Environmental Science and Policy Committee

Meeting will be held at the Lake Wānaka Centre,89 Ardmore Street, Wānaka, Otago.

ORC Official YouTube Livestream

Members:
Cr Lloyd McCall (Co-Chair)
Mr Edward Ellison (Co-Chair)
Ms Karen Coutts
Cr Alexa Forbes
Cr Gary Kelliher
Cr Michael Laws
Cr Kevin Malcolm
Cr Tim Mepham
Cr Andrew Noone
Cr Gretchen Robertson
Cr Bryan Scott
Cr Alan Somerville
Cr Elliot Weir
Cr Kate Wilson

Senior Officer: Richard Saunders, Chief Executive

Meeting Support: Kylie Darragh, Governance Support Officer

11 October 2023 01:00 PM

Agenda Topic Page

1. WELCOME

2. APOLOGIES

Karen Coutts and Cr Kevin Malcolm are apologies for this meeting.

3. PUBLIC FORUM

Mandy Bell will speak from Wai Wānaka (15 Minutes)
Tom Kay will speak from Forest and Bird (10 Minutes)
Wānaka Catchment Management Group

4. CONFIRMATION OF AGENDA

Note: Any additions must be approved by resolution with an explanation as to why they cannot be delayed until a future meeting.

5. DECLARATION OF INTERESTS

Members are reminded of the need to stand aside from decision-making when a conflict arises between their role as an elected representative and any private or other external interest they might have. Councillor interests are published on the ORC website.

6. PRESENTATION

6.1 Environmental Management - New and Emerging Technology

Eve Bruhns & Nick Boyens (30 Minutes)

7. CONFIRMATION OF MINUTES 3

That the minutes of the Environmental Science and Policy Meeting of 29 June 2023 be received and confirmed as a true and accurate record.

8. MATTERS FOR CONSIDERATION 8

9. CLOSURE

Otago Regional Council

Environmental Science and Policy Committee
MINUTES

Minutes of an ordinary meeting of the Environmental Policy and Science Committee held in the Council Chamber, Level 2 Philip Laing House, 144 Rattray Street, Dunedin on Thursday 29 June 2023, commencing at 2:02 PM.

PRESENT

Cr Lloyd McCall	*(Co-Chairperson)*
Edward Ellison	*(Co-Chairperson)*
Cr Alexa Forbes	
Cr Gary Kelliher (online)	
Cr Michael Laws (online)	
Cr Kevin Malcolm	
Cr Tim Mepham	
Cr Andrew Noone	
Cr Gretchen Robertson	
Cr Alan Somerville	
Cr Elliot Weir	
Cr Kate Wilson	

1. WELCOME

Chairperson Cr Lloyd McCall welcomed Councillors, members of the public and staff to the meeting at 2.02pm Staff present included Richard Saunders (Chief Executive), Nick Donnelly (GM Corporate Services), Anita Dawe (GM Policy and Science), Tom Dyer (Manager, Science) Gavin Palmer (GM Operations), Amanda Vercoe (GM Governance, Culture and Customer), Fleur Matthews - online (Manager, Policy and Planning), Sam Thomas (Coastal Scientist) Jason Augspurger (Senior Scientist Fresh Water Ecology), Amir Levy (Senior Scientist Ground Water) Hugo Borges (Senior Scientists, Lakes), Markus Dengg (Scientist Water Quality) Scott Jarvie (Science Biodiversity) Sarah Harrison (Scientist Air Quality), Kylie Darragh (Governance Support)

Edward Ellison said an opening karakia for the Committee which he described as aspiring to unite, combine and work together to seek a common purpose.

2. APOLOGIES

Resolution: Cr Forbes Moved, Cr Robertson Seconded:
That *the apologies for Cr Bryan Scott and Karen Coutts be accepted.*
MOTION CARRIED

3. PUBLIC FORUM

No requests to speak were received for this Committee.

4. CONFIRMATION OF AGENDA

Resolution: Cr McCall Moved, Cr Robertson Seconded:
That the order of the agenda be changed.
MOTION CARRIED

5. DECLARATIONS OF INTERESTS

Members were reminded of the need to stand aside from decision-making when a conflict arises between their role as an elected representative and any private or other external interest they might have. Councillor Declarations of Interests are published on the ORC website.

6. CONFIRMATION OF MINUTES

Resolution: Cr Robertson Moved, Cr Mepham Seconded
That the minutes of the Environmental Science and Policy Meeting of 26 April 2023 be received and confirmed as a true and accurate record.
MOTION CARRIED

7. MATTERS FOR CONSIDERATION

7.2 Estuary SOE Programme Update 2023

The report updated the Committee on the progress of the State of the Environment (SoE) Monitoring Programme over the last two years and outlined the next steps of monitoring and prioritising of restoration. Tom Dyer (Manager, Science), Anita Dawe (General Manager Policy and Science) and Sam Thomas (Coastal Scientist) were present to respond to questions.

Resolution ESP23-107: Cr Malcolm Moved, Cr Mepham Seconded

That the Council:

1) ***Notes*** *this report.*
2) ***Notes*** *that the estuary monitoring programme is being implemented according to the estuary monitoring programme plan that was updated in 2020.*
3) ***Notes*** *that next steps include an estuary monitoring programme review to ensure the programme is delivering maximum value and to start prioritising areas for investigations and targeted management/restoration where needed.*

MOTION CARRIED

7.5. Vulnerable Ecosystems in Otago

Tom Dyer (Manager Science), Scott Jarvie (Science Biodiversity), and Anita Dawe (GM Policy and Science) presented the report with an opportunity for questions. The report described Otago's diverse range of ecosystems including those identified as naturally uncommon, it detailed the rationale for developing a monitoring programme and the programmes developed for the coastal saline and the coastal turf ecosystems in order to work towards the ORC statutory obligations under the RMA.

Resolution ESP23-108: Cr Noone Moved, Cr Forbes Seconded

That the Council:

1) ***Notes*** *this report.*
2) ***Notes*** *that the monitoring programmes have been developed for two naturally uncommon ecosystems: inland saline and coastal turf.*
3) ***Notes*** *that this work is part of a broader programme to inform management of naturally uncommon ecosystems in the Otago region.*

MOTION CARRIED

7.7. Water Quality State and Trends - Lakes, Rivers, and Groundwater

Anita Dawe (GM Policy and Science), and senior scientists Jason Augspurger, Amir Levy, Hugo Borges presented the paper which reports on the state and trends of lake, river and ground water quality in the Otago region including a full technical report and graphical summary. There was an opportunity for the Committee to ask questions.

Resolution ESP23-109: Cr Robertson Moved, Cr Weir Seconded

That the Committee*:*

1) ***Notes*** *this report.*

MOTION CARRIED

7.4. Annual Water Quality and Biomonitoring results (SoE Report Cards)

Anita Dawe (GM Science and Policy) and senior scientists Hugo Borges, Jason Augspurger and Markus Dengg responded to questions. The annual water quality report details the current state of water quality and ecology which is key information for the proposed Land and Water Regional

Plan. The Chair thanked the scientists for the excellent and really interesting presentation of the data.

Resolution ESP23-110: Cr Wilson Moved, Cr Weir Seconded
That the Committee:

*1) **Notes** the annual State of the Environment water quality and biomonitoring report cards.*

MOTION CARRIED

7.1. Contact recreation Report 2022/2023
Markus Dengg and Anita Dawe were present to respond to questions. The report summarised the contact recreation programme between December and March and focuses on human health risks of faecal contamination and potentially toxic cyanobacteria. It was noted to the Committee that the 2022-2023 summer season had been a particularly dry period for Otago and contamination results were likely to be lower due to this factor.

Resolution ESP23-111: Cr Mepham Moved, Cr Wilson Seconded
That the Committee:

1. ***Notes** this report.*

MOTION CARRIED

7.3. Air Plan Review: Proposed Process and Timeframes
The report informed the Committee on the work beginning on the review of the Regional Plan and the proposed process and timeframe. Sarah Harrison (Scientist Air Quality), Vita Manning (Senior Policy Analyst), and Anita Dawe (GM Policy and Science) Fleur Matthews, (Manager, Policy and Planning, online), were available to answer questions on the report.

Resolution ESP23-112: Cr Somerville Moved, Cr Weir Seconded
That the Council:

*1) **Notes** this report.*

*2) **Notes** that an Air Plan Issues and Options paper will be brought to Committee for consideration on 11 October 2023 as part of the early review work.*

MOTION CARRIED

7.6. Otago Lakes Management Approach
Hilary Lennox (Consultant Strategy Team) and Andrea Howard (Acting Manager Strategy Activities) and Anita Dawe (GM Policy and Science) were present to respond to questions regarding the activities underway to better manage Otago lakes and updates on the recommendations of *Otago Lakes Management Review* (2022) from Landpro Limited were described in this report.
With an increase in sites, the amount of monitoring has increased massively over the last 3 years. Actions to address gaps were outlined. Some of the region's lakes are well understood, less so the 3 deep lakes. Considering the size of these lakes, any degradation is very hard to turn around.

Resolution ESP23-113: Cr Robertson Moved, Cr Malcolm Seconded
That the Council*:*

1) ***Notes** this report.*
2) ***Notes** the range of existing work programmes that have addressed / will address the majority of the recommendations contained in the Otago Lakes Management Review report.*

3) ***Notes*** *the four actions not currently under active consideration (through current or planned work programmes) that will be reviewed, prioritised, and costed by the relevant Council departments as part of the 2024- 2034 Long-Term Plan process. These actions center around gaining an improved understanding of the three deep lakes, undertaking a stock take of related work of other agencies, groups and other stakeholders within each FMU, further consideration of aquatic pest management programmes and enhanced land use mapping.*
4) ***Directs*** *staff to focus on the pRPS, pLWRP and ICM work programmes and continue rolling out the NOF for each FMU/rohe rather than developing a separate Otago Lakes Strategic Plan.*
5) ***Recommends*** *that the previously established Lakes Management Working Group focus their attention specifically on Lakes Hāwea, Wānaka, and Whakatipu-Wai-Māori/Wakatipu and that Council, through this group, seek to establish a joint work programme with the Ministry of the Environment (and other experts) to improve understanding of these inland deep lakes.*
6) ***Notes*** *that the Lakes Management Working Group will be kept informed of the broader initiatives underway that are planned to improve management of all lakes (and water bodies) across the region.*

MOTION CARRIED

Resolution ESP23-114: Cr Wilson Moved, Cr Forbes Seconded
That *the* Council*:*

1) ***Invites*** *Edward Ellison and one other mana whenua representative to be included in the Otago Lakes Management working group.*

MOTION CARRIED

8. CLOSURE

There was no further business, Edward Ellison said a karakia and the meeting was closed at 4:42 pm.

_____ _____

Chairperson Date

8.1. Regional Threat Assessment of Bat Species in Otago

Prepared for:	Environmental Science and Policy Comm
Report No.	SPS2325
Activity:	Governance Report
Author:	Scott Jarvie, Terrestrial Ecologist
Endorsed by:	Anita Dawe, General Manager Policy & Science
Date:	11 October 2023

PURPOSE

[1] This paper provides an overview of the development of regional threat classifications, provides examples from other regions where regional conservation statuses have added values to national assessments, and includes details of the first regional conservation status for bat species in the Otago region.

EXECUTIVE SUMMARY

[2] This report details the first regional conservation status assessment for all bat species in Otago. Standardised methodology was followed to assess the regional threat status of three bat species.

[3] Two living bat species were assessed as part of the methodology: one was assessed as Regionally Critical (pekapeka-tou-roa, long-tailed bat) which is the most severely threatened status, while the other was Regionally Data Deficient (pekapeka-tou-poto, southern lesser short-tailed bat), due to a lack of information on the species in Otago. A third bat taxon was considered Regionally Extinct (greater short-tailed bat).

[4] The information in the report will be used for biodiversity and biosecurity management in the Otago region.

RECOMMENDATIONS

That the Environmental Science and Policy Comm*:*

1) ***Notes*** *this report.*

2) ***Notes*** *that regional threat assessment for other (taxonomic) groups will continue as part of the biodiversity work programme.*

BACKGROUND

[5] 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.

[6] Threat classifications play a key role in monitoring biodiversity and biosecurity. At a national scale, the New Zealand Threat Classification System (NZTCS) is the primary tool used to assign a threat status to candidate species in Aotearoa New Zealand. The NZTCS scores species against criteria based on an understanding of population state, size, and trend, while considering population status, impacts of threat, 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.

[7] The need for regional threat classifications to help local authorities manage and protect biodiversity within their regions has been identified as a high priority for regional councils. Knowledge of the threatened species present at a site is of particular importance for both RMA consenting processes and conservation planning such as that associated with pest control programmes for biodiversity restoration purposes.

[8] Regional council ecologists have worked with DOC to develop a standardised methodology for regional threat classifications. This methodology uses national criteria where appropriate but takes the size of each region into account for some of the decision-making. Regional threat classifications for native flora and fauna, which are under development for some groups, complement the existing NZTCS.

[9] The regional conservation statuses can also be used to help guide decisions on where local authorities spend funding on pest control and/or biodiversity management programmes. Information regarding the species present, as well as their threat status can aid decision-making processes regarding priority sites and guiding management actions to ensure appropriate activities are part of the site restoration programme. For example, if spotless crake or pūweto are present in only one wetland in part of the region (even though the species may be less rare in other parts of the country), that knowledge can guide appropriate protection, conservation funding and actions.

[10] The Otago Regional Council has recently completed a regional conservation status for reptiles in Otago. That report documented the number of reptiles in Otago and suggests the region as currently having the highest diversity of lizards in Aotearoa New Zealand. This bat report is the next regional assessment to be completed.

[11] The first two reports – for reptiles and bats – were chosen due to having a manageable size group, to pilot the approach.

DISCUSSION

[12] The second regional conservation status for a taxonomic (species) group has recently been completed for Otago (after the reptiles), this time focusing on all bat species that occur in, or near, the region.

[13] An expert panel and an ecologist from the Otago Regional Council identified two bat species as present in, or near, the Otago region: the pekapeka-tou-roa, the long-tailed bat, and pekapeka-tou-poto, the southern lesser short-tailed bat.

[14] The long-tailed bat has been recorded widely across Otago but is severely threatened, including by introduced predators, habitat loss, and human-induced climate change.

[15] Long-tailed bats were assessed as Regionally Critical, the most severely threatened status. This means the species faces an immediate high risk of extinction in Otago.

[16] Although the Catlins in south-eastern Otago and the Dart in western Otago have been identified by DOC as priority sites for management of long-tailed bats, all bat populations should be conserved due to severe threats facing the species.

[17] No recent records of southern lesser short-tailed bats have been confirmed in the Otago region. However, the proximity of a southern lesser short-tailed bat record in the upper Eglinton valley just across the Otago-Southland border, and a growing population further down the Eglington valley because of intensive mammalian predator control, raises the possibility that bats from this area could potentially be travelling across the regional boundary into Otago.

[18] The southern lesser short-tailed bat was assessed as Regionally Data Deficient. This status is used where information is so lacking that an assessment is not possible.

[19] Both the long-tailed bat and southern lesser short-tailed bat have large home ranges and are highly mobile, characteristics that were taken into consideration during the assessment.

[20] Long-tailed bats have been recorded in, or within a night's flying range of, three territorial authorities in the Otago region: Central Otago District Council, Clutha District Council, and Queenstown-Lake District Council. These records of long-tailed bats were also in, or within a night's flying range of, six Otago Regional Council Freshwater Management Units (FMU) or rohe: Dunedin & Coast FMU, Catlins FMU, Roxburgh Rohe, Upper Lakes Rohe, Dunstan Rohe, and Lower Clutha Rohe.

[21] For the southern lesser short-tailed bat, the territorial authority within a night's flight of recent known records is the Queenstown-Lakes District Council. The rohe within a night's flight of recent known records for southern lesser short-tailed bats is the Upper Lakes Rohe.

[22] A third taxon identified as previously found in Otago is the greater short-tailed bat; however, it is now considered Regionally Extinct.

OPTIONS

[23] This report is for noting and therefore does not present options.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[24] The biodiversity programme contributes toward the *Healthy water, soil and coast, and Healthy and diverse ecosystems* strategic priorities. The work outlined in this paper contributes to the following elements of ORC's Strategic Direction:

a. Biodiversity Strategy 2018: Our Living Treasure | Tō tatou Koiora Taoka
b. Biodiversity Action Plan Te Mahi hei Tiaki i te Koiora 2019–2024

Financial Considerations

[25] Regional Threat Assessments are budgeted and are a planned activity. The cost of preparing this assessment was low for a number of reasons, including three of the Panel members not charging for their time, and because it is only two species.

[26] Other assessments will be more expensive to prepare – where the number of species is larger, and the number of experts required is higher, then costs will increase.

Significance and Engagement Considerations

[27] NA

Legislative and Risk Considerations

[28] ORC has legislative responsibilities to protect significant habitats of indigenous fauna as a matter of national importance, as well as its biodiversity functions. This work enables ORC to have a better understanding of the state of our species and ecosystems.

Climate Change Considerations

[29] The report assessed whether the bat species are vulnerable to human-induced climate change. The long-tailed bat was assessed as being adversely being affected by long-term climate trends and/or extreme climatic events. The southern short-tailed was not assessed due to being Regionally Data Deficient.

Communications Considerations

[30] The reports will be published on the ORC website, where it will be available to key stakeholders (e.g., DOC, iwi, consultants) and the public. The reports will also be provided at the Otago Biodiversity Forum to iwi partners, territorial authorities, and other agencies. Accompanying the publication of each report is a media release.

[31] Guides and/or informatics are in development to accompany the technical report. Such documents are being developed to be more accessible to members of the public and can be used in community science initiatives.

NEXT STEPS

[32] Regional threat assessments for other species (taxonomic) groups will continue as part of the biodiversity work programme.

[33] Assessments have already started for birds and indigenous vascular plants.

ATTACHMENTS

1. Conservation Status of Bat Species in Otago [**8.1.1** - 25 pages]

Conservation Status of Bat Species in Otago

Scott Jarvie, Ian Davidson-Watts, Gillian Dennis, Catriona Gower, Moira Pryde

August 2023

Otago Threat Classification Series 2

orc.govt.nz

Regional conservation status of bat species in Otago

August 2023 – Otago Threat Classification Series 2

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Otago Threat Classification Series 2

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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 the Otago region. Most will be lists providing regional threat assessments of members of a plant or animal group (e.g., reptiles, bats, birds, indigenous vascular plants), and leverages off national assessments for the New Zealand Threat Classification System within the regional context.

Recommended citation

Jarvie, S., Davidson-Watts, I., Dennis, G., Gower, C., Pryde M. (2023). Regional conservation status of bat species in Otago. Otago Regional Council, Otago Threat Classification Series, 2023/2

Cover and frontispiece image credits

Long-tailed bat, pekapeka-tou-roa (*Chalinolobus tuberculatus*), Threatened – Regionally Critical. Cover image – Photograph by Ian Davidson-Watts.

Long-tailed bat, pekapeka-tou-roa (*Chalinolobus tuberculatus*), Threatened – Regionally Critical. Frontispiece image – Photograph by Ian Davidson-Watts.

Executive Summary

This report provides the first assessment of the regional conservation status of all bat taxa known to occur in Otago since human arrival. Standardised methodology was followed to assess the regional threat status of three bat taxa. Two extant bat taxa were assessed for Otago; one taxon was assessed as Regionally Threatened [Regionally Critical: 1; pekapeka-tou-roa, long-tailed bat (*Chalinolobus tuberculatus*)], the other as Regionally Data Deficient [pekapeka-tou-poto, southern lesser short-tailed bat (*Mystacina tuberculata tuberculata*)]. A third bat taxon was considered Regionally Extinct [greater short-tailed bat (*Mystacina robusta*)].

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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 (Townsend et al. 2008). The classification system was developed to apply equally to terrestrial, freshwater, and marine biota (flora and fauna). 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 of threatened taxa is to understand regional population sizes, and to monitor trends and conservation effectiveness. Regional threat assessments also provide a stronger foundation for assessing the threat status of taxa nationally.

This report is the first regional conservation status assessment for bats in the Otago region. Regional threat assessments have been completed following a standardised methodology by Otago Regional Council for one taxonomic group (reptiles, Jarvie et al. 2023), Greater Wellington Regional Council for five taxonomic groups (birds, Crisp 2020a; indigenous freshwater fish, Crisp et al. 2022; indigenous vascular plants, Crisp 2020b; reptiles, Crisp et al. 2023; bats, Crisp et al. 2023) and Auckland Council for four taxonomic groups (amphibians, Melzer et al. 2022a; reptiles, Melzer et al. 2022b; indigenous vascular plants, Simpkins et al. 2023; bats, Woolly et al. 2023) as of June 2023. The methodology for the regional threat assessments leverages off national threat assessments as determined using the NZTCS (Townsend et al. 2008, Rolfe et al. 2021, Michel 2021), with thresholds for area of occupancy or species numbers adjusted for the land area in the region (Appendix 1). National strongholds and additional regional qualifiers were also considered (Appendix 2).

Methods

The regional threat status of bats was assessed by a panel of experts (Ian Davidson-Watts, Gillian Dennis, Catriona Gower, and Moira Pryde) and an Otago Regional Council ecologist (Scott Jarvie) in May 2023. This assessment covers all bat taxa in 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. Note that the national qualifiers can also be used as regional qualifiers according to the methodology in the regional threat assessments. The national threat assessments and national qualifiers were from O'Donnell et al. (2023). Following O'Donnell et al. (2023), all taxa were classified as 'taxonomically determinate', i.e., legitimately and effectively published and generally accepted by relevant experts as distinct.

Following the standardised methodology, bat taxa not observed in the region were first removed from consideration based on those recognised in the NZTCS list (O'Donnell et al. 2023). The next step was to identify Nationally Threatened and At-Risk taxa that breed or are resident in the region. If more than 20% of the national population is breeding or resident for more than half their life cycle in the region, taxa were assigned National Stronghold status and the NZTCS criteria applied. The regional conservation status must not be a lower threat status than the national status. For example, a Nationally Endangered taxon cannot be assessed as Regionally Vulnerable or lower but could be assessed as Regionally Critical. 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 did 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/decreasing by more than 10%, the NZTCS criteria were used to determine the regional threat status. Population trend criteria were applied based on current knowledge, projecting from recent past into the future. Taxa that have become naturalised after deliberate or accidental introduction by humans are classified as Introduced and Naturalised. To be considered naturalised, taxa must have established a self-sustaining population in the wild over at least three generations and must have spread beyond the site of initial introduction.

To inform decisions on distributions and area of occupancy for assessment of the regional threat status of bat taxa, occurrence records were used from the national DOC Bat database and taxonomically harmonised with the list of bat taxa in the NZTCS (O'Donnell et al. 2023). The records were viewed 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 were 'shiny' (Chang et al. 2021) and 'flexdashboard' (Iannone et al. 2020). The map layers used to view records were OpenStreetMap (OpenStreetMap contributors 2017) and Esri WorldImagery (Esri 2023). Information is also provided on whether taxa have been recorded in, or near, a territorial authority in the region or by Freshwater Management Unit (FMU), of which the Clutha Mata-au FMU is further subdivided into five rohe (areas). To indicate likely areas for long-tailed bats in Otago, a buffer of 25 km was used around known recent records (> 1980; Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023). The 25 km buffer distance was chosen because this closely approximates the furthest straight-line distance long-tailed bats have been recorded travelling in a night

(O'Donnell et al. 2023). To indicate areas in which southern lesser short-tailed bats could potentially be found in Otago, a buffer of 23 km was used around known recent records (> 1980; Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023). This 23 km buffer distance was chosen because it closely approximates the longest known length of a home range for a southern lesser short-tailed bat (Christie & O'Donnell 2014). Taxa that are extinct, regionally extinct, or that could occur in the Otago region were also identified.

Results

Two bat taxa were identified as present in, or near, the Otago region (Table 1; Figure 1). The long-tailed bat (pekapeka-tou-roa, *Chalinolobus tuberculatus*) was assigned the status Regionally Critical, while the southern lesser short-tailed bat (pekapeka-tou-poto, *Mystacina tuberculata tuberculata*) was classified as Regionally Data Deficient. Bat populations known to occur near the regional boundary were also considered, as bats are highly mobile species with large home ranges that may span across boundaries.

The Otago region was not identified as a National Stronghold (> 20% of the national population present) for the long-tailed bat. The data qualifiers that were assigned were Conservation Dependent (CD), Climate Impact (CI), Conservation Research Needed (CR), Data Poor Size (DPS), Data Poor Trend (DPT), and Population Fragmentation (PF) (Table 1).

The southern lesser short-tailed bat was classified as Regionally Data Deficient (Table 1). Although there are no recent records for the southern lesser short-tailed bat in the Otago region, there are records nearby in the Eglinton valley along the Te Anau-Milford Highway, i.e., less than 2 km away from the western boundary of Otago (Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023). Thus, the southern lesser short-tailed bat could potentially be present in the Otago region, but due to insufficient information available its regional conservation status was assessed as Regionally Data Deficient.

A taxon identified as previously found in Otago is the greater short-tailed bat (*Mystacina robusta*); it is considered Regionally Extinct (Table 1).

Long-tailed bats have been recorded in, or within a night's flying range of, three territorial authorities in the Otago region (Table 2): Central Otago District Council, Clutha District Council, and Queenstown-Lake District Council. These records of long-tailed bats were also in, or within a night's flying range of, six Otago Regional Council Freshwater Management Units (FMU) or rohe: Dunedin & Coast FMU, Catlins FMU, Roxburgh Rohe, Upper Lakes Rohe, Dunstan Rohe, and Lower Clutha Rohe (Table 3). For the southern lesser short-tailed bat, the territorial authority within a night's flight of recent known records is the Queenstown-Lakes District Council (Table 2). The rohe

within a night's flight of recent known records for southern lesser short-tailed bats is the Upper Lakes Rohe (Table 3).

Table 1: Regional conservation status of Otago bat species

Name and Authority	Common Name	National Conservation Status (2021)	Regional Conservation Status	Regional Criteria	National Stronghold	Regional Population	Regional Area	Regional Trend	Regional Confidence Population	Regional Confidence Trend	Regional Qualifiers	National Qualifiers
REGIONALLY EXTINCT (1)												
REGIONALLY EXTINCT (1)												
Taxonomically determinate (1)												
Mystacina robusta Dwyer, 1962	greater short-tailed bat	Data Deficient	Regionally Extinct									OL
REGIONALLY THREATENED (1)												
REGIONALLY CRITICAL (1)												
Taxonomically determinate (1)												
Chalinolobus tuberculatus Forster, 1844	long-tailed bat	Nationally Critical	Regionally Critical	C	No	250–1000		>70% decline	Medium	Low	CD, CI, CR, DPS, DPT, PF	CI, CD, CR, PF
REGIONALLY DATA DEFICIENT (1)												
Taxonomically determinate (1)												
Mystacina tuberculata tuberculata Gray, 1843	southern lesser short-tailed bat	Nationally Increasing	Regionally Data Deficient									CI, CD, CR, PF

*

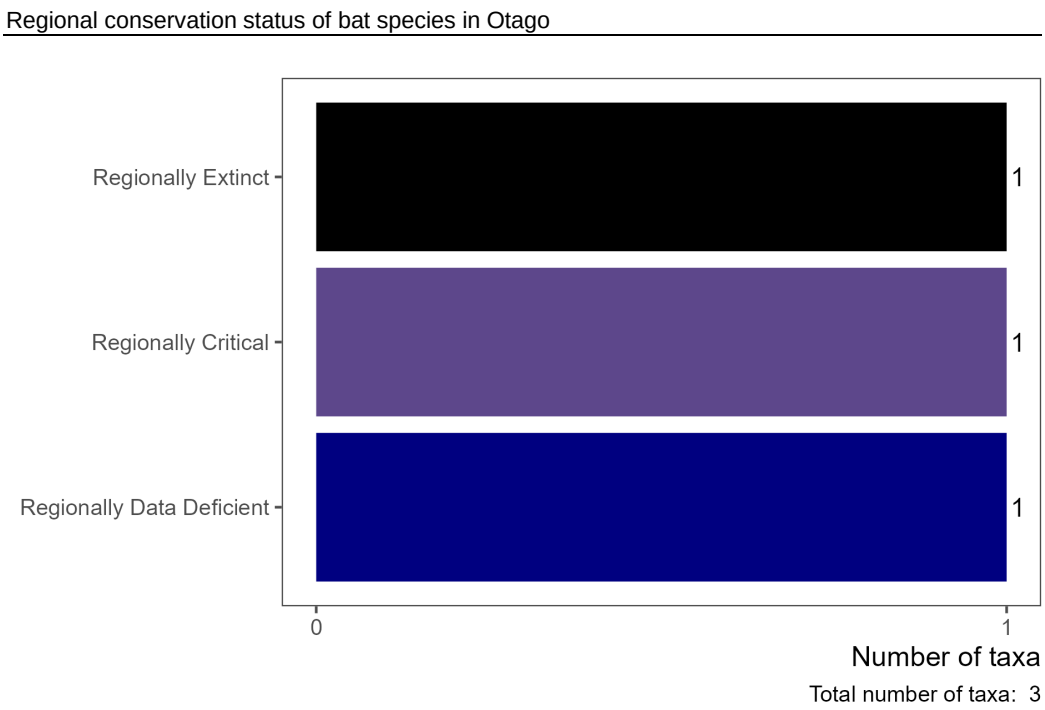

Figure 1: Regional conservation status of bat taxa in the Otago region

Table 2: Long-tailed bats (pekapeka-tou-roa, *Chalinolobus tuberculatus*) and southern lesser short-tailed bats (pekapeka-tou-poto, *Mystacina tuberculata tuberculata*) presence, or priority for survey, by territorial authority in the Otago region. ● indicates long-tailed bats are recently known to occur in, or near to, a territorial authority using presence records buffered with the maximum distance a long-tailed bat is known to fly in a night (O'Donnell et al. 2023; > 1980 for records, Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023); ○ indicates territorial authorities where long-tailed bats are not recorded and should be prioritised for surveys (Wildland Consultants 2020a). Further surveys and monitoring should also occur in territorial authorities where long-tailed bats are already known (see section on *Surveys and monitoring of bats in Otago* in main text). ‡ Indicates a territorial authority where surveys of southern lesser short-tailed bats could occur based on proximity to recent known records outside the Otago boundary buffered with the longest recorded home range span of this species (Christie & O'Donnell 2014; >1980 for records, Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023).

Name and Authority	Common Name	Central Otago District Council	Clutha District Council	Dunedin City Council	Queenstown Lakes District Council	Waitaki District Council (Otago part only)
Chalinolobus tuberculatus Forster, 1844	long-tailed bat	●	●	○	●	○
Mystacina tuberculata tuberculata Gray, 1843	southern lesser short-tailed bat				‡	

Table 3: Long-tailed bats (pekapeka-tou-roa, *Chalinolobus tuberculatus*) and southern lesser short-tailed bats (pekapeka-tou-poto, *Mystacina tuberculata tuberculata*) presence, or priority for survey, in Freshwater Management Units (FMU) in the Otago region. The Clutha Mata-au FMU has been further subdivided into five rohe (areas). ● indicates long-tailed bats are recently known to occur in, or near to, an FMU or rohe using presence records buffered with the maximum distance a long-tailed bat is known to fly in a night (O'Donnell et al. 2023; > 1980 for records, Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023); ○ indicates an FMU or rohe where long-tailed bats are not recorded and should be prioritised for surveys (Wildland Consultants 2020a). Further surveys and monitoring should also occur in FMUs or rohe where long-tailed bats are already known (see section on *Surveys and monitoring of bats in Otago* in main text). ‡ Indicates a rohe where surveys of southern lesser short-tailed bats could occur based on proximity to recent known records outside the Otago boundary buffered with the longest recorded home range span of this species (Christie & O'Donnell 2014; >1980 for records, Department of Conservation | Te Papa Atawhai Bat Distribution Database, v. July 25, 2023).

Name and Authority	Common name	Taieri FMU	North Otago FMU	Dunedin & Coast FMU	Catlins FMU	Clutha Mata-au FMU				
						Manuherekia Rohe	Roxburgh Rohe	Upper Lakes Rohe	Dunstan Rohe	Lower Clutha Rohe
Chalinolobus tuberculatus Forster, 1844	long-tailed bat		○	●	●		●	●	●	●
Mystacina tuberculata tuberculata Gray, 1843	southern leser short-tailed bat							‡		

Discussion

Regional threat assessments have been completed by regional councils in Aotearoa New Zealand, with the resulting regional threat lists being used as a tool to help maintain indigenous biodiversity. This report is the first regional assessment of the conservation status of bats in the Otago region. Two bat taxa are recorded as either being present in, or very near, the Otago region; the long-tailed bat that was classified as Regionally Critical, and the southern lesser short-tailed bat that was classified as Regionally Data Deficient. The greater short-tailed bat was classified as Regionally Extinct.

Long-tailed bat

Although the long-tailed bat is widespread across Otago, the estimated population size is only 250–1000 mature individuals, with the population trend estimated to be >70% decline over the next three generations (Tables 1, 2 and 3). However, there was low confidence in the estimated population size and trend as limited surveys and population monitoring have been done in Otago. For example, long-tailed bats were caught in studies in the 1990's to identify roosts in the Dart and Waikaia (which is just across the regional boundary in Southland), but neither project was long-term. Annual transect monitoring in the Dart since 1995 shows there has been a gradual increase in bat activity in the area, likely because of the extensive introduced mammalian predator control in the valley. Transect monitoring is underway in other parts of the region to determine trends in bat activity, e.g., in the Catlins, but the length of the studies and the continuity of the data has not yet been sufficient to make robust inferences about trends. Overall, the limited amount of monitoring done meant that the panel felt a conservative estimate of the population size was necessary.

Despite the long-tailed bat being recorded in, or within a night's flight of, most territorial authorities or freshwater management units in the Otago region (Tables 2 and 3), human activity and the associated introduction of mammalian predators has resulted in population fragmentation that likely hampers gene flow between populations. Currently, the biggest threats to bats in the region are introduced mammalian predators and clearance and degradation of lowland native forest and large old trees where bats roost (O'Donnell et al. 2010; see section on *Threats to bats in Otago* below for more information). The control of introduced predators in certain locations in Otago, e.g., Dart, has likely benefited local long-tailed bat populations, and hopefully they remain secure with continued successful predator control.

The Catlins in south-eastern Otago has been identified as a priority site for management of long-tailed bats (Sedgeley & O'Donnell 2012), with the site recognised as critical in the persistence of the species as it represents the south-eastern range limit of the species in the South Island. Although populations from this site are hopefully secure with ongoing successful mammalian predator control, the management area does not contain the whole range of this population. For example, the long-tailed bats from this population also make use of highly fragmented and modified landscapes outside of Catlins Forest Park, where they can be more at risk due to high mammalian predator numbers in unmanaged areas. Land-use and development changes might further impact long-tailed bats from this site due to clearance

and degradation of vegetation, including the removal of large old trees where bats potentially roost. A roost monitoring study currently underway in the Tahakopa Valley and parts of the Beresford Range has so far focussed on finding roosts and estimating roost size of colonies. Such a study can inform areas for the control of mammalian predators who prey on bats. The development of wind farms may also pose a risk to long-tailed bats from the Catlins, and also to bats in other parts of the region where they have already been built or are proposed (see section on *Threats to bats in Otago* below for more information).

Long-tailed bats have also been recorded in the highly fragmented and modified landscapes of Tapanui and Leithen just inside the Otago border, and just across the Southland border in Waikaia. As bats are highly mobile species with large home ranges, long-tailed bats from these populations could also be using suitable habitats across the regional boundary.

In both the Dart and Routeburn areas, there have been surveys and monitoring of long-tailed bats. In the Dart area, an increase in bat activity has been recorded since 1995 in areas under invasive mammalian predator control. However, populations closer to the roads and away from predator control might be experiencing declines, particularly if roosts are found in such locations. The Dart population has also been identified as a priority site for management (Sedgeley and O'Donnell 2012; National Predator Control Programme, Department of Conservation | Te Papa Atawhai 2023).

Several recent records from in Makarora, or close to Mount Aspiring National Park, indicate that long-tailed bats are in this region. Acoustic surveys by the Department of Conservation | Te Papa Atawhai, Aspiring Biodiversity Trust, Forest and Bird's South Otago Branch, and Forest and Bird's Tautuku Restoration Project, have detected long-tailed bats in Otago, including in parts of the region where they have not recently been observed. For example, long-tailed bat calls have recently been recorded in coastal locations in the Catlins by the Forest and Bird Society and in Makarora by the Aspiring Biodiversity Trust. Long-tailed bat populations in the Catlins may also move back and forth across the regional Otago/Southland boundary. Anecdotal reports of bats at other locations in the Otago region have not been verified.

Southern lesser short-tailed bat

The southern lesser short-tailed bat has not recently been recorded in the Otago region; however, there is a record less than 2 km from the Otago boundary. The bat record is from the Eglinton valley population, one of only three known populations in the South Island. The Eglinton valley borders the Otago region, and the local bat population has increased in the last *c.* 15 years due to intensive mammalian predator control. Maintaining this increase in numbers, however, is dependent on predator management being sustained and remaining effective (Edmonds et al. 2017). Although there have not yet been any confirmed recent records of lesser short-tailed bats in the Otago region, the proximity of the record in the upper Eglinton valley and the growing population raises the possibility that bats from this area could potentially be travelling across the regional boundary. Natural deposits containing fossilised bones of Holocene age indicate that the southern lesser short-tailed bat previously had a broad distribution in the Otago region (Worthy, 1998).

Greater short-tailed bat

Greater short-tailed bats were last seen in 1967 on Taukihepa / Big South Cape Island in the southern Tītī / Muttonbird Islands following an invasion by ship rats (O'Donnell et al. 2010). However, short-tailed bat-like calls were recorded on nearby Putauhina Island in 1999, following anecdotal sightings of bats after the commencement of rat eradications on the island group. While anecdotal reports of bats have continued, a series of targeted survey trips to the islands has failed to confirm their presence. Thus, the national assessment of the greater short-tailed bat is Data Deficient. In Otago, the greater short-tailed bat is considered to be Regionally Extinct, as the only records are fossilised bones in natural Holocene deposits (Worthy 1998).

Threats to bats in Otago

Long-tailed and lesser short-tailed bats face similar threats, specifically habitat loss, habitat degradation, disturbance, and the impacts of introduced predators (O'Donnell et al. 2010). Lesser short-tailed bats also face some risk of primary or secondary poisoning if anticoagulant toxins, often used in pest control operations, are applied incorrectly or used in sensitive locations (Dennis & Gartrell 2015). Recent studies show that effective predator control can reverse declines in both long-tailed and lesser short-tailed bat populations in beech forest locations, such as the Eglinton valley near the western Otago boundary (O'Donnell et al. 2011, 2017; Edmonds et al. 2017). In the absence of effective predator control, however, populations are probably declining at rates of 5–9% each year (Pryde et al. 2005, 2006).

In the past, the loss of bat habitat through the burning and felling of native forests occurred on a massive scale in Aotearoa New Zealand generally and in Otago specifically (Ewers et al. 2006; Wildland Consultants 2020b). Currently, some smaller scale habitat loss and fragmentation is ongoing and, in some cases, is intensifying due to an increase in the scale of major infrastructure projects in bat habitats, including subdivisions and roads (O'Donnell et al. 2023). These threats can be particularly relevant to the persistence and abundance of long-tailed bat populations, which use habitats that are under threat in some parts of Otago.

Recently, an increase in the number of wind farms has been proposed both nationally and in the Otago region (Zhang et al. 2023). International research indicates that the installation of wind turbines in areas used by bats can potentially heighten the risk of fatalities, and there is evidence that wind farms negatively impact bat populations (e.g., Arnett & Baerwald 2013; Barclay et al. 2007; Baerwald et al. 2008; Cryan & Barclay 2009; Grodsky et al. 2011; Roscioni et al. 2013). The direct causes of wind farm fatalities observed in overseas studies of bats include collisions with the towers and blades, and injuries caused by a decrease in air pressure in the proximity of rotating wind-turbine blades (Cryan & Barclay 2009).

Human-induced climate change is an emerging threat to bats in Otago. This is due to a predicted increase in predation pressure on bats by introduced predators, particularly rats (*Rattus* spp.). A study in Aotearoa New Zealand has suggested that with warming climates there will likely be an increase in both the frequency and volume of mast seeding events that drive rat irruptions (Richardson et al. 2005). This, along with a predicted increase in occupancy of higher altitudes by rats (Walker et al. 2019), means that fewer cool forest

locations will remain where bats are less exposed to high levels of predation pressure from rats. This also means that rats will be more abundant and predation pressure on bats will be greater for longer periods across altitudes and forest types.

Although other climate change effects were discussed for the Otago region, they are more speculative. For example, an increased frequency and intensity of storm events may result in more windthrow events, resulting in an increased mortality of trees with bat roosts and potentially occupants; more frequent mast seeding may influence the longevity and senescence of forest trees; and drought events could potentially reduce food availability.

Surveys and monitoring of bats in Otago

Greater search efforts for bats is needed within the Otago region, like in other parts of Aotearoa New Zealand (e.g., as outlined for the Wellington region in Crisp et al. 2023 and the Auckland region in Woolly et al. 2023). Surveys are required to determine where long-tailed bats occur and the areas they are using, including roosting sites, and feeding areas. Such surveys should also investigate whether southern lesser short-tailed bats are found in the region. The use of transects for long-term monitoring can be useful but they need to be run for longer than 10 years to determine trends (O'Donnell & Langton 2003). Acoustic recording devices can provide a more robust method of measuring bat activity compared to transects, as measurements are done over several nights and at more sites and thus take into account the inherent variability in bat activity. A spatially well-designed acoustic monitoring programme using appropriate methodology (e.g., van Dam-Bates et al. 2018) for bats is likely to detect changes and trends in response to management, is less resource intensive than mark-recapture studies, and is useful to provide baseline monitoring to contribute to the regional and national picture. The use of acoustic recording devices means that surveys can also be undertaken over a wider range of sites. Despite mark-recapture studies being a robust method to understand the state of existing bat populations and any changes in response to management interventions, they are expensive to undertake, requiring specialised equipment and skilled practitioners, and can therefore only be undertaken at a limited number of sites. Outcome monitoring through spatially well-designed acoustic monitoring programmes and mark-recapture studies will provide opportunities for identifying the impacts of emerging threats to bats in the region and the impacts of land use changes and invasive mammalian predator control.

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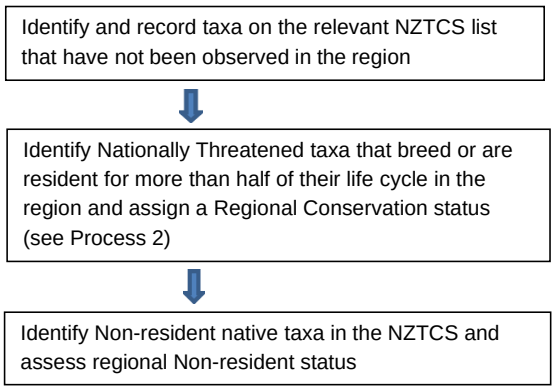
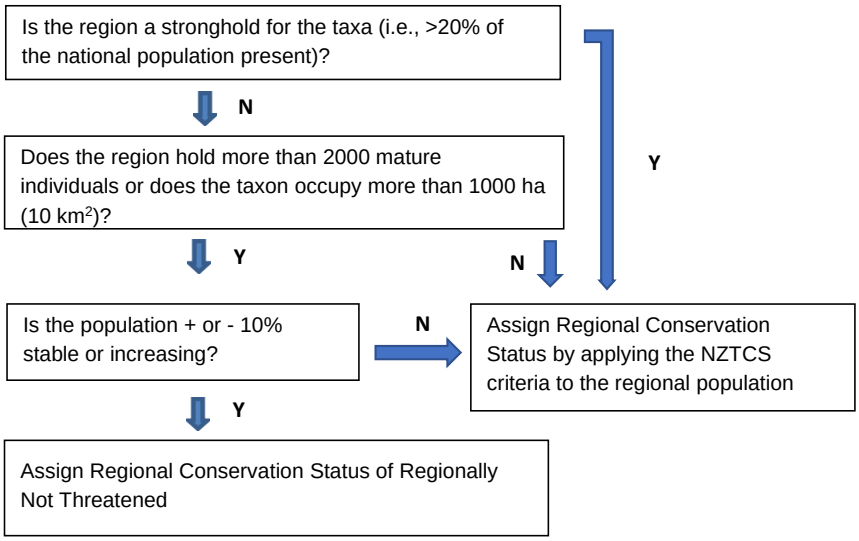
Appendix 1: Process for determining the regional threat status of taxa

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 Conservation Threat Assessments. National qualifiers can also be used as regional qualifiers according to the methodology in regional threat assessments (see Appendix 3 for more details).

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). National qualifiers can be used as regional qualifiers according to the methodology in regional threat assessments (see Appendix 2 for more details).

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 km2 (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	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.
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.

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			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
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'.
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. Population trend qualifiers.
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.