Conservation Assessment of *Austrochloritis kippara* Stanisic, 2010 (Camaenidae)

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***Austrochloritis kippara* Stanisic, 2010 (Camaenidae)**
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

Austrochloritis kippara, was found to be eligible for listing as Critically Endangered under IUCN Criterion B1ab(iii,v).

The main reasons for this species being eligible are: 1) it has a very highly restricted extent of occurrence (16 km^2); 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 the number of mature individuals. This is due to adverse fire regimes, namely high severity and high frequency fire, drought, and native forest timber harvesting.

Description and Taxonomy

Austrochloritis kippara (common name: Kippara forest bristle snail) was first described in Stanisic *et al*. (2010) as follows:

“Shell medium-sized, dark brown, depressedly turbinate; whorls subangulate, sutures impressed; protoconch sculpture of pustules and rugose radial ridges, teleoconch with widely spaced, broad and curled, strap-like setae, microsculpture of wavy periostracal ridgelets; umbilicus moderately open; diameter 14 mm”.

The description is based on external shell characters and external colour only (reproductive anatomy was not described), nonetheless the species is well-defined (Foon *et al*. 2022) both morphologically (Stanisic *et al*. 2010; F. Köhler pers comm. December 2024) and genetically (F. Köhler pers comm. December 2024).

Distribution and Abundance

Austrochloritis kippara is currently known from Kippara and Mount Boss State Forests (Stanisic *et al*. 2010; Foon *et al*. 2022), located approximately 45 km northwest of Port Macquarie in northern New South Wales (NSW). These are the traditional lands of the Dainggatti people (Horton 1996). The species is only known from nine collection events at six sites (Table 1) (Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt.* February 2023; ALA 2024; J.K. Foon *in litt*. October 2024), most or all of which are thought to have overlapped with the 2019–2020 bushfires fire zone (Hyman *et al*. 2020; Marsh *et al*. 2021). Due to road access restrictions following the fires, none of the pre-fire sites have been revisited. One site was discovered post-fire, approximately 950 m from one pre-fire record (Esri 2021; Foon *in litt*. October 2024). *Austrochloritis kippara*

occurs in the NSW North Coast Bioregion, and Macleay Hastings and Upper Manning IBRA Subregions (DAWE 2012; Commonwealth DCCEEW 2024). Despite the few records that exist, *A. kippara* is inferred to be absent from all areas surrounding Kippara and Mount Boss State Forests as surrounding areas have been well sampled for land snails, with no detections of *A. kippara* (Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt.* February 2023). Current survey data are insufficient to assess *A. kippara* snail abundance (Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt.* February 2023) or the number of mature individuals. Only 45 individuals have ever been collected (Table 1) (F. Köhler and J.K. Foon *in litt*. February 2023; ALA 2024; J.K. Foon pers. obs).

Table 1. All confirmed collection events of *Austrochloritis kippara*. Site information has been omitted.

Land tenure	**Date of survey and collection event number**	**Number of individuals collected**
Forestry Corporation of NSW (Kippara State Forest)	15 May 2021 (AM C. 591397) 15 May 2021 (AM C.591126)	12 6
Forestry Corporation of NSW (Kippara State Forest)	30 June 2018 (AM C.575240)	5
Forestry Corporation of NSW (Mount Boss State Forest)	30 June 2018 (AM C. 575241)	1
Forestry Corporation of NSW (Mount Boss State Forest)	4 Jan 1995 (AM C.575431)	1
Forestry Corporation of NSW (Kippara State Forest)	5 Jan 1995 (QM MO78794)	10
Forestry Corporation of NSW (Kippara State Forest)	19 Jan 1993 (QM MO43290) 4 Jan 1995 (QM MO55940)	8 1
Forestry Corporation of NSW (Kippara State Forest)	7 Jan 1992 (QM MO36963)	1

Austrochloritis kippara is inferred to occur in six subpopulations as per the IUCN (2024) definition. This is based on the species' poor dispersal ability, inferred to be < 200 m over their lifespan (F. Köhler and J.K. Foon *in litt.* February 2023), which is significantly less than distances between all sites. Therefore, each site is considered a separate subpopulation. Further information on dispersal ability, genetics (Clark and

Richardson 2002; Gretgrix *et al*. 2023), abundance and density are required to more accurately determine the number of subpopulations.

Extent of Occurrence and Area of Occupancy

The Extent of Occurrence (EOO) of *Austrochloritis kippara* is estimated to be 11 km^2 and is calculated as a minimum convex polygon containing all known occurrences, the method of assessment recommended by IUCN (2024). The Area of Occupancy (AOO) is estimated to be 16 km^2 based on 2 x 2 km grid cells, the scale recommended by IUCN (2024). Both EOO and AOO were calculated using ArcGIS version 10.8.2 (Esri 2021). However, the IUCN guidelines (2024) state that: "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". Therefore, EOO is estimated to be 16 km^2. Based on these estimates, *A. kippara* has a very highly restricted geographic distribution.

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

Ecology

Habitat

Austrochloritis kippara was originally recorded from "dry vine thickets on rocky outcrops, associated with microhabitats such as rocks and logs" (Stanisic *et al*. 2010), but a later survey by Foon *et al*. (2022) also found the species in Eucalypt woodland and forest. The species generally occurs in closed canopy forest (F. Köhler and J.K. Foon *in litt.* February 2023; J.K. Foon *in litt*. October 2024). Individuals have also been found in other microhabitats including deep leaf litter and buried in the ground (F. Köhler and J.K. Foon *in litt.* February 2023).

Behaviour and Life History

Little is known about behaviour and life history. *Austrochloritis kippara* is likely to be most active at night after rain because it has been found aestivating during dry and warm weather in the abovementioned sheltered microhabitats (F. Köhler and J.K. Foon *in litt*. February 2023). The species is inferred to move < 200 m in its entire lifetime due to its relatively small size (F. Köhler and J.K. Foon *in litt*. February 2023). This inference is supported by studies showing limited dispersal ability in *Austrochloritis kosciuszkoensis* (Gretgrix *et al*. 2023) and other larger eastern Australian camaenid species (Clark and Richardson 2002; Parkyn *et al*. 2014; Ridgeway *et al*. 2014). *Austrochloritis kippara* might be passively dispersed over larger distances due to stochastic events such as flooding (F. Köhler and J.K. Foon *in litt.* February 2023).

Austrochloritis kippara is inferred to be a detritus feeder, feeding on various ground substrate items such as fungi and/or organic decaying matter (Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt*. February 2023). As with all pulmonates, the species is hermaphroditic and lays eggs (F. Köhler and J.K. Foon *in litt*. February 2023), but no further reproductive information is known.

There is no longevity or generation length information available for the species. However, another camaenid land snail, the Jervis Bay forest snail (*Meridolum*

jervisensis), is reported as mature at two years with a maximum lifespan of five years and 50% survivorship at 2–4 years in captivity, decreasing to less than 1% survivorship at 4–5 years (McLauchlan 1951). If the two species have similar life histories, and when considering the maximum known *Meridolum* lifespan (10 years), F. Köhler and J.K. Foon (*in litt*. February 2023) conservatively infer the generation length of *Austrochloritis kippara* to be approximately 3–4 years.

Cultural Significance

This assessment is not intended to be comprehensive of the Traditional Ecological Knowledge that exists for *Austrochloritis kippara* 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 *A. kippara*, it is acknowledged that there is Traditional Ecological Knowledge for all plants, animals and fungi connected within the kinship system (Woodward *et al*. 2020).

Threats

The primary threat to *Austrochloritis kippara* is adverse fire regimes, namely high severity and high frequency fire. Drought, particularly in combination with fire, and native timber harvesting are also considered threats to the species.

Adverse fire regimes

Austrochloritis kippara is threatened by adverse fire regimes, particularly high severity 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; F. Köhler and J.K. Foon *in litt*. February 2023).

Analyses immediately after the 2019–2020 bushfires identified *Austrochloritis kippara* as a priority species for urgent post-fire conservation management, including recommendations for on-ground rapid surveys (DAWE 2020; Legge *et al*. 2021). The priority listing was based on estimates that at least 50% of the species' modelled distribution overlapped with the 2019–2020 bushfires fire zone (DAWE 2020; Legge *et al*. 2021). Several other analyses agreed with the priority listing, with Hyman *et al*. (2020) estimating 100% of the species' distribution was within the fire zone, while Marsh *et al*. (2021) estimated 78–95% overlap. Post-fire ground surveys by Foon *et al*. (2022) found *A. kippara* at only one site, which had high burn severity in the leaf litter, understorey and canopy layers, although there were variable burn severities across the species' total known distribution (DPIE 2020; Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt*. February 2023). Foon *et al*. (2022) inferred a > 50% total population decline due to: 100% of the species' distribution overlapping with the 2019–2020 bushfires fire zone (Hyman *et al*. 2020), increased mortality during the fires, and increased indirect mortality from post-fire habitat loss and degradation (*i.e*. snail desiccation caused by reduced humidity, ground shelter and canopy cover). High and moderate-severity fires were observed to cause significant declines in land snail

abundance in southeastern Australia following the 2019–2020 bushfires (Decker *et al*. 2023). It is therefore reasonable to infer a similar decline for *A. kippara*.

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).

A slight annual increase in severe fire weather days is projected for the NSW North Coast region, which includes Kippara and Mount Boss State Forests, 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 frequent and severe fires, further threatening the *Austrochloritis kippara* population in the future.

Other risk factors that may cause adverse fire regimes within the distribution of *Austrochloritis kippara* 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 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 *Austrochloritis kippara* (Stanisic *et al*. 2010; F. Köhler and J.K. Foon *in litt*. February 2023), make it prone to desiccation and mortality from drought weather (Stanisic and Ponder 2004). Although the species may be somewhat adapted to dry conditions, for example, by aestivating in sheltered habitat (Stanisic and Ponder 2004; Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt*. February 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). Foon *et al*. (2022) suggested that extreme drought, worsened by climate change (Abram *et al*. 2021), may have caused high mortality in eastern Australian 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 NSW North Coast region is projected to see a decline in average annual rainfall of approximately 6%, along with an annual increase of 6–13 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 21st century (CSIRO and BOM 2024). It is therefore inferred that *Austrochloritis kippara* 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*.

Native forest timber harvesting

Austrochloritis kippara is inferred to be threatened by habitat loss and degradation caused by native forest timber harvesting. The species' current known distribution is entirely within Kippara and Mount Boss State Forests (Stanisic *et al*. 2010; Foon *et al*. 2022), where native forest timber harvesting has occurred historically (*e.g*., Forests NSW 2012; FCNSW 2014a, 2014b; EPA 2015) and relatively recently (*e.g*., EPA 2014, 2015, 2019). Harvesting may also continue in the future (*e.g*., FCNSW 2024a, b). Harvesting, as with fire (Foon *et al*. 2022) temporarily opens the forest canopy, thereby creating drier and hotter microhabitats (F. Köhler and J.K. Foon *in litt*. February 2023). This in turn potentially increases the risk of snail desiccation (F. Köhler and J.K. Foon *in litt*. February 2023). Native forest timber harvesting activities may also cause direct mortality by physically crushing snails (F. Köhler and J.K. Foon *in litt*. February 2023). These threats, however, are now mitigated by modern forestry practices that require complex restrictions on harvesting including various habitat buffer zones (Slade and Law 2018; FCNSW 2024b). Furthermore, approximately 62% of Kippara State Forest and 40% of the entire NSW native forest estate are reserved for conservation (Slade and Law 2018; FCNSW 2024a).

Number of Locations

When the threat of adverse fire regimes is considered, *Austrochloritis kippara* 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. Analyses including a remote-sensing study by Hyman *et al*. (2020) has already shown that 78–100% of the species' distribution was burnt during the 2019–2020 bushfires (Hyman *et al*. 2020; Marsh *et al*. 2021). The species' geographic distribution remains very highly restricted, and with the projected future increase in fire weather due to climate change (Abram *et al*. 2021; Adapt NSW 2024, CSIRO and BOM 2024), it is highly plausible that a single fire event could adversely affect the species across its entire distribution within a short time frame.

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Austrochloritis kippara* 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.

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.

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]*.

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.

based on any of the following:

(a) direct observation *[except A3]*

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality

(d) actual or potential levels of exploitation

(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

Outcome

Austrochloritis kippara is considered Data Deficient under Criterion A.

Population reductions

The estimated three-generation timespan for *Austrochloritis kippara* is approximately 12 years. There are not enough past or future population abundance, density or trend data to extrapolate and assess a population size reduction over 12 years.

Conclusion

Austrochloritis kippara is considered Data Deficient under Criterion A because there are insufficient population data available over 12 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 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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

Austrochloritis kippara is eligible for listing as Critically Endangered under Criterion B1ab(iii,v).

EOO and AOO

Austrochloritis kippara has an EOO of 16 km^2 and an AOO of 16 km^2.

Number of threat-defined locations

Austrochloritis kippara is found at one threat-defined location when considering the most serious plausible threat of adverse fire regimes, namely high severity and high frequency fire.

Severely fragmented

Austrochloritis kippara is not severely fragmented as it inhabits continuous forest (Esri 2021; Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt.* February 2023).

Continuing decline

A continuing decline in area, extent and quality of habitat, and the number of mature individuals, is inferred due to the susceptibility of *Austrochloritis kippara* to high 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*. February 2023). Foon *et al*. (2022) inferred a > 50% total population decline due to 100% of the species' distribution overlapping with the 2019–2020 bushfires fire zone (Hyman *et al*. 2020), increased mortality during the fires, and increased indirect mortality from post-fire habitat loss and degradation (*i.e*. snail desiccation caused by reduced humidity, ground shelter and canopy cover). Significant declines in land snail abundance were also observed in southeastern Australia following the 2019–2020 bushfires (Decker *et al*. 2023), further supporting these inferences. A slight annual increase in severe fire weather days is projected for the NSW North Coast 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 frequent and severe fires, further threatening the *Austrochloritis kippara* 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).

Although there are no data to determine the severity of this threat to *Austrochloritis kippara*, recent native forest timber harvesting is inferred to have led to a decline in area, extent and quality of the species' closed forest habitat (*e.g*., EPA 2014, 2015, 2019; F. Köhler and J.K. Foon *in litt*. February 2023).

Extreme fluctuations

There are insufficient data to determine if *Austrochloritis kippara* 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

Austrochloritis kippara is eligible to be listed as Critically Endangered under Criterion B1ab(iii,v) because the EOO and number of threat-defined locations fall under the Critically Endangered thresholds and continuing decline in the area, extent and quality of habitat, and the number of mature individuals, is inferred due to adverse fire regimes (high severity and high frequency fire), drought, and native forest timber harvesting.

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

Austrochloritis kippara is considered Data Deficient under Criterion C.

Number of mature individuals

There are no population size data for *Austrochloritis kippara*.

Continuing decline

Continuing decline is inferred in the number of mature individuals of *Austrochloritis kippara* 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 % of mature individuals in any subpopulation.

Extreme fluctuations

It is unknown if *Austrochloritis kippara* experiences extreme fluctuations as insufficient data have been collected over time.

Conclusion

Austrochloritis kippara 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 % 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 km² or number of locations ≤ 5

Outcome

Austrochloritis kippara 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 *Austrochloritis kippara*.

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

Austrochloritis kippara occurs at one threat-defined location (due to the threat of adverse fire regimes) and has an estimated AOO of 16 km^2. Foon *et al*. (2022) inferred a > 50% total population decline due to: 100% of the species' distribution overlapping with the 2019–2020 bushfires fire zone (Hyman *et al*. 2020), increased mortality during the fires, and increased indirect mortality from post-fire habitat loss and degradation (*i.e*. snail desiccation caused by reduced humidity and ground shelter) (Foon *et al*. 2022; F. Köhler and J.K. Foon *in litt.* February 2023). An increase in fire weather across the species' distribution is also projected due to climate change (Adapt NSW 2024; CSIRO and BOM 2024). Therefore, the threat of adverse fire regimes, namely high severity and high frequency 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

Austrochloritis kippara is considered Data Deficient under Criterion E.

Probability of extinction

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

Conservation and Management Actions

This species 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 Environment, Climate Change, Energy, the Environment and Water 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.

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Expert Communications

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APPENDIX 1

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:
Austrochloritis kippara 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

(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 criterion 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: Critically Endangered under Clause 4.3(a)(d)(e i,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 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: 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.