THE UNIVERSITY OF NEWCASTLE AUSTRALIA

SCHOOL OF ENVIRONMENTAL AND LIFE SCIENCES

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5 December 2022

Kerry Darcovich
Senior Manager Environment & Ecology
Sydney Olympic Park Authority

Dear Kerry

EXPERT HERPETOLOGICAL ADVICE - PARRAMATTA LIGHT RAIL STAGE 2 ENVIRONMENTAL IMPACT STATEMENT

We refer to our meetings 16, 21 and 23 November and your request for advice in relation to potential impacts to green and golden bell frogs and their habitat at Sydney Olympic Park associated with the proposed Parramatta Light Rail Stage 2.

As practicing research ecologists we have a combined 17 years' experience related to understanding the biology, ecology, conservation and management of the green and golden bell frog, listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act and endangered under the NSW Biodiversity Conservation Act*. This includes applied research with several government and industry partners associated with mitigating impacts of development on bell frog population viability. Our full curriculum vitaes are provided in Appendix 1.

Our provision of advice, enclosed herein, is based on our review of the EIS for Parramatta Light Rail Stage 2, specifically the following chapters and technical papers, sourced from https://plr2.ghdengage.com/eis-portal/ :

- Chapter 6 – Project description – Operation
- Chapter 7 – Project description – Construction
- Chapter 9 – Transport and traffic
- Chapter 10 – Noise and vibration
- Chapter 16 – Biodiversity
- Chapter 17 – Water
- Chapter 23 – Environmental management and mitigation
- Tech Paper 9 – Biodiversity Development Assessment

We provide the following advice based on our education, training and experience, review of the aforementioned documents and on a reasonable degree of probability and certainty.

Summary
Within its environmental management portfolio, the Sydney Olympic Park Authority is charged with the responsibility to protect, maintain or improve habitat to assure viability of the green and golden bell frog population that occupies the site, which is a stronghold for the Parramatta Key Population (Darcovich and O'Meara, 2008; DECC, 2007). To support this objective, there has been an active ecological restoration program at the site for more than 20 years, including management of primary habitats (conserved or constructed) that are essential to maintaining population viability, directed by the SOPA Biodiversity Management Plan Scientific licence under NSW Biodiversity Conservation Act 2016. Thus, maintenance of the amount and quality of green and golden bell frog habitat at Sydney Olympic Park is paramount to the viability of the Parramatta Key Population. To our knowledge, there is very little monitoring and active management of the other two populations previously known to belong to the Parramatta Key Population of green and golden bell frogs: Clyde/Rosehill and Merrylands (E. Lee, personal communication, 2020). Additionally, Sydney Olympic Park is classified as a 'key management site' for the Green and Golden Bell Frog under the NSW Government's Saving Our Species program. This is the formal Biodiversity Conservation Program under the NSW Biodiversity Conservation Act 2016 that aims to increase the number of threatened species that are secure in the wild in New South Wales for 100 years.

Based on our review of the EIS documents for the Parramatta Light Rail Stage 2 project (construction and operation), our knowledge of the vulnerable green and golden bell frog and factors that affect population viability, we consider there are several areas of concern relating to the adequacy of the EIS assessment of impacts and the resulting commitments to mitigate those impacts as they relate to the green and golden bell frog and its habitat at Sydney Olympic Park. The impacts identified in the EIS and associated technical papers are understated in some cases, not considered in others, and mitigation measures generalised to qualifying statements that show no firm intent to minimise impact to the viability of the species. Of the greatest concern are the clear inconsistencies in the project footprint between the EIS and Tech Paper 9 *Biodiversity Development Assessment (BDAR)*. We believe these inconsistencies require an update of the assessment of significance associated with the EPBC Act referral in relation to Matters of National Environmental Significance as they relate to biodiversity at Sydney Olympic Park.

Further detail relating to the aforementioned concerns are provided in the **Detail** section of this letter. However, in summary, there are contradictions in the project footprint between the EIS and the BDAR with regard to physical impact to green and golden bell frog habitat at Sydney Olympic Park, and failures to adequately address the impacts of noise, vibration, light spill, and disturbance to ponds on green and golden bell frogs at Sydney Olympic Park.

The proponent should therefore update the BDAR to

a) confirm the correct physical footprint in relation to green and golden bell frog habitat at Sydney Olympic Park, and

b) include the data that characterises the nature and extent of noise, vibration and lighting impacts to affected green and golden bell frog habitats during construction and operation, and

c) have the data reviewed by an experienced specialist in the ecology of pond-breeding amphibians to assess impacts with particular consideration of frog ecology and population dynamics, and propose appropriate mitigative measures.

Detail

Topic	Issue	Recommendation
Overall comment: No net loss of green and golden bell frog habitat within Sydney Olympic Park.	The project should *not result* in a net loss of green and golden bell frog habitat on Sydney Olympic Park and this includes temporary or permanent, direct or indirect changes to breeding habitat, or terrestrial habitat that functions as a dispersal corridor between waterbodies. The green and golden bell frog habitat at Sydney Olympic Park preserves the viability of the population in the following ways: - Provides a habitat mosaic (including variable hydroperiods and water salinity) that supports bell frog breeding in the presence of irreversible landscape environmental threats (for example infection by the chytrid fungal pathogen that causes the global pandemic chytridiomycosis, and predation by the invasive fish *Gambusia holbrooki*). - Maintains terrestrial connectivity between waterbodies to ensure safe dispersal for juveniles and for breeding movements. - Protects breeding adults from a number of anthropogenic effects that	Natural and created green and golden bell frog habitat at Sydney Olympic Park is recognised as essential to conserving the Parramatta Key Population and is a key management site under the NSW Government's Saving Our Species (SOS) Program. The importance of the population of bell frogs at Sydney Olympic Park is elevated by the fact that, to our knowledge, it is now the only managed and monitored population in the Greater Sydney Region (E. Lee personal communication, 2020). The project alignment should seek to avoid a project footprint that intrudes into green and golden bell frog habitat behind frog-fences on Sydney Olympic Park or interrupts major dispersal pathways. Any modifications to breeding (aquatic) habitat or terrestrial habitat that functions as a dispersal corridor, whether temporary or permanent, whether direct or indirect, need to be appropriately quantified and offset on site (ie within Sydney Olympic Park) to protect the viability of the Parramatta Key Population and SOS key management site. Where absolute protection of extant habitat cannot be guaranteed, the creation of additional habitat at Sydney Olympic Park is required to maintain the viability of the Parramatta Key Population. This should be co-designed with, or endorsed by a suitably qualified ecologist who demonstrates extensive experience and success with landscape protection of green and golden bell frog populations and relevant SOPA personnel (including siting) and monitored for a minimum of 3-6 years. This should be created *before* construction commences to ensure success as a mitigation measure. Where temporary or permanent loss of breeding habitat occurs as a

Topic	Issue	Recommendation
	have the potential to limit reproductive success, including the provision of aquatic habitats with low noise, low vibration and low light conditions.	result of direct or indirect impacts, individuals should be translocated to suitable source ponds at Sydney Olympic Park (based on the advice of a suitably qualified ecologist who demonstrates extensive experience and success with landscape protection of green and golden bell frog populations) and monitored weekly for 3 years in the breeding period (August to May) to determine the effects of translocation which are not well understood both in this species or in Australian amphibians generally. Despite this, translocation is often considered an appropriate mitigation measure, the success of which is rarely documented in the public literature.
Important first principles of seasonal pond breeding amphibians are not considered in the EIS.	The EIS fails to consider the fundamental biology and ecology of, and threats to, the green and golden bell frog in order to be able to a) develop an accurate impact assessment and b) develop associated mitigation measures with a predictably high level of success	GGBF breeding ponds are located within a few metres of the project footprint and so will be subject to noise, vibration, light and disturbance impacts during construction and operation. In some locations the EIS footprint includes GGBF breeding ponds. The Assessment of Significance concludes that increased flood levels will increase spread of Gambusia between ponds. The EIS does not identify how the project considers first principles of pond breeding amphibians in both its impact assessment and development of mitigation measures. Seasonal pond breeding amphibians, and especially the green and golden bell frog: - Vary widely in population sizes between years due to their reproductive response to climatic variation - Need water to breed but will breed in different waterbodies in different years which appear to be random - Need waterbodies free of the invasive predatory fish *Gambusia holbrooki* in order to reliably reproduce and have tadpoles that develop to metamorphosis - Move between waterbodies to breed, so need safe links across terrestrial landscapes (connectivity) but as a taxa are considered to have low mobility and limited ecological versatility, so fragmentation poses a serious risk to local extinction and recolonisation potential, reducing genetic variation and thus,

Topic	Issue	Recommendation
		population viability. - Need moisture to stay hydrated when moving between waterbodies - Have episodic recruitment, often moving en masse at metamorphosis in the thousands in what appears to be random directions - Rely on vocalisation (chorusing) to attract mates which is a direct indicator of reproductive potential. This can be affected by environmental noise, ecological light pollution and ground vibrations, affecting the chance of reproduction. - Are subject to local pond extinctions, thus relying heavily on connectivity to facilitate recolonisation and thus, population viability. Assessment of impacts to the GGBF and development of proposed mitigation measures requires further analysis by a suitably qualified ecologist who demonstrates extensive experience and success with landscape protection of green and golden bell frog populations to assist in the development of the impact assessment, mitigation measures and in the implementation and performance monitoring of aforementioned mitigation measures.
There appear to be different project footprints between assessment documents	The project footprint described in the EIS does not match the project footprint described in *Tech Paper 9 – Biodiversity Development Assessment* and thus a new assessment of significance is required for any works not explicitly assessed in the BDAR in relation to project construction and operation impacts to the green and golden bell from and its habitat at Sydney Olympic Park.	Under the current legislative environmental planning framework, the BDAR (Biodiversity Development Assessment Report) is the key document that describes the assessment of biodiversity impacts and mitigation potential associated with a project or activity. The BDAR for the Parramatta Light Rail Stage 2 EIS includes a footprint substantially different to that described in the EIS in respect of the finer detail relevant to assessing impacts to bell frog habitat, including, but not limited to the following elements: - Potential construction works and operation in the vicinity of Narrawang Wetland (including ambiguity around impacts to N22 and N17 aquatic habitats), including works to the west of the

Topic	Issue	Recommendation
		existing frog fence. - Timing and impact of potential construction works in the vicinity of the frog underpass U1, Holker Busway, Kronos Hill Precinct. Maintenance of habitat connectivity and quality is contradictory between documents. Removal and replacement of underpasses would have an impact footprint that extends to GC7 and GE9 waterbodies and the grassy terrestrial corridor. - Potential differences in construction methodology and footprint associated with the bridge strengthening works for the Holker Busway over green and golden bell frog habitat. - Temporary or permanent works within green and golden bell frog habitat in Narrawang Wetland, Kronos Hill, Haslams Reach, Brickpit, Woo-la-ra precinct and other areas identified in the EIS that are inconsistent with those assessed in the BDAR. The EIS and BDAR are required to reflect the same footprint so that an appropriate assessment of significance of impact of temporary and permanent, direct and indirect impacts can be developed and exhibited for comment, and a suite of appropriate and evidence-based mitigation measures developed to achieve minimum environmental impact. Specifically, the footprint consistent with the BDAR assessment identifies: • No footprint within ponds and pond edges at N22, N17 or other ponds within Narawang Wetland • No footprint associated with the Holker Busway works within GGBF habitats – including bridge strengthening and underpass U1 strengthening • Removal of some grassland habitat in the Woo-la-ra precinct within the mapped project footprint Any works inconsistent with the above will require new assessment

Topic	Issue	Recommendation
		under the BDAR and the EPBC Assessment of Significance
BDAR/EPBC Assessment	Adequacy	Even if the BDAR footprint is the correct footprint for assessment (which means green and golden bell frog ponds are not directly affected as a result of construction and operation of the project), the BDAR/EPBC Assessment as it relates to green and golden bell frogs: - Does not adequately consider the impacts of noise and vibration as expressly required in the SEARs, nor does it adequately consider the potential impacts of light and disturbance. - Does not reflect an understanding of the biology and ecology of the species, suggesting for example, that fragmentation of the population is not an issue 'given the fidelity of the species to suitable breeding habitat' if works that affect connectivity happen outside breeding season. This does not account for the two movement patterns of many pond-breeding amphibians – migration and dispersal (the latter associated with juvenile movements). These issues, together with the impacts that are identified in the BDAR (eg – potential for increased spread of gambusia) may result in a loss of pond functionality and breeding success, resulting in far greater-reaching significant impacts to the population beyond those identified in the BDAR. The opportunity to offset impacts by using the 27 species credits for the species to further improve green and golden bell frog habitat at Sydney Olympic Park, should be investigated.
Impacts of noise, vibration, disturbance and lightspill during both construction and operation are not assessed	There needs to be clear assessment of impact and acknowledgement of uncertainty of impacts. There needs to be clear commitment to mitigation to reduce impacts.	A number of impacts are not addressed in the EIS and associated Tech Paper 9 – Biodiversity Assessment Report. This includes the potential direct impact of noise and vibration from construction and operation to sensitive ecological receptors. These were expressly required to be assessed for fauna in the project SEARs (S3.1), but there is no consideration of these impacts on the green and golden bell frog in the

Topic	Issue	Recommendation
	Mitigation measures need to be fit for purpose (that is – they should be developed with understanding of the first principles of pond breeding amphibians). Mitigation measures need to be monitored for success and intervention points identified to minimise impact. Some mitigation measures need to be implemented *prior to construction* to ensure success.	BDAR, nor subsequently, the EIS. Noise and vibration are known to alter the calling pattern of male frogs. The inference is that this could have significant impacts to breeding patterns. Breeding is imperative to maintain population viability. However, this remains an untested assumption, but not an unreasonable inference. To adequately address the potential direct impacts of noise and vibration in the significance assessment the project should obtain a baseline of noise profiles in the wetlands alongside the project footprint from 6pm until 6am and confirm the predicted noise profiles in these areas as a result of evening construction and evening operations. These values should be compared with values quoted in the relevant scientific literature to bring more certainty to the potential impact. If there is likely potential impact associated with changes in noise profiles to green and golden bell frog habitat, then controlled studies should be undertaken to further quantify that impact, including the investigation of stress biomarkers in green and golden bell frogs. A similar approach is recommended to provide some certainty to the presence and scale of impacts associated with vibrations within adjacent ponds and at Underpass U1. The extent of lighting impact to Narawang Wetland is not assessed. Existing roadside trees which currently screen the wetland from light and disturbance generated along Hill Road will be removed, resulting in increased lightspill across the wetland. Modelling is required to characterise the extent of the impact. Mitigation measures outlined in the EIS, and particularly Chapter 16 Biodiversity, are non-committal. All mitigation measures should be considered as project conditions of consent. The current EIS includes statements such as 'as far as practicable', 'minimum necessary', 'where reasonable and feasible' and 'where appropriate', without any evidence-based thresholds that demonstrate reduction of impact, or indeed a commitment to reduce impact. Mitigation measures (some pertinent

Topic	Issue	Recommendation
		ones already described in this letter, and further detailed below) should be clearly articulated, previously demonstrate a high level of success, be fit for purpose and many of them should be implemented well in advance of the initial stages of project implementation (site establishment, vegetation disturbance etc) to confirm adequacy. In general, mitigation measures should be fit for purpose and demonstrate a good understanding of the first principles of pond breeding amphibians. They should be co-designed with, or endorsed by, a suitably qualified ecologist who demonstrates extensive experience and success with landscape protection of green and golden bell frog populations. This includes, but is not limited to: a) Temporary measures such as frog proof fences and their design (keeping frogs in is different to keeping frogs out), timing of installation and operation, monitoring for adequacy and animal welfare, maintenance, developing contingencies for dispersal and movement events b) Mitigation from noise, vibration and light (for example, hoarding for noise and light mitigation) c) Timing of works with sensitivity to frog activity – juvenile dispersal in Summer and Autumn, breeding movements in Spring and Autumn, and flexibility in the delivery of the project schedule to minimise impact at these times. The 'temporary' nature of some construction activities are long enough to be permanent in a frog's life cycle. d) Translocation of green and golden bell frogs from wetlands that will experience any permanent direct impacts or temporary impacts occurring over the breeding season (August to May) (including, but not limited to, changes in hydrology, water quality, shading, noise and vibration) to appropriate recipient sites, with

Topic	Issue	Recommendation
		frequent monitoring to determine health and survival. Source sites should be fenced to prevent ingress and the fences adequately maintained and monitored for animal return. These activities are required to occur at least 6 months before site establishment commences and should occur prior to June in any year. Mitigation measures need to be monitored for success and intervention points identified to minimise impact. Monitoring plans and intervention points (stop work, adaptive management) should be co-designed with, or endorsed by, a suitably qualified ecologist who demonstrates extensive experience and success with landscape protection of green and golden bell frog populations. The conditions of consent for the project should include the development of a project construction biodiversity management plan that is co-designed with, or endorsed by, a suitably qualified ecologist who demonstrates extensive experience and success with landscape protection of green and golden bell frog populations and then approved by the consent authority. The plan should include 6 monthly reports and clearly identify the process and requirement for reporting of additional or unexpected impacts.

This advice was reviewed by Professor Michael Mahony, conservation biologist studying frogs professionally for over 30 years, and he agrees with its content. Michael has spent over a decade sitting on the technical and scientific advisory committee for the Gondwana Rainforests of Australia World Heritage Area and most recently assessed the impacts of the Black Summer bushfires on a suite of Australia's threatened amphibians. He has a long history overseeing research projects investigating the green and golden bell frog, its threats to survival, and actions to conserve the species, including on Sydney Olympic Park, Kooragang Island and the NSW Central Coast.

Please do not hesitate to contact me should you require further clarification of this advice.

Kind regards and thanks

Dr Alex Callen (also on behalf of Dr Colin McHenry)

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Reference List

Darcovich, K., & O'Meara, J. (2008). An olympic legacy: green and golden bell frog conservation at Sydney Olympic Park 1993-2006. *Australian Zoologist*, *34*(3), 236-248.

Department of Environment and Climate Change (NSW) 2007, Draft Management Plan for the Green and Golden Bell Frog Parramatta Key Population, Department of Environment and Climate Change (NSW), Sydney.

Alex Callen - CV

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QUALIFICATIONS

2018 **Doctor of Philosophy (Environmental Science)** - University of Newcastle, Australia
- A refuge for amphibian reintroduction - Manipulating salinity in created habitat for a chytrid-susceptible model species*, Litoria aurea* (green and golden bell frog)

2000 **Bachelor of Environmental Science (Honours Class I)** - University of Newcastle, Australia
- Assessment of vertebrate pest control programs, Singleton Army Training Area

1999 **Bush Regeneration Certificate** - TAFE

RESEARCH EXPERIENCE

Postdoctoral Researcher University of Newcastle Jan 2018 – Present

Conserving vulnerable amphibian fauna in protected habitats

Responsible for leading the project to satisfy empirically based objectives and determining the appropriate method for data collection across a large spatial scale for cryptic species. Field surveys (Senior First Aid + CPR certified), acoustic analysis and citizen science comprise the three primary data collection methods, complemented by tissue collection for genetic analysis and qPCR for infection analysis. Training open source software (AviaNZ) to compare extant distribution with historical distribution using acoustic data occupancy modelling. Collaboration with the School of Psychology (Prof Scott Brown) to evaluate the accuracy of citizen science data - a global gap in public participation programs in conservation. Partnership with the School of Information and Physical Sciences (A/Prof Stephan Chalup) to advance machine learning to streamline data analysis using acoustic data. Daily responsibilities: postgraduate and honours student supervision, data analysis, budget control, annual reporting, project management (ethics, scientific licence, WHS), media liaison, manuscript review and development.

Assessment of population dynamics, distribution and habitat use for the green and golden bell frog at Avoca

Project lead to determine the role of intermittent closed and open lakes and lagoons as amphibian refuges and how they mitigate key threats including disease and aquatic invasive predators as well as being drivers of decline (habitat fragmentation, genetic isolation). Collaboration with SELS Coastal and Marine Science Group (A/Prof Troy Gaston) and Dr Dave Wainwright for coastal salinity and hydrology modelling. Key responsibilities as above.

Landscape and population dynamics of Kooragang Island and Ash Island Bell Frogs

Responsible for assisting the lead academic in a longitudinal study of a threatened frog population in a mixed use landscape including protected areas and industrial zones. Applied research examining the impact of adaptive management to enhance conservation. The research is developed in close liaison with four industry research partners, and a collaboration with UON School of Biomedical Sciences and Pharmacy (A/Prof Phil Jobling) in conservation endocrinology to investigate hormonal pathways in amphibians as indicators of stress.

Co-supervision of 5 post-graduate research students (Primary Supervisor of 1)

PhD University of Newcastle 2013 - 2018

A refuge for amphibian reintroduction - Manipulating salinity in created habitat for a chytrid-susceptible model species, Litoria aurea (green and golden bell frog)

Examined the feasibility of habitat manipulations to mitigate wildlife disease in free-living disease-susceptible frogs. This included field based ecological surveys and investigations and laboratory experiments. Ecological modelling techniques included generalised additive mixed models, survival analysis and multi-state modelling applying Bayesian methods using a number of software packages including R and Program MARK.

TRADITIONAL RESEARCH OUTPUTS

Year	Citation	Metrics
2021	Gould, J., **Callen, A.,** Maynard, C., Knibb, G., McGregor, J., Gill, L., Sanders, S., Davies, B., … (2021). Standing out in a crowd: Intraspecific variability in dorsal patterning allows for photo-identification of a threatened anuran. Austral Ecology (early view).	Early view
2020	Meyer NFV, Balkenhol N, Dutta T, Hofman M, Meyer J-Y, Ritchie EG, Alley C, Beranek C, Bugir CK, **Callen A**... 'Beyond species counts for assessing, valuing, and conserving biodiversity: response to Wallach et al. 2019', Conservation Biology, 35 369-372 (2020) DOI 10.1111/cobi.13665	Citations 2 Altmetrics 18
2020	Griffin AS, **Callen A**, Klop-Toker K, Scanlon RJ, Hayward MW, 'Compassionate conservation clashes with conservation biology: Should empathy, compassion and	Citations 6 Altmetrics 76

	deontological moral principles drive conservation', Frontiers in Psychology, 11 (2020) [C1] DOI 10.3389/fpsyg.2020.01139	
2020	Klop-Toker K, **Callen A,** King JP, Beranek C, Lenga D, Valdez J, Clulow S, Pizzatto L, Stockwell M, Clulow J, Mahony M. (2020). Reintroduction of green and golden bell frogs into created habitats on Kooragang Island, Australia. Soorae, P. S. (ed). Global Reintroduction Perspectives: 2020. Case studies from around the globe. **IUCN/SSC** Reintroduction Specialist Group, Gland, Switzerland	
2020	**Callen A,** Hayward MW, Klop-Toker K, Allen BL, Ballard G, Beranek CT, et al., 'Response to comments on "Compassionate Conservation deserves a morally serious rather than dismissive response - reply to Callen et al., 2020"', Biological Conservation; 244 (2020) DOI 10.1016/j.biocon.2020.108517	Citations 2
2020	**Callen A,** Hayward MW, Klop-Toker K, Allen BL, Ballard G, Broekhuis F, et al., 'Envisioning the future with compassionate conservation : An ominous projection for native wildlife and biodiversity', Biological Conservation, 241 (2020) [C1] DOI 10.1016/j.biocon.2019.108365	Citations 17 Altmetrics 118
2019	Hayward, Matt W.; Jachowski, David S.; Bugir, Cassandra K.; Clulow, John; Krishnamurthy, Ramesh; Griffin, Andrea S.; Chalmers, Anita C.; … **Callen, Alex**….'The search for novelty continues for rewilding', Biological Conservation, 236 584-585 (2019) DOI 10.1016/j.biocon.2019.05.041	Citations 1 Altmetrics 8
2019	Hayward MW, Scanlon RJ, **Callen A**, Howell LG, Klop-Toker KL, Di Blanco Y, et al., 'Reintroducing rewilding to restoration Rejecting the search for novelty', Biological Conservation, 233 255-259 (2019) [C1] DOI 10.1016/j.biocon.2019.03.011	Citations 23 Altmetrics 96
2019	Hayward MW, **Callen A,** Allen BL, Ballard G, Broekhuis F, Bugir C, et al., 'Deconstructing compassionate conservation', Conservation Biology, 33 760-768 (2019) [C1] DOI 10.1111/cobi.13366	Citations 31 Altmetrics 151

NON-TRADITIONAL RESEARCH OUTPUTS

Year	Citation
2020	Kelly M, O'Donnell L, Sailer P, O'Callaghan S, **Callen A**, Drabsch, B. Biomes 2020 3D Virtual Gallery Creative Work
2020	O'Callaghan S, **Callen A**, Kelly M, Drabsch, B. Biomes 2020 Website. Creative Work
2020	Drabsch B and **Callen A**. Biomes combines art, conservation, technology. Interview with Robin Williams ABC National 'Science Show'.
2018	Klop Toker, K and **Callen, A**. Worth their salt. 'Could seasoning' our frogs stop them croaking it? Wildlife Australia, Summer 2018. Wildlife Preservation Society of Queensland.

CONFERENCE PAPERS AND WORKSHOPS

Year	Title
2020	'Outcome bias of auditory survey methods may negatively affect detectability of anurans' Paper presented to the 9th World Congress of Herpetology, Dunedin, New Zealand.
2019	'Clues to controlling the impact of chytrid on the green and golden bell frog' Presented at Managing threats; landscape solutions for the Green and Golden Bell Frog, NSW Office of Environment and Heritage and the Sydney Olympic Park Authority, Parramatta, Australia.
2017	'Understanding movement patterns of the Green and Golden Bell Frog in a closed population can improve survey methods and enhance reintroduction efforts' Presented at the NSW Ecological Society Conference, Kooinda Resort, and Central Coast, Australia.
2014	'Build it and they *still may not come*. Using new knowledge to move beyond physical restoration of amphibian habitat' Presented at the Singleton Mined Lands Rehabilitation Conference, Tom Farrell Institute, Singleton, NSW, Australia.
2014	'Picking a pond – Is preference the key to passive chytrid control for the green and golden bell frog?' Presented at the annual Australian Society for Herpetology Conference, Canberra, Australia.

AWARDS

2019	Faculty of Science Sessional Teaching Excellence and Contribution to Student Learning Award Collaboration Excellence Team Award for the roll-out of the new core first year Science course, *Professional Scientific Thinking*.
2017	NSW Ecological Society of Australia, Student Grant Award. Understanding movement patterns of the Green and Golden Bell Frog in a closed population can improve survey methods and enhance reintroduction efforts ($2000).
2014	Tom Farrell Institute, Singleton Mined Lands Rehabilitation Conference Award. *Build it and they <u>still</u> may not come*. Using new knowledge to move beyond physical restoration of amphibian habitat.
2008	Inaugural Environment Officer of the Year Award (*Kicking the Dirt*), Department of Defence
1999	Honours scholarship from the Department of Defence ($10 000). Assessing the effectiveness of vertebrate pest control programs on the Singleton Army Training Area.

GRANTS

I have been successful in obtaining 16 grants totalling more than $4M (some of these during my PhD). Of these I have written successful grants totalling more than $600 000. However, UON requires that chief investigators must not draw salary from these grants so although my grant success is significant, the chief investigator status is formally recognised under the profile of tenured academics who are investigators, rather than mine.

Grant Details

2021-2024 $808 639 *Post-fire conservation action for the heath frog and giant burrowing frog*
NSW Government (Planning, Industry & Environment); Coinvestigator, Post-doctoral Researcher, HDR Supervisor
Collaborators: Prof Hayward, Prof Michael Mahony, A/Prof John Clulow, Dr Kaya Klop-Toker

2020 – 2023 $215 000 *Assessment of population dynamics, distribution and habitat use for the green and golden bell frog at Avoca* Central Coast Council; Grant Writer, Coinvestigator, Post-doctoral Researcher, HDR Supervisor; **Collaborators:** Prof Matt Hayward, Prof Michael Mahony, A/Prof Troy Gaston, Dr Andrea Griffin, Dr David Wainwright

2020 – 2023 $ 9 200 *Citizen Scientists Improving Frog Conservation in NSW National Parks*
Foundation for National Parks & Wildlife; Grant Writer, Coinvestigator, Post-Doctoral Researcher
Collaborators: Prof Matt Hayward

2019 – 2022 $300 627 *Conserving vulnerable amphibian fauna in protected habitats*
NSW Environmental Trust; Grant Writer, Coinvestigator, Post-doctoral Researcher, HDR Supervisor
Collaborators: Prof Hayward, Prof Michael Mahony, Prof Brett Neilan, A/Prof John Clulow, Dr Kaya Klop-Toker

2020 – 2021 $751 982 *Securing threatened frogs from bushfire impact* Commonwealth Government (Agriculture, Water & the Environment); Coinvestigator **Collaborators:** Prof Hayward, Prof Michael Mahony, A/Prof John Clulow, Dr Kaya Klop-Toker

2020 – 2021 $ 42 350 *Post-fire actions for threatened amphibians* NSW Government (Planning, Industry & Environment); Co-writer, Coinvestigator, Post-Doctoral Researcher; **Collaborators:** Prof Hayward, Prof Michael Mahony, Dr Kaya Klop-Toker

2020 – 2021 $ 5 000 *The effect of shading and microhabitat use on disease loads in the threatened green and golden bell frog* Hunter Wetlands Centre; Writer, Coinvestigator, Post-Doctoral Researcher
Collaborators: Dr Kaya Klop-Toker, Dr Ryan Witt

2010 – 2022 >$1.5M *Landscape and population dynamics of Kooragang Island and Ash Island Bell Frogs*
Kooragang Island Research Partners Consortium (NSW Government DPIE, Port Waratah Coal Services, Newcastle Coal Infrastructure Group, Hunter Central Coast Development Corporation, Port of Newcastle); Coinvestigator, Post-Doctoral Researcher; **Collaborators:** Prof Hayward, Prof Michael Mahony, Dr Colin McHenry, Dr John Gould

2019 – 2021 $88 000 *Clyde Wetland Frog Assessment* VIVA Energy Australia; Writer, Coinvestigator, Post-Doctoral Researcher; **Collaborators:** Prof Michael Mahony

2019 $10 510 *Measurement of the genetic diversity of the population of the threatened green and golden bell frog in the Brickpit habitat at the Sydney Olympic Parklands;* Sydney Olympic Park Authority; Co-Writer, Coinvestigator; **Collaborators:** Prof Michael Mahony

2018 $31 703 *Expert herpetology advice for restoration of green and golden bell frog habitat at Clyde Terminal;* VIVA Energy Australia; Co-Writer, Coinvestigator, Post-Doctoral Researcher; **Collaborators:** Prof Michael Mahony; UNSW

2018-2019 $50 000 *Determining adaptive capacity of mountain top frogs to climate change predictions; Establishing population status and identifying priority management sites for stuttering frog*
NSW Government (Planning, Industry & Environment); Coinvestigator; **Collaborators:** Prof Michael Mahony

TEACHING/LECTURING EXPERIENCE

Course Co-ordinator/Sessional Academic/Conjoint Lecturer University of Newcastle Feb 2014 – Present

- *Undergraduate – Environmental Science/Biology*

1st Year

- *Environmental Concepts & Methods (core)*

Eight years in various roles including Head Demonstrator, Lecturer, Demonstrator and Marker. Responsibilities included field and laboratory instruction, adhering to and student training in work health and safety requirements, review and renewal of practical class content, including the transition to online learning during the 2020 Covid Lockdown (video practicals). Administrative duties student attendance, liaison with Technical Staff and demonstrators to manage logistics, timely marking of assessments and exams and provision of constructive feedback.

- *Professional Skills for Biological Sciences (core)*

Co-ordinator & Head Demonstrator, and demonstrator. Responsibilities as described above; also communication with students regarding performance, adverse circumstances, extra needs. Administration through Blackboard, co-ordination of lecturing academics, reporting of grades to the examination board and review of student feedback.

- *Professional Scientific Thinking (core)*

Workshop demonstrator in a team teaching environment under a flipped classroom pedagogy.

2nd Year

- *Catchment & Water Resource Management*

Demonstrator with responsibility for blended learning design for practical classes including the transition to online learning laboratory classes during the 2021 Covid Lockdown. Other responsibilities as per ENVS1001.

- *Australian Fauna; Australian Flora*

Demonstrator: teaching students various terrestrial ecology survey methodologies during 2 day field trips, including work, health and safety requirements, animal handling, ethics and data recording. Marking, developing online assessment content. Demonstrator with the responsibility for teaching students taxonomic and morphological plant identification skills.

3rd Year

- *Environmental Management Perspectives (capstone)*

Demonstrator in a final year professional preparatory course for Environmental Science Students. Assisted course co-ordinator in development of multidisciplinary applied assessment tasks.

- *Conservation Biology; Restoration Ecology*

Demonstrator in ecological field surveys, marker, restoration and rehabilitation of terrestrial environments.

- *Work Integrated Learning (Organisation placement, work/volunteer experience, Advanced Research Project)*

Provided mentoring and support for Work Integrated Learning students with purposeful and applied projects

- *Postgraduate – Master of Environment & Sustainability ONL*

- *Sustainability & Ecosystem Health (core); Biodiversity, Conservation Science &* Management

Responsibilities include course co-ordination, tutor and marker in an online asynchronous environment. Management of Blackboard for all course content including routine announcements. Liaison with students regarding coursework and progress-related issues. Review of course feedback (course experience surveys) and adjustment of content and teaching medium as appropriate. Course and curriculum design, including incorporation of synchronous learning opportunities.

- *Enabling – Open Foundation ONL*

- *Environmental Biology Course*

Responsible for the transition of face to face courses into an online synchronous learning environment via Blackboard including complementing course notes with relevant videos and independent online activities. Co-ordinator, Tutor, Marker. Liaison with Learning Design and Teaching Innovation team to develop online tutorial resources and filming. Responsible for course review paperwork to substitute rote-learning examinations for critical thinking assessments.

OUTREACH & INTERNAL ROLES/ACADEMIC SERVICE

2021	Examiner for Undergraduate SCIE seminars; Science Academic Panel member Confirmation Board – College of Human and Social Futures
	National Science Week Exhibitions and Events – *Biomes – Our Footprint*. Co-exhibited with *Brain* (School of Psychological Sciences).
	Cessnock Bioblitz (2020). Raising awareness of the biodiversity values of the Hunter Economic Zone and the role of community in citizen science. Contributor (evening spotlight surveys)
2020	Exhibition – *Biomes – Our Place on the Planet*. In conjunction with the international technology art festival *Ars Electronica – Kepler's Gardens*
	Cessnock Bioblitz (2019). Raising awareness of the biodiversity values of the Hunter Economic Zone and the role of community in citizen science. Contributor (evening spotlight surveys, daytime information stall on *cool conservation science* at the University of Newcastle)

St James Primary School – Climate Change Proposals - Stage 3 students presented their climate change proposals for biodiversity conservation to a panel of UoN scientists. Panel member.

MEDIA ENGAGEMENT

Print "Leaping into frog research" – The Newcastle Herald (September, 2021)

Online Print "Scientists, volunteers push to save frogs using cryopreservation" – ABC News (June 2021)

Radio

"Scientists, volunteers push to save frogs using cryopreservation" – ABC Radio Australia Wide Segment (June 2021)
"Biomes combines art, conservation and technology" – ABC The Science Show with Robyn Williams (September 2020)

PEER REVIEW ACTIVITIES

Ad hoc reviewer for the following journals:
Frontiers in Ecology & Evolution; Journal of Applied Ecology; Biological Conservation

MEMBERSHIPS

Hunter Environment Institute; Society for Conservation Biology

PROFESSIONAL/INDUSTRY EXPERIENCE

Senior Ecologist Sinclair Knight Merz Jul 2011 – Feb 2013
Project manager and terrestrial field ecologist (flora and fauna) conducting ecological assessments for impact assessment and compliance with biodiversity survey guideline requirements. Collaboration with environmental planners and design engineers for impact mitigation, liaison with clients, report preparation, compliance with scientific licences and animal ethics approvals.

Environment Officer Department of Defence May 2002 – Jun 2011
Environmental impact assessment and environmental management of Defence Estate. Designed and delivered environmental awareness training to military and contract personnel. Budget management >$1 Million p.a for environmental improvement projects. Scoped environmental works programs for tender and evaluated and awarded tenders including feral animal and weed management, contaminated land management, biodiversity conservation. Reported progress against the implementation of Environmental Impact Statement Conditions of Consent and drafting of ministerial submissions for high profile issues. Certified Environmental Lead Auditor Training.

Remnant Vegetation Project Officer Hunter Catchment Management Trust Mar 2000 – Apr 2002
Williams River Total Catchment Management Co-ordinator (now Local Land Services)
Responsible for promoting sustainable natural resource management to landholders via site visits, field days and demonstrations in relation to the protection of native remnant vegetation. Chaired a committee comprising landholders, community groups and government representatives for catchment management, taking minutes and setting agendas. Design of quarterly Hunter Flora newsletter including editing and review. Project management of land management grants including budget control and progress reporting.

Environmental Scientist Hunter Water Australia May 1999 – Aug 2001
Responsible for the development of flora and fauna impact assessment and management plans and local government stormwater management plans. This including compliance with regulatory survey guidelines, leading community consultation via stakeholder workshops, project management and delivery of high quality outcomes on time and within budget.

Environmental Sampler ACIRL Australia May 1996 – Sep 1998
Responsible for the collection of dust and surface water samples in accordance with Australian Standards. Worked as part of a team to build and manage a native plant nursery including seed collection and native plant propagation, bushland regeneration and media communication.

Landcare Trainee Landcare Australia Feb 1994 – Dec 1994
Worked as part of a team to build and manage a native plant nursery including seed collection and native plant propagation, bushland regeneration and media communication.

REFEREES

Honorary Professor Michael Mahony
School of Environmental & Life Sciences
University of Newcastle
P: 4977 2773 (home)
E: Michael.mahony@newcastle.edu.au

Colin McHenry Ph.D.

Scientific Officer, Kooragang Island Bell Frog Monitoring Program
Conjoint Fellow, School of Engineering, University of Newcastle
Adjunct Lecturer in Anatomy, Monash University

Telephone: (+61) 412 659541
Email: colmac39@gmail.com

SUMMARY

I currently manage the Island-Wide Surveys for Green and Golden Bell Frogs on Kooragang Island (2015-present). As a chief scientist / project leader I have worked on remote area environmental science surveys in the Kimberley and Pilbara regions of Western Australia (2011-16).

As a graduate student, I have led environmental and earth science research projects in Sumatra, central western Queensland, Cape York, and central western NSW. I have assisted with other projects in the Simpson Desert and the Great Barrier Reef Marine Park.

I have taught at universities since 2003, in both Environmental Science and Biomedical Sciences. My current teaching position is as Senior Lecturer in the School of Medicine and Life Sciences, University of Newcastle. I am currently in the final stages of a Master of Education (secondary schools).

In addition to environmental and biomedical sciences, my research interests include palaeontology and biomechanics. My doctoral degree was in geology, and I held a post-doctoral fellowship in mechanical engineering.

EDUCATION & QUALIFICATIONS

2015–2020	Master of Teaching (Secondary)	***University of Newcastle***
2012–2013	Graduate Certificate in Academic Practice	***Monash University***
2007–2009	Ph.D. (Geology/Palaeontology & Biomechanics)	***University of Newcastle***
1989–1992	B.Sc. Honours (first class) in Biology	***University of Southampton (UK)***

RESEARCH & OTHER WORK EXPERIENCE

2015– *University of Newcastle*	**Scientific Officer, Kooragang Island Green and Golden Bell Frog monitoring program, Amphibian Research Group** Responsible for ongoing ecological monitoring of an endangered population of Green and Golden Bell Frog in the Newcastle area. Organising and conducting field work, data collection and analysis on industrial and National Parks sites. Involves recruiting and leading a small team of field ecologists, operating within heavy industry OH&S protocols, and report writing.
2011–2016	**Chief Investigator, Project Kimberley** Multi-institutional project targeting the impact of cane toads on the tropical ecosystems of north-west Australia. Emphasis on compiling long-term datasets that can quantify the effect of this invasive species upon community structure, targeting knowledge gaps relevant to developing new management strategies, and investigating links between anatomy, biomechanics, and ecology in Australian reptiles
2011–2015 *Monash University*	**Lab Head, Functional Anatomy and Biomechanics Lab (FABLab)** Using the methods developed as part of the CBRG (see below), the FABLab used state-of-the-art in computational biomechanics to produce ultra-high resolution 3D models of actual anatomical systems. This has already led to a number of applied projects, including the development of 3D printing as a learning tool for medical anatomy. Ecomechanical applications of these techniques include continuing work on the reptiles of Northern Australia, dolphins, and crocodiles.
2009–2011 *University of Newcastle*	**ARC Post-Doctoral Fellow, Palaeoecology** Sole CI on Discovery Project "The role of natural selection in macroevolution: a case study examining convergence of form and function in marine predator guilds". The project aimed to quantify links between morphology and ecology in a diverse range of marine predators, and use that data to test macroevolutionary models.
2006–2009 *UNSW & University of Newcastle*	**Research Fellow, Biomechanics** Founding member of Computational Biomechanics Research Group (**CBRG**), funded by ARC and internal grants. The Group developed world-leading protocols to allow high resolution computer modelling of biomechanics in a range of species using a multi-disciplinary approach. Research questions were strongly grounded in functional anatomy and methods require expert knowledge of morphology and ecology in a wide range of species, whilst the techniques developed have direct application to environmental, biomedical and engineering sciences.
1998–2002 *Canowindra, NSW*	**Managing Curator, Age of Fishes Museum** Responsible for all aspects of running a regional fossil museum: Strategic planning, raising funds (government grants and corporate sponsorship), designing exhibitions and public outreach programs, recruiting, training and managing staff, day-to-day running of museum, developing budget and reporting to Board, liaising with Government and Industry partners, networking with Tourism, Education, and Science organisations, and media liaison.

TEACHING EXPERIENCE

Senior Lecturer, Medical Education

2019–2021: University of Newcastle, School of Medicine and Public Health

Curriculum support and eLearning resource development
Working across multiple schools within the Faculty of Medicine to identify opportunities for eLearning within the undergraduate medical program, and develop suitable resources. Includes extensive experience with the SECTRA imaging system. This project assumed increased importance with the switch to online learning during COVID in 2020-21.

Teaching associate

2015–2021: University of Newcastle, School of Medicine and Public Health, School of Biomedical Sciences & Pharmacy, School of Environmental and Life Sciences (whilst completing Master's degree)

Medi1
Medi2
Medi3
Medi5

Lecturing and tutoring (casual)
Lecturer / Lead Demonstrator / Demonstrator (in the Discipline of Anatomy, teaching anatomy in 1st and 2nd Year MED (MBBS, MD) and HUBS (Physiotherapy, Occupational Therapy, Radiography, Biomedical Science, Speech Pathology) courses, as well as the Postgraduate Surgical Training Workshops. Material taught includes gross anatomy, musculoskeletal biomechanics, neuro- and visceral anatomy, and head & neck anatomy. **Received the Teaching Prize (Faculty Medicine) for Casual Teachers, 2016**.

HUBS1105
HUBS1107
HUBS2103

Guest lecturer/tutor *University of New England, School of Rural Medicine (2016)*
Lectures and lab tutoring for UNE rural medical students whilst UNE recruits permanent anatomy staff. Included an intensive revision week supplied in late October 2016.

GEOS1040

Ran the **palaeontology** component of the introductory geology unit for the School of Environmental and Life Science.

ENVS3002

Course coordinator, *School of Environmental & Life Sciences* (2016)
Working on course documentation, curriculum alignment, and clear assessment rubrics whilst using online media to support student engagement and learning.

Lecturer, Course coordinator

2011–2015: Monash University, Anatomy & Developmental Biology

BMS1021
BMS2011
DEV2011
MED1011
MED1022
MED2022
P/G Rural Med

Course coordinator and lecturer for 1st year Medical (MBBS) and 2nd year Biomedical Science anatomy units. The MBBS unit focused on musculoskeletal anatomy, using cadaveric dissection; I designed and implemented lab procedures that considerably improved learning outcomes from these dissection-based practicals. I redesigned the Biomed. Sci. Introductory Anatomy unit to incorporate developmental, functional, evolutionary perspectives on gross anatomy. I coordinated units in both semesters of >300 students each. My teaching was highly rated by my students and colleagues, and **in 2014 I received the Faculty of Medicine Teaching Award**.

Lecturer, Researcher, Tutor, Demonstrator

2003–2010: University of Newcastle

HUBS1105
HUBS1106

Lecturer/Demonstrator in Anatomy, School of Biomed. Sci. & Pharmacy
Demonstrator in musculoskeletal anatomy courses; providing lectures on human gait biomechanics and the evolutionary context of human anatomy.

GEOS1040
BIOL2070
BIOL3110
BIOL3340
ENVS3340

Lecturer/Tutor/Demonstrator in School of Environmental & Life Science
Numerous roles, including:

- Delivered the 'Intro to Palaeontology' module (12 lectures) for 1st year Geology unit
- Helped to design and deliver a new 3rd year unit in the Environmental Management degree
- Tutored in Ecology subjects

MECH4841

Research Project Supervisor, School of Engineering Supervised computational biomechanics final year projects whilst an ARC Postdoctoral Fellow in the discipline of Mechanical Engineering.

ACADEMIC SERVICE

- Departmental representative, School of Biomedical Sciences Education Committee. Monash University, 2011-2015.
- Dept. Anatomy and Developmental Biology Education Committee. Monash University 2011-2015.

GRANTS AND FUNDS RECEIVED

- **Research program for Green and Golden Bell Frogs on Kooragang Island, 2015**–. Funded by industry partnerships, renewed annually. Total value of 2022-23 season projects is currently approximately $340,000.
- **Taronga Conservation Society Field Conservation Grant, 2013-2015**: "Building the Kimberley Ark: measuring genetic diversity of native predators prior to impact by cane toads". $17,000
- **Faculty of Medicine, Nursing, and Health Science, Learning and Teaching Research Grant, 2013**: "Building anatomy in the classroom: multi-user, real time image processing of 3D computer images". $20,000
- **Faculty of Medicine, Nursing, and Health Sciences Strategic Research Grant, 2012-2103**: "Integrating computer modelling and regenerative medicine for better treatment of Pelvic Organ Prolapse". $40,000
- **Early Career Grant, University of Newcastle, 2010**: "Ecomechanics - the prediction of ecology from structure". $15,000
- **ARC Postdoctoral Fellowship**, 2009-2011. "The role of natural selection in macroevolution: a case study examining convergence of form and function in marine predator guilds". $277,182

AWARDS

- Casual Academic Staff **Faculty Teaching and Learning Prize**, Faculty of Health and Medicine, University of Newcastle, 2016.
- Monash Student Association Prize for **Teaching Excellence**, Faculty of Medicine, Nursing, and Health Science, 2014.
- Faculty Award for **Research Higher Degree Excellence** (Science & IT), U. Newcastle, 2010.
- Listed in Discovery Magazine **Top 100 Science Stories**, 2008, for work on jaw mechanics and bite force in Great White Sharks.
- Faculty Award for **Outstanding Student Achievement** (Science & IT), U. Newcastle, 2007
- American Museum of Natural History travelling scholarship, 1996
- Research grant from the Australian Geographic Magazine, 1996
- Commonwealth Universities Postgraduate Fellowship, 1994–98
- Research studentship from Association for Study of Animal Behaviour, 1992
- Research studentship from the Nuffield Foundation, 1991

STUDENT SUPERVISION

- 2007: J. Morris, J. Ingle, F. McLellan. B. Eng FYP projects, U. Newcastle.
- 2009-2010: B. McLachlan, B. Eng FYP projects, U. Newcastle.
- 2010: J. Lee, C. Oldfield, C. Walmsley, B. Eng FYP projects, U. Newcastle.
- 2010-current: M. White, Ph.D. (part-time), U. Newcastle.
- 2011: M. McCurry, M. Quayle. B. Env. Mgmt Hons. Projects, U. Newcastle.
- 2011–2012: M. Johnston, M.Sc., Monash University.
- 2011–current: D. Rhind, Ph.D. (part-time), Monash University.
- 2012: P. Bishop, B.Sc. Hons., QUT.
- 2012–2016: M. McCurry, Ph.D., Monash University. *Ecomorphology and Biomechanics of marine reptiles and mammals.*
- 2012–2016: C. Walmsley, M.Sc., Monash University. *High resolution 3D modelling of musculoskeletal biomechanics.*
- 2013: A. Rofe, B. Med. Sci, Monash University
- 2013: P. Kippen, B. Biomed. Sci. Hons, Monash University
- 2013: J. Green, H. James. B.Sc. Hons. University of Newcastle
- 2013–2014: K. Hart, Angela Olah. B.Sc. Hons, Monash University
- 2018—2020: C. Maynard, B. Env. Mgmt Hons., U. Newcastle

MEDIA COVERAGE OF RESEARCH

Research projects have received **extensive media coverage** on regional, national, and international radio, print and online media, including;

- Widespread national coverage (print and online) on innovations in 3D printing for anatomy teaching
- **New Scientist**: news articles have reported work on plesiosaur palaeoecology (2005, research paper published in **Science**) and sabre-toothed cat skull mechanics (2007, research paper published in **PNAS**). In addition, my work has featured prominently in feature articles focussing on recent advances in marine reptile research (2009) and on the work done by my research group, the CBRG (2008).
- **National Geographic Magazine**: I was a consultant for the *December* 2005 feature article on 'Sea Monsters', which featured my PhD work on *Kronosaurus*. Research on bite force in carnivorous mammals was featured in the magazine in 2009.
- **Discovery Magazine**: Research on jaw mechanics in Great White Sharks was listed in the magazine's 'Top 100 Science Stories of 2008'.
- Leading science blogs, including Not Exactly Rocket Science, Laelaps, and Tetrapod Zoology .

The results of several publications have been featured in television documentaries;

- A documentary on the Australia megafauna (National Geographic Channel, 2004).
- A feature on the 2005 'Bite Club' paper (Catalyst, 2005).
- A documentary on crocodiles featured my FE model of a saltwater crocodile (National Geographic Channel, 2007).
- Work on sabre-tooth skull mechanics was featured in a documentary looking at the evolution of sabre-toothed cats (National Geographic Channel, 2007).
- The bite force of the marsupial lion *Thylacoleo* (Discovery Channel, 2008).

OTHER EXPERIENCE

- Consultancy work for University of Queensland (2010) and Richmond Marine Fossil Museum (2008-2010). *This covers a range of work, from training researchers in 3-D modelling software (UQ), to assembly of fossil exhibitions and leading fossil tours (RMFM).*

- Delegate, Frontiers in Science Symposium, Australian Academy of Science, Canberra, February 2008. *The Frontiers symposium is designed to encourage inter-disciplinary discussions between early- / mid- career scientists: Australian universities and research institutions are asked to send 'up and coming' scientists to the workshop, and I was one of two attendees from the University of Newcastle.*

- Organised and raised funds for student-led University of Southampton expedition to Way Kambas National Park, Sumatra, Indonesia in 1993. *Conducted six month field project surveying elephant and rhino population: was able to establish the hitherto unconfirmed presence of a Sumatran rhino population within the park.*

- Extensive work with Queensland Museum in collection, identification, and curation of state fossil collections as part of my PhD on the plesiosaur fossils of the Great Artesian Basin. *Requires skills in remote area field work and safety (collection localities include Cape York and Simpson Desert) and building on-going relationships with regional communities.*

PUBLICATIONS (for current citation metrics see Google Scholar)

[in biomedical sciences, last authorship (underlined) denotes a senior supervising role]

Dawson P, McHenry CR. 2022. Approaches to Assessment: A Perspective from Education. *In: Nestel D, Reedy G, McKenna L, Gough S (eds) Clinical Education for the Health Professions*. Springer, Singapore. https://doi.org/10.1007/978-981-13-6106-7_74-1

Beranek CT, Maynard C, McHenry C, Clulow J, Mahony M. 2022. Identifying a limiting factor in the population dynamics of a threatened amphibian: The influence of extended female maturation on operational sex ratio. *Austral Ecology* **47**(2), 239-250

Doody JS, McHenry C, Rhind C, Gray C, Clulow S. 2021. Impacts of invasive cane toads on an Endangered marsupial predator and its prey. *Endangered Species Research* **46**, 269-277

Gould J, Callen A, Maynard C, Knibb G, McGregor J, Gill L, Sander, S, Davies B, Schmahl K, Donelly R, Turner A, McHenry CR. 2021. Standing out in a crowd: Intraspecific variability in dorsal patterning allows for photo-identification of a threatened anuran. *Austral Ecology* **46**(8), 1383-1391

Beranek CT, Maynard C, McHenry CR, Clulow J, 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

Doody JS, Soennichsen KF, James H, McHenry CR, Clulow S. 2020. Ecosystem engineering by deep-nesting monitor lizards. *Ecology*, e03271-e03271

Parrott ML, Doody JS, McHenry CR, Clulow S. 2019. Eat your heart out: choice and handling of novel toxic prey by predatory water rats. *Australian Mammalogy* **42**(2), 235-239

McCurry MR, Evans AR, Fitzgerald EMG, McHenry CR, Bevitt J, Pyenson ND. 2019. The repeated evolution of dental apicobasal ridges in aquatic-feeding mammals and reptiles. *Biol. J. Linn. Soc*., **127**(2): 245-259.

Doody JS, McHenry CR, Rhind D, Clulow S. 2019. Novel habitat causes a shift to diurnal activity in a nocturnal species. *Scientific Reports* **9:** e230.

Doody JS, McHenry CR, Letnic M, Everitt C, Sawyer G, Clulow S. 2019. Forecasting the spatiotemporal pattern of the cane toad invasion into north-western Australia. *Wildlife Research* **45**(8): 718-725.

Doody JS, McHenry CR, Durkin L, Brown M, Simms A, Coleman L, Phizacklea C, Jones H, Phizacklea O, Clulow S. 2018. Deep Communal Nesting by Yellow-Spotted Monitors in a Desert Ecosystem: Indirect Evidence for a Response to Extreme Dry Conditions. *Herpetologica* **74**(4): 306-310.

Doody JS, McHenry CR, Brown M, Canning G, Vas G, Clulow S. 2018. Deep, helical, communal nesting and emergence in the sand monitor: ecology informing paleoecology? *Journal of Zoology* **305**(2): 88-95.

D'Amore DC, Meadows D, Clulow JS, Doody S, Rhind R, McHenry CR. 2018. Increasing dietary breadth through allometry: bite forces in sympatric Australian skinks. *Herpetology Notes* **11**: 179-187.

D'Amore DC, Clulow S, Doody JS, Rhind D, McHenry CR. 2018. Claw morphometrics in monitor lizards: Variable substrate and habitat use correlate to shape diversity within a predator guild. *Ecology and Evolution* **8**(13): 6766-6778.

Doody JS, Rhind R, Greeb B, Castellano C, McHenry CR, Clulow S. 2017. Chronic effects of an invasive species on an animal community. *Ecology* 98(8): 2093-2101.

McCurry MR, EMG Fitzgerald, AR Evans, JW Adams, and CR McHenry. 2017. Skull shape reflects prey size niche in toothed whales. *Biol. J. Linn. Soc.* **121**(4): 936-946.

McCurry MR, CW Walmsley, EMG Fitzgerald, CR McHenry. 2017. The biomechanical consequences of longirostry in crocodilians and odontocetes. *J. Biomechanics* **56**: 61-70.

McCurry MR, AR Evans, EMG. Fitzgerald, JW Adams, P Clausen and CR McHenry. 2017. The remarkable convergence of skull shape in crocodilians and toothed whales. *Proc. Roy. Soc. B* **284**(1850), http://doi.org/10.1098/rspb.2016.2348

Hudson CM, MR McCurry, P Lundgren, **CR McHenry**, R Shine. 2016. Constructing an Invasion Machine: The Rapid Evolution of a Dispersal-Enhancing Phenotype During the Cane Toad Invasion of Australia. **PLoS ONE** 11 (9), e0156950

McCurry MR, AR Evans, MG Fitzgerald, M Shaw, CR McHenry. 2016. The ecomorphology and biomechanics of crocodilians and odontocetes **). Integrative and Comparative Biology** 56, E144-E144

Doody, J. S., R. Soanes, C. Castellano, D. Rhind, B. Green, C. R. McHenry. and S. Clulow. 2015. Invasive toads shift predator-prey densities in animal communities by removing top predators. **Ecology** 96(9): 2544-2554.

Doody, J. S., S. Clulow, G. Kay, D. D'Amore, D. Rhind, S. Wilson, R. Ellis, C. Castellano, C. R. McHenry**,** M. Quayle, K. Hands, G. Sawyer, M. Bass. 2015. The dry season shuffle: Gorges provide refugia for animal communities in tropical savannah ecosystems**. PLoS ONE**, 10(7): e0131186.

McCurry, M. R., M. Mahony, P.D. Clausen, M. R. Quayle, C.W. Walmsley, T.S. Jessop, S. Wroe, H. Richards, C.R. McHenry. 2015. The relationship between cranial structure, biomechanical performance, and ecological diversity in varanoid lizards**. PLoS ONE**, 10(6): e0130625.

Doody, J. S., H. James, K. Colyvas, C.R. McHenry, S. Clulow. 2015. Deep nesting in a lizard, *déjà vu* devil's corkscrews: first helical reptile burrow and deepest vertebrate nest. **Biological Journal of the Linnean Society**, 1116(1): 13-26.

McCurry, M. R., A.R. Evans, C.R. McHenry. 2015. The sensitivity of biological finite element models to the resolution of surface geometry: a case study of crocodilian crania. **PeerJ** 3: e988.

Bishop, P. J., C.W. Walmsley, M.J. Phillips, M.R. Quayle, C.A. Boisvert, **C.R. McHenry**. 2015. Oldest pathology in a tetrapod bone illuminates the origin of terrestrial vertebrates. **PLoS ONE**, 10(5): e0125723.

Rhind D., J. S. Doody , R. Pritchard, **C. R. McHenry**. 2015. *Varanus panoptes* (Yellow-spotted Monitor) Cannibalism. **Herpetological Review** 46(1): 96-97.

McMenamin, P.G., M. R. Quayle, **C. R. McHenry**, J. W. Adams. 2014 . The production of anatomical teaching resources using three-dimensional (3D) printing technology. **Anatomical Sciences Education** 7(6): 479-486.

Quayle, M. R., D. G. Barnes, O. L. Kaluza, **C.R. McHenry**. 2014 An interactive three dimensional approach to anatomical description—the jaw musculature of the Australian laughing kookaburra (Dacelo novaeguineae). **PeerJ** 2:e355.

Doody, J. S., P. Mayes, S. Clulow, D. Rhind, B. Green, C. Castellano, D. D'Amore, **C. R. McHenry**. 2014. Impacts of the invasive cane toad on aquatic reptiles in a highly modified ecosystem: the importance of replicating impact studies. **Biological Invasions** 16: 2303-2309.

Doody, J. S., H. James, R. Ellis, N. Gibson, M. Raven, S. Mahony, D. G. Hamilton, D. Rhind, S. Clulow, and **C. R. McHenry**. 2014. Cryptic and complex nesting in the yellow-spotted monitor, *Varanus panoptes*. **Journal of Herpetology** 48(3) 363-370.

Barnes DG, Vidiassov M, Ruthensteiner B, Fluke C, Quayle MR, **McHenry CR.** 2013 Embedding and publishing interactive, 3-dimensional, scientific figures in Portable Document Format (PDF) files. **PLoS ONE** 8(9): e69446.

Doody, J. S., H. James, D. Dunlop, D. D'Amore, M. Edgar, M. Fidel, D. Meadows, C. W. Walmsley, S. Clulow. & **C. R. McHenry**. 2013. *Strophurus ciliaris* (northern spiny-tailed gecko) communal nesting. **Herpetological Review**, 44(4): 685.

McMenamin P.G. and **McHenry C.R**. 2013. An Anatomy Learning Resource Centre: What should it look like and what should it ideally achieve? In "***Education in Anatomical Sciences***" Ed. P. Ganguly. Nova, New York, USA

Rhind, D., J. S. Doody, R. Ellis, A. Ricketts, G. Scott, S. Clulow, **C. R. McHenry**. 2013. *Varanus glebopalma* (black-palmed monitor) nocturnal activity and foraging. **Herpetological Review**, 44(4): 687-688.

Walmsley CW, Smits PD, Quayle MR, McCurry MR, Richards HS, Oldfield CC, Wroe S, Clausen PD, **McHenry CR**. 2013. Why the long face? The mechanics of mandibular symphysis proportions in crocodiles. **PLoS ONE** 8(1): e53873.

Walmsley C, McCurry M, Clausen PD, **McHenry CR**. 2013. Beware the black box: investigating the sensitivity of FEA simulations to modelling factors in comparative biomechanics. **PeerJ** 1:e204.

Oldfield C, **McHenry CR**, Clausen P, Chamoli U, Parr W, Stynder D, Wroe S. 2012. Finite element analysis of ursid cranial mechanics and the prediction of feeding behaviour in the extinct giant *Agriotherium africanum* **Journal of Zoology**, 286:163-170.

Parr W, Wroe S, Chamoli U, Richards H, McCurry M, Clausen P**.,** **McHenry CR**. 2012. Toward integration of geometric morphometrics and computational biomechanics: New methods for 3D virtual reconstruction and quantitative analysis of Finite Element Models. **J. Theoretical Biol.** 301:1-14.

D'Amore D, Moreno K, **McHenry CR**, Wroe S. 2011. The Effects of Biting and Pulling on the Forces Generated during Feeding in the Komodo Dragon (*Varanus komodoensis*) **PLoS ONE**, 6 (1): e26226

Ferrara T, Clausen P, Huber D, **McHenry CR**, Peddemors V, Wroe S. 2011. Mechanics of biting in great white and sandtiger sharks. **J. Biomechanics** 44(3): 430-435.

Cook A, McHenry CR. 2010. A homonym of *Leptocleidus* Andrews, 1922 (Sarcopterygia, Plesiosauria, Leptocleidoidea, Leptocleididae) and a replacement name for *Leptocleidus* Mueller 1936 (Platyhelminthes, Monogenea). **Mem. Qld. Mus.** 55(1): 118.

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SELECTED PRESENTATIONS

McHenry C., S. Clulow, M. Brown, G. Cooper, G. Vas, S. Doody. 2015: Goanna cities in the Pilbara: the structure of a remarkable nesting complex of Varanus panoptes. *Presentation to the 51st meeting of the Australian Society of Herpetologists (21–24 Jan 2015), Eildon, Victoria, Australia.*

McHenry C. 2014: Mechanical properties of bone: an engineer's perspective. *Invited presentation to the Bone Health in Sport Symposium, Sports Medicine Association / Australian Institure of Sport (1-2 Feb 2014, Canberra), Australia.*

McHenry C., Clulow S. Doody S. 2014: Cane toad impact in the East Kimberley – the same old story again? *Presentation to the 50th meeting of the Australian Society of Herpetologists (29 Jan – 1 Feb 2014), ACT, Australia.*

McHenry C. 2013: Feeding behaviour in a large pliosaur – the palaeoecology of *Kronosaurus queenslandicus*. Presentation to the 49th *meeting of the Australian Society of Herpetologists (29 Jan – 1 Feb 2013), Point Wolstoncraft, Australia.*

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McHenry C, Wroe S, Clasuen P, Moreno K. 2008. 'Structural mechanics in the vertebrate skull - using 3D computer models to test functional explanations of complex morphology'. *Invited presentation to* Modern Functional Anatomy Workshop*, Centre for Ecology and Evolution, London (April 23rd 2008).*

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McHenry C, Daniel W, Clausen P. 2004. 'Developing a Biomechanical Model of the Feeding Apparatus in Aquatic Tetrapods, Part 1: An Investigation of the Crocodilian Skull Using Finite Element Analysis'. *Invited paper presented to the 7th International Congress of Vertebrate Morphology, Boca Raton (Florida, USA).*