard’s diet Reptiles & Amphibians 26 (1), 54-55.

Melville Jane, David G. Chapple, J. Scott Keogh, Joanna Sumner, Andrew Amey, Phil Bowles, Ian G. Brennan, Patrick Couper, Stephen C. Donnellan, Paul Doughty, Danielle L. Edwards, Ryan J. Ellis, Damien Esquerre, Jessica Fenker, Michael G. Gardner, Arthur Georges, Margaret L. Haines, Conrad J. Hoskin, Mark Hutchinson, Craig Moritz, James Nankivell, Paul Oliver, Carlos J. PavoÂ´n-VaÂ´zquez, Mitzy Pepper, Daniel L. Rabosky, Kate Sanders, Glenn Shea, Sonal Singhal, Jessica Worthington Wilmer, Reid Tingley (2021) Return-on-investment approach for prioritization of rigorous taxonomic research needed to inform responses to the biodiversity crisis. PLoSONE 19(6) e3001210. "

Victoria

La Trobe University

Applied animal physiology

In collaboration with Deb Bower, Ricky Spencer, and Mike Thompson, my group has received both an ARC Linkage grant and a federal Citizen Science grant this year to support freshwater turtle conservation in south-eastern Australia. The linkage aims to test whether several forms of nest protection (from foxes) increase turtle nest survival and hatchling recruitment in comparison to traditional lethal fox management. The citizen science grant aims to increase community engagement with TurtleSAT and also contribute to a "National Nest Predation Experiment" where we train communities to measure local fox predation rates using artificial turtle nests. This project will support two PhD students, and Deb and I are both advertising scholarships at UNE and La Trobe. A new honours student, Regan Terry, is going to do some work related to both grants to test the effectiveness of mesh for protecting nests.

My students have also had success. PhD student Angela Simms was awarded both a Margaret Middleton Grant and an ESA Holsworth grant to support parts of her project aimed at testing some assumptions around turtle headstarting methods using wild source populations.

Two students I co-supervise, Kristen Petrov at Western Sydney Uni (with Ricky Spencer and Arthur Georges), and Alice Buddle at the University of Sydney (with Camilla Whittington, Mike Thompson, and Colin Simpfendorfer) handed in their PhDs this year. Kristen studied the ecology of Bellinger River Snapping Turtles in the aftermath of their 2015 disease event, and Alice studied the morphology, physiology, and evolution of the placenta in Australian sharks.

Chapple, D.G., U. Roll, M. BÖhm, R. Aguilar, A.P. Amey, C.C. Austin, M. Baling, A.J. Barley, M.F. Bates, A.M. Bauer, D.G. Blackburn, P. Bowles, R.M. Brown, S.R. Chandramouli, L. Chirio, H. Cogger, G.R. Colli, W. Conradie, P.J. Couper, M.A. Cowan, M.D. Craig, I. Das, A. Datta-Roy, C.R. Dickman, R.J. Ellis, A.L. Fenner, S. Ford, S.R. Ganesh, M.G. Gardner, P. Geissler, G.R. Gillespie, F. Glaw, M.J. Greenlees, O.W. Griffith, L.L. Grismer, M.L. Haines, D.J. Harris, S.B. Hedges, R.A. Hitchmough, C.J. Hoskin, M.N. Hutchinson, I. Ineich, J. Janssen, G.R. Johnston, B.R. Karin, J.S. Keogh, F. Kraus, M. LeBreton, P. Lymberakis, R. Masroor, P.J. McDonald, S. Mecke, J. Melville, S. Melzer, D.R. Michael, A. Miralles, N.J. Mitchell, N.J. Nelson, T.Q. Nguyen, C. de Campos Nogueira, H. Ota, P. Pafilis, O.S.G. Pauwels, A. Perera, D. Pincheira-Donoso, R.N. Reed, M.A. Ribeiro-Junior, J.L. Riley, S. Rocha, P.L. Rutherford, R.A. Sadlier, B. Shacham, G.M. Shea, R. Shine, A. Slavenko, A. Stow, J. Sumner, O.J.S. Tallowin, R. Teale, O. Torres-Carvajal, J.-F. Trape, P. Uetz, K.D.B. Ukuwela, L. Valentine, J.U. Van Dyke, D. van Winkel, R. Vasconcelos, M. Vences, P. Wagner, E. Wapstra, G.M. While, M.J. Whiting, C.M. Whittington, S. Wilson, T. Ziegler, R. Tingley, and S. Meiri. 2021. Conservation status of the world's skinks (Scincidae): taxonomic and geographic patterns in extinction risk. Biological Conservation. 257: 109101.

Buddle, A.L., J.U. Van Dyke, M.B. Thompson, C.A. Simpfendorfer, C.R. Murphy, S.N. Dowland, and C.M. Whittington. 2021. Structure of the paraplacenta and the yolk sac placenta of the viviparous Australian sharpnose shark, *Rhizoprionodon taylori*. Placenta. 108:11-22.

Santori, C., R.J. Keith, C.M. Whittington, M.B. Thompson, J.U. Van Dyke, and R.J. Spencer. 2021. Changes in participant behaviour and attitudes are associated with knowledge and skills gained by using a turtle conservation citizen science app. People and Nature. 3:66-76.

Santori, C., R.J. Spencer, M.B. Thompson, C.M. Whittington, and J.U. Van Dyke. 2021. Hatchling short-necked turtles (*Emydura macquarii*) select aquatic vegetation habitats, but not after one month in captivity. Aquatic Ecology. 55:85-96.

D.C. Lettoof, J.U. Van Dyke, and M.M. Gagnon. 2021. Evidence and patterns of maternal transfer of metals and trace elements in Western tiger snakes (*Notechis scutatus occidentalis*)-a pilot study. Austral Ecology. 46: 337-341.

Petrov, K., R.J. Spencer, N. Malkiewicz, J. Lewis, C. Keitel, and J.U. Van Dyke. 2020. Prey-switching does not protect a generalist turtle from bioenergetic consequences when its preferred food is scarce. BMC Ecology. 20:1-12.

Santori, C., R.J. Spencer, M.B. Thompson, C.M. Whittington, T.H. Burd, S.B. Currie, T.J. Finter, and J.U. Van Dyke. 2020. Scavenging by threatened turtles regulates freshwater ecosystem health during fish kills. Scientific Reports. 10:1-7.

Skalkos, Z.M.G., J.U. Van Dyke, and C.M. Whittington. 2020. Paternal nutrient provisioning during male pregnancy in the seahorse *Hippocampus abdominalis*. Journal of Comparative Physiology, B. 190:547-556.

Stanford, C.B., J.B. Iverson, A.G.J. Rhodin, P. Paul van Dijk, R.A. Mittermeier, G. Kuchling, K.H. Berry, A. Bertolero, K.A. Bjorndal, T.E.G. Blanck, K.A. Buhlmann, R.L. Burke, J.D. Congdon, T. Diagne, T. Edwards, C.C. Eisemberg, J.R. Ennen, G. Forero-Medina, M. Frankel, U. Fritz, N. Gallego-GarcÃa, A. Georges, J.W. Gibbons, S. Gong, E.V. Goode, H.T. Shi, H. Hoang, M.D. Hofmeyr, B.D. Horne, R. Hudson, J.O. Juvik, R.A. Kiester, P. Koval, M. Le, P.V. Lindeman, J.E. Lovich, L. Luiselli, T.E.M. McCormack, G.A. Meyer, V.P. PÁez, K. Platt, S.G. Platt, P.C.H. Pritchard, H.R. Quinn, W.M. Roosenburg, J.A. Seminoff, H.B. Shaffer, R. Spencer, J.U. Van Dyke, R.C. Vogt, and A.D. Walde. 2020. Turtles and Tortoises Are in Trouble. Current Biology. 30:R721-R735.

Santori, C., M.B. Thompson, J.U. Van Dyke, C.M. Whittington, and R.J. Spencer. 2020. Smartphone citizen science for turtles: identifying motives, usage patterns and reasons why citizens stop participating. Australian Zoologist. 40:438-448.

Foster, C.P., M.B. Thompson, J.U. Van Dyke, M.C. Brandley, and C.M. Whittington. 2020. Emergence of an evolutionary innovation: gene expression differences associated with the transition between oviparity and viviparity. Molecular Ecology. 29: 1315-1327.

Buddle, A.L., N.M. Otway, J.U. Van Dyke, M.B. Thompson, C.R. Murphy, S.N. Dowland, C.A. Simpfendorfer, M.T. Ellis, and C.M. Whittington. 2020. Structural changes to the uterus of the dwarf ornate wobbegong shark (*Orectolobus ornatus*) during pregnancy. Journal of Morphology. 281:428-437."

Monash University

Macroecology Research Group

The Macroecology Research Group has remained an active and productive space, despite Melbourne's frequent lockdowns. Our large common garden of *Litoria ewingii*, originating from 16 populations across Victoria and Tasmania, keeps Lab Manager Maddie Sanders and our Honours students exceptionally busy.

New exciting projects in the group include an ARC Discovery Project on illegal trade in Australian reptiles; several government-funded projects on environmental DNA sampling; work on the biogeography and conservation of Australian reptiles; and of course, more field work on European newts in Melbourne! Please feel free to get in touch with Reid if any of this aligns with your interests!

Ward M, Carwardine J, Yong C, Watson J, Silcock J, Taylor G, Lintermans M, Gillespie, GR, Garnett S, Woinarski J, Tingley R, Fensham R, Hoskin C, Hines H, Roberts D, Kennard M, Harvey M, Chapple D, Reside A (In press) A national-scale dataset for threats impacting Australia's imperilled flora and fauna. Ecology and Evolution.

Senior AF, BÖhm M, Johnstone CP, McGee MD, Meiri S, Chapple DG, Tingley R (In press) Correlates of extinction risk in Australian squamate reptiles. Journal of Biogeography.

McColl-Gausden E, Weeks A, Coleman R, Robinson K, Song S, Raadik,T, Tingley R (2021) Multi-species models reveal that eDNA metabarcoding is more sensitive than backpack electrofishing for conducting fish surveys in freshwater streams. Molecular Ecology, 30, 3111-3126.

Melville J, Chapple DG +23 others, Tingley R (2021) A return-on-investment approach for prioritization of rigorous taxonomic research needed to inform responses to the biodiversity crisis. PLOS Biology 19, e3001210.

Michael D, Moore H, Wassens S, Craig M, Tingley R, Chapple DG, O'Sullivan J, Hobbs R, Nimmo, D (2021) Rock removal associated with agricultural intensification will exacerbate loss of reptile diversity. Journal of Applied Ecology, 58, 1557-1565.

Chapple DG, +94 others, Tingley R*, Meiri S* (2021) Conservation status of the world's skinks (Scincidae): taxonomic and geographic patterns in extinction risk. Biological Conservation, 257, 109101.

Norris J, Tingley R, Meiri S, Chapple DG (2021) Environmental correlates of morphological diversity in Australian geckos. Global Ecology and Biogeography, 30, 1086-1100.

Geyle HM, Tingley R, +26 othersâ€¦Chapple DG (2021) Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology, 27, 3-12.

Wilkinson DP, Golding N, Guillera-Arroita G, Tingley R, McCarthy MA (2021) Defining and evaluating predictions of joint species distribution models. Methods in Ecology and Evolution, 12, 394- 404.

Tingley R, Coleman R, Gecse N, van Rooyen A, Weeks AR (2021) Accounting for false positive detections in occupancy studies based on environmental DNA: a case study of a threatened freshwater fish (*Galaxiella pusilla*). Environmental DNA, 3, 388-397.

Smart AS, Tingley R, Phillips BL (2020) Estimating the benefit of quarantine: eradicating invasive cane toads from islands. Neobiota, 60, 117-136.

Enriquez-Urzelai U, Tingley R, Kearney MR, Sacco M, Palacio AS, Tejudo M, Nicieza AG (2020) The roles of acclimation and behavior in buffering climate change impacts along elevational gradients. Journal of Animal Ecology, 89, 1722-1734.

McColl-Gausden EF, Weeks AR, Tingley R (2020) A field ecologist's guide to environmental DNA sampling in freshwater environments. Australian Zoologist, 40, 641-651.

Visintin C, Briscoe N, Woolley S, Lentini P, Tingley R, Wintle B, Golding N (2020). steps: software for spatially- and temporally-explicit population simulations. Methods in Ecology and Evolution, 11, 596-603.

Pili A, Tingley R, Sy E, Diesmos ML, Diesmos A (2020) Niche shifts and environmental non-equilibrium undermine the usefulness of ecological niche models for invasion risk assessments. Scientific Reports, 10, 7972."

La Trobe University

Animal Behaviour Group

It has been a relatively quiet time for the Animal Behaviour Group (ABG), but here is a brief update on activities of members of the group that have a herpetological focus:

Bhagya Herath submitted her PhD thesis in March 2021. Her project addressed multimodal signalling by *Litoria fallax* covering genetic differences between populations as well as ecological and social constraints. She reported on fieldwork along eastern Australia as well as captive playback experiments of acoustic and multimodal signals. Her thesis was passed with minor amendments.

Estefania Boada is writing up her PhD thesis on Ecuadorian lava lizards (genus: Microlophus) having completed fieldwork in January 2020. Estefania thesis examines the effect of sympatry on mainland species, ecological/environmental influences on social behaviour across several species found on the mainland and the Galapagos Islands, as we all as a focus on anthropogenic influences on behaviour on the Islands.

Jonathan Salisbury is also finalising his PhD project on Jacky lizard (*Amphibolorus muricatus*) dorsal patterns. His data collection is now complete and he is busy processing a large library of images that will examine pattern variation across the geographic range of the species, comparing within and between clades and microhabitats. He is also comparing patterns with substrate and ontogenetic changes in patterns, with all analyses undertaken from the perspective of multiple receivers - conspecific, predator and human.

Estefany Guerra joined the group late in 2020. Based in Ecuador, Estefany's PhD will be examining the thermal ecology of Stenocercus lizards in the tropical Andes mountains. Her fieldwork is due to commence in final quarter of 2021.

Nicholas Gale undertook a 3rd year undergraduate research project to examine patterns of morphological diversity in isolated populations of Victorian Egernia skinks. Although he has completed the formal teaching aspect of the project, this work is ongoing.

PhD graduates from the group - Drs Andrea Narvaez, Xue Bian and Jose Ramos - are all still very much involved in herpetological research, but do so on three separate continents. Andrea is based in Ecuador and supervises students on a variety or reptile/amphibian species. Xue is currently based in China and working on signalling of Phrynocephalus lizards, while Jose is based in Australia but continues to be involved in all of our herpetological research projects. Recent Honours student, Ben Wilson, had his Honours work on *Ctenophorus fionni* published early this year. Last time we heard from Ben he was conducting fieldwork in the Northern Territory. So jealous!

The ABG would like to take this opportunity to thank all of those that have assisted us over the last 12 months or more - collaborators, volunteers and thesis examiners.

Wilson BC, Ramos JA, Peters RA (2021). Intraspecific variation in behaviour and ecology in a territorial agamid, *Ctenophorus fionni*. Australian Journal of Zoology 68, 85-97.

Bian X, Pinilla A, Chandler T, Peters R (2021) Simulations with Australian dragon lizards suggest movement-based signal effectiveness is dependent on display structure and environmental conditions. Scientific Reports 11, 6383.

Monash University

Reina Ecophysiology and Conservation Research Group

Recent graduations:

- Dr. Franciscus Scheelings (Thesis: The microbiota of sea turtles) PhD conferred in November 2019
- Dr. Christopher Gatto (Thesis: The role of incubation moisture and metabolism in sea turtle hatchling locomotor performance) PhD conferred in August 2020

Departures:

- Dr. Sean Williamson has left the lab for Dr. Jeanette Wyneken’s lab at Florida Atlantic University. He will continue his work with Upwell Turtles and will be working with leatherback turtles, trying to understand their ‘lost years’.

New to the research group:

- Abigail Parker has joined the lab for her PhD. She will explore the role that maternal influence plays in determining reproductive success in both marine and freshwater turtles. Specifically, she will be investigating intrinsic factors of the female as well as the role of maternal transfer of pollutants.
- David Adams has also joined the lab for his PhD. He will investigate species-specific responses to environmental factors that influence embryonic developmental arrest in sea turtles. The goal of his thesis is to increase our understanding of how embryonic arrest affects sea turtle population dynamics.

Media interest:

Monash Science students help save sea turtles from extinction
https://www.youtube.com/watch?v=28PeW7RuId4

Other news:

- Richard and Dr. Sean Williamson, with Upwell Turtles, were awarded funding to investigate potential conservation strategies to reverse the population decline of Eastern Pacific leatherback turtles. The project began in 2019 and is wrapping up this year.
- Dave Adams has been awarded funding from the Holsworth Wildlife Research Endowment for his PhD work.
- Abigail Parker has been awarded funding from Melbourne Water for her PhD work.
- Former lab member, Dr. Diego Amorocho was voted president-elect of the International Sea Turtle Society.

Role of incubation environment in determining thermal tolerance of sea turtle hatchlings, CR Gatto, B Matthews, RD Reina, Endangered Species Research 44, 397-408

Comparison of UAV and Boat Surveys for Detecting Changes in Breeding Population Dynamics of Sea Turtles, A Yaney-Keller, R San Martin, RD Reina Remote Sensing 13 (15), 2857

Extreme rainfall events and cooling of sea turtle clutches: Implications in the face of climate warming, JO Laloã, JN Tedeschi, DT Booth, I Bell, A Dunstan, RD Reina, GC Hays Ecology and Evolution 11 (1), 560-565

Microbial symbiosis and coevolution of an entire clade of ancient vertebrates: the gut microbiota of sea turtles and its relationship to their phylogenetic history, TF Scheelings, RJ Moore, TTH Van, M Klaassen, RD Reina, Animal microbiome 2 (1), 1-12

Sea turtle hatchling locomotor performance: incubation moisture effects, ontogeny and species-specific patterns, CR Gatto, RD Reina, Journal of Comparative Physiology B 190 (6), 779-793

Nearshore neonate dispersal of Atlantic leatherback turtles (*Dermochelys coriacea*) from a non-recovering subpopulation, AL Hoover, GL Shillinger, SA Williamson, RD Reina, H Bailey, Scientific reports 10 (1), 1-10

Low male production at the world's largest green turtle rookery, DT Booth, A Dunstan, I Bell, R Reina, J Tedeschi, Marine Ecology Progress Series 653, 181-190

Anaesthesia of hatchling green sea turtles (*Chelonia mydas*) with intramuscular ketamine-medetomidine-tramadol, TF Scheelings, C Gatto, RD Reina, Australian Veterinary Journal 98 (10), 511-516

The ontogeny of sea turtle hatchling swimming performance, CR Gatto, RD Reina, Biological Journal of the Linnean Society 131 (1), 172-182

The gut bacterial microbiota of sea turtles differs between geographically distinct populations, TF Scheelings, RJ Moore, TTH Van, M Klaassen, RD Reina, Endangered Species Research 42, 95-108

No correlation between microbiota composition and blood parameters in nesting flatback turtles (Natator depressus), TF Scheelings, RJ Moore, TTH Van, M Klaassen, RD Reina, Scientific reports 10 (1), 1-10 A method for the collection of early-stage sea turtle embryos., A Garriz, SA Williamson, RD Evans, RD Reina, Endangered Species Research 42, 59-65

Frogs Victoria

Frogs Victoria has just turned 3 and top-notch support from Victorian herpers and the frog curious remains stronger than a cane toad's bufotoxin.

Over the last year events have been held in a somewhat stochastic manner. Steph Versteegan and Teisha Sloane-Lay joined forces to create an Events Sub-committee on the prediction of less lockdowns and more beer. Although the amount of beer hasn't reduced, many of our events in the last 12 months have been online (and fantastic). Check out the website (www.frogsvic.org) to watch them!

The Frogs Victoria Newsletter now has a name - ‘Pobblebonk’ and issues leap forth twice a year. Submissions always welcome - event listings, Victorian frog, frogging or frogger related news and stories etc. We’re not really fussy.

Lynette Plenderleith (President) currently works at the Department of Land Water and Planning. It’s fixed term though - she still has commitment issues.

Nick Clemann continues as Vice President. He leads the Threatened Fauna Program at the Arthur Rylah Institute for Environmental Research, is an honorary Research Associate at Museums Victoria, and a member of several National Recovery Teams for threatened frogs in south-eastern Australia.

Colin McHenry is still counting bell frogs and has spent most of the multiple COVID lockdowns dreaming about fieldwork in the Kimberley / East Gippsland / look, at this stage the pond at the end of the street is starting to look pretty good. He's still Secretary for Frogs Vic, and is patiently waiting for someone to explain what that involves. The society's face-to-face meetings have been a rare treat but at this rate he will have seen more frogs than people by the end of the year.

David De Angelis (Treasurer) has been continuing surveys for the Victorian-threatened Brown Toadlet (*Pseudophryne bibronii*) for local government and private industry in his role as an ecological consultant. During COVID lockdown, Dave has also been working with postgraduate students Jessica Keem and Kevin Newman, and entomologist Nikolas Johnston, on documenting a novel instance of myiasis (in this case external parasitism) by an Oscinelline fly in the Southern Brown Tree Frog (*Litoria ewingii*).

Maggie Haines has joined the Frogs Vic committee as an (extra)Ordinary Member. Maggie spent the past year as ecological consultant and recently started a postdoc at Monash with Dave Chapple, Jane Melville, and Reid Tingley. She’ll be putting together conservation advice for the frog Species Expert Assessment Plan (SEAP).

Matt Clancy retains the office of (extra)Ordinary Member of the Frogs Vic committee. He presented the most anticipated talk in Frogs Vic history this year when he treated us all to tales from his Honours thesis.

Robert Lab

La Trobe University

One new herpetology related project & Student joined the lab - Kushini Kularatne (honours) will be testing the immunocompetence handicap hypothesis in Jacky dragons.

Gangloff, E.J., Manes, M.B., Schwartz, T.S., Robert, K.A., Huebschman, N., Bronikowski, A.M. (2021). Multiple paternity in garter snakes with evolutionarily divergent life-histories. Journal of Heredity. esab043.

Atkins, Z.A., Clemann, N., Chapple, D.G., Edwards, A.M., Sinsch, U., Hantzschmann, A.M., Schroder, M., Scroggie, M.P., Robert, K.A. (2020) Demographic and life history variation in two sky-island populations of an endangered alpine lizard. Journal of Zoology. DOI:10.1111/jzo.12728 "

Museums Victoria

Museums Victoria Herpetology

Despite months and months (and months) of lockdowns the MV Herpetology group has been incredibly busy and constructive!!

The Herpetology group at Museums Victoria is now headed by Dr Jane Melville, OAM - Jane was awarded a 2021 Order of Australia medal for significant service to herpetological research, and to the museums sector. Congratulations Jane!

We have welcomed Dr Claire McLean as Ian Potter Fellow working on the effects of fire on the reptile and invertebrate fauna of the Little Desert region in western Victoria. Jaclyn Harris has started her PhD on this project with Jane and Claire and will be looking at skink diversity in the Little Desert.

Jane received a Discovery grant to look at Macroecology of reptiles and frogs over latitudinal and temporal gradients. This grant is through Monash University, and Jane will be based there 25% of the time throughout this grant. This gave us the opportunity to hire an assistant Curator of Herpetology, and we welcome Bec Rose back to MV in this role. Juan Valbuena Fernandez a PhD at MV and will be working on this project. Juan completed his MSc last year with Jane, entitled: 'Impacts of Quaternary climate change on shaping past reptile and frog distribution along Australia'.

Jo Sumner's student, Theo Tasoulis, submitted his PhD at University of Newcastle, entitled 'A phylogeny-based comparative analysis of the venom proteome of Australian elapid snakes'.

Jo has received a Bioplatforms Australia Threatened Species Initiative grant to work on conservation genomics of the Corangamite water skink with Garry Peterson and Nick Clemann from DELWP.

MV are part of the collaborative Bushfire Genomics projects lead by Craig Moritz and Renee Catullo, contributing a bunch of tissue samples and working as species leads. Looking forward to all sorts of insights coming out of this work.

Jane is part of a team that successfully bid to complete federal conservation assessments for herps and amphibians and we have Dr Maggie Haines back at MV to run the amphibian side of things.

The fabulous Rocio Aguilar continues her quest to CT scan every Australian reptile as part of a Linkage Grant with Prof Dave Chapple, Jane and Jo.

We are also pleased to have Katie Date back from maternity leave!

Melville, J., Chapple, D.G., Keogh, J.S., Sumner, J., Amey, A., Bowles, P., Brennan, I.G., Couper, P., Donnellan, S.C., Doughty, P., Edwards, D.L. et al., 2021. A return-on-investment approach for prioritization of rigorous taxonomic research needed to inform responses to the biodiversity crisis. PLoS biology, 19(6), p.e3001210.

Geyle, H.M., Tingley, R., Amey, A.P., Cogger, H., Couper, P.J., Cowan, M., Craig, M.D., Doughty, P., Driscoll, D.A., Ellis, R.J. and Emery, J.P. et al., 2020. Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology, 27(1), pp.3-12.

Chapple, D.G., Roll, U., Bohm, M., Aguilar, R., Amey, A.P., Austin, C.C., Baling, M., Barley, A.J., Bates, M.F., Bauer, A.M. and Blackburn, D.G et al., 2021. Conservation status of the world's skinks (Scincidae): Taxonomic and geographic patterns in extinction risk. Biological Conservation, 257, p.109101.

Chaplin, K., Sumner, J., Hipsley, C.A. and Melville, J., 2020. An integrative approach using phylogenomics and high-resolution x-ray computed tomography for species delimitation in cryptic taxa. Systematic Biology, 69(2), pp.294-307.

Fenker, J., Tedeschi, L.G., Melville, J. and Moritz, C., 2020. Predictors of Phylogeographic Structure among co-distributed taxa across the complex Australian Monsoonal Tropics. Authorea Preprints.

Hamdan, B., Guedes, T.B., Carrasco, P.A. and Melville, J., 2020. A complex biogeographic history of diversification in Neotropical lancehead pitvipers (Serpentes, Viperidae). Zoologica Scripta, 49(2), pp.145-158.

Tasoulis, T., Lee, M.S., Ziajko, M., Dunstan, N., Sumner, J. and Isbister, G.K., 2020. Activity of two key toxin groups in Australian elapid venoms show a strong correlation to phylogeny but not to diet. BMC evolutionary biology, 20(1), pp.1-13.

Wildlife Ecology and Community Ecology Sections

Arthur Rylah Institute (DELWP) VIC

Herpetologists working within the Wildlife Ecology section at ARI include Nick Clemann, Michael Scroggie, Geoff Brown, Katie Howard and Louise Durkin, with a close working relationship with Zak Atkins from Snowline Ecology. Despite COVID-19 restrictions and multiple lockdowns our research group has been extremely busy with a wide variety of projects including annual monitoring, impact assessments following the Black Summer fires including artificial habitat creation, contributing to captive breeding programs, population genetic assessments, and assessing species' behaviour in response to managed environmental flows.

Specific projects include:

Annual monitoring: condition monitoring of frog and turtle populations along the mid-Murray River as part of The Living Murray program; establishing a multi-year frog monitoring project for the Victorian Murray Floodplain Restoration Project (VMFRP), which will investigate environmental flow impacts on frog populations; monitoring the responses of amphibians to water regimes for the Wetland Monitoring and Assessment Program (WetMAP); and monitoring of Alpine She-oak Skinks and Alpine Tree Frogs across the Victorian Alps.

2019-20 Black Summer fires: targeted surveys of the Swamp Skink, Gippsland Water Dragon and Alpine Bog Skink, including population genetics; general reptile surveys across the fire scar to assess impacts; artificial habitat supplementation for Alpine She-Oak Skinks in Kosciuszko National Park.

Assessing species behaviour: monitoring Murray River Turtle movement in response to flow regimes along the mid-Murray using acoustic telemetry; establishing a project to monitor the movement of Eastern Long-necked Turtles along the mid-Murray.

Captive breeding program: collaborating with Zoos Victoria to survey for and establish the first captive breeding program for the Giant Burrowing Frog.

Population genetic assessments: all sites with Large Brown Tree Frog (*L. watsoni*) records since its rediscovery in 2015 were surveyed in 2021 to collect genetic material. Results will inform an assessment of the need for genetic mixing between possible sub-populations, if identified.

A particular project that has recently received media interest is our recently developed deep learning neural network (NNet) model to automate species detection in acoustic datasets. The model has so far been trained to identify the calls of 14 frog species found in Victoria. The NNet model has an overall test accuracy of 98% when identifying single species calls and, although still in development, it is hoped will provide a more efficient approach for analysing large acoustic datasets. Further development is underway and will include chorus analysis, improve individual species: call recognition and increase the number of species the model can recognise.

Senior, A., Chapple, D., Atkins, Z.S., Clemann, N., Gardner, M.G., While, G.M., Wong, B.B.M. (2021) Agonistic behavioural asymmetry in two species of montane lizard that exhibit elevational replacement. Landscape Ecology 36(3): 1-14.

Burns, T.J., Scheele, B.C., Brannelly, L.A., Clemann, N., Gilbert, D., Driscoll, D.A. (2020) Indirect terrestrial transmission of amphibian chytrid fungus from reservoir to susceptible host species leads to fatal chytridiomycosis. Animal Conservation: doi 10.1111/acv.12665.

Geyle, H., Hoskin, C., Bower, D., Catullo, R., Clulow, C., Driessen, M., Daniels, K., Garnett, S., Gilbert, D., Heard, G., Hero, J-M., Hines, H., Hoffman, E., Hollis, G., Hunter, D., Lemckert, F., Mahony, M., Marantelli, G., McDonald, K., Mitchell, N., Newell, D., Roberts, J.D., Scheele, B., Scroggie, M.P., Vanderduys, E., Wassens, S., West, M., Woinarski, J. & Gillespie, G.R. (2021) Red hot frogs: identifying the Australian frogs most at risk of extinction. Pacific Conservation Biology https://doi.org/10.1071/PC21019"

Western Australia

Curtin University

I, Damian Lettoof, am just wrapping up my PhD! Since 2020 I've published six data papers and three natural history observations on western tiger snake ecology and health. And I have two more data chapter in review. My research on tiger snake exposure and accumulation of anthropogenic contaminants has led to a bunch of radio interviews, news articles, podcasts and two Conversation articles. I've been extremely lucky and thankful to collaborate with friends and new colleagues across Australia, including academics, consultants and government.

I've also been really thankful to supervise and work alongside Jari Cornelis, who has just submitted his Masters thesis looking at tiger snake thermal ecology and habitat quality in urbanised and natural wetlands. He published a review this year (2021) and has some great data to publish from his Masters.

Cornelis, J. and D.C. Lettoof. 2020. *Notechis scutatus occidentalis* (Western tiger snake) unfertilized ova. Herpetological Review 51: 873.

Cornelis, J., and D.C. Lettoof. 2020. *Notechis scutatus occidentalis* (Western tiger snake) defensive behavior. Herpetological Review 51: 623-4.

Cornelis, J., T. Parkin, and P.W. Bateman. 2021. Killing them softly: a review on snake translocation and an Australian case study. Herpetological Journal 31: 118-30.

Lettoof, D.C., F. Aubret, F. Spilsbury, P.W. Bateman, J. Haberfield, J. Vos, and M.M. Gagnon. 2021a. Plasma Biochemistry Profiles of Wild Western Tiger Snakes (*Notechis Scutatus Occidentalis*) before and after Six Months of Captivity. Journal of Wildlife Diseases 57: 253-63.

Lettoof, D.C., P.W. Bateman, F. Aubret, and M.M. Gagnon. 2020a. The Broad-Scale Analysis of Metals, Trace Elements, Organochlorine Pesticides and Polycyclic Aromatic Hydrocarbons in Wetlands Along an Urban Gradient, and the Use of a High Trophic Snake as a Bioindicator. Archives of Environmental Contamination and Toxicology 78: 631-45.

Lettoof, D.C., J. Cornelis, J. Harvey-Hall, and F. Aubret. 2020b. NOTECHIS SCUTATUS OCCIDENTALIS (Western Tiger Snake). DIET. Herpetological Review 51: 873.

Lettoof, D.C., M.T. Lohr, F. Busetti, P.W. Bateman, and R.A. Davis. 2020c. Toxic time bombs: Frequent detection of anticoagulant rodenticides in urban reptiles at multiple trophic levels. Science of the Total Environment 724: 138218.

Lettoof, D.C., K. Rankenburg, B.J. McDonald, N.J. Evans, P.W. Bateman, F. Aubret, and M.M. Gagnon. 2021b. Snake scales record environmental metal(loid) contamination. Environmental Pollution 274: 116547.

Lettoof, D.C., A. Santoro, C.V. Swinstead, and J. Cornelis. 2021c. First record of predation of a hatchling turtle by the Western tiger snake (*Notechis scutatus occidentalis*). Australian Zoologist.

Lettoof, D.C., J.U. Van Dyke, and M.M. Gagnon. 2021d. Evidence and patterns of maternal transfer of metals and trace elements in Western tiger snakes (*Notechis scutatus occidentalis*) - a pilot study. Austral Ecology 46: 337-41.

Lettoof, D.C., B. von Takach, P.W. Bateman, M.M. Gagnon, and F. Aubret. 2020d. Investigating the role of urbanisation, wetlands and climatic conditions in nematode parasitism in a large Australian elapid snake. Int J Parasitol Parasites Wildl 11: 32-9."

University of Western Australia

Mitchell Lab

The Mitchell Lab at UWA is enjoying the recent arrival of the Catullo Lab and the co-supervision opportunities this brings in all things frogs (see Catullo Lab report). Nicki's lab includes an expanding group of PhD students and a postdoc working on threatened mammals, but has plenty of herpetological activity to balance things out. She notes that herpetological students are more interested in decorating themselves with tattoos of their study animals than are mammal students. Remarkably, despite several Covid-19 lockdowns in WA, most projects have been able to progress without too much disruption, and Nicki is more rested thanks to fewer visits to the airport.

JP Emery just submitted his PhD on two Extinct in the Wild reptiles on Christmas Island, with his viva still to come. In sum, he concluded that wolf snakes and giant centipedes are not conducive to the success of reptile reintroductions. He is now busy writing up the final chapters as publications, dabbling in consulting, and looking for an interesting job. Speaking of which, Kristen Schubert completed her MSc in late 2020 on a project closely related to JP's, where she spent arduous but happy months monitoring assisted colonisation trials of the blue-tailed slink to small islands in the Cocos-Keeling group. Kristen is now working with the skinks and other endemic reptiles in a paid capacity through her role as a Threatened Species Program Coordinator with Christmas Island National Park, applying many of the techniques developed in her master's research at various translocation sites.

Emily Hoffmann is at the sharp and pointy end of her PhD on range-restricted Geocrinia near Margaret River, and is (somewhat madly) writing up her last chapter, following a short 'sabbatical' working for Ben Scheele on frog reports for the NESP Threatened Species Recovery Hub. Her final thesis chapter, amongst other things, uses stable isotopes to uncover potential habitats with hydrological resilience that may help the species' combat drying conditions in the region.

Bethany Nordstrom is well underway on her PhD project on the Critically Endangered western swamp tortoise. Over the last year she has been in the lab developing and testing eDNA techniques to detect tortoises, and in the field scouting candidate wetlands near East Augusta that might be suitable for assisted colonisation of the swamp tortoise. A major release of 73 captive-bred juveniles occurred mid-August, and so Beth has moved to a farmhouse 3 km from the release site to closely monitor turtle activity for the next six months. The broader goal is to understand whether cooler wetland habitats have appropriate abiotic and biotic attributes to support the species over the short and long term. Former honours student and now Master of Science student Nick Rodriguez is also studying the western swamp tortoise, investigating hatching cues in the wild and in captivity, as well as quantifying nest predation and monitoring the impacts of a major wildfire that burnt most of the habitat of the only viable natural population near Perth.

Malindi Gammon is in the third year of her PhD on assessing the vulnerability of flatback turtles nesting in the North-West shelf to climate change. Having completed all her fieldwork on Thevenard Island (and just avoiding a cyclone), Malindi has turned her attention to volunteering for other students' fieldwork (plus a lot of writing and analysis, she promises). Malindi is currently crafting her third PhD chapter - a GIS-based model which predicts the exposure of flatback nesting sites to severe storms and sea level rise.

Michigan-based Masters student Anna Ortega joined the lab in 2020, and is appraising ex-situ management options (such as headstarting and egg translocations) to rescue the collapsing Eastern Pacific Leatherback population. She has done most of this modelling work from her bedroom, as Scott Morrison refuses to let her

in to the country, and it is looking like she will be the first lab member to complete her Masters coursework and dissertation entirely online. Anna is instead hoping to make it to Australia for a PhD.

Lab alumni and now adjunct Blair Bentley recently relocated to Lisa Komoroske's Lab at the University of Massachusetts Amherst to explore sea turtle genomes and investigate the breeding sex ratios of Brazilian green turtle populations in the context of climate change. He spent the first year of his postdoc working remotely in Perth, and is now enjoying a lot less Zoom time in the USA.

Lab associate Ruchira Somaweera moved from CSIRO to Stantec Australia, but continues his herpetological work including freshwater crocodile work in the Kimberley with DBCA, a National Geographic-funded project on snake bites in Sri Lanka, and further investigations on sea snakes from Ashmore Reef. In his current role, Ru is running several reptile-related projects including using real-time, point-of-need eDNA analysis to detect rare species. A recent highlight was publishing a paper on octopus and fish with his 10 year old son, the backstory of which may soon be revealed in a TED talk.

Bentley, B.P., McGlashan, J. K., Bresette, M. J. and Wyneken, J. (2020) No evidence of selection against anomalous scute arrangements between juvenile and adult sea turtles in Florida. Journal of Morphology, 282(2): 173-184. DOI: 10.1002/jmor.21294.

Bentley, B.P., Stubbs, J.L., Whiting, S.D. and Mitchell, N.J. (2020) Variation in thermal traits describing sex determination and development in Western Australian sea turtle populations. Functional Ecology, 34(11): 2302-2314. DOI: 10.1111/1365-2435.13645.

Bentley, B. P., Kearney, M. K., Whiting S. D., and Mitchell, N. J. (2020) Microclimate modelling of beach sand temperatures reveals high spatial and temporal variation at sea turtle rookeries. Journal of Thermal Biology, 88: 102522. DOI: 10.1016/j.jtherbio.2020.102522

Bouma, A., Kuchling, G., Zhai, S and Mitchell, N.J. (2020). Assisted colonisation trials for the Western Swamp Turtle show that juveniles can grow in cooler and wetter climates. Endangered Species Research 43, 75-88

Chapple, D.G., and a lot of others, including Mitchell, N.J. 2021. Conservation status of the world's skinks (Scincidae): Taxonomic and geographic patterns in extinction risk. Biological Conservation, 257, p.109101.

Emery, J.P., Mitchell, N.J., Cogger, H., Agius, J., Andrew, P., Arnall, S., Detto, T., Driscoll, D.A., Flakus, S., Green, P. and Harlow, P., 2021. The lost lizards of Christmas Island: A retrospective assessment of factors driving the collapse of a native reptile community. Conservation Science and Practice, 3(2), p.e358.

Emery, J.P., Valentine, L.E., Hitchen, Y. and Mitchell, N. J. 2021, Survival of an Extinct in the Wild skink from Christmas Island is reduced by an invasive centipede: implications for future reintroductions. Biological Invasions, vol. 23, pp. 581-592, doi:10.1007/s10530-020-02386-3

Gammon, M., Fossette-Halot, S., McGrath, G. and Mitchell, N.J. 2020. A systematic review of metabolic heat in sea turtle nests and methods to model its impact on hatching success. Frontiers in Ecology and Evolution 8, 556379

Gammon, M., Bentley, B., Fossette, S., and Mitchell, N. J. (2021) Metabolic rates and thermal thresholds of embryonic flatback turtles (*Natator depressus*) from the North West Shelf of Australia. Physiological and Biochemical Zoology, in press

Geyle, H, Tingley, R, Amey, A, Cogger, H, Couper, P., Cowan, M., Craig, M.D., Doughty, P., Driscoll, D.A., Ellis, R. â€ Emery, J.P. Fenner, A., Gardner ,M.G., Garnett, S.T., Gillespie, G.R., Greenlees, M.J., Hoskin, C.J., Keogh, S., Lloyd, R., Melville, J., McDonald, P., Michael, D.R., Mitchell, N.J., Sanderson, C., Shea, G.M., Sumner, J., Wapstra, E., Woinarski, J.C.Z. and Chapple, D. (2020) Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology https://doi.org/10.1071/PC20033

Geyle, H. M., C. J. Hoskin, D. S. Bower, R. Catullo, S. Clulow, M. Driessen, K. Daniels, S. T. Garnett, D. Gilbert, G. W. Heard, J.-M. Hero, H. B. Hines, E. P. Hoffmann, G. Hollis, D. A. Hunter, F. Lemckert, M. Mahony, G. Marantelli, K. R. McDonald, N. J. Mitchell, D. Newell, J. D. Roberts, B. C. Scheele, M. Scroggie,

E. Vanderduys, S. Wassens, M. West, J. C. Z. Woinarski and G. R. Gillespie. (2021) Red hot frogs: identifying the Australian frogs most at risk of extinction. Pacific Conservation Biology https://doi.org/10.1071/PC21019

Hoffmann, E. P., Williams, K., Hipsey, M. R., and Mitchell, N. J. (2021). Drying microclimates threaten persistence of natural and translocated populations of threatened frogs. Biodiversity and Conservation, 30(1), 15-34.

Hoffmann, E. P., Cavanough, K. L. and Mitchell, N. J. (2021) Low desiccation and thermal tolerance constrains a terrestrial amphibian to a rare and disappearing microclimate niche, Conservation Physiology, 9 (1), doi:10.1093/conphys/coab027

Lachlan, P., Somaweera, R., Kaiser, S., Ward-Fear, G. and Shine, R. (2021) The impact of invasive toads (Bufonidae) on monitor lizards (Varanidae): an overview and prospectus. Quarterly Review of Biology 96(2): 105-125.

Rudinâ€• Bitterli, T.S., Evans, J.P. and Mitchell, N.J. (2020) Geographic variation in adult and embryonic desiccation tolerance in a terrestrial breeding frog. Evolution, 74(6), pp.1186-1199.

Rudin-Bitterli, T.S., Mitchell, N.J and Evans, J. P. (2020) Extensive geographic variation in testes size and ejaculate traits in a terrestrial-breeding frog. Biology Letters 16 (9) 20200411

Rudin-Bitterli, T.S., Evans, J.P. and Mitchell, N. J. (2021) Fitness consequences of targeted gene flow to counter impacts of drying climates on terrestrial-breeding frogs, Communications Biology, in press

Somaweera, R. (2021) Crocodiles. In Smith, B., Waudby, H., Alberthsen, C. and Hampton, J. (Eds.) Wildlife research in Australia: A practical guide. CSIRO Publishing: Melbourne, Australia.

Somaweera, R., Udyawer, V., Guinea, M., Ceccarelli, D., Clarke, R., Glover, M., Hourston, M., Keesing, J., Rasmussen, A.R., Sanders, K., Shine, R., Thomson, D., and Webber, B. (2021) Ashmore Reef and the case of the disappearing sea snakes. Frontiers in Marine Science. doi.org/10.3389/fmars.2021.658756

Stubbs, J. L., Marn, N., Vanderklift, M.A., Fossette, S., and Mitchell, N.J. (2020) Simulated growth and reproduction of green turtles (Chelonia mydas) under climate change and marine heatwave scenarios. Ecological Modelling 431, 109185

Tezak, B., Bentley, B., Arena, M., Mueller, S., Snyder, T. and Sifuentes-Romero, I. (2020) Incubation environment and parental identity affect sea turtle development and hatchling phenotype. Oecologia, 192, 939-951.

University of Western Australia

Catullo Lab

Big year since the last meeting. I managed to score a sweet job at UWA, which is a great place to work, and even managed to go to the Pilbara once. It was on a botany trip, but fun regardless. I had a personally interesting 2020 with the Canberra fires, then hail destroying my new car (had it for 2 weeks), blowing a disk in my back, moving to WA during a pandemic, breaking both my arms in a bicycle accident, getting a new dog (arrived while in hospital from said accident) and buying a house. Also Covid. There are a lot of things I forgot to do or respond to in a rather tumultuous year. My apologies if you were one of them – life is now somewhat back on track. Do get in touch if I've forgotten something.

The past year or so has been dominated by research supporting the recovery of vertebrate species from the 2019-2020 fires. Supported to an astonishing level by a huge group of scientists (including many ASH people), I lead a project to provide genetic assessments on ~60 priority vertebrate species to the state and federal agencies. This resulted in a lot of undescribed diversity being recognised and protected, particularly at the federal level. Our first assessment was directly used in the bushfire-caused listing re-assessments under the EPBC Act. For many species without genetic data we have now generated SNP sequencing in one huge batch, which is turning up many interesting taxonomic questions, particularly in the herpetofauna. These data

will be used for the next set of state- and federally- focused conservation assessments, which will be incorporated into threatened species management plans. I think the work of this group will establish genetic-lead conservation management best practice in Australia, with support of state and federal agencies.

I am always looking for talented graduate students – get in touch!

Christiana McDonald-Spicer (Research Officer). After graduating from my PhD last year, I've moved to WA and joined the Catullo lab as a research officer. I've been working with Renee on examining the conservation genetics of species impacted by the 2019/2020 bushfires and have been busy publishing the remaining chapters of my PhD on the biogeography of lizards in the Australian Monsoonal Tropics. In amongst all that I am working part time for the federal government and am looking for postdocs!

Jarrod Sopniewski began his PhD in late June 2021, after completing honours at the ANU where he modelled the potential distributional responses of Australian frogs to climate change as a member of the Cardillo lab. His PhD will explore the theme of frog conservation with an emphasis on the use and development of conservation genomic techniques, as well as conducting further investigations into the impacts of climate change on Australian frogs. This will include projects such as identifying management priorities following the Black Summer bushfires using novel spatial genetic methods, assessing the effectiveness of the reserve system of Northern Australia of retaining genetic diversity amongst frogs, exploring the genomic mechanisms that allow *Litoria rubella* to persist over such a large and climatically variable distribution, and modelling the impacts that climate change has already had upon the distributions of frogs in Australia's southwest.

Simon Lin (Masters Candidate) is working on the conservation genetics of *Philoria* frogs (collaboration with Steve Donnellan and Michael Mahony). His project is focused on assessing genetic diversity and structure in each species of Mountain Leaf Litter Frogs. This project will provide important information to conservation managers on the recovery of *Philoria* species from the 2019-2020 bushfires, particularly in relation to habitat restoration, monitoring, and any future captive breeding.

Will Purser (Masters) recently handed in a systematic evaluation of *Litoria rubella* (collaboration with Steve Donnellan, Paul Doughty, and Jodi Rowley). He used continent-wide genomic data, acoustic data from FrogID, and morphology to figure out how many species of *Litoria rubella* there are in Australia and Indonesia, and their distributions. The results were surprising!

University of Western Australia, Albany campus

J Dale Roberts,

No lab, no students - not doing too much! Still based at the UWA Albany campus currently working up Mike Tyler's last manuscript on museum disasters and loss of type specimens: it is a monster! In discussion with Renee Catullo about digitising my analog frog call recordings - a mammoth task. Still reviewing papers from time to time, fielding the odd query from FROGID and rejecting offers of consultancy work. Retired from the Geocrinia Recovery Team after about 40 years involvement but appreciating an unexpected upside of having been there – a high school buddy saw my name on something when he was at Margaret River – my guess is *Geocrinia* related, we are now in contact after a 50 year break! Fielding the odd query from people working on Australian frog systematics and *contemplating* one more field trip to check out a report from someone working on fish of an odd frog in down south peat swamps that I rejected as delusional at the time but a lot more plausible post *Spicospina.*

Recent publications: you may notice a slight drift to the derived herps - birds

Roberts, J.D., Danks, A., Berryman A., Sidhu, N., Burbidge A.H. and Comer S. 2020. Population decline of the noisy scrub-bird is not correlated with territory size, marginal declines in rainfall or fire impacts. *Pacific Conservation Biology*, 2020, 26, 230–238, https://doi.org/10.1071/PC19029

Callaghan, C.T., Roberts, J.D., Poore, A.G.B., Alford, R.A., Cogger H., and Rowley J.J.L. 2020. Citizen science data accurately predicts expert-derived species richness at a continental scale when sampling thresholds are met. *Biodiversity and Conservation* 29:1323–1337 https://doi.org/10.1007/s10531-020-01937-3

Gillespie, G.R., Roberts, J.D., Hunter D., Hoskin C.J., Alford R.A., Heard G.W., Hines, H., Lemckert, F., Newell, D., & Scheele, B.C. 2020. *Status and priority conservation actions for Australian frog species*. *Biological Conservation* 247, 108543

Thomas, A., Speldewinde P., Roberts J.D., Burbidge A.H.. & Comer S. 2020. If a bird calls, will we detect it? Factors that can influence the detectability of calls on automated recording units in field conditions. *Emu - Austral Ornithology* 120, 239–248. https://doi.org/10.1080/01584197.2020.1787848

Roberts, J.D. 2020. The frog fauna of south-western Australia: diverse, bizarre, old and polyandrous. *Journal of Herpetology* . Journal of Herpetology, 54(3) : 306-316

Roberts J.D. 2020. Michael James Tyler: Anuran Systematics, Natural History, and Conservation (1937–2020). Herpetological Review 51(4), 930–934

Silla, A, Roberts J.D. & Byrne P. 2021. The effect of injection and topical application of hCG and GnRH agonist to induce sperm-release in the roseate frog, *Geocrinia rosea*. *Conservation Physiology* – 28,1310-1324

Ward, M., Cawardine J., Yong, C.J., Watson, J.E.M., Silcock, J., Taylor, G.S., Lintermans, M., Gillespie, G., Garnett, S.T., Woinarski, J ., Tingley, R., Fensham, R.J., Hoskin, C., Hines, H.B., Roberts, D., Kennard, M.J., Harley, M.S., Chapple, D. Reside, A.E. 2021. A national-scale dataset for threats impacting Australia's imperiled flora and fauna. *Ecology and Evolution* doi 10.1002/ece3.7920