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Conservation status of selected species of non-lichenised agarics, boletes and russuloid fungi in Aotearoa New Zealand, 2021

Jerry A. Cooper, Peter K. Buchanan, Pat Leonard, Lois Allison-Cooper, Peter Johnston, Mahajabeen Padamsee, Eric McKenzie and Pascale Michel

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Cover: *Lactarius novae-zelandiae*, At Risk – Naturally Uncommon in Keith George Memorial Park, Upper Hutt. *Photo: Jerry Cooper*

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Abstract

The conservation status of 961 species of non-lichenised mushroom-like agarics, boletes and russuloid fungi found in the wild in Aotearoa New Zealand was assessed using the New Zealand Threat Classification System (NZTCS). A general process for assessing the threat of extinction of fungal taxa is described, and a list of selected taxa is presented, along with a statistical summary and brief notes on the most important changes since the last assessment in 2002. These assessments replace all previous NZTCS assessments for non-lichenised mushroom-like taxa in the groups considered. A total of 44 taxa are assessed as being Threatened, 3 as At Risk, 330 as Not Threatened, and 19 as Introduced and Naturalised, while 565 taxa are considered Data Deficient (i.e. there is insufficient information available to assess their conservation status). Of the 961 selected taxa of agarics, boletes and russuloid fungi in Aotearoa New Zealand, 160 (17%) have not been formally described and named but have been assigned tag names.

Keywords: Agaricaceae, Agaricales, Boletales, Cortinariaceae, Entolomataceae, Hygrophoraceae, mushroom, Mycenaceae, Russulales

1. Background

The New Zealand Threat Classification System (NZTCS) was established in 2002 to complement the International Union for Conservation of Nature (IUCN) Red List system.[1] Categories and criteria were defined to reflect the unique environments of Aotearoa New Zealand, while accounting for the country's relatively small size and diversity of ecosystems, and the large number of taxa with naturally restricted ranges and/or small population sizes (Molloy et al. 2002). The NZTCS methodology was refined in 2007 to ensure that all possible combinations of status and trend were covered within the different categories, and the resulting manual (Townsend et al. 2008) was used as the basis for the assessments presented here. However, the protocols recommended by the IUCN/NZTCS were developed for assessing animal and plant populations, and are not consistently directly applicable to fungal populations.

The IUCN recently adopted a modified protocol that had been specifically designed for assessing fungal populations (Dahlberg & Mueller 2011). In 2019, Jerry Cooper, Peter Buchanan and Pat Leonard were part of a team that used this new protocol to assess the conservation status of several Australasian fungi for the IUCN Red List. Here, we introduce that fungal assessment protocol and its adoption within the 2008 NZTCS framework (Townsend et al. 2008). Because of the large number of fungal taxa present in Aotearoa New Zealand and the limited availability of expertise, the panel also adopted a preliminary selection mechanism to reduce the number of candidate taxa taken forward into the IUCN/NZTCS detailed assessment process.

There has been only one broad assessment of the conservation status of fungi in Aotearoa New Zealand to date (Hitchmough 2002), which was based largely on data held in the New Zealand Fungarium (PDD[2]) and the panel's interpretation of the NZTCS protocol as it applied to fungal populations (Molloy et al. 2002). Revisions were subsequently made to some of the species listed as Data Deficient (Johnston et al. 2010; Johnston & Cooper 2012). Lichenised and lichenicolous fungi have been assessed separately (de Lange et al. 2018), and reassessments of all non-lichenised/lichenicolous fungi in Aotearoa New Zealand were initiated in 2017, the results of which will be published progressively. This report summarises the results of the reassessment of 961 taxa of non-lichenised mushroom-like agarics, boletes and russuloid fungi. Related taxa that are lichenised or have non-agaricoid forms, such as puffballs, crust fungi, club fungi and truffles, were excluded from this assessment but will be considered in future assessments, while several more conspicuous pouch-like fungi were included.

Taxa were assessed using the categories, criteria and qualifiers defined in the NZTCS manual (Townsend et al. 2008) and the supplement to that manual (Rolfe et al. 2021), while adopting the fungal-specific definitions developed for the IUCN (Dahlberg & Mueller 2011). The expert panel for this assessment of mushroom-like fungi consisted of eight members plus one administration/support member. However, the assessment was primarily carried out by Jerry Cooper with support from Peter Buchanan and Pat Leonard.

[1] www.iucnredlist.org/

[2] https://scd.landcareresearch.co.nz/Search?collectionId=PDD

2. Methodology for assessing the conservation status of fungi in Aotearoa New Zealand

To determine the risk of extinction for fungi in Aotearoa New Zealand, it is necessary to assess and quantify past, current and future threats to populations. As for other groups of organisms, the principal threats to fungi are associated with the loss of habitat and a decrease in habitat quality due to land-use change, the impact of invasive species, and climate change. However, specific threats to fungal organisms are relatively difficult to assess and often poorly understood.

As heterotrophs, fungi are intimately linked to other organisms. These linkages include symbiotic, commensal, parasitic and pathogenic relationships, with fungi occurring in plant roots as mycorrhizae, inside host plants as endophytes and as pathogens.[3] Consequently, anything that negatively affects a population of organisms is a de facto threat to any associated fungi. For example, Aotearoa New Zealand has many endemic mycorrhizal fungi associated with native Nothofagaceae and Myrtaceae (*Kunzea* and *Leptospermum* spp.), and the latter group is under threat from myrtle rust (*Austropuccinia pisidii*). However, many fungus–plant interactions remain poorly understood, making it difficult to accurately assess risks.

There are also instances where an organism is not considered to be under threat even though the associated fungi are threatened. And the association between fungi and associated organisms can be affected by external influences – for example, it is well known that increased nitrogen availability (such as that associated with dairy farming run-off) negatively affects ectomycorrhizal fungi.

The spores of many fungi are dispersed by wind, but this is not universal and a loss of or change in specific dispersal mechanisms may also pose a threat to some fungi. For example, Aotearoa New Zealand has an unusually high number of endemic truffle-like species, particularly secotioid (pouch) fungi, which cannot disperse spores in the wind and are often reliant on animal vectors consuming their fruiting bodies (sporocarps). In other countries, those vectors are mammals, but we are unsure of their identity in Aotearoa New Zealand. There is a belief that ground-dwelling birds (many of which are now extinct) are the vectors, in which case all truffles will be in decline, with many existing populations representing relicts.

Mycorrhizal species in Aotearoa New Zealand

Nearly all land plants form mycorrhizal associations with fungi, and these associations are critical to the establishment, survival and health of plant populations. The majority of plants are associated with arbuscular mycorrhizal (AM) fungi, which form microscopic, morphologically rather similar sporocarps in soil with restricted diversity, little host/fungus specificity and broad distributions. However, taxonomic studies of AM fungi in Aotearoa New Zealand using modern taxonomic methods have been limited compared with other fungal groups, so estimates of diversity may change. By contrast, ectomycorrhizal (ECM) fungi are diverse, forming more specific host–fungus relationships, and have relatively large and more conspicuous sporocarps, making them generally better known. In Aotearoa New Zealand, beech (*Fuscospora* spp. and *Lophozonia menziesii*) and tea-tree (*Leptospermum scoparium* and *Kunzea* spp.) are the only indigenous ectomycorrhizal trees. They are critically dependent on their association with over 450 described mushroom species, and that is less than half the estimated total number of ECM fungi in Aotearoa New Zealand.

[3] For definitions of technical terms used in this report, see the Glossary in section 7.

And while introduced pest mammals may now be playing a role in the dispersal of these fungi, the perceived patchy occurrence of many truffle-like fungi suggests that this is not significant. More research is needed on the dispersal mechanisms of native truffle-like fungi, as any inability to disperse will affect estimates of the current fragmentation of populations.

Invasive fungi may also have a significant role in the reduction of fungal diversity and pose threats to indigenous species. In recent decades, the introduced fungus *Amanita muscaria* has broadened its ectomycorrhizal (ECM) association with introduced host trees and is now associated with native beech species. In less than three decades, it has spread across the country and is now found in nearly every beech forest, where it continues to increase in abundance. We have little information on the impact of this continued expansion on populations of native ECM species. Similarly, the bright orange introduced saprophytic wood-decay fungus *Favolaschia claudopus* has swept across the country in a few years and once again we have no data on the potential exclusion of native saprophytic species occupying the same niche.

Fungal species are also often restricted to specific ecosystems and habitats. Sometimes those restrictions are due to habitat-specific plant/animal associations, but they can also be related to the physical parameters of the ecosystem (e.g. sand dunes and wetlands). Therefore, it is possible to assess threats to those fungal species based on a knowledge of changes to the associated ecosystems and habitats.

Climate change will have both direct and indirect impacts on fungal populations. Fungi associated with alpine habitats have a limited capacity to migrate to higher elevations, and sea-level rise may ultimately impact on some coastal species, especially those associated with sand dunes and lagoon systems. Most significant climate change impacts are likely to be indirect as a result of increased climate instability and the effects on associated indigenous and alien plant and animal species. Such effects are likely to remain unquantified for the foreseeable future.

In assessing threats to fungi, it is critical to have demographic information on the distribution, status and change of associated organisms, ecosystems and land use/cover. Sometimes we have reliable, nationally comprehensive or usefully specific data covering the relevant assessment period of the last 50 years. However, often we do not have good data, or it is problematic to objectively compare data from different time periods.

The collection, review and assessment of information relevant to assessing fungal conservation status requires a breadth of expertise that is currently very limited. It has been suggested that 'conservation mycology' should be recognised as a distinct discipline (May et al. 2019), and only greater expertise in, and resources for, this discipline will result in improved fungal threat assessments.

2.1 Key issues for assessing fungal conservation status

2.1.1 Rarity

Rare species are not always at risk of extinction, although if a fungus is reliably known to occur in a single small area then any impact on that area could lead to extinction. In assessing fungi, there is a temptation to focus on these rare species, perhaps because other threat processes for more common species are often quite difficult to quantify. This focus is apparent in previous threat lists for fungi in Aotearoa New Zealand.

Declaring a fungus to be rare is associated with a considerable degree of uncertainty. The perception of rarity, based on known occurrences, may often reflect a lack of surveying effort by appropriately skilled individuals, the sporadic occurrence of sporocarps and/or taxonomic uncertainty. The term 'rare' is perhaps most confidently applied to those fungal species with few records that are very conspicuous, are easily identified by non-specialists and occur in areas where lots of people visit. Use of the term 'rare' for any other category of fungus requires significant evidence and justification.

2.1.2 Identification issues

Substantial effort over two centuries has allowed most of the plant species in Aotearoa New Zealand to be described. However, there has not been a commensurate degree of effort to describe our fungi due to the relatively small number of professional resident mycologists, especially those studying the larger fungi. This problem is compounded by the sporadic and ephemeral nature of most sporocarps, the absence of which does not preclude the unseen presence of the feeding stage of the fungus, which potentially grows year-round in association with its host or within soil, plant, animal or fungal substrates. This means that the right person needs to be in the right place at the right time to record the occurrence of fungi as sporocarps. Consequently, relatively few of our fungal species have been described and the information available for identification is very incomplete, although future analyses of environmental DNA will help supplement our earlier dependency on visual sporocarp records.

Numbers of fungal species in Aotearoa New Zealand

A conservative and widely used estimate indicates that there are six fungal species for every vascular plant species. The vascular plants in Aotearoa New Zealand are relatively well known, with approximately 2200 indigenous species having been described. We can therefore estimate that there are at least 13 000 species of indigenous fungi. There are also approximately 2500 introduced and naturalised plants in Aotearoa New Zealand, many of which will be associated with specific introduced fungi, and there are many thousands more introduced plants in cultivation that may harbour yet more fungi. Therefore, while we have not estimated the total number of introduced fungi associated with introduced plants, it will be significant. To date, approximately 6000 native fungal species have been described and around 2000 fungi that were clearly introduced have been catalogued. These figures indicate that we have described less than half of our indigenous fungi, and that is likely to be a significant underestimate. Many of these undescribed fungi will be small, inconspicuous forms.

Approximately 2000 species of larger fungi (mainly basidiomycetes – agarics, brackets, etc.) have been described in Aotearoa New Zealand. DNA data from environmental samples together with sequence 'barcode' data on known species support the estimate that less than half of these species have been described, even though this group is conspicuous. The task of formally describing these species will be significant, and some of them will probably be under threat although most must remain Data Deficient. We have allocated 'tag names' (phrase names) to many of these species.

Many fungal species described by early taxonomists, and even up to the 1980s, have been poorly defined, with many of the descriptions (often based on single collections) failing to provide the information necessary to accurately identify the named species. In addition, the type collections of those species are often in poor condition and do not yield additional critical data, especially definitive sequence data. Fungal species are notoriously variable in morphology, and the boundaries between inter- and intraspecific variation can sometimes be difficult to infer. This incomplete knowledge means that many historical records of fungi have unreliable identifications that may never be improved – and it is not possible to reliably assess the conservation status of species where identifications are uncertain.

Modern sequence-based techniques and large-scale observations, especially those generated by the Fungal Network of New Zealand (FUNNZ)[4] and iNaturalist[5] citizen science communities, are rapidly changing our understanding of macrofungi in Aotearoa New Zealand. Modern sequence-based techniques now allow us to more accurately determine taxon boundaries based on phylogenetic species concepts, and to correlate these concepts with reliable, stable morphological characters, known distributions, host associations and ecological niches. The data obtained support the assertion that many of the fungal species in Aotearoa New Zealand remain undescribed, including a substantial number of easily observed and potentially threatened taxa. However, while it is now easier to detect undescribed species using sequence data, our ability to name these species and provide non-technical aids to species identification will continue to lag behind that of our botanical colleagues with current resources. Nevertheless, the taxonomic uncertainty around some described taxa is being reduced.

For other fungal taxa, the uncertainty and difficulty in correct identification continues to increase. Careful microscopy is often required to observe stable morphological characters, so that identification based on field characters alone is inadequate. In many cases, accurate identification requires access to a good microscope and extensive technical literature and expertise, as well as accurate field data on appearance, substrates and habitat – but sometimes it is simply not possible to distinguish species without sequence data. Sequence data also frequently demonstrate the presence of cryptic species hiding under a single species name due to relatively recent regional evolutionary radiations or convergent evolution. Indeed, convergent evolution has led to some quite unrelated taxa showing identical macromorphological features – for example, the well-known purple-pouch species *Cortinarius porphyroideus sensu lato* is now known to represent at least five different cryptic species with often overlapping distributions (Nilsen et al. 2020). In addition, up until recently, it was common practice to apply the names of species described from the northern hemisphere to superficially similar indigenous species, but sequence data usually demonstrate that these names have been misapplied. Most of the indigenous fungal species considered in this report are geographically restricted within Australasia, with few being shared with South America or Asia and hardly any being shared with the northern hemisphere.

Our overall understanding of the taxonomy, distribution, ecology and population dynamics of most fungal species remains relatively poor. Threat listing is most reliably applied to distinctive macrofungi, as non-specialists are more likely to observe and correctly report these species, giving us a high degree of confidence in the occurrence data. Most other taxa will remain Data Deficient in the near term.

[4] www.funnz.org.nz/

[5] https://inaturalist.nz/

2.1.3 Aggregating occurrence data

The threat listing process starts with current knowledge of the distribution of fungal taxa in Aotearoa New Zealand. For many years, the only accessible source of such data was the named specimens deposited in fungaria such as PDD and, over wider regions, the information provided by data aggregators such as the Atlas of Living Australia (ALA)[6] and the Global Biodiversity Information Facility (GBIF).[7] The data available from PDD specimens has been enriched in the last 20 years by the annual FUNNZ fungal foray, which has been based in many different areas across Aotearoa New Zealand. The foray attracts between 40 and 60 people over a 1-week period who visit many sites. In recent years, this has been supplemented by an explosion in citizen science observation data of macrofungi provided by iNaturalist. Records in iNaturalist that reach Research Grade have been confirmed by two or more people and have a reasonable level of quality. For some taxa, the quality of these data exceeds that of fungarium material where the resources are unavailable to provide confirmation by appropriate experts.

It is important to note that all these sources of occurrence data are highly biased both taxonomically towards distinctive taxa and geographically towards areas with easy accessibility. Therefore, assessments need to take these biases into account when estimating population metrics.

It should also be noted that any collecting of fungal material needs to be carried out with documented proof of permission from the landowner or, in the case of land administered by DOC, iwi and local authorities, with a collecting permit.

2.1.4 Estimating population metrics

The formal threat listing process requires pragmatic definitions of populations, individuals and lifespan. Precise definitions of these concepts are especially hard to achieve for fungi due to their cryptic lifestyle and occurrence as filamentous threads (hyphae) or yeasts in the soil, in dead organic matter, on roots and inside living material. Generally, we only become aware of the presence of these species when they produce sporocarps, and most of our knowledge comes from records of these sporocarps, which are often short lived and have a patchy, inconsistent appearance that is linked to environmental conditions. The dynamics of fungal populations are poorly understood because of this cryptic lifestyle and the uncertain knowledge of the lifespan and spatial extent of genetic individuals.

There can be no doubt that our understanding of and ability to assess population dynamics will continue to improve with the increasing development of cheap, easy and reliable molecular methods to directly assay fungal tissue *in situ*. In particular, the promise of large-scale environmental DNA/RNA surveying will potentially provide a means of assessing ecosystem status and change based on all components of the biodiversity rather than just a few easily observed groups that represent a fraction of total biodiversity. It is time that we moved on from using the common phrase 'flora and fauna' to indicating all relevant biodiversity so that the many species of fungi and bacteria that provide fundamentally critical roles in ecosystem functioning and may be independently at risk of extinction are included.

[6] www.ala.org.au/

[7] www.gbif.org/

2.2 Adaptation of the IUCN process within the context of the NZTCS for fungi

The NZTCS guidelines used in this assessment (Townsend et al. 2008) did not include any specific recommendations for assessing fungal conservation status, yet it is important that we find ways to directly assess the status of fungi ahead of new techniques and knowledge becoming available. The pragmatic approach adopted by the IUCN (Dahlberg & Mueller 2011) allows us to calculate metrics for fungal individuals and populations based on a standardised approach to data that are readily available on the occurrence of sporocarps. While we acknowledge that the approximations used are subject to considerable uncertainty and unquantified variance, this assessment methodology, as described below, forms an integral part of the revised version of the NZTCS manual (Rolfe et al. in press).

Therefore, in the present assessment of fungi in Aotearoa New Zealand, we have adopted the proposed (Dahlberg & Mueller 2011) pragmatic definitions for population size, sub-populations, and mature individuals, which should be applicable under both the IUCN and NZTCS processes. Once these metrics are fixed, the assessment criteria and classification categories adopted by the IUCN and NZTCS are broadly similar, although minor differences exist for most assignments. One significant difference is the IUCN category of Near Threatened, which the NZTCS recognises as At Risk with the useful categories of Declining, Recovering, Relict and Naturally Uncommon.

The NZTCS process is based primarily on a knowledge of the total population size. Where the population size is not known with any certainty, as is the case for fungal populations, the NZTCS permits classification using secondary criteria of the number of sub-populations and the size of the largest sub-population, or the area of occupancy (as a surrogate for total population size). This approach has been adopted for lichenised fungi (de Lange et al. 2018). However, the definition of area of occupancy under the NZTCS differs from that under the IUCN, as noted in section 2.5 below.

A critical consideration under both the IUCN and NZTCS is the inclusion of potential undiscovered sites in the estimates of area of occupancy and population size.

2.3 IUCN assessment criteria for assessing fungal conservation status

The key questions that allow us to estimate the threat of extinction are:

1. Is there enough information to demonstrate a historic and predicted sustained decline in the overall population?
2. Can we demonstrate a restricted area of occupancy and sustained change in the quality or extent of suitable habitat?
3. Can we demonstrate a small population and decline?
4. Is this genuinely a very rare species that may be subject to extinction through stochastic events?

The IUCN has identified five different assessment criteria associated with these questions that may be used to formally assess the conservation status of a taxon. A taxon can be considered under any of these assessment criteria, and if more than one assessment criterion is applied, then the highest category is adopted. In practice, the choice of assessment criteria is usually dictated by the available knowledge of the taxon and its threats. For fungi, assessments under IUCN criteria C (small population size and decline) and D (very small or restricted populations) are generally facilitated by the available data. Detailed information on the assessment criteria and categories may be found in the IUCN guide (IUCN 2019) and a paper describing fungal threat listings under the IUCN criteria (Dahlberg & Mueller 2011).

2.4 Key terms used by the IUCN in relation to the assessment of fungal populations

In this section, we summarise the key terms used in the formal threat assessment process and their interpretations for fungi (Dahlberg & Mueller 2011).

These interpretations have been developed for fungi with large sporocarps, such as the mushrooms, bracket fungi and some larger ascomycetes, so the application of key concepts to microfungi such as rusts, smuts and most ascomycetes remains problematic. Therefore, candidate taxa in these latter groups should be assessed based on factors such as perceived rarity and the conservation status of the associated host.

The **population** is the totality of **mature individuals** (see below). This may be known, estimated or inferred. A *known* population has had all individuals counted, while an *estimate* is based on some direct measurement and *inferred* generally means that a proxy has been used as an indirect measure. With fungi, we are invariably dealing with inferred measurements of populations.

Sub-populations are recognised as groups within the population that are geographically or otherwise distinct and between which there is little demographic or genetic exchange, where 'little exchange' is typically defined as one successful migrant individual or gamete per year or less. Genetic exchange for fungi is dependent on fungal spore dispersal, viability, associated organism proximity and sexual compatibility. We have few data on genetic exchange for fungi that would allow us to consistently define sub-population limits. Therefore, within Aotearoa New Zealand, we have assigned a 20-km buffer as a pragmatic unit of separation between sub-populations for all species.

The distribution of sub-populations is an important consideration. Small, isolated sub-populations (fragmented) have an increased extinction risk because of the limited potential for even the occasional dispersal of spores between sites within the fungal generation time (see below). Unless there is more specific information on limitations to the dispersal process, a population is considered **severely fragmented** if the sub-populations are separated by 500 km or more.

Fungi are dispersed via spores, which may be produced by either sexual or asexual processes and dispersed by various mechanisms. Spores may germinate under the right conditions to produce growing threads called hyphae. To produce sporocarps (containing sexual spores), the hyphae of compatible mating types that originated from different sexual spores need to meet and fuse. Fungi generally exist as networks of fungal hyphae compartmentalised into colonies. A mature colony (composed of compatible mating types) usually produces sexual spores (within sporocarps) or asexual spores (in structures that are usually less obvious than sporocarps). Therefore, separate fungal colonies in a sub-population may have arisen through different mechanisms: by physical fragmentation of an existing colony; by dispersal and growth of asexual propagules; or by dispersal and growth of sexual propagules. Consequently, different fungal colonies may have the same genetic identity (different clonal ramets within a single genet) or may represent different genotypes (multiple genets), and may be physically separate or contiguous.

The unit for threat listing should be the number of reproducing ramets (**mature individuals**) within the sub-population, regardless of the number of genets. However, it is usually impossible to directly determine the number of ramets, the number of genets or even the number of discrete colonies of sexually compatible hyphae growing cryptically within a substrate.

The term **functional individual** has been introduced for fungi as a pragmatic correlative unit of a fungal genet and is based on the distribution of easily observed sporocarps. For terrestrial fungi, as opposed to lignicolous fungi (on wood), we may conservatively assume that clusters of sporocarps separated by 10 m or more represent two different genets. Each of these genets

may be fragmented into several clonal ramets, with the degree of fragmentation (ramets per genet) depending on the fungal lifestyle (Dahlberg & Mueller 2011). We can provide a pragmatic estimate of the number of mature individuals (ramets) in a sub-population from observations of the distribution of sporocarps and the lifestyle of the fungus (Table 1). In practice, the distribution of sporocarps within a sub-population is rarely explicitly recorded and the advice of those familiar with the taxon should be sought. Where possible there should be surveys and ongoing monitoring of sub-populations associated with taxa identified as potentially at risk.

Table 1. Definition of mature individual for fungi with different lifestyles.

	NO. MATURE INDIVIDUALS = NO. GENETS × NO. RAMETS PER GENET	
LIFESTYLE	FUNCTIONAL INDIVIDUAL (NO. GENETS) DEFINITION	LIKELY NO. RAMETS PER GENET
Terrestrial fungi	A distance of 10 m	(2–)10
Lignicolous fungi	Each log	2(–10)
Discrete substrata (e.g. dung)	Each unit of substratum	1

To derive the totality of mature individuals in the population, we need to sum the mature individuals across all sub-populations at **known sites**, but it is also important to consider potential **undiscovered sites**. Fungal fruiting bodies are often difficult to detect due to their sporadic occurrence and usually rapid decay. It is therefore important that we estimate the potential for the undetected occurrence of the taxon in other suitable areas. An estimate for the number of undiscovered sites should consider the difficulty of observing the taxon, the difficulty of identifying the taxon, the distribution of suitable habitat/environments in which the taxon might occur, the known life history of the taxon and especially any host-specific associations, the survey/observation effort, and the expertise of those carrying out the surveying/observation. Estimating the number of undiscovered sites is associated with significant potential uncertainty, and expert judgment must be adopted and accepted. For the most recent assessment of lichenised fungi (de Lange et al. 2018), the population metrics were generally based on known sites, but lichens have long-lived and discrete thalli, and are relatively well surveyed.

To summarise, we can get some inferred measure of the totality of mature individuals in a fungal population from:

Population = (No. functional individuals × No. ramets per genet)
× (No. known sites + No. undiscovered sites)

It is important to emphasise, however, that such multiplicative expansion may lead to a potentially large and unquantified variance.

We also need to estimate changes to the population over a meaningful timescale which, for the threat-listing process, is generally taken as three **generation times**. The generation time is generally defined as the average age of the parents of the current cohort and provides a measure of the turnover rate of the population. Once again, however, this cannot be applied to fungi, so we instead use some estimate of the persistence of a fungal colony at a locality to achieve the same purpose. Persistence as a proxy for generation time is not ideal because we also have few data on the persistence of fungal colonies. It has been proposed that 20–50 years is an appropriate measure of persistence (three generation times), but this may be changed where more direct knowledge is available. We recommend that fungi known to be associated with ephemeral substrates and habitats are assigned a significantly shorter persistence than those with more stable lifestyles and habitats (e.g. beech forest mycorrhizal fungi).

The number of **locations** is often used as an important criterion in threat listing. Within the IUCN process, the term 'location' has a specific meaning that differs from common usage, being defined as the area in which one or more sub-populations may occur where a single event or single causative process might threaten the taxon. One example of this is the local impact of an invasive species.

2.5 IUCN extent of occurrence (EOO) and area of occupancy (AOO)

Measurements of the EOO and AOO are used under IUCN Criterion B (geographic range in the form of either B1(EOO) and/or B2 (AOO); IUCN 2012). The IUCN EOO is defined as the area contained within the shortest boundary that can be drawn around all the known and inferred (undiscovered) sites of the current occurrence. EOO is not a measure of the taxon range because it does not consider the fraction of viable habitat within the boundary, although it should exclude significant oceanic gaps – for example, a single EOO boundary would not include Australia and Aotearoa New Zealand if the taxon occurs in both countries. By contrast, the IUCN AOO represents the area of suitable habitat currently occupied (or inferred to be occupied) by the taxon. To ensure consistency across organism groups, this is defined as the total number of 2 × 2 km grid cells with suitable habitat across the taxon's distribution. Consequently, estimates of AOO require appropriately scaled habitat maps. Online tools are available to estimate EOO and AOO but do not generally accurately estimate habitat extent.

Area of occupancy is also used within the NZTCS but differs in definition, being taken as the total area of suitable habitat occupied by the taxon, without scaling.

3. Summary

This report presents the conservation status of 961 taxa of non-lichenised mushroom-like agarics, boletes and russuloid fungi that are found in the wild in Aotearoa New Zealand. The formal threat assessment protocol outlined in the sections above is labour intensive when applied to categories of fungi with very large numbers of species. Therefore, a triage methodology was developed to rapidly assess candidate taxa for more detailed assessment (see Appendix 1).

The expert panel also recommended additional taxa for detailed assessment that were not identified as candidate taxa through the triage process. Ideally, these candidate taxa should have been subject to a period of surveillance and monitoring to allow their population metrics to be accurately quantified although, in practice, the resources were usually not available to carry out this level of scrutiny. Taxa assigned a candidate conservation status through the initial triage process described in Appendix 1 were then assessed in detail using the formal assessment process.

3.1 Change to the list of taxa

Hitchmough (2002) listed the conservation status of 424 indigenous taxa of agarics, boletes and russuloid fungi in Aotearoa New Zealand, using the criteria specified by Molloy et al. (2002). Twenty-nine of these taxa were not assessed in the present report because either they are absent from Aotearoa New Zealand, their presence is uncertain or their name is of uncertain taxonomic application (*nomen dubium*) (Table 2). These taxa have now been permanently removed from the NZTCS listing. Sixteen taxa of agarics that were assessed in Hitchmough (2002) are now considered to be conspecific with other species that were also assessed at that time (Table 3).

Here, we report on a new assessment of 961 taxa using the criteria specified in the current NZTCS manual (Townsend et al. 2008). This assessment includes 363 out of the 424 taxa of non-lichenised mushroom-like agarics, boletes and russuloid fungi previously assessed in Hitchmough (2002). A total of 598 taxa are assessed for the first time. In addition, 104 taxa of agarics and two taxa of russuloid fungi have changed name since the publication of Hitchmough (2002) (Table 4), and 160 taxa are considered to be taxonomically unresolved (taxa that either are undescribed or have an uncertain taxonomic status).

Table 2. Taxa that were assessed in Hitchmough (2002) but are now excluded from the New Zealand Threat Classification System listing, and the reasons for their removal. Abbreviations: DD = Data Deficient, NC = Nationally Critical.

NAME IN HITCHMOUGH (2002)	NAME IN 2021	2002 STATUS	REASONS FOR NOT BEING ASSESSED IN THIS REPORT
Agarics			
Agrocybe howeana		DD	Presence uncertain
Calvatia candida	*Calvatia fusca*	DD	Presence uncertain
Collybia vinacea	*Gymnopus vinaceus*	DD	*Nomen dubium* (name uncertain)
Coprinus hemerobius	*Parasola hemerobia*	DD	*Nomen dubium* (name uncertain)
Cortinarius acutus		DD	Absent from Aotearoa New Zealand
Cortinarius sinapicolor		DD	Absent from Aotearoa New Zealand
Crinipellis micropilus	*Marasmius micropilus*	DD	*Nomen dubium* (name uncertain)
Cystoderma amianthinum		DD	Absent from Aotearoa New Zealand
Dermocybe aurantiocastanea	*Cortinarius* "aurantiocastanea"	DD	Not validly published
Dermocybe aurata		DD	Not validly published
Dermocybe cinnabarina	*Cortinarius cinnabarinus*	DD	Absent from Aotearoa New Zealand
Dermocybe viscida		DD	Not validly published
Entoloma cephalocystis		DD	Not validly published
Entoloma psittacinum		DD	Absent from Aotearoa New Zealand
Gymnopilus hanmerensis	*Pholiota multicingulata* var. *hanmerensis*	DD	Assessed at species level
Hygrophorus turundus	*Hygrocybe turunda*	DD	Absent from Aotearoa New Zealand
Inocybe luteobulbosa var. *luteobulbosa*		DD	Assessed at species level
Inocybe luteobulbosa var. *volvata*		DD	Assessed at species level
Marasmius aurantiobasalis var. *aurantiobasalis*		DD	Assessed at species level
Marasmius bellus		DD	Absent from Aotearoa New Zealand
Mycena hygrophora		DD	*Nomen dubium* (name uncertain)
Mycena pura		DD	Absent from Aotearoa New Zealand
Phaeomycena fusca		DD	*Nomen dubium* (name uncertain)
Pluteus spegazzinianus		DD	Absent from Aotearoa New Zealand
Protoglossum violaceum	*Cortinarius subviolaceus*	DD	Presence uncertain
Thaxterogaster viola	*Cortinarius violaceovolvatus* var. *viola*	DD	Assessed at species level
Tricholoma bubalinum		DD	*Nomen dubium* (name uncertain)
Tricholoma saponaceum var. *squamosum*		DD	Absent from Aotearoa New Zealand
Boletes			
Gyroporus castaneus	*Gyroporus* cf. *castaneus*	NC	Recorded in error

Table 3. Taxa that were assessed in Hitchmough (2002) but are treated as conspecific with other taxa assessed in the present report.

TAXON IN HITCHMOUGH (2002)	CONSPECIFIC TAXON IN THIS REPORT	FAMILY
Collybia druceae	*Rhodocollybia purpurata*	Omphalotaceae
Cortinarius anauensis	*Cortinarius marmoratus*	Cortinariaceae
Entoloma parsonsiae	*Entoloma translucidum*	Entolomataceae
Entoloma rubescentipes	*Entoloma phaeomarginatum*	Entolomataceae
Entoloma rubromarginatum	*Entoloma melanocephalum*	Entolomataceae
Entoloma viridomarginatum var. *milfordense*	*Entoloma viridomarginatum*	Entolomataceae
Flammulaster foliicola	*Flammulaster pulveraceus*	Tubariaceae
Hohenbuehelia luteohinnulea	*Hohenbuehelia luteola*	Pleurotaceae
Hohenbuehelia podocarpinea	*Hohenbuehelia brunnea*	Pleurotaceae
Hypholoma stuppeum	*Lacrymaria asperospora*	Psathyrellaceae
Lepiota exstructa	*Macrolepiota clelandii*	Agaricaceae
Mycena ochracea	*Mycena olivaceomarginata*	Mycenaceae
Mycena subfragillima	*Mycena olivaceomarginata*	Mycenaceae
Pleurotopsis roseola	*Scytinotus longinquus*	Pleurotaceae
Pleurotopsis subgrisea	*Scytinotus longinquus*	Pleurotaceae
Thaxterogaster ohauensis	*Cortinarius novae-zelandiae* ined.	Cortinariaceae

Table 4. Name changes affecting taxa of agarics, boletes and russuloid fungi in Aotearoa New Zealand between the publication of Hitchmough (2002) and the present report.

NAME IN HITCHMOUGH (2002)	NAME IN THIS REPORT	FAMILY
Agarics		
Agaricus bambusae var. *australis*	*Agaricus horakianus*	Agaricaceae
Cheimonophyllum roseum	*Arrhenia rosea* ined.	Hygrophoraceae
Calocybe readiae	*Calocybe carnea*	Lyophyllaceae
Hygrotrama roseolum	*Camarophyllopsis roseola*	Clavariaceae
Clavogaster novozelandicus	*Clavogaster virescens*	Strophariaceae
Clitocybe dealbata	*Clitocybe rivulosa*	Clitocybaceae
Coprinus colensoi	*Coprinopsis stercorea*	Psathyrellaceae
Cortinarius alboserrulatus ined.	*Cortinarius alboaggregatus*	Cortinariaceae
Dermocybe alienata	*Cortinarius alienatus*	Cortinariaceae
Thaxterogaster anisodorus	*Cortinarius anisodorus*	Cortinariaceae
Dermocybe aurantiella	*Cortinarius aurantiellus*	Cortinariaceae
Dermocybe cardinalis	*Cortinarius cardinalis*	Cortinariaceae
Thaxterogaster cartilagineus	*Cortinarius cartilagineus*	Cortinariaceae
Thaxterogaster coneae	*Cortinarius coneae*	Cortinariaceae
Dermocybe cramesina	*Cortinarius cramesinus*	Cortinariaceae
Gigasperma cryptica	*Cortinarius crypticus*	Cortinariaceae
Cuphocybe melliolens	*Cortinarius dulciolens*	Cortinariaceae
Dermocybe egmontiana	*Cortinarius egmontianus*	Cortinariaceae
Rozites fusipes	*Cortinarius elacatipus*	Cortinariaceae
Thaxterogaster epiphaeus	*Cortinarius epiphaeus*	Cortinariaceae
Thaxterogaster leoninus	*Cortinarius flavidulus*	Cortinariaceae
Dermocybe icterinoides	*Cortinarius icterinoides*	Cortinariaceae
Dermocybe indotata	*Cortinarius indotatus*	Cortinariaceae
Cortinarius exlavatus	*Cortinarius ionomataius*	Cortinariaceae
Dermocybe largofulgens	*Cortinarius largofulgens*	Cortinariaceae
Dermocybe leptospermarum	*Cortinarius leptospermorum*	Cortinariaceae
Thaxterogaster leucocephalus	*Cortinarius leucocephalus*	Cortinariaceae

Continued on next page

Table 4 continued

NAME IN HITCHMOUGH (2002)	NAME IN THIS REPORT	FAMILY
Thaxterogaster luteolus	*Cortinarius luteobrunneus*	Cortinariaceae
Thaxterogaster nivalis	*Cortinarius nivalis*	Cortinariaceae
Austrogaster novae-zelandiae	*Cortinarius novae-zelandiae* ined.	Cortinariaceae
Dermocybe olivaceonigra	*Cortinarius olivaceoniger*	Cortinariaceae
Dermocybe splendida	*Cortinarius persplendidus*	Cortinariaceae
Thaxterogaster pisciodorus	*Cortinarius pisciodorus*	Cortinariaceae
Dermocybe purpurata	*Cortinarius rubripurpuratus*	Cortinariaceae
Rozites rugosiceps	*Cortinarius rugosiceps*	Cortinariaceae
Thaxterogaster carneolus	*Cortinarius sarcinochrous*	Cortinariaceae
Cortinarius rotundisporus subsp. *nothofagi*	*Cortinarius tessiae*	Cortinariaceae
Dermocybe vinicolor	*Cortinarius vinicolor*	Cortinariaceae
Thaxterogaster violaceovolvatus	*Cortinarius violaceovolvatus*	Cortinariaceae
Mycena viscidocruenta	*Cruentomycena viscidocruenta*	Mycenaceae
Marasmius exustoides	*Cryptomarasmius exustoides*	Physalacriaceae
Marasmius fishii	*Cryptomarasmius fishii*	Physalacriaceae
Marasmius micraster	*Cryptomarasmius micraster*	Physalacriaceae
Marasmius rhopalostylidis	*Cryptomarasmius rhopalostylidis*	Physalacriaceae
Camarophyllus griseorufescens	*Cuphophyllus griseorufescens*	Hygrophoraceae
Xerulina asprata	*Cyptotrama asprata*	Physalacriaceae
Nivatogastrium baylisianum	*Deconica baylisiana*	Strophariaceae
Melanotus citrisporus	*Deconica citrispora*	Strophariaceae
Psilocybe novaezelandiae	*Deconica novae-zelandiae*	Strophariaceae
Melanotus vorax	*Deconica vorax*	Strophariaceae
Entoloma pteridicola	*Entoloma chloroxanthum*	Entolomataceae
Eccilia haeusleriana	*Entoloma haeuslerianum*	Entolomataceae
Entoloma aromaticum f. *minimum*	*Entoloma imbecille*	Entolomataceae
Entoloma decolorans	*Entoloma melanocephalum*	Entolomataceae
Entoloma parsonsiae	*Entoloma translucidum*	Entolomataceae
Entoloma perzonatum	*Entoloma translucidum*	Entolomataceae
Entoloma caesiomarginatum	*Entoloma viridomarginatum*	Entolomataceae
Hygrophorus waikanaensis	*Gerronema waikanaense*	Porotheleaceae
Collybia stevensoniae	*Gymnopus villosipes*	Omphalotaceae
Heimiomyces neovelutipes	*Heimiomyces velutipes*	Agaricales *incertae sedis*
Hohenbuehelia metuloidea	*Hohenbuehelia parsonsiae*	Pleurotaceae
Oudemansiella japonica var. *colensoi*	*Hymenopellis colensoi*	Physalacriaceae
Astrosporina aequalis	*Inocybe aequalis*	Inocybaceae
Astrosporina amygdalina	*Inocybe amygdalina*	Inocybaceae
Astrosporina graveolens	*Inocybe graveolens*	Inocybaceae
Astrosporina avellana	*Inocybe horakomyces*	Inocybaceae
Astrosporina leptospermi	*Inocybe leptospermi*	Inocybaceae
Astrosporina manukanea	*Inocybe manukanea*	Inocybaceae
Astrosporina paracerasphora	*Inocybe paracerasphora*	Inocybaceae
Astrosporina straminea	*Inocybe straminea*	Inocybaceae
Astrosporina subclavata	*Inocybe subclavata*	Inocybaceae
Astrosporina viscata	*Inocybe viscata*	Inocybaceae
Inocybe latericia	*Inosperma latericium*	Inocybaceae
Stropharia lepiotiformis	*Lacrymaria asperospora*	Psathyrellaceae
Rhodocybe antipoda	*Lepista antipoda*	Clitocybaceae
Agaricus campigenus	*Macrolepiota clelandii*	Agaricaceae

Continued on next page

Table 4 continued

NAME IN HITCHMOUGH (2002)	NAME IN THIS REPORT	FAMILY
Marasmius podocarpi	*Marasmius podocarpicola*	Marasmiaceae
Mycena conicola	*Mycena filopes*	Mycenaceae
Insiticia flavovirens	*Mycena flavovirens*	Mycenaceae
Mycena leaiana	*Mycena leaiana* var. *australis*	Mycenaceae
Fayodia granulospora	*Mycena olivaceomarginata*	Mycenaceae
Crinipellis roseola	*Mycena stevensoniae*	Mycenaceae
Mycena pinicola	*Mycena vinacea*	Mycenaceae
Marasmius curraniae	*Mycetinis curraniae*	Omphalotaceae
Lepiota purpurata	*Rhodocollybia purpurata*	Omphalotaceae
Pholiota squarrosoides	*Pholiota subflammans*	Strophariaceae
Conocybe gracilenta	*Pholiotina gracilenta*	Bolbitiaceae
Conocybe novae-zelandiae	*Pholiotina novae-zelandiae*	Bolbitiaceae
Hydropus ardesiacus	*Pleurella ardesiaca*	Cyphellaceae
Pouzaromyces minutus	*Pouzarella minuta*	Entolomataceae
Stropharia semiglobata	*Protostropharia semiglobata*	Strophariaceae
Omphalina foetida	*Pseudoclitocybe foetida*	Pseudoclitocybaceae
Inocybe renispora	*Pseudosperma renisporum*	Inocybaceae
Stigmatolemma huia	*Resupinatus huia*	Pleurotaceae
Marasmiellus violaceogriseus	*Resupinatus violaceogriseus*	Pleurotaceae
Clitocybe albida	*Rhizocybe albida*	Lyophyllaceae
Marasmius delicatus	*Rhodocollybia delicata* ined.	Omphalotaceae
Collybia druceae	*Rhodocollybia purpurata*	Omphalotaceae
Melanoleuca vinosa	*Ripartitella* sp. *'Totaranui'*	Agaricales *incertae sedis*
Panellus crawfordiae	*Scytinotus longinquus*	Porotheleaceae
Phaeomarasmius aureosimilis	*Tubaria aureosimilis*	Tubariaceae
Phaeomarasmius hispidulus	*Tubaria hispidula*	Tubariaceae
Phaeomarasmius lanatulus	*Tubaria lanatula*	Tubariaceae
Phaeomarasmius verrucipes	*Tubaria verrucipes*	Tubariaceae
Russuloid fungi		
Lentinellus marginatus	*Lentinellus novae-zelandiae*	Auriscalpiaceae
Russula littoralis	*Russula littorea*	Russulaceae

3.2 Trends

Of the 961 taxa assessed in this report, 44 (4.6%) are Threatened, 3 (0.3%) are At Risk and 330 (34.3%) are Not Threatened (Table 5). New information on 135 taxa previously assessed as Data Deficient (Hitchmough 2002) was sufficient to determine their conservation status in the present assessment (Tables 6 & 7). Of these, 19 taxa are Threatened, including 1 that is Nationally Critical; 1 taxon is At Risk; and 97 taxa are Not Threatened. Nineteen species that were previously believed to be native to Aotearoa New Zealand are now understood to be exotic and so are reported as Introduced and Naturalised in this assessment.

Nine taxa that were previously assessed as Threatened – Nationally Critical (Hitchmough 2002) have an improved status because of a better understanding of their potential distributions (Tables 6 & 7). This includes *Russula pleurogena,* which is Threatened – Nationally Endangered; *Squamanita squarrulosa,* which is At Risk – Naturally Uncommon; *Volvariella surrecta,* which is Introduced and Naturalised; and *Cortinarius cartilagineus, Chalciporus aurantiacus, Russula papakaiensis, Russula miniata, Russula littorea* and *Russula inquinata,* which are Not Threatened.

Of the 598 newly listed taxa, 23 (3.8%) are Threatened, 1 (0.2%) is At Risk and 228 (38.1%) are Not Threatened.

Table 5. Comparison of the status of taxa of agarics, boletes and russuloid fungi in Aotearoa New Zealand listed in 2002 (Hitchmough 2002) and re-assessed in 2021 (this report).

CATEGORY	2002				2021			
	AGARICS	BOLETES	RUSSULOID FUNGI	TOTAL	AGARICS	BOLETES	RUSSULOID FUNGI	TOTAL
Data Deficient	396	8	6	410	546	7	12	565
Threatened – Nationally Critical	4	2	8	14	1			1
Threatened – Nationally Endangered						1	1	2
Threatened – Nationally Vulnerable					30	3	8	41
At Risk – Naturally Uncommon					2		1	3
Not Threatened					280	16	34	330
Introduced and Naturalised*					19			19
Total	400	10	14	424	878	27	56	961

* Only taxa that were listed in Hitchmough (2002) and have since been identified as exotic are reported as Introduced and Naturalised in this assessment; all other exotic taxa of fungi are omitted.

Table 6. Summary of changes to the number of taxa of agarics, boletes and russuloid fungi assigned to each conservation status between 2002 (Hitchmough 2002) and 2021 (this report). A 'neutral' change is any movement into or out of Data Deficient.

TYPE OF CHANGE, REASON AND CONSERVATION STATUS	AGARICS	BOLETES	RUSSULOID FUNGI	TOTAL
BETTER	**3**	**1**	**5**	**9**
More knowledge	**3**	**1**	**5**	**9**
Nationally Endangered			1	1
Naturally Uncommon	1			1
Not Threatened	1	1	4	6
Introduced and Naturalised	1			1
NEUTRAL	**132**	**1**	**6**	**139**
Greater uncertainty	**1**		**3**	**4**
Data Deficient	1		3	4
More knowledge	**131**	**1**	**3**	**135**
Nationally Critical	1			1
Nationally Vulnerable	16	1	1	18
Naturally Uncommon	1			1
Not Threatened	95		2	97
Introduced and Naturalised	18			18
NO CHANGE	**211**	**3**	**1**	**215**
Data Deficient	211	3	1	215
NEW LISTING	**532**	**22**	**44**	**598**
Data Deficient	334	4	8	346
Nationally Endangered		1		1
Nationally Vulnerable	14	2	7	23
Naturally Uncommon			1	1
Not Threatened	184	15	28	227
TOTAL	**878**	**27**	**56**	**961**

Table 7. Summary of status changes of taxa of agarics, boletes and russuloid fungi between 2002 (data in rows; Hitchmough 2002) and 2021 (data in columns; this report). Numbers to the right of the diagonal (shaded green) indicate an improved status (e.g. one taxon has moved from Threatened – Nationally Critical in 2002 to Threatened – Nationally Endangered in 2021), numbers to the left of the diagonal (shaded pink) indicate a poorer status, numbers on the diagonal (shaded black) have not changed, and numbers without shading are taxa that either have moved into or out of Data Deficient, have been added to this assessment, or are no longer considered to be distinct (TI) from other taxa in this report.

		CONSERVATION STATUS 2021									
		Total	DD	NC	NE	NV	NU	NT	IN*	NA†	TI‡
		1006	**565**	**1**	**2**	**41**	**3**	**330**	**19**	**29**	**16**
CONSERVATION STATUS 2002	Data Deficient (DD)	**394**	215	1		18	1	97	18	28	16
	Threatened – Nationally Critical (NC)	**14**	4		1		1	6	1	1	
	Threatened – Nationally Endangered (NE)	**0**									
	Threatened – Nationally Vulnerable (NV)	**0**									
	At Risk – Naturally Uncommon (NU)	**0**									
	Not Threatened (NT)	**0**									
	Introduced and Naturalised (IN)	**0**									
	New listing	**598**	346	0	1	23	1	227	0		

* Only taxa that were listed in Hitchmough (2002) and have since been identified as exotic are reported as Introduced and Naturalised in this assessment; all other exotic taxa of fungi are omitted.

† Not Assessed taxa are listed in Table 2.

‡ Taxonomically Indistinct taxa are listed in Table 3.

3.3 Assessments of the principal threatened taxa

Brief definitions of the criteria and qualifiers used in the assessments outlined below are provided in section 4.2 below, while the qualifier abbreviations are explained in section 4.2.1.

Anthracophyllum pallidum

At Risk – Naturally Uncommon
Qualifiers: DPS, DPT, RR

Anthracophyllum pallidum is a rarely recorded shell-like species of fungus with pinkish gills that is specifically associated with dead and living attached branches of the coastal shrub *Olearia furfuracea*, which has a large and stable population in the northern half of the North Island of Aotearoa New Zealand. Other similar but common species have occasionally been misidentified as this species, specifically *Campanella* spp. and *Gymnopus* spp. Shell-like species growing at eye-level on living trees attract attention and are regularly reported.

There are three known sites for this fungus: one close to Auckland, another on a small and uninhabited island in The Noises group in the Hauraki Gulf, and a third in the Gisborne region. However, it has not been seen since 1998 despite targeted surveying. Considering its high detectability and specific host requirements, 50 sites is a reasonable estimate to account for unknown sites. Each site would be expected to have three functional individuals, each representing three mature individuals, giving a total population size estimate of 450 individuals.

Of the three known sites, the first site has legal protection but occurs in an area that is subject to kauri die-back, with potential changes to habitat, and is a tourist destination close to the major centre of Auckland; the second site on a small and uninhabited island in the Hauraki Gulf appears to be relatively secure; and the third site in the Gisborne region occurs in a small patch of native bush surrounded by intensive farming. No population decline is currently known, but monitoring is recommended.

Deconica baylisiana

Threatened – Nationally Critical A(1)
Qualifiers: CI, CR, DPS, DPT, RR, Sp

This species was originally described as *Nivatogastrium baylisianum* by Egon Horak from a collection made by Trevor Baylis in the Rock and Pillar Range (900 m) in Otago and a subsequent collection from Mt Rakeahua on Stewart Island/Rakiura, both in 1969.

Deconica baylisiana is a saprophytic secotioid (pouch or truffle-like) fungus that is endemic in southern Aotearoa New Zealand. It is the only such species in Aotearoa New Zealand associated with alpine grassland and is easily seen and recognised due to its bright colour in open habitat. The species has been sequence barcoded and is phylogenetically well characterised. Truffle-like species have been extensively surveyed in Aotearoa New Zealand for over 50 years. They do not have active spore dispersal, instead relying on animal vectors, and those that are found in forests are presumed to be dispersed by flightless birds like the extinct moa and threatened kiwi and kākāpō. The identity of the vector for this upland species is unknown but is likely to be extinct or threatened. In addition, as an alpine species, it is likely to be negatively impacted by climate change.

This species is known from five records of only a few sporocarps at five sites over an 83-year period. It should be noted that one of the sites was only recently discovered and post-dates the current IUCN assessment. Based on this, we infer the presence of five genotypes, which has been multiplied by 3 to account for unrecorded individuals at the known sites and then 2–5 to convert this to the number of mature individuals, giving 30–75 mature individuals present at

the known sites. Considering this is a conspicuous fungus found in very specific habitats, a multiplier of 2 is considered appropriate to account for unknown sites, giving a total estimate of 60–150 mature individuals. Suitable habitat in alpine southern Aotearoa New Zealand should be surveyed to assess the validity of the estimate of unknown sites.

Hygrophoropsis umbriceps

Threatened – Nationally Vulnerable
Qualifier: De

Hygrophoropsis umbriceps is an uncommon but rather easily recognised mushroom. Historically, the name has been incorrectly used for another rather more common but easily distinguished and undescribed mushroom. Therefore, care is required when interpreting historical data.

This species is only known from five confirmed records at five sites in the northern half of Aotearoa New Zealand. Although the species is reasonably easily detected, it has only been recorded once among 25 000 curated iNaturalist postings. Given that it is probably rare but under-reported, it is estimated that there are no more than 500 sites in total, each with five colonies representing three mature individuals, giving a total estimated population size of no more than 7500 mature individuals occurring in two sub-populations.

Hygrophoropis umbriceps grows on soil in scrub containing tea tree (Myrtaceae). The species is probably ectomycorrhizal, but some species in the genus are known to be able to switch nutritional modes to saprotrophism. The five known sites are/were all relatively small patches of native bush surrounded by developed land, and the type locality in the South Island has been cleared for pasture and one historic site in Auckland has now been developed for housing. Only one site is on protected land.

Tea tree scrub is currently widespread throughout much of Aotearoa New Zealand, but is in decline and becoming highly fragmented in some areas due to land transformation to farming and forestry. The quality of remaining isolated fragments is also decreasing in some areas due to invasive species coupled with nutrient runoff from adjacent intensive farming. In addition, tea tree species are currently classified as Nationally Vulnerable due to the perceived future impact of myrtle rust. Consequently, all fungi with a specific association with tea tree are minimally assessed as Nationally Vulnerable but many are likely under threat independently of the projected consequences of myrtle rust.

Lactarius novae-zelandiae

At Risk – Naturally Uncommon

The macroscopic appearance of this taxon is striking, and the fact that there was a 44-year gap between the initial records (1968–1971) and subsequent records (2015–2018) suggests it is uncommon. There has been extensive surveying of the Russulaceae by Ross McNabb in the 1960/70s and by Jerry Cooper and Pat Leonard from 2005 onwards, and there are three known and extant sub-populations of this species. The single original locality from which the species was described (Karamea) has been lost due to the conversion of forest habitat to pasture.

The species was originally assessed by the IUCN in 2017 as Endangered under Criterion B. The geographic range for B2 Area of occupancy (NZ 18 km^2) met subcriterion (a) Severely fragmented, with one currently known population at the time near Lower Hutt in the North Island. It has not been re-collected at the type locality of Karamea in the South Island despite extensive searching over many years.

Since 2017, two additional locations in Nelson and Buller have been identified and confirmed from sequence data. These locations significantly change the value of the area of occupancy (AOO of known sites), making the 2017 IUCN assessment of Endangered no longer

appropriate. The distribution of records suggests some degree of regional restriction, but as an associate of beech, the potential distribution of this species remains considerable, and there is no reason to suspect population decline. For that reason, the panel re-assessed this species as Naturally Uncommon.

Macrocystidia reducta

Threatened – Nationally Vulnerable C(1)
Qualifiers: CR, DPS, DPT

Macrocystidia reducta is the only secotioid member of a genus with perhaps just four currently known species described globally in a monotypic family of currently unresolved position within the Agaricales. In other words, *M. reducta* is very distinct in evolutionary terms. Like other species of *Macrocystidia*, the species has a distinct odour of fish oil or linseed oil. Its sporocarps are typically associated with well-drained (often sloping), bare soil under dense indigenous bush (dominated by tea tree and podocarps). It is known from several sites but only within the ecological districts of Banks Peninsula and the Port Hills in Canterbury. It is perhaps the best surveyed threat-listed species in Aotearoa New Zealand, with numerous dedicated search efforts over 18 years in suitable habitats in Canterbury and nationally. These searches have revealed a related and undescribed species (*Macrocystida* sp. 'Pennycook'), but this remains Data Deficient. Like the truffle *Deconica baylisiana*, the vector for spore dispersal is unknown and may be reduced or absent, which will impact on the genetic diversity within sub-populations.

Each known site is relatively small and estimated to contain up to 10 genets, with five ramets per genet, corresponding to 50 mature individuals per site. This species is potentially present at up to 30 sites, including an estimate of undiscovered sites, giving an estimated maximum size of the known population of 1500 mature individuals.

The remaining podocarp fragments in Aotearoa New Zealand are under threat from surrounding pastures, which are intensively farmed. The impact of eutrophication through run-off and invasion by coarse grasses into known sites is also a concern, with the area of suitable habitat (i.e. 'bare soil') within these remnants decreasing.

Russula albolutescens

Threatened – Nationally Vulnerable
Qualifiers: De, DPS, DPT

Russula albolutescens is one of the more recognisable but uncommon species of *Russula*, a genus that has been extensively surveyed and studied in Aotearoa New Zealand over a period of 60 years. This fungus has been recorded 23 times at seven localities, four of which are in unprotected areas with < 30% indigenous cover (indicating past clearance) adjacent to pasture grassland. The type locality, and centre of most records, is west of Auckland, and the original location from 1967 is now a built-up area, while another has been cleared of tea tree. Over the last 5 years, 2500 observers have recorded 54 000 observations of fungi in Aotearoa New Zealand using the iNaturalist platform, 20 000 of which have been verified by multiple experts. This mushroom has been recorded just twice. Despite this increased level of recording, there is a strong possibility of multiple undiscovered sites. Considering the broad geographic extent of the host, we estimate a total of 1000 potential sites. Assuming three genets per site (each representing 10 mature individuals), we estimate a maximum of 30 000 mature individuals.

As a strict mycorrhizal associate of tea tree, this species is designated the same conservation status as the host plant, in a similar way to other associates listed here (e.g. *Hygrophoropsis umbriceps*).

Russula pleurogena

Threatened – Nationally Endangered C(1)
Qualifiers: DPS, DPT

Russula pleurogena is a small, brown species that is recognised by its eccentric stem and habitat but is otherwise rather indistinct and may be overlooked. It is a strict mycorrhizal associate of tea tree. The genus *Russula* has been extensively surveyed and studied in Aotearoa New Zealand over a period of 60 years and this species has not been re-found since the original collection in 1981.

This fungus has only been recorded once from a single site. Considering that several other related species are restricted to the northern North Island, it is reasonable to believe that this species is similarly restricted. We estimate 100 sites, including undiscovered sites, as a likely maximum. From the lifestyle of this fungus, we infer the presence of three genotypes per site each representing five mature individuals, giving a maximum estimate of 1500 mature individuals.

Squamanita squarrulosa

At Risk – Naturally Uncommon
Qualifiers: CR, DPS, DPT

The genus *Squamanita* has a global distribution but none of its species are common anywhere on Earth. *Squamanita* species are parasites of other mushrooms, often species of the related *Cystoderma*, which are present in many habitat types. *Squamanita squarrulosa* is an Aotearoa New Zealand endemic that is known from just two sites, and its host remains unknown. The species is potentially threatened but difficult to assess with certainty due to the unusual and uncertain life history and sporadic distribution records of all species in the genus.

Xerocomus griseoolivaceus

Threatened – Nationally Endangered C(1)
Qualifiers: DPS, DPT

Xerocomus griseoolivaceus is known with certainty from only three records, all from the same locality in the Waitākere Ranges. All known sites are in areas of bush directly adjacent to pasture farmland.

Considering that several other related species are restricted to the northern North Island, it is reasonable to believe that this species is similarly restricted. We estimate 100 sites, including undiscovered sites, as a likely maximum. From the lifestyle of this fungus, we infer the presence of three genotypes per site each representing five mature individuals, giving a maximum estimate of 1500 mature individuals.

As a strict mycorrhizal associate of tea tree, this species may be affected by decline in the host taxa due to myrtle rust.

4. Conservation status of 961 taxa of non-lichenised mushroom-like agarics, boletes and russuloid fungi in Aotearoa New Zealand

4.1 Assessments

Taxa were assessed according to the criteria of Townsend et al. (2008) and have been grouped in Table 8 by conservation status and then alphabetically by scientific name. Categories are ordered by degree of loss, with Data Deficient at the top of the list and Not Threatened at the bottom, above Introduced and Naturalised.

Brief descriptions of the NZTCS categories and criteria are provided in section 4.2. See Townsend et al. (2008)[8] and Rolfe et al. (2021)[9] for further details.

The full data for the assessments listed in Table 8 can be viewed and downloaded from the NZTCS website (https://nztcs.org.nz/reports/1112).

Table 8. Conservation status of 961 taxa of non-lichenised mushroom-like agarics, boletes and russuloid fungi in Aotearoa New Zealand.

Qualifiers are abbreviated as follows: CI = Climate Impact, CR = Conservation Research Needed, De = Designated, DPR = Data Poor Recognition, DPS = Data Poor Size, DPT = Data Poor Trend, IE = Island Endemic, OL = One Location, RR = Range Restricted, SO = Secure Overseas, Sp = Sparse.

Designated (De) indicates taxa for which the conservation status has been designated by the panel. This may be due to the current conservation status of the host species. For example, many ectomycorrhizal species associated with mānuka (*Leptospermum* spp.) and kānuka (*Kunzea* spp.) are designated Threatened – Nationally Vulnerable because of the potential impact of myrtle rust.

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
DATA DEFICIENT (565)			
Taxonomically determinate (417)			
Agarics (406)			
Aeruginospora furfuracea	Hygrophoraceae		No change
Agaricus campbellensis	Agaricaceae		New listing
Agaricus horakii	Agaricaceae	DPR	No change
Agaricus kroneanus	Agaricaceae	DPR, SO	No change
Agaricus lanatoniger	Agaricaceae	DPR	No change
Agaricus oligocystis	Agaricaceae	OL	No change
Agaricus purpureoniger	Agaricaceae	DPR, OL	No change
Agaricus subantarcticus	Agaricaceae	IE	New listing
Agaricus thujae	Agaricaceae	DPR, SO	New listing
Agrocybe olivacea	Strophariaceae		No change
Amanita karea	Amanitaceae		New listing
Amanita mumura	Amanitaceae		New listing
Anastrophella macrospora	Physalacriaceae	DPR	No change
Anthracophyllum glaucophyllum	Omphalotaceae	DPR	No change
Armillaria aotearoa	Physalacariaceae		New listing

Continued on next page

[8] www.doc.govt.nz/globalassets/documents/science-and-technical/sap244.pdf

[9] www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs-supplement-2021.pdf

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Armillaria hinnulea	Physalacariaceae		New listing
Arrhenia rosea ined.	Hygrophoraceae		No change
Calyptella hebe	Porotheleaceae	OL	No change
Camarophyllopsis roseola	Clavariaceae		No change
Camarophyllus apricosus	Hygrophoraceae	DPR	New listing
Camarophyllus aurantiopallens	Hygrophoraceae	DPR	New listing
Camarophyllus canus	Hygrophoraceae	DPR	No change
Camarophyllus delicatus	Hygrophoraceae	DPR	No change
Camarophyllus impurus	Hygrophoraceae	DPR	No change
Camarophyllus muritaiensis	Hygrophoraceae	DPR	No change
Camarophyllus patinicolor	Hygrophoraceae	DPR	No change
Cantharellula waiporiensis	Hygrophoraceae	DPR	No change
Clitocybe brunneocaperata	Clitocybaceae		New listing
Clitocybe wellingtonensis	Clitocybaceae	DPR	No change
Clitocybula grisella	Porotheleaceae	DPR	No change
Clitopilus kamaka	Emtolomataceae		New listing
Collybiopsis rimutaka	Omphalotaceae	DPR	New listing
Conocybe echinata	Bolbitiaceae		New listing
Conocybe horakii	Bolbitiaceae	DPR	No change
Coprinopsis austrophlyctidospora	Psathyrellaceae		New listing
Cortinarius aegrotus	Cortinariaceae	DPR	No change
Cortinarius aerugineoconicus	Cortinariaceae	DPR, DPS	No change
Cortinarius amblyonis	Cortinariaceae		New listing
Cortinarius anisodorus	Cortinariaceae	DPR	No change
Cortinarius araniiti	Cortinariaceae		New listing
Cortinarius artosus	Cortinariaceae		New listing
Cortinarius atrolazulinus	Cortinariaceae		No change
Cortinarius atropileatus	Cortinariaceae		New listing
Cortinarius aurantiellus	Cortinariaceae	DPR	No change
Cortinarius basifibrillosus ined.	Cortinariaceae	DPR	New listing
Cortinarius calaisopus	Cortinariaceae		New listing
Cortinarius carneipallidus	Cortinariaceae		New listing
Cortinarius caryotoides	Cortinariaceae		New listing
Cortinarius castaneiceps	Cortinariaceae		No change
Cortinarius castaneodiscus	Cortinariaceae		New listing
Cortinarius chlorophyllus	Cortinariaceae		New listing
Cortinarius chrysma	Cortinariaceae	DPR	No change
Cortinarius chrysoconius	Cortinariaceae		New listing
Cortinarius citribasalis	Cortinariaceae		New listing
Cortinarius crypticus	Cortinariaceae		No change
Cortinarius cuphocyboides	Cortinariaceae		New listing
Cortinarius cuphomorphus	Cortinariaceae		New listing
Cortinarius cycneus	Cortinariaceae		No change
Cortinarius cypripedii	Cortinariaceae		New listing
Cortinarius dulcamarus	Cortinariaceae		New listing
Cortinarius dulciolens	Cortinariaceae	DPR	No change
Cortinarius dulciorum	Cortinariaceae		New listing
Cortinarius durifoliorum	Cortinariaceae		New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Cortinarius elacatipus	Cortinariaceae		No change
Cortinarius elaiochrous	Cortinariaceae		New listing
Cortinarius elaiops	Cortinariaceae		New listing
Cortinarius entheosus	Cortinariaceae		New listing
Cortinarius eucollybianus	Cortinariaceae		New listing
Cortinarius eutactus	Cortinariaceae		New listing
Cortinarius exlugubris	Cortinariaceae		No change
Cortinarius fiordlandensis	Cortinariaceae		New listing
Cortinarius flavidulus	Cortinariaceae		No change
Cortinarius gymnocephalus	Cortinariaceae		New listing
Cortinarius hebelomaticus ined.	Cortinariaceae		New listing
Cortinarius icterinoides	Cortinariaceae		No change
Cortinarius ignellus	Cortinariaceae		New listing
Cortinarius incensus	Cortinariaceae		New listing
Cortinarius indotatus	Cortinariaceae		No change
Cortinarius iringa	Cortinariaceae	DPR	New listing
Cortinarius ixomolynus	Cortinariaceae		New listing
Cortinarius juglandaceus	Cortinariaceae		New listing
Cortinarius lachanus	Cortinariaceae		New listing
Cortinarius lamproxanthus	Cortinariaceae		New listing
Cortinarius leptospermorum ined.	Cortinariaceae	DPR	No change
Cortinarius leucocephalus	Cortinariaceae	DPR	No change
Cortinarius luteinus	Cortinariaceae		New listing
Cortinarius luteobrunneus	Cortinariaceae	DPR	No change
Cortinarius marmoratus	Cortinariaceae	DPR	No change
Cortinarius memoria-annae	Cortinariaceae	SO	New listing
Cortinarius mycenarum	Cortinariaceae		New listing
Cortinarius mysoides	Cortinariaceae		New listing
Cortinarius myxenosma	Cortinariaceae		New listing
Cortinarius naphthalinus	Cortinariaceae		No change
Cortinarius napivelatus	Cortinariaceae		New listing
Cortinarius nivalis	Cortinariaceae		No change
Cortinarius novae-zelandiae ined.	Cortinariaceae		Neutral
Cortinarius olivaceoniger	Cortinariaceae	DPR	No change
Cortinarius olorinatus	Cortinariaceae	DPR	No change
Cortinarius opaculus	Cortinariaceae	OL	New listing
Cortinarius ophryx	Cortinariaceae		New listing
Cortinarius palissandrinus	Cortinariaceae		New listing
Cortinarius pansicolor	Cortinariaceae		New listing
Cortinarius papaver	Cortinariaceae	DPR	No change
Cortinarius paraoniti	Cortinariaceae		New listing
Cortinarius paraonui	Cortinariaceae	DPR	New listing
Cortinarius pectochelis	Cortinariaceae		New listing
Cortinarius peraurilis	Cortinariaceae		New listing
Cortinarius periclymenus	Cortinariaceae		No change
Cortinarius peristeris	Cortinariaceae		New listing
Cortinarius persicanus	Cortinariaceae		No change
Cortinarius pisciodorus	Cortinariaceae	DPR	No change

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Cortinarius promethenus	Cortinariaceae		New listing
Cortinarius pseliocaulis	Cortinariaceae		New listing
Cortinarius pselioticton	Cortinariaceae	DPR	New listing
Cortinarius purpureocapitatus	Cortinariaceae	DPR	New listing
Cortinarius rattinoides	Cortinariaceae		New listing
Cortinarius rattinus	Cortinariaceae		No change
Cortinarius rubrimarginatus	Cortinariaceae		New listing
Cortinarius rubrocastaneus	Cortinariaceae		No change
Cortinarius rubrodactylus	Cortinariaceae		New listing
Cortinarius rugosiceps	Cortinariaceae	DPR	No change
Cortinarius sarcinochrous	Cortinariaceae	DPR	No change
Cortinarius sciurellus	Cortinariaceae		New listing
Cortinarius suecicolor	Cortinariaceae	DPR	New listing
Cortinarius thaumastus	Cortinariaceae		New listing
Cortinarius tigrellus	Cortinariaceae		New listing
Cortinarius turcopes	Cortinariaceae		New listing
Cortinarius urbiculus	Cortinariaceae		New listing
Cortinarius ursus	Cortinariaceae		No change
Cortinarius vinicolor	Cortinariaceae	DPR	No change
Cortinarius violaceovolvatus	Cortinariaceae	DPR	No change
Cortinarius viscincisus	Cortinariaceae		New listing
Cortinarius viscostriatus	Cortinariaceae	DPR	No change
Cortinarius viscoviridis	Cortinariaceae		No change
Cortinarius vitreofulvus	Cortinariaceae		New listing
Cortinarius waiporianus	Cortinariaceae		New listing
Cortinarius wallacei	Cortinariaceae		New listing
Cortinarius xenosmatoides	Cortinariaceae		New listing
Crepidotus affinis	Crepidotaceae		New listing
Crepidotus albolanatus	Crepidotaceae		New listing
Crepidotus brunneomarginatus	Crepidotaceae		New listing
Crepidotus carneolus	Crepidotaceae		New listing
Crepidotus dilutus	Crepidotaceae		New listing
Crepidotus fuscovelutinus	Crepidotaceae		New listing
Crepidotus fuscus	Crepidotaceae		New listing
Crepidotus gilvidus	Crepidotaceae		New listing
Crepidotus improvisus	Crepidotaceae	DPR	No change
Crepidotus isabellinus	Crepidotaceae		New listing
Crepidotus lateralipes	Crepidotaceae		New listing
Crepidotus mutabilis	Crepidotaceae		New listing
Crepidotus nanicus	Crepidotaceae	DPR	No change
Crepidotus novae-zealandiae	Crepidotaceae		No change
Crepidotus occultus	Crepidotaceae		New listing
Crepidotus parietalis	Crepidotaceae		No change
Crepidotus plumulosus	Crepidotaceae		New listing
Crepidotus praecipuus	Crepidotaceae		New listing
Crepidotus rufidulus	Crepidotaceae		New listing
Crepidotus rufofloccosus	Crepidotaceae		New listing
Crepidotus semiorbatus	Crepidotaceae		New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Crepidotus trulliformis	Crepidotaceae		New listing
Crepidotus variegatus	Crepidotaceae		New listing
Crucispora naucorioides	Tubariaceae		No change
Cryptomarasmius exustoides	Physalacriaceae		No change
Cryptomarasmius fishii	Physalacriaceae		No change
Cryptomarasmius micraster	Physalacriaceae		No change
Cryptomarasmius rhopalostylidis	Physalacriaceae		No change
Cuphophyllus griseorufescens	Hygrophoraceae	OL	No change
Cyathus colensoi	Nidulariaceae		No change
Cyathus hookeri	Nidulariaceae		No change
Cystoagaricus strobilomyces	Psathyrellaceae		New listing
Deconica citrispora	Strophariaceae		No change
Deconica vorax	Strophariaceae		No change
Dermoloma hemisphaericum	Agaricaceae		No change
Dermoloma murinum	Agaricaceae		No change
Entoloma aberrans	Entolomataceae	DPR	No change
Entoloma acuminatum	Entolomataceae	DPR	New listing
Entoloma asprelloides	Entolomataceae	DPR	No change
Entoloma cavipes	Entolomataceae	DPR	No change
Entoloma cerifactum	Entolomataceae	DPR	New listing
Entoloma cerinum	Entolomataceae		No change
Entoloma colensoi	Entolomataceae	DPR	No change
Entoloma confusum	Entolomataceae	DPR	New listing
Entoloma consanguineum	Entolomataceae	DPR	New listing
Entoloma corneum	Entolomataceae	DPR	No change
Entoloma crinitum	Entolomataceae		No change
Entoloma croceum	Entolomataceae		No change
Entoloma cucurbita	Entolomataceae	DPR	No change
Entoloma deceptivum	Entolomataceae	DPR	No change
Entoloma deprensum	Entolomataceae	DPR	New listing
Entoloma distinctum	Entolomataceae	DPR	New listing
Entoloma duplocoloratum	Entolomataceae	DPR	New listing
Entoloma elegantissimum	Entolomataceae	DPR	New listing
Entoloma fabulosum	Entolomataceae		New listing
Entoloma farinolens	Entolomataceae	DPR	No change
Entoloma gelatinosum	Entolomataceae		No change
Entoloma glaucoroseum	Entolomataceae		New listing
Entoloma gracile	Entolomataceae	DPR	No change
Entoloma haeuslerianum	Entolomataceae	DPR	No change
Entoloma imbecille	Entolomataceae	DPR	No change
Entoloma improvisum	Entolomataceae	DPR	New listing
Entoloma inops	Entolomataceae	DPR	New listing
Entoloma inventum	Entolomataceae	DPR	New listing
Entoloma latericolor	Entolomataceae		No change
Entoloma macnabbianum	Entolomataceae	DPR	No change
Entoloma mancum	Entolomataceae	DPR	New listing
Entoloma mariae	Entolomataceae	DPR	New listing
Entoloma melleum	Entolomataceae	DPR	No change

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Entoloma minutoalbum	Entolomataceae		No change
Entoloma neosericellum	Entolomataceae	DPR	New listing
Entoloma niveum	Entolomataceae	SO	No change
Entoloma obrusseum	Entolomataceae		No change
Entoloma orichalceum	Entolomataceae	DPR	New listing
Entoloma parasericeum	Entolomataceae	DPR	New listing
Entoloma peraffine	Entolomataceae	DPR	New listing
Entoloma perconfusum	Entolomataceae		New listing
Entoloma perplexum	Entolomataceae		No change
Entoloma pumilum	Entolomataceae	DPR	New listing
Entoloma rancidulum	Entolomataceae	DPR	No change
Entoloma readiae	Entolomataceae		No change
Entoloma squamiferum	Entolomataceae	DPR	No change
Entoloma stramineum	Entolomataceae	DPR	New listing
Entoloma sulphureum	Entolomataceae		No change
Entoloma tectum	Entolomataceae	DPR	New listing
Entoloma vulsum	Entolomataceae		No change
Entoloma waikaremoana	Entolomataceae		New listing
Favolaschia austrocyatheae	Mycenaceae		New listing
Flammula croesus	Hymenogastraceae	DPR	No change
Flammula schinziana	Hymenogastraceae	DPR	No change
Flammulaster ciliatus	Tubariaceae		New listing
Flammulaster disseminatus	Tubariaceae	DPR	New listing
Flammulaster pulveraceus	Tubariaceae	DPR	No change
Flammulina stratosa	Physalacriaceae		No change
Galerina excentrica	Hymenogastraceae		No change
Galerina nothofaginea	Hymenogastraceae		No change
Gerhardtia pseudosaponacea	Lyophyllaceae		New listing
Gerronema waikanaense	Porotheleaceae		No change
Gliophorus fumosogriseus	Hygrophoraceae		No change
Gliophorus lilacinoides	Hygrophoraceae	DPR	New listing
Gliophorus ostrinus	Hygrophoraceae	DPR	No change
Gliophorus subheteromorphus	Hygrophoraceae	DPR	No change
Gliophorus sulfureus	Hygrophoraceae	DPR	New listing
Gliophorus versicolor	Hygrophoraceae	DPR	New listing
Gliophorus viscaurantius	Hygrophoraceae		No change
Gloiocephala gracilis	Physalacriaceae		No change
Gloiocephala phormiorum	Physalacriaceae		No change
Gloiocephala tibiicystis	Physalacriaceae		No change
Gymnopilus mesosporus	Agaricales *incertae sedis*		No change
Gymnopus ceraceicola	Omphalotaceae		New listing
Gymnopus cockaynei	Omphalotaceae	DPR	New listing
Gymnopus imbricatus	Omphalotaceae		New listing
Gymnopus subsupinus	Omphalotaceae	DPR	New listing
Heimiomyces atrofulvus	Mycenaceae		No change
Hemimycena hirsuta	Agaricales *incertae sedis*		No change
Hemimycena reducta	Agaricales *incertae sedis*	OL	No change
Hohenbuehelia ligulata	Pleurotaceae	SO	New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Hohenbuehelia luteola	Pleurotaceae	DPR	No change
Humidicutis conspicua	Hygrophoraceae	DPR	No change
Humidicutis multicolor	Hygrophoraceae	DPR	No change
Humidicutis rosella	Hygrophoraceae		No change
Hydnangium kanuka	Hydnangiaceae		New listing
Hygrocybe blanda	Hygrophoraceae	DPR	No change
Hygrocybe cavipes	Hygrophoraceae	DPR	New listing
Hygrocybe elegans	Hygrophoraceae	DPR	No change
Hygrocybe fuliginata	Hygrophoraceae		No change
Hygrocybe fuscoaurantiaca	Hygrophoraceae	DPR	No change
Hygrocybe helobia	Hygrophoraceae	DPR	New listing
Hygrocybe keithgeorgei	Hygrophoraceae	DPR	New listing
Hygrocybe miniatoaurantiaca	Hygrophoraceae	DPR	No change
Hygrocybe miniceps	Hygrophoraceae	DPR	No change
Hygrocybe singeri	Hygrophoraceae	DPR	New listing
Hygrophorus carcharias	Hygrophoraceae	DPR	No change
Hygrophorus gloriae	Hygrophoraceae	DPR	No change
Hygrophorus segregatus	Hygrophoraceae	DPR	No change
Inocybe brunneolutea	Inocybaceae		New listing
Inocybe callichroa	Inocybaceae		New listing
Inocybe cerea	Inocybaceae	DPR	No change
Inocybe densipruinosa	Inocybaceae		New listing
Inocybe destruens	Inocybaceae	DPR	No change
Inocybe dissimilis	Inocybaceae		New listing
Inocybe intermedia	Inocybaceae		New listing
Inocybe irregularis	Inocybaceae		New listing
Inocybe magnibulbosa	Inocybaceae		New listing
Inocybe mendica	Inocybaceae		No change
Inocybe microsperma	Inocybaceae		New listing
Inocybe misera	Inocybaceae		New listing
Inocybe ovispora	Inocybaceae		New listing
Inocybe paracerasphora	Inocybaceae	DPR	No change
Inocybe phaeosquarrosa	Inocybaceae	DPR	No change
Inocybe scabriuscula	Inocybaceae		No change
Inocybe scobifera	Inocybaceae		New listing
Inocybe strobilacea	Inocybaceae		New listing
Inocybe subclavata	Inocybaceae	DPR	No change
Inocybe tenax	Inocybaceae		New listing
Inocybe turbata	Inocybaceae		New listing
Inocybe umbrosa	Inocybaceae	DPR	No change
Inocybe vagata	Inocybaceae		New listing
Inocybe vicina	Inocybaceae		New listing
Inocybe viscata	Inocybaceae	DPR	No change
Laccaria ambigua	Hydnangiaceae		New listing
Laccaria lilacina	Hydnangiaceae		New listing
Lepiota adusta	Agaricaceae	DPR	No change
Lepista antipoda	Clitocybaceae	DPR	No change
Leucoagaricus croceovelutinus	Agaricaceae	DPR	New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Limacella pitereka	Amanitaceae	DPR	New listing
Limacella wheroparaonea	Amanitaceae		No change
Lyophyllum moncalvoanum	Lyophyllaceae		New listing
Marasmiellus omphaloides	Omphalotaceae	DPR	No change
Marasmius aucklandicus	Marasmiaceae	DPR	No change
Marasmius aurantiobasalis	Marasmiaceae	DPR	New listing
Marasmius croceus	Marasmiaceae		No change
Marasmius kanukaneus	Marasmiaceae	DPR	No change
Marasmius masoniae	Marasmiaceae	DPR	No change
Marasmius meridionalis	Marasmiaceae	DPR	No change
Marasmius otagensis	Marasmiaceae	DPR	No change
Marasmius pallenticeps	Marasmiaceae	DPR	No change
Marasmius perpusillus	Marasmiaceae	DPR	No change
Marasmius podocarpicola	Marasmiaceae	DPR	No change
Marasmius pusillissimus	Marasmiaceae	DPR	No change
Marasmius rhombisporus	Marasmiaceae	DPR	No change
Marasmius rimuphilus	Marasmiaceae	DPR	No change
Marasmius rosulatus	Marasmiaceae	DPR	No change
Marasmius tinctorius	Marasmiaceae	DPR	New listing
Marasmius unilamellatus	Marasmiaceae	DPR	No change
Mycena austroavenacea	Mycenaceae	DPR	No change
Mycena galopus	Mycenaceae	DPR, SO	No change
Mycena helminthobasis var. *novae-zelandiae*	Mycenaceae		No change
Mycena leaiana var. *australis*	Mycenaceae	SO	No change
Mycena lividorubra	Mycenaceae	DPR	No change
Mycena mamaku	Mycenaceae		No change
Mycena oratiensis	Mycenaceae	DPR	No change
Mycena podocarpi	Mycenaceae	DPR	No change
Mycena primulina	Mycenaceae	DPR	No change
Mycena rubroglobulosa	Mycenaceae	DPR	No change
Mycena subdebilis	Mycenaceae	DPR	New listing
Mycena vinacea	Mycenaceae		No change
Mycena vinaceipora	Mycenaceae	DPR	No change
Naucoria aurora	Hymenogastraceae	DPR	No change
Neohygrocybe innata	Hygrophoraceae		No change
Neohygrocybe squarrosa	Hygrophoraceae		No change
Nivatogastrium lignicola	Strophariaceae	DPR	No change
Nivatogastrium sulcatum	Strophariaceae	DPR	No change
Omphalia colensoi	Mycenaceae	DPR	No change
Panellus niger	Mycenaceae	DPR	No change
Phaeocollybia elegans	Hymenogastraceae		New listing
Phaeocollybia gracilis	Hymenogastraceae		New listing
Phaeocollybia longipes	Hymenogastraceae		No change
Phaeocollybia minuta	Hymenogastraceae		No change
Phaeocollybia ratticauda	Hymenogastraceae		New listing
Phaeocollybia tenuis	Hymenogastraceae		New listing
Phaeomarasmius umbrinus	Tubariaceae		New listing
Pholiota chrysmoides	Strophariaceae	DPR	No change

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Pholiotina novae-zelandiae	Bolbitiaceae	DPR	No change
Pleurocollybia cremea	Biannulariaceae	DPR	No change
Pleuroflammula ambigua	Crepidotaceae		New listing
Pleurotus novae-zelandiae	Pleurotaceae	DPR	No change
Pleurotus velatus	Pleurotaceae	DPR	No change
Pluteus decoloratus	Pluteaceae	DPR	New listing
Pluteus hispidilacteus	Pluteaceae	DPR	New listing
Pluteus microspermus	Pluteaceae	DPR	New listing
Pluteus minor	Pluteaceae	DPR	No change
Pluteus paradoxus	Pluteaceae	DPR	New listing
Pluteus readiarum	Pluteaceae	DPR	New listing
Pluteus sabulosus	Pluteaceae	DPR	New listing
Pluteus subantarcticus	Pluteaceae	DPR	New listing
Pluteus terricola	Pluteaceae	DPR	New listing
Porpoloma amyloideum	Tricholomataceae		No change
Pouzarella minuta	Entolomataceae		No change
Psathyloma leucocarpum	Hymenogastraceae		New listing
Pseudoarmillariella fistulosa	Hygrophoraceae	DPR	No change
Pseudoclitocybe foetida	Pseudoclitocybaceae	DPR	No change
Pseudosperma renisporum	Inocybaceae		No change
Pyrrhoglossum pyrrhum	Cortinariaceae	DPR	New listing
Pyrrhoglossum viriditinctum	Cortinariaceae	DPR	No change
Resupinatus huia	Pleurotaceae	DPR	No change
Resupinatus poriaeformis	Pleurotaceae	DPR	New listing
Resupinatus subapplicatus	Pleurotaceae	DPR	New listing
Resupinatus trichotis	Pleurotaceae	DPR	New listing
Rhodocybe albovelutina	Entolomataceae	DPR	No change
Rhodocybe conchata	Entolomataceae	DPR	No change
Rhodocybe dingleyae	Entolomataceae	DPR	No change
Rhodocybe fuliginea	Entolomataceae	DPR	No change
Rhodocybe iti	Entolomataceae	DPR	No change
Rhodocybe maleolens	Entolomataceae	DPR	No change
Rhodocybe multilamellata	Entolomataceae	DPR	New listing
Simocybe austrorubi	Crepidotaceae	DPR	No change
Simocybe largispora	Crepidotaceae		New listing
Simocybe luteomellea	Crepidotaceae	DPR	No change
Simocybe tabacina	Crepidotaceae	DPR	No change
Simocybe unica	Crepidotaceae	DPR	No change
Tubaria aureosimilis	Tubariaceae		No change
Tubaria deceptiva	Tubariaceae		New listing
Tubaria divulgata	Tubariaceae		New listing
Tubaria excentrica	Tubariaceae		New listing
Tubaria hispidula	Tubariaceae	DPR	No change
Tubaria lanatula	Tubariaceae	DPR	No change
Tubaria mediocris	Tubariaceae		New listing
Tubaria pallidissima	Tubariaceae		New listing
Tubaria peculiaris	Tubariaceae		New listing
Tubaria perplexa	Tubariaceae		New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Tubaria perstriata	Tubariaceae		New listing
Tubaria recta	Tubariaceae		New listing
Tubaria similis	Tubariaceae		New listing
Tubaria verrucipes	Tubariaceae	DPR	No change
Volvaria primulina	Pluteaceae	DPR	No change
Xeromphalina podocarpi	Mycenaceae		No change
Xeromphalina testacea	Mycenaceae	DPR	No change
Boletes (5)			
Boletus novae-zelandiae	Boletaceae		No change
Boletus rawlingsii	Boletaceae		New listing
Xerocomus lentistipitatus	Boletaceae	DPR	No change
Xerocomus rufostipitatus	Boletaceae	DPR	No change
Xerocomus scabripes	Boletaceae	DPR	New listing
Russuloid fungi (6)			
Auriscalpium umbella	Auriscalpiaceae		New listing
Lactarius maruiaensis	Russulaceae	DPR	Neutral
Lactarius nothofagi	Russulaceae	DPR	No change
Lactifluus leonardii	Russulaceae		New listing
Russula solitaria	Russulaceae	DPR	Neutral
Russula vivida	Russulaceae	DPR	Neutral
Taxonomically unresolved (148)			
Agarics (140)			
Agaricus sp. 'Kaitorete (PDD 105574)'	Agaricaceae		New listing
Agaricus sp. 'Prices Valley (PDD 87152)'	Agaricaceae		New listing
Agaricus sp. 'Rimu Valley (PDD 94844)'	Agaricaceae		New listing
Agaricus sp. 'Trounson Park (PDD 106423)'	Agaricaceae		New listing
Agaricus sp. 'Waipoua (PDD 106424)'	Agaricaceae		New listing
Amanita sp. 'Bealey (PDD 95341)'	Amanitaceae		New listing
Arrhenia sp. 'Klondyke (PDD 96475)'	Hygrophoraceae		New listing
Bolbitius sp. 1 (ZT 69/109)	Bolbitiaceae		New listing
Bolbitius sp. 2 (PDD 86214)	Bolbitiaceae		New listing
Callistosporium sp. 'Mt Grey (PDD 95689)'	Callistosporiaceae		New listing
Clavogaster sp. 'Whakapapa (PDD 72612)'	Strophariaceae		New listing
Clitocella sp. 'Huntly (PDD 106942)'	Entolomataceae		New listing
Clitocybe sp. 'Klondyke (PDD 95822)'	Clitocybaceae		New listing
Clitocybula sp. 'Hay Reserve (PDD 96442)'	Porotheleaceae		New listing
Conocybe sp. 'Omahu Bush (PDD 87267)'	Bolbitiaceae		New listing
Coprinopsis sp.	Psathyrellaceae		New listing
Cortinarius sp. (PDD 77486)	Cortinariaceae	DPR	New listing
Cortinarius sp. (ZT NZ8682)	Cortinariaceae	DPR	New listing
Cortinarius sp. 'badiohepaticus'	Cortinariaceae	DPR	New listing
Cortinarius sp. 'Alborn (PDD 83767)'	Cortinariaceae	DPR	New listing
Cortinarius sp. 'Blyth Track (PDD 80792)'	Cortinariaceae		New listing
Cortinarius sp. 'Nina Valley (PDD106575)'	Cortinariaceae		New listing
Cortinarius sp. 'Okuti (PDD 96759)'	Cortinariaceae		New listing
Cortinarius sp. 'Punchbowl (PDD 95246)'	Cortinariaceae		New listing
Cortinarius sp. 'Waipori (PDD 87651)'	Cortinariaceae		New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Cortinarius sp. 'Waitematā (PDD 106495)'	Cortinariaceae		New listing
Cortinarius sp. 'Whakapapa (PDD 80871)'	Cortinariaceae	DPR	New listing
Crepidotus sp. 'Waipori Gorge (PDD 87521)'	Crepidotaceae		New listing
Cyptotrama sp. 'Waipoua (PDD 72864)'	Physalacriaceae		New listing
Cystoderma sp. 'Canaan (PDD 107735)'	Cystodermataceae		New listing
Cystolepiota sp. 'Kaikoura (PDD 96136)'	Agaricaceae		New listing
Cystolepiota sp. 'Maungatautari (PDD 106899)'	Agaricaceae		New listing
Cystolepiota sp. 'Nile River (PDD 87126)'	Agaricaceae		New listing
Galerina sp. 1	Hymenogastraceae		New listing
Galerina sp. 2	Hymenogastraceae		New listing
Galerina sp. 3	Hymenogastraceae		New listing
Gerhardtia sp. 'Waipoua (PDD 106827)'	Lyophyllaceae		New listing
Gerronema sp. 'Howick (PDD 105913)'	Porotheleaceae		New listing
Gerronema sp. 'Lake Rotoiti (PDD 81522)'	Porotheleaceae		New listing
Gerronema sp. 'Pororari (PDD 87079)'	Porotheleaceae		New listing
Gymnopus sp. 'Craigieburn (PDD 95664)'	Omphalotaceae		New listing
Gymnopus sp. 'Moonlight Valley (PDD 112442)'	Omphalotaceae		New listing
Gymnopus sp. 'Oparara (PDD 87100)'	Omphalotaceae		New listing
Hodophilus sp. 'Aongatete (PDD 106327)'	Clavariaceae		New listing
Hohenbuehelia sp. 'Ahuriri (PDD 79837)'	Pleurotaceae		New listing
Hydropus sp. 'Kaituna Valley (PDD 86984)'	Porotheleaceae		New listing
Hydropus sp. 'Kennedys Bush (PDD 86896)'	Porotheleaceae		New listing
Hydropus sp. 'Totara Reserve (PDD 106626)'	Porotheleaceae		New listing
Laccaria sp. 'Lewis Pass (PDD 80273)'	Hydnangiaceae		New listing
Lactocollybia sp. 'Waitangi (PDD 83732)'	Marasmiaceae		New listing
Leucoagaricus sp. 'Bankside (PDD 96879)'	Agaricaceae		New listing
Leucoagaricus sp. 'Borland (PDD 96572)'	Agaricaceae		New listing
Leucoagaricus sp. 'Erua Forest (PDD 80769)'	Agaricaceae		New listing
Leucoagaricus sp. 'Evansdale Glen (PDD 87531)'	Agaricaceae		New listing
Leucoagaricus sp. 'Glenorchy (PDD 106356)'	Agaricaceae		New listing
Leucoagaricus sp. 'Gypsy Glen (PDD 87679)'	Agaricaceae		New listing
Leucoagaricus sp. 'Hay Reserve (PDD 87677)'	Agaricaceae		New listing
Leucoagaricus sp. 'Huntsbury (PDD 106702)'	Agaricaceae		New listing
Leucoagaricus sp. 'Kahikatea (PDD 106095)'	Agaricaceae		New listing
Leucoagaricus sp. 'Kaituna Valley (PDD 86991)'	Agaricaceae		New listing
Leucoagaricus sp. 'Lake Daniell (PDD 97167)'	Agaricaceae		New listing
Leucoagaricus sp. 'Lake Rotoiti (PDD 97161)'	Agaricaceae		New listing
Leucoagaricus sp. 'Mt Bruce (PDD 87444)'	Agaricaceae		New listing
Leucoagaricus sp. 'Okuti Valley (PDD 87672)'	Agaricaceae		New listing
Leucoagaricus sp. 'Prices Valley (PDD 87159)'	Agaricaceae		New listing
Leucoagaricus sp. 'Rotokuru Lakes(PDD 80831)'	Agaricaceae		New listing
Leucoagaricus sp. 'Waiohine Gorge (PDD 87425)'	Agaricaceae		New listing
Leucoagaricus sp. 'Waipoua (PDD 106461)'	Agaricaceae		New listing
Leucoagaricus sp. 'Woodside Glen (PDD 87532)'	Agaricaceae		New listing
Lyophyllum sp. 'Rangitaiki (PDD 96287)'	Lyophyllaceae		New listing
Macrocystidia sp. 'Pennycook (PDD 106058)'	Macrocystidiaceae		New listing
Marasmiellus sp. 'Ahuriri (PDD 87323)'	Omphalotaceae		New listing
Marasmiellus sp. 'Mt Fyffe (PDD 96142)'	Omphalotaceae		New listing

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Marasmiellus sp. 'Taieri (PDD 87549)'	Omphalotaceae		New listing
Melanophyllum sp. 'coffeinum (PDD 72512)'	Agaricaceae		New listing
Mycena sp. 'Ahuriri Reserve (PDD 80918)'	Mycenaceae		New listing
Mycena sp. 'Arnold River (PDD 112464)'	Mycenaceae		New listing
Mycena sp. 'Barracouta (PDD 96657)'	Mycenaceae		New listing
Mycena sp. 'Croydon Bush (PDD 96601)'	Mycenaceae		New listing
Mycena sp. 'Crystal Falls (PDD 87606)'	Mycenaceae		New listing
Mycena sp. 'Duffy Creek (PDD 83791)'	Mycenaceae		New listing
Mycena sp. 'Erua (PDD 80772)'	Mycenaceae		New listing
Mycena sp. 'Huia (PDD 94356)'	Mycenaceae		New listing
Mycena sp. 'Kaituna (PDD 105568)'	Mycenaceae		New listing
Mycena sp. 'Kennedys Bush (PDD 80686)'	Mycenaceae		New listing
Mycena sp. 'Mt Grey (PDD 87308)'	Mycenaceae		New listing
Mycena sp. 'Nile River (PDD 87114)'	Mycenaceae		New listing
Mycena sp. 'Okuti (PDD 105529)'	Mycenaceae		New listing
Mycena sp. 'Oparara Arches (PDD 87085)'	Mycenaceae		New listing
Mycena sp. 'Rangitaiki (PDD 96286)'	Mycenaceae		New listing
Mycena sp. 'Rangiwahia (PDD 106087)'	Mycenaceae		New listing
Mycena sp. 'Riwaka (PDD 88434)'	Mycenaceae		New listing
Mycena sp. 'Waiohine Gorge (PDD 87377)'	Mycenaceae		New listing
Mycena sp. 'Waiopehu (PDD 112491)'	Mycenaceae		New listing
Myochromella sp. 'Craigieburn (PDD 96415)'	Lyophyllaceae		New listing
Omphalina sp. 'Rangitaiki (PDD 96275)'	Tricholomataceae		New listing
Phaeocollybia sp. 1	Hymenogastraceae		New listing
Phaeocollybia sp. 2	Hymenogastraceae		New listing
Phloeomana sp. 'Lincoln (PDD 106167)'	Porotheleaceae		New listing
Pholiota sp. (PDD 78806)	Strophariaceae		New listing
Pholiota sp. 'Borland (PDD 96574)'	Strophariaceae		New listing
Pholiota sp. 'Hinewai (PDD 80269)'	Strophariaceae		New listing
Pholiota sp. 'Te Wera (PDD 97060)'	Strophariaceae		New listing
Pluteus sp. 'Howick (PDD 107524)'	Pluteaceae		New listing
Porpoloma sp. 'caespitosa (PDD 96731)'	Tricholomataceae		New listing
Psathyrella sp. 'Butterfly Creek (PDD 10619)'	Psathyrellaceae		New listing
Psathyrella sp. 'Jollies Bush (PDD 96201)'	Psathyrellaceae		New listing
Psathyrella sp. 'Travis (PDD 87699)'	Psathyrellaceae		New listing
Pseudotricholoma sp. 'Munro (PDD 112523)'	Tricholomataceae		New listing
Psilocybe sp. 1	Hymenogastraceae		New listing
Psilocybe sp. 2	Hymenogastraceae		New listing
Resinomycena sp. 'Montgomery Park (PDD 87050)'	Mycenaceae		New listing
Resupinatus sp. 'Howick (PDD 107004)'	Pleurotaceae		New listing
Rhizocybe sp. 'Lake Taylor (PDD 96758)'	Lyophyllaceae		New listing
Rhizocybe sp. 'Pureora (PDD 96261)'	Lyophyllaceae		New listing
Rhodocollybia delicata ined.	Omphalotaceae		No change
Rhodocollybia sp. 'Monowai (PDD 96596)'	Omphalotaceae		New listing
Rhodocollybia sp. 'Mt Bruce (PDD 87462)'	Omphalotaceae		New listing
Rhodocollybia sp. 'Mt Holdsworth (PDD 87463)'	Omphalotaceae		New listing
Rhodocollybia sp. 'Rimutaka (PDD 95543)'	Omphalotaceae		New listing
Rhodocollybia sp. 'Trounson Park (PDD 106475)'	Omphalotaceae		New listing

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Rhodocybe sp. 'Rimutaka (PDD 95549)'	Entolomataceae		New listing
Ripartitella sp. 'Totaranui (PDD 105703)'	Agaricales *incertae sedis*		No change
Roridomyces sp. 'Sugarloaf (PDD 86843)'	Mycenaceae		New listing
Stropharia sp. 'Kennedys Bush (PDD 79791)'	Strophariaceae		New listing
Tephrocybella sp. 'Howick (PDD 106517)'	Lyophyllaceae		New listing
Tephrocybella sp. 'Pohangina (PDD 106933)'	Lyophyllaceae		New listing
Tricholoma sp. 'apricota (PDD 96895)'	Tricholomataceae		New listing
Tricholoma sp. 'atrofibrillosa (PDD 106578)'	Tricholomataceae		New listing
Tricholoma sp. 'aurilamellata (PDD 72632)'	Tricholomataceae		New listing
Tricholoma sp. 'beeveri (PDD 71133)'	Tricholomataceae		New listing
Tricholoma sp. 'crocipes'	Tricholomataceae		New listing
Tricholoma sp. 'koura (PDD 96646)'	Tricholomataceae		New listing
Tricholoma sp. 'pohutihuti (PDD 72757)'	Tricholomataceae		New listing
Tricholoma sp. 'tasmanense (PDD 101806)'	Tricholomataceae		New listing
Tricholoma sp. 'tenebripila (PDD 96653)'	Tricholomataceae		New listing
Tricholoma sp. 'tokena (PDD 88256)'	Tricholomataceae		New listing
Tricholoma sp. 'wangapeka (PDD 101809)'	Tricholomataceae		New listing
Tricholoma sp. 'whakapapa (PDD 88824)'	Tricholomataceae		New listing
Zhuliangomyces sp. 'Rangitikei (PDD 108478)'	Amanitaceae		New listing
Boletes (2)			
Boletus paradisiacus	Boletaceae	DPR	New listing
Tylopilus sp. 'Keith George (PDD 96917)'	Boletaceae		New listing
Russuloid fungi (6)			
Russula sp. 'canaanesis (PDD 107487)'	Russulaceae		New listing
Russula sp. 'hinewaiensis (PDD 95309)'	Russulaceae		New listing
Russula sp. 'horopito (PDD 80761)'	Russulaceae		New listing
Russula sp. 'pyrispora (PDD 101430)'	Russulaceae		New listing
Russula sp. 'riwakaensis (PDD 101437)'	Russulaceae		New listing
Russula sp. 'wilsonii (PDD 96004)'	Russulaceae		New listing
THREATENED (44)			
NATIONALLY CRITICAL (1)			
Taxonomically determinate (1)			
Agarics (1)			
Deconica baylisiana	Strophariaceae	A(1) | Sp, CI, CR, DPS, DPT, RR	Neutral
NATIONALLY ENDANGERED (2)			
Taxonomically determinate (2)			
Boletes (1)			
Xerocomus griseoolivaceus	Boletaceae	C(1) | DPS, DPT	New listing
Russuloid fungi (1)			
Russula pleurogena	Russulaceae	C(1) | DPS, DPT	Better
NATIONALLY VULNERABLE (41)			
Taxonomically determinate (37)			
Agarics (28)			
Cortinarius canovestitus	Cortinariaceae	De	New listing

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Cortinarius coneae	Cortinariaceae	DPR, De	Neutral
Cortinarius cremeorufus	Cortinariaceae	DPR	New listing
Cortinarius cruentoides	Cortinariaceae	De	New listing
Cortinarius egmontianus	Cortinariaceae	DPR, De	Neutral
Cortinarius gemmeus	Cortinariaceae	DPR, De	Neutral
Cortinarius ignotus	Cortinariaceae		Neutral
Cortinarius largofulgens	Cortinariaceae	De	Neutral
Cortinarius medioscaurus	Cortinariaceae	De	New listing
Cortinarius minilacus	Cortinariaceae	De	New listing
Cortinarius minoscaurus	Cortinariaceae	De	Neutral
Cortinarius phaeochlorus	Cortinariaceae	DPR, De	Neutral
Cortinarius pholiotellus	Cortinariaceae	De	Neutral
Cortinarius porphyrophaeus	Cortinariaceae	De	Neutral
Cortinarius psilomorphus	Cortinariaceae	De	New listing
Cortinarius salmastrium	Cortinariaceae	De	New listing
Cortinarius vernicifer	Cortinariaceae	De	New listing
Cortinarius verniciorum	Cortinariaceae	De	New listing
Inocybe aequalis	Inocybaceae	DPR, De	Neutral
Inocybe amygdalina	Inocybaceae	DPR, De	Neutral
Inocybe graveolens	Inocybaceae	DPR, De	Neutral
Inocybe infirma	Inocybaceae	De	New listing
Inocybe manukanea	Inocybaceae	DPR, De	Neutral
Inocybe poculata	Inocybaceae	De	New listing
Inocybe straminea	Inocybaceae	DPR, De, OL	Neutral
Laccaria paraphysata	Hydnangiaceae	De	New listing
Macrocystidia reducta	Macrocystidiaceae	CR, DPS, DPT	Neutral
Mycena flavovirens	Mycenaceae	C(1) | DPS, DPT	Neutral
Boletes (3)			
Fistulinella viscida	Boletaceae	De	New listing
Gyroporus mcnabbii	Gyroporaceae	De	New listing
Hygrophoropsis umbriceps	Hygrophoropsidaceae	A(1) | De	Neutral
Russuloid fungi (6)			
Russula albolutescens	Russulaceae	DPS, DPT, De	New listing
Russula allochroa	Russulaceae	De	New listing
Russula aucklandica	Russulaceae	DPR, De	New listing
Russula multicystidiata	Russulaceae	De	Neutral
Russula pudorina	Russulaceae	DPR, De	New listing
Russula vinaceocuticulata	Russulaceae	De	New listing
Taxonomically unresolved (4)			
Agarics (2)			
Cortinarius sp. 'Medbury (PDD 96943)'	Cortinariaceae	De	New listing
Tricholoma sp. 'leptospermi (PDD 96889)'	Tricholomataceae	De	New listing
Russuloid fungi (2)			
Russula sp. 'macnabbii (PDD 87008)'	Russulaceae	De	New listing
Russula subvinosa	Russulaceae	DPR, De	New listing

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
AT RISK (3)			
NATURALLY UNCOMMON (3)			
Taxonomically determinate (3)			
Agarics (2)			
Anthracophyllum pallidum	Omphalotaceae	DPS, DPT, RR	Neutral
Squamanita squarrulosa	Cystodermataceae	CR, DPS, DPT	Better
Russuloid fungi (1)			
Lactarius novae-zelandiae	Russulaceae	CR, DPS, DPT	New listing
NOT THREATENED (330)			
Taxonomically determinate (322)			
Agarics (273)			
Agaricus comtulus	Agaricaceae	SO	New listing
Agaricus horakianus	Agaricaceae	SO	Neutral
Agaricus karstomyces	Agaricaceae	DPR, SO	New listing
Agaricus viridopurpurascens	Agaricaceae		Neutral
Amanita australis	Amanitaceae		New listing
Amanita nehuta	Amanitaceae		New listing
Amanita nigrescens	Amanitaceae		New listing
Amanita nothofagi	Amanitaceae		New listing
Amanita pareparina	Amanitaceae		New listing
Amanita pekeoides	Amanitaceae		New listing
Amanita pumatona	Amanitaceae	DPR	New listing
Amanita taiepa	Amanitaceae		New listing
Anthracophyllum archeri	Omphalotaceae		New listing
Armillaria limonea	Physalacariaceae		New listing
Armillaria novae-zelandiae	Physalacariaceae		New listing
Bolbitius muscicola	Bolbitiaceae		New listing
Calvatia lilacina	Agaricaceae		New listing
Camarophyllus lilacinus	Hygrophoraceae	SO	New listing
Campanella tristis	Marasmiaceae		New listing
Chaetocalathus cocciformis	Marasmiaceae		New listing
Cheimonophyllum candidissimum	Cyphellaceae	SO	Neutral
Clavogaster virescens	Strophariaceae		Neutral
Clitocybe metachroa	Clitocybaceae	SO	New listing
Clitocybe paraditopa	Clitocybaceae	SO	New listing
Clitopilus hobsonii	Emtolomataceae	SO	Neutral
Conchomyces bursiformis	Fayodiaceae		New listing
Coprinopsis mitrispora	Psathyrellaceae	SO	New listing
Cortinarius achrous	Cortinariaceae		New listing
Cortinarius alboaggregatus	Cortinariaceae		Neutral
Cortinarius alboroseus	Cortinariaceae		New listing
Cortinarius alienatus	Cortinariaceae		Neutral
Cortinarius armiae	Cortinariaceae		New listing
Cortinarius aurantioferreus	Cortinariaceae		Neutral
Cortinarius australiensis	Cortinariaceae	SO	New listing
Cortinarius australis	Cortinariaceae		New listing
Cortinarius austrocyanites	Cortinariaceae		Neutral

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Cortinarius tessiae	Cortinariaceae		Neutral
Cortinarius trichocarpus	Cortinariaceae		New listing
Cortinarius veronicae	Cortinariaceae		Neutral
Cortinarius viscilaetus	Cortinariaceae		Neutral
Cortinarius vitreopileatus	Cortinariaceae		Neutral
Cortinarius xenosma	Cortinariaceae		New listing
Crepidotus inconspicuus	Crepidotaceae		New listing
Crinipellis filiformis	Marasmiaceae		New listing
Crinipellis procera	Marasmiaceae		New listing
Cuphophyllus pratensis	Hygrophoraceae		New listing
Cyclocybe parasitica	Tubariaceae		New listing
Cyptotrama asprata	Physalacriaceae		Neutral
Cystoderma clastotrichum	Cystodermataceae		New listing
Deconica horizontalis	Strophariaceae		New listing
Deconica novae-zelandiae	Strophariaceae		Neutral
Descolea gunnii	Bolbitiaceae		New listing
Descolea maculata	Bolbitiaceae		New listing
Descolea phlebophora	Bolbitiaceae		New listing
Descolea recedens	Bolbitiaceae	SO	New listing
Entoloma aromaticum	Entolomataceae		New listing
Entoloma atrellum	Entolomataceae		Neutral
Entoloma baronii	Entolomataceae	SO	New listing
Entoloma blandiodorum	Entolomataceae		New listing
Entoloma brunneolilacinum	Entolomataceae		Neutral
Entoloma canoconicum	Entolomataceae		Neutral
Entoloma captiosum	Entolomataceae		New listing
Entoloma chloroxanthum	Entolomataceae		Neutral
Entoloma convexum	Entolomataceae		New listing
Entoloma gasteromycetoides	Entolomataceae		New listing
Entoloma haastii	Entolomataceae		New listing
Entoloma hochstetteri	Entolomataceae		New listing
Entoloma melanocephalum	Entolomataceae		Neutral
Entoloma nothofagi	Entolomataceae		Neutral
Entoloma panniculus	Entolomataceae	SO	New listing
Entoloma peralbidum	Entolomataceae		New listing
Entoloma persimile	Entolomataceae		New listing
Entoloma phaeomarginatum	Entolomataceae		Neutral
Entoloma pluteimorphum	Entolomataceae		Neutral
Entoloma porphyrescens	Entolomataceae		New listing
Entoloma procerum	Entolomataceae		New listing
Entoloma translucidum	Entolomataceae		Neutral
Entoloma uliginicola	Entolomataceae		Neutral
Entoloma viridomarginatum	Entolomataceae		Neutral
Favolaschia cyatheae	Mycenaceae		New listing
Favolaschia pustulosa	Mycenaceae		New listing
Galerina nana	Hymenogastraceae		New listing
Galerina neocalyptrata	Hymenogastraceae	SO	New listing
Galerina patagonica	Hymenogastraceae		New listing

Continued on next page

Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Galerina subcerina	Hymenogastraceae	SO	New listing
Gliophorus chromolimoneus	Hygrophoraceae		New listing
Gliophorus graminicolor	Hygrophoraceae		Neutral
Gliophorus lilacipes	Hygrophoraceae		Neutral
Gliophorus luteoglutinosus	Hygrophoraceae		Neutral
Gliophorus pallidus	Hygrophoraceae		Neutral
Gliophorus viridis	Hygrophoraceae		New listing
Gloiocephala nothofagi	Physalacriaceae		Neutral
Gloiocephala rubescens	Physalacriaceae		New listing
Gloiocephala xanthocephala	Physalacriaceae		New listing
Gymnopus hakaroa	Omphalotaceae		New listing
Hebeloma aminophilum	Hymenogastraceae		New listing
Hebeloma lacteocoffeatum	Hymenogastraceae		New listing
Hebeloma mediorufum	Hymenogastraceae		Neutral
Hebeloma victoriense	Hymenogastraceae		New listing
Heimiomyces velutipes	Mycenaceae		Neutral
Hohenbuehelia brunnea	Pleurotaceae		Neutral
Hohenbuehelia nothofaginea	Pleurotaceae		Neutral
Hohenbuehelia parsonsiae	Pleurotaceae		Neutral
Humidicutis luteovirens	Hygrophoraceae		Neutral
Humidicutis mavis	Hygrophoraceae		New listing
Hydropus funebris	Porotheleaceae		New listing
Hydropus nigrita	Porotheleaceae	SO	New listing
Hygrocybe astatogala	Hygrophoraceae		New listing
Hygrocybe cantharellus	Hygrophoraceae		New listing
Hygrocybe cerinolutea	Hygrophoraceae		Neutral
Hygrocybe firma	Hygrophoraceae		New listing
Hygrocybe julietae	Hygrophoraceae		Neutral
Hygrocybe lilaceolamellata	Hygrophoraceae		New listing
Hygrocybe miniata	Hygrophoraceae		Neutral
Hygrocybe procera	Hygrophoraceae		New listing
Hygrocybe rubrocarnosa	Hygrophoraceae		New listing
Hygrocybe striatolutea	Hygrophoraceae		Neutral
Hygrophorus involutus	Hygrophoraceae		Neutral
Hygrophorus salmonipes	Hygrophoraceae		New listing
Hymenopellis colensoi	Physalacriaceae		Neutral
Hypholoma acutum	Strophariaceae		New listing
Hypholoma australianum	Strophariaceae	SO	New listing
Hypholoma brunneum	Strophariaceae		New listing
Inocybe albovestita	Inocybaceae		New listing
Inocybe brevicula	Inocybaceae	SO	New listing
Inocybe brunneidisca	Inocybaceae	SO	New listing
Inocybe bulbinella	Inocybaceae	SO	New listing
Inocybe caerulata	Inocybaceae	SO	New listing
Inocybe fulvilubrica	Inocybaceae	SO	New listing
Inocybe fuscosquarrosa	Inocybaceae	SO	New listing
Inocybe horakomyces	Inocybaceae	SO	Neutral
Inocybe leptospermi	Inocybaceae		Neutral

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Inocybe lucifera	Inocybaceae	SO	New listing
Inocybe luteobulbosa	Inocybaceae	SO	New listing
Inocybe scissa	Inocybaceae		New listing
Inocybe serratoides	Inocybaceae		New listing
Inocybe strobilomyces	Inocybaceae		New listing
Inocybe subferruginea	Inocybaceae	SO	New listing
Inocybe sylvicola	Inocybaceae	SO	New listing
Inosperma calamistratoides	Inocybaceae		New listing
Inosperma latericium	Inocybaceae		Neutral
Kuehneromyces brunneoalbescens	Strophariaceae	SO	New listing
Laccaria fibrillosa	Hydnangiaceae		New listing
Laccaria glabripes	Hydnangiaceae		New listing
Laccaria masoniae	Hydnangiaceae		New listing
Laccaria violaceonigra	Hydnangiaceae		New listing
Lacrymaria asperospora	Psathyrellaceae	SO	Neutral
Lentinula novae-zelandiae	Omphalotaceae		New listing
Lepiota calcarata	Agaricaceae		Neutral
Leratiomyces erythrocephalus	Strophariaceae		New listing
Leucoagaricus serenus	Agaricaceae	SO	New listing
Leucopaxillus eucalyptorum	Tricholomataceae	SO	New listing
Leucopaxillus lilacinus	Tricholomataceae		New listing
Lyophyllum decastes	Lyophyllaceae	SO	New listing
Macrolepiota clelandii	Agaricaceae		Neutral
Marasmiellus bonii	Omphalotaceae		Neutral
Marasmiellus dichrous	Omphalotaceae	SO	New listing
Marasmiellus subnudus	Omphalotaceae	SO	New listing
Marasmius atrocastaneus	Marasmiaceae		New listing
Marasmius elegans	Marasmiaceae		New listing
Marasmius gelatinosipes	Marasmiaceae		Neutral
Marasmius pusio	Marasmiaceae		Neutral
Melanoleuca fusca	Pluteaceae	SO	New listing
Melanophyllum haematospermum	Agaricaceae	SO	New listing
Mycena austrofilopes	Mycenaceae	SO	New listing
Mycena carmeliana	Mycenaceae	SO	New listing
Mycena clarkeana	Mycenaceae	SO	New listing
Mycena cystidiosa	Mycenaceae	SO	New listing
Mycena fuscovinacea	Mycenaceae	SO	New listing
Mycena globuliformis	Mycenaceae		Neutral
Mycena interrupta	Mycenaceae		New listing
Mycena mariae	Mycenaceae		New listing
Mycena morrisjonesii	Mycenaceae		Neutral
Mycena oculisnymphae	Mycenaceae	SO	New listing
Mycena parsonsii	Mycenaceae		New listing
Mycena roseoflava	Mycenaceae		New listing
Mycena stevensoniae	Mycenaceae		Neutral
Mycena subviscosa	Mycenaceae		New listing
Mycena ura	Mycenaceae		New listing
Mycetinis curraniae	Omphalotaceae		Neutral

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Omphalina wellingtonensis	Tricholomataceae		Neutral
Oudemansiella australis	Physalacariaceae		New listing
Panaeolus fimbriatus	Panaeolaceae		New listing
Panellus luxfilamentus	Mycenaceae		New listing
Panellus minimus	Mycenaceae		New listing
Panellus stypticus	Mycenaceae		New listing
Pholiota cerea	Strophariaceae		New listing
Pholiota glutinosa	Strophariaceae		Neutral
Pholiota multicingulata	Strophariaceae		Neutral
Pholiota subflammans	Strophariaceae		Neutral
Pholiotina gracilenta	Bolbitiaceae		Neutral
Pleurella ardesiaca	Cyphellaceae		Neutral
Pleuroflammula praestans	Crepidotaceae		Neutral
Pleurotus australis	Pleurotaceae		New listing
Pleurotus djamor	Pleurotaceae		New listing
Pleurotus parsonsiae	Pleurotaceae		New listing
Pleurotus purpureo-olivaceus	Pleurotaceae		New listing
Pluteus concentricus	Pluteaceae		New listing
Pluteus pauperculus	Pluteaceae		New listing
Pluteus perroseus	Pluteaceae		Neutral
Pluteus velutinornatus	Pluteaceae		New listing
Porpolomopsis lewelliniae	Hygrophoraceae	SO	New listing
Pouzarella farinosa	Entolomataceae		New listing
Psathyloma catervatim	Hymenogastraceae		New listing
Psathyrella echinata	Psathyrellaceae		New listing
Psilocybe makarorae	Hymenogastraceae		New listing
Psilocybe weraroa	Hymenogastraceae		New listing
Resupinatus vinosolividus	Pleurotaceae		New listing
Resupinatus violaceogriseus	Pleurotaceae		Neutral
Rhizocybe albida	Lyophyllaceae		Neutral
Rhodocollybia incarnata	Omphalotaceae		New listing
Rhodocollybia purpurata	Omphalotaceae		Neutral
Rhodocybe piperita	Entolomataceae		Neutral
Roridomyces austrororidus	Mycenaceae		New listing
Scytinotus longinquus	Porotheleaceae		Neutral
Simocybe phlebophora	Crepidotaceae		Neutral
Simocybe pruinata	Crepidotaceae		Neutral
Singerocybe clitocyboides	Clitocybaceae		New listing
Tricholoma elegans	Tricholomataceae		New listing
Tricholoma viridiolivaceum	Tricholomataceae		New listing
Tricholomopsis ornaticeps	Typhulaceae	DPR	Neutral
Tricholomopsis scabra	Typhulaceae		New listing
Tubaria rufofulva	Tubariaceae		New listing
Tulostoma simulans	Agaricaceae		New listing
Tympanella galanthina	Strophariaceae		New listing
Xeromphalina leonina	Mycenaceae		Neutral
Boletes (16)			
Austroboletus niveus	Boletaceae		New listing

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Austroboletus novae-zelandiae	Boletaceae		New listing
Austropaxillus mcnabbii	Serpulaceae		New listing
Austropaxillus nothofagi	Serpulaceae		New listing
Austropaxillus squarrosus	Serpulaceae		New listing
Boletus leptospermi	Boletaceae		New listing
Calostoma fuscum	Calostomataceae		New listing
Calostoma rodwayi	Calostomataceae		New listing
Chalciporus aurantiacus	Boletaceae		Better
Fistulinella violaceipora	Boletaceae		New listing
Hygrophoropsis coacta	Hygrophoropsidaceae		New listing
Phylloporus novae-zelandiae	Boletaceae		New listing
Tylopilus brunneus	Boletaceae		New listing
Xerocomus mcrobbii	Boletaceae		New listing
Xerocomus nothofagi	Boletaceae		New listing
Xerocomus squamulosus	Boletaceae		New listing
Russuloid fungi (33)			
Lactarius clarkeae	Russulaceae		New listing
Lactarius tawai	Russulaceae		New listing
Lactarius umerensis	Russulaceae		New listing
Lactifluus sepiaceus	Russulaceae		New listing
Lentinellus castoreus	Auriscalpiaceae		New listing
Lentinellus crawfordiae	Auriscalpiaceae		New listing
Lentinellus novae-zelandiae	Auriscalpiaceae		Neutral
Lentinellus pulvinulus	Auriscalpiaceae		Neutral
Lentinellus subargillaceus	Auriscalpiaceae	SO	New listing
Russula acrolamellata	Russulaceae		New listing
Russula atroviridis	Russulaceae		New listing
Russula australis	Russulaceae		New listing
Russula cremeoochracea	Russulaceae		New listing
Russula griseobrunnea	Russulaceae		New listing
Russula griseostipitata	Russulaceae		New listing
Russula griseoviolacea	Russulaceae		New listing
Russula griseoviridis	Russulaceae		New listing
Russula inquinata	Russulaceae		Better
Russula kermesina	Russulaceae		New listing
Russula littorea	Russulaceae		Better
Russula macrocystidiata	Russulaceae		New listing
Russula miniata	Russulaceae		Better
Russula novae-zelandiae	Russulaceae		New listing
Russula papakaiensis	Russulaceae		Better
Russula pilocystidiata	Russulaceae		New listing
Russula pseudoareolata	Russulaceae		New listing
Russula purpureotincta	Russulaceae		New listing
Russula rimulosa	Russulaceae		New listing
Russula roseopileata	Russulaceae		New listing
Russula roseostipitata	Russulaceae		New listing
Russula tawai	Russulaceae		New listing
Russula tricholomopsis	Russulaceae		New listing

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Table 8 continued

ASSESSMENT NAME	FAMILY	CRITERIA | QUALIFIERS	STATUS CHANGE
Russula umerensis	Russulaceae		New listing
Taxonomically unresolved (8)			
Agarics (7)			
Amanita drummondii	Amanitaceae	SO	New listing
Campanella sp. 'Ashurst (PDD 106900)'	Marasmiaceae		New listing
Campanella sp. 'Pureora (PDD 96255)'	Marasmiaceae		New listing
Laccaria sp. 'Milnethorpe (PDD 105764)'	Hydnangiaceae		New listing
Lepiota haemorrhagica	Agaricaceae	SO	New listing
Ossicaulis sp. 'Prices Valley (PDD 87161)'	Lyophyllaceae		New listing
Porpoloma sp. 'brunneogrisea (PDD 96890)'	Tricholomataceae		New listing
Russuloid fungi (1)			
Russula sp. 'austrofoetida (PDD 79881)'	Russulaceae		New listing
INTRODUCED AND NATURALISED (19)*			
Taxonomically determinate (19)			
Agarics (19)			
Calocybe carnea	Lyophyllaceae		Neutral
Calocybe onychina	Lyophyllaceae	OL	Neutral
Clitocybe fragrans	Clitocybaceae	SO	Neutral
Clitocybe nebularis	Clitocybaceae	SO	Neutral
Clitocybe rivulosa	Clitocybaceae	SO	Neutral
Coprinopsis stercorea	Psathyrellaceae		Neutral
Cruentomycena viscidocruenta	Mycenaceae		Neutral
Entoloma congregatum	Entolomataceae		Neutral
Entoloma sericellum	Entolomataceae		Neutral
Gymnopus villosipes	Omphalotaceae		Neutral
Lepiota alopochroa	Agaricaceae		Neutral
Lepiota grangei	Agaricaceae	OL	Neutral
Lepista luscina	Clitocybaceae		Neutral
Mycena filopes	Mycenaceae	SO	Neutral
Mycena miriamae	Mycenaceae		Neutral
Mycena olivaceomarginata	Mycenaceae		Neutral
Mycena sanguinolenta	Mycenaceae		Neutral
Protostropharia semiglobata	Strophariaceae	SO	Neutral
Volvariella surrecta	Pluteaceae		Better

* Only taxa that were listed in Hitchmough (2002) and have since been identified as exotic are reported as Introduced and Naturalised in this assessment; all other exotic taxa of fungi are omitted.

4.2 NZTCS qualifiers, categories and criteria used in this assessment

4.2.1 Qualifiers

The qualifiers used in this assessment are abbreviated as follows:

CD	Conservation Dependent (CDB indicates the need for only good biosecurity)
CI	Climate Impact
CR	Conservation Research Needed
De	Designated
DPR	Data Poor Recognition
DPS	Data Poor Size
DPT	Data Poor Trend
EF	Extreme Fluctuations
IE	Island Endemic
Inc	Increasing
OL	One Location
PD	Partial Decline
PF	Population Fragmentation
RF	Recruitment Failure
RR	Range Restricted
SO	Secure Overseas
Sp	Sparse
TO	Threatened Overseas

Further details about each of these can be found at https://nztcs.org.nz/home.

4.2.2 Categories and criteria

Data Deficient

Taxa that cannot be assessed due to a lack of current information about their distribution and abundance. It is hoped that listing such taxa will stimulate research to find out the true category (for a fuller definition, see Townsend et al. (2008)).

Threatened

NATIONALLY CRITICAL

A – very small population (natural or unnatural)

A(1) < 250 mature individuals
A(2) ≤ 2 sub-populations, ≤ 200 mature individuals in the larger sub-population
A(3) Total area of occupancy ≤ 1 ha (0.01 km^2)

B – small population with a high ongoing or forecast decline of 50–70%

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

C – population (irrespective of size or number of sub-populations) with a very high ongoing or forecast decline of > 70%

C Predicted decline > 70%

NATIONALLY ENDANGERED

A – small population that has a low to high ongoing or forecast decline of 10–50%

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

B – small, stable population (unnatural)

B(1) 250–1000 mature individuals
B2) ≤ 5 sub-populations, ≤ 300 mature individuals in the largest sub-population
B(3) Total area of occupancy ≤ 10 ha (0.1 km^2)

C – moderate population and high ongoing or forecast decline of 50–70%

C(1) 1000–5000 mature individuals
C(2) ≤ 15 sub-populations, ≤ 500 mature individuals in the largest sub-population
C(3) Total area of occupancy ≤ 100 ha (1 km^2)

NATIONALLY VULNERABLE

A – small population (unnatural), increasing > 10%

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

B – moderate population (unnatural), stable ± 10%

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

C – moderate population with low to high ongoing or forecast decline of 10–50%

C(1) 1000–5000 mature individuals
C(2) ≤ 15 sub-populations, ≤ 500 mature individuals in the largest sub-population
C(3) Total area of occupancy ≤ 100 ha (1 km^2)

D – moderate to large population with moderate to high ongoing or forecast decline of 30–70%

D(1) 5000–20 000 mature individuals
D(2) ≤ 15 sub-populations, ≤ 1000 mature individuals in the largest sub-population
D(3) Total area of occupancy ≤ 1000 ha (10 km^2)

E – large population with high ongoing or forecast decline of 50–70%

E(1) 20 000–100 000 mature individuals
E(2) Total area of occupancy ≤ 10 000 ha (100 km^2)

At Risk

NATURALLY UNCOMMON

Taxa whose distributions are confined to specific geographical areas or that occur within naturally small and widely scattered populations, where these distributions are not the result of human disturbance.

Not Threatened

Resident native taxa that have large, stable populations.

Introduced and Naturalised

Taxa that have become naturalised in the wild after being deliberately or accidentally introduced into Aotearoa New Zealand by human agency.

5. Acknowledgements

We acknowledge Jeremy Rolfe for his assistance in interpreting the NZTCS categories and criteria, and Nikki Pindur for reviewing an earlier version of this report. This assessment has benefitted greatly from the data provided by attendees at the annual foray of the Fungal Network of New Zealand (FUNNZ) and from the thousands of citizen scientists contributing to iNaturalist records and identifications.

6. References

Dahlberg, A.; Mueller, G. 2011: Applying IUCN red-listing criteria for assessing and reporting on the conservation status of fungal species. *Fungal Ecology 4*: 147–162.

de Lange, P.; Blanchon, D.; Knight, A.; Elix, J.; Lucking, R.; Frogley, K.; Harris, A.; Cooper, J.; Rolfe, J. 2018: Conservation status of New Zealand indigenous lichens and lichenicolous fungi, 2018. *New Zealand Threat Classification Series 27*. Department of Conservation, Wellington. 64 p. www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs27entire.pdf

Hitchmough, R. (comp.) 2002: New Zealand Threat Classification System lists 2002. *Threatened Species Occasional Publication 23*. Department of Conservation, Wellington. 210 p. www.doc.govt.nz/globalassets/documents/science-and-technical/tsop23pre.pdf

IUCN (International Union for Conservation of Nature) 2012: IUCN Red List categories and criteria. Version 3.1, second edition. IUCN, Gland and Cambridge. 32 p. www.iucnredlist.org/resources/categories-and-criteria

IUCN (International Union for Conservation of Nature) 2019: Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Retrieved from www.iucnredlist.org/resources/redlistguidelines.

Johnston, P.; Cooper, J. 2012: Data deficient non-rust pathogenic fungi. Investigation No. 4360 Landcare Research Contract Report: LC1010. Prepared for the Department of Conservation. 25 p.

Johnston, P.; Park, D.; Dickie, I.;Walbert, K. 2010: Using molecular techniques to combine taxonomic and ecological data for fungi: reviewing the Data Deficient fungi list, 2009. reviewing the Data Deficient fungi list. *Science for Conservation 306*. Department of Conservation, Wellington. 31 p. www.doc.govt.nz/globalassets/documents/science-and-technical/sfc306entire.pdf

May, T.; Cooper, J.; Dahlberg, A.; Furci, G.; Minter, D.; Mueller, G.; Pouliot, A.; Yang, Z. 2019: Recognition of the discipline of conservation mycology. *Conservation Biology 33*: 733–736.

Molloy, J.; Bell, B.; Clout, M.; de Lange, P.; Gibbs, G.; Given, D.; Norton, D.; Smith, N.; Stephens, T. 2002: Classifying species according to threat of extinction. A system for New Zealand. *Threatened Species Occasional Publication 22*. Department of Conservation, Wellington. 26 p. www.doc.govt.nz/globalassets/documents/science-and-technical/tsop22.pdf

Nilsen, A.; Wang, X.; Soop, K.; Cooper, J.; Ridley, G.; Wallace, M.; Summerfield, T.C.; Brown, C.M.; Orlovich, D. 2020: Purple haze: cryptic purple sequestrate *Cortinarius* in New Zealand. *Mycologia 112*: 588–605.

Rolfe, J.; Hitchmough, R.; Michel, P.; Makan, T.; Cooper, J.; de Lange, P.J.; Townsend, A.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J. in press: New Zealand Threat Classification System manual 2021. Part 1: Assessments. Department of Conservation, Wellington. 45 p.

Rolfe, J.: Makan, T.; Tait, A. 2021: Supplement to the New Zealand Threat Classification System 2008: new qualifiers and amendments to qualifier definitions, 2021. Department of Conservation, Wellington. 9 p. www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs-supplement-2021.pdf

Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D.A. 2008: New Zealand Threat Classification System manual. Department of Conservation, Wellington. 35 p. www.doc.govt.nz/globalassets/documents/science-and-technical/sap244.pdf

7. Glossary of terms as applied to fungi in this publication

agaric	Common name for a fungus with a mushroom-like fruiting body that produces spores from gills on the underside of the cap; many are members of Agaricales.
bolete	Common name for a fungus with a fleshy, mushroom-like fruiting body that produces spores from a spongy layer of tubes opening as pores on the underside of the cap; members of Boletales.
commensal	A close and enduring association between a fungus and host where the fungus benefits without causing harm to the host.
endophyte	A fungus that lives inside a host plant for at least some of its lifecycle without showing visible signs of infection or disease.
fungarium	A curated collection of fungal specimens that is typically preserved by drying, along with associated data.
heterotroph	An organism that is unable to produce its own food, gaining its nutrition from other sources of organic matter such as plants, animals or other fungi.
lichenicolous fungus	A fungus that lives exclusively on or in a lichen as its host; mostly occur as parasites but some may form a commensal or saprophytic association.
lichenised fungus	A fungus that lives as a partner with an alga or cyanobacterium to form a composite organism known as a lichen. Lichens are classified according to the fungal name.
macrofungus	A common term for a fungus with a fruiting body that is readily visible to the naked eye.
mycorrhizal	A symbiotic to weakly parasitic relationship between a fungus and the roots of a host plant, whereby fungal hyphae (branched cellular threads) interact with root cells to enable the transfer of water and minerals to the root and plant carbohydrates to the fungus. In Aotearoa New Zealand, mycorrhizal fungi with mushroom-like fruiting bodies are restricted to hosts of tea tree and beech.
parasitic	A close relationship between a fungus and a host plant, animal or other fungus in which the parasitic fungus lives on or in the host causing a disease or other harm.
pathogenic	Similar to parasitic but typically refers to a fungus that causes disease.
russuloid	Fungi with mushroom-like fruiting bodies that are distinctive in texture when fresh, breaking like chalk instead of being flexible or fibrous; members of Russulales.
saprophytic	A mode of nutrition where the fungus absorbs nutrients from dead organic matter.
secotioid	A fungus that forms partially closed mushroom-like fruiting bodies that do not open up to disperse spores and instead may rely on animals for dispersal; most are classified as agarics, boletes and russuloid fungi.
sporocarp	Another name for the fruiting body of a fungus in which spores are produced.
symbiotic	A close and enduring association between a fungus and its host that can be commensal, parasitic or of mutual benefit.

Appendix 1

A rapid assessment methodology

A triage process was developed to facilitate the rapid preliminary assessment of large numbers of fungal taxa. At this preliminary stage, the process disregards the problematic concepts of population size and numbers of mature individuals as they apply to fungi, instead focusing on more easily accessible data of known occurrences and distributions. Application of the process relies on the ability to visualise aggregated and geo-referenced occurrence data. An important pre-requisite is that taxon names associated with occurrence records are unified to conform with those presented by the New Zealand Organisms Register (NZOR).[10] Candidate taxa that were considered to have a potential elevated conservation status based on this assessment were carried forward into the formal assessment process. In addition, some taxa that were excluded by this preliminary assessment were also added to the formal assessment process by the expert panel.

A taxon may be categorised as Data Deficient for several different reasons. The process captures important information about why it is not possible to carry out a detailed assessment for each taxon.

Support for visualising taxon distribution data

There are several visual tools that can be used to assess the distributions of taxa:

- The Atlas of Living Australia – This brings together data in the New Zealand Fungarium (PDD)[11] and the Australia fungaria. It is especially useful because setting the map scale to 50 km and the record spot size to 12 allows the number of locations (as defined in the key) to be assessed. Data should be viewed in the 'interactive viewer'. https://bie.ala.org.au/
- Geographic information systems (GIS) layers available for viewing in applications such as QGIS, together with point location data from PDD, International Collection of Microorganisms from Plants (ICMP)[12] and iNaturalist data (a curated subset). A QGIS[13] project facilitates the viewing of species distributions using the criteria in the key and the visualisation against important base maps, such as the Land Cover Database,[14] DOC ecological regions and protected areas. Use of QGIS for visualisation requires a basic level of GIS expertise.
- GBIF allows the global status to be assessed, and includes records from all available sources, including overseas fungaria, iNaturalist, etc. The GBIF data for the species should be selected and mapped. It is critical to assess the quality of global GBIF data. www.gbif.org/occurrence/search
- iNaturalist may show additional records that have not reached Research Grade status and so have not been exported to GBIF. This is especially true of rare or difficult fungal species, where multiple endorsements of identifications are difficult to obtain. https://www.inaturalist.org/

[10] https://nzor.org.nz

[11] https://scd.landcareresearch.co.nz/Search?collectionId=PDD

[12] https://scd.landcareresearch.co.nz/Search?collectionId=ICMP

[13] www.qgis.org/

[14] https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/

Rapid pre-selection of candidate taxa

Table A1.1. The decision key.

0	Resource available to assess the taxon in detail	1
0’	Resource not available to assess the taxon in detail	Data Deficient
1	Introduced	Exclude – not assessed
1’	Indigenous or endemic	2
2	Taxon requires significant expertise for correct identification (panel view)	3
2’	Taxon likely to be both collected and correctly identified by non-experts	9
3	Taxonomic status uncertain (panel view)	Data Deficient
3’	Taxonomic status certain	4
4	Representative distribution data available (panel view)	8
4’	Representative distribution data not available	5
5	Recent (< 10 year) records of newly described / newly recorded taxon	Data Deficient
5’	Records over ≥ 10-year timespan	6
6	National expertise available	7
6’	National expertise not available	Not assessed
7	Expert opinion indicates taxon is likely to be widespread, nationally or globally, regardless of sparse records (a consequence of under-sampling)	Not Threatened
7’	Expert opinion indicates taxon is not widespread, but expertise insufficiently resourced to collect representative data	Data Deficient
8	Expertise insufficiently resourced to assess available data	Not assessed
8’	Expertise available to assess available data	9
9	Possesses a strict biotrophic association with an organism that is itself listed as Threatened or At Risk	Status same as associate or result of independent assessment, whichever is higher
9’	Without a biotrophic association, or associated organism is Not Threatened	10
10	Indigenous taxon where overseas populations have been assessed as Least Concern	Not Threatened
10’	Endemic taxon, or indigenous and not assessed as Least Concern overseas	11
11	No records in the last 50 years	Candidate Extinct
11’	Records in the last 50 years	12
12	Known from only one or two localities (Localities are here defined as the number of separate units when all point sites are mapped with a 20-km-diameter buffer. However, Department of Conservation ecological regions are taken as a final boundary on this buffering, i.e. aggregations that span two regions count as two locations (use ALA mapper/QGIS).)	13
12’	Known from more than two localities	14
13	Total area of occupancy within locations ≤ 50 ha (0.5 km^2) (Area of occupancy is defined as the sum of the area bounded by recorded point locations with constant land use over the recorded period, each with a 200-m-radius buffer (c. 12 ha per isolated point) (estimated by inspection of the mapped data, or preferably using QGIS).)	Candidate Nationally Critical
13’	Total area of occupancy within locations > 10 ha	Candidate Nationally Endangered
14	Known from five or less localities	15
14’	Known from more than five localities	16
15	Locality land use / ecosystem / habitat / host with past or predicted reduction	Candidate Nationally Critical
15’	Locality land use / ecosystem / habitat / host stable	Candidate Nationally Vulnerable
16	Known from 15 or less localities	17
16’	Known from more than 15 localities	18
17	Locality land use / ecosystem / habitat / host with past or predicted reduction	Candidate Nationally Endangered
17’	Locality land use / ecosystem / habitat / host stable	Candidate Nationally Vulnerable
18	Area of occupancy at each location ≤ 50 ha or restricted to one or two contiguous ecoregions (Range Restricted)	Candidate Naturally Uncommon
18’	Area of occupancy > 50 ha or present in three or more ecoregions	Not Threatened