Conservation Status of Otago's Onchyophora ('peripatus' or velvet worm), 2025

Scott Jarvie

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Otago Threat Classification Series 8

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Otago Threat Classification Series is a scientific monograph series presenting publications related to regional threats assessments of groups of taxa in Otago. Most will be lists providing regional threat assessments of members of a plant or animal group (e.g., amphibians, bats, birds, indigenous vascular plants, peripatus, reptiles, selected species of mushroom fungi – non-lichenised agarics, boletes and russuloid), and leverages off national assessments for the New Zealand Threat Classification System within the regional context.

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Peripatoides otepoti (Trewick et al., 2024), peripatus/ngaokeoke. Photograph by Samuel Purdie

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Ooperipatellus viridimaculatus Dendy, 1890, peripatus/ngaokeoke. Photograph by Samuel Purdie

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Executive Summary

This report provides the first assessment of the regional conservation status of Onychophora ('peripatus' or velvet worm) in the Otago Region. Standardised methodology was followed to assess the regional threat status of Onychophora taxa in Otago. Three Onychophora taxa were assessed as Regionally Not Threatened (*Peripatoides otepoti*, *P. taitonga* and *Ooperipatellus viridimaculatus*) and one taxon as Regionally Data Deficient (*P. waikaia*).

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Introduction

Threat classifications play an important role in monitoring biodiversity and informing conservation actions. The New Zealand Threat Classification System (NZTCS) is a tool used to assign a threat status to candidate taxa (species, subspecies, varieties, and forma) in Aotearoa New Zealand (Rolfe et al. 2022). The classification system was developed to apply equally to terrestrial, freshwater, and marine biota (flora, fauna, and fungal taxa). The NZTCS scores taxa at the national scale against criteria based on an understanding of population state, size, and trend, while considering population status, impact of threats, recovery potential, and taxonomic certainty. The Department of Conservation | Te Papa Atawhai (DOC) administers the NZTCS in Aotearoa New Zealand, with national assessments used to inform conservation action, target resources, and monitor biodiversity trends and conservation effectiveness.

While DOC is tasked with managing indigenous taxa nationally, regional and district councils have statutory obligations to maintain indigenous biodiversity under the Resource Management Act 1991 (RMA), including to manage the habitats of threatened taxa. The regional threat status of taxa is particularly important in the context of the RMA and in conservation planning. A key requirement of managing the habitats occupied by taxa is to understand regional population sizes and distributions, and to monitor trends and management effectiveness.

The Regional Threat Classification System is a regional system to assess the conservation status of candidate taxa in Aotearoa New Zealand's sixteen geopolitical regions. It is complementary to the NZTCS, using the same categories, status rankings and criteria, adjusted to account for smaller regional scales. This report is the first regional conservation status for Onychophora in the Otago Region. Regional threat assessments have been completed by Otago Regional Council for six taxonomic groups (bats, Jarvie et al. 2023; amphibians, Jarvie 2024; selected species of mushroom fungi – non-lichenised agarics, boletes, and russuloid fungi, Jarvie and Cooper, 2024; reptiles, Jarvie et al. 2024a; birds, Jarvie et al. 2024b; indigenous vascular plants, Jarvie et al. 2024c), Greater Wellington Regional Council for five taxonomic groups (birds, Crisp et al. 2024; indigenous freshwater fish, Crisp et al. 2022; indigenous vascular plants, Crisp 2020a; reptiles, Crisp et al. 2023b; bats, Crisp et al. 2023b) and Auckland Council for five taxonomic groups (amphibians, Melzer et al. 2022a; reptiles, Melzer et al. 2022b; indigenous vascular plants, Simpkins et al. 2023; bats, Woolly et al. 2023; freshwater fish, Bloxham et al. 2023) as of May 2025.

Methods

The regional threat status of Onychophora was assessed in December 2024. This assessment covers all Onychophora taxa in, or near, the region, following standardised methodology for regional threat assessments as shown in Appendix 1, the list of regional qualifiers in Appendix 2, and the list of national qualifiers in Appendix 3. A map of the Otago region is shown in Appendix 4. The national threat assessments and national qualifiers were from Trewick et al. (2018). All the taxa names in this regional assessment were updated from Trewick et al. (2018) to Trewick et al. (2024) to reflect the latest taxonomy.

Following the standardised methodology, Onychophora taxa recognised in the NZTCS list (Trewick et al. 2018) but not known to occur in, or near, Otago were first removed from consideration. The next step was to identify Nationally Threatened and At-Risk taxa that are present in the region. If more than 20% of the national population of native taxa are breeding or resident for more than half their life cycle in the region, they were assigned a National Stronghold status and the NZTCS criteria applied. In this exercise, the regional conservation status must not be of a lower threat status than the national status.

Regional thresholds were set at more than 2000 mature individuals present or occupancy of more than 1000 ha. If taxa did not meet the threshold, they were assigned a regional threat status by applying the NZTCS criteria. If taxa meet the threshold and the population trend was ±10% stable or increasing, they were assigned the status Regionally Not Threatened. For Nationally Not Threatened and Non-Resident taxa, the regional population threshold was applied. If the population was not stable to increasing or decreasing by more than 10%, the NZTCS criteria were used to determine the regional threat status. Population trend criteria are applied based on current knowledge, representing trends over the next 10 years or 3 generations, whichever is longer.

Regional conservation assessments for Onychophora taxa were completed in a locally operated dashboard using R v. 4.2.2 (R Core Team 2022) via the RStudio platform (Posit Team 2023). The main packages used for the dashboard were 'shiny' (Chang et al. 2021) and 'flexdashboard' (Iannone et al. 2020). Other packages used in the dashboard and for other data wrangling include the 'tidyverse' (Wickham et al. 2019), 'readxl' (Wickham and Bryan 2022), sf (Pebesma 2018), lubridate (Grolemund and Wickham 2011), leaflet (Cheng et al. 2022), leaflet.extras (Karambelkar and Schloerke 2018), plotly (Sievert 2020), janitor (Firke 2020), ggplot2 (Wickham 2016), and terra (Hijmans 2022). The map layers used to view records in the dashboard were OpenStreetMap (OpenStreetMap Contributors 2017) and Esri World Imagery (Esri 2023).

Results

Four Onychophora taxa were identified as present in, or near, Otago (Figure 1; Table 1). Of these taxa three were assigned the threat status Regionally Not Threatened: *Peripatoides otepoti*, *P. taitonga* and *Ooperipatellus viridimaculatus*. A fourth taxon was considered Regionally Data Deficient: *P. waikaia*.

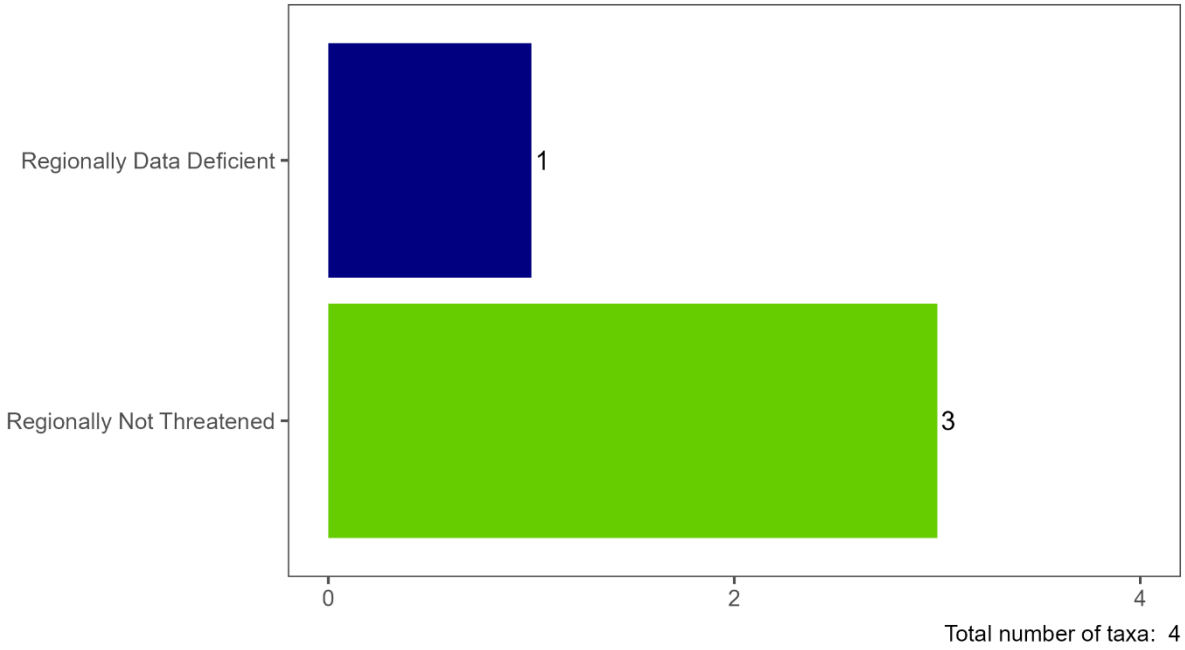

Figure 1: Regional conservation status of Otago's Onychophora ('peripatus' or velvet worm).

Table 1: Regional conservation status of Otago's Onychophora ('peripatus' or velvet worm)

Name and Authority	Common Name	Māori Name	Regional Criteria	National Stronghold	Regional Endemic	Regional Population	Regional Area	Regional Trend	Regional Confidence Population	Regional Confidence Trend	Regional Qualifiers	National Conservation Status	National Qualifiers	Notes
REGIONALLY DATA DEFICIENT (1)														
TAXONOMICALLY DETERMINATE (1)														
Peripatoides waikaia (Trewick et al., 2024)	peripatus	ngaokeoke										Data Deficient		Previous name: *Peripatoides* "Piano Flat". Distribution: Currently documented only from native forest towards the head of the Waikaia River.
REGIONALLY NOT THREATENED (3)														
TAXONOMICALLY DETERMINATE (3)														
Peripatoides otepoti (Trewick et al., 2024)	peripatus	ngaokeoke		yes		20,000–100,000		±10%	Low	Low	DPT, DPS, DPR, NStr, NR, TL, PF	Not Threatened		Previous name: *Peripatoides* "Dunedin". Distribution information: the southern range limit is in Otago. Type locality: Nichols Creek, Dunedin, Otago, New Zealand.
Peripatoides taitonga (Trewick et al., 2024)	peripatus	ngaokeoke		yes			>10,000 ha	±10%	Low	Low	DPT, DPS, DPR, NStr, NR, PF	Not Threatened		Previous name: *Peripatoides* "Catlins". Distribution information: the northern range limit is in Otago.
Ooperipatellus viridimaculatus Dendy, 1890	peripatus	ngaokeoke					>10,000 ha	±10%	Low	Low	DPT, DPS, DPR, PF	Not Threatened		Previous name: *Ooperipatellus viridimaculatus* (Dendy, 1900)

Regional and national qualifiers: CD = Conservation Dependent; DPR = Data Poor Recognition; DPS = Data Poor Size; DPT = Data Poor Trend; De = Designated; EF = Extreme Fluctuations; NR = Natural Range Limit; NS = Natural State; NStr = Natural Stronghold; OL = One Location; PD = Partial Decline; RR = Range Restricted; SO = Secure Overseas; SO? = Secure Oversea?; S?O = Secure?Overseas; TO = Threatened Overseas' TO? = Threatened Overseas?; T?O = Threatened? Overseas; CI = Climate Impact; CRN = Conservation Research Needed; EW = Extinct in the Wild; INC = Increasing; PF = Population Fragmentation' PE = Possibly/Presumed Extinct; RE = Regional Endemic; Rel = Relict; RF = Recruitment Failure; Sp = Biologically Sparse

Discussion

Regional threat assessments have already been completed by regional councils in Aotearoa New Zealand (Bloxham et al. 2024; Crisp 2020, Crisp et al. 2022, 2023a, 2023b, 2024; Jarvie et al. 2023, 2024a, 2024b, 2024c; Jarvie 2024; Jarvie and Cooper 2024; Melzer et al. 2022a, 2022b; Simpkins et al. 2023). This report is the first regional assessment of the conservation status of Onychophora ('peripatus' or velvet worm) species in Otago. Three Onychophora species in Otago were assessed at Regionally Not Threatened, while one species was identified as Regionally Data Deficient.

The three species assessed as Regionally Not Threatened are *P. otepoti*, *P. taitonga,* and *O. viridimaculatus*. Of these three species, two were identified as having a National Stronghold, i.e., > 20% of the national population being present, in Otago; these are *P. otepoti* and *P. taitonga*. Both *P. otepoti* and *P. taitonga* also have their limits to their known natural range in Otago; for *P. otepoti* this is in the south of their natural range and for *P. taitonga* this is in the north. Moreover, the type locality for *P. otepoti* is in Otago.

For the three species assigned the threat status Regionally Not Threatened, all had the three assessment process qualifiers for Data Poor, where confidence in the assessment is low because of lack of information for population size, trend and how to recognise them in the field and/or laboratory. Moreover, for these three species the pressure management qualifier for Population Fragmentation was chosen, because gene flow between subpopulations is likely hampered as a result of human activity.

While *P. waikaia* has only currently been documented from native forest towards the head of the Waikaia River, given there is no major biogeographical barrier to prevent it being in Otago its plausible this species could be in the region. This is why *P. waikaia* was assigned the threat status Regionally Data Deficient because there was insufficient data to assess the threat status of the species in Otago.

Aotearoa New Zealand is a biodiversity hotspot for temperate invertebrate taxa and home to high levels of endemicity. Only four of the 12 previously identified taxa species of Onychophora (two are *Ooperipatellus* and 10 species are *Peripatoides*) were identified as being in, or near, the Otago Region. Recent studies, however, suggest there may between 16 and 21 *Ooperipatellus* species and between 13 and 67 *Peripatoides* species endemic to Aotearoa (Lord et al. 2024). Further exploration of species-level diversity and distributions of the genera *Ooperipatellus* and *Peripatoides,* using an integrative approach to taxonomy of molecular work, morphological examination, and species-level ecological niche modelling, will likely lead to the confirmation of additional species in

both genera. Future national and regional assessments will have to incorporate any changes to this species-level diversity.

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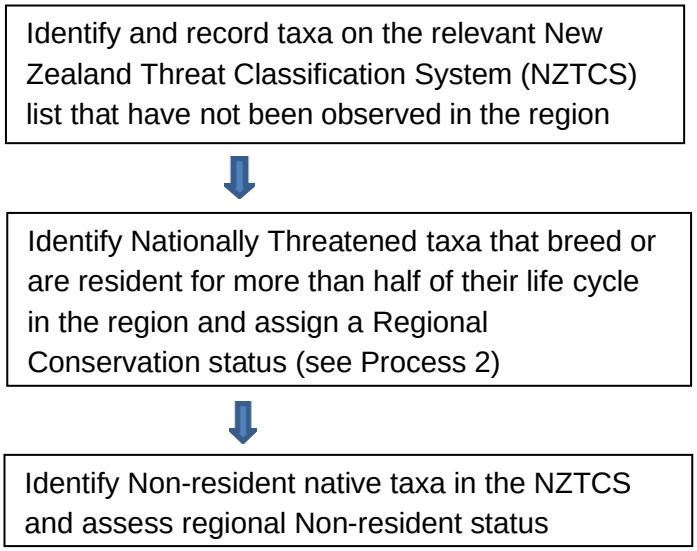
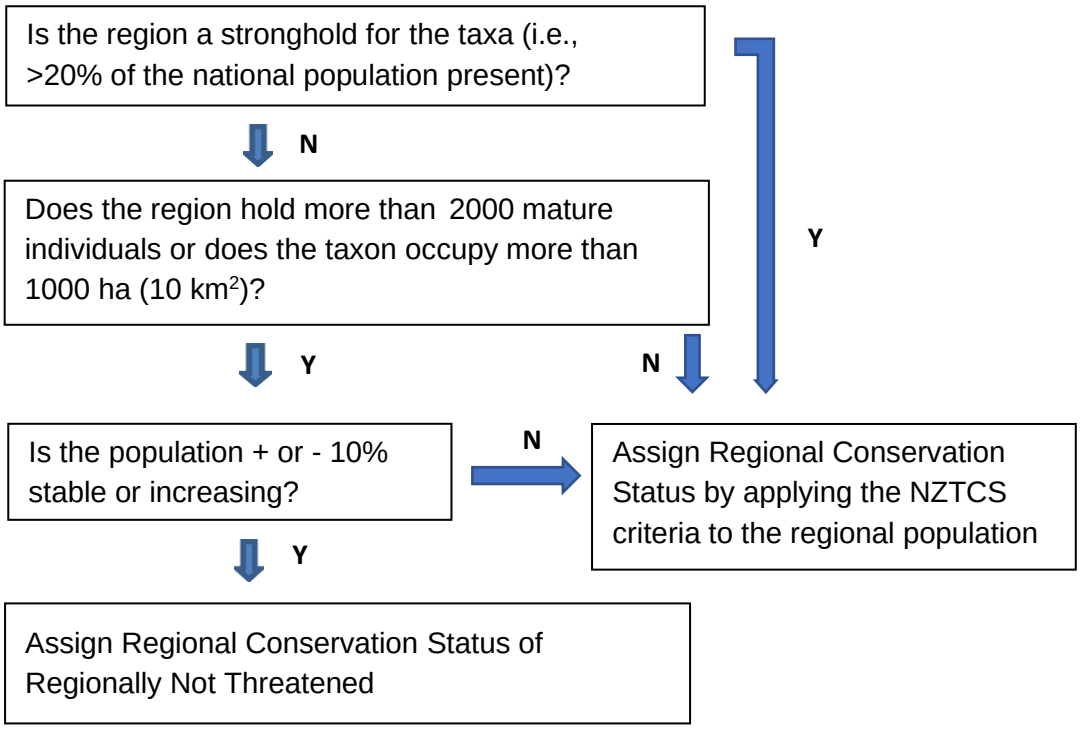
Appendices

Appendix 1: Process for determining the regional threat status of taxa

Process 1: Determination of regional threat status



Process 2: Determination of strongholds and Regionally Not Threatened species



Appendix 2: List of Regional Qualifiers for Regional Threat Classification System

Code	Qualifier	Description
FR	Former Resident	Breeding population (existed for more than 50 years) extirpated from region but continues to arrive as a regional vagrant or migrant. FR and RN are mutually exclusive.
HR	Historical Range	The inferred range (extending in any direction) of the taxon in pre-human times meets its natural limit in the region.
IN	Introduced Native	Introduced to the region, though not known to have previously occurred in it.
NS	National Stronghold	More than 20% of the national population breeding or resident for more than half their life cycle in the region.
NR	Natural Range	The known range (extending in any direction) of the taxon meets it natural limit in the region.
RE	Regional Endemic	Known to breed only in the region.
RN	Restored Native	Reintroduced to the region after having previously gone extinct there.
TL	Type Locality	The type locality of the taxon is within the region. Ignore if the taxon is or has ever been regionally extinct

Appendix 3: List of National Qualifiers from the New Zealand Threat Classification System (Townsend et al. 2008; Michel 2021; Rolfe et al. 2021)

Code	Qualifier	Qualifier Type	Description
DPR	Data Poor: Recognition	Assessment Process Qualifier	Confidence in the assessment is low because of difficulties determining the identity of taxon in the field and/or in the laboratory. Taxa that are DPR will often be DPS and DPT. In such cases, the taxon is most likely to be Data Deficient.
DPS	Data Poor: Size	Assessment Process Qualifier	Confidence in the assessment is low because of a lack of data on population size.
DPT	Data Poor: Trend	Assessment Process Qualifier	Confidence in the assessment is low because of a lack of data on population trend.
DE	Designated	Assessment Process Qualifier	A taxon that the Expert Panel has assigned to what they consider to be the most appropriate status without full application of the criteria. For example, a commercial fish that is being fished down to Biomass Maximum Sustainable yield (BMSy) may meet criteria for 'Declining', however, it could be designated as 'Not Threatened' if the Expert Panel believes that this better describes the taxon's risk of extinction.
IE	Island Endemic	Biological Attribute Qualifier	A taxon whose naturally distribution is restricted to one island archipelago (e.g., Auckland Islands) and is not part of the North or South Islands or Steward Island/Rakiura. This qualifier is equivalent to the 'Natural' Population State value in the database.
NS	Natural State	Biological Attribute Qualifier	A taxon that has a stable or increasing population that is presumed to be in a natural condition, i.e., has not experienced historical human-induced decline.
RR	Range Restricted	Biological Attribute Qualifier	A taxon naturally confined to specific substrates, habitats or geographic areas of less than 100 km^2 (100,000 ha), this is assessed by taking into account the area of occupied habitat of all sub-populations (and summing the areas of habitat if there is more than one sub-population), e.g., Chatham Island forget-me-not (*Myosotidium hortensia*) and Auckland Island snipe (*Coenocorypha aucklandica aucklandica*). This qualifier can apply to any 'Threatened' or 'At Risk' taxon. It is redundant if a taxon is confined to 'One Location' (OL)
Sp	Biologically Sparse	Biological Attribute Qualifier	The taxon naturally occurs within typically small and widely scattered subpopulations. This qualifier can apply to any 'Threatened' or 'At Risk' taxon.
NO	Naturalized Overseas	Population State Qualifier	A New Zealand endemic taxon that has been introduced by human agency to another country (deliberately or accidentally) and has naturalised there, e.g., *Olearia traversiourum* in the Republic of Ireland.

Continued on next page

List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
OL	One Location	Population State Qualifier	Found at one location in New Zealand (geographically or ecologically distinct area) of less than 100,000 ha (1000 km2), in which a single event (e.g., a predator irruption) could easily affect all individuals of the taxon, e.g., L'Esperance Rock groundsel (*Senecio esperensis*) and Open Bay leech (*Hirudobdella antipodum*). 'OL' can apply to all 'Threatened', 'At Risk', 'Non-resident Native' – Coloniser and Non-resident Native – Migrant taxa, regardless of whether their restricted distribution in New Zealand is natural or human-induced. Resident native taxa with restricted distributions but where it is unlikely that all sub-populations would be threatened by a single event (e.g., because water channels within an archipelago are larger than known terrestrial predator swimming distances) should be qualified as 'Range Restricted' (RR).
SO	Secure Overseas	Population State Qualifier	The taxon is secure in the parts of its natural range outside New Zealand
SO?	Secure Overseas?	Population State Qualifier	It is uncertain whether a taxon of the same that is secure in the parts of its natural range outside New Zealand is conspecific with the New Zealand taxon.
S?O	Secure? Overseas	Population State Qualifier	It is uncertain whether the taxon is secure in the parts of its natural range outside New Zealand.
TO	Threatened Overseas	Population State Qualifier	The taxon is threatened in the parts of its natural range outside New Zealand.
T?O	Threatened Overseas?	Population State Qualifier	It is uncertain whether a taxon of the same name that is threatened in the parts of its natural range outside New Zealand is conspecific with the New Zealand taxon.
T?O	Threatened? Overseas	Population State Qualifier	It is uncertain whether the taxon is threatened in the parts of its natural range outside New Zealand.
CI	Climate Impact	Pressure Management Qualifier	The taxon is adversely affected by long-term climate trends and/or extreme climatic events. The following questions provide a guide to using the CI Qualifier: Is the taxon adversely affected by long-term changes in the climate, such as an increase in average temperature or sea-level rise? If NO = no Qualifier but needs monitoring and periodic re-evaluation because projected changes to the average climate and sea-level rise may adversely impact the taxon (including via changes to the distribution and prevalence of pests, weeds and predators) in the future. If YES = CI Qualifier Is the taxon adversely affected by extreme climate events, such as a drought, storm or heatwave? If No = no Qualifier but needs monitoring and periodic re-evaluation because projected changes to the climate are likely to increase the frequency and/or severity of these events in the future. If YES = CI Qualifier Use of the Climate Impact Qualifier would indicate the need for more in-depth research, ongoing monitoring of climate impacts, and potentially a climate change adaptation plan for the taxon

Continued on next page

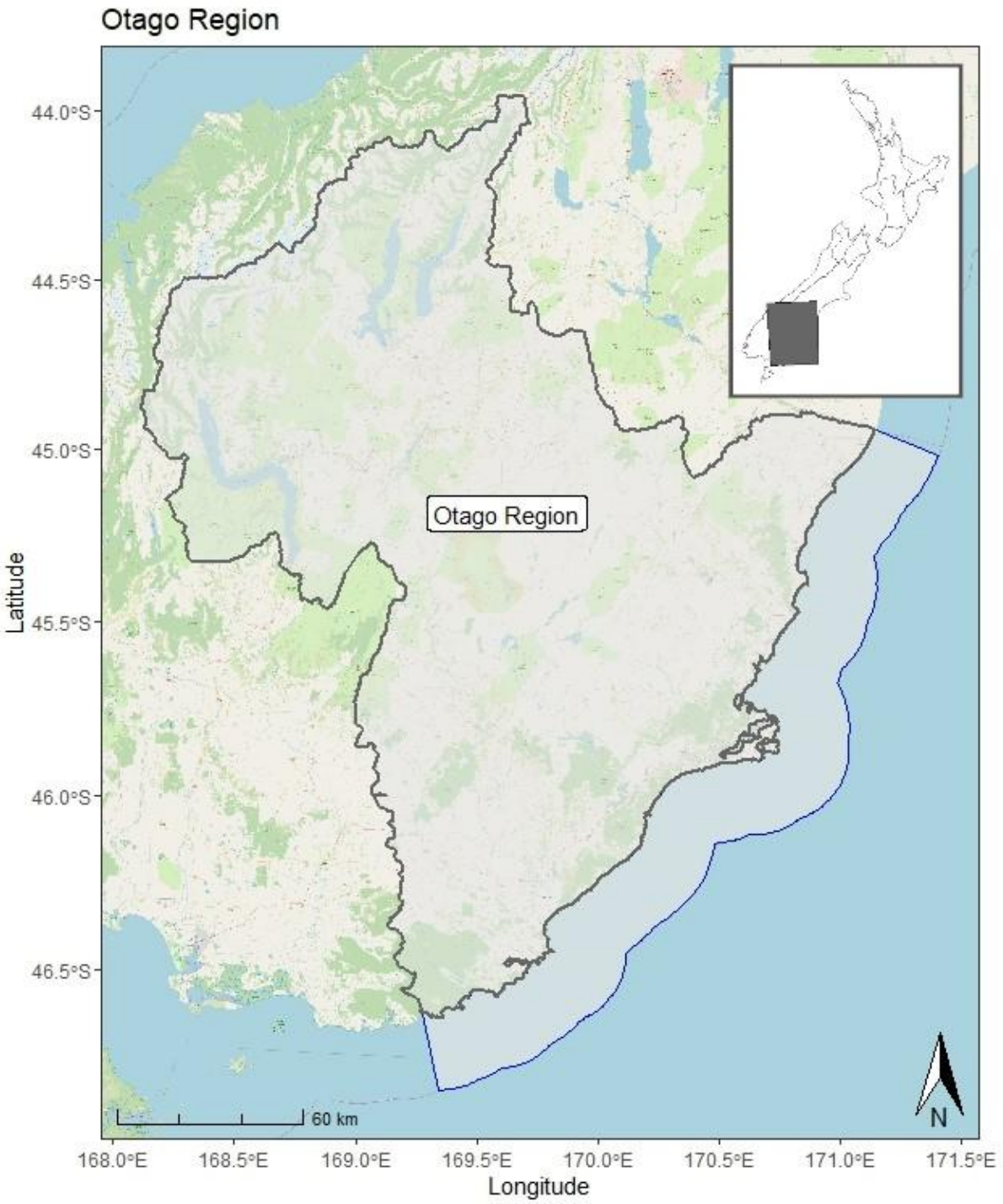
List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
CD	Conservation Dependent	Pressure Management Qualifier	The taxon is likely to move to a worse conservation status if current management ceases. The term 'management' can include indirect actions that benefit taxa, such as island biosecurity. Management can make a taxon CD only if cessation of the management would result in a worse conservation status. The influence of the benefits of management on the total population must be considered before using CD. The benefit of managing a single subpopulation may not be adequate to trigger CD, but may trigger Partial Decline (PD). Taxa qualified CD may also be PD because of the benefits of management.
CR	Conservation Research Needed	Pressure Management Qualifier	Causes of decline and/or solutions for recovery are poorly understood and research is required.
EW	Extinct In The Wild	Pressure Management Qualifier	The taxon is known only in captivity or cultivation or has been reintroduced to the wild but is not self-sustaining. Assessment of a reintroduced population should be considered only when it is self-sustaining. A population is deemed to be self-sustaining when the following two criteria have been fulfilled: it is expanding or has reached a stable state through natural replenishment and at least half the breeding adults are products of the natural replenishment, and it has been at least 10 years since reintroduction
EF	Extreme Fluctuations	Pressure Management Qualifier	The taxon experiences extreme unnatural population fluctuations, or natural fluctuations overlaying human-induced declines, that increase the threat of extinction. When ranking taxa with extreme fluctuations, the lowest estimate of mature individuals should be used for determining population size, as a precautionary measure.
INC	Increasing	Pressure Management Qualifier	There is an ongoing or forecast increase of > 10% in the total population, taken over the next 10 years or three generations, whichever is longer. This qualifier is redundant for taxa ranked as 'Recovering'.
PD	Partial Decline	Pressure Management Qualifier	The taxon is declining over most of its range, but with one or more secure populations (such as on offshore islands). Partial decline taxa (e.g., North Island kākā *Nestor meridionalis septentrionalis* and Pacific gecko *Dactylocnemis pacificus*) are declining towards a small stable population, for which the Relict qualifier may be appropriate.
PF	Population Fragmentation	Pressure Management Qualifier	Gene flow between subpopulations is hampered as a direct or indirect result of human activity. Naturally disjunct populations are not considered to be 'fragmented'.

Continued on next page

List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
PE	Possibly/Presumed Extinct	Pressure Management Qualifier	A taxon that has not been observed for more than 50 years but for which there is little or no evidence to support declaring it extinct. This qualifier might apply to several Data Deficient and Nationally Critical taxa.
RF	Recruitment Failure	Pressure Management Qualifier	The age structure of the current population is such that a catastrophic decline is likely in the future. Failure to produce new progeny or failure of progeny to reach maturity can be masked by apparently healthy populations of mature specimens.
Rel	Relict	Pressure Management Qualifier	The taxon has declined since human arrival to less than 10% of its former range but its population has stabilised. The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. Reintroduced and self-sustaining populations within or outside the former known range of a taxon should be considered when determining whether a taxon is relictual. This definition is modified from the definition of the At Risk – Relict category in the NZTCS manual (Townsend et al. 2008). The main difference is that trend is not included in the qualifier definition. This enables the qualifier to be applied to any taxon that has experienced severe range contraction, regardless of whether that contraction continues or has been arrested. This qualifier complements the 'Naturally Uncommon (NU)' qualifier which can be applied to taxa whose abundance has declined but which continue to occupy a substantial part of their natural range.



Appendix 4: Map of the Otago Region, showing the coastal marine area.

Inset map shows Otago relative to the three main islands of Aotearoa New Zealand.

Find out more:
www.orc.govt.nz/environment/biodiversity/regional-threat-assessments/
or visit:
www.orc.govt.nz/environment/biodiversity/

Otago Regional Council