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Notice 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 Kate's leaf-tailed gecko *Saltuarius kateae* Couper, Sadlier, Shea & Wilmer, 2008 as an ENDANGERED species in Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that Kate's leaf-tailed gecko *Saltuarius kateae* 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 (2023), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

Summary of Conservation Assessment

Kate's leaf-tailed gecko *Saltuarius kateae* Couper, Sadlier, Shea & Wilmer, 2008 was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Endangered under 4.3 (b)(d)(e i,ii,iii) because: i) the geographic distribution of the species is highly restricted (EOO 120 km² and AOO 84 km²); ii) it occurs in one threat-defined location; and iii) continuing decline in geographic distribution, habitat area, extent and quality, and number of mature individuals has been estimated and inferred due to adverse fire regimes, weed encroachment, predation by cats and foxes, and poaching for the pet trade.

The NSW Threatened Species Scientific Committee has found that:

1. *Saltuarius kateae* Couper, Sadlier, Shea & Wilmer, 2008 (family Gekkonidae) is a relatively large (~20 cm total length), flat-bodied gecko with a thin body and limbs with long, thin toes and claws. The head is broader than the body and the tail is also broad and leaf-like in shape. While capable of slight changes in colour, the gecko is generally greenish-grey to brown with darker brown blotches. It has a distinctive brown stripe down the back that is broken by about 6–7 weak, pale bands and a weak 'V-shaped' mark between the eyes. The original tail has continuing pale cross-bands and tapers to a narrow tip (Wilson and Swan 2021).
2. *Saltuarius kateae* is restricted to the 'Kangaroo Creek Series' sandstone between the Clarence River and the southern end of the Richmond Range in northern New South Wales (Couper *et al.* 2008). The species is most strongly associated with large sandstone outcrops and boulder deposits within the central distribution of the 'Kangaroo Creek Series' sandstone, in the vicinity of Mount Marsh and Mount Neville, north of Grafton (M Greenlees pers. comm. March 2022). Recent surveys have increased the known distribution of this species, and it is now known to occur approximately from Banyabba to Busby's flat, southwest from Grafton (covering approximately 30 km from north to south) (Greenlees and Jago 2022).

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- Saltuarius kateae* has a highly restricted geographic distribution. The extent of occurrence (EOO) for the current recorded *S. kateae* distribution is 120 km² (range 83–166 km²) and the area of occupancy (AOO) is also 84 km² (range 56–112 km²). The EOO and AOO are suspected to be contracting due to threats including fire. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Guidelines (2022).
- Saltuarius kateae* is known from one threat-defined location. A single high intensity fire is considered likely to affect all habitat in the entire distribution of *S. kateae* and rapidly affect the species in one generation.
- Important habitat attributes for *Saltuarius kateae* include sandstone escarpment and associated rock outcropping and boulder fields which provide crevices and caves for refuge, breeding and foraging. On slopes around outcrops, dry sclerophyll forests with a dominant canopy of *Corymbia intermedia* (Pink Bloodwood), *Angophora subvelutina* (Broad-leaved Apple) and *Eucalyptus pilularis* (Blackbutt) provide habitat for foraging and dispersal, and a ground cover is also required for safe dispersal. Similar woodlands/forest on the flats below outcrops which have an understory of *Allocasuarina* species and *Syncarpia glomulifera* (Turpentine) act as important buffers to breeding habitat and which are used for dispersal and potentially foraging (NSW TSSC 2019; Greenlees and Jago 2022).
- Habitat occurs largely in protected areas but several recently discovered habitat sites were on private land (Greenlees and Jago 2022). *Ficus rubiginosa* (Port Jackson Fig) is reported as a consistent feature of *S. kateae* habitat; however, their importance or role to the species is not yet known (Greenlees and Jago 2022). *Saltuarius kateae* has also been found in man-made environments up to 300 m from rocky environments, utilising man-made structures such as screen doors, outdoor furniture, and sheds. These records suggest that dispersal between sites may not be reliant on continuous rock outcrop and indicate surrounding woodland/forest environments on slopes and flats are just as important as sandstone escarpment environments (Greenlees and Jago 2022).
- Saltuarius kateae* is a nocturnal, ‘sit and wait’ predator. The species is likely to shelter during the day in cracks and crevices in the sandstone and emerge at night to be active on the open rock surfaces (M Greenlees pers. Comm. March 2022).
- Saltuarius kateae* has an estimated generation length of 9 years. Females lay two eggs at a time, as is the case for most geckos (Kluge 1987). There is no published literature on their natural reproductive ecology; however, observations of closely related species (*S. swainii* and *S. wyberba*) in captivity suggest that eggs are laid between September and January. Multiple clutches may be laid in a given season (up to four) and take between ~70 and 100 days from laying to hatching. Maturity (the age at which geckos first reproduce) is reached at 3–4 years (Porter 1999). As animals in captivity are kept constantly at optimal temperatures, provided with food *ad libitum* and eggs are incubated at a constant optimum temperature, it is likely that wild reproductive rates are lower. Based on allowing for differences between captive and natural conditions, maturity may not be reached until animals are five or six years of age (M Greenlees pers. Comm. March 2022).

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9. *Saltuarius kateae* is threatened by adverse fire regimes, particularly high frequency and high severity fire, consequent changes in habitat quality including weed invasion, predation by feral cats (*Felis catus*) and European foxes (*Vulpes vulpes*), and potentially, poaching for the pet trade. 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', 'Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. Lat', 'Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758), and 'Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)' are listed as a Key Threatening Processes under the Act.
10. Weed encroachment in *Saltuarius kateae* habitat has been observed to be contributing to continuing decline in habitat quality for the species (Commonwealth DCCEEW 2023). Surveys of habitat for *S. kateae* following the 2019–2020 fires identified weed invasion of recently burnt sites, shading rock faces where the species occurs (Greenlees and Jago 2022). *Saltuarius kateae* were not detected at sites where weed species such as lantana had entirely covered outcrops, despite habitat otherwise being considered suitable (Greenlees and Jago 2022). Changes in vegetation cover have been demonstrated to alter the thermal environment for reptiles using rock outcrops (Webb *et al.* 2005), hence the encroachment by weeds on the habitat of *S. kateae* is likely to alter the thermal properties of the habitat and may affect its suitability for the species.
11. Increased fire frequency and severity is estimated and inferred to be contributing to continuing decline in the number of mature individuals, EOO, AOO, and habitat extent and quality of *Saltuarius kateae*. Surveys for this species have suggested the 2019–2020 fires have resulted in population losses of up to 50% based on observed densities compared to those expected based on previous reports, and a total absence of the species in apparently suitable habitat at other sites surveyed (Greenlees and Jago 2022). Post fire surveys of three known locations of Kate's leaf-tailed geckos found no more than three geckos at any site and in most cases, only a single gecko per site. This is significantly fewer than "between 6 and 10 per 100 m of outcrop" that had been previously estimated (NSW TSSC 2019), or that were easily collected for the description paper (Couper *et al.* 2008). This decline is greater than that of ~15% made by an expert assessment panel (Legge *et al.* 2021) and suggests that the rocky outcrop habitat in which they occur may not provide the shelter or protection from fires that was expected (Couper and Hoskin 2008; Michael and Lindenmeyer 2018). Climate change is expected to increase the frequency and intensity of bushfires and those occurring in 2019–2020 demonstrate unequivocally that the entire distribution of *S. kateae* may be affected by a single event.
12. Direct harvesting/poaching for the pet trade is inferred to contributing to continuing decline in the number of mature individuals of *Saltuarius kateae*. Reptiles, especially 'rare' reptiles, are highly sought after by the pet trade (Altherr and Lameter 2021) and poaching of such species can affect local populations (Jolly *et al.* 2021). Despite not being recorded as being kept in the Australian pet trade, *S. kateae* was available to European hobbyists by 2011, just three years after the species was described (Marshall *et al.* 2022).

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13. Continuing decline in the number of mature individuals of *Saltuarius kateae* is inferred due to predation by introduced European red fox and feral cat. There is no direct evidence of European red foxes or feral cats preying upon *S. kateae*; however, both European red foxes and red foxes are predators of small reptiles (Woinarski *et al.* 2018; Stobo-Wilson *et al.* 2021) and occur in all areas where *S. kateae* has been detected (Greenlees and Jago 2022). Furthermore, European red foxes were detected using ground level caves as den sites in the same outcrops where *S. kateae* were present (Greenlees and Jago 2022). Geckos are frequently observed utilising the lower areas of rock faces where they would be accessible to these terrestrial predators (Greenlees and Jago 2022). European red foxes or feral cats in particular are also known to exploit areas recently affected by fire for hunting (McGregor *et al.* 2016; Hradsky *et al.* 2017).
14. Kate's leaf-tailed gecko *Saltuarius kateae* Couper, Sadler, Shea & Wilmer, 2008 is not eligible to be listed as a Critically Endangered species.
15. Kate's leaf-tailed gecko *Saltuarius kateae* Couper, Sadler, 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 very high risk of extinction in Australia in the near 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: Vulnerable under Clause 4.2 (1)(c)(2)(b)(c).

(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)(ei,ii,iii).

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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.

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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: Vulnerable under Clause 4.7.

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.
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Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023). Conservation advice for *Saltuarius kateae* (Kate's leaf-tailed gecko). Australian Government, Canberra, ACT.

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[Site/Documents/Animals-and-plants/Scientific-Committee/data-deficient-conservation-assessment-saltuarius-kateae.pdf](#) (11 December 2023)

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