
THE STATUS OF FUNGAL SPECIES IN NEW ZEALAND 2026 (EXCLUDING LICHENS)

Mycological Notes 47

Jerry Cooper, Christchurch, March 2026

Background

In 1992 the New Zealand government recognised the status of several biological collections and databases held by some New Zealand institutes as ‘Nationally Significant’¹. Since that time these Nationally Significant Databases & Collections (NSDCs) have received financial support for their continued development and the curation of the data they contain. Manaaki Whenua – Landcare Research (MWLR, now the Bioeconomy Science Institute) maintain seven of these NSDCs. The fungal collection and databases contain the most comprehensive national dataset on our fungal biota (Johnston, Weir & Cooper 2017). PDD² is the national fungarium and contains, by far, the most significant collection of New Zealand fungi globally (>120,000 specimens). MWLR also manage the International Collection of Microorganisms from Plants (ICMP³) which is a repository of >20,000 cultures of fungi and bacteria held in metabolic stasis under liquid nitrogen. Significant technical resource have been invested to develop robust, standards-based information management systems and websites to manage these data and make them publicly and freely available. The data content is continuously curated, and that includes limited taxonomic research to support the quality of that content. The associated databases contain information on all the fungal names that have been used to refer to species in New Zealand, and the literature citing those names. The databases track which fungal species are associated with which plants (especially plant pathogens). They track the currently accepted names for species as new research uncovers new species, merges older species concepts, or splits them. Species are listed as endemic (known only from New Zealand), Indigenous

¹ <https://www.mbie.govt.nz/science-and-technology/science-and-innovation/funding-information-and-opportunities/investment-funds/strategic-science-investment-fund/funded-infrastructure/nationally-significant-collections-and-databases>

² [New Zealand Fungarium – Te Kohinga Hekaheka o Aotearoa » Manaaki Whenua](#)

³ [International Collection of Microorganisms from Plants – Te Kohinga Moroiti o Aotearoa » Manaaki Whenua](#)

(native to New Zealand but perhaps also present overseas), or introduced. Species are classified within the currently accepted taxonomic hierarchy.

The pace of change to this data has increased significantly in recent years. The introduction of relatively cheap gene sequencing technologies around the turn of the century has dramatically changed how we define and classify fungal species globally. In New Zealand sequencing has uncovered a very substantial level of cryptic native fungal species diversity that we were unaware of. We now have sequence barcode ⁴data for a substantial proportion of both our native and introduced fungal biota allowing us to rapidly and unambiguously identify both physical specimens and interpret environmental eDNA ⁵data. A detailed comparison of modern specimens with older described species reveals that many newly sequenced specimens represent undescribed species. This comparative research process takes significant time. The next step of formally publishing new species descriptions and names is also a labour-intensive process. Currently there are insufficient funds and available skilled taxonomists to carry out that task. In the meantime, if a verified undescribed sequenced species is known from multiple vouchered specimens from different localities, then I have allocated a provisional name. We currently have over 500 of these provisionally-named, undescribed species. These provisional names provide an important stop-gap allowing us to collate information on species, assess the status as indigenous or introduced, and assess the conservation status. In addition, there are another 500 species known only from single sequenced specimens.

Our recently increased knowledge on undescribed New Zealand fungal species is just scratching the surface. For example, the MycoMap ⁶project in the USA has been leveraging the national collecting power of Citizen Scientists (through iNaturalist⁷) and has used large-scale and cost-effective nanopore sequencing to barcode over 150,000 specimens. They have identified around 17,000 undescribed fungal species, although few have deposited vouchers or compared critically with known described species. They have 500 provisionally named species in the mushroom family Cortinariaceae alone. In New Zealand we currently have 41 New Zealand provisional species in that family. A similar future effort in New Zealand (through iNaturalist and the Fungal Foray⁸) would add substantially to our knowledge of national fungal diversity, although the human taxonomic resource necessary to critically evaluate specimens and data would probably remain inadequate.

We use our existing dynamically shifting information resources on fungi to manage and interpret the data we hold for specimens. All this data is publicly available via our taxonomy portal (BiotaNZ⁹) and our Collections portal (SCD¹⁰). Few countries have this degree of integrated national-scale quality data on their fungal biota. The combined data allows us to provide valuable services. Our national biosecurity agency can rapidly determine if a fungal organism, perhaps detected at the border, is new to New Zealand, or whether a post-border incursion is new to New Zealand or spreading. For an

⁴ [DNA barcoding - Wikipedia](#)

⁵ [Environmental DNA - Wikipedia](#)

⁶ [Home - MycoMap](#)

⁷ <https://inaturalist.org.nz>

⁸ [Fungal Network of New Zealand | New Zealand mycological society](#)

⁹ [Biota of NZ](#)

¹⁰ [SCD Home](#)

economy dependent on primary industries this information is vital in supporting timely and cost-effective decision-making.

In addition to this biosecurity aspect the national-scale data also allows us to assess threats to fungal species. The data are used to support biodiversity assessments and develop conservation actions. New Zealand fungal species are included in several reports under the New Zealand Threat Classification System (NZTCS¹¹) and are listed under the IUCN Red-Data ¹²list.

Our public web portals are designed to facilitate specific queries about the status of a species, but they are less useful for providing an overview of the status of all fungal species at a point in time. The spreadsheet associated with this report was produced for that primary reason. In essence it is a simple snapshot in time (March 2026) of all the fungal species (excluding lichens) currently reported from New Zealand, their biostatus as indigenous or introduced, and their position within a classification. However, the production of such a list facilitates a more detailed overview and it includes additional data, with a focus on conservation.

Threatened species lists

Many species in nearly all organism groups are under the threat of extinction and lists of designated species are published by the New Zealand Department of Conservation. It is important to understand that assigning a threat status (or not threatened status) to a species may have significant consequences. Threat status provides an important tool for prioritizing the allocation of limited funding for biodiversity research, protection and restoration. In addition, the status may be used as one of the statutory instruments in assessing actions around land use change and management. In New Zealand it is possible that the assignment of a threat category could be legally tested in the Environment Court. Consequently, the threat assessment process must be objective, robust, scientifically defensible and based on the best available data.

Whilst many organisms face the threat of extinction only a few of those are officially recognised, and even fewer have any level of funded support to slow, halt or reverse the threats. In considering the allocation of scarce funds for conservation it is natural to attempt to score biodiversity value as an important aspect of prioritisation. This phrase ‘biodiversity value’ is commonly encountered, but what does it really mean? One would hope that significant value is assigned to the contribution that each species makes to ecosystem integrity and the provision of ecosystem services¹³. Fungi are essential components of all ecosystems. However, significant ‘biodiversity value’ is also placed on those threatened species with a high public awareness, including iconic animals and plants. These groups often provide a limited contribution to ecosystem diversity, stability, or services. In this respect fungi have a public image problem. They are rarely iconic, but their profile is rising. On the popular iNaturalist website 7% of 5.6 million New Zealand observations of birds, plants and fungi are for the fungi despite the fact they are only usually seen during a small portion of the year.

¹¹ [NZTCS](#)

¹² [IUCN Red List of Threatened Species](#)

¹³ [Ecosystem service - Wikipedia](#)

Currently our fungi have little profile with those holding the purse strings for conservation funding. This lack of awareness by those charged with national conservation management needs to change.

Assessing fungal species for the threat of extinction is a labour-intensive process, especially for fungi, and despite having easy access to the available national-scale fungal species occurrence data. Currently at least, the existence of threat listed fungal species has very limited consequences for conservation actions, and that situation is a considerable disincentive to carrying out assessments. For these reasons, relatively few of our fungal species have been assessed to date. In 2021 we published an assessment covering the mushroom-like fungi (Cooper et al, 2021), and prior to that there was a more general assessment in 2002 (Hitchmough et al, 2007). That early assessment used limited data available at the time, and a protocol that would not now be considered fit for purpose. Many of the species listed in 2007 require re-assessment.

Extinct fungi?

Under NZTCS a species is considered extinct if “*there is no reasonable doubt, after repeated surveys in known or expected habitats at appropriate times (diurnal, seasonal and annual) and throughout the taxon’s historic range, that the last individual has died*” (Rolfe et al., 2022). But how can we possibly say that a fungal species is extinct according to this definition? Many fungal species are small, cryptic, requiring specialists to identify them, and without any systematic survey effort.

Nationally Critical?

If a population is restricted to very few localities, then regardless of sources causing long-term decline (like climate change or habitat loss) they are at risk from catastrophic events and can thus be considered Nationally Critical under NZTCS criteria. Once again however the problem is being sure how many localities there are for a particular species. This mechanism for declaring species Nationally Critical should not be automatically applied to rarely found species because there can be many reasons for apparent rarity. Nevertheless, it has been applied to a few species in New Zealand that are relatively easily seen, identified and considered truly rare. The Nationally Critical *Deconica baylissiana* falls into this category. For over 50 years it was known from just two upland locations in the south of New Zealand. It was then observed at one of the original sites by an iNaturalist observer, and importantly, it was recognised (by me). After that public record the species re-entered the public consciousness. Having been forgotten about for over 50 years it has now been reliably recorded from several more similar sites in the South of New Zealand by iNaturalist observers. This re-discovery process highlights the importance of Citizen Science platforms like iNaturalist. If the species were assessed today then it could no longer be considered Nationally Critical. The same is true of two other enigmatic species *Claustula fischeri* and *Berggrenia aurantiaca*. To avoid these mis-classifications we need some mechanism for stimulating discovery and surveying before an assessment is carried out.

Lost and Found

At the global scale there has been an increasing interest in so-called lost species. We aren’t sure if these species are extinct or not, but they haven’t been seen for a while. There isn’t enough data to

assess the threat of extinction, and we need more. Leonardo DiCaprio’s philanthropic Rewild¹⁴ organisation has recently highlighted the issue of lost species. Raising awareness of these lost species may stimulate the effort to find them again, and to generate additional data that may be used for threat assessments, and so potentially protect endangered fungal species and their habitats.

A recent paper (Long & Rodriguez, 2022) introduced a nomenclature for lost species. They defined:

- Long-Lost – not seen in the last 50 years
- Lost – not seen in the last 10 years
- Missing – not seen in the last 5 years

Applying these definitions to New Zealand fungal occurrence records to generate categorised lists is much easier than full species threat assessments (although the interpretation of data in the resulting categories requires careful consideration). First, we need to define the set of data to apply these criteria. From the national fungal database (NZFUNGI), and excluding lichens, the number of correctly accepted species-level taxa (including invalid and tag names) is 8,000. These are the species that are considered present in NZ, or probably present. Of those 188 species are flagged as uncertain if they are present or not. We have records, but they can’t easily be confirmed and/or we don’t have the resource to assess them.

In addition to presence/absence status we try to apply a biostatus label, as exotic, indigenous, with that broken down into endemic and non-endemic, and then those where we aren’t sure if they are exotic or indigenous.

Numbers of fungal species present or probably present in New Zealand

Exotic	2436+3 fully naturalised)
Indigenous	724+1902+1624=4250
...endemic	(1902)
... non-endemic	(1624)
Uncertain origin	1311

These figures include a few lichen names where specimens are kept in PDD. Most lichen specimens in New Zealand are housed in other collections and consequently lichen species names are excluded from the analysis from this point forward.

The methodology adopted here to assess the status as potentially Lost is to count the number of specimens in the PDD national fungarium in time periods. Then we can partition the data into: 1) the set of taxa with all specimens last collected over 50 years ago (Long-Lost 2) last collected between 10 and 50 years ago (Lost), last collected more than 5 years ago (Missing). In the first instance this breakdown is applied only to those species we are sure are indigenous (4,032 species), although the complete source data in the accompanying spreadsheet may be filtered by many criteria.

¹⁴ [The Search for Lost Species | rewild.org | Re:wild](https://rewild.org/)

There is a significant caveat that we are considering only specimens in PDD, and not the ICMP living collection, or New Zealand specimens in all other fungaria, or observation records without vouchered specimens. These omissions need to be taken into consideration when interpreting the data. 33% of the species probably present in New Zealand are not represented by specimens in the national collection. The gap will be quite high for micro-fungi which are frequently isolated into culture and will be present in the ICMP national culture collection, or overseas collections. Specimens held in collections overseas are rarely adequately curated and the associated identifications uncertain (except for type specimens). Observation-only records are useful, but only when they are of species that can be unambiguously identified without examining a specimen, and that proportion is a small minority. Any list of global species occurrence data extracted from resources like GBIF and used for the purpose of identifying Lost and Long-Lost species requires significant record-by-record evaluation, and in many cases the original material would require review and verification by a taxon expert before these records could be usefully used in any analysis. Despite this issue, and the necessary reduced volume of reliable data used for this assessment, a more detailed analysis is possible, but would require significant time investment that is not currently available. We can be confident the statistics reported here for basidiomycetes based only on specimens in the PDD national fungarium are reasonably exhaustive and representative. This report is the first attempt to enumerate New Zealand's Lost (and Long-Lost) fungal species.

A further interesting category extracted from this data is the number of species for which we have specimens identified in the last 10 years and for which the remaining records are over 50 years old (Long-Lost). I call this category Found. There aren't many of them and it reflects recent work on those taxa.

In doing this analysis I also felt it useful to also know which species have barcode sequence data, because the availability of sequence data has also significantly improved the quality of identifications and our general understanding of fungal diversity. The barcode data is either from New Zealand specimen, or for exotic/non-endemic specimens it may be represented only by sequences associated with overseas specimens. There will be some I have missed due to lack of time for an exhaustive search.

I have included data on the current threat status of our species according to the 2022 NZTCS assessment of mushrooms groups, the older NZTCS 2002 general assessment (now very dated), and the current IUCN status.

And finally, I have included the few species (which are all indigenous/endemic) that are listed by the Ministry of Primary Industries (MPI) on their register of pests and diseases¹⁵. The occurrence of any native species on these lists requires some explanation.

Summaries for species present in New Zealand and indigenous and excluding the main lichenised taxa.

All species	# species	%
No PDD data	786	19%

¹⁵ [Registers and lists for pests and diseases | NZ Government](#)

With PDD data	3250	81%
Total # species	4036	
Long-Lost	409	10%
Lost	1285	32%
Missing	678	17%
Found	35	1%
Barcoded	2141	53%

Breaking this down for the major phyla we have

Ascomycota	# species	%
No PDD data	533	29%
With PDD data	1289	71%
Total # species	1822	
Long-Lost	253	14%
Lost	776	43%
Missing	123	7%
Found	10	1%
Barcoded	543	30%

Basidiomycota	# species	%
No PDD data	179	8%
With PDD data	1946	92%
Total # species	2125	
Long-Lost	152	7%
Lost	502	24%
Missing	552	26%
Found	25	1%
Barcoded	1588	75%

Much of the difference between these two tables may be associated with the significant lack of PDD specimen data for Ascomycetes relative to Basidiomycetes, and we have mentioned some reasons for that. It is clear however, that the percentage of barcode data for the basidiomycetes is considerably greater than that for ascomycetes. For the Agaricales (the mushrooms and allies) the figures are even higher, and we have barcode data for 85% of our known (both formally described and undescribed) indigenous species. The figures reflect a consistent targeted effort to characterise these species over the last decade. The efficiency and success of that process has been facilitated through by a relatively small number of individuals with good 'field naturalist' skills (to recognise and prioritise samples) together with the collective effort resulting from the annual fungal foray and the iNaturalist community.

The total number of Lost species is very high, with 1285 species (32%). The definition of Lost as not being seen for over ten years is appropriate for large animals. It is much less appropriate for fungi and insects because of multiple factors: species numbers are very high; significant expertise is required for the identification of many species; and many species are cryptic and not seen by the casual observer. The fungal figures for Long-Lost are probably more comparable with those for large animals, and even in this category the same factors will have significant impact.

Long Lost

Let's take a look at the 152 Long-Lost Basidiomycota. 24 of them (16%) are indigenous rusts, and that is surprising considering the recent effort that has gone into surveying for rust species for a new (yet to be published) national revision. It may reflect declining populations of the plants on which they depend. 111 (73%) are agaricomycetes with 69 of those bracket, jelly and paint splash fungi and these are groups that have received less attention in recent years.

Long-Lost species of rusts

<i>Aecidium myrsines</i> McNabb
<i>Aecidium ranunculi-maculati</i> McKenzie & Padamsee
<i>Aecidium ranunculi-monroi</i> G. Cunn.
<i>Melampsora kusanoi</i> Dietel
<i>Melampsora novae-zelandiae</i> G. Cunn.
<i>Milesina lindsaeae</i> (S.D. Baker) McKenzie & Padamsee
<i>Puccinia abrotanellae</i> McKenzie & Padamsee 2024
<i>Puccinia alboclava</i> G.T.S. Baylis
<i>Puccinia arnaudensis</i> G. Cunn.
<i>Puccinia contegens</i> G. Cunn.
<i>Puccinia gahniae</i> Dingley
<i>Puccinia gei</i> McAlpine
<i>Puccinia koherika</i> G. Cunn.
<i>Puccinia lagenophoricola</i> McKenzie & Padamsee
<i>Puccinia liparophylli</i> McKenzie & Padamsee 2024
<i>Puccinia litorosae</i> McKenzie & Padamsee
<i>Puccinia mania</i> G. Cunn.
<i>Puccinia menthae</i> var. <i>pseudomenthae</i> (G. Cunn.) J.W. Baxter
<i>Puccinia morrisonii</i> McAlpine
<i>Puccinia moschata</i> G. Cunn.
<i>Puccinia rhagodiae</i> (Cooke & Masee) McTaggart & R.G. Shivas
<i>Puccinia thuenenii</i> McAlpine
<i>Pucciniastrum dingleyae</i> McKenzie & Padamsee
<i>Uredo horopito</i> G. Cunn.

Many people are interested in the mushroom groups, and here is the list of Long-Lost species

Long-Lost Agaricales

Species name	# specimens (> 50 years ago)
Anthracoephyllum glaucophyllum (Cooke & Masee) Segedin	1
Calyptella hebe (G. Cunn.) W.B. Cooke	1
Cortinarius luteobrunneus Peintner & M.M. Moser	1
Crepidotus brunneomarginatus E. Horak	1
Crepidotus carneolus E. Horak	1
Crepidotus fuscus E. Horak	1
Crepidotus variegatus E. Horak	1
Cyphella discoidea Cooke	1
Dendrothele australis Nakasone & Burds.	5
Dendrothele magninavicularis Nakasone & Burds.	1
Disciseda verrucosa G. Cunn.	2
Entoloma cerinum E. Horak	1
Entoloma colensoi G. Stev.	3
Entoloma corneum E. Horak	1
Entoloma mcNabbianum E. Horak	2
Entoloma obrusseum E. Horak	3
Flagelloscypha aotearoa (G. Cunn.) Agerer	4
Galerina excentrica E. Horak	1
Gliophorus viscauranti E. Horak	2
Inocybe straminea (E. Horak) Garrido	1
Lachnella nikau G. Cunn.	4
Lachnella pyriformis (G. Cunn.) W.B. Cooke	1
Lachnella turbinata (G. Cunn.) W.B. Cooke	1
Lepiota adusta (E. Horak) E. Horak	1
Marasmius podocarpicola Pennycook	1
Marasmius rhombisporus Desjardin & E. Horak	1
Neohygrocybe squarrosa E. Horak	1
Nivatogastrium lignicola E. Horak	1
Nivatogastrium sulcatum E. Horak	1
Parvobasidium lianicola (G. Cunn.) Stalpers	3
Tubaria deceptiva E. Horak	1
Tubaria hispidula (E. Horak) E. Horak	1
Tubaria lanatula (E. Horak) E. Horak	1
Xeromphalina testacea E. Horak	1

Nearly all these species of Agaricales require specialist expertise and microscopy to reliably name them. Only one (*C. luteobrunneus*) has a barcode sequence, which reflects the difficulty in barcode sequencing older specimens. These species are also sometimes misidentified, and in some cases the species are subject to taxonomic uncertainty and may not represent good phylogenetic species.

It is worth noting how many are known (and were described) from a single collection (the holotype). In my opinion nearly all these should be dismissed as ambiguous species that will probably never be found again. It is premature to describe any fungal species based on one specimen. Some species are known from multiple old specimens and these should be looked for, although they are difficult to recognise. Some would be easily recognised and should be a priority for re-collection, if only to resolve their taxonomic status using sequence data. They are *Disciseda verrucosa*, *Anthracophyllum glaucophyllum* and *Nivatogastrium sulcatum/lignicola*. The holotype of the puffball *D. verrucosa* was collected from the Milford Track and there is another specimen by Cunningham from 'Waikare – Canterbury' and surely refers to Waikari in chalk grassland and not North Island (as currently geo-referenced in SCD). *D. verrucosa* is widely reported overseas but such a broad distribution is biogeographically very unlikely and several species are probably involved. Records from Australia, however, may represent the same species, but we currently lack significant barcode data for most Australian basidiomycete species. The case of *D. verrucosa* highlights one of the important issues in assessing species as Lost. A superficial survey of available data would suggest this species isn't Lost, but that is due to uncertain (and almost certainly incorrect) occurrence data. *A. glaucophyllum* was collected by Colenso near Dannevirke in the 19th century and there is some doubt about the identity of this species. It may represent a form of *A. archeri*. *N. sulcatum* was collected from the Urewera national park in the 1960s. It is a whitish secotioid species on soil, perhaps similar to *Psilocybe weraroa* but with a gelatinised gleba and microscopically with chrysocystidia. It is known from a single specimen. *N. lignicola* was collected from dead wood near Dunedin, also in the 1960s, and is known from a single specimen. It was also reported with chrysocystidia (although not found on recent re-examination of the holotype). It seems similar to the provisionally named *Clavogaster sp. 'whakapapa'* but with larger spores. Poor quality genome skimming data of the type suggests it is a *Pholiota*. These and many more type specimens would provide valuable phylogenetic data, if only we had the capacity to do that.

Lost

Relatively few countries have formally reported lists of Lost fungal species and it is likely that we will see an increased effort in the near future. It is essential the context for such lists is understood. Most countries will find it difficult or impossible to collate, with any degree of certainty, the list of those species which are indigenous/endemic and that have not been seen for over ten years. Indeed, it is likely that most countries will have very many fungal species that were recorded historically but not observed recently, and for varying reasons. Often it will be because the historical application of a species name is poorly understood taxonomically. Consequently, even it is possible to assemble the baseline data for assessing the status as Lost, categorising why a particular species is Lost will take considerable effort. Even more (taxonomic) effort will then be required to resolve those historical applications with an ambiguous status. Any list of Lost species is therefore likely to have been 'cherry-picked' from easily available data and will most certainly be incomplete, and all such lists will be associated with varying degrees of reliability. This should not detract from their utility in public engagement, if the scientific basis for their inclusion is understood and taken into account in any attempt to use the data for threat-listing purposes.

The very long list of Lost New Zealand species doesn't provide much meaningful data in my opinion. Further categorization about why they are Lost would be needed to add more value. It is perhaps

worth considering those that were frequently recorded and now Lost. This is the list of basidiomycetes that were historically recorded ten times or more, but now Lost.

<i>Hysterangium neotunicatum</i> Castellano & Beever	61
<i>Phanerochaete cordyline</i> (G. Cunn.) Burds.	32
<i>Xylodon subscopinellus</i> (G. Cunn.) Hjortstam & Ryvarden	31
<i>Hysterangium rugisporum</i> Castellano & Beever	29
<i>Exidiopsis mucedinea</i> (Pat.) K. Wells	28
<i>Hygrocybe procera</i> (G. Stev.) E. Horak	16
<i>Mycena subdebilis</i> G. Stev.	14
<i>Pisolithus tinctorius</i> sensu G. Cunn.	14
<i>Ustilago spinificis</i> F. Ludw.	14
<i>Anthracoidea schoenus</i> (G. Cunn.) Vánky	13
<i>Dendrothele corniculata</i> (G. Cunn.) Stalpers	12
<i>Echinochaete russiceps</i> (Berk. & Broome) D.A. Reid	12
<i>Uromyces edwardsiae</i> G. Cunn.	12
<i>Ustilago bullata</i> Berk.	12
<i>Hyphoderma litschaueri</i> sensu G. Cunn.	11
<i>Phlebia columellifera</i> (G. Cunn.) Duhem	11
<i>Stephanospora poropingao</i> T. Lebel & Castellano	11
<i>Phaeocollybia ratticauda</i> E. Horak	10
<i>Russula spinispora</i> T. Lebel	10
<i>Uromyces danthoniae</i> McAlpine	10
<i>Uromyces sellierae</i> G. Cunn.	10

Hysterangium neotunicatum is well in the lead, but I suspect many of these specimens (if sequenced) would turn out to be morphologically similar but phylogenetically different species of *Hysterangium*. Recent sequence data for specimens in this group indicate the diversity is high. Some of the other listed species are ‘paint splash’ fungi which have not been collected extensively in recent years, but were the focus of attention (by Barbara Paulus) over ten years ago. The wax cap agaric *Hygrocybe procera* is frequently misidentified and relates to several undescribed species, which can be distinguished on microscopy but that is rarely done. *Pisolithus tinctorius* in the sense of Cunningham will relate to several different species we recognise today. Smuts have not been extensively collected recently and we have few sequences. *Ustilago spinificis* is well recorded on iNaturalist but with no recent PDD specimens, as is the rust *Uromyces sellierae*.

This brief study of the top Lost species indicates good reasons for them being Lost, and there isn’t much doubt that many would be found if looked for. Few can be considered as potentially in decline.

Found

An interesting category is the number of indigenous species we have found recently after a gap of 50 years. These are:

Recently re-discovered (Found) species
<i>Abstoma purpureum</i> G. Cunn.
<i>Aecidium hupiro</i> G. Cunn.
<i>Aecidium traversiae</i> G. Cunn.
<i>Agaricus oligocystis</i> Heinem.
<i>Amylocorticiellum oblongisporum</i> (G. Cunn.) Gorjón, Gresleb. & Rajchenb.
<i>Cortinarius egmontianus</i> (E. Horak) G. Garnier
<i>Artomyces austropiperatus</i> Lickey
<i>Cortinarius pisciodorus</i> (E. Horak) Peintner & M.M. Moser
<i>Capnodium walteri</i> Sacc.
<i>Chionomyces meliolicola</i> (Cif.) Deighton & Piroz.
<i>Cuphophyllus patinicolor</i> (E. Horak) J.A. Cooper
<i>Dermoloma hemisphaericum</i> (G. Stev.) E. Horak
<i>Phlegmacium artosum</i> (Soop) Niskanen & Liimat.
<i>Ellisembia leptospora</i> (Sacc. & Roum.) W.P. Wu 2005
<i>Entoloma gelatinosum</i> E. Horak
<i>Euantennaria fraseriae</i> (S. Hughes) Sugiy. & Hosoya
<i>Galerina nothofaginea</i> E. Horak
<i>Hypocrea subcitrina</i> Kalchbr. & Cooke
<i>Janetia capnophila</i> S. Hughes
<i>Murinectria polythalama</i> (Berk.) Niranjan & V.V. Sarma
<i>Mycogloea macrospora</i> (Berk. & Broome) McNabb
<i>Mycosphaerella enteleae</i> (Dingley) Sivan.
<i>Ophiocapnocomma batistae</i> S. Hughes 1967
<i>Ophiocordyceps hauturu</i> (Dingley) P.R. Johnst.
<i>Phragmidium novae-zelandiae</i> G. Cunn.
<i>Pluteus hispidilacteus</i> E. Horak
<i>Pluteus terricola</i> E. Horak
<i>Podoscypha vespillonea</i> (Berk.) Boidin & Lanq.
<i>Puccinia ruizensis</i> Mayor
<i>Puccinia toa</i> G. Cunn.
<i>Rhodocybe fuliginea</i> E. Horak
<i>Simocybe tabacina</i> E. Horak
<i>Steccherinum resupinatum</i> G. Cunn.
<i>Tremellodendropsis pusio</i> (Berk.) D.A. Crawford
<i>Tubaria rufofulva</i> (Cleland) D.A. Reid & E. Horak
<i>Uromyces novae-zelandiae</i> McKenzie & Padamsee 2024

The re-discovery of many of these is a consequence of a recent focus on agarics and sooty moulds (both by me) and rusts (by my colleagues Eric McKenzie & Maj Padamsee). The rate at which we have re-discovered species has increased recently. In the case of the agarics it is a direct consequence of targeted barcoding. The emphasis is deciding if something is undescribed, or

described previously (which takes significant research effort, as mentioned before). The lack of type sequence data for older names is especially problematic and for agarics the current 85% of described species with barcodes is unlikely to increase at the same rate without an increased effort to barcode older specimens

MPI Register of unwanted organisms

The Ministry of Primary Industries maintain the official New Zealand pest register¹⁶. Several indigenous or endemic New Zealand species are listed as unwanted and/or regulated either directly or as one of their accepted synonyms. An organism is unwanted if “[it] is capable or potentially capable of causing unwanted harm to any natural and physical resources or human health”. An organism is placed in the regulated category if “the organism [is] of potential importance to New Zealand and not yet present here, or present but not widely distributed and being officially controlled”. The critical words are **unwanted harm**, and **potential importance to New Zealand**. We must assume that ‘potential importance’ is a catchall for any impact on economic productivity or biodiversity values (the latter is more of a hope than an assumption).

Name	Regulation status	Unwanted
Amylostereum chailletii (Pers.) Boidin	Regulated	Yes
Australovuilleminia coccinea Ghobad-Nejhad & Hallenb.	Regulated	Yes
Cyptotrama asprata		Yes
Diplomitoporus cunninghamii P.K. Buchanan & Ryvarden	Regulated	Yes
Flagelloscypha austrofilicis J.A. Cooper	Regulated	Yes
Flammulaster pulveraceus E. Horak	Regulated	No
Hypoderma cordyline P.R. Johnst. 1990	Regulated	No
Melanocephala cupulifera S. Hughes 1979	Regulated	No
Naematelia aurantia (Schwein.) Burt	Regulated	Yes
Ochrosporellus dingleyae (P.K. Buchanan & Ryvarden) Y.C. Dai & F. Wu	Regulated	Yes
Periconiella cordyline McKenzie	Regulated	No
Phanerochaete cordyline (G. Cunn.) Burds.	Regulated	No
Phragmidium acaenae G. Cunn.	Regulated	Yes
Phragmidium constrictosporum G.F. Laundon	Regulated	Yes
Polyporus septosporus P.K. Buchanan & Ryvarden	Regulated	Yes
Postia globicystidia P.K. Buchanan & Ryvarden	Regulated	No
Protocreopsis pertusoides (Samuels) Samuels & Rossman 1999	Regulated	No
Simocybe tabacina E. Horak	Regulated	No
Skeletocutis coprosmae (G. Cunn.) A. Korhonen & Miettinen	Regulated	Yes
Sphaeropsis cordyline G.F. Laundon	Regulated	No

¹⁶ [About the Pest Register | ONZPR | MPI | NZ Govt](#)

The occurrence of any native New Zealand species on this list should raise questions. In my opinion none of the listed species seem capable of producing harm or are important in the sense outlined. It has been clear the MPI register of unwanted organisms has been in need to critical review for at least 15 years.

I believe a significant issue, historically at least, is what we mean by the term pathogen. A pathogen is an organism that causes disease. So, then what do we really mean by disease? From an ecological standpoint it would be an organism that reduces the fitness of another organism, i.e. it impacts on its ability to maintain its population. In the broader sense it is simply something that humans perceive as being bad. A plant pathogen is viewed as something bad because it has a negative impact on economic output and/or biodiversity values. In this sense the term pathogen is very much a social construct, and an objective definition becomes elusive. Many native fungi have very close, often biotrophic associations with host plants. Some will cause symptoms that may be categorized as disease symptoms. However, rarely will such fungi decrease the fitness of the host, because if they did then, under normal conditions, both fungus and host would have gone extinct long ago. Some fungus-plant associations may be in a current Red Queen¹⁷ evolutionary battle, whilst others will have reached a stable equilibrium that may, in fact, be beneficial to both partners. When fungi do cause disease, in an ecological sense, the consequence for host populations is relatively rapid. It is always due to humans (or sometimes stochastic climate events) moving the species, or altering their natural environment, or reducing the genetic diversity of the host, especially crop monocultures. You can't blame the fungus for taking advantage of a situation we created. The MPI register contains problematic entries because the subjective term 'pathogen' has been applied much too loosely. In no way should any of these native organisms be considered 'regulated'. They are not 'bad' and should be celebrated as part of our native diversity.

Recommendations for future funding

There are two clear categories of research that are currently inadequately funded (in addition to the substantial lack of funding for basic taxonomic research).

The first piece of work is to more objectively define the complete list of Lost & Long-Lost species. Then to additionally categorize why each species is Lost. Then to identify and survey the subsets that are truly at risk of extinction, why they are at risk, to formally classify them under NZTCS/IUCN criteria, and develop action plans for their survival (if they aren't already truly extinct).

The second piece of work is around our biotrophic fungi, especially the subset that have been inappropriately black-listed as pathogens (and often historically misidentified using northern hemisphere names). We know relatively little about the diversity of our native fungi co-dependent on native plants. Historical focus has been on well-known 'pathogen' groups such as rusts, smuts and mildews. The broader diversity of co-dependent fungal organisms is significant, and their ecological functions spread across the spectrum from active pathogens (with the caveats mentioned above) through to endophytes essential in maintaining native plant fitness. This vital microbial community is currently entirely ignored in ecosystem conservation efforts. In considering the subset of

¹⁷ https://en.wikipedia.org/wiki/Red_Queen_hypothesis

threatened plants then we should remember they will almost certainly be associated with a range of specific co-evolved and beneficial fungi that are also at risk of extinction.

Conclusions

Enumerating and understanding more about our Lost fungal species is important for several reasons. It provides a focus for public engagement and generally raising the profile of fungi. It may stimulate the generation of data critical to understanding the threats to fungal populations. It allows us (taxonomists) to clarify what our predecessors meant when they originally described these (now) Lost species. It provides a focus for defining what species we have now in New Zealand (and don't have), and whether the species are endemic and should be considered vital national taonga.

This preliminary study of our Lost species wouldn't have been possible without numerous co-dependent resources.

- 1 Citizen Science support provided by the annual FUNNZ foray and a subset of iNaturalist observers who have negotiated collecting permits with DOC and local authorities. Fungi species cannot be 'collected on demand' by researchers because they occur sporadically and are ephemeral.
- 2 The enabling of the Citizen Science community as parataxonomists (to recognise and prioritise collections) through access to reliable information resources and tools.
- 3 The physical curatorial resources needed to maintain the PDD national fungarium that stores specimen to long-term archival standards.
- 4 The historical development of robust data-management systems allowing easy collation and analysis of baseline specimen data and facilitates management of the collection.
- 5 A digitisation programme that has ensured all relevant specimen data is captured and continuously curated.
- 6 Technical resources for sequence barcoding specimens.
- 7 Significant phylogenetic analysis to compare specimens and place them in an evolutionary classification.
- 8 Significant skills-based taxonomic research in applying historically defined species concepts to modern specimens, and to recognise what is new and undescribed.
- 9 The formal description of priority species, according to the limited available resource.

This suite of co-dependent activities forms the bulk of activity surrounding the nationally significant collections of organisms. This report on Lost & Found is one small incidental output. The broader program of work forms an inextricable mix of support from the broader community, technical support, and research. It cannot be compartmentalised into independent projects. Neither can it be tested against a timetable of deliverable outputs, or against specified economic outcomes, or any concept of 'leveraged value'. It is the essence of public good research, and currently it is under significant threat in New Zealand. In my opinion there is a significant danger that tightly defined, outcome-focussed 'projectisation' of the collections, databases and taxonomic research will critically degrade the national knowledge base. I would argue this kind of broad-scale public-good research (and technical/community effort) is essential to the future of New Zealand from economic, cultural and social perspectives.

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Notes on the accompanying spreadsheet

The spreadsheet is in MS-Excel format, so apologies to those without access to Excel. It is based on data extracted in March 2026 and so is already out of date. I hope to publish revisions in the future. The data includes the accepted names for all fungal species (excluding many lichens) thought to be present in New Zealand. The data can be filtered and sorted in many different ways. The columns should be most self-explanatory. An invalid name is one not published according to code of nomenclature and doesn't really exist in a formal sense. Nevertheless many invalid names are in current use. All species with provisional names are invalid in this sense. They can be filtered by using this column in combination with the presence of the string " sp. " in the name. For example, *Conocybe* sp. 'Omahu Bush (PDD 87267)' J.A. Cooper ined. is an invalid provisional name. The identifier in brackets, e.g. PDD 87267, is the accession number of a vouchered and sequenced specimen that serves as an informal 'type' to anchor the use of the name. These identifiers are usually PDD accession numbers or OTA (Otago) accession numbers. The misapplied status indicates that a name has been used incorrectly. The GUID is a globally unique code used for matching names across data-sets.

There can be several reasons why a name you are looking for is not present. 1) it has been added to the NZ list after March 2026, 2) the name is not accepted as a species recorded as present in New Zealand (note that some species observations on iNaturalist are not currently accepted as being present), 3) the name is a synonym, i.e. it is not the currently accepted name for the species according to our databases. To find the accepted name you should use the BiotaNZ website to search for the name.