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Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list Moritz's leaf-tailed gecko *Saltuarius moritzi* Couper, Sadlier, Shea & Wilmer, 2008 as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that Moritz's leaf-tailed gecko *Saltuarius moritzi* Couper, Sadlier, Shea & Wilmer, 2008 has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2024), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

Summary of Conservation Assessment

Moritz's leaf-tailed gecko *Saltuarius moritzi* Couper, Sadlier, Shea & Wilmer, 2008 was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3(b)(d)(e i,ii,iii) because: 1) the species has an area of occupancy of 408 km^2; 2) the species is found in three threat-defined locations; and 3) continuing decline is inferred in the geographic distribution, area, extent and quality of habitat, and the number of mature individuals due to adverse fire regimes, habitat loss due to land clearing, and increased frequency and duration of drought due to climate change.

The NSW Threatened Species Scientific Committee has found that:

1. Moritz's leaf-tailed gecko *Saltuarius moritzi* Couper, Sadlier, Shea & Wilmer, 2008 (family Carphodactylidae) is a relatively large (~20 cm total length), flat and thin bodied gecko that possesses limbs with long, thin toes and claws (Wilson and Swan 2021). The head is broader than the body, and the tail is also broad and leaf-like in shape. The colour and pattern can be extremely variable, though is typically finely marbled with grey and light-to-dark brown blotches and a narrow, dark-edged vertebral stripe broken by 3–6 pale bands and a prominent V-shape between the eyes (Wilson and Swan 2021). The tail has continuous pale bands and a slender tip, free of tubercles (Wilson and Swan 2021). The species can most easily be distinguished from congeners by location and large spinose tubercles on the upper side of the feet (Couper *et al*. 2008).

2. *Saltuarius moritzi* is patchily distributed in New South Wales (NSW) from the Hunter River in the south, to the Clarence River in the north (ALA 2023). Two divergent lineages or evolutionarily significant units (ESUs) are recognised (Catullo and Moritz 2021). The north-western ESU is patchily distributed between Dorrigo, Armidale, and Washpool National Park (NP), with the coastal ESU found across three geographically distinct regions: the northern-most from Nambucca Heads north to the Clarence River, the 'middle' cluster from Taree north to Port Macquarie, and the southern cluster from Buladelah north to around Gloucester. Each of these three clusters appear to extend into the eastern Great Dividing Range, with the northern-most seemingly co-occurring on the Dorrigo Plateau with the north-

western ESU. Given the available genetic information and lack of connecting habitat between each cluster, the species is estimated to have four subpopulations.

3. *Saltuarius moritzi* has a highly restricted geographic distribution. The extent of occurrence (EOO) is based on a minimum convex polygon enclosing confirmed point records, the method of assessment recommended by IUCN (2024) and was estimated to be 34,866 km^2. The area of occupancy (AOO) is estimated to be 408 km^2 based on 2 x 2 km grid cells, the scale recommended by IUCN (2024).

4. No population surveys have been undertaken for *Saltuarius moritzi*. Therefore, there are no estimates for the number of mature individuals.

5. *Saltuarius moritzi* occurs in rainforest, wet sclerophyll forest, gorges, and along wetter drainage lines in dry sclerophyll forest (Wilson and Swan 2021). The species is most frequently observed on larger trees and fallen logs that contain crevices and hollows in which it presumably takes shelter during the day, and occasionally forages on rock outcrops and boulders (M. Greenlees pers comm. March 2022 in DCCEEW 2024). Large, old trees with hollows are considered important habitat as this species is primarily arboreal. Continuity of forest habitat has been identified as critical to allow individual dispersal (EA 1999 in Commonwealth DCCEEW 2024).

6. Leaf-tailed geckos of the genus *Saltuarius* are nocturnal generalist predators, primarily feeding on arthropods and are known to consume spiders (Araneae), bugs (Hemiptera), moths (Lepidoptera), grasshoppers (Orthoptera), cockroaches (Blattodea) and beetles (Coleoptera) (Wilson 2012).

7. The main threats *to Saltuarius moritzi* are adverse fire regimes; habitat loss and fragmentation due to land clearing; increased frequency and duration of drought due to climate change; predation by invasive species, particularly European red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*). ‘High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition’, ‘Clearing of native vegetation’, ‘Anthropogenic climate change’, ‘Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)’, and ‘Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)’ are listed as Key Threatening Processes under the Act.

8. The 2019–20 bushfires affected approximately 44% of the known distribution of *Saltuarius moritizi* and demonstrated that substantial tracts of continuous forest can be burnt in a single wildfire event (Legge *et al*. 2022) The species occurs in four subpopulations; however, the northwest subpopulation and the northern most coastal subpopulation both occur on the Dorrigo Plateau and are close enough to be considered occurring in a single threat-defined location. Given the distance and lack of connecting habitat between this location and the remaining two subpopulations, the number of threat-defined locations is considered to be three.

9. Continuing decline is inferred in the geographic distribution (both in EOO and AOO), the area, extent and quality of habitat, and the number of mature individuals *of Saltuarius moritzi*. Approximately 44% of the known distribution of Moritz’s leaf-tailed gecko was affected by the 2019–20 bushfires (Legge *et al*. 2022). It is unknown what level of protection may have been provided to the species by sheltering in large tree hollows and crevices. A recent expert elicitation considered that the population declines after the 2019–20 bushfires were modest (estimated

at a 12% (plausibly 3–26%) decline one year after the fire; Legge *et al*. 2022). Population declines in fire-affected areas may be at least 30% if they are affected similarly to the related *S. kateae* (Greenlees and Jago 2022). Given that *S. moritzi* is more arboreal, and trees are likely to provide less protection than rock structures, the negative effects of fire may be even greater than seen in *S. kateae*. Fire frequency and intensity are also expected to increase with climate change (Abram *et al*. 2021), exacerbating these declines. Furthermore, increased temperatures and altered precipitation under future climate scenarios will likely result in some currently occupied habitat becoming unsuitable. Extended periods of drought may result in increased vulnerability to fire, and reduced canopy cover from drought induced dieback could change forest structure and can result in increased weed invasion (DPE n.d.).

10. Woody vegetation clearing in NSW has increased over the last decade, mostly due to agriculture (EPA 2023). Although the exact rate of clearance within the distribution of *Saltuarius moritzi* is unknown, it is likely to be removing suitable habitat, such as hollow-bearing trees, and potentially further fragmenting the species' distribution. Forestry practices could also have negative impacts on the species; however, recent changes to logging practices aim to protect hollow-bearing trees and riparian corridors (EPA 2018). *Saltuarius moritzi* relies on hollow-bearing trees to forage and shelter, and the removal of these trees will likely have detrimental impacts on the species' ability to persist.

11. Threats can also operate synergistically and be cumulative to drive continuing decline, *e.g*., small reptiles, including arboreal geckos, are frequently recorded as prey items of both feral cats (*Felis catus*) and European red foxes (*Vulpes vulpes*), and the impacts of these introduced predators can be exacerbated by both fire and habitat fragmentation (Hradsky 2020; Stobo-Wilson *et al*. 2021). Both predator species are known to exploit fire scars, targeting vulnerable survivors (McGregor *et al*. 2016; Hradsky 2020). Additionally, fire and habitat removal not only directly affect habitat availability but can degrade the quality of connecting habitat (Kupfer *et al*. 2006).

12. *Saltuarius moritzi* Couper, Sadlier, Shea & Wilmer, 2008 is not eligible to be listed as a Critically Endangered species.

13. *Saltuarius moritzi* Couper, Sadlier, Shea & Wilmer, 2008 is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a high risk of extinction in Australia in the medium-term future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

Assessment against *Biodiversity Conservation Regulation* 2017 criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Endangered under Clause 4.3(b)(d)(e i,ii,iii)

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Data Deficient

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 – Restricted geographic distribution of species and other conditions
(Equivalent to IUCN criterion B)
Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e i,ii,iii)

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 – Low numbers of mature individuals of species and other conditions (Equivalent to IUCN criterion Clause C)
Assessment Outcome: Data Deficient

The estimated total number of mature individuals of the species is:						
	(a)	for critically endangered species				very low, or
	(b)	for endangered species				low, or
	(c)	for vulnerable species				moderately low.
and either of the following 2 conditions apply:						
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):				
		(i)	for critically endangered species			very large, or
		(ii)	for endangered species			large, or
		(iii)	for vulnerable species			moderate,
	(e)	both of the following apply:				
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and			
		(ii)	at least one of the following applies:			
			(A)	the number of individuals in each population of the species is:		
				(I)	for critically endangered species	extremely low, or
				(II)	for endangered species	very low, or
				(III)	for vulnerable species	low,
			(B)	all or nearly all mature individuals of the species occur within one population,		
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.		

Clause 4.5 – Low total numbers of mature individuals of species (Equivalent to IUCN criterion D)
Assessment Outcome: Data deficient

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 – Quantitative analysis of extinction probability (Equivalent to IUCN criterion E)
Assessment Outcome: Data Deficient

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 – Very highly restricted geographic distribution of species– vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Not met

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.

Professor Angela Moles, FRSN
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

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