

# NSW Threatened Species Scientific Committee

---

## Conservation Assessment of *Rhophodon mcgradyorum* Hyman & Stanisic, 2005 (Charopidae)

Christopher Portway 23/10/2025

NSW Department of Climate Change, Energy, the Environment and Water

### ***Rhophodon mcgradyorum* Hyman & Stanisic, 2005 (Charopidae)**

Distribution: Endemic to NSW

Current EPBC Act Status: Not Listed

Current NSW BC Act Status: Not Listed

Proposed listing on NSW BC Act and EPBC Act: Critically Endangered

### **Summary of Conservation Assessment**

*Rhophodon mcgradyorum*, was found to be eligible for listing as Critically Endangered under IUCN Criteria B1ab(iii,v)+2ab(iii,v).

The main reasons for this species being eligible are: 1) it has a very highly restricted AOO (4–8 km<sup>2</sup>) and EOO (4–8 km<sup>2</sup>); 2) the population is found within one threat-defined location; and 3) there is an inferred continuing decline in the area, extent, and quality of habitat and mature individuals, due to adverse fire regimes, namely high and moderate severity fire and high frequency fire, and drought.

### **Description and Taxonomy**

*Rhophodon mcgradyorum* (common name: McGrady's pinwheel snail) was first described based on shell characters only in Hyman & Stanisic (2005) as follows:

“Shell very small, golden brown to yellow, with 4.5-4.9 (mean 4.7) tightly coiled whorls, the last descending more rapidly in front. Shell diameter 1.64-1.69 mm (mean 1.67 mm). Apex and early spire slightly concave to flat. Height of shell 0.82-0.99mm (mean 0.88 mm), H/D 0.50-0.59 (mean 0.53). Protoconch exsert of 1.7-1.8 whorls. Apical sculpture of curved, moderately spaced, radial ribs, becoming more crowded toward protoconch/teleoconch boundary; width of interstices (in multiples of rib width) 6 at apex, 3 at post-nuclear boundary; secondary sculpture of weak, discontinuous spiral cords. Teleoconch sculpture of numerous, protractively sinuated widely spaced radial ribs; 35-47 (mean 42) ribs on last whorl. Ribs/mm 6.79-8.96 (mean 8.04). Ribs relatively broad, height less than width; straight in section, rounded on top. Rib interstices on first post-nuclear whorl equal to width of 4-6 ribs; interstices on penultimate whorl equal to width of 7 ribs. Interstitial sculpture of microradial riblets and fine microspiral cords. Microradial riblets low, 12-13 between ribs on first post-nuclear whorl and 20 between ribs on penultimate whorl; microspiral cords low, crossing major radials, forming strong, round to square beads at their intersection with microradial riblets. Umbilicus widely open, saucer-shaped, diameter 0.61-0.64 mm (mean 0.63 mm). D/U 2.61-2.67 (mean 2.68). Sutures impressed, whorls evenly rounded above and below periphery. Aperture ovately lunate, parietal callus present. Three parietal barriers, one baso-columellar barrier and four palatal barriers present; barriers thickened.”

# NSW Threatened Species Scientific Committee

---

Foon *et al.* (2022) provides the differential diagnosis as: “Distinguished from congeners by a combination of six apertural barriers, pronounced, widely spaced radial ribs on teleoconch, and wide umbilicus (Hyman & Stanisc 2005; Stanisc *et al.* 2010).”

Anatomy is unknown (Hyman & Stanisc 2005), and no *Rhophodon mcgradyorum* molecular phylogenetic studies are available (Foon *et al.* 2022).

## Distribution and Abundance

*Rhophodon mcgradyorum* is currently known only from Bellbird Gully, Gibraltar Range National Park (NP) (Hyman & Stanisc 2005; Foon *et al.* 2022), in northeastern New South Wales (NSW). These are the traditional lands of the Bundjalung people (Horton 1996). The species is known only from two sites several hundred metres to 3 km apart (F. Köhler and J.K. Foon *in litt.* March 2023), comprising only three collection events (Table 1) (Foon *et al.* 2022; F. Köhler and J.K. Foon *in litt.* March 2023; ALA 2024a). *Rhophodon mcgradyorum* has been recorded in the NSW North Coast Bioregion, and Washpool IBRA Subregion (DAWE 2012; Commonwealth DCCEEW 2024). *Rhophodon mcgradyorum* may occur elsewhere in the Gibraltar Range region—previous survey efforts have focussed only on accessible areas near roads and trails, yet suitable habitat in less accessible areas exists, and the species’ minute size makes it difficult to detect (Stanisc and Window 2020; F. Köhler and J.K. Foon *in litt.* March 2023). However, the species is unlikely to be found outside of the Gibraltar Range region as charopid land snails are typically narrow-range endemics (Stanisc and Window 2020; F. Köhler and J.K. Foon *in litt.* March 2023). Furthermore, despite extensive land snail surveys conducted in areas adjacent to and within the Gibraltar Range region, *R. mcgradyorum* has not been detected elsewhere (Stanisc 1990; Hyman & Stanisc 2005; Stanisc *et al.* 2010; Foon *et al.* 2022; F. Köhler and J.K. Foon *in litt.* March 2023; ALA 2024b, 2024c, 2024d, 2024e). The species’ entire known distribution overlapped with the 2019–2020 bushfires fire zone (DPIE 2020; Foon *et al.* 2022), yet the species was found post-fire within several hundred metres of the two pre-fire occurrence records (ALA 2024a; Foon *et al.* 2022; F. Köhler and J.K. Foon *in litt.* March 2023).

Current survey data are insufficient to accurately assess *Rhophodon mcgradyorum* abundance (Foon *et al.* 2022; F. Köhler and J.K. Foon *in litt.* March 2023) or in turn the number of mature individuals, although the number of individuals found relative to survey effort suggests the species could be naturally rare and in low abundance (Stanisc 1990; Hyman & Stanisc 2005; Stanisc *et al.* 2010; Foon *et al.* 2022; F. Köhler and J.K. Foon *in litt.* March 2023). Only nine individuals have ever been collected (Table 1) (F. Köhler and J.K. Foon *in litt.* March 2023; ALA 2024a; J.K. Foon pers. obs).

# NSW Threatened Species Scientific Committee

---

**Table 1.** All confirmed collection events of *Rhophodon mcgradyorum*. Site information has been omitted.

Land management agency	Date of survey and collection event number	Number of individuals collected
NSW National Parks and Wildlife Service (NPWS)	3 January 1988 (QM MO66108)	5
NSW National Parks and Wildlife Service (NPWS)	3 January 1988 (QM MO70392)	1
NSW National Parks and Wildlife Service (NPWS)	20 May 2021 (AM C.591077)	3

*Rhophodon mcgradyorum* is inferred to occur in two subpopulations as per the IUCN (2024) definition. This is based on the species' minute size and poor dispersal ability, inferred to be only several metres over their lifespan (F. Köhler and J.K. Foon *in litt.* March 2023), which is significantly less than distance between sites. Further data on dispersal ability, genetics (Clark and Richardson 2002), abundance and density are required to more accurately determine the number of subpopulations.

## Extent of Occurrence and Area of Occupancy

The recorded locality in Hyman & Stanistic (2005) suggests that it is within several hundred metres of the site recorded by Foon *et al.* (2022), and closer than the Hyman & Stanistic (2005) coordinates indicate (F. Köhler and J.K. Foon *in litt.* March 2023). Thus, the Area of Occupancy (AOO) of *Rhophodon mcgradyorum* may be as small as 4 km<sup>2</sup> when using this locality. However, the original coordinates are used here as a conservative estimate considering the species' true distribution may be wider than currently known (F. Köhler and J.K. Foon *in litt.* March 2023) and the precise coordinates are not published. The Extent of Occurrence (EOO) is typically calculated using a minimum convex polygon to enclose all known occurrences, as recommended by IUCN (2024). However, with only two spatially unique sites, this is not possible for *R. mcgradyorum*. The AOO is estimated therefore to be 8km<sup>2</sup> (with a plausible range of 4–8 km<sup>2</sup>) based on 2 x 2 km grid cells, the scale recommended by IUCN (2024). AOO was calculated using ArcGIS version 10.8.2 (Esri 2021). Given that the two sites fall within two contiguous 2 x 2 km AOO grid cells, and in accordance with IUCN guidelines (2024), which state: "If EOO is less than AOO, EOO should be changed to make it equal to AOO to ensure consistency with the definition of AOO as an area within EOO." the EOO is therefore estimated to be 8 km<sup>2</sup> (with a plausible range of 4–8 km<sup>2</sup>). Based on AOO and EOO estimates, *R. mcgradyorum* has a very highly restricted geographic distribution.

The spatial dataset used to inform the AOO and EOO estimates contains three occurrence records in total, sourced from Atlas of Living Australia (ALA 2024a) and Foon *et al.* (2022). No records were excluded from either data source.

# NSW Threatened Species Scientific Committee

---

## Ecology

### Habitat

*Rhophodon mcgradyorum* occurs in rainforest on limestone, where it is found in leaf litter (Hyman & Stanistic 2005; Stanistic *et al.* 2010; Foon *et al.* 2022; F. Köhler and J.K. Foon *in litt.* March 2023). The species is restricted to southern slopes of the Gibraltar Range, which receive higher rainfall and have suitable rainforest habitat, compared to the drier eucalypt forests north and west (F. Köhler and J.K. Foon *in litt.* March 2023).

### Behaviour and Life History

Little is known about the behaviour and life history of *Rhophodon mcgradyorum*. The species is only active at night after rain and has only been found in leaf litter (F. Köhler and J.K. Foon *in litt.* March 2023). While this suggests that *R. mcgradyorum* is dependent on moist habitat, the species is also likely able to tolerate some drier weather via aestivation (F. Köhler and J.K. Foon *in litt.* March 2023). *Rhophodon mcgradyorum* is inferred to move < 50 m in its entire lifetime due to its relatively small size (F. Köhler and J.K. Foon *in litt.* March 2023). This inference is supported by several studies showing only marginally greater dispersal distances in larger eastern Australian camaenid species (Clark and Richardson 2002; Parkyn *et al.* 2014; Ridgeway *et al.* 2014). *Rhophodon mcgradyorum* might be passively dispersed larger distances due to stochastic events such as flooding (F. Köhler and J.K. Foon *in litt.* March 2023).

*Rhophodon mcgradyorum* is inferred to be a detritus feeder, feeding on various ground substrate items such as fungi and/or organic decaying matter found in its leaf litter habitat (F. Köhler and J.K. Foon *in litt.* March 2023). As with all pulmonate land snails, the species is hermaphroditic and lays eggs (F. Köhler and J.K. Foon *in litt.* March 2023), but no further reproductive information is known.

There is no longevity or generation length information available for the species. However, based on age of maturity and longevity observed in *Meridolum jervisensis* (two years and 5 years respectively) (McLauchlan 1951), and the suggested age of maturity for another charopid land snail, *Pseudocharopa lidgbirdi* (< 3–5 years) (DEWHA 2009), F. Köhler and J.K. Foon (*in litt.* March 2023) suggest that the generation length of *Rhophodon mcgradyorum* is approximately three years, with maturity reached at approximately two years and a maximum lifespan of approximately six years.

## Cultural Significance

This assessment is not intended to be comprehensive of the Traditional Ecological Knowledge that exists for *Rhophodon mcgradyorum* or to speak for Aboriginal people. Aboriginal people have a long history of biocultural knowledge, which comes from observing and being on Country, and evolves as it is tested, validated, and passed through generations (Woodward *et al.* 2020). Aboriginal Peoples have cared for Country for tens of thousands of years (Bowler *et al.* 2003; Clarkson *et al.* 2017). Although no specific information was available on the *R. mcgradyorum*, it is acknowledged that there is Traditional Ecological Knowledge for all plants, animals and fungi connected within the kinship system (Woodward *et al.* 2020).

# NSW Threatened Species Scientific Committee

---

## Threats

The primary threat to *Rhophodon mcgradyorum* is adverse fire regimes, particularly high and moderate severity fire and high frequency fire. Drought, particularly in combination with fire, is also considered a threat to the species.

### Adverse fire regimes

*Rhophodon mcgradyorum* is threatened by adverse fire regimes, particularly high and moderate severity fire and high frequency fire. The species is highly susceptible to direct mortality from fire and associated heat due to its small, soft body and fragile, thin shell that provide minimal protection (Stanisic and Ponder 2004; Decker *et al.* 2023). Furthermore, the species' poor dispersal ability prevents escape from fires (Stanisic and Ponder 2004) and likely delays post-fire recovery as the species' capacity to recolonise previously burnt sites is limited (Foon *et al.* 2022). High and moderate severity fire destroys and degrades leaf litter and other potential ground layer shelter habitat such as woody debris, and can open the forest canopy layer, likely causing land snail declines in abundance (Foon *et al.* 2022; Decker *et al.* 2023) as habitat moisture is lost and desiccation risk increases (Baker 1958; Getz 1974; Martin and Sommer 2004; Foon *et al.* 2022). If high or moderate severity fires are too frequent, unburnt shelter habitat will become rarer over time and result in lower snail abundance (Decker *et al.* 2023).

A number of studies have estimated the proportion of habitat impacted by the 2019/2020 fires and the population declines that resulted from that event (DAWE 2020, Legge *et al.* 2021, Marsh *et al.* 2021, Foon *et al.* 2022, DPIE 2020). Decker *et al.* (2023) found high and moderate severity fires caused a 12–75% population decline in charopid land snails and a 75% decline in overall micro-snail (*i.e.*, species less than 5 mm) abundance in southeastern Australia after the 2019–2020 bushfires.

Adverse fire regimes are exacerbated by pre-fire drought, which creates drier and more combustible fuel loads in the landscape (Abram *et al.* 2021). Pre-fire drought and low vegetation fuel moisture content were considered the main causes of the 2019–2020 bushfire's heightened severity and scale (Nolan *et al.* 2020).

The climate change projections map for NSW (Adapt NSW 2024) indicates that *Rhophodon mcgradyorum* occurrence records are within the New England and North West region but very close to the North Coast region's western border. An annual increase of approximately two severe fire weather days is projected for the New England and North West region by 2079 due to climate change (Adapt NSW 2024). Increased risks of fire are also expected under future climates due to the effect of droughts on vegetation fuel moisture (Abram *et al.* 2021). Similarly, a harsher fire-weather climate is also projected for the region in the future, but the magnitude of the change is uncertain (CSIRO and BOM 2024). It is inferred that these changes will lead to more severe and more frequent fires, further threatening the *Rhophodon mcgradyorum* population in the future

Other risk factors that may cause adverse fire regimes within the distribution of *Rhophodon mcgradyorum* include ignition by dry lightning and human ignition. Dry lightning is the leading natural cause of fires in NSW remote areas and started most of the fires during the 2019–2020 bushfires (EPA 2021). There has been an increase

# NSW Threatened Species Scientific Committee

---

in the number of dry lightning events in coastal NSW since 1979 (Abram *et al.* 2021), and climate change is likely increasing the frequency of dry lightning events and creating more suitable conditions for fire-generated thunderstorms in southeast Australia (EPA 2021). Human ignitions from adjacent farmland and other rural areas could also spread into the species' distribution - arson, accidental ignition or escapes from prescribed burns are significant causes of bushfires in NSW (EPA 2021).

'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a Key Threatening Process under the *NSW Biodiversity Conservation Act 2016* and 'Fire regimes that cause declines in biodiversity' is listed as a Key Threatening Process under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

## Drought

As with adverse fire regimes, the biological traits of *Rhophodon mcgradyorum* (Stanisic *et al.* 2010; F. Köhler and J.K. Foon *in litt.* March 2023) make it prone to desiccation and mortality from drought conditions (Stanisic and Ponder 2004). Although the species may be somewhat adapted to dry conditions by aestivating (Stanisic and Ponder 2004; F. Köhler and J.K. Foon *in litt.* March 2023), most Australian land snails are reliant on at least partial environmental moisture availability (Stanisic and Ponder 2004; Stanisic and Window 2020; Foon *et al.* 2022) suggested that extreme drought, worsened by climate change (Abram *et al.* 2021), may have caused high mortality in land snails. High or moderate severity fire, or high frequency fire, exacerbate the adverse effects of drought by destroying or degrading moisture-retaining habitat. Drought also reduces habitat and food resources pre- and post-fire (Keith *et al.* 2022).

The New England and North West region is projected to see a decline in average annual rainfall of approximately 9%, along with an annual increase of 14–31 hot days (over 35°C) by 2079 (Adapt NSW 2024). An increase in time spent in drought, the temperature reached on hot days and the duration of warm spells are also projected for the region through the 21<sup>st</sup> century (CSIRO and BOM 2024). It is therefore inferred that *Rhophodon mcgradyorum* will be threatened by more frequent and extreme droughts due to climate change.

'Anthropogenic climate change' is listed as a Key Threatening Process under the *NSW Biodiversity Conservation Act 2016* and 'Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' is listed as a Key Threatening Process under the *Environment Protection and Biodiversity Conservation Act 1999*.

## **Number of Locations**

When the threat of adverse fire regimes is considered, *Rhophodon mcgradyorum* occurs within one threat-defined location, as per the IUCN (2024) definition. This is due to adverse fire regimes being the most serious plausible threat that results in the lowest number of locations for the taxon. Foon *et al.* (2022) has already shown that 100% of the species' distribution was within the 2019–2020 bushfires fire zone (DPIE 2020; Foon *et al.* 2022) and that the fires were inferred to have caused a population decline of < 50%. The species' geographic distribution remains very highly restricted, and with the projected future increase in severe fire weather due to climate change

# NSW Threatened Species Scientific Committee

(Abram *et al.* 2021; Adapt NSW 2024, CSIRO and BOM 2024), it is highly plausible that a single fire event could again adversely affect the species across its entire distribution within a very short time frame.

## Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Rhophodon mcgradyorum* has been adequate and there is sufficient scientific evidence to support the listing outcome.

### Criterion A Population size reduction

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.	} based on any of the following:	(a) direct observation [except A3]	
A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.		(b) an index of abundance appropriate to the taxon	
A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3].		(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality	
A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.		(d) actual or potential levels of exploitation	
		(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	

### Outcome

*Rhophodon mcgradyorum* is considered Data Deficient under Criterion A.

### Population reductions

The estimated three-generation timespan for *Rhophodon mcgradyorum* is approximately nine years. There are not enough past or future population abundance, density or trend data to extrapolate and assess a population size reduction over nine years.

### Conclusion

*Rhophodon mcgradyorum* is considered Data Deficient under Criterion A because there are insufficient population data available over nine years.

### Criterion B Geographic range

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
	Critically Endangered	Endangered	Vulnerable
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(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			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

### Outcome

# NSW Threatened Species Scientific Committee

---

*Rhophodon mcgradyorum* is eligible for listing as Critically Endangered under Criteria B1ab(iii,v)+B2ab(iii,v).

## EOO and AOO

*Rhophodon mcgradyorum* has an EOO of 8 km<sup>2</sup> and an AOO of 8 km<sup>2</sup> (with a plausible range of 4–8 km<sup>2</sup> for both).

## Number of threat-defined locations

*Rhophodon mcgradyorum* is found at one threat-defined location when considering the most serious plausible threat of adverse fire regimes, namely high and moderate severity fire.

## Severely fragmented

*Rhophodon mcgradyorum* is considered unlikely to be severely fragmented as the AOO contains large areas of continuous closed forest (Esri 2021; Foon *et al.* 2022). Charopid land snails also typically have narrow distributions (Stanisic and Window 2020), so are likely to be able to persist even in small habitat patches.

## Continuing decline

A continuing decline in area, extent and quality of habitat, and the number of mature individuals, is inferred due to recent adverse fire regimes, namely high and moderate severity fire and high frequency fire (Stanisic and Ponder 2004; Foon *et al.* 2022; Decker *et al.* 2023; F. Köhler and J.K. Foon *in litt.* March 2023). Large declines in the post-fire abundance of other charopid land snail species in southeastern Australia have been attributed to high and moderate severity fires (Decker *et al.* 2023). Given that moderate burn intensities to leaf litter and understorey habitat were recorded at one of only two known *Rhophodon mcgradyorum* sites (Foon *et al.* 2022), it is reasonable to infer that similar declines may have occurred for this species.

Adverse fire regimes have not only caused a recent inferred continuing decline in the number of mature individuals from direct mortality, but also from indirect mortality via increased desiccation from loss of habitat moisture (Baker 1958; Getz 1974; Martin and Sommer 2004; Foon *et al.* 2022). High and moderate severity fires have also caused a recent inferred continuing decline in habitat area, extent and quality by destroying and reducing available ground sheltering habitat, both through direct burning and by decreasing ground layer moisture through canopy loss and resultant increased sunlight (Foon *et al.* 2022; Decker *et al.* 2023).

An annual increase of approximately two severe fire weather days is projected for the New England and North West region by 2079 due to climate change (Adapt NSW 2024). Similarly, a harsher fire-weather climate is also projected for the region in the future, but the magnitude of the change is uncertain (CSIRO and BOM 2024). It is inferred that these changes will lead to more severe and more frequent fires, further threatening the *Rhophodon mcgradyorum* population in the future.

A continuing decline in area, extent and quality of habitat, and the number of mature individuals is also inferred due to drought in combination with fire (Nolan *et al.* 2020; Abram *et al.* 2021; Keith *et al.* 2022) and drought exacerbated by climate change (Abram *et al.* 2021; Foon *et al.* 2022).

# NSW Threatened Species Scientific Committee

---

## Extreme fluctuations

There are insufficient data to determine if *Rhophodon mcgradyorum* experiences extreme fluctuations in EOO, AOO, number of subpopulations or number of mature individuals. The species is unlikely to experience extreme fluctuations in number of locations due to its very highly restricted geographic range and the identification of one threat-defined location.

## Conclusion

*Rhophodon mcgradyorum* is eligible to be listed as Critically Endangered under Criteria B1ab(iii,v)+B2ab(iii,v) because the EOO, AOO, and number of threat-defined locations all fall under the Critically Endangered thresholds and continuing decline in the number of mature individuals and the area, extent and quality of habitat, is inferred due to adverse fire regimes (high and moderate severity fire and high frequency fire) and drought.

## *Criterion C Small population size and decline*

C. Small population size and decline			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals	< 250	< 2,500	< 10,000
AND at least one of C1 or C2			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals			

## Outcome

*Rhophodon mcgradyorum* is considered Data Deficient under Criterion C.

## Number of mature individuals

There are no population size data for *Rhophodon mcgradyorum*.

## Continuing decline

Continuing decline is inferred in the number of mature individuals of *Rhophodon mcgradyorum* due to the threat of adverse fires regimes. The continuing decline is inferred, however, which does not meet the minimum data quality requirements (estimated or projected) for listing under C1.

## Mature individuals in each subpopulation

There are insufficient data to determine the number of mature individuals in each subpopulation.

## % of mature individuals in a single subpopulation

There are insufficient data to determine the percent of mature individuals in any subpopulation.

## Extreme fluctuations

# NSW Threatened Species Scientific Committee

It is unknown if *Rhophodon mcgradyorum* experiences extreme fluctuations as insufficient data has been collected over time.

## Conclusion

*Rhophodon mcgradyorum* is considered Data Deficient under Criterion C because there are no population size data available and no estimated or projected data to measure continuing decline as required under Criterion C1. For C2, there are insufficient data for the number or percent of mature individuals in each subpopulation, or to determine if the species experiences extreme fluctuations.

## Criterion D Very small or restricted population

D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	D1. < 1,000
D2. Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	D2. typically: AOO < 20 km <sup>2</sup> or number of locations ≤ 5

## Outcome

*Rhophodon mcgradyorum* is considered Data Deficient under Criterion D but is eligible for listing as Vulnerable under Criterion D2.

## Number of mature individuals

There are no population size data for *Rhophodon mcgradyorum*.

## Risk of future extinction in a very short amount of time (D2)

*Rhophodon mcgradyorum* occurs at one threat-defined location (due to the threat of adverse fire regimes) and has an estimated AOO of 8 km<sup>2</sup> that was contained entirely within the 2019–2020 bushfires fire zone (DPIE 2020; Foon *et al.* 2022). Several studies have inferred a significant decline in the species' total population due to the 2019–2020 bushfires and associated habitat loss and reduction in quality (Marsh *et al.* 2021; Foon *et al.* 2022), and large post-fire declines in charopid land snail abundance in southeastern Australia were caused by the same fires (Decker *et al.* 2023). An increase in severe fire weather across the distribution of *Rhophodon mcgradyorum* is also projected due to climate change (Adapt NSW 2024; CSIRO and BOM 2024). Therefore, the threat of adverse fire regimes, namely high or moderate severity fire, could plausibly drive the species to Extinct in a very short time.

## Criterion E Quantitative Analysis

E. Quantitative Analysis			
	Critically Endangered	Endangered	Vulnerable
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

## Outcome

*Rhophodon mcgradyorum* is considered Data Deficient under Criterion E.

## Probability of extinction

# NSW Threatened Species Scientific Committee

---

There are insufficient data available to undertake a quantitative analysis to determine the probability of extinction in *Rhophodon mcgradyorum*.

## **Conservation and Management Actions**

*Rhophodon mcgradyorum* is currently not listed on the NSW Biodiversity Conservation Act 2016. Following publication of a Final Determination by the NSW Threatened Species Scientific Committee, a conservation project will be developed by the NSW Department of Planning and Environment under the Saving our Species (SoS) program. The conservation project will identify priority locations, critical threats and required management actions to secure the species in the wild for the next 100 years.

# NSW Threatened Species Scientific Committee

---

## References

- Abram NJ, Henley BJ, Sen Gupta A, Lippmann TJR, Clarke H, Dowdy AJ, Sharples JJ, Nolan RH, Zhang T, Wooster MJ, Wurtzel JB, Meissner KJ, Pitman AJ, Ukkola AM, Murphy BP, Tapper NJ, Boer MM (2021) Connections of climate change and variability to large and extreme forest fires in southeast Australia. *Communications Earth and Environment* **2** 8, 2662–4435.
- Adapt NSW (2024) Interactive climate change projections map. Available at: <https://www.climatechange.environment.nsw.gov.au/projections-map> (accessed 25 November 2024).
- ALA (Atlas of Living Australia) (2024a) *Rhophodon mcgradyorum* occurrence download. Available at: <https://doi.org/10.26197/ala.229a636f-0d41-4d75-9c9f-6672f168f6c3> (accessed 18 November 2024).
- ALA (Atlas of Living Australia) (2024b) Charopidae occurrence records. Available at: [https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Charopidae%22#tab\\_mapView](https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Charopidae%22#tab_mapView) (accessed 25 November 2024).
- ALA (Atlas of Living Australia) (2024c) Helicarionidae occurrence records. [https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Helicarionidae%22#tab\\_mapView](https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Helicarionidae%22#tab_mapView) (accessed 25 November 2024).
- ALA (Atlas of Living Australia) (2024d) Camaenidae occurrence records [https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Camaenidae%22#tab\\_mapView](https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Camaenidae%22#tab_mapView) (accessed 25 November 2024).
- ALA (Atlas of Living Australia) (2024e) Punctidae occurrence records [https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Punctidae%22#tab\\_mapView](https://biocache.ala.org.au/occurrences/search?q=taxa%3A%22Punctidae%22#tab_mapView) (accessed 25 November 2024).
- Baker HB (1958) Land snail dispersal. *Nautilus* **71**, 141–148.
- Bowler JM, Johnston H, Olley JM, Prescott JR, Roberts RG, Shawcross W, Spooner NA (2003) New ages for human occupation and climatic change at Lake Mungo, Australia. *Nature* **421**(6925), 837–840.
- Clark SA, Richardson BJ (2002) Spatial analysis of genetic variation as a rapid assessment tool in the management of narrow range endemics. *Invertebrate Systematics* **16**, 583–587.
- Clarkson C, Jacobs Z, Marwick B, Fullagar R, Wallis L, Smith M, Roberts RG, Hayes, E, Lowe K, Carah X, Florin SA (2017) Human occupation of northern Australia by 65,000 years ago. *Nature* **547**(7663), 306–310.
- Commonwealth DCCEEW (Commonwealth of Australia and Department of Climate Change, Energy, the Environment and Water) (2024) Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions), accessed from The Sharing and Enabling Environmental Data Portal. Available at: <https://datasets.seed.nsw.gov.au/dataset/b1284c2c-f3bd-4b50-ab07-e1b593b8ee67> (accessed 26 November 2024).
- CSIRO and BOM (Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology) (2024) Climate Change in Australia: East Coast South

# NSW Threatened Species Scientific Committee

---

- projection summaries. Available at: <https://www.climatechangeinaustralia.gov.au/en/projections-tools/regional-climate-change-explorer/sub-clusters/?current=ECSC&tooltip=true&popup=true> (accessed 21 October 2024).
- DAWE (Commonwealth Department of Agriculture, Water and the Environment) (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Agriculture, Water and the Environment. Available at: <https://www.dcceew.gov.au/sites/default/files/env/pages/5b3d2d31-2355-4b60-820c-e370572b2520/files/ibra-subregions.pdf> (accessed 11 November 2024).
- DAWE (Department of Agriculture, Water and the Environment) (2020). Provisional list of priority invertebrate species requiring urgent management intervention or on-ground assessment. Canberra: Department of Agriculture, Water and the Environment, Australian Government. Available at: <https://www.dcceew.gov.au/sites/default/files/env/pages/9a6a5628-21b9-4a1b-9474-e953fc5138db/files/provisional-list-invertebrates-requiring-urgent-management-intervention.pdf> (accessed 21 October 2024).
- Decker O, Foon JK, Köhler F, Moussalli A, Murphy NP, Green PT (2023) Fire severity is an important driver of land snail declines after the black summer bushfires in Australia. *Biological Conservation* **279**, 109906.
- DEWHA (Department of the Environment, Water, Heritage and the Arts) (2009) Commonwealth Listing Advice on *Pseudocharopa lidgbirdi*. Available at: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/81248-listing-advice.pdf> (accessed 28 November 2024).
- DPIE (State Government of NSW and NSW Department of Planning, Industry and Environment) (2020) Fire Extent and Severity Mapping (FESM), accessed from The Sharing and Enabling Environmental Data Portal. Available at: <https://datasets.seed.nsw.gov.au/dataset/33c2ee86-d2f7-4aaf-8c40-76b6d393a35c> (accessed 16 December 2024).
- EPA (New South Wales Environment Protection Authority) (2021) NSW State of the Environment Report 2021. Available at: <https://www.soe.epa.nsw.gov.au/all-themes/land/fire#causes-of-fire-pressures> (Accessed 20 March 2025).
- Esri (Environmental Systems Research Institute) (2021) ArcGIS 10.8.2 for desktop. Redlands, California, USA. Esri Inc. 1999–2021.
- Foon JK, Moussalli A, McIntosh F, Laffan S, Köhler F (2022) Assessing the immediate impacts of the 2019/2020 bushfires on land snails in north-eastern New South Wales. *Australian Zoologist* **42**(2), 386–461.
- Getz L (1974) Species diversity of terrestrial snails in the great Smoky Mountains. *Nautilus* **88**, 6–9.
- Horton DR (1996) The AIATSIS Map of Indigenous Australia. Australian Institute of Aboriginal and Torres Strait Islander Studies. Available at: <https://aiatsis.gov.au/explore/map-indigenous-australia> (Accessed 27 September 2024).

# NSW Threatened Species Scientific Committee

---

- Hyman I, Stanistic J (2005) New charopid land snails chiefly from limestone outcrops in NSW (Eupulmonata: Charopidae). *Memoirs of the Queensland Museum* **50**, 219–302.
- IUCN (2024) Guidelines for Using the IUCN Red List Categories and Criteria. Version 16 (March 2024). Standards and Petitions Committee of the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Keith DA, Allen SP, Gallagher RV, Mackenzie BDE, Auld, TD, Barrett S, Buchan A, English V, Gosper C, Kelly D, McIlwee A, Melrose RT, Miller BP, Neldner VJ, Simpson CC, Tolsma AD, Rogers D, van Leeuwen S, White MD, Yates CJ, Tozer MG (2022) Fire-related threats and transformational change in Australian ecosystems. *Global Ecology and Biogeography* **31**, 2070–2084.
- Legge S, Woinarski JCZ, Scheele BC, Garnett ST, Lintermans M, Nimmo DG, Whiterod NS, Southwell DM, Ehmke G, Buchan A, Gray J, Metcalfe DJ, Page M, Rumpff L, Leeuwen S van, Williams D, Ahyong ST, Chapple DG, Cowan M, Hossain MD, Kennard M, Macdonald S, Moore H, Marsh J, McCormack R B, Michael D, Mitchell N, Newell D, Raadik TA, Tingley R (2021) Rapid assessment of the biodiversity impacts of the 2019–2020 Australian megafires to guide urgent management intervention and recovery and lessons for other regions. *Diversity and Distributions* **28**, 571–591.
- Marsh J, Bal P, Fraser H, Umers K, Greenville A, Rumpff L, Woinarski J (2021) Assessment of the impacts of the 2019-20 wildfires of southern and eastern Australia on invertebrate species. NESP Threatened Species Recovery Hub Project 8.3.1 Final report, Brisbane. Available at: [https://www.nespthreatenedspecies.edu.au/media/b2oi2hyc/8-3-1-assessment-of-the-impacts-of-the-2019-20-wildfires-of-southern-and-eastern-australia-on-invertebrate-species-final-report\\_v3.pdf](https://www.nespthreatenedspecies.edu.au/media/b2oi2hyc/8-3-1-assessment-of-the-impacts-of-the-2019-20-wildfires-of-southern-and-eastern-australia-on-invertebrate-species-final-report_v3.pdf) (accessed 21 October 2024).
- Martin K, Sommer M (2004) Relationships between land snail assemblage patterns and soil properties in temperate-humid forest ecosystems. *Journal of Biogeography* **31**(4), 531–545.
- McLauchlan CF (1951) Basic work on the life cycles of some Australian snails. *Proceedings of the Royal Zoological Society New South Wales* **14**, 26–36.
- Nolan RH, Boer MM, Collins L, Resco de Dios V, Clarke H, Jenkins M, Kenny B and Bradstock RA (2020) Causes and consequences of eastern Australia's 2019–20 season of mega-fires. *Global Change Biology* **26**, 1039–1041.
- Parkyn J, Brooks L, Newell D (2014) Habitat use and movement patterns of the endangered land snail *Thersites mitchellae* (Cox, 1864) (Camaenidae). *Malacologia* **57**(2), 295–307.
- Ridgeway PA, Lindsay K, Pou D, Visintin A (2014) Indications of diverse behavioural ecologies in the morphologically conservative Australian land snails *Pommerhelix* and *Meridolum* (Stylommatophora: Camaenidae), *Molluscan Research* **34**, 25–39.
- Stanistic J (1990) Systematics and biogeography of eastern Australian Charopidae (Mollusca, Pulmonata) from subtropical rainforests. *Memoirs of the Queensland Museum* **30**, 1–241.

# NSW Threatened Species Scientific Committee

---

Stanisic J, Ponder WP (2004) Forest snails in eastern Australia-one aspect of the other 99%. In 'Conservation of Australia's Forest Fauna' (Ed. D. Lunney) pp. 127–149. Royal Zoological Society of New South Wales, Mosman.

Stanisic J, Shea M, Potter D, Griffiths, O (2010) Australian land snails. A field guide to eastern Australian species. Vol. 1. Bioculture Press, Rivière des Anguilles, Mauritius.

Stanisic J, Window E (2020) Land snails of the Eungella plateau and environs, Clarke range, mid-eastern Queensland. *The Proceedings of the Royal Society of Queensland* **125**, 23–31.

Woodward E, Hill R, Harkness P and R Archer (Eds) (2020) 'Our Knowledge Our Way in caring for Country: Indigenous-led approaches to strengthening and sharing our knowledge for land and sea management, best practice guidelines from Australian experiences' (NAILSMA and CSIRO: Cairns, QLD).

## Expert Communications

Junn Kitt Foon. Research Associate, Malacology, Australian Museum Research Institute, NSW. And PhD candidate, School of Science, Western Sydney University. Email: Junn.Foon@Australian.Museum

Frank Köhler. NSW Principal Research Scientist and Group Manager, Malacology, Australian Museum Research Institute, NSW.

# NSW Threatened Species Scientific Committee

## APPENDIX 1

### Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

#### Overall Assessment Outcome:

*Rhophodon mcgradyorum* was found to be Critically Endangered under Clause 4.3(a)(d)(e i, iii).

#### Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Data Deficient

<b>(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:</b>			
	(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.
<b>(2) - The determination of that criterion is to be based on any of the following:</b>			
	(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: Critically Endangered under Clause 4.3(a)(d)(e i,iii)

<b>The geographic distribution of the species is:</b>			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
<b>and at least 2 of the following 3 conditions apply:</b>			
	(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,

# NSW Threatened Species Scientific Committee

	(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**

<b>The estimated total number of mature individuals of the species is:</b>		
(a)	for critically endangered species	very low, or
(b)	for endangered species	low, or
(c)	for vulnerable species	moderately low,
<b>and either of the following 2 conditions apply:</b>		
(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.	

# NSW Threatened Species Scientific Committee

---

## **Clause 4.5 - Low total numbers of mature individuals of species**

**(Equivalent to IUCN criterion D)**

**Assessment Outcome: Data Deficient**

<b>The total number of mature individuals of the species is:</b>			
	(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**

<b>The probability of extinction of the species is estimated to be:</b>			
	(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,	
-------------------------	--