Herpetological Conservation and Biology 17(2):362–369.
Submitted: 23 November 2021; Accepted: 9 July 2022; Published: 31 August 2022.

De Vis' Banded Snake, *Denisonia devisi* (Squamata: Elapidae): an Addition to the Elapid Fauna of South Australia with Notes on Its Ecology and Conservation

Shawn Scott[1,6]***, Harrison T. Jones***[2]***, Connor Margetts***[3]***, Scott G. Regan***[4]***, and Sean Kirby***[5]

[1]*UniSA STEM, University of South Australia, Mawson Lakes Boulevard, Mawson Lakes, South Australia 5095, Australia*
[2]*Reptile City, 86 Beach Road, Christies Beach, South Australia 5165, Australia*
[3]*Royal Adelaide Hospital, Port Road, Adelaide, South Australia 5000, Australia*
[4]*Animals Anonymous, 111 Ridge Road, Mylor, South Australia 5153, Australia*
[5]*1 Ayre Street, Morphett Vale, South Australia 5162, Australia*
[6]*Corresponding author, e-mail: shawn.gonzalez-scott@mymail.unisa.edu.au*

Abstract.—**Human-mediated disturbances appear to be ever-increasing and wide-ranging, and if we are to mitigate biodiversity loss, it is essential that we continue to survey and monitor both poorly known and well-understood ecosystems. This recommendation may be especially relevant for Australian herpetofauna, including many snake taxa, as many species are small, morphologically and/or behaviorally cryptic, and occur in specialized ecosystems. Here, we describe a westerly range extension and present the first records of the De Vis' Banded Snake (*Denisonia devisi*) in South Australia. We also describe the habitat and our observations of behavior, foraging, and refugia, and discuss potential conservation concerns and recommendations for this newly discovered population. Our discovery contextualizes the need for ongoing fauna surveys, especially near jurisdictional borders. Detection of new populations of fringing taxa will undoubtedly continue to occur across Australia and may have implications for conservation management.**

Key Words.—batrachophagy; Chowilla floodplain; *Litoria raniformis*; Murray River; range extension; riparian; reptile; wetland

Introduction

Human-mediated disturbances appear to be ever-increasing and wide-ranging, producing habitat degradation, fragmentation, and destruction; loss of biodiversity; and potentially irreversible consequences for essential ecosystem processes (Loreau et al. 2001; Sinclair and Byrom 2006; Murphy and Romanuk 2014). These effects may also be compounded by climate change (Reed et al. 2010; Pereira et al. 2012; Bowler et al. 2019), emphasizing the urgency for greater biodiversity conservation efforts. Therefore, if we are to mitigate biodiversity loss, it is essential that we continue to monitor not only remote or poorly understood ecosystems, but also areas with extensive survey histories if we are to identify any changes to biodiversity, including the discovery of species that may have been undetected in the past (Lindenmayer et al. 2012; Baumgardt et al. 2021). This recommendation may be especially relevant for Australian herpetofauna, as many species are small, morphologically and/or behaviorally cryptic, or occur in restricted or specialized ecosystems (How and Shine 1999; Geyle et al. 2021). The literature detailing new records and distribution extensions for Australian reptile taxa is voluminous (e.g., Read 1994; Macdonald et al. 2013; Clemann et al. 2016; Scott and Biffin 2021; Beranek et al. 2022), and through taxonomic reappraisals, novel survey techniques, or monitoring jurisdictional boundaries, new populations may be encountered (e.g., Miller and Schwaner 1982; Schwaner and Miller 1984; Clemann et al. 2007; Madani 2020; Michael et al. 2020).

Australia hosts a diverse assemblage of native snakes, the majority of which are terrestrial elapids (Elapidae; Greer 1997; Cabrelli et al. 2014). Australian elapids are continentally widespread and diverse, numbering over 100 species across 26 genera (Wilson and Swan 2021). Elapids are venomous and highly variable in their respective ecologies, morphologies, geographic distributions, adaptive responses to anthropogenic disturbance, conservation requirements, and venom toxicities (Shine 1993; Greer 1997; Mirtschin et al. 2017; Wilson and Swan 2021).

The elapid genus *Denisonia* currently hosts two species, and each is nocturnal, is robust with moderately depressed and darkened heads with barred labial scales, and possesses large eyes with vertically elliptical pupils, smooth and glossy body scales, and 17 midbody scale rows (Wilson and Swan 2021). They are viviparous, primarily batrachophagous, and typically associated with floodplains and riparian systems that receive significant seasonal inundation (Cogger 2014; Wilson and Swan 2021). The Ornamental Snake (*Denisonia maculata*) occupies low-lying cracking clay gilgais (shrink-swell depressions subject to seasonal inundation) of central-eastern Queensland (Qld). Owing to their specialized ecology, endemicity to Qld, and exposure to anthropogenic disturbance, they are listed as Vulnerable in Qld and under the federal Environment Protection and Biodiversity Conservation (EPBC) Act (Covacevich et al. 1998; Cabrelli et al. 2014).

De Vis' Banded Snake (*Denisonia devisi*) is widespread through central and southern Qld and into central-northern New South Wales (NSW), where riparian cracking clay and alluvial flats support woodlands and shrublands (Wilson and Swan 2021). Allopatric populations occur in south-western NSW and north-western Victoria (Vic) in similar habitat along the Murray River (Clemann et al. 2007). Currently, *D. devisi* is listed as Least Concern by the International Union for Conservation of Nature (IUCN; Vanderduys et al. 2018), although in Vic, it is listed as Critically Endangered (Robertson and Coventry 2019). A robust, medium-sized elapid that attains 500–600 mm in total length, *D. devisi* typically exhibits a yellow- to orange-brown or olive basal coloration contrasted by dark brown-gray or orange streaks, reticulations, or banding that become irregular or broken at the flanks and vertebral midline (Wilson and Swan 2021). Herein, we describe a westerly range extension and present the first records of *D. devisi* in South Australia (SA). We also describe the habitat and our observations of behavior, foraging, and refugia, and discuss potential conservation concerns for this newly discovered population.

Materials and Methods

Study site.—The Chowilla floodplain constitutes one of the largest floodplains adjoining the Murray River and overlaps the junction of the NSW, SA, and Vic borders (Morelli and de Jong 1996; Kingsford 2000; Overton et al. 2006) in Australia. Although the Chowilla floodplain is recognized as the largest extant riverine forest in SA and is categorized under the Ramsar Convention as a wetland of international importance, the health of Chowilla vegetation communities and availability of water have each declined following river regulation (Maheshwari et al. 1995; Kingsford 2000; Overton et al. 2006). The Chowilla region experiences a semi-arid climate, contains many associated wetlands, and hosts extensive terrestrial and aquatic vegetation communities, supporting rich assemblages of invertebrates and vertebrates (O'Malley and Sheldon 1990; Sheldon and Lloyd 1990; Walker and Thoms 1993).

The Chowilla floodplain has attracted considerable attention, with focuses on riverine ecology, biodiversity, and conservation research (O'Malley and Sheldon 1990; Stewart et al. 2010). Few attempts, however, have been made to survey and document the herpetofauna of the region, with key exceptions being Bird and Armstrong (1990) and Brandle (2010). The results of Bird and Armstrong (1990), combined with records and specimens held by the South Australian Museum (SAM) at the time, provided an initial herpetofaunal diversity of 35 species for Chowilla. Brandle (2010) surveyed and discussed herpetofaunal diversity across the Murray Valley but failed to specify the diversity for Chowilla.

Survey methods.—On 17 February 2021, we conducted nocturnal spotlight surveys in the western portion of the Chowilla Game Reserve (33°56'50.3"S, 140°52'40.7"E), approximately 30 km northeast of Renmark, SA (Fig. 1). Our active search area approximated 4,500 m^2 and was located beside Monoman Creek, a tributary of the Murray River, and surrounding an isolated pool 30 m from the creek. We randomly traversed the search area and focused our efforts on cracking clay near water and beneath nearby trees and low vegetation. We did not catch herpetofauna, we only observed and photographed what we found. The maximum daytime temperature was 37.4° C and relative humidity at the time is unknown; however, the area collectively received 2.0 mm of rainfall in the preceding two weeks (http://www.bom.gov.au/climate/dwo/202102/html/IDCJDW5059.202102.shtml).

Verification of a new population.—To determine whether *D. devisi* had previously been recorded in SA, we reviewed relevant texts (Ehmann 1992; Cogger 2014; Robertson and Coventry 2019; Wilson and Swan 2021), articles (Shine 1983; Edwards and Tyler 1990; Clemann et al. 2007), online databases (Vanderduys et al. 2018; Atlas of Living Australia. 2021. *Denisonia devisi* Waite & Longman, 1920. De Vis' Banded Snake. Available from https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:c9b85505-59d1-4d41-a105-088a3c3b48ec [Accessed 21 February 2021]), and liaised with researchers at the SAM.

Results

Between 2219 and 2340, we found four adult *D. devisi* surrounding the above-mentioned isolated pool. The ambient temperature at time of first encounter was 22° C. We encountered the first individual (Fig. 2) at 2219 inactive at the base of a large River Red Gum (*Eucalyptus camaldulensis*; 12 m from the pool). We found two other individuals in soil cracks, one of which was partially exposed (10 m from water) and the other

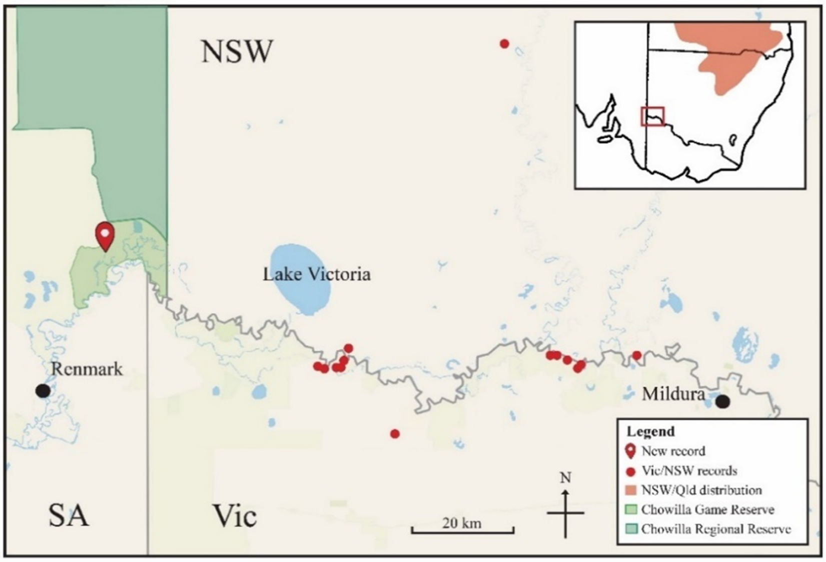


Figure 1. Distribution of De Vis' Banded Snake (*Denisonia devisi*) in south-eastern Australia, with current records from South Australia, south-western New South Wales, and Victoria. Inset displays their distribution in northern New South Wales and southern Queensland. Records from the Atlas of Living Australia (*Denisonia devisi* Waite & Longman, 1920. De Vis' Banded Snake. Available from https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:c9b85505-59d1-4d41-a105-088a3c3b48ec [Accessed 21 February 2021]).

concealed yet visible within the crack (5 m from water). We located the fourth individual active atop cracking clay (3 m from water). Floristic diversity at the site agrees with other descriptions for the area (O'Malley and Sheldon 1990), with the dominant canopy vegetation consisting of *E. camaldulensis*, midstory Tangled Lignum (*Duma florulenta*), and sparse, unidentified grasses and shrubs on the surface (Fig. 3).

Of particular interest was the *D. devisi* encountered at 2248 and 10 m from the water. This individual was located with its head exposed and its body and tail concealed in a soil crack while biting onto the left hindlimb and thigh of a large (about 90 mm), adult Southern Bell Frog (*Litoria raniformis*). The snake continually adjusted and strengthened its bite on the thigh of the frog as it periodically attempted to flee through erratic movements. To reduce observer disturbance, we ceased observations after 5 min. We returned 1 h later, and the snake and frog were absent, and we do not know the result of this predator-prey interaction.

Discussion

Here, we provide the first records of *D. devisi* in SA, despite previous biological surveys throughout the region and in the Chowilla floodplain (Bird and Armstrong

Figure 2. The first De Vis' Banded Snake (*Denisonia devisi*) encountered from the newly discovered population in South Australia. (Photographed by Scott G. Regan).

Figure 3. The habitat in which we located De Vis' Banded Snake (*Denisonia devisi*) in South Australia, Australia. (A) The isolated pool beside Monoman Creek around which four individuals were detected. (B) The soil-cracks beside the pool that are used by *D. devisi* for shelter and foraging. (Photographed by Connor Margetts).

1990; Brandle 2010). Our population marks a 45.6-km westerly range extension (from the nearest records in Vic) and most south-westerly known population of *D. devisi* in Australia. South Australia hosts a diverse elapid fauna, and with *D. devisi*, the known elapid diversity for SA increases to 37 species (Wilson and Swan 2021). Our preliminary observations of the habitat, behaviors (occupation of soil cracks and surface activity close to water), and activity times (nocturnal in warm conditions) are congruent with other records of *D. devisi* in Vic (Clemann et al. 2007; Robertson and Coventry 2019). Whether the SA, southern NSW, and Vic populations are continuous or disjunct is unknown. The discovery of *D. devisi* in SA emphasizes the value of greater survey efforts in riparian systems along the Murray-Darling basin, which is similarly reflected in the recent discovery of a southerly population of the wetland and frog-eating specialist elapid, Grey Snake (*Hemiaspis damelii*; Michael et al. 2020). Our discovery of this population contextualizes the need for ongoing biodiversity monitoring, even in urban areas or those with extensive survey histories. Detection of new populations across state or territory borders for fringing taxa will undoubtedly continue to occur across Australia, which has implications for conservation management within those respective jurisdictions.

Denisonia are well-known for their primarily batrachophagous diets and our observation of a predatory interaction between *D. devisi* and *L. raniformis* is, to the best of our knowledge, the first record of a predator-prey interaction between these taxa. While not surprising considering the diversity of frog taxa known to be consumed by *Denisonia* species (Shine 1983), the total size of the prey item demonstrates the willingness of these snakes to prey on proportionally large food items. We also observed the *D. devisi* repeatedly strengthening its bite on the thigh of the frog, likely to hinder the frog from escaping while facilitating envenomation (Greer 1997). Although it is unknown whether the *L. raniformis* was ingested, observations of feeding behavior and predator-prey interactions in nocturnal and cryptic snake taxa are rare, emphasizing the importance of reporting feeding observations, particularly those concerning threatened prey taxa, such as *L. raniformis* (Wassens et al. 2010; Michael et al. In Press). The size disparity between *D. devisi* and *L. raniformis* is also of note, and the consumption of potentially dangerously large prey items has been discussed for other snake (Natusch et al. 2021) and serpentiform lizard species (Wall and Shine 2007). Natusch et al. (2021) suggests that the snake did not realize the total size of the frog, but chemoreception or movement elicited a strike response, nonetheless. Because *D. devisi* are ambush predators (Shine 1993; Reed and Shine 2002), we speculate that the snake may have been foraging or inactive near the surface and through chemoreception, detected and struck the *L. raniformis*.

***Conservation and management*.**—With the confirmation of *D. devisi* in SA, consideration should be given to their conservation. We recommend initial surveys of suitable habitat throughout the Riverland region to determine the extent of their state distribution and potential threatening processes. Nocturnal spotlight surveys in riparian and cracking clay flats surrounding water in warm weather are an effective detection technique as alternative trapping methods are rarely used in these areas (Clemann et al. 2007). Liaison with NSW and Vic conservation authorities will be required to determine whether the SA, southern NSW, and Vic populations are connected and how management can be planned accordingly.

Denisonia devisi is currently listed as Least Concern by the IUCN (Vanderduys et al. 2018); however, Reed and Shine (2002) suggested that *D. devisi* is likely to be susceptible to threatening processes because of its specialist ecology, which is apparent in the status and comparable ecology of the congeneric *D. maculata*. Climate change has also been identified as a threat to the persistence of *D. devisi,* which was assigned a medium-level climate change Vulnerability Score (Cabrelli et al. 2014). Clemann et al. (2007) cited the concerns of Reed and Shine (2002) for the small and apparently isolated Vic population of *D. devisi* and expressed further concerns for livestock grazing and timber removal, which we share for the SA population. The Murray River in SA is heavily regulated, used for anthropogenic purposes, and fringed by many townships, and the relative influence of these disturbances on dispersal, connectivity, and persistence of *D. devisi* populations is unknown.

Identifying the extent of the SA distribution of *D. devisi* is essential for developing effective management plans for both their conservation and river regulation, as the Murray River is one of the most regulated rivers in the world (Mosley et al. 2012; Bice et al. 2017). The Chowilla floodplain depends on the allocation of environmental water from upstream flows for inundation (Morelli and de Jong 1996; Kingsford 2000; Peake et al. 2011; Furst et al. 2014; Bice et al. 2017), which is required for lateral wetland connectivity and the reproduction of zooplankton, invertebrates, fish, and frogs, and the loss of wetland connectivity can extirpate populations (Walker 1985; Wassens et al. 2010; McGinness et al. 2014; Wedderburn et al. 2017; Rowe et al. 2021). Wetland connectivity may also strengthen populational sustainability for frogs afflicted with chytrid fungus, *Batrachochytrium dendrobatidis* (Heard et al. 2015), which is widespread in Australia and implicated in the extinction and decline of many frog taxa, including *L. raniformis* (Skerratt et al. 2007; Murray et al. 2011; Scheele et al. 2014; Gillespie et al. 2020).

As predators with specialized diets and foraging strategies are likely to be particularly susceptible to disturbance and extinction because of loss of prey (Webb and Shine 1998; Webb et al. 2008), we recommend ongoing and simultaneous chytrid testing and frog population monitoring to enable detection of chytrid outbreaks and any associated declines in prey-frog populations (Murray et al. 2011; Scheele et al. 2014). Meticulous planning and management of water resources and adequate allocation of environmental water into the Chowilla floodplain are also recommended. This would ensure that specialized predator-prey dynamics (e.g., frogs and snakes) are maintained and protected in the face of climatic change.

The SA population of *D. devisi* had so far remained undetected in an area close to human populace, which is likely attributable to their small size, nocturnality, riparian ecology, and lack of surveys congruent with detection (Clemann et al. 2007; Michael et al. 2020). The nearby Vic population is susceptible to multiple threatening processes and has been declared as Critically Endangered (Robertson and Coventry 2019). Until further data are accrued for the SA population, recommendations for a state conservation status can be difficult to assert, although one can speculate that with a potentially limited distribution proximal to anthropogenic disturbance and comparable threats to those in Vic, a similar status may be afforded here. The ecological and dietary specializations of *D. devisi* and the proximity of this population to immediate and potential anthropogenic threats highlight that further study is required to underpin its conservation. Population monitoring is crucial for both *D. devisi* and their herpetofaunal prey, and understanding population densities and connectivity, and how these relationships may be mediated by water flows and river regulation, should be carefully and continuously studied, especially in the face of climatic change (Reed and Shine 2002; Lindenmayer et al. 2012; Cabrelli et al. 2014).

Acknowledgments.—We are grateful to Alexandra Winston for assistance in initial surveys and to Jasmine Armstrong for producing the map used here. Mark Hutchinson at the South Australian Museum confirmed the unknown status of *Denisonia devisi* in South Australia.

Literature Cited

Baumgardt, J.A., M.L. Morrison, L.A. Brennan, M. Thornley, and T.A. Campbell. 2021. Variation in herpetofauna detection probabilities: implications for study design. Environmental Monitoring and Assessment 193:657–714.

Beranek, C., S. Mahony, and S. Scott. 2022. 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 42:146–155.

Bice, C.M., M.S. Gibbs, N.N. Kilsby, M. Mallen-Cooper, and B.P. Zampatti. 2017. Putting the "river" back into the Lower River Murray: quantifying the hydraulic impact of river regulation to guide ecological restoration. Transactions of the Royal Society of South Australia 141:108–131.

Bird, P., and G. Armstrong. 1990. Reptiles and amphibians. Pp. 102–117 *In* Chowilla Floodplain Biological Study. O'Malley, C., and F. Sheldon (Eds.). Nature Conservation Society of South Australia Inc, Adelaide, South Australia, Australia.

Bowler, D.E., A.D. Bjorkman, M. Dornelas, I.H. Myers-Smith, L.M. Navarro, A. Niamir, S.R. Supp,

C. Waldock, M. Winter, M. Vellend, et al. 2019. Mapping human pressures on biodiversity across the planet uncovers anthropogenic threat complexes. People and Nature 2:380–394.

Brandle, R. 2010. Reptiles and amphibians. Pp. 197–206 *In* Impacts of Salinity on the Fauna of the Murray River Valley Floodplain 2002–2004. Stewart, H.J., R. Brandle, and J.N. Foulkes (Eds.). Science Resource Centre, Department for Environment and Heritage, Adelaide, South Australia, Australia.

Cabrelli, A.L., A.J. Stow, and L. Hughes. 2014. A framework for assessing the vulnerability of species to climate change: a case study of the Australian elapid snakes. Biodiversity and Conservation 23:3019–3034.

Clemann, N., J. Lawrence, and P. Lawrence. 2016. A new Victorian locality for the threatened Alpine She-oak Skink *Cyclodomorphus praealtus*. Victorian Naturalist 133:51–54.

Clemann, N., P. Robertson, D. Gibbons, G. Heard, D. Steane, A.J. Coventry, and R. Chick. 2007. An addition to the snake fauna of Victoria: De Vis' Banded Snake *Denisonia devisi* (Serpentes: Elapidae) Waite and Longman. Victorian Naturalist 124:33–38.

Cogger, H.G. 2014. Reptiles and Amphibians of Australia. 7th Edition. CSIRO Publishing, Collingwood, Victoria, Australia.

Covacevich, J.A., P.J. Couper, and K.R. McDonald. 1998. Reptile diversity at risk in the Brigalow Belt, Queensland. Memoirs of the Queensland Museum 42:475–486.

Edwards, A., and M.J. Tyler. 1990. Reptiles and amphibians. Pp. 55–67 *In* A List of the Vertebrates of South Australia. Watts, C.H.S. (Ed.). Biological Survey Coordinating Committee and the Department of Environment and Planning, Adelaide, South Australia, Australia.

Ehmann, H. 1992. Encyclopedia of Australian Animals: Reptiles. Collins Angus and Robertson Publishers Pty Limited, Pymble, New South Wales, Australia.

Furst, D.J., K.T. Aldridge, R.J. Shiel, G.G. Ganf, S. Mills, and J.D. Brookes. 2014. Floodplain connectivity facilitates significant export of zooplankton to the main River Murray channel during a flood event. Inland Waters 4:413–424.

Geyle, H.M., R. Tingley, A.P. Amey, H. Cogger, P.J. Couper, M. Cowan, M.D. Craig, P. Doughty, D.A. Driscoll, R.J. Ellis, et al. 2021. Reptiles on the brink: identifying the Australian terrestrial snake and lizard species most at risk of extinction. Pacific Conservation Biology 27:3–12.

Gillespie, G.R., J.D. Roberts, D. Hunter, C.J. Hoskin, R.A. Alford, G.W. Heard, H. Hines, F. Lemckert, D. Newell, and B.C. Scheele. 2020. Status and priority conservation actions for Australian frog species. Biological Conservation 247:108543. https://doi.org/10.1016/j.biocon.2020.108543.

Greer, A.E. 1997. The Biology and Evolution of Australian Snakes. Surrey Beatty and Sons Pty Limited, Chipping Norton, New South Wales, Australia.

Heard, G.W., C.D. Thomas, J.A. Hodgson, M.P. Scroggie, D.S.L. Ramsey, and N. Clemann. 2015. Refugia and connectivity sustain amphibian metapopulations afflicted by disease. Ecology Letters 18:853–863.

How, R.A., and R. Shine. 1999. Ecological traits and conservation biology of five fossorial 'sand-swimming' snake species (*Simoselaps*: Elapidae) in south-western Australia. Journal of Zoology, London 249:269–282.

Kingsford, R.T. 2000. Ecological impacts of dams, water diversions and river management on floodplain wetlands in Australia. Austral Ecology 25:109–127.

Lindenmayer, D.B., P. Gibbons, M. Bourke, M. Burgman, C.R. Dickman, S. Ferrier, J. Fitzsimons, D. Freudenberger, S.T. Garnett, C. Groves, et al. 2012. Improving biodiversity monitoring. Austral Ecology 37:285–294.

Loreau, M., S. Naeem, P. Inchausti, J. Bengtsson, J.P. Grime, A. Hector, D.U. Hooper, M.A. Huston, D. Raffaelli, B. Schmid, et al. 2001. Biodiversity and ecosystem functioning: current knowledge and future challenges. Science 294:804–808.

Macdonald, S.L., A.C. Borsboom, R. Best, and C.J. Hoskin. 2013. Significant range extensions for *Delma labialis* and a review of its biology. Australian Zoologist 36:470–477.

Madani, G. 2020. First confirmed records of the Western Hooded Scaly-foot *Pygopus nigriceps* from New South Wales. Australian Zoologist 41:102–106.

Maheshwari, B.L., K.F. Walker, and T.A. McMahon. 1995. Effects of regulation on the flow regime of the River Murray, Australia. Regulated Rivers: Research and Management 10:15–38.

McGinness, H.M., A.D. Arthur, K.A. Ward, and P.A. Ward. 2014. Floodplain amphibian abundance: responses to flooding and habitat type in Barmah Forest, Murray River, Australia. Wildlife Research 41:149–162.

Michael, D.R., G. Bourke, D. Paris, and S. Wassens. 2020. A range extension for the endangered Grey Snake *Hemiaspis damelii* (Günther 1876) in the Murrumbidgee catchment, southern NSW. Australian Zoologist 40:652–655.

Michael, D.R., T. Schlen, and D. Lanceman. In Press. A feeding observation in a free-ranging Grey Snake *Hemiaspis damelii* (Günther 1876) in the Murrumbidgee catchment, southern NSW. Australian Zoologist. https://doi.org/10.7882/AZ.2022.011.

Miller, B., and T.D. Schwaner. 1982. The Speckled Brown Snake *Pseudonaja guttata* Parker: an addition to the fauna of South Australia. Transactions of the Royal Society of South Australia 106:79–80.

Mirtschin, P., A.R. Rasmussen, and S.A. Weinstein. 2017. Australia's Dangerous Snakes: Identification, Biology and Envenoming. CSIRO Publishing, Clayton South, Victoria, Australia.

Morelli, J., and M.C. de Jong. 1996. A directory of important wetlands in South Australia. Department of Environment and Natural Resources, Adelaide, South Australia, Australia.

Mosley, L.M., B. Zammit, E. Leyden, T.M. Heneker, M.R. Hipsey, D. Skinner, and K.T. Aldridge. 2012. The impact of extreme low flows on the water quality of the Lower Murray River and Lakes (South Australia). Water Resource Management 26:3923–3946.

Murphy, G.E.P., and T.N. Romanuk. 2014. A meta-analysis of declines in local species richness from human disturbances. Ecology and Evolution 4:91–103.

Murray, K.A., R.W.R. Retallick, R. Puschendorf, L.F. Skerratt, D. Rosauer, H.I. McCallum, L. Berger, R. Speare, and J. VanDerWal. 2011. Assessing spatial patterns of disease risk to biodiversity: implications for the management of the amphibian pathogen, *Batrachochytrium dendrobatidis*. Journal of Applied Ecology 48:163–173.

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.

O'Malley, C., and F. Sheldon. (Eds.). 1990. Chowilla Floodplain Biological Study. Nature Conservation Society of South Australia Inc., Richmond, South Australia, Australia.

Overton, I.C., I.D. Jolly, P.G. Slavich, M.M. Lewis, and G.R. Walker. 2006. Modelling vegetation health from the interaction of saline groundwater and flooding on the Chowilla floodplain, South Australia. Australian Journal of Botany 54:207–220.

Peake, P., J. Fitzsimmons, D. Frood, M. Mitchell, N. Withers, M. White, and R. Webster. 2011. A new approach to determining environmental flow requirements: sustaining the natural values of floodplains of the southern Murray-Darling Basin. Ecological Management and Restoration 12:128–137.

Pereira, H.M., L.M. Navarro, and I.S. Martins. 2012. Global biodiversity change: the bad, the good, and the unknown. Annual Review of Environment and Resources 37:25–50.

Read, J.L. 1994. A major range extension and new ecological data on *Oxyuranus microlepidotus* (Reptilia: Elapidae). Transactions of the Royal Society of South Australia 118:143–145.

Reed, R.N., and R. Shine. 2002. Lying in wait for extinction: ecological correlates of conservation status among Australian elapid snakes. Conservation Biology 16:451–461.

Reed, T.E., D.E. Schindler, and R.S. Waples. 2010. Interacting effects of phenotypic plasticity and evolution on population persistence in a changing climate. Conservation Biology 25:56–63.

Robertson, P., and A.J. Coventry. 2019. Reptiles of Victoria: a Guide to Identification and Ecology. CSIRO Publishing, Clayton South, Victoria, Australia.

Rowe, J.C., A. Duarte, C.A. Pearl, B. McCreary, P.K. Haggerty, J.W. Jones, and M.J. Adams. 2021. Demography of the Oregon Spotted Frog along a hydrologically modified river. Ecosphere 12(6):e03634. https://doi.org/10.1002/ecs2.3634.

Scheele, B.C., D.A. Hunter, L.F. Grogan, L. Berger, J.E. Kolby, M.S. McFadden, G. Marantelli, L.F. Skerratt, and D.A. Driscoll. 2014. Interventions for reducing extinction risk in chytridiomycosis-threatened amphibians. Conservation Biology 28:1195–1205.

Schwaner, T.D., and B. Miller. 1984. Reptiles new to the fauna of South Australia. Transactions of the Royal Society of South Australia 108:217–218.

Scott, S., and R. Biffin. 2021. Notes on a newly discovered population of the Pygmy Copperhead *Austrelaps labialis* (Jan, 1859) in the Adelaide Hills, South Australia. Australian Zoologist 41:753–760.

Sheldon, F., and L. Lloyd. 1990. Physical limnology and aquatic habitats. Pp. 119–135 *In* Chowilla Floodplain Biological Study. O'Malley, C., and F. Sheldon (Eds.). Nature Conservation Society of South Australia Inc., Richmond, South Australia, Australia.

Shine, R. 1983. Food habits and reproductive biology of Australian elapid snakes of the genus *Denisonia*. Journal of Herpetology 17:171–175.

Shine, R. 1993. Australian Snakes: A Natural History. Revised Edition. Reed, Chatswood, New South Wales, Australia.

Sinclair, A.R.E., and A.E. Byrom. 2006. Understanding ecosystem dynamics for conservation of biota. Journal of Animal Ecology 75:64–79.

Skerratt, L.F., L. Berger, R. Speare, S. Cashins, K.R. McDonald, A.D. Phillott, H.B. Hines, and N. Kenyon. 2007. Spread of chytridiomycosis has caused the rapid global decline and extinction of frogs. EcoHealth 4:125–134.

Stewart, H.J., R. Brandle, and J.N. Foulkes (Eds.). 2010. Impacts of salinity on the fauna of the Murray River Valley Floodplain 2002–2004. Science Resource Centre, Department for Environment and Heritage, Adelaide, South Australia, Australia.

Vanderduys, E., S. Wilson, R. Hobson, and C. Sanderson. 2018. *Denisonia devisi*. The IUCN Red List of Threatened Species 2018. International Union for Conservation of Nature. https://www.iucnredlist.org.

Walker, K.F. 1985. A review of the ecological effects of river regulation in Australia. Hydrobiologia 125:111–129.

Walker, K.F., and M.C. Thoms. 1993. Environmental effects of flow regulation on the lower River Murray, Australia. Regulated Rivers: Research and Management 8:103–119.

Wall, M., and R. Shine. 2007. Dangerous food: lacking venom and constriction, how do snake-like lizards (*Lialis burtonis*, Pygopodidae) subdue their lizard prey? Biological Journal of the Linnean Society 91:719–727.

Wassens, S., A. Hall, W. Osborne, and R.J. Watts. 2010. Habitat characteristics predict occupancy patterns of the endangered amphibian *Litoria raniformis* in flow-regulated flood plain wetlands. Austral Ecology 35:944–955.

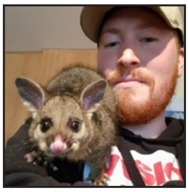
Webb, J.K., and R. Shine. 1998. Ecological characteristics of a threatened snake species, *Hoplocephalus bungaroides* (Serpentes, Elapidae). Animal Conservation 1:185–193.

Webb, J.K., D.A. Pike, and R. Shine. 2008. Population ecology of the Velvet Gecko, *Oedura lesueurii* in south eastern Australia: implications for the persistence of an endangered snake. Austral Ecology 33:839–847.

Wedderburn, S.D., M.P. Hammer, C.M. Bice, L.N. Lloyd, N.S. Whiterod, and B.P. Zampatti. 2017. Flow regulation simplifies a lowland fish assemblage in the Lower River Murray, South Australia. Transactions of the Royal Society of South Australia 141:169–192.

Wilson, S., and G. Swan. 2021. A Complete Guide to the Reptiles of Australia. 6th Edition. Reed New Holland Publishers, Wahroonga, New South Wales, Australia.

Shawn Scott is an Ecologist and Wildlife Photographer with broad interests in biodiversity conservation, particularly South Australian herpetofauna. He graduated with a Bachelor of Environmental Science and Bachelor of Science with Honors in Environmental Biology and is a current Ph.D. candidate researching the effects of fire on herpetofauna in South Australia. (Photographed by Jules Farquhar).



Harrison T. Jones has extensive experience as a wildlife demonstrator, educator, and reptile breeder. He is particularly interested in the ecology, behavior, and captive husbandry of Australian varanid lizards. Harrison is also passionate about travelling and wildlife photography, having travelled across much of Australia. (Photographed by Harrison T. Jones).

Connor Margetts has a diverse professional background in restoration and rehabilitation of remnant vegetation, animal demonstration, and snake-catching. Connor has travelled extensively around Australia, enjoys photography, and has broad interests in biodiversity, particularly herpetofauna, fish, and plants. (Photographed by Connor Margetts).

Scott G. Regan has worked extensively in the zoological industry in Australia, having filled zookeeper, demonstrator, and educator roles in a number of zoos and private facilities across South Australia, Queensland, and Tasmania. Scott also enjoys travelling, fieldwork, and wildlife photography, with a particular passion for herpetofauna. (Photographed by Tamara Clifford).

Sean Kirby is an avid herpetoculturist with broad interests in the husbandry, breeding, and welfare of captive reptile species, particularly varanids, scincids, agamids, and pythons. Sean seeks to enhance the standard of living for captive reptiles by emulating natural environmental settings for his captive species as much as possible. He supports this awareness through extensive travel to observe and photograph reptiles in the wild. (Photographed by Sean Kirby).