Australian fungi, slime moulds and the people who find them

AFSM Volume 6 - to end of 2022

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Contents

Changes and additions

Volume 6 (to 2022-12-28)
* Added international observation comparison
* Added open code repository: https://github.com/adrian-power/afsm
* Fungi photography guide

Volume 5 (to 2022-08-31)
* Added Fungimap flags to the Top species by proportion of research grade observations
* Added Protozoa breakdown in Fungimap 2 section
* Added level of completeness (LOC) table, so it is easier to compare changes over time
* Corrected chart title: Frequency distribution of species by research grade proportion

Volume 4 (to 2022-06-30)
* Added the proportion of observations that are research grade by month created
* Added the proportion of observations by taxon level of completeness (LOC)
* Added the proportion of Fungimap 1 and 2 observations of all species level observations

Volume 3 (to 2022-06-30)
* Added the Fungimap original and version 2 target species analysis
* Added the cumulative total of observations and users
* Improved charts

Volume 2 (to 2022-05-31)
* Added the Mycetozoa (observed) family tree
* Added IDs to the Top 50 Obs tables
* Added Red Triangle Slugs to Bidjigal map and added overlap analysis for Red Triangle Slug and Ghost Fungus distribution
* Improved map quality and halved file size

Volume 1 (to 2022-03-27)

Introduction - Australian fungi, slime moulds and the people who find them

This document brings together some interesting insights about fungi and protozoa that are not available from iNaturalist directly. It can be downloaded from https://adrianpower.com/. Volume 1 was shared by the Australian Mycological Society in their April 2022 newsletter.

The insights highlight the value and potential of citizen science to contribute to an evidence base to help understand a subject that is literally and figuratively ‘in the dark’. My favourite insight is that the top 50 observers of fungi on iNaturalist represent only 0.37% of all users, yet their observations contribute almost half (43.52%) of the total observations. This shows that one person *can* make a world of difference to the information available about fungi and protozoa in Australia.

Adrian Power

Background and aim - an exploration of iNaturalist fungi and protozoa data

My interest in fungi took off while bushwalking in April 2019 where in just a few kilometres I saw an incredible array of different fungi. I was so surprised by the variety, I bought the Field Guide to Australian Fungi (Bruce Fuhrer, 2016) and tried to identify them from the photos I took. The guide opened my eyes to an even larger world of fungi and from that point I was hooked. I quickly learnt how to take better photos for identification purposes and even created a page on my website (now removed) to catalogue my observations. It had square cropped photos with a small description in a grid layout - I didn't realise at the time that I had created a D-I-Y iNaturalist page.

In late 2021 I came across what I thought might have been an orange slime mould that I could not identify and contacted Sarah Lloyd for assistance, who kindly suggested I might be interested in iNaturalist. From that point on life has never been the same. By using iNaturalist I have become even more aware of the sheer variety of fungi out there and a better observer in the field. I also became acutely aware of the stark lack of documented species and reference material.

The more I contributed to iNaturalist, the more I wondered how the data collected is being used. I did a little research yet couldn't find much information except for FungiMap. Though I don't have any biology training, I do have a background in data and analytics and decided to look at the iNaturalist data for myself, to see what I could see.

What started out as a little data exploration has morphed into this document - a mix of ideas for how iNaturalist data can be used. Sometimes even simple ideas can provide compelling insights. Initially I wanted to understand distributions of species but became even more interested in the human factor: what drives people to post their observations and how citizen science contributes to an evidence base.

Looking into the people side of things acknowledges the contributions of those who have added to the data. Though every contribution is valuable, there are a few avid users who have significantly impacted the amount and quality of data available. This document aims to celebrate those contributions.

I aim to release updates of this document regularly (seasonally) and incorporate improvements and additions as I go. This document has been coded in the R and SQL programming languages so it can update automatically.

I have included a couple of interests of mine: documenting the distribution of fungi and protozoa in Bidjigal Reserve (Sydney, Aus) and a little about Red Triangle Slugs and Ghost Fungus. Some people might find it strange that I have mixed kingdoms - i.e. fungi and protozoa. I believe these go hand in hand in that they happen to take up residence in similar locations. If I can help raise the profile of slime moulds even a little, I consider that a success.

I hope you enjoy reading this as much as I enjoyed putting it together. Please let me know if you have any feedback or suggestions for future versions. Message me on iNaturalist, or email fungi@adrianpower.com

iNaturalist, Australian data and limitations

This document explores observations and identifications of fungi and protozoa in Australia. iNaturalist is where I contribute observations and the website makes it easy to download the data I want to analyse. It is also recommended by FungiMap. I am aware of the iNaturalist and Atlas of Living Australia (ALA) collaboration but have not explored the ALA data.

The iNaturalist data for observations is well structured, with minimal data cleansing required. 'Casual' observations are excluded (as these are missing a valid date or location). Non-research grade observations are important contributions to the evidence base and analysing these highlights the need for people to review and accurately identify observations.

Contributions to identifications are as important as the observations themselves. Unfortunately, there is currently no way to export detailed information about identification activity, but some summary statistics have been explored.

A note about iNaturalist species
When looking at an iNaturalist user's observations, there is a species count at the top of the page. There appears to be no 'raw' data available from iNaturalist that corresponds exactly to the iNaturalist species counts. For example, the following fields and their counts have been compared: species_guess, scientific_name, common_name, iconic_taxon_name and taxon_species_name. As such, the species related counts in this document do not always match what is displayed on the iNaturalist website, and so I have minimised the amount of species ranking. There is limited information on how exactly the iNaturalist species counts are calculated, for background see: https://www.inaturalist.org/posts/19369-how-does-inaturalist-count-taxa.

The data fields used in this document to calculate species counts are scientific_name or species_name, depending on the analysis.

Table 1: Proportion of fields that are missing values

Kingdom	Species Guess	Scientific Name	Common Name	Phylum	Class	Order	Genus	Species Name
Fungi	9.0%	0.0%	34.0%	2.0%	2.0%	6.0%	25.0%	53.0%
Protozoa	8.0%	0.0%	37.0%	0.0%	7.0%	18.0%	22.0%	43.0%

Table 2: Proportion of fields by Kingdom and Level Of Completeness (LOC)

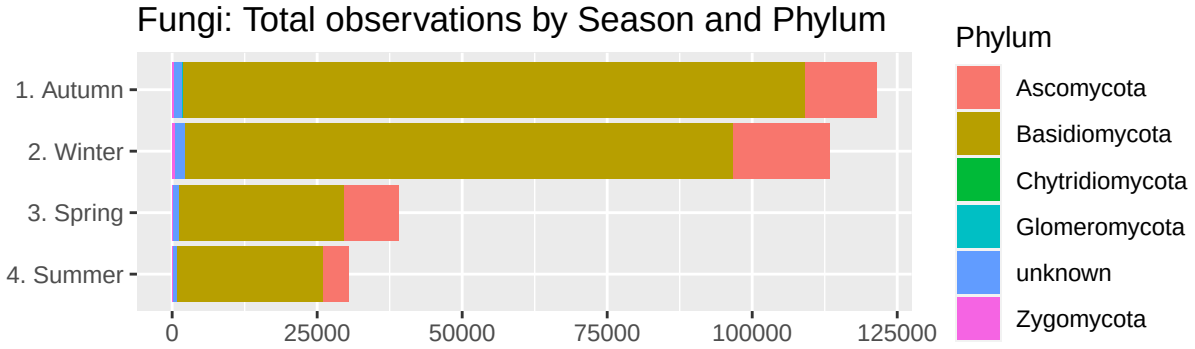
LOC	Fungi Obs	Fungi LOC %	Protozoa Obs	Protozoa LOC %
1. Kingdom	4,875	1.6%	20	0.2%
2. Phylum	2,614	0.9%	549	6.9%
3. Class	11,788	3.9%	889	11.1%
4. Order	57,953	19.0%	314	3.9%
5. Genus	82,882	27.2%	1,683	21.0%
6. Species	144,307	47.4%	4,559	56.9%

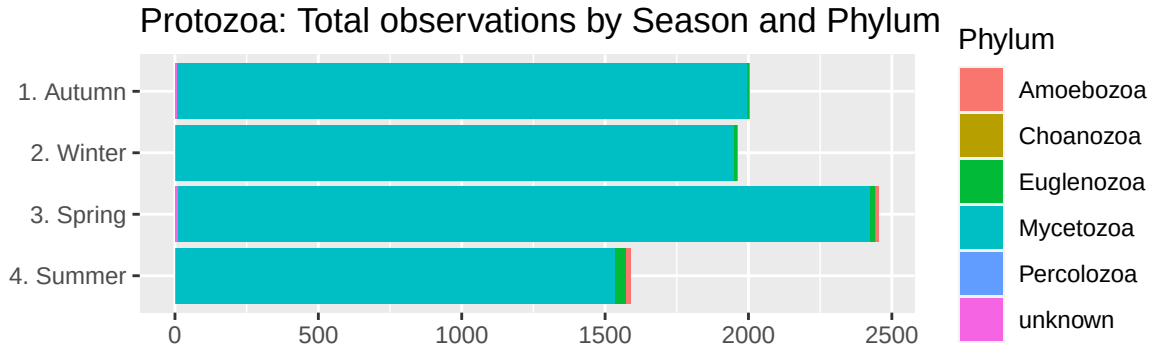
General observations and exploration of the data

As of iNaturalist data to 2022-12-27 , there are 304,419 observations of fungi in Australia, from 13,619 observers and as of 2022-12-28 , there are 8,014 observations of protozoa in Australia, from 1,615 observers.

Seasonal distribution of observations

iNaturalist shows the seasonality for each species on the site by month, however seeing observations aggregated to the level of kingdom and phylum by season reveals broad trends.

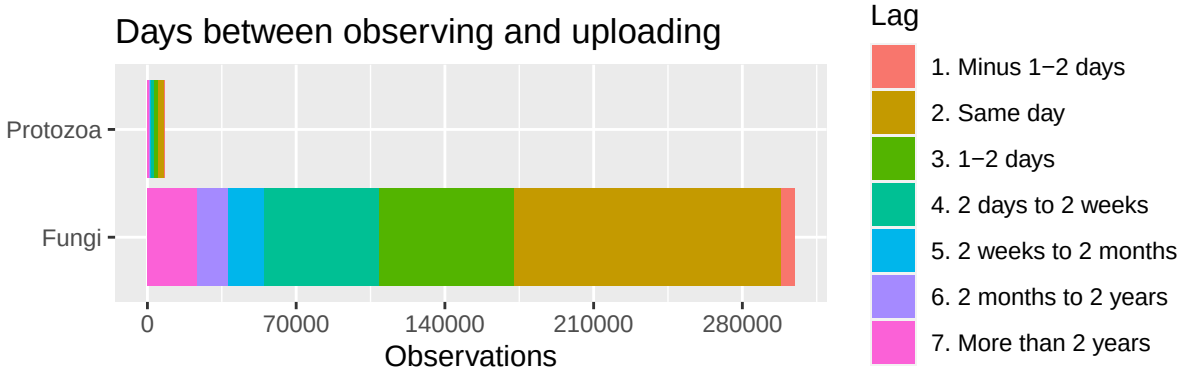




Time between observation and uploading

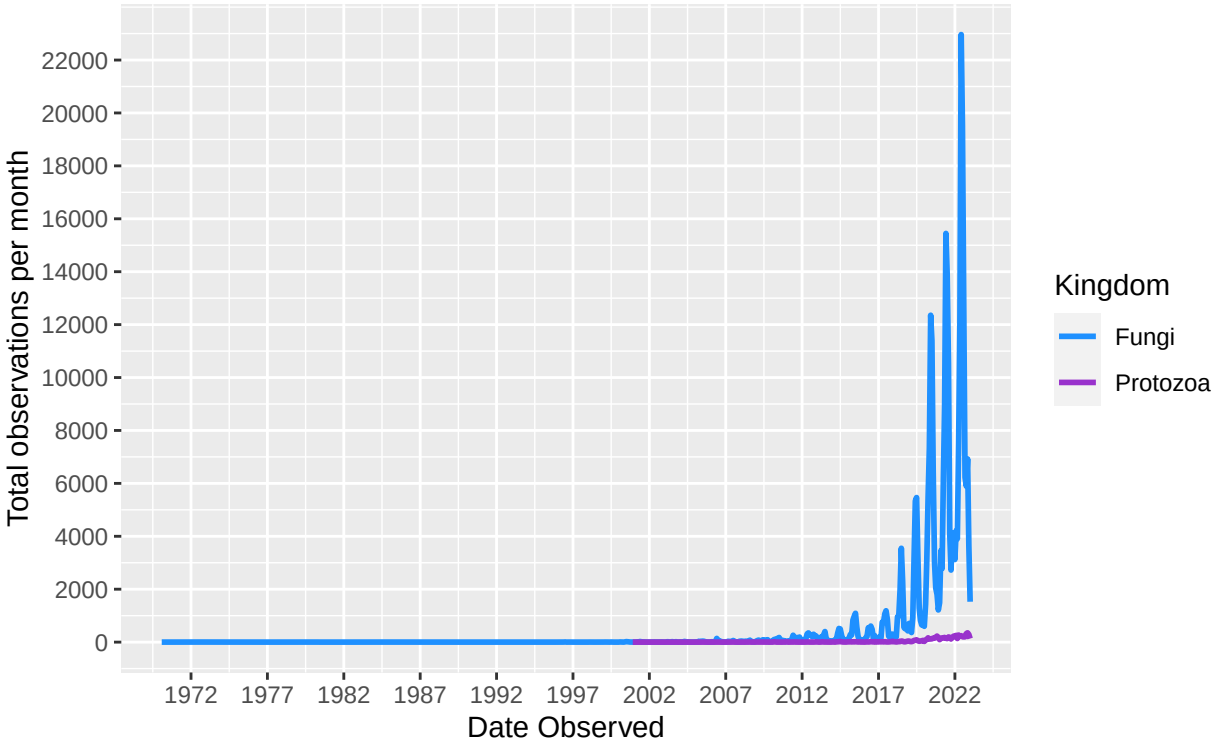
Often people create observations in the field with the iNaturalist app. Sometimes they become interested in fungi and upload photos from 10 years ago. This chart explores the 'lag' between when something was observed VS when the iNaturalist entry was created. There can be a negative lag, sometimes the entry is created before the observation date. This might be for various reasons, such as the adjustment of dates by photo editing software or differences in time zones, or simply a result of incorrect data entry.

On average, observations on iNaturalist are posted 188 days after they were seen in the wild, with a maximum of 18,537, a minimum of -2 and a median of 1.

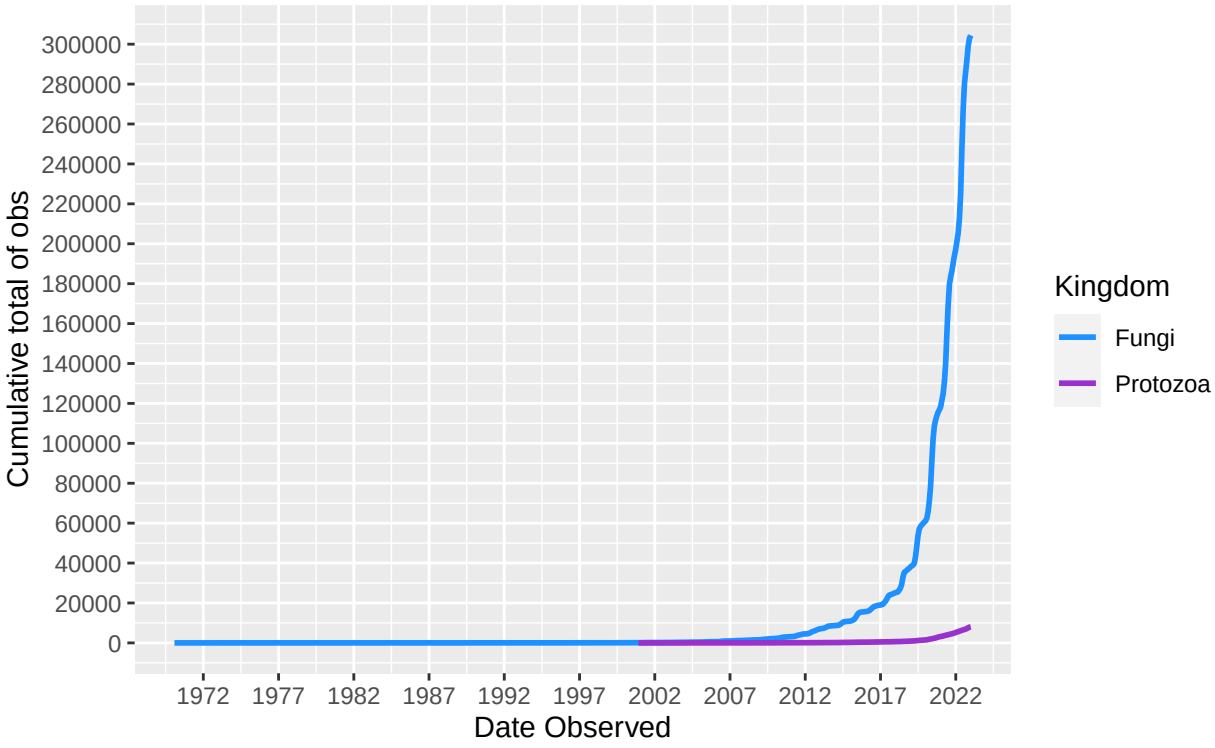


Total observations per month

The following chart shows the total number of observations per month by kingdom.

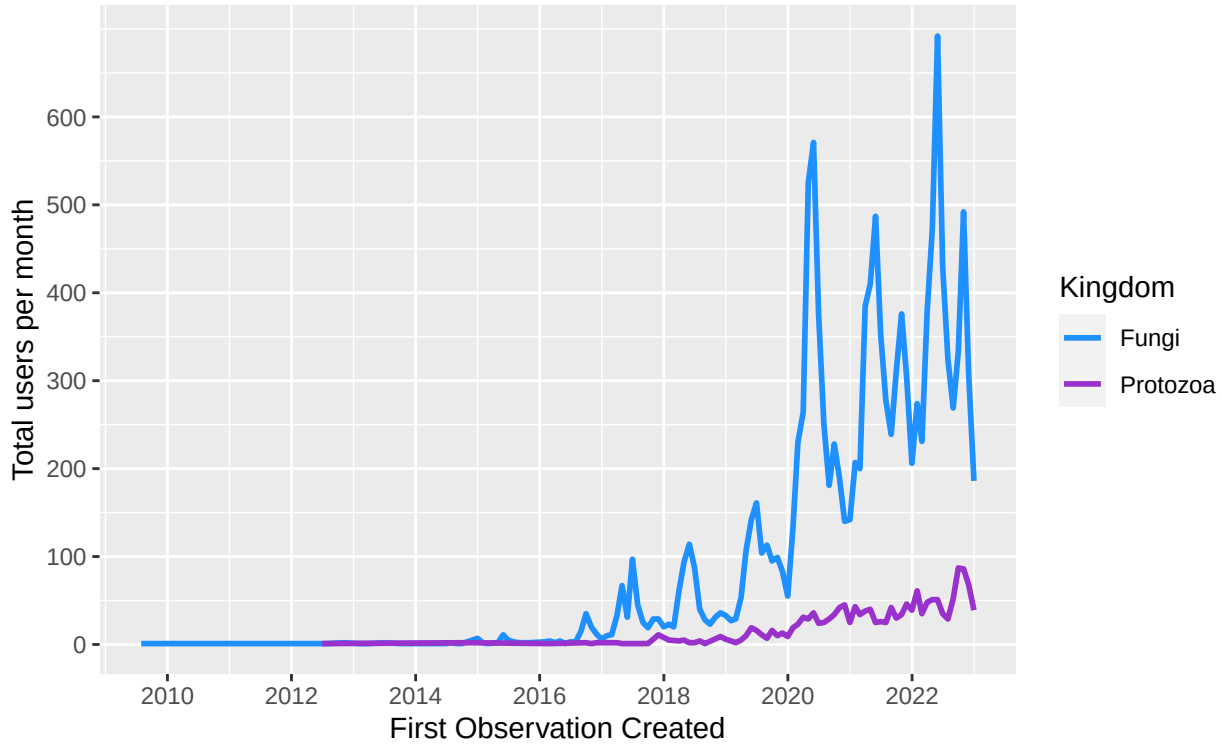


Cumulative total of observations



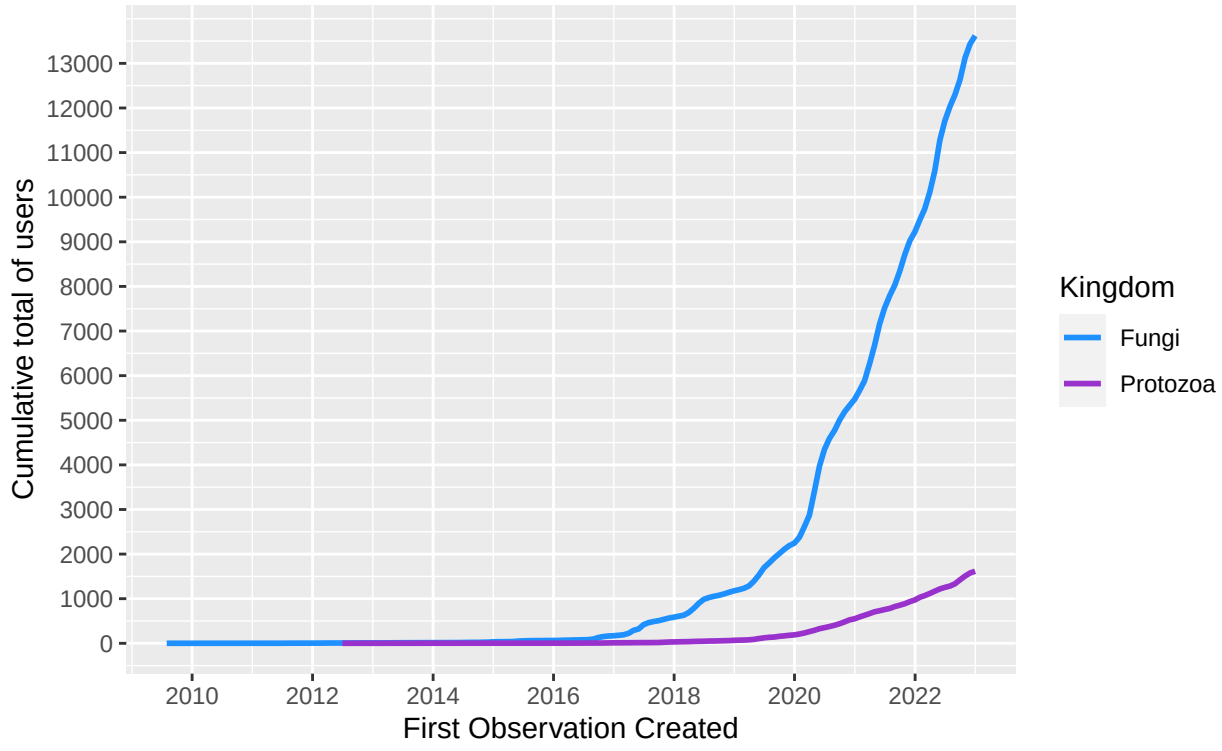
New observers per month

This chart shows the number of new observers per month, based on their first observation date. It would be interesting to look into peaks of interest and whether it correlates with seasons, or events such as bio-blitzes or the release of “Fantastic Fungi” on Netflix. 2020 was clearly a turning point for fungi and protozoa - perhaps this is related to COVID-19 lockdowns and people getting more outdoor exercise.



Cumulative total of observers

Based on the earliest observation created date.



Research Grade Analysis

Thanks to Sequoia Lewien for the idea to look at the species that have high proportions of research grade records. A far higher number of species do not have any research grade observations, which is probably a reflection of the limited number of experts actively contributing to the site for identifications, and that to get a positive ID, often microscopy or DNA sequencing is required. Sometimes people simply upload photos that can't be used for identification, due to being blurry or missing important surfaces or features. It's quite interesting that the RG proportion by kingdom is so similar. In the table below, FM (and version) indicates a FungiMap target species.

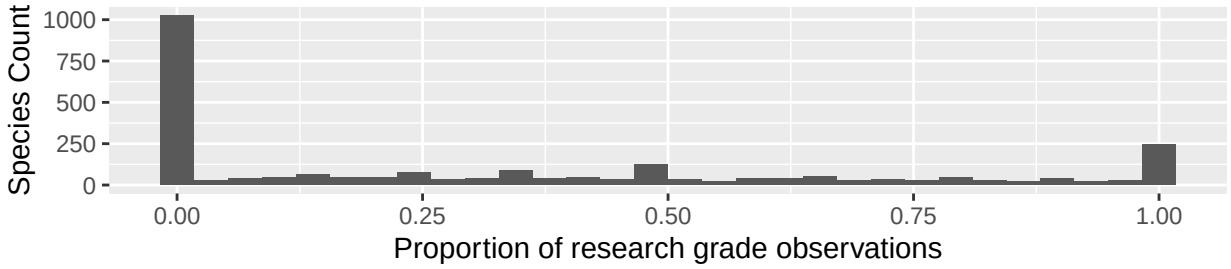
Table 3: Research Grade Observations by Kingdom

Kingdom	RG Count	Obs Count	RG Prop.
Fungi	91,796	304,419	30.2%
Protozoa	2,668	8,014	33.3%

Table 4: Top 25 species by proportion of research grade observations with more than 100 observations

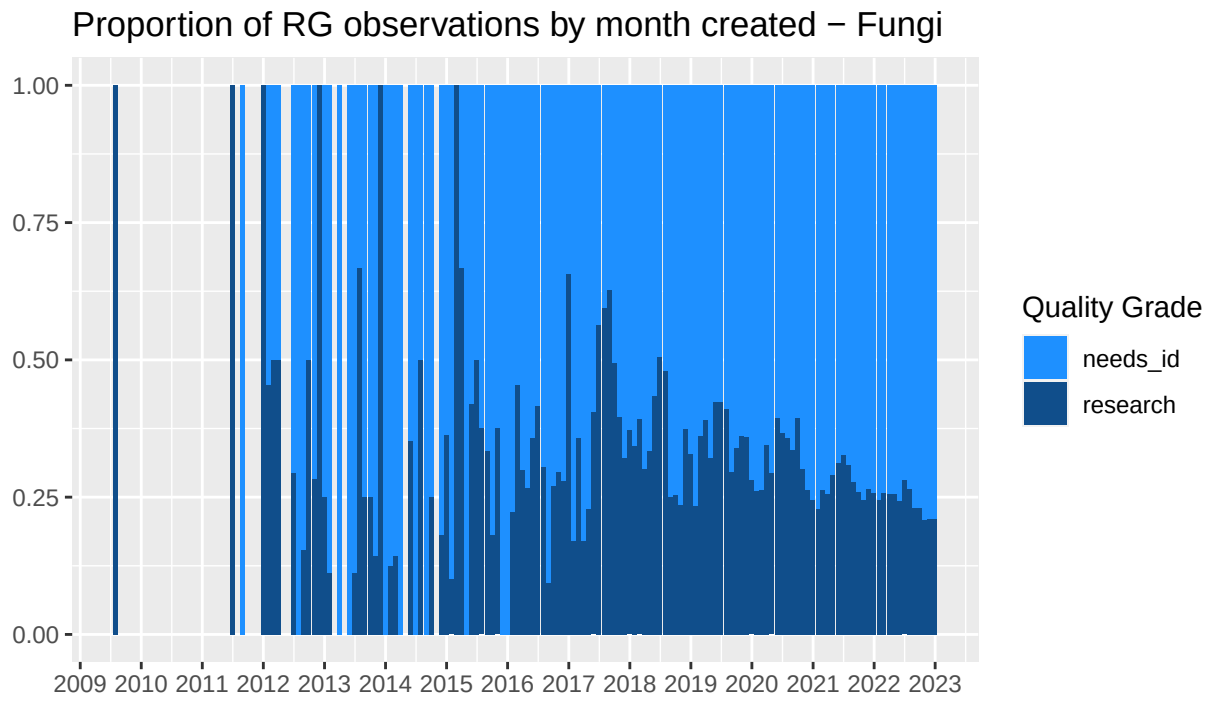
Kingdom	Scientific Name	RG Count	Obs Count	RG Prop.	FM 1	FM 2
Fungi	Favolaschia claudopus	1,927	1,927	100.0%	.	Y
Fungi	Cyttaria gunnii	175	175	100.0%	Y	.
Fungi	Neobarya agaricicola	246	246	100.0%	.	Y
Fungi	Hispidula dicksoniae	102	102	100.0%	.	.
Fungi	Mycena interrupta	1,405	1,408	99.8%	Y	.
Fungi	Colus pusillus	352	353	99.7%	Y	.
Fungi	Amanita muscaria	2,029	2,035	99.7%	Y	.
Fungi	Aseroe rubra	1,125	1,130	99.6%	Y	.
Fungi	Mycena lazulina	520	522	99.6%	.	Y
Fungi	Clathrus archeri	155	156	99.4%	Y	.
Fungi	Cruentomycena viscidocruenta	1,814	1,837	98.7%	Y	.
Fungi	Entoloma virescens	154	156	98.7%	Y	.
Protozoa	Ceratiomyxa fruticulosa	612	622	98.4%	.	Y
Fungi	Lysurus mokusin	288	293	98.3%	.	.
Fungi	Hymenoscyphus berggrenii	177	180	98.3%	.	.
Fungi	Clathrus ruber	186	190	97.9%	.	.
Fungi	Ileodictyon gracile	185	189	97.9%	Y	.
Fungi	Coprinus comatus	721	738	97.7%	Y	.
Fungi	Porpolomopsis lewelliniae	297	304	97.7%	Y	.
Fungi	Mycena epipterygia	361	370	97.6%	.	.
Fungi	Psilocybe subaeruginosa	666	683	97.5%	.	Y
Fungi	Pseudohydnum gelatinosum	617	635	97.2%	Y	.
Fungi	Fistulina hepatica	128	132	97.0%	Y	.
Fungi	Favolaschia manipularis	185	191	96.9%	.	.
Fungi	Phallus multicolor	375	389	96.4%	.	.

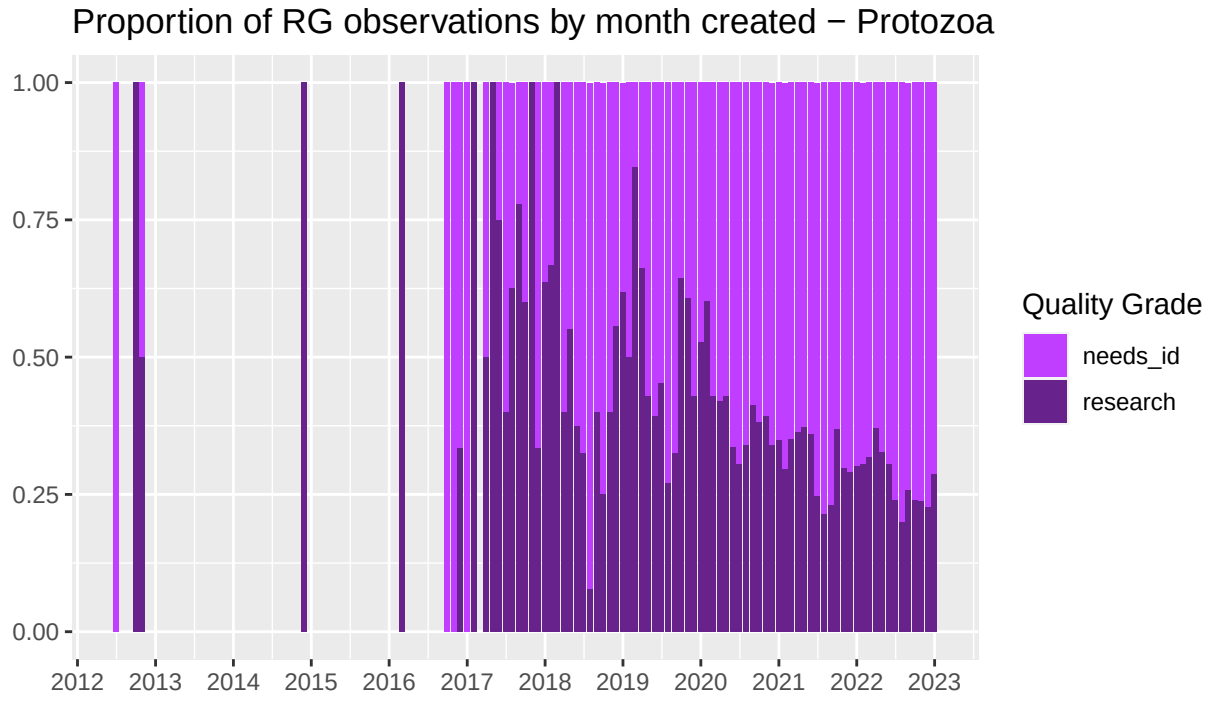
Frequency distribution of species by research grade proportion (scientific name)



Proportion of observations that are research grade by month created

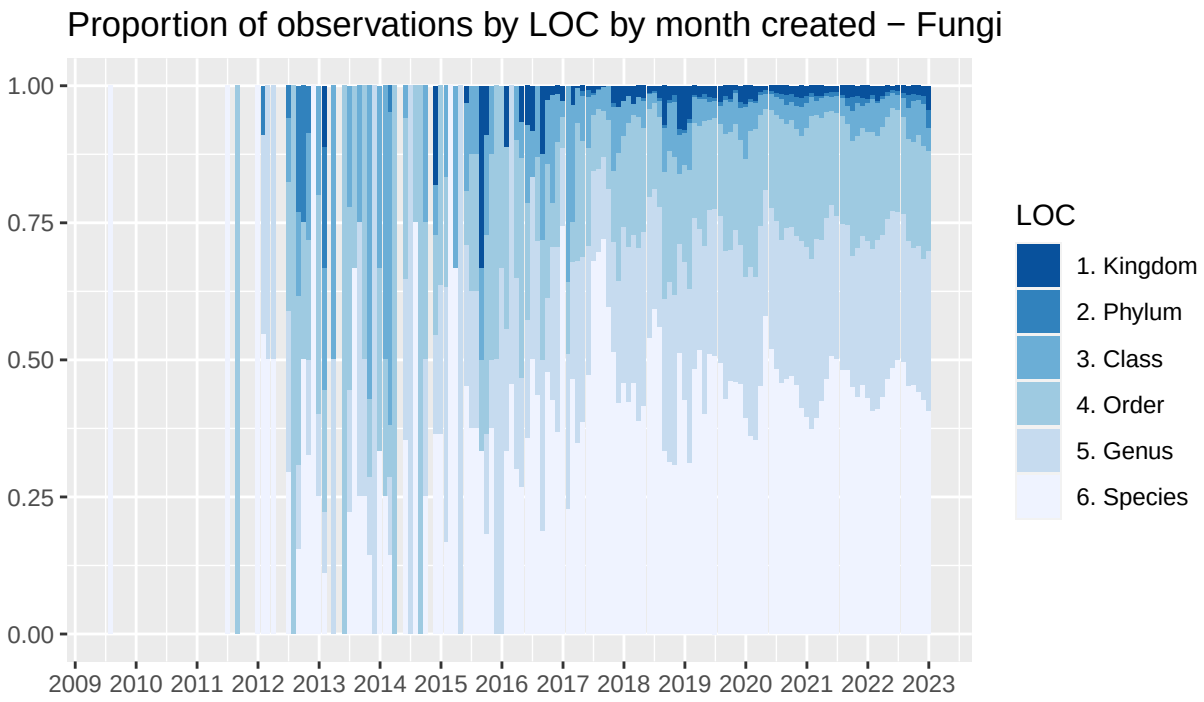
Thanks to Tom May for this suggestion.

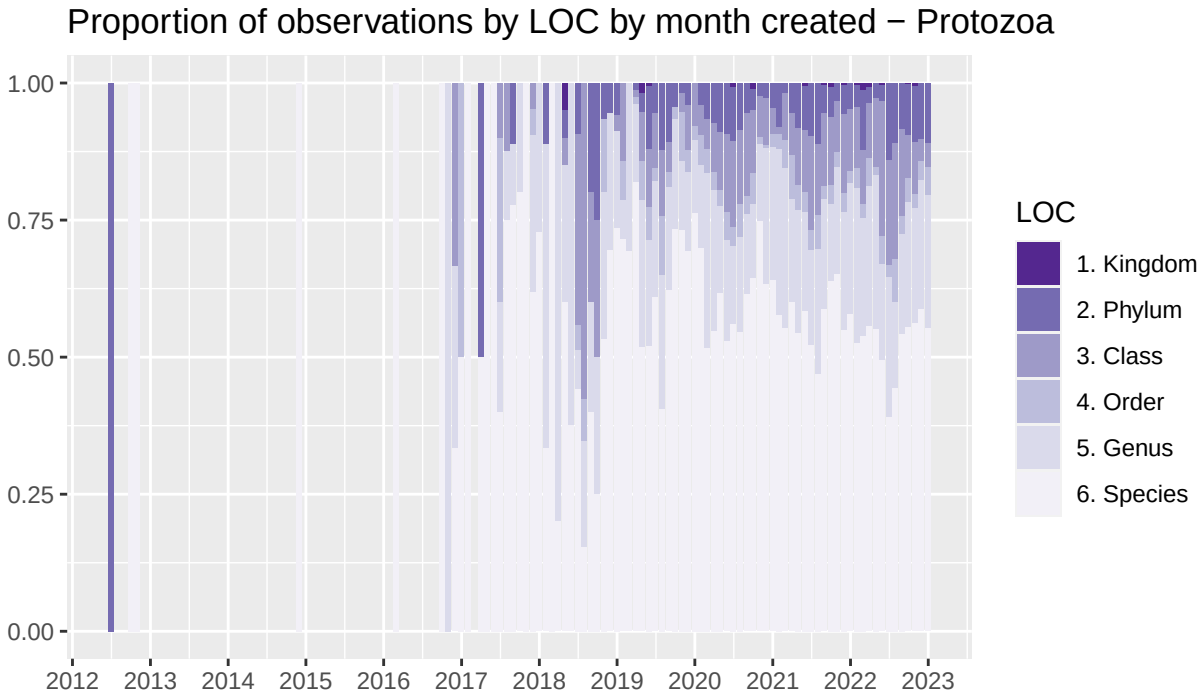




Proportion of observations by taxon Level Of Completeness (LOC)

Level Of Completeness (LOC) meaning the lowest level of taxon recorded for each observation. Thanks to Tom May for this suggestion.





First Find

What species first captures someone's attention enough to lead to their first observation for fungi and protozoa? Note: the aggregation is based on the lowest level of taxon recorded (scientific name).

Table 5: First find - Fungi

Rank	Scientific Name	Count
1	Agaricales	1,204
2	Agaricomycetes	569
3	Trametes coccinea	400
4	Amanita muscaria	285
5	Fungi	272
6	Aseroe rubra	270
7	Polyporales	263
8	Trametes	253
9	Omphalotus nidiformis	218
10	Lecanoromycetes	205
11	Gymnopilus junonius	188
12	Amanita	172
13	Gymnopilus	151
14	Psathyrellaceae	147
15	Agaricus	139
16	Chlorophyllum	127
17	Cruentomycena viscidocruenta	116
18	Lichenomphalia chromacea	115
19	Boletales	114
20	Leratiomyces ceres	105
21	Hymenochaetaceae	104
22	Coprinus comatus	102
23	Leucocoprinus birnbaumii	99
24	Geastrum	94
25	Polyporaceae	94

Table 6: First find - Protozoa

Rank	Scientific Name	Count
1	Fuligo septica	374
2	Myxomycetes	149
3	Tubifera ferruginosa	144
4	Mycetozoa	131
5	Stemonitis	108
6	Mucilago crustacea	78
7	Ceratiomyxa fruticulosa	75
8	Fuligo	71
9	Lycogala epidendrum	59
10	Lycogala	42
11	Mucilago	30
12	Stemonitis splendens	28
13	Tubifera	26
14	Arcyria	23
15	Leocarpus fragilis	22
16	Leocarpus	18
17	Physarales	17
18	Arcyria obvelata	16
19	Physaraceae	13
20	Reticularia lycoperdon	13
21	Trichia verrucosa	11
22	Diachea leucopodia	11
23	Physarum	11
24	Trichia decipiens	11
25	Trichia	9

Bidjigal Reserve - a secret valley

Bidjigal Reserve is a hidden sanctuary in the north-west of Sydney that is an important place to me and is named after the Bidjigal people who are the traditional custodians. I highly recommend you read this incredible overview, "The bushland of Bidjigal Reserve and adjoining reserves", which points out on page 7 that the reserve is known for its diversity of Fungi.

A place to preserve
I hope drawing attention to this area will help its preservation. There are some pristine areas in the reserve, which are maintained through many dedicated local bush care groups both past and present. But it is not perfect. Until the 1970's, when the surrounding area was bulldozed for housing and sewer lines installed along the many creek-lines, the area had crystal clear water which was home to platypus. The area is under pressure, with many sections plagued by weeds, vandalism, rubbish and over-use. The creek lines are often contaminated by sewage overflow. Bidjigal reserve needs coordinated and active management, which sadly is not occurring. It is a beautiful place, home to many plants and animals, including echidna.

The project
When I started on iNaturalist, there were very few records of fungi in this area so I set about changing that through **my project, "The Fungi and Slime Moulds of The Hills District, especially Bidjigal Reserve and Northmead Gully in Sydney, Australia"**. You can help by reviewing identifications on the project page or by visiting the reserve and contributing observations.

The variety
With an incredible diversity of habitats and vegetation communities comes an abundance of varieties of fungi, including (at the time of writing) the southern-most recorded Green Pepe (*Mycena chlorophos*) in Australia. I suspect there are species unique to this area or that are undescribed to science. Without microscopy or DNA sequencing, these species will remain a mystery.

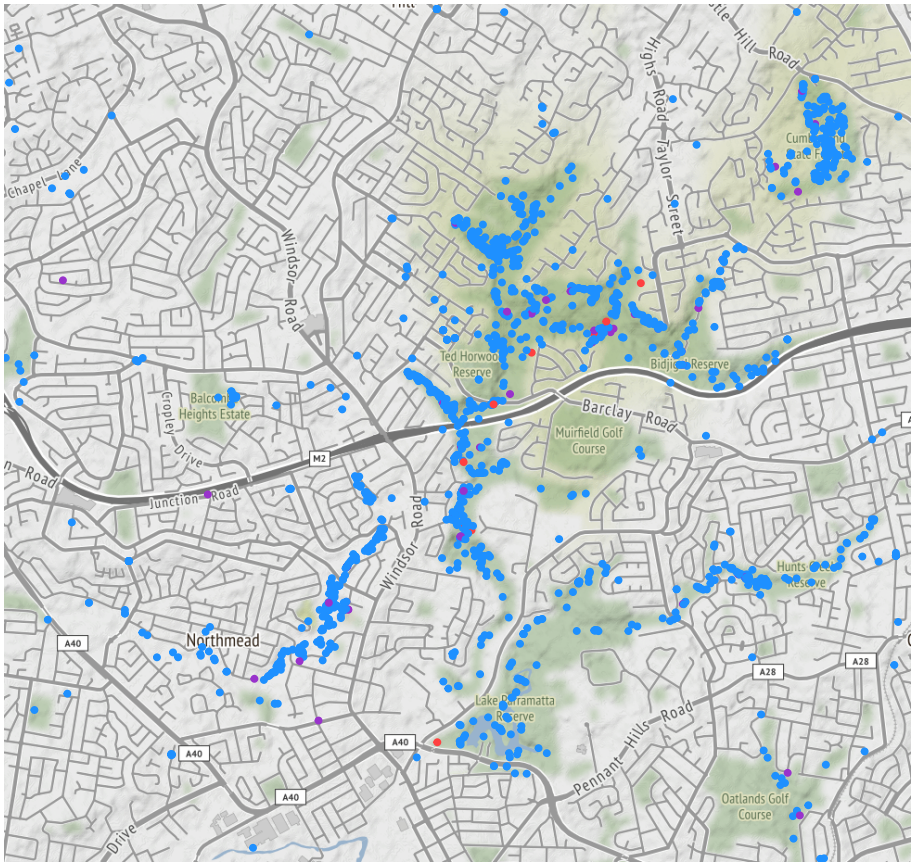


Figure 1: The recorded distribution of fungi (blue), slime moulds (purple) and Red Triangle Slugs (red) in Bidjigal Reserve, Northmead Gully and surrounding areas

The recorded distribution of Red Triangle Slugs and Ghost Fungus in Australia

Omphalotus nidiformis, commonly known as Ghost Fungus, is bio-luminescent and endemic to Australia. Anyone who has seen it glow in the dark will be captivated by its eerie beauty and there are plenty of great long-exposure photos on iNaturalist.

I wondered why it glows. Is it to attract insects who might spread its spores? A quick look on Wikipedia shows Ghost Fungus has, "been observed to attract nocturnal insects such as beetles, native cockroaches and crickets (white-kneed cricket (*Papuastus spp.*) and thorny cricket), as well as giant rainforest snails (*Hedleyella falconeri*) and red triangle slugs (*Triboniophorus graeffei*), which voraciously consume the fungus" ([13],[35]).

Triboniophorus graeffei, commonly known as Red Triangle Slugs are large, air breathing land slugs also endemic to Australia, and equally as captivating with their bright red triangle. One thing I find fascinating is that often in nature, patterns are symmetrical, yet with this slug, the triangle is not.

I wanted to know how closely distributed these two species are. The location data for the map below has been aggregated to 4 decimal places, which groups the observations into approximately 10 m x 10 m areas. Based on the data to date, there are 2,432 areas with only Ghost Fungus observations, 1,121 areas with only Red Triangle Slug observations and just 3 areas with both.

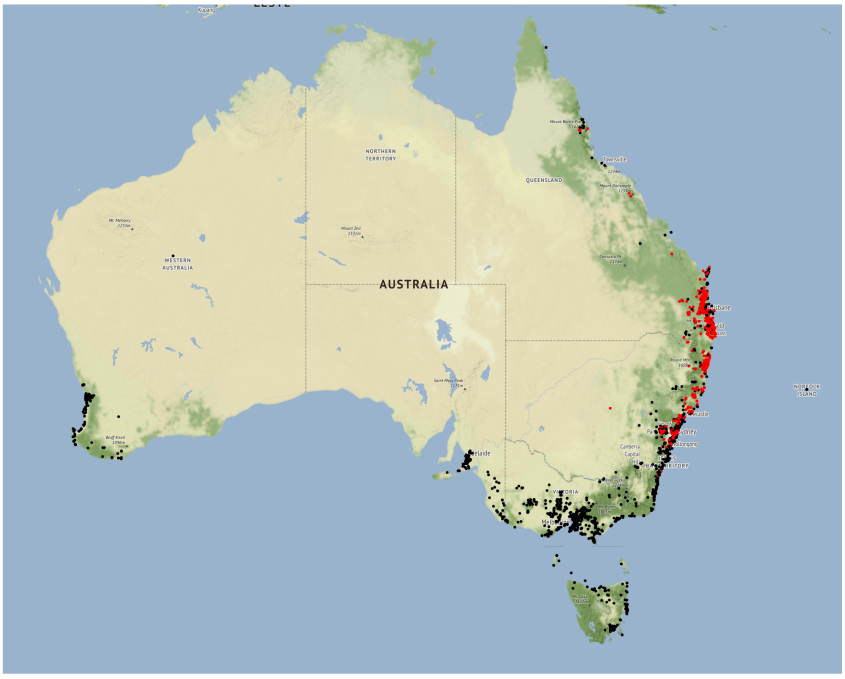
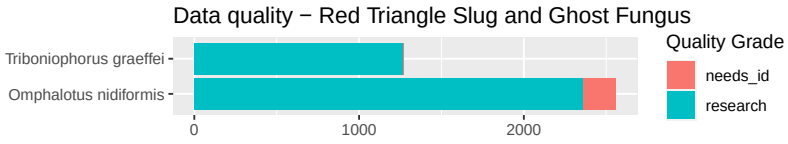


Figure 2: Recorded distribution (in ~10 m^2 areas) of Red Triangle Slugs (red), Ghost Fungus (black) and both (yellow)



Source: https://en.wikipedia.org/wiki/Omphalotus_nidiformis: [13] Maguire, Garry (9 December 2011). "Luminous Ghost Fungus". Springbrook, Queensland: Springbrook Research Centre. [35] Young, T. (1996). "Some more records of fungi used as food by animals in Australia" (PDF). Australasian Mycologist. 15 (1): 8–9.

The recorded distribution of fungi in Australia

As of iNaturalist data to: 2022-12-27

The dots on the map below represent the approximate location of observations, with each dot representing an area of approximately 10 km x 10 km. A colour change from blue to red represents an increase in observations in an area.

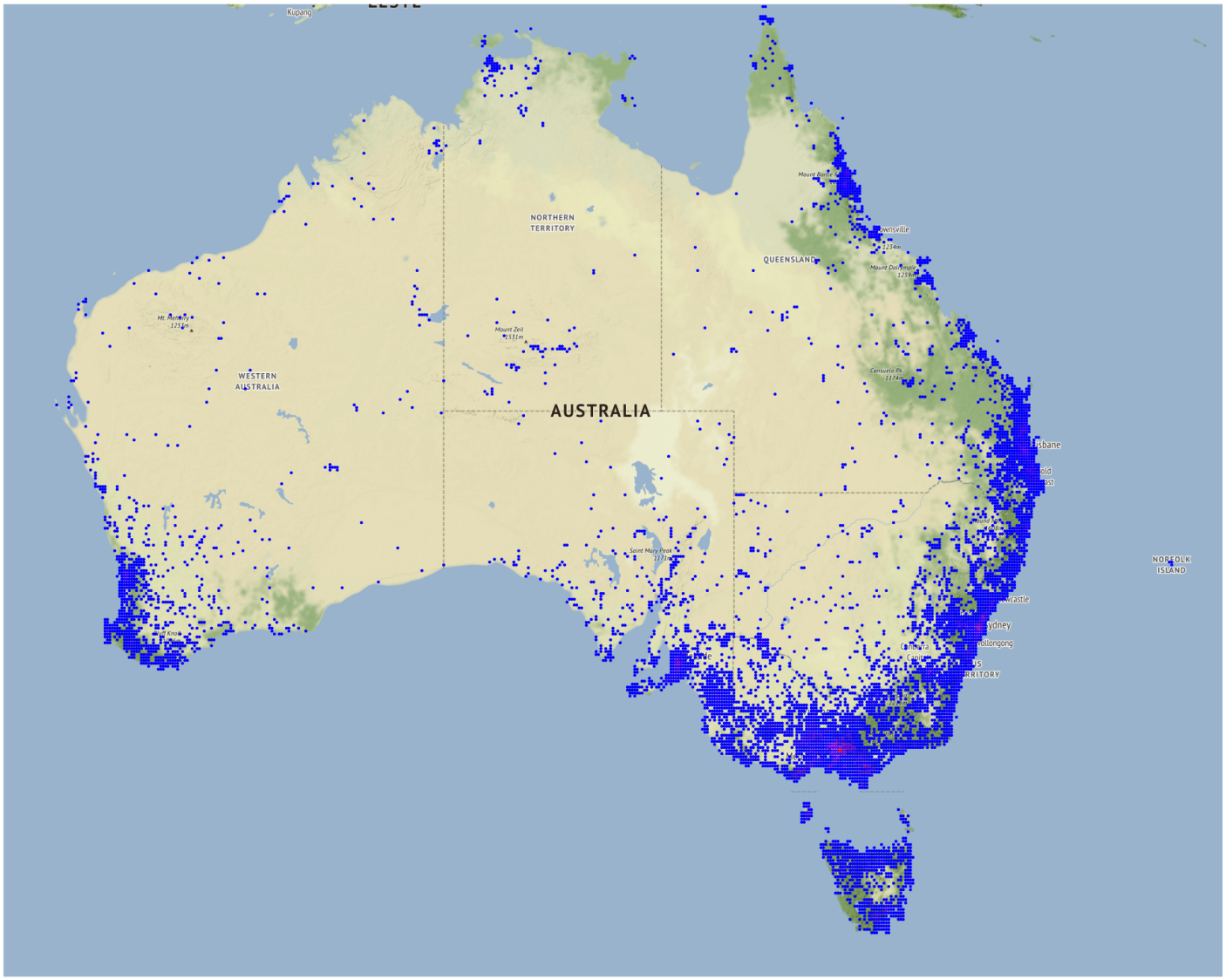


Figure 3: Fungi Distribution Map

The top 50 observers of fungi in Australia

As of iNaturalist data to: 2022-12-27 , there are 304,419 observations of fungi in Australia, from 13,619 observers. Each user represents 0.007% of the total. The Top 50 users contributed 132,479 observations, or 43.52% of the total, while representing only 0.37% of total observers. This page celebrates the contribution these users have made to the data available.

Table 7: Top 50 observers of fungi in Australia

User	Obs Rank	Obs	Obs %	Species Rank	Species ^	Species %	RG	RG Ratio	IDs	ID Rank #
reiner	1	57,128	18.8%	1	1,091	32.2%	25,600	44.8%	21,545	3
sofiazed1	2	5,545	1.8%	5	479	14.1%	1,116	20.1%	49,529	1
felix75	3	5,503	1.8%	5	479	14.1%	1,624	29.5%	4,680	10
peterzuidland	4	3,807	1.3%	2	799	23.6%	1,056	27.7%	14	492
kenharris	5	3,560	1.2%	12	412	12.2%	571	16.0%	67	206
ghjake	6	3,173	1.0%	3	634	18.7%	1,115	35.1%	5,265	9
blackangus	7	2,597	0.9%	8	455	13.4%	1,346	51.8%	652	45
davidsando	8	2,496	0.8%	54	199	5.9%	770	30.8%	26	354
questagame	9	2,109	0.7%	17	363	10.7%	357	16.9%	39	275
triciastewart	10	2,061	0.7%	14	380	11.2%	510	24.7%	178	110
mononymous	11	1,829	0.6%	42	222	6.6%	677	37.0%	NA	NA
adrian_aus	12	1,794	0.6%	15	376	11.1%	392	21.9%	8,931	8
paul2george	13	1,790	0.6%	4	533	15.7%	873	48.8%	958	31
cinclosoma	14	1,754	0.6%	68	179	5.3%	187	10.7%	277	79
franklinhermit	15	1,732	0.6%	16	364	10.7%	630	36.4%	307	75
pardalotebellion	16	1,693	0.6%	25	285	8.4%	354	20.9%	479	52
michaelcincotta	17	1,673	0.5%	13	384	11.3%	371	22.2%	802	37
bushbandit	18	1,611	0.5%	5	479	14.1%	650	40.3%	9,526	7
daviaker	19	1,591	0.5%	23	297	8.8%	487	30.6%	116	153
eileen64	20	1,541	0.5%	11	437	12.9%	866	56.2%	98	167
rvraders	21	1,493	0.5%	22	299	8.8%	364	24.4%	45	252
kim-tarpey	22	1,485	0.5%	74	172	5.1%	685	46.1%	NA	NA
ladydawn	23	1,298	0.4%	26	281	8.3%	243	18.7%	33	312
melvinxu	24	1,280	0.4%	24	295	8.7%	293	22.9%	NA	NA
crazy_horse	25	1,187	0.4%	27	272	8.0%	497	41.9%	175	113
streglystendec	26	1,146	0.4%	33	254	7.5%	332	29.0%	136	137
mattcampbellaus	27	1,130	0.4%	9	451	13.3%	391	34.6%	1,852	17
godinoz	28	1,090	0.4%	31	259	7.6%	204	18.7%	NA	NA
nicklambert	29	986	0.3%	36	243	7.2%	186	18.9%	223	91
anon135	30	954	0.3%	18	351	10.4%	217	22.7%	397	59
konan_farrelly	31	920	0.3%	52	200	5.9%	530	57.6%	16,345	4
tassietravelsblog	32	861	0.3%	29	265	7.8%	405	47.0%	38	287
nyoni-pete	33	860	0.3%	37	232	6.8%	165	19.2%	205	96
rattyexplores	34	824	0.3%	77	162	4.8%	72	8.7%	NA	NA
johneichler	35	814	0.3%	10	450	13.3%	317	38.9%	136	136
claribell	36	812	0.3%	44	214	6.3%	177	21.8%	NA	NA
matisafunguy	37	809	0.3%	59	188	5.6%	288	35.6%	738	41
leshanrahan	38	804	0.3%	32	258	7.6%	326	40.5%	78	186
rainforestfolk	38	804	0.3%	177	99	2.9%	91	11.3%	NA	NA
arripis	40	783	0.3%	20	319	9.4%	319	40.7%	NA	NA
malcolm_mckinty	41	754	0.2%	21	301	8.9%	212	28.1%	NA	NA
ivan-theaged	42	751	0.2%	35	244	7.2%	163	21.7%	NA	NA
robertcronin	43	750	0.2%	50	204	6.0%	169	22.5%	NA	NA
hbeshara	44	748	0.2%	34	253	7.5%	242	32.4%	328	68
rhinolophus	45	714	0.2%	68	179	5.3%	196	27.5%	16	455
gregtasney	46	708	0.2%	65	181	5.3%	254	35.9%	18	427
judy_rob_peters	47	707	0.2%	82	157	4.6%	86	12.2%	NA	NA
bennybotany85	48	685	0.2%	91	149	4.4%	175	25.5%	153	125
cobaltducks	49	668	0.2%	121	125	3.7%	177	26.5%	206	95
damontighe	50	667	0.2%	46	211	6.2%	66	9.9%	80	183

Notes - For each user in the list:

- Obs Rank: based on the number of observations. If there is a tie for positions, users are sorted alphabetically
- Obs: the number of observations
- Obs %: the proportion of observations by the user compared to the total observations of all users
- Species Rank: based on the total number of species observed (distinct taxon_species_name)
- Species: the count of distinct taxon_species_name for each observer ^ **N.B. this will not match the count on iNaturalist (the reason is explained in this document)**
- Species %: the proportion of species observed by the user compared to the the total of all species with observations recorded from all users
- RG: the number of research grade observations
- RG Ratio: the proportion of research grade observations
- IDs and ID Rank (#): based on the Top 500 identifiers per kingdom. See the Identifications section for more detail.

The recorded distribution of protozoa in Australia

As of iNaturalist data to: 2022-12-28

The dots on the map below represent the approximate location of observations, with each dot representing an area of approximately 10 km x 10 km. A colour change from blue to red represents an increase in observations in an area.

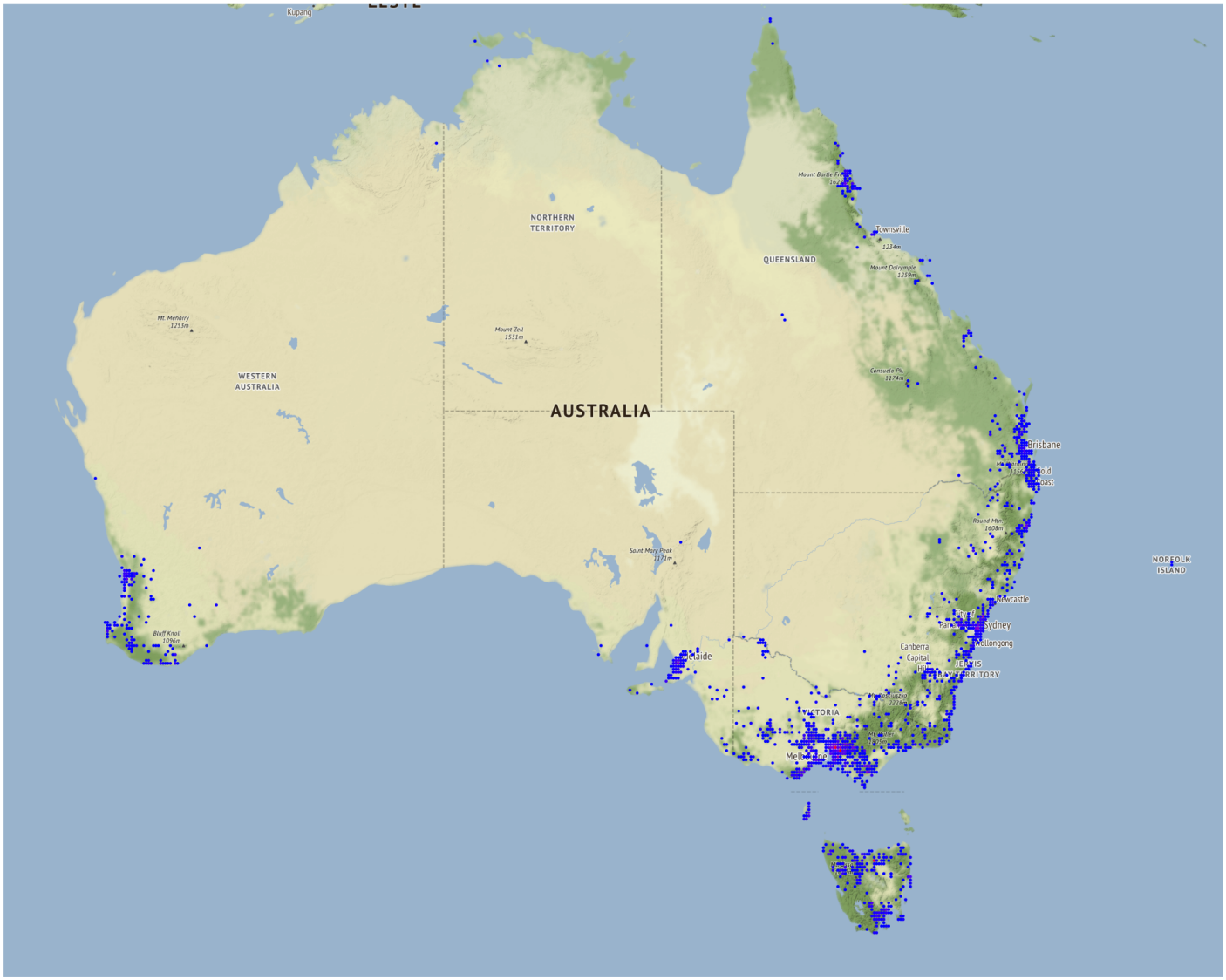


Figure 4: Protozoa Distribution Map

The top 50 observers of protozoa in Australia

As of iNaturalist data to: 2022-12-28 , there are 8,014 observations of protozoa in Australia, from 1,615 observers. Each user represents 0.062% of the total. The Top 50 users contributed 4,590 observations, or 57.27% of the total, while representing only 3.1% of total observers. This page celebrates the contribution these users have made to the data available.

Table 8: Top 50 observers of protozoa in Australia

User	Obs Rank	Obs	Obs %	Species Rank	Species ^	Species %	RG	RG Ratio	IDs	ID Rank #
reiner	1	1,336	16.7%	4	66	23.0%	483	36.2%	486	3
petamcdonald	2	584	7.3%	1	138	48.1%	258	44.2%	102	9
sarahlloyd	3	382	4.8%	2	93	32.4%	236	61.8%	903	2
peterzuidland	4	159	2.0%	3	78	27.2%	43	27.0%	1	355
ghjake	5	136	1.7%	10	28	9.8%	50	36.8%	86	13
adrian_aus	6	135	1.7%	8	33	11.5%	31	23.0%	1,322	1
sofiazed1	7	117	1.5%	13	24	8.4%	30	25.6%	231	6
felix75	8	108	1.3%	13	24	8.4%	31	28.7%	48	19
triciastewart	9	77	1.0%	26	16	5.6%	22	28.6%	9	58
sypster	10	72	0.9%	7	34	11.8%	42	58.3%	8	66
paul2george	11	70	0.9%	6	35	12.2%	34	48.6%	54	15
cowirrie	12	66	0.8%	43	12	4.2%	41	62.1%	9	60
franklinhermit	13	64	0.8%	22	17	5.9%	12	18.8%	5	104
ladydawn	14	63	0.8%	18	19	6.6%	20	31.7%	7	78
rattyexplores	15	57	0.7%	22	17	5.9%	12	21.1%	1	444
mononymous	16	54	0.7%	75	7	2.4%	25	46.3%	3	148
davidandjill123	17	53	0.7%	5	39	13.6%	19	35.8%	NA	NA
wildthingstas	18	52	0.6%	12	25	8.7%	6	11.5%	4	134
jameskdouch	19	51	0.6%	11	27	9.4%	8	15.7%	191	7
claribell	20	50	0.6%	18	19	6.6%	11	22.0%	NA	NA
crazy_horse	21	47	0.6%	22	17	5.9%	15	31.9%	11	51
fayearcaro1	21	47	0.6%	8	33	11.5%	11	23.4%	NA	NA
bushbandit	23	46	0.6%	16	20	7.0%	29	63.0%	283	5
peterbos	24	43	0.5%	16	20	7.0%	5	11.6%	NA	NA
coddiwompler	25	40	0.5%	15	21	7.3%	9	22.5%	NA	NA
blackangus	26	39	0.5%	26	16	5.6%	7	17.9%	10	53
elusiveorchids	26	39	0.5%	32	14	4.9%	11	28.2%	1	250
nicklambert	28	38	0.5%	20	18	6.3%	8	21.1%	11	49
ronef	29	37	0.5%	38	13	4.5%	8	21.6%	NA	NA
mattcampbellaus	30	33	0.4%	22	17	5.9%	12	36.4%	34	25
ppolito	31	31	0.4%	75	7	2.4%	2	6.5%	NA	NA
jessster78	32	29	0.4%	29	15	5.2%	9	31.0%	17	41
rvraders	33	28	0.3%	58	9	3.1%	13	46.4%	1	286
kenharris	34	27	0.3%	38	13	4.5%	3	11.1%	NA	NA
questagame	34	27	0.3%	50	10	3.5%	14	51.9%	NA	NA
anon135	36	26	0.3%	20	18	6.3%	3	11.5%	20	33
elisefleming	37	25	0.3%	50	10	3.5%	5	20.0%	NA	NA
em_lamond	37	25	0.3%	43	12	4.2%	4	16.0%	21	31
jenny_w	37	25	0.3%	29	15	5.2%	9	36.0%	NA	NA
mariannebroug	37	25	0.3%	32	14	4.9%	9	36.0%	4	129
tjeales	37	25	0.3%	43	12	4.2%	7	28.0%	1	314
whitehorseprimaryscience	37	25	0.3%	50	10	3.5%	4	16.0%	NA	NA
eileen64	43	23	0.3%	32	14	4.9%	12	52.2%	1	334
nomennudum	43	23	0.3%	26	16	5.6%	10	43.5%	NA	NA
pardalotebellion	43	23	0.3%	43	12	4.2%	6	26.1%	4	139
godinoz	46	22	0.3%	67	8	2.8%	4	18.2%	NA	NA
johneichler	46	22	0.3%	48	11	3.8%	8	36.4%	NA	NA
ngaruru	46	22	0.3%	32	14	4.9%	8	36.4%	NA	NA
hbeshara	49	21	0.3%	38	13	4.5%	7	33.3%	NA	NA
sandra-tuszynska	49	21	0.3%	43	12	4.2%	6	28.6%	NA	NA

Notes - For each user in the list:

- Obs Rank: based on the number of observations. If there is a tie for positions, users are sorted alphabetically
- Obs: the number of observations
- Obs %: the proportion of observations by the user compared to the total observations of all users
- Species Rank: based on the total number of species observed (distinct taxon_species_name)
- Species: the count of distinct taxon_species_name for each observer **^ N.B. this will not match the count on iNaturalist (the reason is explained in this document)**
- Species %: the proportion of species observed by the user compared to the the total of all species with observations recorded from all users
- RG: the number of research grade observations
- RG Ratio: the proportion of research grade observations
- IDs and ID Rank (#): based on the Top 500 identifiers per kingdom. See the Identifications section for more detail.

Observers by State

Table 9: Summary of users by state

Kingdom	State	Total Users	Total Obs
Fungi	Victoria	4,722	159,510
	New South Wales	4,043	58,750
	Queensland	3,015	34,687
	Tasmania	1,178	17,713
	South Australia	1,146	18,155
	Western Australia	946	12,101
	Australian Capital Territory	408	2,797
	Northern Territory	164	706
Protozoa	Victoria	570	3,983
	New South Wales	384	1,355
	Queensland	271	706
	Tasmania	190	1,188
	South Australia	136	339
	Western Australia	123	397
	Australian Capital Territory	29	41
	Northern Territory	3	5

Identifications

The work people put into identifications on iNaturalist is just as important as the observations. Although there isn't a way to extract the complete identifications data to allow for a detailed analysis, there are some summary statistics available on the site. iNaturalist lists the top 500 users for identifications per kingdom. The top user below refers to the user with the highest number of identifications per kingdom.

Table 10: Summary statistics for top the 500 identifiers by Kingdom

Kingdom	Total Users	Total IDs	Average IDs	Top user IDs	Top user % of Top 500 user IDs
Fungi	500	262,609	525	49,529	18.86%
Protozoa	500	6,464	13	1,322	20.45%

Are the users in the Top 50 Observers the same as the Top 50 Identifiers? Not as much as I anticipated.

Table 11: Proportion of Top 50 Observers who are also Top 50 Identifiers

Kingdom	Proportion
Fungi	20.0%
Protozoa	30.0%

Protozoa and fungi observers

As there are relatively few Protozoa observations and observers compared to those of Fungi, I looked at the proportion of Protozoa observers who also observe Fungi, to understand whether they are predominately the same people.

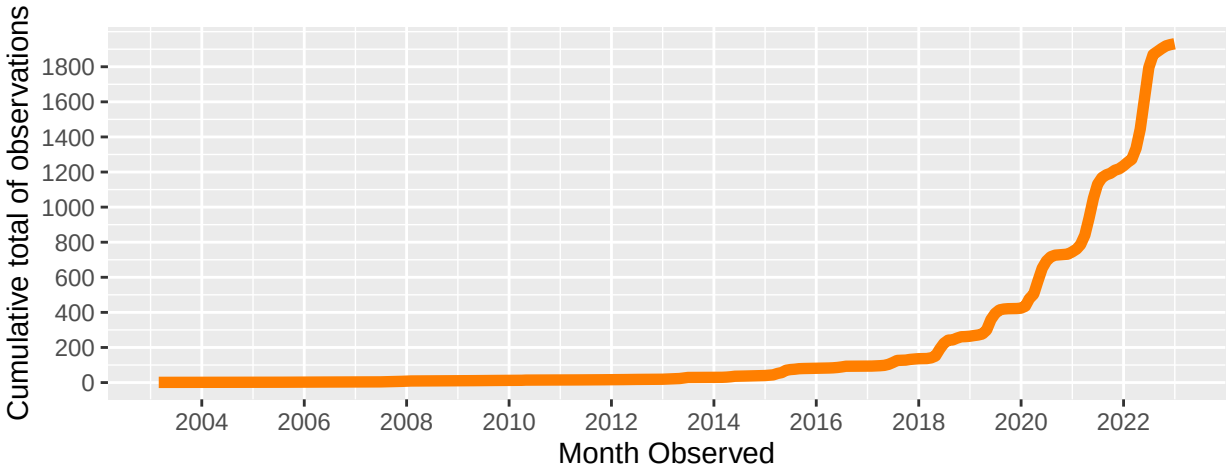
Table 12: Proportion of Protozoa observers who also observe Fungi

Protozoa Observers	Protozoa and Fungi Observers	Proportion of both
1,615	1,481	91.7%

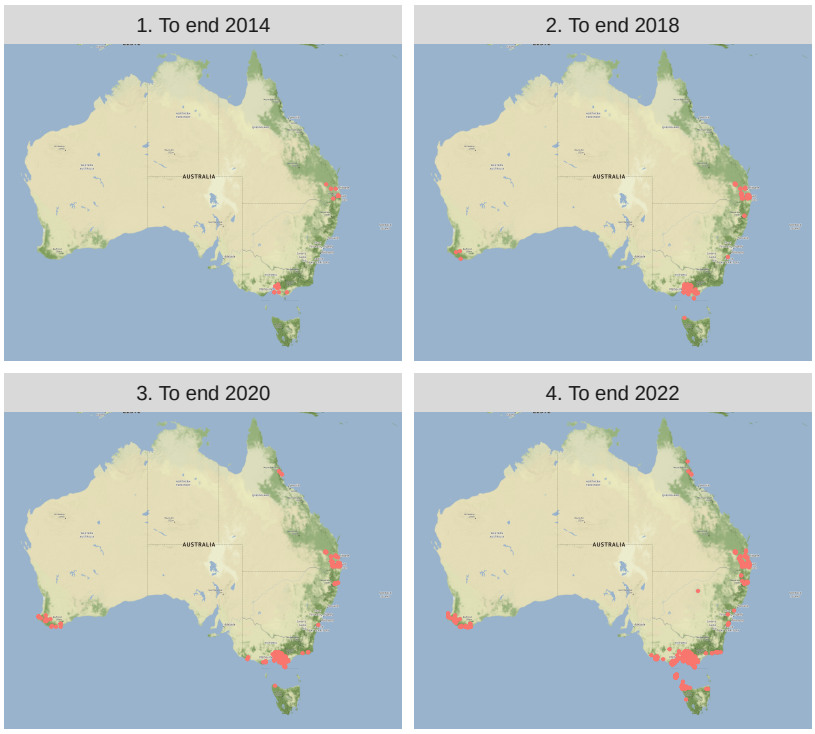
Orange Pore Fungus

Orange Pore Fungus is an introduced invasive species. I consider it the *Lantana* of fungi in Australia. iNaturalist data can be used to track the spread of this species. It is easy to identify and as such has a high proportion of research grade observations. Between the 24th and 25th of March 2022, after the data for Volume 1 was analysed, a taxon split occurred on iNaturalist based on https://doi.org/10.3390/f12101397. This means that *Favolaschia calocera*, was swapped with *Favolaschia claudopus*. The impact of that change meant that many observations required a huge amount of effort from the community to restore the species level IDs. The common name of Orange Pore Fungus has been transferred to *Favolaschia claudopus*.
Note (#): for the time being, logic has been applied to include all observations from the genus Favolaschia, specifically excluding *F. manipularis* and *F. pustulosa* (the only other species with observations in Australia) and as such includes all observations entered under Complex *Favolaschia calocera*, in recognition that it will take time for users to become aware of the change.

Cumulative total of Orange Pore Fungus(#) observations in Australia



Recorded distribution of Orange Pore Fungus(#) in Australia



The Mycetozoa (observed) family tree

This table shows the number of observations for each branch of the Mycetozoa phylum (of the Protozoa kingdom) tree: *class* > *order* > *genus*. Branches of the tree without observations are not included.

Table 13: Mycetozoa (observed) family tree

Mycetozoa Tree: Class > Order > Genus	Branch Obs	Species	Branch RG	RG %
Dictyosteliomycetes > Dictyosteliales > Polysphondylium	1	0	0	0.0%
Myxomycetes > Echinosteliales > Clastoderma	24	1	15	62.5%
Myxomycetes > Echinosteliales > Echinostelium	5	2	0	0.0%
Myxomycetes > Liceales > Alwisia	40	1	17	42.5%
Myxomycetes > Liceales > Cribraria	142	14	52	36.6%
Myxomycetes > Liceales > Dictydiaethalium	57	1	21	36.8%
Myxomycetes > Liceales > Licea	8	6	3	37.5%
Myxomycetes > Liceales > Lindbladia	5	1	2	40.0%
Myxomycetes > Liceales > Lycogala	511	3	165	32.3%
Myxomycetes > Liceales > Reticularia	41	3	6	14.6%
Myxomycetes > Liceales > Tubifera	465	6	252	54.2%
Myxomycetes > Liceales > unknown	24	0	0	0.0%
Myxomycetes > Physarales > Badhamia	65	3	31	47.7%
Myxomycetes > Physarales > Craterium	20	3	12	60.0%
Myxomycetes > Physarales > Diachea	25	1	14	56.0%
Myxomycetes > Physarales > Diderma	52	8	14	26.9%
Myxomycetes > Physarales > Didymium	67	9	21	31.3%
Myxomycetes > Physarales > Elaeomyxa	91	2	74	81.3%
Myxomycetes > Physarales > Fuligo	1,161	4	639	55.0%
Myxomycetes > Physarales > Leocarpus	135	1	44	32.6%
Myxomycetes > Physarales > Mucilago	349	1	49	14.0%
Myxomycetes > Physarales > Physarella	3	1	3	100.0%
Myxomycetes > Physarales > Physarum	326	24	128	39.3%
Myxomycetes > Physarales > unknown	103	0	0	0.0%
Myxomycetes > Physarales > Willkommlangea	18	1	12	66.7%
Myxomycetes > Stemonitales > Brefeldia	1	0	0	0.0%
Myxomycetes > Stemonitales > Collaria	5	1	1	20.0%
Myxomycetes > Stemonitales > Colloderma	11	1	9	81.8%
Myxomycetes > Stemonitales > Comatricha	81	9	13	16.0%
Myxomycetes > Stemonitales > Enerthenema	15	1	13	86.7%
Myxomycetes > Stemonitales > Lamproderma	60	3	7	11.7%
Myxomycetes > Stemonitales > Macbrideola	11	3	1	9.1%
Myxomycetes > Stemonitales > Paradiachea	34	2	11	32.4%
Myxomycetes > Stemonitales > Paradiacheopsis	4	2	3	75.0%
Myxomycetes > Stemonitales > Stemonitis	553	6	44	8.0%
Myxomycetes > Stemonitales > Stemonitopsis	58	4	20	34.5%
Myxomycetes > Stemonitales > Symphytocarpus	2	0	0	0.0%
Myxomycetes > Stemonitales > unknown	114	0	0	0.0%
Myxomycetes > Trichiales > Arcyria	441	15	88	20.0%
Myxomycetes > Trichiales > Calomyxa	9	1	3	33.3%
Myxomycetes > Trichiales > Dianema	3	1	1	33.3%
Myxomycetes > Trichiales > Hemitrichia	52	4	27	51.9%
Myxomycetes > Trichiales > Metatrichia	58	2	27	46.6%
Myxomycetes > Trichiales > Perichaena	21	3	9	42.9%
Myxomycetes > Trichiales > Prototrichia	4	1	4	100.0%
Myxomycetes > Trichiales > Trichia	493	13	167	33.9%
Myxomycetes > Trichiales > unknown	55	0	0	0.0%
Myxomycetes > unknown > unknown	888	0	0	0.0%
Protosteliomycetes > Ceratiomyxales > Ceratiomyxa	639	3	623	97.5%
Protosteliomycetes > Ceratiomyxales > unknown	1	0	0	0.0%
unknown > unknown > unknown	532	0	0	0.0%

Fungimap target species - original

Fungimap is “a not for profit, citizen-science organisation dedicated to furthering the conservation and knowledge of Australian fungi and started in 1995 as a mapping project”. Please visit the Fungimap site and support their work if you can.

Of the 304,419 observations of fungi in Australia, 36,459 or 12.0% are of an original Fungimap target species.

Of the 144,307 **species level** observations of fungi in Australia, 36,459 or 25.3% are of an original Fungimap target species.

The 100 original Fungimap target species are detailed below. Note: Some target species are groups of multiple species; I have initially included only the most common species of those groups. Please let know any specific species that should be included in this list.

Table 14: Fungimap Original Target Species

Class > Order > Genus	Scientific Name	RG	Obs	RG %	Users	States / Territories
Agaricomycetes > Agaricales > Agaricus	Agaricus xanthodermus	288	500	57.6%	285	7
Agaricomycetes > Agaricales > Amanita	Amanita austroviridis	14	15	93.3%	10	3
Agaricomycetes > Agaricales > Amanita	Amanita muscaria	2,029	2,035	99.7%	1,093	7
Agaricomycetes > Agaricales > Amanita	Amanita phalloides	57	63	90.5%	34	4
Agaricomycetes > Agaricales > Amanita	Amanita xanthocephala	1,217	1,304	93.3%	470	7
Agaricomycetes > Agaricales > Anthracophyllum	Anthracophyllum archeri	433	456	95.0%	192	6
Agaricomycetes > Agaricales > Armillaria	Armillaria luteobubalina	449	696	64.5%	344	7
Agaricomycetes > Agaricales > Asterophora	Asterophora mirabilis	15	16	93.8%	8	1
Agaricomycetes > Agaricales > Battarrea	Battarrea phalloides	103	115	89.6%	74	6
Agaricomycetes > Agaricales > Bolbitius	Bolbitius titubans	207	409	50.6%	292	7
Agaricomycetes > Agaricales > Coprinus	Coprinus comatus	721	738	97.7%	510	7
Agaricomycetes > Agaricales > Cortinarius	Cortinarius austroalbidus	7	27	25.9%	14	4
Agaricomycetes > Agaricales > Cortinarius	Cortinarius austrovenetus	719	760	94.6%	338	7
Agaricomycetes > Agaricales > Cortinarius	Cortinarius metallicus	25	28	89.3%	20	3
Agaricomycetes > Agaricales > Cortinarius	Cortinarius persplendidus	105	189	55.6%	96	7
Agaricomycetes > Agaricales > Cortinarius	Cortinarius roseolilacinus	2	3	66.7%	2	1
Agaricomycetes > Agaricales > Cortinarius	Cortinarius rotundisporus	830	878	94.5%	340	6
Agaricomycetes > Agaricales > Cortinarius	Cortinarius sublargus	1	24	4.2%	17	3
Agaricomycetes > Agaricales > Cortinarius	Cortinarius symeae	0	2	0.0%	2	1
Agaricomycetes > Agaricales > Cruentomycena	Cruentomycena viscidocruenta	1,814	1,837	98.7%	801	7
Agaricomycetes > Agaricales > Cuphophyllus	Hygrocybe cheelii	86	101	85.1%	54	4
Agaricomycetes > Agaricales > Cyptotrama	Cyptotrama asprata	436	464	94.0%	231	4
Agaricomycetes > Agaricales > Entoloma	Entoloma virescens	154	156	98.7%	112	3
Agaricomycetes > Agaricales > Fistulina	Fistulina hepatica	128	132	97.0%	67	6
Agaricomycetes > Agaricales > Gliophorus	Gliophorus graminicolor	153	259	59.1%	71	4
Agaricomycetes > Agaricales > Gymnopilus	Gymnopilus junonius	1,110	1,833	60.6%	907	8
Agaricomycetes > Agaricales > Hebeloma	Hebeloma aminophilum	7	50	14.0%	27	5
Agaricomycetes > Agaricales > Lepista	Lepista nuda	179	296	60.5%	185	6
Agaricomycetes > Agaricales > Leucopaxillus	Leucopaxillus lilacinus	19	30	63.3%	15	4
Agaricomycetes > Agaricales > Lichenomphalia	Lichenomphalia chromacea	1,650	1,922	85.8%	820	7
Agaricomycetes > Agaricales > Macrotyphula	Macrotyphula juncea	124	143	86.7%	35	3
Agaricomycetes > Agaricales > Marasmius	Marasmius elegans	488	576	84.7%	158	8
Agaricomycetes > Agaricales > Marasmius	Marasmius oreades	104	412	25.2%	286	7
Agaricomycetes > Agaricales > Mucronella	Mucronella pendula	95	99	96.0%	44	4
Agaricomycetes > Agaricales > Mycena	Mycena interrupta	1,405	1,408	99.8%	363	5
Agaricomycetes > Agaricales > Mycena	Mycena leaiana australis	21	30	70.0%	16	4
Agaricomycetes > Agaricales > Mycena	Mycena nargan	266	338	78.7%	126	6
Agaricomycetes > Agaricales > Omphalotus	Omphalotus nidiformis	2,357	2,561	92.0%	1,178	7
Agaricomycetes > Agaricales > Oudemansiella	Oudemansiella radicata	25	153	16.3%	118	5
Agaricomycetes > Agaricales > Panellus	Panellus pusillus	209	292	71.6%	78	4
Agaricomycetes > Agaricales > Pleurotus	Pleurotus australis	23	53	43.4%	35	4
Agaricomycetes > Agaricales > Podaxis	Podaxis pistillaris	117	153	76.5%	82	6
Agaricomycetes > Agaricales > Porpolomopsis	Porpolomopsis lewelliniae	297	304	97.7%	149	5
Agaricomycetes > Agaricales > Roridomyces	Roridomyces austrororidus	286	377	75.9%	64	3
Agaricomycetes > Agaricales > Schizophyllum	Schizophyllum commune	1,616	1,750	92.3%	753	8
Agaricomycetes > Agaricales > Schizostoma	Schizostoma laceratum	2	2	100.0%	2	2
Agaricomycetes > Agaricales > Tubaria	Tubaria rufofulva	144	215	67.0%	94	7
Agaricomycetes > Agaricales > Volvopluteus	Volvopluteus gloiocephalus	258	495	52.1%	307	7
Agaricomycetes > Amylocorticiales > Podoserpula	Podoserpula pusio	254	295	86.1%	67	5
Agaricomycetes > Auriculariales > Pseudohydnum	Pseudohydnum gelatinosum	617	635	97.2%	192	4
Agaricomycetes > Boletales > Astraeus	Astraeus hygrometricus	33	45	73.3%	30	4
Agaricomycetes > Boletales > Boletellus	Boletellus obscurecoccineus	301	383	78.6%	236	7
Agaricomycetes > Boletales > Calostoma	Calostoma fuhreri	1	1	100.0%	1	1
Agaricomycetes > Boletales > Calostoma	Calostoma fuscum	60	80	75.0%	53	6
Agaricomycetes > Boletales > Calostoma	Calostoma rodwayi	20	21	95.2%	12	2
Agaricomycetes > Cantharellales > Craterellus	Craterellus cornucopioides	56	61	91.8%	28	4
Agaricomycetes > Geastrales > Geastrum	Geastrum fornicatum	10	23	43.5%	9	4
Agaricomycetes > Gloeophyllales > Gloeophyllum	Gloeophyllum concentricum	2	2	100.0%	2	1
Agaricomycetes > Gloeophyllales > Neolentinus	Neolentinus dactyloides	20	29	69.0%	21	3

Agaricomycetes > Gomphales > Beenakia	Beenakia dacostae	49	52	94.2%	13	2
Agaricomycetes > Phallales > Aseroe	Aseroe rubra	1,125	1,130	99.6%	850	7
Agaricomycetes > Phallales > Clathrus	Clathrus archeri	155	156	99.4%	128	6
Agaricomycetes > Phallales > Claustula	Claustula fischeri	2	2	100.0%	2	1
Agaricomycetes > Phallales > Colus	Colus pusillus	352	353	99.7%	252	6
Agaricomycetes > Phallales > Ileodictyon	Ileodictyon cibarium	8	8	100.0%	7	3
Agaricomycetes > Phallales > Ileodictyon	Ileodictyon gracile	185	189	97.9%	158	7
Agaricomycetes > Phallales > Phallus	Phallus indusiatus	137	151	90.7%	111	2
Agaricomycetes > Polyporales > Cymatoderma	Cymatoderma elegans	404	438	92.2%	261	5
Agaricomycetes > Polyporales > Fomitopsis	Piptoporus australiensis	104	202	51.5%	136	6
Agaricomycetes > Polyporales > Laccocephalum	Laccocephalum hartmannii	54	82	65.9%	38	6
Agaricomycetes > Polyporales > Laccocephalum	Laccocephalum mylittae	2	6	33.3%	6	4
Agaricomycetes > Polyporales > Microporus	Microporus affinis	133	168	79.2%	99	3
Agaricomycetes > Polyporales > Microporus	Microporus xanthopus	744	784	94.9%	414	3
Agaricomycetes > Polyporales > Neolentiporus	Neolentiporus maculatissimus	29	31	93.5%	18	2
Agaricomycetes > Polyporales > Panus	Panus fasciatus	188	269	69.9%	181	7
Agaricomycetes > Polyporales > Phlebia	Phlebia subceracea	131	167	78.4%	53	5
Agaricomycetes > Polyporales > Sanguinoderma	Sanguinoderma rude	494	543	91.0%	226	7
Agaricomycetes > Russulales > Hericium	Hericium coralloides	201	209	96.2%	128	4
Agaricomycetes > Russulales > Stereum	Stereum hirsutum	285	532	53.6%	317	7
Agaricomycetes > Russulales > Stereum	Stereum ostrea	103	203	50.7%	130	6
Leotiomycetes > Helotiales > Ascocoryne	Ascocoryne sarcoides	530	565	93.8%	114	5
Leotiomycetes > Helotiales > Banksiamyces	Banksiamyces macrocarpus	20	32	62.5%	11	2
Leotiomycetes > Helotiales > Chlorovibrissea	Chlorovibrissea bicolor	15	15	100.0%	4	1
Leotiomycetes > Helotiales > Cyttaria	Cyttaria gunnii	175	175	100.0%	116	2
Leotiomycetes > Helotiales > Vibrissea	Vibrissea dura	62	68	91.2%	18	3
Leotiomycetes > Leotiales > Leotia	Leotia lubrica	353	368	95.9%	138	6
Pezizomycetes > Pezizales > Cookeina	Cookeina tricholoma	16	19	84.2%	17	2
Pezizomycetes > Pezizales > Geomorium	Geomorium beatonii	6	6	100.0%	4	2
Pezizomycetes > Pezizales > Helvella	Helvella fibrosa	33	34	97.1%	13	3
Pezizomycetes > Pezizales > Morchella	Morchella australiana	87	126	69.0%	94	6
Pezizomycetes > Pezizales > Morchella	Morchella esculenta	4	10	40.0%	5	2
Pezizomycetes > Pezizales > Urnula	Urnula campylospora	280	339	82.6%	97	4
Sordariomycetes > Hypocreales > Cordyceps	Cordyceps hawkesii	27	41	65.9%	26	3
Sordariomycetes > Hypocreales > Drechmeria	Drechmeria gunnii	327	405	80.7%	136	6
Sordariomycetes > Hypocreales > Hypocreopsis	Hypocreopsis amplectens	17	17	100.0%	10	1
Sordariomycetes > Xylariales > Poronia	Poronia erici	85	89	95.5%	59	8
Tremellomycetes > Tremellales > Tremella	Tremella fuciformis	1,310	1,465	89.4%	538	7
Tremellomycetes > Tremellales > Tremella	Tremella mesenterica	612	842	72.7%	502	7
x No obs x	Flabellophora superposita	0	0	NA	0	0
x No obs x	Uromyces politus	0	0	NA	0	0

Fungimap - Fungi Down Under 2 target species

Fungimap is working on their second target species list https://fungimap.org.au/fungi-down-under-100-target-species/fungi-down-under-2/. The list below includes the species as of 2022-06-20 and interestingly will include several slime moulds!

Fungi: Of the 304,419 observations of fungi in Australia, 28,793 or 9.5% are of a Fungimap version 2 target species. Of the 144,307 **species level** observations of fungi in Australia, 28,793 or 20.0% are of a Fungimap version 2 target species.

Protozoa: Of the 8,014 observations of protozoa in Australia, 2,312 or 28.8% are of a Fungimap version 2 target species. Of the 4,559 **species level** observations of protozoa in Australia, 2,312 or 50.7% are of a Fungimap version 2 target species.

Note: Some target species are groups of multiple species; I have included only the most common species of those groups. Please let know any specific species that should be included in this list, noting this list will be reviewed once Fungimap makes it final.

Table 15: Fungimap 2 Target Species - PROTOZOA

Class > Order > Genus	Scientific Name	RG	Obs	RG %	Users	States / Territories
Myxomycetes > Liceales > Lycogala	Lycogala epidendrum	157	319	49.2%	156	6
Myxomycetes > Physarales > Elaeomyxa	Elaeomyxa cerifera	68	82	82.9%	14	3
Myxomycetes > Physarales > Fuligo	Fuligo septica	632	1,022	61.8%	553	8
Myxomycetes > Physarales > Leocarpus	Leocarpus fragilis	44	103	42.7%	57	5
Myxomycetes > Physarales > Physarum	Physarum viride	73	125	58.4%	34	6
Myxomycetes > Trichiales > Hemitrichia	Hemitrichia serpula	22	23	95.7%	15	4
Protosteliomycetes > Ceratiomyxales > Ceratiomyxa	Ceratiomyxa fruticulosa	612	622	98.4%	200	7

Table 16: Fungimap 2 Target Species - FUNGI

Class > Order > Genus	Scientific Name	RG	Obs	RG %	Users	States / Territories
Agaricomycetes > Agaricales > Agaricus	Gyrophragmium inquinans	1	1	100.0%	1	1
Agaricomycetes > Agaricales > Amanita	Amanita arenaria	0	1	0.0%	1	1
Agaricomycetes > Agaricales > Amanita	Amanita armeniaca	31	35	88.6%	16	5
Agaricomycetes > Agaricales > Amanita	Amanita flavella	106	123	86.2%	86	3
Agaricomycetes > Agaricales > Calyptella	Calyptella longipes	19	21	90.5%	16	2
Agaricomycetes > Agaricales > Chlorophyllum	Chlorophyllum brunneum	180	451	39.9%	292	7
Agaricomycetes > Agaricales > Chlorophyllum	Chlorophyllum molybdites	231	474	48.7%	306	4
Agaricomycetes > Agaricales > Clavaria	Clavaria zollingeri	113	135	83.7%	103	6
Agaricomycetes > Agaricales > Collybia	Collybia eucalyptorum	444	688	64.5%	144	4
Agaricomycetes > Agaricales > Collybiopsis	Marasmiellus affixus	98	201	48.8%	32	4
Agaricomycetes > Agaricales > Coprinellus	Coprinellus micaceus	100	399	25.1%	284	7
Agaricomycetes > Agaricales > Cortinarius	Cortinarius archeri	1,018	1,092	93.2%	589	7
Agaricomycetes > Agaricales > Cortinarius	Cortinarius canarius	18	20	90.0%	16	3
Agaricomycetes > Agaricales > Cortinarius	Cortinarius globuliformis	5	7	71.4%	4	2
Agaricomycetes > Agaricales > Cortinarius	Cortinarius phalarus	28	46	60.9%	18	4
Agaricomycetes > Agaricales > Cortinarius	Cortinarius sinapicolor	523	581	90.0%	225	7
Agaricomycetes > Agaricales > Cyclocybe	Cyclocybe parasitica	79	106	74.5%	50	4
Agaricomycetes > Agaricales > Cystoderma	Cystoderma muscicola	19	40	47.5%	17	3
Agaricomycetes > Agaricales > Deconica	Deconica horizontalis	144	279	51.6%	49	5
Agaricomycetes > Agaricales > Descolea	Descolea recedens	365	536	68.1%	161	7
Agaricomycetes > Agaricales > Descolea	Descolea tenuipes	0	3	0.0%	3	1
Agaricomycetes > Agaricales > Entoloma	Entoloma albidosimulans	9	46	19.6%	5	3
Agaricomycetes > Agaricales > Entoloma	Entoloma aromaticum	12	74	16.2%	12	3
Agaricomycetes > Agaricales > Entoloma	Entoloma austroroseum	1	2	50.0%	2	1
Agaricomycetes > Agaricales > Entoloma	Entoloma panniculus	22	44	50.0%	20	5
Agaricomycetes > Agaricales > Entoloma	Entoloma splendidum	0	2	0.0%	1	1
Agaricomycetes > Agaricales > Entoloma	Entoloma viridomarginatum	73	92	79.3%	42	5
Agaricomycetes > Agaricales > Favolaschia	Favolaschia claudopus	1,927	1,927	100.0%	583	6
Agaricomycetes > Agaricales > Galerina	Galerina patagonica	401	685	58.5%	180	7
Agaricomycetes > Agaricales > Gymnopilus	Gymnopilus allantopus	330	560	58.9%	249	7
Agaricomycetes > Agaricales > Hebeloma	Hebeloma victoriense	0	7	0.0%	6	4
Agaricomycetes > Agaricales > Henningsomyces	Henningsomyces candidus	66	93	71.0%	13	5
Agaricomycetes > Agaricales > Hygrocybe	Hygrocybe astatogala	49	97	50.5%	58	5
Agaricomycetes > Agaricales > Hypholoma	Hypholoma brunneum	161	247	65.2%	90	5
Agaricomycetes > Agaricales > Inocybe	Inocybe violaceocaulis	5	14	35.7%	11	4
Agaricomycetes > Agaricales > Lentinula	Lentinula lateritia	7	10	70.0%	9	2
Agaricomycetes > Agaricales > Lepista	Lepista sublilacina	53	75	70.7%	57	3
Agaricomycetes > Agaricales > Leratiomyces	Leratiomyces ceres	980	1,211	80.9%	710	7
Agaricomycetes > Agaricales > Leucoagaricus	Leucoagaricus leucothites	20	105	19.0%	98	7
Agaricomycetes > Agaricales > Leucocoprinus	Leucocoprinus birnbaumii	484	556	87.1%	436	6
Agaricomycetes > Agaricales > Limacella	Limacella pitereka	36	72	50.0%	36	6
Agaricomycetes > Agaricales > Macrolepiota	Macrolepiota clelandii	688	1,010	68.1%	518	7
Agaricomycetes > Agaricales > Macrolepiota	Macrolepiota dolichaula	126	189	66.7%	143	5
Agaricomycetes > Agaricales > Marasmius	Marasmius alveolaris	88	146	60.3%	36	5
Agaricomycetes > Agaricales > Melanophyllum	Melanophyllum haematospermum	66	68	97.1%	17	2
Agaricomycetes > Agaricales > Montagnea	Montagnea arenaria	10	30	33.3%	14	5
Agaricomycetes > Agaricales > Mycena	Mycena cystidiosa	690	870	79.3%	161	5
Agaricomycetes > Agaricales > Mycena	Mycena lazulina	520	522	99.6%	19	2
Agaricomycetes > Agaricales > Mycena	Mycena toyerlaricola	71	103	68.9%	21	3
Agaricomycetes > Agaricales > Nidula	Nidula emodensis	8	16	50.0%	13	2
Agaricomycetes > Agaricales > Oudemansiella	Oudemansiella australis	1	1	100.0%	1	1
Agaricomycetes > Agaricales > Pholiota	Pholiota aurivella	25	48	52.1%	27	4
Agaricomycetes > Agaricales > Pleurotus	Pleurotus tuber-regium	23	30	76.7%	16	1
Agaricomycetes > Agaricales > Pluteus	Pluteus atromarginatus	83	100	83.0%	38	4
Agaricomycetes > Agaricales > Porodisculus	Porodisculus pendulus	4	5	80.0%	5	4
Agaricomycetes > Agaricales > Psathyrella	Psathyrella echinata	256	320	80.0%	61	4
Agaricomycetes > Agaricales > Psilocybe	Psilocybe subaeruginosa	666	683	97.5%	302	7
Agaricomycetes > Agaricales > Scytinotus	Scytinotus longinquus	111	143	77.6%	58	5
Agaricomycetes > Agaricales > Simocybe	Simocybe phlebophora	35	55	63.6%	15	3
Agaricomycetes > Agaricales > Xeromphalina	Xeromphalina leonina	43	60	71.7%	16	3
Agaricomycetes > Auriculariales > Auricularia	Auricularia delicata	31	67	46.3%	42	2
Agaricomycetes > Boletales > Australopilus	Australopilus palumanus	13	13	100.0%	10	2
Agaricomycetes > Boletales > Austroboletus	Austroboletus lacunosus	40	94	42.6%	42	5
Agaricomycetes > Boletales > Austropaxillus	Austropaxillus infundibuliformis	111	341	32.6%	138	6
Agaricomycetes > Boletales > Boletus	Boletus edulis	22	27	81.5%	10	3
Agaricomycetes > Boletales > Gymnogaster	Gymnogaster boletoides	16	16	100.0%	13	3
Agaricomycetes > Boletales > Gyrodontium	Gyrodontium sacchari	14	14	100.0%	12	2
Agaricomycetes > Boletales > Phlebopus	Phlebopus marginatus	820	1,011	81.1%	445	7
Agaricomycetes > Boletales > Sutorius	Sutorius australiensis	7	10	70.0%	8	4
Agaricomycetes > Cantharellales > Cantharellus	Cantharellus concinnus	555	737	75.3%	251	8

Agaricomycetes > Cantharellales > Hydnum	Hydnum repandum	34	111	30.6%	58	6
Agaricomycetes > Geastrales > Geastrum	Geastrum pectinatum	7	67	10.4%	50	8
Agaricomycetes > Geastrales > Sphaerobolus	Sphaerobolus stellatus	95	98	96.9%	36	7
Agaricomycetes > Gomphales > Ramaria	Ramaria botrytoides	31	89	34.8%	46	4
Agaricomycetes > Gomphales > Ramaria	Ramaria capitata	52	224	23.2%	154	7
Agaricomycetes > Gomphales > Ramaria	Ramaria fennica	5	10	50.0%	6	2
Agaricomycetes > Hymenochaetales > Coltriciella	Coltriciella dependens	68	95	71.6%	28	6
Agaricomycetes > Hymenochaetales > Cotylidia	Cotylidia undulata	0	3	0.0%	3	2
Agaricomycetes > Phallales > Phallus	Phallus rubicundus	297	377	78.8%	277	5
Agaricomycetes > Polyporales > Aurantiporus	Aurantiporus pulcherrimus	169	186	90.9%	134	4
Agaricomycetes > Polyporales > Byssomerulius	Byssomerulius corium	183	321	57.0%	96	7
Agaricomycetes > Polyporales > Hexagonia	Hexagonia vesparia	188	215	87.4%	131	7
Agaricomycetes > Polyporales > Laetiporus	Laetiporus portentosus	742	1,172	63.3%	644	7
Agaricomycetes > Polyporales > Lentinus	Lentinus sajor-caju	66	144	45.8%	105	3
Agaricomycetes > Polyporales > Podoscypha	Podoscypha petalodes	445	555	80.2%	288	6
Agaricomycetes > Russulales > Auriscalpium	Auriscalpium barbatum	3	3	100.0%	2	1
Agaricomycetes > Russulales > Lactarius	Lactarius eucalypti	690	776	88.9%	202	7
Agaricomycetes > Russulales > Lentinellus	Lentinellus tasmanicus	20	96	20.8%	10	2
Agaricomycetes > Russulales > Multifurca	Multifurca stenophylla	17	21	81.0%	7	2
Agaricomycetes > Russulales > Russula	Russula persanguinea	549	859	63.9%	304	7
Arthoniomycetes > Arthoniales > Chrysothrix	Chrysothrix candelaris	248	422	58.8%	148	7
Dacrymycetes > Dacrymycetales > Heterotextus	Heterotextus peziziformis	319	513	62.2%	227	7
Lecanoromycetes > Lecanorales > Badimiella	Badimiella pteridophila	1	1	100.0%	1	1
Lecanoromycetes > Lecanorales > Cladia	Cladia muelleri	29	79	36.7%	40	5
Lecanoromycetes > Lecanorales > Psora	Psora decipiens	115	193	59.6%	53	5
Lecanoromycetes > Lecanorales > Xanthoparmelia	Xanthoparmelia semiviridis	58	96	60.4%	43	4
Lecanoromycetes > Peltigerales > Nephroma	Nephroma australe	0	2	0.0%	2	2
Lecanoromycetes > Pertusariales > Thamnolia	Thamnolia vermicularis	7	7	100.0%	5	2
Lecanoromycetes > Teloschistales > Teloschistes	Teloschistes chrysophthalmus	449	733	61.3%	183	7
Leotiomycetes > Helotiales > Chlorociboria	Chlorociboria aeruginascens	71	141	50.4%	73	5
Leotiomycetes > Helotiales > Hymenotorrendiella	Hymenotorrendiella eucalypti	328	385	85.2%	32	4
Leotiomycetes > Helotiales > Lachnum	Lachnum virgineum	119	197	60.4%	36	6
Leotiomycetes > Helotiales > Phaeohelotium	Phaeohelotium baileyanum	653	782	83.5%	206	6
Pezizomycetes > Pezizales > Aleuria	Aleuria aurantia	91	149	61.1%	107	6
Pezizomycetes > Pezizales > Aleurina	Aleurina ferruginea	336	375	89.6%	153	7
Pezizomycetes > Pezizales > Cookeina	Cookeina insititia	3	3	100.0%	3	2
Pezizomycetes > Pezizales > Gyromitra	Gyromitra tasmanica	20	24	83.3%	13	3
Pezizomycetes > Pezizales > Phillipsia	Phillipsia subpurpurea	37	47	78.7%	37	2
Pezizomycetes > Pezizales > Scutellinia	Scutellinia scutellata	13	33	39.4%	20	4
Pezizomycetes > Pezizales > Sowerbyella	Sowerbyella rhenana	47	70	67.1%	37	5
Pezizomycetes > Pezizales > Trichaleurina	Trichaleurina javanica	2	2	100.0%	2	1
Pucciniomycetes > Septobasidiales > Septobasidium	Septobasidium clelandii	55	56	98.2%	15	3
Sordariomycetes > Hypocreales > Cordyceps	Cordyceps meneristitis	29	39	74.4%	14	3
Sordariomycetes > Hypocreales > Neobarya	Neobarya agaricicola	246	246	100.0%	53	3
Sordariomycetes > Hypocreales > Trichoderma	Trichoderma gelatinosum	101	157	64.3%	23	6
Sordariomycetes > Xylariales > Annulohypoxylon	Annulohypoxylon bovei	177	213	83.1%	46	6
Sordariomycetes > Xylariales > Daldinia	Daldinia concentrica	4	39	10.3%	30	6
Sordariomycetes > Xylariales > Hypoxylon	Hypoxylon howeanum	272	298	91.3%	48	4
Sordariomycetes > Xylariales > Xylaria	Xylaria hypoxylon	48	134	35.8%	60	6
x No obs x	Amanita hemibapha	0	0	NA	0	0
x No obs x	Austroboletus subvirens	0	0	NA	0	0
x No obs x	Clavaria amoena	0	0	NA	0	0
x No obs x	Cribbea gloriosa	0	0	NA	0	0
x No obs x	Cribbea reticulata	0	0	NA	0	0
x No obs x	Entoloma carminicolor	0	0	NA	0	0
x No obs x	Entoloma matthinae	0	0	NA	0	0
x No obs x	Filoboletus manipularis	0	0	NA	0	0
x No obs x	Humidicutis viridimagentea	0	0	NA	0	0
x No obs x	Itajahya hornseyi	0	0	NA	0	0
x No obs x	Laccaria sp. A (not broken down to sp.)	0	0	NA	0	0
x No obs x	Oudemansiella turbinispora	0	0	NA	0	0
x No obs x	Ramaria abietina	0	0	NA	0	0
x No obs x	Stalked puffballs (not broken down to sp.)	0	0	NA	0	0
x No obs x	Tulostoma pulchellum	0	0	NA	0	0

International species and incorrect identifications

iNaturalist provides identification suggestions, along with those from the community. This functionality is incredibly valuable, however, it is common for these identification suggestions to be incorrect, particularly for fungi. Data quality issues can arise when a user selects a suggestion from the iNaturalist system, which often incorrectly suggests species as 'seen nearby' that actually have not been observed in the country.

If users apply these incorrect identification suggestions to their observations, it can result in incorrect data being added to iNaturalist's database. This can lead to inaccurate or misleading information being shared with other users and researchers, and can also affect the accuracy of research studies that rely on data from iNaturalist. It is important for users to carefully review identification suggestions and seek additional input or confirmation if they are uncertain about the accuracy of the suggestion, and if in doubt, select the Kingdom.

As incorrect identifications are a common issue that takes the time and effort of the community to rectify, I had the idea to analyse species with IDs that are recorded mostly overseas, so these can be reviewed for accuracy. Both @allyvan and Tom May supported this idea, making it the most popular feature request for this report.

Data for the comparison regions includes all research grade (RG) observations from 'East Asia', 'Northern Europe', Canada and New Zealand as of September 2022. A summary of the overlap of species between regions is provided below.

Considering the value this reporting can provide to the community, and due to the large number of species in common, I trialed many approaches to generating lists for review. The first approach compared the proportions of each species to all species in a region, also factoring in the proportion of research grade observations, with the idea being if the proportion of a species in Australia is relatively small compared to other regions, and has a low proportion of research grade observations, it might indicate an incorrect species. However, it was not a reliable method and the resulting list was too long. I then trialed more advanced approaches to calculating the probability of any given species being one found in Australia, based on region, quality grade, genus and seasonality. These results were more promising, although more work needs to be done.

Table 17: Overlap between species (Sp.) observed in Australia and other regions

Region	Region RG Sp.	Sp. in common	Sp. in common that have any RG obs in Aus	Sp. in common without RG obs in Aus
Canada	3,490	815 of 2,267	415 of 1,314	400 of 1,019
East Asia	1,473	600 of 2,267	394 of 1,314	206 of 1,019
New Zealand	2,127	707 of 2,267	483 of 1,314	224 of 1,019
Northern Europe	5,158	897 of 2,267	483 of 1,314	414 of 1,019

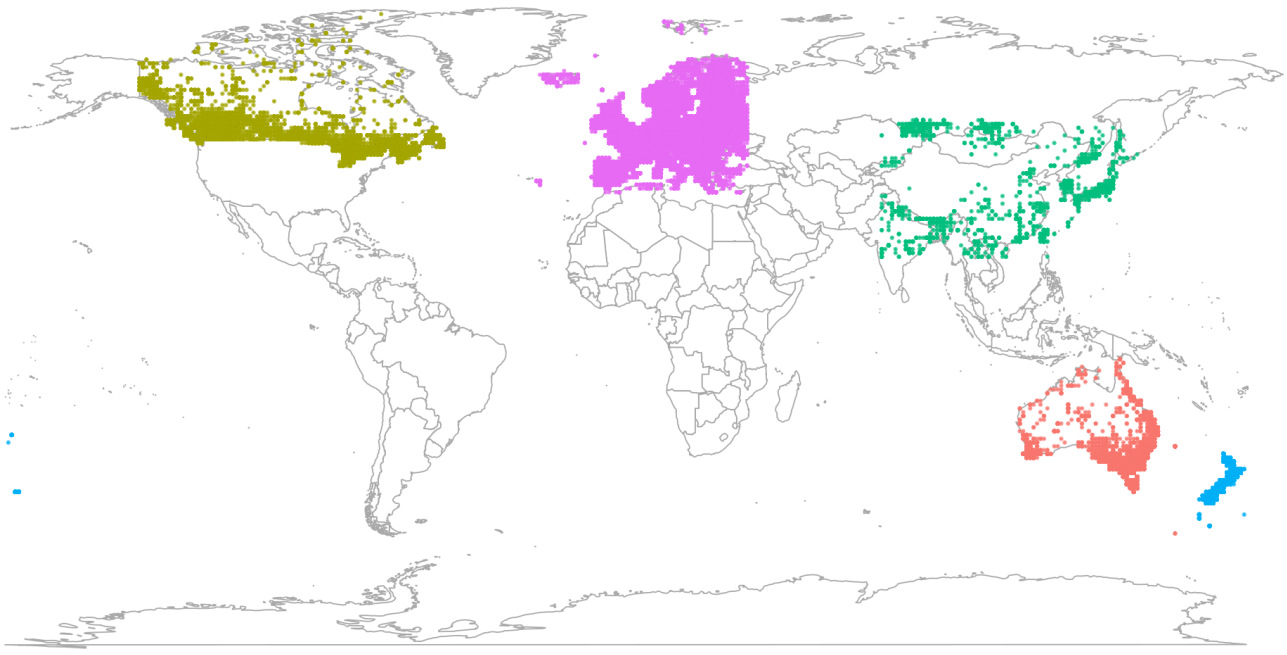


Figure 5: Distribution of fungi observations per specific regions for comparison

How to take photos of fungi for identification purposes

So you're becoming interested in fungi, that's fantastic!

Here are 5 tips to taking photos of fungi I wish I had when starting out:

- take photographs from different angles. Get close and photograph the fungus from above, the side and most importantly, from below. This will help show the different features and make it easier to identify
- use a mirror or smartphone to get photos from below (of the gills or pores) without disturbing the fungus
- use a flash or light to get good photos in focus. Photos from too far away, or that are blurry are hard to ID
- take a photo of the surrounding habitat for context - was the fungi on a log, in the soil, by itself, or with others
- most of all, have fun!

The most important thing I can suggest is getting a photo from below. Fungi can have all sorts of different structures, like gills, pores and spines. Take the example below. You would be forgiven for thinking these are the same mushroom from above, but after seeing a photo from underneath, it is easy to see they are completely different species. This is why photos from different angles can help you and others identify your photos.

Amanita xanthocephala (Vermilion Amanita)
phylum Basidiomycota, class Agaricomycetes, order Agaricales

Image © Adrian Power 2021. https://adrianpower.com/
https://www.inaturalist.org/observations/92653309

Unknown species in the family Boletaceae
phylum Basidiomycota, class Agaricomycetes, order Boletales

Image © Adrian Power 2022. https://adrianpower.com/
https://www.inaturalist.org/observations/105289539

Figure 6: Comparison of fungi observations for identifcation purposes

Thanks

Thank you to everyone who has provided feedback and to everyone on iNaturalist. I hope it's motivating to know how your contributions can be used. Your feedback motivates me to keep producing new volumes.

Future versions

My plan is to update this document regularly, or when there is something interesting to add. Let me know if you have any ideas that can be considered for future versions.

Data Source

iNaturalist. Available from https://www.inaturalist.org. Accessed per "Date To" in the table below.

Table 18: iNaturalist data dates for this report (excluding international)

iNaturalist Data Source	Kingdom	Data From	Data To
Observations	Fungi	1970-01-01	2022-12-27
Observations	Protozoa	2000-11-12	2022-12-28
Observations	Animalia	2001-10-19	2022-12-26
Identifications	Fungi	2022-12-28	2022-12-28
Identifications	Protozoa	2022-12-28	2022-12-28

Open Code

The source code for the report is available here: https://github.com/adrian-power/afsm

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