Identifiers Wanted: iNaturalist and You!

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So many eyes on the ground: Citizen scientists cover much more ground than any of us can do in a season or lifetime. Not every one of these eager eyes immediately recognizes the importance of its finds, or has the resources to identify those beautiful clumps of mushrooms. That is where the scientific community, YOU, professional mycologists, come in and can contribute, educate, and encourage!

Abundant fungal records for the United States of America and Canada can be found on two low-threshold platforms, one for all organisms, iNaturalist (https://www.inaturalist.org/), and one specifically for fungi, Mushroom Observer (https://mushroomobserver.org/).Though these are quite different from the databases specifically for fungi in some European countries, they harbor a wealth of data. As of September 19 at 3:58 PM, iNaturalist houses, 2,772,501 observations of fungi (including lichens) from around the world. Over one and a half million of these observations were made in the USA and 258,000 in Canada. This platform is widely used for mycoblitzes, school and class projects, fungal diversity initiatives, and regional and local flora projects. Mushroom Observer focusing only on fungi (again including lichens), has 391,074 observations by 37,459 members.

A third site is Mycology Collections Portal (https://mycoportal.org/portal/), which is primarily a database for herbarium collections, but also links to the observations at iNaturalist and Mushroom Observer.
In addition, there are Facebook and Instagram groups where many people post their mushroom pictures. Unlike iNaturalist and Mushroom Observer, Facebook and Instagram are not databases, so information retrieval is extremely limited.

To put it mildly, a wealth of data are available. Phenology, distribution, habitat and ecology, and morphological variability of taxa are easy to extract. Changes in distribution and trends in fruiting can also be deduced from such databases (especially in comparison to the older data on Mycoportal). One can use the databases to look for mycophagy (how often can we spot mushroom-eating golden-mantled ground squirrels or box turtles?) and for insect and slug damage to your pet fungus. The data also shows which taxa are in need of better keys, more accessible tools for identification, and which taxonomic groups would make for nice student projects.

The first questions any mycologist might have are, of course, how reliable is this data, and shouldn't we rely on herbarium/fungarium data for our research in the first place. Let it be clear that all of these platforms except for Mycoportal are mainly populated by citizen scientists with various levels of knowledge. Their strength is in numbers!

The observations at iNaturalist are labeled "research grade" when the community agrees on species-level ID or lower, i.e., when more than two-thirds of identifiers agree on a taxon. This means that at least two people must have reached the same conclusion on the identity of the species. There are additional rules to this (details can be found at: https://www.inaturalist.org/pages/help#quality), but there is no higher authority which confirms or rejects these identifications. Around a quarter of all

observations are labeled “research grade”, leaving three-quarters still in need of further identification.

A small study by Allyson Kido and Michael Hood in 2020 on anther smuts is revealing. They compared three sources of data: plant herbaria, fungal herbaria, and the data from iNaturalist. Their findings were that all three sources provided the same geographical distribution data overall, and the same disease incidence data.

The time period covered differed among the three sets, with iNaturalist spanning the last 10 years and herbarium data covering 200 years. In these 10 years of iNaturalist, comparable numbers of data were collected compared to the 200 years of collecting for plant or fungal herbaria. It is relatively easy to spot the anther smuts in the flowers, even on photos, and identification is based on the identity of the host plant. Mushroom identification is not always that easy, certainly not for people who have never really looked at mushrooms or used a field guide to identify them. iNaturalist has an inbuilt artificial intelligence function that provides suggestions to users. However, this project is under development and not yet reliable.

The majority of observers contribute only a few records, and the same is true for the identifiers; only a handful of people are dedicated to the hard work of identification and help with educating people to present their observations in such a way that these are identifiable.

Those people do a lot of work. The top identifier has looked at more than 250,000 observations, the second at half that number, and third ranked identifier at almost 60,000. Unfortunately, with the enormous numbers of observations, most observations never get further than “Fungi” or “Agaricales.”

Here is your chance to help improve the data and their usefulness, for your own work and for the recently re-launched Fungal Diversity Survey program (formerly North American Mycoflora Project). You can help turn iNaturalist fungal observations into a massive database vetted by experts (https://www.inaturalist.org/projects/fundis-fungal-diversity-survey). This is also a great way to give back to the wider community which, with their tax dollars, supports research and education.

I have no illusions that all 2,772,501 can be identified to species, but we definitely can increase the number of research-grade observations by each of us doing a little bit.

If you are a polypore specialist, please take 15 minutes a day between meetings and/or classes to review observations and put some names on them. If polypores are not your specialty but you know your agarics from your county, focus on those. You’re a specialist in the genus *Resupinatus* and always thought that nobody would find them except you? You will be surprised to see the more than 1,000 observations of this genus!

It will be your daily dose of community service: educating the public; telling them about the importance of fungi in the environment; and helping them contribute to science in important ways.

Not quite sure how or where to start? Sign in at iNaturalist (https://www.inaturalist.org/) and click on “Identify”, or go directly to (https://www.inaturalist.org/observations/identify). Filter the observations according to your expertise and mood of the day, and have fun! If you have questions, Sigrid Jakob (inat-admin@fundis.com) is happy to extend a helping hand.

I myself have learned a lot by looking at thousands of photos of mushrooms. Many species are much more variable than I thought and others stand out even in bad photos. There are observations in places I’ve never been to, and probably will never visit in my life. I learn a lot from looking at those, and get a better feel for the diversity and variability of the species in which I’m most interested. It gives me ideas for research projects and which genera and groups are in need of some tender loving taxonomic care.

This work has also made me very appreciative of everyone who gets it right, and everyone who contributes to science and is happy to learn more about these fascinating organisms.

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References and useful web sites:

Fungal Diversity Survey https://fundis.org/ - accessed 22 September 2020
https://www.iNaturalist.org - accessed on 19 September 2020
https://www.inaturalist.org/projects/fundis-fungal-diversity-survey
Kido, A. & Hood, M. 2020. Mining new sources of natural history observations for disease interactions. *American Journal of Botany* 107: 3–11. doi:10.1002/ajb2.1409
www.mushroomobserver.org - accessed on 14 September, 2020, 3.26 PM PDST
www.mycoportal.org

Legends
1. *Abortiporus biennis* on the UC Berkeley campus
Inonotus arizonicus on *Platanus* in Berkeley