



NEW ZEALAND THREAT CLASSIFICATION SERIES 33

Conservation status of New Zealand indigenous terrestrial Gastropoda (slugs and snails), 2020

Part 2. Achatinellidae, Bothriembryontidae (pūpūharakeke), Euconulidae, Helicarionidae, Pupinidae and Vertiginidae

K. Walker, F.J. Brook, G.M. Barker, D.J. Roscoe, E. Edwards, R.A. Hitchmough, J.R. Rolfe and P. Michel



Department of
Conservation
Te Papa Atawhai

Cover: *Placostylus ambagiosus*, Te Paki Ecological Region. Photo: G.R. Parrish.

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Part 2. Achatinellidae, Bothriembryontidae (pūpūharakeke), Euconulidae, Helicarionidae, Pupinidae and Vertiginidae

K. Walker^{1, 6}, F.J. Brook², G.M. Barker³, D.J. Roscoe⁴, E. Edwards⁵, R.A. Hitchmough⁵, J.R. Rolfe⁵ and P. Michel⁵

¹ Biodiversity Group, Department of Conservation, Private Bag 5, Nelson 7042, New Zealand

² P.O. Box 1652, Nelson 7040, New Zealand

³ Manaaki Whenua Landcare Research, PO Box 69040, Lincoln 7640, New Zealand

⁴ 2 Oakleigh Street, Maungaraki, Lower Hutt 5010, New Zealand

⁵ Department of Conservation, Biodiversity Group, PO Box 10-420, Wellington 6143, New Zealand

⁶ Email: kwalker@doc.govt.nz

Abstract

The conservation status of 48 New Zealand indigenous terrestrial Gastropoda taxa in the Achatinellidae, Bothriembryontidae, Euconulidae, Helicarionidae, Pupinidae and Vertiginidae families was assessed using the New Zealand Threat Classification System (NZTCS). A full list is presented, along with a statistical summary and brief notes on the most important changes since the last assessment. This list replaces all previous NZTCS assessments for terrestrial Gastropoda in these families. Of the species assessed, 23 are ranked as Threatened and 13 At Risk, while 4 are Not Threatened and 8 are Data Deficient – insufficient information is available to assess them. In addition, 15 of the species have yet to be formally described and named.

Keywords: New Zealand Threat Classification System, NZTCS, conservation status, snail, pūpūharakeke, flax snail, Achatinellidae, Bothriembryontidae, Euconulidae, Helicarionidae, Vertiginidae.

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1. Summary

The conservation status of New Zealand indigenous terrestrial Gastropoda, excluding *Powelliphanta*, was last assessed in 2010 (Mahlfeld et al. 2012). *Powelliphanta* had been previously assessed in 2005 (Hitchmough et al. 2007) but were excluded from the 2010 assessment because of ongoing research into their taxonomy. A reassessment of terrestrial Gastropoda including *Powelliphanta* was initiated in 2014 and is continuing. Reports on the new assessments will be published progressively in four parts. Part 1 covers the Athoracophoridae (leaf-veined slugs) and Succineidae (amber snails). Part 2, this report, covers Achatinellidae, Bothriembryontidae (pūpūharakeke/flax snails), Euconulidae, Helicarionidae, Pupinidae and Vertiginidae. Part 3 will cover Rhytididae (carnivorous snails); Part 4 will cover Charopidae and Punctidae.

The taxonomy that was used to assess taxa in these families in the 2010 assessment (Mahlfeld et al. 2012) remains largely unchanged except for *Placostylus ambagiosus* (family Bothriembryontidae). This species is endemic to the northernmost North Island, and consists of a series of small, relict populations that are scattered across the c. 40 km wide northern tip of Aupouri Peninsula and on nearby Motuopao Island. The original forest cover of this region has been severely depleted and fragmented over the last c. 800 years of human occupation, and now covers only c. 3% of the area (Lux et al. 2009). The remaining extant populations of *P. ambagiosus* occupy very small areas in degraded habitat, and most populations are under intense predatory pressure from invasive species, particularly feral pigs and rodents.

Powell (1938, 1947, 1951) described 10 extant subspecies of *P. ambagiosus*, one of which (*P. a. hancoxi*) was subsequently treated as a synonym of *P. a. annectens* (Powell 1951). He described a further five subspecies based on fossil shells from sand dunes. The fossils are of Late Pleistocene (last interglacial) and Mid-Late Holocene age (Brook 1999, 2000).

Over the last few decades there have been a number of studies looking at morphological and genetic diversity within *P. ambagiosus*. Allozyme, mtDNA and morphometric analyses have all identified differences between local populations (Triggs & Sherley 1993; Sherley 1996; Buckley et al. 2011; Daly, 2016; Daly et al. 2020). Buckley et al. (2011) synonymised all of Powell's fossil and extant subspecies of *P. ambagiosus* but this was contentious, and the taxonomy remains unsettled due to differing views as to how to best express the infraspecific variation. One point that these studies have agreed on is the need to preserve all the remaining extant populations of *P. ambagiosus* in order to conserve the full range of diversity in this taxon.

The 2005 assessment of land snail threat status by Hitchmough et al. (2007) listed nine extant subspecies of *P. ambagiosus* (*P. a. ambagiosus*, *P. a. annectens*, *P. a. keenorum*, *P. a. lesleyae*, *P. a. michiei*, *P. a. pandora*, *P. a. paraspirtus*, *P. a. whareana*, *P. a. consobrina*). The 2005 assessment also listed 9 'tag-named' *P. ambagiosus* populations within or on the fringes of the range of known subspecies ("Hauptototo", "Kauaetewhakaheke Stream", "Poroiki", "Rangiora", "Tapotupotu", "Ngaupoko", "Te Paki", "Tirikawa trig", "Tirikawa coast").

By contrast, the 2010 NZTCS assessment of land snails by Mahlfeld et al. (2012) treated *Placostylus ambagiosus* as single taxonomic entity.

For this report we assessed nine of Powell's extant subspecies of *P. ambagiosus* and a morphologically distinctive population that is referred to here as *P. ambagiosus* "Tirikawa coast". Two panel members, Fred Brook and Gary Barker, considered that *P. ambagiosus* should be assessed as one taxon, given the relatively small genetic and morphological differences between the 10 local populations, while the remainder of the panel considered they should be assessed as separate entities. The role of NZTCS is to identify the risk of biodiversity loss, so it is prudent to acknowledge a 'taxonomy' of *P. ambagiosus* that reflects the variation evident in the population. This we do here, using Powell's subspecies names for local geographic populations, whilst noting that there has been some sharing of haplotypes among them as a result of either very

recent divergence, incomplete lineage sorting or recent translocations. We note that the revised conservation status assessment of *P. ambagiosus* sensu lato was the same whether considered as a single undifferentiated species or as 10 separate taxonomic entities. In this report the various subspecies of *P. ambagiosus* are listed as ‘taxonomically unresolved’.

1.1 Changes to conservation status assessments

Table 1 compares the number of taxa in each category in this report with the 2010 assessment (Mahlfeld et al. 2012). Table 2 summarises the changes in conservation status that are reported in this report.

Five species in Pupinidae – *Liarea aupouria aupouria*, *Cytora hispida*, *C. kerana*, *C. lignaria* and *C. tepakiensis* – had been assessed as At Risk – Relict by Mahlfeld et al. (2012), meaning populations had stabilised after historical decline to very low levels. The recent arrival of Argentine ants (*Linepithema humile*) into Te Pahi poses a great threat to these snails; indeed, to many invertebrate species. Primarily because of the arrival of Argentine ants, these species are now assessed as Threatened – Nationally Vulnerable.

Table 1. Comparison of the number of taxa in each category in the 2010 assessment (Mahlfeld et al. 2012) with the 2020 assessment (this report).

CONSERVATION STATUS	2010	2020
Data Deficient	7	8
Threatened – Nationally Critical	4	12
Threatened – Nationally Endangered	4	5
Threatened – Nationally Vulnerable	2	6
At Risk – Relict	9	4
At Risk – Naturally Uncommon	10	9
Not Threatened	4	4
Total	40	48

Table 2. Summary of status changes of New Zealand Achatinellidae, Bothriembryontidae, Helicarionidae, Pupinidae and Vertiginidae between 2010 (Mahlfeld et al. 2012) and 2020 (this document). Numbers in light-grey-shaded cells above the dark grey cells indicate improved status (e.g. 2 taxa of 4 assessed as Nationally Critical in 2010 have moved to Nationally Endangered in 2020); numbers in mid-grey-shaded cells below the dark grey cells indicate change to poorer status. Numbers in the dark grey cells have not changed status. Numbers in cells without colour are either new to this report or are now considered to be Data Deficient.

		Conservation status 2020							
		Total 48	DD 8	NC 12	NE 5	NV 6	Rel 4	NU 9	NT 4
Conservation status 2010	Data Deficient (DD)	7	7						
	Threatened – Nationally Critical (NC)	4		2	1				
	Threatened – Nationally Endangered (NE)	4			4				
	Threatened – Nationally Vulnerable (NV)	2		1		1			
	At Risk – Relict (Rel)	9				5	4		
	At Risk – Naturally Uncommon (NU)	10	1					9	
	Not Threatened (NT)	4							4
	Not listed	8		9					

Improved data on the state of *Cytora taipa* (Pupinidae) have resulted in its conservation status improving from Threatened – Nationally Critical to Threatened – Nationally Endangered.

Kieconcha kermadeci is a Raoul Island endemic that Mahlfeld et al. (2012) assessed as At Risk – Naturally Uncommon. However, there is no information on the current state of the population or its area of occupancy, so it is now listed as Data Deficient.

Mahlfeld et al. (2012) assessed *Placostylus ambagiosus* as Threatened – Nationally Critical, and all the subspecies of *P. ambagiosus* that are recognised in this report are also Nationally Critical because of very small, fragmented populations that are susceptible to pigs, rats and Argentine ants, fire and drought.

The great uncertainties in the threat status of island taxa raise concerns. Seven out of eight land-snail taxa, assessed as Data Deficient, are only found on one single island (single-island endemics; Table 3). The lack of data for island-dwelling taxa is primarily due to a lack of monitoring efforts on northern New Zealand islands in the last few decades. Furthermore, changes in vegetation on Rangitāhua/Raoul Island and dry spells predicted for islands in the vicinity of Northland present additional threats to these taxa (West 2002; Rutledge et al. 2017).

In addition, 81% of all listed taxa (excluding *Placostylus* species and taxa assessed as Data Deficient) have a limited distribution. These taxa are assessed with a qualifier 'Range Restricted' or 'One Location' (Table 3). This suggests a limited dispersal to alternative locations. For these taxa, translocations may not be an appropriate conservation tool; their conservation remains highly dependent on successful in-situ interventions.

2. Conservation status of New Zealand indigenous Achatinellidae, Bothriembryontidae (pūpūharakeke/flux snails), Helicarionidae, Pupinidae and Vertiginidae (Gastropoda), 2020

Taxa are assessed according to the criteria of Townsend et al. (2008), and the results are presented in Table 3. The Data Deficient list precedes the other categories, which are ordered by degree of loss, with Nationally Critical at the top of the list and Not Threatened at the bottom. Although the true status of Data Deficient taxa will span the entire range of available categories, taxa are in that list mainly because they are very seldom seen, so most are likely to end up being considered threatened and some may already be extinct. The Data Deficient list is likely to include many of the most threatened species in New Zealand.

The full data for the assessments listed in Table 3 can be viewed and downloaded at <https://nztc.org.nz/reports/1100>.

The definitions of qualifiers and criteria for assessments are summarised in section 2.2. See Townsend et al. (2008) for details (<https://www.doc.govt.nz/globalassets/documents/science-and-technical/sap244.pdf>).

Brief descriptions of the NZTCS categories and criteria are provided in section 2.2. See Townsend et al. (2008) for full definitions of categories, criteria and qualifiers, and explanation of the assessment process

2.1 Assessments

Table 3. Conservation status of New Zealand indigenous Achatinellidae, Bothriembryontidae, Helicarionidae, Pupinidae and Vertiginidae.

NAME AND AUTHORITY				
DATA DEFICIENT (8)				
<i>Taxonomically determinate (8)</i>				
<i>Cytora pakotai</i> Marshall & Barker, 2007		OL	No change	Pupinidae
<i>Fanulum expositum</i> (Mousson, 1873)		IE, OL	No change	Euconulidae
<i>Kermarion kermadecensis</i> (E.A. Smith, 1873)		IE, OL	No change	Helicarionidae
<i>Kieconcha kermadeci</i> (Pfeiffer, 1856)		IE, OL	Greater uncertainty	Euconulidae
<i>Pronesopupa senex</i> (Iredale, 1913)		IE, OL	No change	Vertiginidae
<i>Tornatellides subperforatus kermadecensis</i> Pilsbry & Cooke, 1915		IE, OL	No change	Achatinellidae
<i>Tornatellinops iredalei</i> (Pilsbry & Cooke, 1915)		IE, OL	No change	Achatinellidae
<i>Tubuaia raoulensis</i> (Pilsbry & Cooke, 1915)		IE, OL	No change	Achatinellidae
NAME AND AUTHORITY				
THREATENED (23)				
NATIONALLY CRITICAL (12)				
<i>Taxonomically determinate (2)</i>				
<i>Cytora hirsutissima</i> (Powell, 1951)	A(3)	CD, IE, OL	No change	Pupinidae
<i>Cytora houhora</i> Marshall & Barker, 2007	A(3)	OL	No change	Pupinidae
<i>Taxonomically unresolved (10)</i>				
<i>Placostylus ambagiosus ambagiosus</i> Suter, 1906	B(3)	CD	New listing	Bothriembryontidae
<i>Placostylus ambagiosus annectens</i> Powell, 1938	C	CD, DPS	New listing	Bothriembryontidae
<i>Placostylus ambagiosus consobrinus</i> Powell, 1938	B(3)	CD, DPS	New listing	Bothriembryontidae
<i>Placostylus ambagiosus keenorum</i> Powell, 1947	B(3)	DPS, DPT	New listing	Bothriembryontidae
<i>Placostylus ambagiosus pandora</i> Powell, 1947	A(3)	DPS, DPT	New listing	Bothriembryontidae
<i>Placostylus ambagiosus michiei</i> Powell, 1951	B(3)	DPS, DPT	New listing	Bothriembryontidae
<i>Placostylus ambagiosus paraspiritus</i> Powell, 1951	B(3)	DPS, DPT	New listing	Bothriembryontidae
<i>Placostylus ambagiosus watti</i> Powell, 1947	B(3)	CD, RF, RR, Sp	No change	Bothriembryontidae
<i>Placostylus ambagiosus whareana</i> Powell, 1951	B(3)	CD, DPT	New listing	Bothriembryontidae
<i>Placostylus ambagiosus</i> (NMNZ M.331630) "Tirikawa coast"	C(3)	DPS, DPT	New listing	Bothriembryontidae
NATIONALLY ENDANGERED (5)				
<i>Taxonomically determinate (5)</i>				
<i>Cytora brooki</i> Marshall & Barker, 2007	A(3)	DPT, RR, Sp	No change	Pupinidae
<i>Cytora gardneri</i> Marshall & Barker, 2007	A(3)	DPT, RR, Sp	No change	Pupinidae
<i>Cytora parrishi</i> Marshall & Barker, 2007	A(3)	RR, Sp	No change	Pupinidae
<i>Cytora taiapa</i> Marshall & Barker, 2007	A(3)	OL	More knowledge	Pupinidae
<i>Placostylus (Basileostylus) bollonsi</i> Suter, 1908	B(2)	CD, IE, RR	No change	Bothriembryontidae
NATIONALLY VULNERABLE (6)				
<i>Taxonomically determinate (5)</i>				
<i>Cytora hispida</i> Gardner, 1967	D(3)	RR	Actual decline	Pupinidae
<i>Cytora kerrana</i> Gardner, 1968	D(3)	RR	Actual decline	Pupinidae
<i>Cytora lignaria</i> (Pfeiffer, 1857)	D(3)	RR	Actual decline	Pupinidae
<i>Cytora tepakiensis</i> Gardner, 1967	D(3)	RR	Actual decline	Pupinidae
<i>Liarea aupouria aupouria</i> Powell, 1954	D(3)	RR	Actual decline	Pupinidae
<i>Taxonomically unresolved (1)</i>				
<i>Liarea</i> sp. 1 (NMNZ M.158257) "Bream Head"	C(3)	CD, OL	No change	Pupinidae

Continued on next page

Table 3 continued

NAME AND AUTHORITY					
AT RISK (13)					
RELICT (4)					
<i>Taxonomically determinate (3)</i>					
<i>Liarea bicarinata</i> (Suter, 1907)	Sp	No change		Pupinidae	
<i>Liarea ornata</i> Powell, 1954	Sp	No change		Pupinidae	
<i>Liarea partula</i> Powell, 1954	Sp	No change		Pupinidae	
<i>Taxonomically unresolved (1)</i>					
<i>Liarea</i> sp. 2 (NMNZ M.158258) "Manaia"	RR	No change		Pupinidae	
NATURALLY UNCOMMON (9)					
<i>Taxonomically determinate (9)</i>					
<i>Cytora annectens</i> (Powell, 1948)	IE, OL	No change		Pupinidae	
<i>Cytora climoi</i> Marshall & Barker, 2007	RR	No change		Pupinidae	
<i>Cytora filicosta</i> (Powell, 1948)	IE, RR	No change		Pupinidae	
<i>Cytora hazelwoodi</i> Marshall & Barker, 2007	Sp	No change		Pupinidae	
<i>Cytora motu</i> Marshall & Barker, 2007	RR	No change		Pupinidae	
<i>Cytora rakiura</i> Marshall & Barker, 2007	RR	No change		Pupinidae	
<i>Cytora solitaria</i> (Powell, 1935)	IE, OL	No change		Pupinidae	
<i>Cytora tawhiti</i> Marshall & Barker, 2007	IE, RR	No change		Pupinidae	
<i>Placostylus (Maoristylus) hongii</i> (Lesson, 1830)	CD, DP, RR	No change		Bothriembryontidae	
NAME AND AUTHORITY		CRITERIA	QUALIFIERS	CHANGE REASON	FAMILY
NOT THREATENED (4)					
<i>Taxonomically determinate (2)</i>					
<i>Liarea waipoua</i> Powell, 1954				No change	Pupinidae
<i>Liarea egea</i> (Gray, 1850)				No change	Pupinidae
<i>Taxonomically unresolved (2)</i>					
<i>Liarea hochstetteri</i> species complex				No change	Pupinidae
<i>Liarea turriculata</i> species complex				No change	Pupinidae

2.2 NZTCS categories, criteria and qualifiers

Categories and criteria

Data Deficient

Taxa that are suspected to be threatened, or in some instances, possibly extinct but are not definitely known to belong to any particular category due to a lack of current information about their distribution and abundance. It is hoped that listing such taxa will stimulate research to find out the true category (for a fuller definition see Townsend et al. 2008).

Threatened

Taxa that meet the criteria specified by Townsend et al. (2008) for the categories Nationally Critical, Nationally Endangered and Nationally Vulnerable.

Threatened – Nationally Critical

Criteria for Nationally Critical:

A – very small population (natural or unnatural)

A(1) <250 mature individuals

- A(2) ≤ 2 subpopulations, ≤ 200 mature individuals in the larger subpopulation
- A(3) Total area of occupancy ≤ 1 ha (0.01 km^2)

B – small population (natural or unnatural) with a high ongoing or predicted decline

- B(1) 250–1000 mature individuals, predicted decline 50–70%
- B(2) ≤ 5 subpopulations, ≤ 300 mature individuals in the largest subpopulation, predicted decline 50–70%
- B(3) Total area of occupancy ≤ 10 ha (0.1 km^2), predicted decline 50–70%

C – population (irrespective of size or number of subpopulations) with a very high ongoing or predicted decline ($>70\%$)

- C Predicted decline $>70\%$

Threatened – Nationally Endangered

Criteria for Nationally Endangered:

A – small population (natural or unnatural) that has a low to high ongoing or predicted decline

- A(1) 250–1000 mature individuals, predicted decline 10–50%
- A(2) ≤ 5 subpopulations, ≤ 300 mature individuals in the largest subpopulation, predicted decline 10–50%
- A(3) Total area of occupancy ≤ 10 ha (0.1 km^2), predicted decline 10–50%

B – small stable population (unnatural)

- B(1) 250–1000 mature individuals, stable population
- B(2) ≤ 5 subpopulations, ≤ 300 mature individuals in the largest subpopulation, stable population
- B(3) Total area of occupancy ≤ 10 ha (0.1 km^2), stable population

C – moderate population and high ongoing or predicted decline

- C(1) 1000–5000 mature individuals, predicted decline 50–70%
- C(2) ≤ 15 subpopulations, ≤ 500 mature individuals in the largest subpopulation, predicted decline 50–70%
- C(3) Total area of occupancy ≤ 100 ha (1 km^2), predicted decline 50–70%

Threatened – Nationally Vulnerable

Criteria for Nationally Vulnerable:

A – small, increasing population (unnatural)

- A(1) 250–1000 mature individuals, predicted increase $>10\%$
- A(2) ≤ 5 subpopulations, ≤ 300 mature individuals in the largest subpopulation, predicted increase $>10\%$
- A(3) Total area of occupancy ≤ 10 ha (0.1 km^2), predicted increase $>10\%$

B – moderate, stable population (unnatural)

- B(1) 1000–5000 mature individuals, stable population
- B(2) ≤ 15 subpopulations, ≤ 500 mature individuals in the largest subpopulation, stable population
- B(3) Total area of occupancy ≤ 100 ha (1 km^2), stable population

C – moderate population, with population trend that is declining

- C(1) 1000–5000 mature individuals, predicted decline 10–50%
- C(2) ≤ 15 subpopulations, ≤ 500 mature individuals in the largest subpopulation, predicted decline 10–50%
- C(3) Total area of occupancy ≤ 100 ha (1 km^2), predicted decline 10–50%

D – moderate to large population and moderate to high ongoing or predicted decline

D(1) 5000–20000 mature individuals, predicted decline 30–70%

D(2) ≤15 subpopulations, ≤1000 mature individuals in the largest subpopulation, predicted decline 30–70%

D(3) Total area of occupancy ≤1000 ha (10 km²), predicted decline 30–70%

E – large population and high ongoing or predicted decline

E(1) 20000–100000 mature individuals, predicted decline 50–70%

E(2) Total area of occupancy ≤10000 ha (100 km²), predicted decline 50–70%

At Risk

Taxa that meet the criteria specified by Townsend et al. (2008) for Declining, Recovering, Relict and Naturally Uncommon.

At Risk – Declining

Criteria for Declining:

A – moderate to large population and low ongoing or predicted decline

A(1) 5000–20000 mature individuals, predicted decline 10–30%

A(2) Total area of occupancy ≤1000 ha (10 km²), predicted decline 10–30%

B – large population and low to moderate ongoing or predicted decline

B(1) 20000–100000 mature individuals, predicted decline 10–50%

B(2) Total area of occupancy ≤10000 ha (100 km²), predicted decline 10–50%

C – very large population and low to high ongoing or predicted decline

C(1) >100000 mature individuals, predicted decline 10–70%

C(2) Total area of occupancy >10000 ha (100 km²), predicted decline 10–70%

At Risk – Relict

Taxa that have undergone a documented decline within the last 1000 years, and now occupy <10% of their former range and meet one of the following criteria:

A 5000–20000 mature individuals; population stable (±10%)

B >20000 mature individuals; population stable or increasing at >10%

The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. Relict can also include taxa that exist as reintroduced and self-sustaining populations within or outside their former known range (for more details see Townsend et al. (2008)).

At Risk – Naturally Uncommon

Taxa whose distribution is confined to a specific geographical area or which occur within naturally small and widely scattered populations, where this distribution is not the result of human disturbance.

Not Threatened

Resident native taxa that have large, stable populations.

Qualifiers

See Townsend et al. (2008) for details of criteria and qualifiers, which are abbreviated as follows:

CD	Conservation Dependent
DPS	Data Poor: Size
DPT	Data Poor: Trend
IE	Island Endemic
OL	One Location
RF	Recruitment Failure
RR	Range Restricted
Sp	Sparse

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