

# **Alps Bush Blitz** **Herpetological Survey**

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Nomenclature and taxonomy used in this report is consistent with The Australian Faunal Directory (AFD)

<http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/home>

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## Abstract

The alpine and subalpine environments of Kosciuszko National Park (KNP) are a biologically diverse and important part of Australia. During the Bush Blitz, we targeted a broad range of habitats and elevations across KNP, with a focus on high-altitude habitats considered most likely to contain endemic diversity or threatened species. Although unseasonably cold weather reduced detectability, surveys at sites from ~260 to 1800 m elevation resulted in records of 6 frog and 11 reptile species. The tissue samples collected are particularly important as they fill major sampling gaps. Further research on this material, and additional surveys in alpine areas across NSW, the ACT and Victoria, are likely to help elucidate the true herpetological diversity of the Australian Alps.

## 1. Introduction

The alpine and subalpine environments of Kosciuszko National Park (KNP) support a diverse assemblage of frogs and reptiles, including several endemic and threatened species. Most notable are the 'sky island' communities which are restricted to higher elevation mountain ranges and isolated mountaintops, separated by valleys or lower elevation areas of unsuitable habitat (i.e., Atkins et al. 2020; Sumner et al. 2021). Given the highly specialised nature of sky island ecosystems, and their restricted and fragmented distributions, these ecosystems are particularly sensitive to climatic change and other environmental threats. Understanding patterns of genetic diversity, gene flow and population structure among sky island faunal communities is therefore considered a conservation priority.

The remote, mountainous and climatically extreme conditions in KNP present obvious challenges for fieldwork and, as result, relatively few specimens or tissue samples of reptiles and frogs from KNP exist in museum collections in Australia. Where they do exist, samples are often collected around geographically clustered locations near well-visited areas, rendering vast areas of KNP relatively unsampled. An assessment of museum records prior to these surveys found that of ~38 species of reptiles recorded in KNP, representative genetic samples are available for only 4 species. Similarly for frogs, of the ~17 species recorded, only 3 species were represented by genetic samples.

Records from the Australian Museum's national citizen science project, FrogID, give further insight into the presence, distribution and breeding habitat of frogs within the park, particularly from more accessible areas. More than 700 records of 13 species of frogs have been made since November 2017. The most common is the Common Eastern Froglet (*Crinia signifera*), but records of rarer species such as Brood Frogs (*Pseudophryne* sp.), Southern Green Stream Frogs (*Litoria nudidigita*) and Whistling Tree Frogs (*Litoria verreauxii*) represent important records for the park.

In this survey, we aimed to improve geographic representation of reptiles and frogs from KNP in museum collections to facilitate baseline assessments of genetic diversity within the region. We aimed to sample a broad range of habitats and elevations across KNP, with a focus on high-altitude habitats considered most likely to contain endemic diversity or threatened species. We also swabbed frogs for the presence of the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), a pathogen responsible for frog population declines. In addition, we made opportunistic observations of other fauna (i.e., native freshwater fish) wherever sighted.

## 2. Methods

### 2.1 Site selection

Our surveys focused on sampling locations with few frog and reptile records, with an emphasis on higher altitude habitat (>1200 m a.s.l.) deemed potentially suitable for key

endemic or threatened species i.e., Alpine She Oak-skink (*Cyclodomorphus praealtus*), Alpine Tree Frog (*Litoria verreauxii alpina*) or Southern Corroboree Frog (*Pseudophryne corroboree*).

We chose survey sites by first identifying broad areas of KNP with low sampling effort for reptiles and frogs, assessed via interrogating species occurrence records obtained from the Atlas of Living Australia and OZCAM. Specific survey locations were then selected within these broad areas based on the presence of suitable habitat or environmental features (i.e., alpine sphagnum bogs, wetlands, tussock grasslands and rocky outcrops), identified using habitat maps and satellite imagery.

Survey sites were also chosen opportunistically by vehicle and one standard survey site (Cascade Hut area) was surveyed twice.

## 2.2 Survey techniques

Unseasonably cold weather prevented us from setting traps to capture animals, so our surveys were primarily opportunistic, focusing on nocturnal and diurnal active searches. Reptiles and frogs were generally located via active searching methods (i.e., visual encounter surveys, checking under logs and rocks, raking soil and leaf litter, or by auditory survey of calling frogs). Calling frogs were recorded with the FrogID app. Adult frogs were swabbed for the presence of the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*). Tadpole surveys were also conducted in some waterways using hand dip-nets. Tissue samples for DNA analysis were obtained from all voucher specimens collected during the survey; vouchers were carefully prepared and fixed in shallow trays of formalin prior to preservation in ethanol; tissue samples were preserved in absolute ethanol.

### 2.2.1 Methods used at standard survey sites

We used the standard survey techniques as outlined by Bush Blitz. We conducted diurnal and nocturnal audio and visual active searches for frogs and reptiles. Surveys involved two people thoroughly walking around the site for one hour and recording all reptiles and frogs heard or seen. No trapping was used. Calling frogs were recorded with the FrogID app. The weather was unexpectedly cold, likely dramatically reducing our probability of detecting frogs and reptiles.

## 2.3 Identifying the collections

Specimens retained as vouchers were processed in the field and lodged in the Australian Museum. Species identifications were made in the lab or field with diagnostic features for species observed under hand lens or microscope where necessary. Species identifications were based on the following resources:

Wilson, S. & Swan, G. (2020). A complete guide to reptiles of Australia. Sixth edition. New Holland Publishing. **ISBN:** 9781925546712

Swan, G., Shea, G., & Sadler, R. (2022). Field guide to reptiles of New South Wales. Fourth edition. New Holland Publishing. **ISBN:** 9781925546835

Cogger, H. (2018). Reptiles and amphibians of Australia. Seventh edition. CSIRO Publishing. **ISBN:** 9781486309702

Anstis, M. (2018). Tadpoles and frogs of Australia. Second edition. New Holland Publishing. **ISBN:** 9781925546019

To confirm the identification of several morphologically cryptic species, we obtained mitochondrial DNA sequences from tissue samples collected during the surveys.

Dr Michael Hammer (Curator of fishes, Museum and Art Gallery of the Northern Territory) provided expert identification and advice on the native freshwater fish we observed.

### 3. Results and Discussion

A blast of unseasonably cold weather, including snow during the trip, limited access to high altitude sites and reduced our overall ability to effectively survey for reptiles and frogs in KNP. However, our surveys still documented 6 frog species, 3 snakes, 8 skinks and one native freshwater fish and one native freshwater crayfish, as well as several invasive species (i.e., feral horses, deer and rainbow trout).

Appendix 1 lists all frogs, reptiles and other fauna recorded during the Bush Blitz. Collections made during this Bush Blitz will result in 38 specimens and associated tissues being added to public collections and 61 records being added to publicly accessible databases.

#### 3.1 Un-named or not formalised taxa

There were no obviously un-named or not formalised taxa collected during the survey. However, several of the currently widespread taxa collected during the trip are suspected to represent morphologically cryptic species complexes (i.e., *Crinia signifera*, *Litoria verreauxii*, *Hemiergis talbingoensis*, *Eulamprus kosciuskoi*). Genetic comparisons are currently underway to evaluate whether any taxa collected in KNP represent regionally significant populations of high genetic or conservation value. Tissues and call recordings collected during this survey are likely to contribute towards new taxa descriptions in the future.

**Table 1. Putatively un-named or not formalised taxa**

Taxon	Comment
NA	NA

#### 3.2 Putative new species (new to science)

In this report, 'putative new species' means an unnamed species that, as far as can be ascertained, was identified as a new species as a direct result of this Bush Blitz.

There were no putative new species collected during the survey.

**Table 2. Putative new species (new to science)**

Species	Comment
NA	NA

#### 3.3 Exotic and pest species

Observations of feral animals were made opportunistically throughout the survey period. We noted trampling and grazing damage caused by feral horses and/or deer at every site surveyed, with damage particularly severe in sensitive alpine sphagnum bog habitat (i.e., site H2; -36.498135, 148.386734, altitude 1772 m a.s.l.) and alongside streams and creeks, important frog and reptile habitats.

Rainbow trout were abundant in most waterways we surveyed, however, were notably absent from site H2 (where the native *Galaxias* species were observed, see below).

Given the high potential conservation value of site H2 and the current threats posed by invasive species, we recommend this site as a priority for ongoing feral animal management.

Exotic/pest species	Location sighted/observed	Indication of abundance	Comments
Rainbow Trout	Most waterways surveyed	abundant	Commonly observed in flowing creeks and streams. Notably absent from site H2 which is the only location we observed native <i>Galaxias</i> .
Feral Horse	All sites surveyed	abundant	Damage from trampling, grazing and scat piles noted at all sites. Herd of >10 horses seen at one location near Tin Mine Hut.
Deer (species unknown)	Most sites surveyed	abundant	

### 3.4 Threatened species

No EPBC or NSW State listed threatened frog or reptile species were observed during the survey, however at site H2 (-36.498135, 148.386734, altitude 1772 m a.s.l.), we heard a frog call which resembled a Brood Frog (*Pseudophryne* sp.). Unfortunately, inclement weather prevented us from thoroughly surveying the site to assess presence or absence. It is possible the call was a non-typical *Crinia signifera*, however, given the site contains suitable habitat for Corroboree frogs (*Pseudophryne corroboree*; alpine sphagnum bog), and even though historical records of the species are not present, we believe further investigation is warranted. Future surveys during the peak summer breeding period, or the installation of acoustic monitoring devices at the site, may help confirm presence or absence.

The identity of three Whistling Tree Frog (*Litoria verreauxii*) specimens collected during the trip is under review. At present, the taxonomic status of the Alpine Tree Frog (*Litoria verreauxii alpina*), a species listed as Endangered under NSW legislation and Vulnerable by the EBPC, remains unclear (J. Rowley, T. Parkin & S. Donnellan unpublished data). We aimed to survey the type locality for *Litoria verreauxii alpina* (=Mount Kosciusko), during the Bush Blitz trip to: (1) confirm whether *L. v. alpina* still persists in the area, and (2) collect topotypic genetic material to enable a thorough taxonomic revision of the group, however, inclement weather hampered our efforts.

Two skink species, *Eulamprus kosciuskoi* and *Pseudemoia pagenstecheri*, are listed as Critically Endangered and Endangered respectively under Victorian State legislation.

Species	Listing status and level (EBPC, State/Territory)	Location sighted/observed	Indication of abundance
NA	NA	NA	NA



**Figure 1. Sphagnum habitat at site H2.**

### 3.5 Range extensions

Our surveys fill short-range sampling gaps for a number of reptile and frog species in KNP, however, no species were found outside of their expected distribution.

**Table 5. Range extensions or significant infill in distribution records for species**

Species	Location sighted/observed	Distance from nearest known record (km)	Comments
NA	NA	NA	NA

### 3.6 Genetic information

Tissue samples were obtained from all individuals collected and were stored in 100% ethanol and deposited at the Australian Museum. The genetic material collected during this survey improves regional representation for a range of reptile and frog species, and for 10 of the 14 species sampled, the tissues are the first collected in KNP. These tissue samples will enable preliminary molecular comparisons to establish whether any populations in KNP contain genetic diversity of high conservation value.

Preliminary genetic analyses are underway at the Australian Museum for taxa that were known or suspected to form part of species complexes or for which morphology differed from that anticipated. The results of these analyses are yet to be finalised, however, we will update project partners with any interesting results as they become available.



## 4. Information on species lists

The collection of vouchers and tissues from KNP on this survey will be vital in resolving the true diversity and list of amphibians and reptiles from KNP.

## 5. Information for land managers

We recommend further surveys at site H2 to collect tissue samples and voucher specimens of the native freshwater fish (*Galaxias* species) to confirm their identification, as well as establish presence/absence of the potential Brood Frog (*Pseudophryne* sp.) heard at the site. The site also contains significant alpine sphagnum bog habitat which has been damaged by feral horse/deer trampling and grazing. Given the potential conservation value of this site, ongoing feral animal management may be a priority.

The use of the FrogID app to record frog calls and promotion of the use of this app to the public (i.e., via signage) will also aid in adding occurrence records of frogs across KNP, and also inform ongoing taxonomic work.

## 6. Other significant findings

An interesting opportunistic record of native galaxias (freshwater fish) was made at site H2. This site is a small stream on a headwater alpine swamp, on upper No. 1 Creek a tributary of Thredbo River, at around 1700 m elevation. The galaxias were common at the site and apparently isolated from introduced trout (*Salmonidae* species) which are otherwise pervasive in the area. While identification is not possible from images alone, the fish were confirmed to be part of the part of the Mountain Galaxias *Galaxias olidus* species complex which has recently undergone significant revision to document numerous narrow range endemic species (Adams et al. 2014; Raadik 2014). Moreover, expert assessment noted an elongated body shape with distinct marbling (without black bars), a well offset anal fin and extended, fleshy snout/upper lips that are less typical of the widespread *G. olidus* s.s. and more similar to Kosciuszko galaxias (*Galaxias supremus*), a narrow range Critically Endangered species (EPBC; NSW recently nominated) known from the Snowy River to the north, or an otherwise cryptic undescribed species (T. Raadik & M. Hammer pers. comm, 2023).

The Alpine Spiny Crayfish (*Euastacus crassus*) from the same site is listed as Endangered under Victorian State legislation.

Future collection of fresh tissue and matching voucher specimens of fish from this site, along with survey of other nearby alpine waterways, is a key recommendation to better document and conserve aquatic biodiversity in the region (e.g., ACT Bush Blitz; Hammer and Beitzel 2019).



**Figure 2. Mountain Galaxias in the *Galaxias olidus* species complex. Possibly Kosciuszko galaxias (*Galaxias supremus*), a narrow range Critically Endangered species or an otherwise cryptic undescribed species (T. Raadik & M. Hammer pers. comm, 2023) at site H2.**



**Figure 3. Alpine Spiny Crayfish (*Euastacus crassus*) at site H2.**

We detected the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) in four of the 13 frogs swabbed.

Species	Number swabbed	Number positive	Comments
<i>Crinia signifera</i>	4	2	Two of three sampled at high elevation (H2) were positive.
<i>Limnodynastes tasmaniensis</i>	1	0	
<i>Litoria lesueuri</i>	6	1	Single positive from Pinch River.
<i>Litoria verreauxii</i>	2	1	Single positive from near Jacobs River, high elevation site (Diggers Dam) sample was negative.

## 7. Conclusions

Surveys at sites from ~260 to 1,800 m elevation resulted in records of 6 frog species and 11 reptile species. While there were no range extensions or clearly new species of frog and reptile, the specimens and tissues collected, combined with additional surveys in alpine areas across NSW, the ACT and Victoria, will likely contribute to future revisions of a number of morphologically conserved species and description of new taxa. Further surveys of a potentially high-priority conservation site (H2) during more suitable weather conditions may be a priority. In addition, collection of further genetic samples of the Alpine Tree Frog (*Litoria verreauxii alpina*) from higher elevation areas in KNP is required to evaluate the subspecies' taxonomic and conservation status.

## Acknowledgements

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Appendix 1. List of frogs, reptiles and other opportunistic fauna recorded during the Alps Bush Blitz						
Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
<b>Fish</b>						
Galaxiidae	<i>Galaxias olidus</i> species complex (possibly <i>Galaxias</i> cf. <i>supremus</i> )	Mountain/Kosciuszko galaxias		<i>G. supremus</i> Critically endangered	<i>G. supremus</i> recently nominated for Critically endangered listing in NSW	no
Salmonidae	<i>Oncorhynchus mykiss</i>	Rainbow Trout		no	no	yes
<b>Crustaceans</b>						
Parastacidae	<i>Euastacus crassus</i>	Alpine Spiny Crayfish		no	Endangered (IUCN)	no
<b>Frogs</b>						
Myobatrachidae	<i>Crinia signifera</i>	Common Eastern Froglet		no	no	no
Limnodynastidae	<i>Limnodynastes dumerilli</i>	Eastern Banjo Frog		no	no	no
Limnodynastidae	<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog		no	no	no
Pelodyadinae	<i>Litoria lesueuri</i>	Stony Creek Frog		no	no	no
Pelodyadinae	<i>Litoria verreauxii</i> ( <i>L. v. verreauxii</i> or <i>L. v. alpina</i> )	Whistling Tree Frog (possibly Alpine Tree Frog)		<i>L. v. alpina</i> Vulnerable	<i>L. v. alpina</i> Endangered (NSW), Critically Endangered (VIC), Vulnerable (ACT)	no
Myobatrachidae	<i>Pseudophryne</i> sp.	Brood Frog				
Myobatrachidae	<i>Uperoleia laevigata</i>	Smooth Toadlet		no	no	no
<b>Reptiles</b>						
Scincidae	<i>Anepischetosia maccoyi</i>	Highland's Forest Skink		no	no	no
Elapidae	<i>Austrelaps ramsayi</i>	Highland Copperhead		no	no	no
Scincidae	<i>Carinascincus coventryi</i>	Southern Forest Cool-skink		no	no	no
Elapidae	<i>Cryptophis nigrescens</i>	Small-eyed Snake		no	no	no
Elapidae	<i>Drysdalia coronoides</i>	White-lipped Snake		no	no	no
Scincidae	<i>Eulamprus heatwolei</i>	Yellow-bellied Water Skink		no	no	no

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
Scincidae	<i>Eulamprus kosciuskoi</i>	Alpine Water Skink		no	(VIC)	no
Scincidae	<i>Eulamprus tympanum</i>	Southern Water Skink		no	no	no
Scincidae	<i>Hemiergis talbingoensis</i>	Skink		no	no	no
Scincidae	<i>Pseudemoia entrecasteauxii</i>	Southern Grass Skink		no	no	no
Scincidae	<i>Pseudemoia pagenstecheri</i>	Tussock Skink		no	Endangered (VIC)	no
<b>Mammals</b>						
Ornithorhynchida	<i>Ornithorhynchus anatinus</i>	Platypus		no	(IUCN)	no
Equidae	<i>Equus ferus</i>	Feral Horse		no	no	yes
Cervidae	<i>species unknown</i>	Feral deer (species unknown)		no	no	yes