Conservation Assessment of *Karma tryoni* Longman 1918 (Scincidae)

C Bray, J Rowley, June 2019
NSW Threatened Species Scientific Committee

***Karma tryoni* Longman 1918 (Scincidae)**
Distribution: Endemic to NSW and Queensland
Current EPBC Act Status: Not listed
Current NSW BC Act Status: Not listed
This species is listed as Vulnerable as *Karma tryoni* under the Queensland Nature Conservation Act

Proposed listing on NSW BC Act: Not listed (Data Deficient)

Conservation Advice: *Karma tryoni*

Summary of Conservation Assessment

Karma tryoni was found to be ineligible for listing as it does not meet any of the Criteria. Although understood to be relatively range restricted (with an EOO of 265 km^2 and AOO of 40 km^2), survey effort has not been adequate to determine distribution and habitat requirements. In addition, there is no information on threats to the population or habitat of this species and the majority of records occur within reserves. There are no data available on population size or trends.

Description and Taxonomy

Cogger (2014) describes *Karma tryoni* (as *Concinnia tryoni*) as "Rich brown to chocolate-brown above, many scales with darker brown edges and/or paler centres, often forming irregular, narrow, dark cross-bands. Head scales narrowly margined with darker brown. Lips and cheeks dark brown to blackish with pale cream or yellow bars or spots. Side of neck and body with agglomerations of purplish-black scales that form irregular blackish patches or even dense black blotches on the neck and shoulder regions; side of neck and flanks with numerous very small white dots and scattered larger pale spots and blotches. Throat cream or yellow, chin shields broadly margined with dark brown. Belly white to bright yellow. Limbs and tail finely to strongly flecked or barred with brown. Nasals separated. Prefrontals separated or in a point contact. Four supraoculars. Usually six supralabials. Postmental contacting a single infralabial on each side. Ear-opening conspicuous, much larger than the nasal. Scales smooth in 38-42 rows at mid-body. Limbs well developed, strongly overlapping when adpressed, the hindlimb about 40-45% of snout-vent length. 16-21 smooth lamellae under the fourth toe, divided only at the base of the toe where there are no more than two lamellae or granules between the lateral scales. 100 mm (snout-vent)."

This species is readily distinguishable from similar species by the following combination of characters: "upper labials 6; last upper labial scale divided by an oblique longitudinal suture; mid body scale rows 38-42; dorsal scale rows 81-92; lateral surface featuring a large black shoulder patch; ventral surface in life with a bold enamel yellow flush from forelimb to tail" (Sadlier 1998).

Synonyms for *Karma tryoni* are *Lygosoma tryoni* (Longman 1918), *Sphenomorphus tryoni* (Bustard 1964), *Eulamprus tryoni* (Cogger 2000; Sadlier 1998; Wilson and Swan 2010), *Concinnia tryoni,* (Cogger 2014), and *Silvascincus tryoni* (Skinner *et al.* 2013).

The common names for this species are Border Ranges Blue-spectacled Skink, Forest Skink and Tryon's Skink.

Distribution and Abundance

Karma tryoni has a limited distribution, found only from a relatively narrow section of high-altitude rainforest on the McPherson Range on the Queensland-New South Wales (NSW) border (Cogger 2014). The NSW records are all within reserves (Border Ranges National Park and Limpinwood Nature Reserve) and the Queensland records are from within or adjacent to Lamington National Park (Sadlier 1998). The species is found at altitudes of between 800 and 1,100 m above sea level (Sanderson *et al.* 2018). The maximum linear distance between all known sites is approximately 20 km.

The potential habitat for this species includes connecting primary rainforest habitat above 800 m in elevation on the McPherson/Border Ranges region, an area of around 180 km^2. The suitability of habitat in the western part of the Border Ranges is unknown and there are no records of the species from this area (R. Sadlier *in litt*. October 2018).

The only known targeted survey for this species was conducted in 1997 on the NSW side of the border (Sadlier 1998). During this survey (in which an area was surveyed over two consecutive afternoons in warm conditions), *Karma tryoni* was considered to be the most common skink at the altitude in which it occurs (G. Shea *in litt*. February 2019). Despite this the species was encountered in relatively low numbers when compared with observations of *K. murrayi* at lower elevations (Sadlier 1998).

In Queensland, various opportunistic searches have been undertaken to photograph the species and it is considered to be easily found and 'locally common' (Sanderson *et al.* 2018; G Shea *in litt.* February 2019). However, the population size and trends of *K. tryoni* remain unknown.

Ecology

Habitat Requirements

The specific habitat of *Karma tryoni* is unclear, but it is known to inhabit highland closed rainforest at altitudes of 800 to 1100 m a.s.l. where individuals have been observed during the day on logs or rocks on the forest floor. When disturbed these skinks will hide under or between the logs or rocks (Sadlier 1998).

Dispersal is restricted for this species due to the limited connectivity between rainforest remnants (Hagger *et al.* 2013). It is unlikely to disperse into habitat at lower elevation (where it has not been observed) or between discontinuous areas of preferred forest habitat (R. Sadlier *in litt*. October 2018).

There are no data on the diet of this species, but like the related *Karma murrayi*, it is likely to forage for insects, earthworms and other small prey among leaf litter (Cogger 2014).

Life cycle/Reproduction

There have been no detailed behavioural or ecological studies on *Karma tryoni*. The species is live-bearing (Bustard 1964) and no information is available on generation length. The closely-related *K. murrayi* takes at least two years to mature (G. Shea *in litt*. February 2019).

Threats

There are no documented threats to *Karma tryoni* and much of its range is protected within national parks and a nature reserve. The majority of Border Ranges National Park and all of Limpinwood Nature Reserve is declared wilderness (DECCW 2010). Threats to the species are likely to be those that affect habitat and food resources, and little is known regarding the species' biology,

though its limited distribution indicates very narrow or specialised habitat preferences (Sadlier 1998).

Karma tryoni was predicted to be highly vulnerable to climate change due to its narrow climatic niche (high elevation forest habitats) and low dispersal ability (Hagger *et al.* 2013). Consequences of climate change for this species may include the contraction of its range as a result of increasing temperatures (there is no bioclimatic zone for the species to move into with warming temperatures as it occupies the upper elevations of mountain ranges), fragmentation of now continuous populations, and future competition with lower-elevation species (including *K. murrayi*) as they are forced upwards into *K. tryoni* habitat (Hagger *et al.* 2013). Species with low dispersal ability are likely to find it more difficult to recover from extreme events such as fires, which are predicted to increase with climate change (Hagger *et al.* 2013).

Assessment against IUCN Red List criteria

For this assessment it is considered that previous surveys of *Karma tryoni* have not been adequate and therefore there is insufficient scientific evidence to support any listing outcome.

Criterion A Population Size reduction

Assessment Outcome: Data deficient.

Justification: To be listed as threatened under Criterion A, the species must have experienced a population reduction of ≥30% (VU threshold) over three generations or 10 years (whichever is longer). No quantifiable data are available on the population size or dynamics of this species and there are no data on population declines over any relevant time frames (10 years or 3 generations). Therefore, there are insufficient data to assess *Karma tryoni* against this criterion.

Criterion B Geographic range

Assessment Outcome: Data deficient

Justification: *Karma tryoni* is known only from a relatively narrow section of highland closed forest of the McPherson Ranges on the border of NSW and Queensland and as such, it has one of the most restricted distributions of rainforest dependant reptile species of this region. Potential habitat for this species (i.e. connecting primary rainforest habitat above 800 m in elevation on the McPherson/Border Ranges region) is estimated to be 180 km^2 in this area. Based on the current records for the species, its extent of occurrence (EOO) was estimated to be 265 km^2, based on a minimum convex polygon enclosing all mapped occurrences, the method of assessment recommended by IUCN (2017). A species with an EOO of less than 5,000 km^2 potentially qualifies under the Endangered threshold. The area of occupancy (AOO) for all records was estimated to be 40 km^2, based on 2 km x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2017). A species with an AOO of less than 500 km^2 potentially qualifies under the Endangered threshold.

In addition to these thresholds, however, at least two of three other conditions must be met. These conditions are:

a) The population or habitat is observed or inferred to be severely fragmented or number of locations = 1 (CR), ≤5 (EN) or ≤ 10 (VU).

   Assessment Outcome: Data deficient.

   Justification: There are insufficient data to assess whether *Karma tryoni* has a severely fragmented population or habitat.

b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals

Assessment Outcome: Data Deficient.

Justification: There is no information for this species from which to determine whether or not there is a continuing decline in population size, geographic distribution or habitat quality.

c) Extreme fluctuations.

Assessment Outcome: Data Deficient.

Justification: There are no available data to suggest that extreme fluctuations occur in population size or geographic distribution of *Karma tryoni.*

Criterion C Small population size and decline

Assessment Outcome: Data deficient.

Justification: Currently there are no available census data to assess the population size or trends in *Karma tryoni*. Therefore, there is insufficient information to assess this species under Criterion C.

At least one of two additional conditions must be met. These are:

C1. An observed, estimated or projected continuing decline of at least 25% in 3 years or 1 generation (up to a max. of 100 years in future).

Assessment Outcome: Data Deficient.

Justification: There are no documented threats to *K. tryoni* and no data on population declines over any relevant time frames to determine whether or not there is a continuing decline in population size.

C2. An observed, estimated, projected or inferred continuing decline

Assessment Outcome: Data Deficient.

Justification: There is no information for this species for which to determine whether or not there is a continuing decline in population size.

In addition, at least 1 of the following 3 conditions:

a (i).Number of mature individuals in each subpopulation ≤ 50 (CR), ≤250 (EN) or ≤ 1000 (VU).

Assessment Outcome: Data Deficient.

Justification: There areis no available census data to assess number of mature adults per subpopulation of *K. tryoni*.

a (ii). % of mature individuals in one subpopulation = 90-100% (CR), 95-100% (EN), 100% (VU).

Assessment Outcome: Data Deficient.

Justification: The percentage of mature adults per subpopulation is unknown. There areis insufficient data to assess *K. tryoni* against this subcriterion.

b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Data Deficient.

Justification: There areis no available data to assess the likelihood of extreme fluctuations in population size or geographic distribution of *K. tryoni.*

Criterion D Very small or restricted population

Assessment Outcome: Data deficient

Justification: Currently there are no available census data to assess the population size of *Karma tryoni* although at some locations it has been described as 'locally abundant' and there are no immediate threats have been documented but climate change could be considered a potentional threat (Hagger *et al*. 2013). It is restricted to highland closed forest along the McPherson Ranges on the border of NSW and Queensland. The area of occupancy (AOO) for all known records was estimated to be 40 km^2, based on 2 km x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2017). This species AOO does not qualify to meet sub criterion D2 (AOO <20 km^2).

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient.

Justification: There are insufficient data available to undertake a quantitative analysis to determine the extinction probability of *Karma tryoni.*

Conservation and Management Actions

A comprehensive survey of *Karma tryoni* should be undertaken to properly assess biology, population numbers and distribution and to better assess any threats to the species.

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Expert Communications

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APPENDIX

Assessment against BC Act criteria

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: Data Deficient

~~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 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:

~~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.~~

Overall Assessment Outcome: Not listing (Data Deficient)