Conservation Status of Selected Species of Non-Lichenised Agarics, Boletes and Russuloid Fungi in Otago

Scott Jarvie, Jerry Cooper

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Otago Threat Classification Series is a scientific monograph series presenting publications related to the Regional Threats Classification System of groups of taxa in the Otago Region. Most will be lists providing regional threat assessments of members of a plant, animal, or fungi group (e.g., amphibians, bats, birds, fungi, indigenous vascular plants, reptiles), and leverages off national assessments for the New Zealand Threat Classification System within the regional context.

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Deconica baylisiana, Threatened – Regionally Critical. Photograph by David Lyttle.

Cortinarius minoscaurus, Threatened – Regionally Vulnerable. Photograph by Jerry Cooper.

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Executive Summary

This report provides the first assessment of the conservation status of selected species of non-lichenised agarics, boletes and russuloid fungi in the Otago Region. A general process for assessing the threat of extinction of fungal taxa is described at the regional level, and a list of selected taxa is presented. A total of 331 fungal taxa in the Otago were identified from the national checklist. Nine fungal taxa were assessed as Regionally Threatened (Regionally Critical = 1; Regionally Vulnerable = 8), 203 as Regionally Not Threatened, and 119 as Regionally Data Deficient.

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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 (Appendix 1 – see other regional conservation statuses listed below for more information). National strongholds and additional regional qualifiers are also considered (Appendix 2 – see other regional conservation statuses listed below). This report is the first regional conservation status assessment of selected species of non-lichenised agarics, boletes and russuloid fungi in the Otago Region. Regional threat assessments have been completed by Otago Regional Council for five taxonomic groups (bats, Jarvie et al. 2023; amphibians, Jarvie 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 October 2024.

Methods

The regional threat status of selected species of non-lichenised agarics, boletes and russuloid fungi was assessed by Jerry Cooper in July 2024. The NZTCS was developed for assessing animal and plant populations but was not initially consistently and directly applicable to fungal populations (Molloy et al. 2002; Townsend et al. 2008). In 2021 the NZTCS adopted a modified protocol designed for assessing fungal populations (Cooper et al. 2022) and incorporated into an updated version of the NZTCS (Townsend et al. 2008 cf. Rolfe et al. 2022), based on the International Union for Conservation of Nature (IUCN) Red List system protocol (Dahlberg & Mueller 2011). Due to the large number of fungal taxa present in Aotearoa New Zealand and the limited availability of expertise, the national panel implemented a preliminary selection mechanism to reduce the number of candidate taxa taken forward into the NZTCS detailed assessment process (Cooper et al. 2022).

The 2021 fungal assessment at the national scale provides the set of the candidate taxa to be assessed in Otago. Specifically, this includes species in the fungal orders Agaricales, Russulales and Boletales. These orders include many of the larger mushroom species and many that are mycorrhizal with trees. Note that this means it excludes nearly all micro-fungi, plant pathogens, and many larger bracket fungi and some mycorrhizal groups. Moreover, even within the selected orders, certain groups were excluded because of uncertain taxonomy (e.g., puffballs and club-fungi). In common with other regional assessments, any regional fungal assessment of a threatened species can have a higher threat status than the national assessment, but not lower. All species considered nationally Data Deficient or excluded at the national scale remain Data Deficient and excluded at the regional scale because, for fungi at least, there is not enough information about them. See Rolfe et al. 2022 for the definitions of the threat categories and statuses.

To assess the regional status of the species listed nationally with a Not Threatened and Threatened status, data was needed to compare species populations at the national scale with those at the regional scale. Moreover, a thorough assessment would require

details of the changes over time of regional population, together with the factors influencing those changes at the sub-regional scale. This detailed analysis would provide the baseline data for estimating the resulting likelihood of regional extinction. The protocol does allow the inference of population sizes from occurrence records and considers the lifestyle of each species (or at least the generic lifestyles) to infer estimates of true population size and including some estimate of potential but non-observed populations. If detailed population-level data is available at a sub-regional scale, then it would be possible to apply this methodology. However, such data does not exist for any fungal taxa in Aotearoa New Zealand. The consequence is that for fungi there is no regional-scale population that would lead to differences between the national assessment and regional assessment using the methodology of Cooper et al. 2022. It is possible, however, to reasonably infer that the ratio of regional populations against national populations correlate with the ratio of regional species occurrences against national occurrences. Thus, the starting point for regional assessment is a compilation of the national and regional occurrence data for fungi. Examination of the national versus regional records has the potential to inform regional re-assessment.

Compilation of national and regional species occurrence data

The source of occurrence data was from the Global Biodiversity Information Facility (GBIF) and the University of Otago (OTA) mycological collection. Because taxon names within datasets can be variable and include synonyms, i.e., they don't always provide the correct current name according to New Zealand authorities, the taxon names were matched against the national fungal checklist maintained in Biota of New Zealand (BiotaNZ) database maintained by Manaaki Whenua – Landcare Research. The matched names were assigned biostatus according to the national checklist as present in Aotearoa New Zealand, absent, endemic, indigenous, or introduced. The subset of endemic/indigenous records was extracted and standardised to the currently accepted name in the BiotaNZ national checklist. Note that records of some species based on occurrence records were excluded from analyses because they represent species not known to occur in Aotearoa New Zealand. These records were primarily associated with collections held overseas that have not recently been reviewed and identified.

Compilation of national and regional status and associated data

For this assessment, the focus is the species listed in Cooper et al. 2022 that have occurrence records in the Otago Region. The subset of occurrence records was extracted by linking the subset of species occurrence records in Otago to the species names listed in Cooper et al. 2022. This provided a set of Otago occurrence records for each nationally listed species.

Where the numbers and ratio of national collections versus Otago collections is 40% or above for a taxon, a note was included to highlight which populations in Otago may be nationally significant (Appendix 4). Specific factors for high ratios that do not support high regional representation may be a consequence of three main factors: 1) species that are poorly defined taxonomically and/or difficult to identify (even by experts) will have been collected infrequently both nationally and regionally, and this skews the ratio data to where collecting effort has been significant. 2) Several species have been described recently, or recently recognised in New Zealand, and we do not have enough information to assess true distribution. 3) Otago University (Prof. David Orlovich) specialises in the study of the family Cortinariaceae and collections of many species are associated with that local targeted survey effort and do not represent an unbiased national distribution. The conclusion from comparing national and regional occurrence records is that there is no basis for a regional-level assessment of threat status as higher than the national status for any of the species considered. In addition, the criteria and qualifiers at the national level remain valid at the regional level.

For the current assessment, the lack of detailed regional un-biased surveys on the location and size of fungal populations means that regionally specific information on historic and predicted estimates of population changes over time are not possible. As a consequence, the assessment of regional threat status provided here is based on the comparison of surrogates for regional versus national population size based on known occurrence records. That comparative data is provided in Appendix 4, Table 1. For any listed species, if the majority of national occurrence records are restricted to Otago, then this suggests that local populations are significant at both the regional and national level. However, there can be several reasons why the number of occurrence records are

concentrated in a particular area and this needs to be considered. Inspection of the data provided in Appendix 4 comparing regional versus national metrics on species occurrence records provides no substantive evidence to support regional populations concentrations, except in the case of *Deconica baylisiana*. Consequently, there is no justifiable reason for a higher regional threat status for any of the listed species or their associated qualifiers.

Results

A total of 331 selected species of non-lichenised agarics, boletes and russuloid fungi were identified in the Otago Region (Figure 1). This includes nine fungal taxa assessed as Regionally Threatened (Regionally Critical = 1; Regionally Vulnerable = 8), 203 as Regionally Not Threatened, and 119 as Regionally Data Deficient.

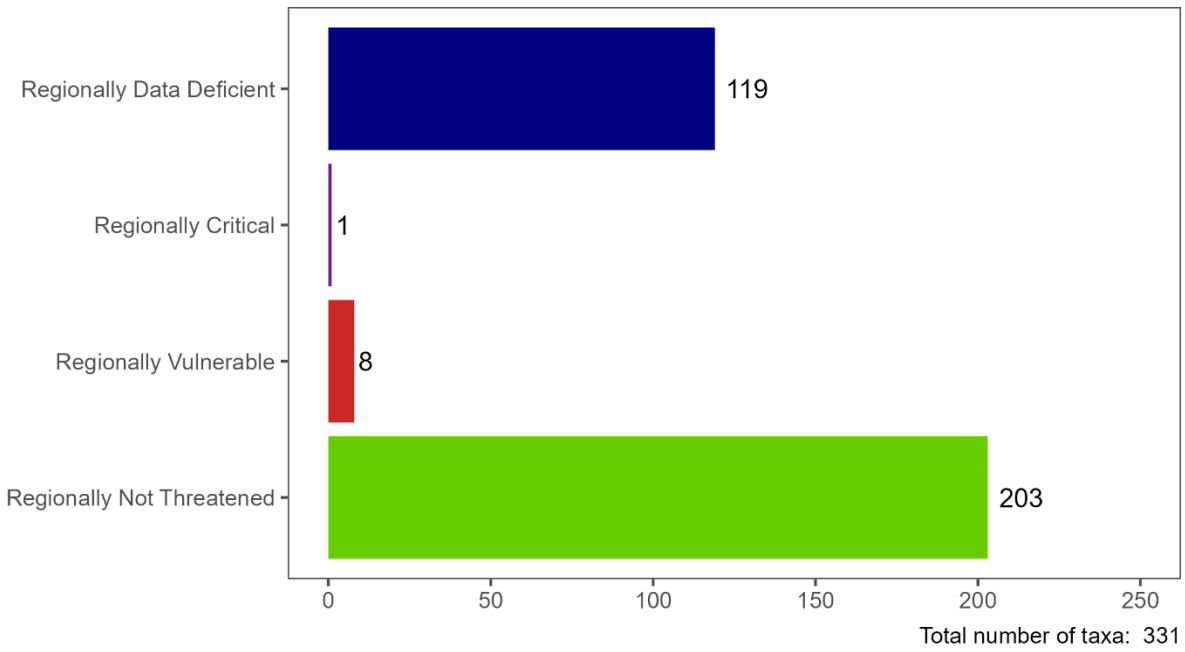

Figure 1: Conservation status of fungal taxa in the Otago Region.

Table 1, below, lists the species that are Regionally Threatened and Table 3 provides geographic details for those species with an Otago holotype locality. All the listed species were described from a single collection (the holotype) except for *Inocybe gilbertoi* where several paratypes were included.

Table 1: Fungal taxa with a Regionally Threatened status the Otago Region.

The source of "occurrences' data are from the Global Biodiversity Information Facility (GBIF) and the University of Otago (OTA) mycological collection. Qualifiers can be found in Appendix 2 and 3. For the full dataset for this regional assessment of non-lichenised agarics, boletes and russuloid fungi in the Otago region see Appendix 4.

Species	# National occurrences	# Otago occurrences	Regional Threat Status	Criteria	Qualifiers	Notes
Deconica baylisiana	10	10	Critical	A(1)	CI, CR, DPS, DPT, RR, NStr, Sp, TL	Distinct species, also present on Rakiura/Stewart Island
Corinarius minoscaurus	8	3	Vulnerable		De, TL	Tea-tree ectomycorrhizal associate
Cortinarius pholiotellus	11	4	Vulnerable		De, TL	Tea-tree ectomycorrhizal associate
Hygrophoropsis umbriceps	11	1	Vulnerable		De, TL	Tea-tree ectomycorrhizal associate
Inocybe gilibertoi	7	1	Vulnerable		De	Tea-tree ectomycorrhizal associate
Mycena flavovirens	42	1	Vulnerable		DPS, DPT	A regional verified outlier
Phylegmacium venicefer	4	1	Vulnerable		De	Tea-tree ectomycorrhizal associate
Russula allochroa	55	2	Vulnerable		De	Tea-tree ectomycorrhizal associate
Thaxterogaster cremeorufus	3	1	Vulnerable		De, TL	Tea-tree ectomycorrhizal associate

Table 2: Type localities of species with a Regionally Threatened status the Otago Region.

Biostatus is from the Biota of New Zealand where endemic refers to Aotearoa New Zealand.

Species	Biostatus	Type locality	Latitude	Longitude	Uncertainty
Deconica baylisiana	Endemic	Otago, Rock and Pillar Range	-45.545	170.003	3000 m
Corinarius minoscaurus	Endemic	Otago, Waipori Falls	-45.893	169.949	3000 m
Cortinarius pholiotellus	Endemic	Otago, Waipori Falls	-45.893	169.949	3000 m
Hygrophoropsis umbriceps	Endemic	North Island			
Inocybe gilibertoi	Endemic	Stewart Island (Paratypes Taranaki, Fiordland, Auckland)			
Mycena flavovirens	Endemic	Australia (on imported fern)			
Phylegmacium venicefer	Endemic	Southland			
Russula allochroa	Endemic	North Island			
Thaxterogaster cremeorufus	Endemic	Otago, Waipori Falls	-45.893	169.949	3000 m

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. For example, regional threat lists have been used to advise resource consent applications, inform conservation actions and target resources, as well as monitor biodiversity trends and conservation effectiveness. This report is the first regional threat assessment for fungal taxa in Otago based on a checklist of fungal species verified as present in the region. A total of 331 selected species of non-lichenised agarics, boletes and russuloid fungi in the Otago Region were identified from the national checklist. Nine fungal taxa were assessed as Regionally Threatened (Regionally Critical = 1; Regionally Vulnerable = 8), 203 as Regionally Not Threatened, and 119 as Regionally Data Deficient.

For fungi there is currently no regional-scale additional data on populations that would lead to any differences between a national assessment and a regional assessment using the methodology presented in Cooper et al. 2022. In this report a supplemental methodology for identifying candidate taxa is presented that may have a different (increased) regional threat status relative to the national status. The pragmatic approach requires a comparison of national and local numbers of verified occurrence records. Using that approach no evidence was found to suggest that any of the taxa under consideration should have a different regional threat status.

In the national 2022 report *Deconica baylisiana* is currently the only fungal species listed as Nationally Critical, and the main population of this species is within the Otago Region. At the regional and national scale this an important species, and yet there is no information on how this species is dispersed, or what additional threats it may face, is known. Future work should investigate dispersal mechanisms and threats.

Currently the number of described indigenous fungal species in Aotearoa New Zealand is around 6,000 and we estimate another 14,000 species remain to be described. This regional assessment is based on the national assessment in Cooper et al. 2022. That

report covered 961 species which is just 16% of the total described. More work is needed at both the national and regional scale to better understand the status and threats to all our fungal species.

Knowledge of fungi lags behind many other groups, and as a consequence there is limited data on species populations and the changes in, and threats to, those populations. Aotearoa New Zealand also has a very limited pool of experts able to interpret the available data. In recent years, the increasing popularity of Community Science platforms, like iNaturalist, has led to an explosion in interest in poorly understood groups like fungi. Our base-line data is increasing, along with considerable increase in the number of people with the interest and skills to document fungi. Nevertheless, the increasing level of data is associated with variable quality. From a scientific perspective it is critical that the professional community engaged in biodiversity management support these kinds of activities through both national and regional efforts.

Acknowledgement

Thanks to Philippa Crisp and Roger Uys from Greater Wellington Regional Council and Sabine Melzer from Auckland Council for advice on the regional conservation status process, Pascale Michel from the Department of Conservation | Te Papa Atawhai (DOC) for advice on the national assessments and the regional conservation status process, Ciaran Campbell and Tim Ware from the Otago Regional Council for editorial advice and discussion on regional threat assessments, and other Council staff that provided support for these assessments, including Karen Warrington for logistical support. Professor David Orlovich, Otago University – Ōtākou Whakaihu Waka, is thanked for providing access to regional data associated with Otago University Fungarium collections.

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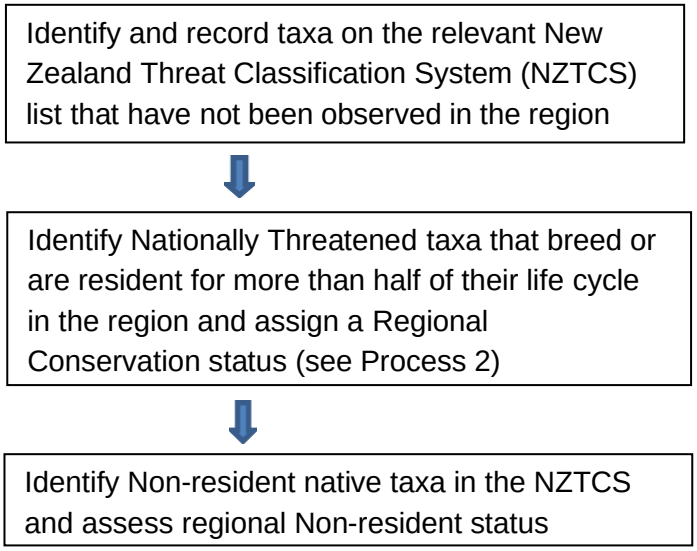
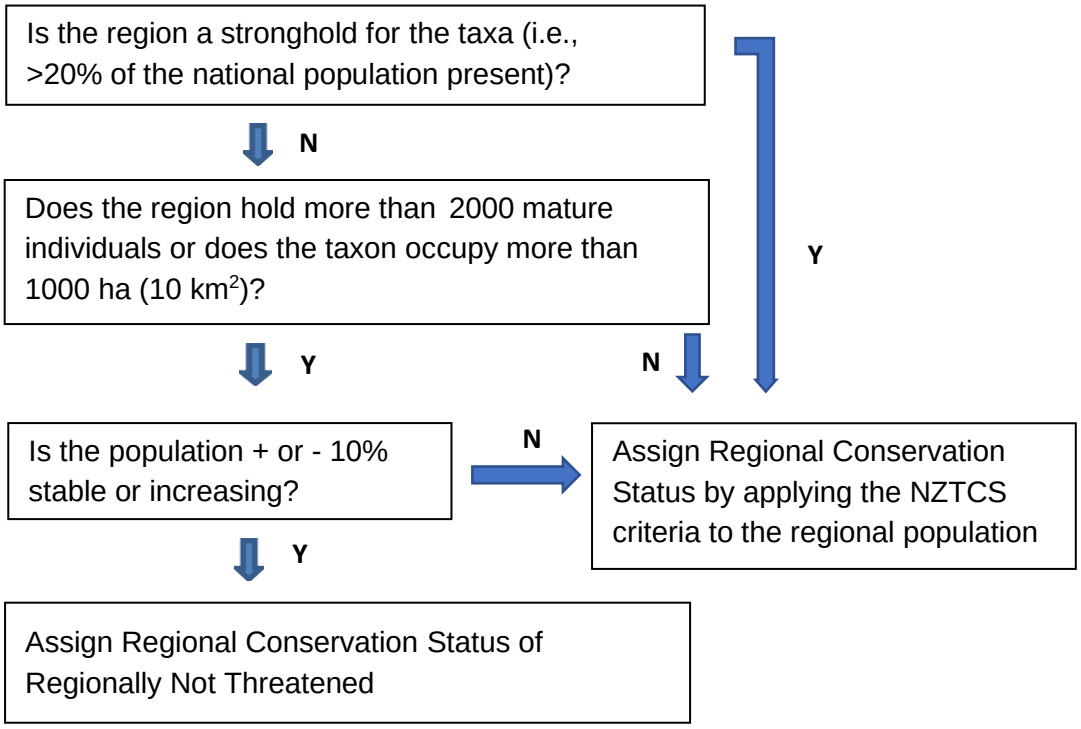
Appendix 1: Process for determining the regional threat status of taxa

Process 1: Determination of regional threat status



Process 2: Determination of strongholds and Regionally Not Threatened species



Appendix 2: List of Regional Qualifiers for the 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.
NStr	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 (Rolfe et al. 2022)

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.

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List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
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.

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List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
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
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.

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List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
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.

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List of National Qualifiers from the New Zealand Threat Classification System

Code	Qualifier	Qualifier Type	Description
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: Regional assessments of selected fungal taxa

Table A4-1. Species in the Agaricales assessed for this report.

Regional and national qualifiers used in the assessment are abbreviated as follows: CD = Conservation Dependent; CI = Climate Impact; CRN = Conservation Research Needed; DPR = Data Poor Recognition; DPS = Data Poor Size; DPT = Data Poor Trend; De = Designated; FR = Former Range; INC = Increasing; NR = Natural Range Limit; NStr = National Stronghold; OL = One Location; PD = Partial Decline; PF = Population Fragmentation; RE = Regional Endemic; RN = Restored Native; RR = Range Restricted; Sp = Biologically Sparse; TL = Type Locality; TO = Threatened Overseas. Further details about each of these qualifiers can be found at Appendix 2, 3 and https://nztcs.org.nz. National Criteria is Regionally Critical A(1) with further information found in Rolfe et al. 2022 and https://nztcs.org.nz.

The source of "occurrences' data are from the Global Biodiversity Information Facility (GBIF) and the University of Otago (OTA) mycological collection. Qualifiers can be found in Appendix 2 and 3. For the full dataset for this regional assessment of non-lichenised boletes and russuloid fungi in the Otago region see Appendix 4-2 and 4-3.

Biostatus is from the Biota of New Zealand (BiotaNZ) where endemic refers to Aotearoa New Zealand.

Taxa listed in bold text are Regionally Threatened in Otago.

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Agaricus crocodilinus	Uncertain	Not Threatened, safe overseas			7	2	29%	Uncertain Biostatus	
Agaricus horakianus	Indigenous	Not Threatened	Not Threatened	Not Threatened	3	1	33%		DPR
Agaricus horakii	Indigenous	Data Deficient	Data Deficient	Data Deficient	10	2	20%		
Agaricus lanatoniger	Indigenous	Data Deficient	Data Deficient	Data Deficient	9	2	22%		DPR
Agaricus purpureoniger	Endemic	Data Deficient	Data Deficient	Data Deficient	6	2	33%		DPR, OL
Amanita karea	Endemic	Data Deficient	Data Deficient	Data Deficient	48	1	2%		
Amanita nehuta	Endemic	Not Threatened	Not Threatened	Not Threatened	240	31	13%		
Amanita nothofagi	Indigenous	Not Threatened	Not Threatened	Not Threatened	468	24	5%		
Amanita pareparina	Endemic	Not Threatened	Not Threatened	Not Threatened	93	4	4%		
Amanita pekeoides	Endemic	Not Threatened	Not Threatened	Not Threatened	473	70	15%		
Anthracophyllum archeri	Indigenous	Not Threatened	Not Threatened	Not Threatened	74	2	3%		
Armillaria limonea	Indigenous	Not Threatened	Not Threatened	Not Threatened	275	2	1%		
Armillaria novae-zelandiae	Indigenous	Not Threatened	Not Threatened	Not Threatened	1104	224	20%		
Arrhenia rosea	Endemic	Data Deficient	Data Deficient	Data Deficient	4	1	25%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Aureonarius armiae	Endemic	Not Threatened	Not Threatened	Not Threatened	16	8	50%	Otago-specific collecting	
Aureonarius collybianus	Endemic	Not Threatened	Not Threatened	Not Threatened	18	1	6%		
Aureonarius rubrocastaneus	Endemic	Data Deficient	Data Deficient	Data Deficient	5	1	20%		
Aureonarius rubrodactylus	Endemic	Data Deficient	Data Deficient	Data Deficient	23	4	17%		
Austrocortinarius australiensis	Indigenous	Not Threatened	Not Threatened	Not Threatened	68	1	1%		
Bolbitius muscicola	Endemic	Not Threatened	Not Threatened	Not Threatened	120	35	29%		
Britzelmayria multipedata	Uncertain	Not Threatened, safe overseas			3	1	33%	Recently recognised in Aotearoa. Uncertain Biostatus	
Campanella bonii	Endemic	Not Threatened	Not Threatened	Not Threatened	12	1	8%		
Campanella tristis	Indigenous	Not Threatened	Not Threatened	Not Threatened	198	2	1%		
Cantharellula fistulosa	Endemic	Data Deficient	Data Deficient	Data Deficient	7	1	14%		
Clavogaster virescens	Endemic	Not Threatened	Not Threatened	Not Threatened	621	19	3%		
Clitocybe brunneocaperata	Endemic	Data Deficient	Data Deficient	Data Deficient	5	2	40%		
Clitocybula grisella	Indigenous	Data Deficient	Data Deficient	Data Deficient	12	2	17%		DPR
Collybiopsis rimutaka	Endemic	Data Deficient	Data Deficient	Data Deficient	41	2	5%		DPR
Collybiopsis subpruinosa	Uncertain	Not Threatened, safe overseas			123	5	4%	Newly recognised in Aotearoa	
Conchomyces bursiformis	Indigenous	Not Threatened	Not Threatened	Not Threatened	303	69	23%		
Coprinopsis picacea	Indigenous	Data Deficient			3	1	33%	Uncertain Biostatus	
Cortinarius achrous	Endemic	Not Threatened	Not Threatened	Not Threatened	35	7	20%		
Cortinarius aerugineoconicus	Endemic	Data Deficient	Data Deficient	Data Deficient	22	3	14%		
Cortinarius alboroseus	Indigenous	Not Threatened	Not Threatened	Not Threatened	63	4	6%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Cortinarius alienatus	Endemic	Not Threatened	Not Threatened	Not Threatened	49	9	18%		
Cortinarius amblyonis	Endemic	Data Deficient	Data Deficient	Data Deficient	3	2	67%	Otago-specific collecting	
Cortinarius atropileatus	Endemic	Data Deficient			2	1	50%	Recently described	
Cortinarius aurantioferreus	Endemic	Not Threatened	Not Threatened	Not Threatened	5	1	20%		
Cortinarius austrovenetus	Uncertain	Data Deficient			8	5	63%	Newly recognised in Aotearoa	
Cortinarius beeverorum	Endemic	Data Deficient			45	14	31%	Not in 2022 assessment	
Cortinarius bellus	Indigenous	Not Threatened	Not Threatened	Not Threatened	19	2	11%		
Cortinarius calaisopus	Endemic	Data Deficient	Data Deficient	Data Deficient	37	7	19%		
Cortinarius canarius	Indigenous	Not Threatened	Not Threatened	Not Threatened	104	9	9%		
Cortinarius cardinalis	Endemic	Not Threatened	Not Threatened	Not Threatened	66	4	6%		OL
Cortinarius carneipallidus	Endemic	Data Deficient	Data Deficient	Data Deficient	59	2	3%		
Cortinarius cartilagineus	Indigenous	Not Threatened	Not Threatened	Not Threatened	42	7	17%		DPR
Cortinarius castaneodiscus	Endemic		Data Deficient	Data Deficient	39	1	3%		
Cortinarius cesarioanus	Endemic	Data Deficient			10	1	10%	Newly described	
Cortinarius chrysma	Endemic	Data Deficient	Data Deficient	Data Deficient	11	1	9%		DPR
Cortinarius cucumeris	Endemic	Not Threatened	Not Threatened	Not Threatened	15	3	20%		
Cortinarius cypripedii	Endemic	Data Deficient	Data Deficient	Data Deficient	2	2	100%	Otago-specific collecting	
Cortinarius dulciolens	Endemic	Data Deficient	Data Deficient	Data Deficient	20	12	60%		
Cortinarius durifoliorum	Endemic	Data Deficient	Data Deficient	Data Deficient	12	2	17%		
Cortinarius elacatipus	Indigenous	Data Deficient	Data Deficient	Data Deficient	13	3	23%		
Cortinarius elaiochrous	Endemic	Data Deficient	Data Deficient	Data Deficient	40	2	5%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Cortinarius epiphaeus	Endemic	Not Threatened	Not Threatened	Not Threatened	94	5	5%		
Cortinarius indolicus	Endemic	Not Threatened	Not Threatened	Not Threatened	16	2	13%		
Cortinarius indotatus	Endemic	Data Deficient	Data Deficient	Data Deficient	13	3	23%		
Cortinarius ionomataius	Endemic	Not Threatened	Not Threatened	Not Threatened	26	1	4%		
Cortinarius lubricanescens	Endemic	Not Threatened	Not Threatened	Not Threatened	30	1	3%		
Cortinarius luteinus	Endemic	Data Deficient	Data Deficient	Data Deficient	14	4	29%		
Cortinarius majestaticus	Endemic	Not Threatened	Not Threatened	Not Threatened	26	6	23%		
Cortinarius malosinae	Endemic	Not Threatened	Not Threatened	Not Threatened	6	2	33%		
Cortinarius meleagris	Indigenous	Not Threatened	Not Threatened	Not Threatened	44	2	5%		
Cortinarius melimyxa	Endemic	Not Threatened	Not Threatened	Not Threatened	19	2	11%		
Cortinarius minorisporus	Endemic	Data Deficient			10	3	30%	Newly described	
Cortinarius minoscaurus	**Endemic**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**8**	**3**	**38%**	**Tea-tree ECM associate**	**De**
Cortinarius mycenarum	Endemic	Data Deficient	Data Deficient	Data Deficient	8	2	25%		
Cortinarius mysoides	Endemic	Data Deficient	Data Deficient	Data Deficient	7	7	100%	Otago-specific collecting	
Cortinarius naphthalinus	Endemic	Data Deficient	Data Deficient	Data Deficient	9	2	22%		
Cortinarius ophryx	Endemic	Data Deficient	Data Deficient	Data Deficient	14	1	7%		
Cortinarius orixanthus	Endemic	Not Threatened	Not Threatened	Not Threatened	16	2	13%		
Cortinarius palissandrinus	Endemic	Data Deficient	Data Deficient	Data Deficient	25	1	4%		
Cortinarius papaver	Indigenous	Data Deficient	Data Deficient	Data Deficient	12	2	17%		DPR
Cortinarius paraoniti	Endemic	Data Deficient	Data Deficient	Data Deficient	5	1	20%		
Cortinarius paraxanthus	Endemic	Data Deficient	Data Deficient	Data Deficient	26	6	23%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Cortinarius pectochelis	Endemic	Data Deficient	Data Deficient	Data Deficient	6	4	67%		
Cortinarius peraurantiacus	Endemic	Data Deficient			50	2	4%	Not in 2022 assessment	
Cortinarius peraureus	Endemic	Not Threatened	Not Threatened	Not Threatened	39	4	10%		
Cortinarius peraurilis	Endemic	Data Deficient	Data Deficient	Data Deficient	4	2	50%	Otago-specific collecting	
Cortinarius persplendidus	Indigenous	Not Threatened	Not Threatened	Not Threatened	39	3	8%		
Cortinarius phaeomyxa	Endemic	Not Threatened	Not Threatened	Not Threatened	51	4	8%		
Cortinarius purpureocapitatus	Endemic	Data Deficient	Data Deficient	Data Deficient	23	1	4%		DPR
Cortinarius rattinoides	Endemic	Data Deficient	Data Deficient	Data Deficient	8	3	38%		
Cortinarius rotundisporus	Indigenous	Not Threatened	Not Threatened	Not Threatened	164	51	31%		
Cortinarius rugosiceps	Endemic	Data Deficient	Data Deficient	Data Deficient	1	1	100%	Poorly known	
Cortinarius saturniorum	Endemic	Not Threatened	Not Threatened	Not Threatened	24	3	13%		DPR
Cortinarius sciurellus	Endemic	Data Deficient	Data Deficient	Data Deficient	6	3	50%	Otago-specific collecting	
Cortinarius sclerophyllorum	Indigenous	Data Deficient			3	2	67%	Not in 2022 assessment	
Cortinarius subcastanellus	Endemic	Not Threatened	Not Threatened	Not Threatened	57	6	11%		
Cortinarius suecicolor	Endemic	Data Deficient	Data Deficient	Data Deficient	14	1	7%		DPR
Cortinarius taylorianus	Endemic	Not Threatened	Not Threatened	Not Threatened	57	13	23%		
Cortinarius tessiae	Endemic	Not Threatened	Not Threatened	Not Threatened	95	11	12%		
Cortinarius tigrellus	Endemic	Data Deficient	Data Deficient	Data Deficient	3	1	33%		
Cortinarius ursus	Endemic	Data Deficient	Data Deficient	Data Deficient	42	3	7%		
Cortinarius veronicae	Indigenous	Not Threatened	Not Threatened	Not Threatened	33	10	30%		
Cortinarius vinicolor	Endemic	Data Deficient	Data Deficient	Data Deficient	39	2	5%		DPR
Cortinarius violaceovolvatus	Endemic	Data Deficient	Data Deficient	Data Deficient	52	15	29%		DPR

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Cortinarius viridipileatus	Endemic	Data Deficient			12	5	42%	Newly described	
Cortinarius waiporianus	Endemic	Data Deficient	Data Deficient	Data Deficient	36	1	3%		
Cortinarius xenosma	Endemic	Not Threatened	Not Threatened	Not Threatened	17	1	6%		
Crepidotus fuscovelutinus	Endemic	Data Deficient	Data Deficient	Data Deficient	58	15	26%		
Crepidotus gilvidus	Indigenous	Data Deficient	Data Deficient	Data Deficient	16	2	13%		
Crepidotus isabellinus	Endemic	Data Deficient	Data Deficient	Data Deficient	3	2	67%	Poorly known	
Crepidotus lateralipes	Endemic	Data Deficient	Data Deficient	Data Deficient	14	2	14%		
Crepidotus nanicus	Endemic	Data Deficient	Data Deficient	Data Deficient	13	4	31%		DPR
Crepidotus novae-zealandiae	Endemic	Data Deficient	Data Deficient	Data Deficient	12	4	33%		
Crepidotus praecipuus	Indigenous	Data Deficient	Data Deficient	Data Deficient	90	15	17%		
Crinipellis procera	Endemic	Not Threatened	Not Threatened	Not Threatened	179	1	1%		
Cuphophyllus carcharias	Endemic	Data Deficient	Data Deficient	Data Deficient	4	1	25%		
Cyclocybe erebia	Uncertain	Not Threatened, safe overseas			11	1	9%	Uncertain Biostatus in Aotearoa	
Cyclocybe parasitica	Uncertain	Not Threatened	Not Threatened	Not Threatened	1373	91	7%		
Cystinarius eutactus	Endemic	Data Deficient	Data Deficient	Data Deficient	19	2	11%		
Cystinarius subgemmeus	Endemic	Not Threatened	Not Threatened	Not Threatened	16	1	6%		
Cystoderma clastotrichum	Indigenous	Not Threatened	Not Threatened	Not Threatened	47	6	13%		
Cystoderma muscicola	Uncertain	Not Threatened, safe overseas			10	1	10%	Newly recognised in Aotearoa	
Deconica baylisiana	**Endemic**	**Regionally Critical**	**Threatened**	**Nationally Critical**	**10**	**10**	**100%**	**Also found on Rakiura/ Stewart Island**	**Sp, Cl, CR, DPS, DPT, RR, NStr, TL**
Deconica citrispora	Indigenous	Data Deficient	Data Deficient	Data Deficient	7	3	43%	Poorly known	

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Descolea phlebophora	Indigenous	Not Threatened	Not Threatened	Not Threatened	42	6	14%		
Entoloma aromaticum	Indigenous	Not Threatened	Not Threatened	Not Threatened	41	3	7%		
Entoloma canoconicum	Endemic	Not Threatened	Not Threatened	Not Threatened	297	4	1%		
Entoloma chloroxanthum	Endemic	Not Threatened	Not Threatened	Not Threatened	27	1	4%		
Entoloma conferendum	Uncertain	Not Threatened	Not Threatened	Not Threatened	21	2	10%		
Entoloma crinitum	Indigenous	Data Deficient	Data Deficient	Data Deficient	19	1	5%		
Entoloma distinctum	Endemic	Data Deficient	Data Deficient	Data Deficient	9	3	33%		DPR
Entoloma glaucoroseum	Endemic	Data Deficient	Data Deficient	Data Deficient	14	1	7%		
Entoloma haastii	Indigenous	Not Threatened	Not Threatened	Not Threatened	69	2	3%		
Entoloma hochstetteri	Indigenous	Not Threatened	Not Threatened	Not Threatened	1310	13	1%		
Entoloma perzonatum	Endemic	Not Threatened			142	19	13%	Newly recognised in Aotearoa	
Entoloma readiae	Uncertain	Data Deficient	Data Deficient	Data Deficient	47	3	6%		
Entoloma translucidum	Indigenous	Not Threatened	Not Threatened	Not Threatened	64	5	8%		
Entoloma uliginicola	Endemic	Not Threatened	Not Threatened	Not Threatened	10	1	10%		
Entoloma viridomarginatum	Indigenous	Not Threatened	Taxonomically indistinct	Taxonomically indistinct	23	2	9%		
Favolaschia pustulosa	Indigenous	Not Threatened	Not Threatened	Not Threatened	232	7	3%		
Flammulaster ciliatus	Indigenous	Data Deficient	Data Deficient	Data Deficient	13	1	8%		
Galerina patagonica	Indigenous	Not Threatened	Not Threatened	Not Threatened	369	56	15%		
Gerronema waikanaense	Endemic	Data Deficient	Data Deficient	Data Deficient	53	3	6%		
Gliophorus graminicolor	Indigenous	Not Threatened	Not Threatened	Not Threatened	117	3	3%		
Gliophorus ostrinus	Endemic	Data Deficient	Data Deficient	Data Deficient	6	1	17%		DPR
Gliophorus pallidus	Indigenous	Not Threatened	Not Threatened	Not Threatened	24	1	4%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Gliophorus viridis	Indigenous	Not Threatened	Not Threatened	Not Threatened	129	2	2%		
Gloiocephala phormiorum	Endemic	Data Deficient	Data Deficient	Data Deficient	14	3	21%		
Gloioxanthomyces chromolimoneus	Endemic	Not Threatened	Not Threatened	Not Threatened	63	1	2%		
Gymnopilus ferruginosus	Indigenous	Data Deficient			36	2	6%	Uncertain Biostatus	
Gymnopus ceraceicola	Endemic	Data Deficient	Data Deficient	Data Deficient	111	11	10%		
Gymnopus cockaynei	Endemic	Data Deficient	Data Deficient	Data Deficient	20	1	5%		DPR
Gymnopus imbricatus	Endemic	Data Deficient	Data Deficient	Data Deficient	51	7	14%		
Gymnopus otagensis	Endemic	Data Deficient	Data Deficient	Data Deficient	16	1	6%		
Gymnopus subsupinus	Indigenous	Data Deficient	Data Deficient	Data Deficient	7	1	14%		DPR
Hebeloma mediorufum	Endemic	Not Threatened	Not Threatened	Not Threatened	32	3	9%		
Hebeloma victoriense	Indigenous	Not Threatened	Not Threatened	Not Threatened	135	1	1%		
Hohenbuehelia luteola	Endemic	Data Deficient	Data Deficient	Data Deficient	32	2	6%		DPR
Humidicutis luteovirens	Endemic	Not Threatened	Not Threatened	Not Threatened	47	4	9%		
Humidicutis mavis	Indigenous	Not Threatened	Not Threatened	Not Threatened	256	19	7%		
Hygrocybe astatogala	Indigenous	Not Threatened	Not Threatened	Not Threatened	242	8	3%		
Hygrocybe blanda	Endemic	Data Deficient	Data Deficient	Data Deficient	25	2	8%		DPR
Hygrocybe cavipes	Endemic	Data Deficient	Data Deficient	Data Deficient	13	1	8%		DPR
Hygrocybe fuscoaurantiaca	Endemic	Data Deficient	Data Deficient	Data Deficient	19	2	11%		DPR
Hygrocybe julietae	Indigenous	Not Threatened	Not Threatened	Not Threatened	41	1	2%		
Hygrocybe keithgeorgei	Endemic	Data Deficient	Data Deficient	Data Deficient	24	1	4%		DPR
Hygrocybe lilaceolamellata	Indigenous	Not Threatened	Not Threatened	Not Threatened	49	3	6%		
Hygrocybe procera	Endemic	Not Threatened	Not Threatened	Not Threatened	42	1	2%		
Hygrocybe striatolutea	Endemic	Not Threatened	Not Threatened	Not Threatened	14	1	7%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Hygronarius viscincisus	Endemic	Data Deficient	Data Deficient	Data Deficient	10	5	50%	Otago-specific collecting	
Hygrophorus involutus	Indigenous	Not Threatened	Not Threatened	Not Threatened	59	1	2%		
Hypholoma acutum	Endemic	Not Threatened	Not Threatened	Not Threatened	398	81	20%		
Hypholoma australianum	Indigenous	Not Threatened	Not Threatened	Not Threatened	134	26	19%		SO
Hypholoma brunneum	Indigenous	Not Threatened	Not Threatened	Not Threatened	512	118	23%		
Inocybe albovestita	Endemic	Not Threatened	Not Threatened	Not Threatened	57	1	2%		
Inocybe gilibertoi	**Endemic**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**7**	**1**	**14%**	**Tea-tree ECM associate**	
Inocybe horakomyces	Indigenous	Not Threatened	Not Threatened	Not Threatened	13	1	8%		SO
Inocybe microsperma	Endemic	Data Deficient	Data Deficient	Data Deficient	1	1	100%	Poorly known	
Inocybe scabriuscula	Endemic	Data Deficient	Data Deficient	Data Deficient	11	1	9%		
Inocybe sylvicola	Indigenous	Not Threatened	Not Threatened	Not Threatened	31	4	13%		SO
Inocybe tenax	Indigenous	Data Deficient	Data Deficient	Data Deficient	13	1	8%		
Inocybe vagata	Indigenous	Data Deficient	Data Deficient	Data Deficient	6	1	17%		
Inocybe viscata	Indigenous	Data Deficient	Data Deficient	Data Deficient	5	1	20%		DPR
Inosperma calamistratoides	Indigenous	Not Threatened	Not Threatened	Not Threatened	40	1	3%		
Kuehneromyces brunneoalbescens	Indigenous	Not Threatened	Not Threatened	Not Threatened	23	2	9%		SO
Laccaria fibrillosa	Endemic	Not Threatened	Not Threatened	Not Threatened	78	6	8%		
Laccaria glabripes	Endemic	Not Threatened	Not Threatened	Not Threatened	116	7	6%		
Laccaria lilacina	Endemic	Data Deficient	Data Deficient	Data Deficient	42	4	10%		
Laccaria masoniae	Endemic	Not Threatened	Not Threatened	Not Threatened	162	11	7%		
Laccaria violaceonigra	Endemic	Not Threatened	Not Threatened	Not Threatened	76	10	13%		
Lacrymaria asperospora	Uncertain	Not Threatened	Not Threatened	Not Threatened	116	17	15%		SO
Lentinula novae-zelandiae	Endemic	Not Threatened	Not Threatened	Not Threatened	137	4	3%		
Lepiota haemorrhagica	Indigenous	Not Threatened	Not Threatened	Not Threatened	6	1	17%		SO

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Lepista antipoda	Endemic	Data Deficient	Data Deficient	Data Deficient	16	1	6%		
Leratiomyces erythrocephalus	Endemic	Not Threatened	Not Threatened	Not Threatened	1463	370	25%		
Leucocoprinus cepistipes	Uncertain	Not Threatened, safe overseas			100	2	2%	Uncertain Biostatus in Aotearoa	
Leucopaxillus eucalyptorum	Indigenous	Not Threatened	Not Threatened	Not Threatened	16	1	6%		SO
Macrolepiota clelandii	Indigenous	Not Threatened	Not Threatened	Not Threatened	456	1	0%		
Marasmiellus candidus	Uncertain	Not Threatened			73	9	12%	Uncertain Biostatus in Aotearoa	
Marasmius croceus	Indigenous	Data Deficient	Data Deficient	Data Deficient	28	1	4%		
Marasmius elegans	Indigenous	Not Threatened	Not Threatened	Not Threatened	51	13	25%		
Mycena acicula	Uncertain	Not Threatened, safe overseas			15	1	7%	Uncertain Biostatus	
Mycena austrofilopes	Indigenous	Not Threatened	Not Threatened	Not Threatened	15	1	7%		SO
Mycena clarkeana	Indigenous	Not Threatened, safe overseas	Not Threatened	Not Threatened	84	40	48%		SO
Mycena filopes	Uncertain	Not Threatened	Introduced and Naturalised	Introduced and Naturalised	17	4	24%		SO
Mycena flavovirens	**Indigenous**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**42**	**1**	**2%**		**DPS, DPT**
Mycena fuscovinacea	Indigenous	Not Threatened	Not Threatened	Not Threatened	25	1	4%		SO
Mycena galericulata	Uncertain	Not Threatened, safe overseas			12	2	17%	Uncertain Biostatus in Aotearoa	
Mycena interrupta	Indigenous	Not Threatened	Not Threatened	Not Threatened	484	74	15%		
Mycena mamaku	Indigenous	Data Deficient	Data Deficient	Data Deficient	12	1	8%		
Mycena mariae	Endemic		Not Threatened	Not Threatened	165	23	14%		
Mycena metata	Uncertain	Not Threatened			19	1	5%	Uncertain Biostatus in Aotearoa, safe overseas	
Mycena parsonsii	Endemic	Not Threatened	Not Threatened	Not Threatened	172	2	1%		
Mycena roseoflava	Indigenous	Not Threatened	Not Threatened	Not Threatened	156	22	14%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Mycena subdebilis	Endemic	Data Deficient	Data Deficient	Data Deficient	17	1	6%		DPR
Mycena subviscosa	Endemic	Not Threatened	Not Threatened	Not Threatened	193	10	5%		
Mycena ura	Indigenous	Not Threatened	Not Threatened	Not Threatened	230	13	6%		
Mycetinis curraniae	Endemic	Not Threatened	Not Threatened	Not Threatened	140	5	4%		
Nivatogastrium lignicola	Endemic	Data Deficient	Data Deficient	Data Deficient	1	1	100%	Poorly known	DPR
Omphalina wellingtonensis	Endemic	Not Threatened	Not Threatened	Not Threatened	39	1	3%		
Oudemansiella australis	Endemic	Not Threatened	Not Threatened	Not Threatened	340	1	0%		
Oudemansiella colensoi	Endemic	Not Threatened	Not Threatened	Not Threatened	23	1	4%		
Phaeocollybia ratticauda	Indigenous	Data Deficient	Data Deficient	Data Deficient	13	1	8%		
Phlegmacium artosum	Endemic	Data Deficient	Data Deficient	Data Deficient	2	1	50%	Poorly known	
Phlegmacium carbonellum	Endemic	Not Threatened	Not Threatened	Not Threatened	7	2	29%		
Phlegmacium cupreonatum	Endemic	Not Threatened	Not Threatened	Not Threatened	24	2	8%		
Phlegmacium exlugubre	Endemic	Data Deficient	Data Deficient	Data Deficient	5	2	40%	Otago-specific collecting	
Phlegmacium rattinum	Endemic	Data Deficient	Data Deficient	Data Deficient	10	3	30%		
Phlegmacium vernicifer	**Endemic**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**4**	**1**	**25%**	**Tea-tree ECM associate**	**De**
Phloeomana minutula	Uncertain	Not Threatened, safe overseas			15	1	7%	Uncertain Biostatus	
Pholiota chrysmoides	Endemic	Data Deficient	Data Deficient	Data Deficient	10	3	30%		DPR
Pholiota glutinosa	Endemic	Not Threatened	Not Threatened	Not Threatened	228	38	17%		
Pholiota multicingulata	Indigenous	Not Threatened	Not Threatened	Not Threatened	102	6	6%		
Pholiota subflammans	Indigenous	Not Threatened	Not Threatened	Not Threatened	214	43	20%		
Pholiotina gracilenta	Endemic	Not Threatened	Not Threatened	Not Threatened	42	3	7%		
Pholiotina novae-zelandiae	Endemic	Data Deficient	Data Deficient	Data Deficient	2	1	50%	Poorly known	DPR

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Pleurella ardesiaca	Indigenous	Not Threatened	Not Threatened	Not Threatened	16	1	6%		
Pleurocollybia cremea	Endemic	Data Deficient	Data Deficient	Data Deficient	14	1	7%		DPR
Pleuroflammula praestans	Indigenous	Data Deficient	Data Deficient	Data Deficient	88	17	19%		
Pleurotus purpureo-olivaceus	Endemic	Not Threatened	Not Threatened	Not Threatened	244	14	6%		
Pluteus concentricus	Endemic	Not Threatened	Not Threatened	Not Threatened	35	7	20%		
Pluteus microspermus	Indigenous	Data Deficient	Data Deficient	Data Deficient	34	4	12%		DPR
Pluteus minor	Endemic	Data Deficient	Data Deficient	Data Deficient	43	1	2%		DPR
Pluteus pauperculus	Indigenous	Not Threatened	Not Threatened	Not Threatened	21	1	5%		
Pluteus perroseus	Indigenous	Not Threatened	Not Threatened	Not Threatened	124	17	14%		
Pluteus readiarum	Endemic	Data Deficient	Data Deficient	Data Deficient	175	22	13%		DPR
Pluteus similis	Uncertain	Data Deficient			40	9	23%	Not in 2022 assessment	
Pluteus velutinornatus	Indigenous	Not Threatened	Not Threatened	Not Threatened	148	19	13%		
Porotheleum albodescendens	Endemic	Data Deficient	Data Deficient	Data Deficient	30	1	3%		
Psathyloma catervatim	Indigenous		Not Threatened	Not Threatened	62	2	3%		
Psathyloma leucocarpum	Endemic	Data Deficient	Data Deficient	Data Deficient	28	5	18%		
Psathyrella echinata	Indigenous	Not Threatened	Not Threatened	Not Threatened	50	17	34%		
Pseudoclitocybe foetida	Endemic	Data Deficient	Data Deficient	Data Deficient	25	1	4%		DPR
Pseudohydropus parafunebris	Endemic	Not Threatened			98	10	10%	Newly described	
Pseudolyophyllum brunneoceraceum	Indigenous	Not Threatened, safe overseas			13	1	8%	Uncertain Biostatus	
Pseudomarasmius efibulatus	Endemic	Data Deficient			2	1	50%	Newly described	
Psilocybe allenii	Uncertain	Not Threatened, safe overseas			4	1	25%	Uncertain Biostatus	

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Psilocybe alutacea	Uncertain	Not Threatened, safe overseas			7	1	14%	Newly recognised in Aotearoa	
Psilocybe makarorae	Endemic	Not Threatened	Not Threatened	Not Threatened	10	2	20%		
Psilocybe semilanceata	Uncertain	Not Threatened, safe overseas			18	4	22%	Uncertain Biostatus	
Resupinatus vinosolividus	Endemic	Not Threatened	Not Threatened	Not Threatened	45	5	11%		
Resupinatus violaceogriseus	Endemic	Not Threatened	Not Threatened	Not Threatened	67	8	12%		
Rhizocybe albida	Endemic	Not Threatened	Not Threatened	Not Threatened	68	4	6%		
Rhodocollybia delicata	Endemic	Data Deficient	Data Deficient	Data Deficient	10	1	10%	Recently re-recognised	
Rhodocollybia incarnata	Endemic	Not Threatened	Not Threatened	Not Threatened	97	11	11%		
Rhodocollybia purpurata	Endemic	Not Threatened	Not Threatened	Not Threatened	36	4	11%		
Rhodocybe dingleyae	Endemic	Data Deficient	Data Deficient	Data Deficient	4	2	50%	Poorly known	DPR
Roridomyces austrororidus	Indigenous	Not Threatened	Not Threatened	Not Threatened	324	59	18%		
Scytinotus longinquus	Indigenous	Not Threatened	Not Threatened	Not Threatened	268	83	31%		
Simocybe phlebophora	Indigenous	Not Threatened	Not Threatened	Not Threatened	58	11	19%		
Singerocybe clitocyboides	Indigenous	Not Threatened	Not Threatened	Not Threatened	43	3	7%		
Stropharia aeruginosa	Uncertain	Not Threatened, safe overseas			4	2	50%	Uncertain Biostatus	
Thaxterogaster alboaggregatus	Indigenous	Not Threatened	Not Threatened	Not Threatened	27	3	11%		
Thaxterogaster australis	Indigenous	Not Threatened	Not Threatened	Not Threatened	9	2	22%		
Thaxterogaster austrovaginatus	Indigenous	Data Deficient			18	8	44%	Newly recognised in Aotearoa	
Thaxterogaster castoreus	Endemic	Not Threatened	Not Threatened	Not Threatened	93	5	5%		
Thaxterogaster chalybeus	Endemic	Not Threatened	Not Threatened	Not Threatened	26	2	8%		

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Species in the Agaricales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Thaxterogaster cremeolina	Endemic	Not Threatened	Not Threatened	Not Threatened	20	3	15%		
Thaxterogaster cremeorufus	**Endemic**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**3**	**1**	**33%**	**Tea-tree ECM associate**	**DPR**
Thaxterogaster cretax	Endemic	Not Threatened	Not Threatened	Not Threatened	20	1	5%		
Thaxterogaster iringa	Endemic	Data Deficient	Data Deficient	Data Deficient	6	3	50%	Otago-specific collecting	
Thaxterogaster ixomolynus	Endemic	Data Deficient	Data Deficient	Data Deficient	5	3	60%	Otago-specific collecting	
Thaxterogaster mariae	Indigenous	Not Threatened	Not Threatened	Not Threatened	30	1	3%		
Thaxterogaster periclymenus	Endemic	Data Deficient	Data Deficient	Data Deficient	9	1	11%		
Thaxterogaster rhipiduranus	Indigenous	Not Threatened	Not Threatened	Not Threatened	23	1	4%		
Thaxterogaster singularis	Endemic	Not Threatened	Not Threatened	Not Threatened	42	3	7%		
Thaxterogaster turcopes	Endemic	Data Deficient	Data Deficient	Data Deficient	11	6	55%	Otago-specific collecting	
Tricholoma elegans	Endemic	Not Threatened	Not Threatened	Not Threatened	50	5	10%		
Tricholoma viridiolivaceum	Indigenous	Not Threatened	Not Threatened	Not Threatened	186	15	8%		
Tricholomopsis ornaticeps	Endemic	Not Threatened	Not Threatened	Not Threatened	143	39	27%		DPR
Tricholomopsis scabra	Indigenous	Not Threatened	Not Threatened	Not Threatened	74	5	7%		
Tubaria rufofulva	Indigenous	Not Threatened	Not Threatened	Not Threatened	11	1	9%		
Tympanella galanthina	Endemic	Not Threatened	Not Threatened	Not Threatened	163	20	12%		
Xeromphalina leonina	Indigenous	Not Threatened	Not Threatened	Not Threatened	23	2	9%		

Table A4-2. Species in the Boletales assessed for this report.

Regional and national qualifiers used in the assessment are abbreviated as follows: CD = Conservation Dependent; CI = Climate Impact; CRN = Conservation Research Needed; DPR = Data Poor Recognition; DPS = Data Poor Size; DPT = Data Poor Trend; De = Designated; FR = Former Range; INC = Increasing; NR = Natural Range Limit; NStr = National Stronghold; OL = One Location; PD = Partial Decline; PF = Population Fragmentation; RE = Regional Endemic; RN = Restored Native; RR = Range Restricted; Sp = Biologically Sparse; TL = Type Locality; TO = Threatened Overseas. Further details about each of these qualifiers can be found at Appendix 2, 3 and https://nztcs.org.nz. National Criteria is Regionally Critical A(1) with further information found in Rolfe et al. 2022 and https://nztcs.org.nz.

The source of "occurrences' data are from the Global Biodiversity Information Facility (GBIF) and the University of Otago (OTA) mycological collection. Qualifiers can be found in Appendix 2 and 3. For the full dataset for this regional assessment of non-lichenised agaricales and russuloid fungi in the Otago region see Appendix 4-1 and 4-3.

Biostatus is from the Biota of New Zealand (BiotaNZ) where endemic refers to Aotearoa New Zealand.

Taxa listed in bold text are Regionally Threatened in Otago.

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Criteria | Qualifiers
Amoenoboletus mcrobbii	Endemic	Not Threatened	Not Threatened	Not Threatened	30	2	7%		
Austroboletus novae-zelandiae	Endemic	Not Threatened	Not Threatened	Not Threatened	223	3	1%		
Austropaxillus mcnabbii	Indigenous	Not Threatened	Not Threatened	Not Threatened	55	2	4%		
Austropaxillus nothofagi	Endemic	Not Threatened	Not Threatened	Not Threatened	48	1	2%		
Calostoma fuscum	Indigenous	Not Threatened	Not Threatened	Not Threatened	36	3	8%		
Calostoma rodwayi	Indigenous	Not Threatened	Not Threatened	Not Threatened	186	18	10%		
Chalciporus aurantiacus	Endemic	Not Threatened	Not Threatened	Not Threatened	26	1	4%		
Fistulinella violaceipora	Indigenous	Not Threatened	Not Threatened	Not Threatened	49	6	12%		
Hygrophoropsis coacta	Endemic	Not Threatened	Not Threatened	Not Threatened	28	1	4%		
Hygrophoropsis umbriceps	**Endemic**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**11**	**1**	**9%**	**Tea-tree ECM associate**	**A(1) | De**
Tylopilus brunneus	Endemic	Not Threatened	Not Threatened	Not Threatened	94	3	3%		
Tylopilus formosus	Endemic	Not Threatened	Not Threatened	Not Threatened	807	73	9%	Not in 2022 assessment	
Xerocomus lentistipitatus	Endemic	Data Deficient	Data Deficient	Data Deficient	12	3	25%		DPR
Xerocomus nothofagi	Endemic	Not Threatened	Not Threatened	Not Threatened	54	9	17%		
Xerocomus squamulosus	Endemic	Not Threatened	Not Threatened	Not Threatened	53	3	6%		

Table A4-3. Species in the Russulales assessed for this report.

Regional and national qualifiers used in the assessment are abbreviated as follows: CD = Conservation Dependent; CI = Climate Impact; CRN = Conservation Research Needed; DPR = Data Poor Recognition; DPS = Data Poor Size; DPT = Data Poor Trend; De = Designated; FR = Former Range; INC = Increasing; NR = Natural Range Limit; NStr = National Stronghold; OL = One Location; PD = Partial Decline; PF = Population Fragmentation; RE = Regional Endemic; RN = Restored Native; RR = Range Restricted; Sp = Biologically Sparse; TL = Type Locality; TO = Threatened Overseas. Further details about each of these qualifiers can be found at Appendix 2, 3 and https://nztcs.org.nz. National Criteria is Regionally Critical A(1) with further information found in Rolfe et al. 2022 and https://nztcs.org.nz.

The source of "occurrences' data are from the Global Biodiversity Information Facility (GBIF) and the University of Otago (OTA) mycological collection. Qualifiers can be found in Appendix 2 and 3. For the full dataset for this regional assessment of non-lichenised agaricales and boletes fungi in the Otago region see Appendix 4-1 and 4-2.

Biostatus is from the Biota of New Zealand (BiotaNZ) where endemic refers to Aotearoa New Zealand.

Taxa listed in bold text are Regionally Threatened in Otago.

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Lactarius tawai	Endemic	Not Threatened	Not Threatened	Not Threatened	68	5	7%		
Lactarius umerensis	Endemic	Not Threatened	Not Threatened	Not Threatened	96	8	8%		
Lactifluus aurantioruber	Endemic	Not Threatened			128	10	8%	Not in 2022 assessment	
Lactifluus clarkeae	Indigenous	Not Threatened			105	20	19%	Not in 2022 assessment	
Lactifluus sepiaceus	Indigenous	Not Threatened	Not Threatened	Not Threatened	56	5	9%		
Lentinellus crawfordiae	Endemic	Not Threatened	Not Threatened	Not Threatened	21	5	24%		
Russula acrolamellata	Endemic	Not Threatened	Not Threatened	Not Threatened	120	7	6%		
Russula allochroa	**Endemic**	**Regionally Vulnerable**	**Threatened**	**Nationally Vulnerable**	**55**	**2**	**4%**	**Tea-tree ECM associate**	**De**
Russula australis	Endemic	Not Threatened	Not Threatened	Not Threatened	46	9	20%		
Russula griseobrunnea	Endemic	Not Threatened	Not Threatened	Not Threatened	66	1	2%		
Russula griseostipitata	Indigenous	Not Threatened	Not Threatened	Not Threatened	87	3	3%		
Russula griseoviolacea	Endemic	Not Threatened	Not Threatened	Not Threatened	67	6	9%		
Russula griseoviridis	Endemic	Not Threatened	Not Threatened	Not Threatened	108	1	1%		
Russula inquinata	Indigenous	Not Threatened	Not Threatened	Not Threatened	35	6	17%		
Russula kermesina	Endemic	Not Threatened	Not Threatened	Not Threatened	200	8	4%		
Russula macrocystidiata	Endemic	Not Threatened	Not Threatened	Not Threatened	104	5	5%		
Russula novae-zelandiae	Endemic	Not Threatened	Not Threatened	Not Threatened	116	11	9%		
Russula pilocystidiata	Endemic	Not Threatened	Not Threatened	Not Threatened	45	1	2%		
Russula pseudoareolata	Indigenous	Not Threatened	Not Threatened	Not Threatened	57	2	4%		
Russula purpureotincta	Endemic	Not Threatened	Not Threatened	Not Threatened	81	5	6%		

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Species in the Russulales assessed for this report continued

Species	Biostatus in Aotearoa	Otago Assessment	National Category	National Status	# National occurrences	# Otago occurrences	% of national records in Otago	Note	Qualifiers
Russula roseopileata	Endemic	Not Threatened	Not Threatened	Not Threatened	159	12	8%		
Russula roseostipitata	Endemic	Not Threatened	Not Threatened	Not Threatened	63	4	6%		
Russula tawai	Endemic	Not Threatened	Not Threatened	Not Threatened	80	4	5%		
Russula tricholomopsis	Endemic	Not Threatened	Not Threatened	Not Threatened	53	6	11%		
Russula umerensis	Endemic	Not Threatened	Not Threatened	Not Threatened	449	3	1%		

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

Otago Regional Council