

Techniques for Preparing Macrofungi Specimens as Scientific Vouchers

Preparing voucher specimens of macrofungi involves the following activities:

- 1) Gather the fungus. For recommendations on the proper way to do this, see the document entitled, *Recommendations for Collecting Mushrooms for Scientific Study*, hereafter referred to as “the Halling Guide.”
- 2) Begin to document the collection while still in the field:
 - a. The collection habitat and substrate, as described in The Halling Guide. It is helpful if you can characterize the type of forest, based either on your own knowledge or by reference to vegetation maps, which can probably be found for the area you are in through a Google search. **How:** using a waterproof pen and notebook, or by including a bit of the substrate and habitat with the specimen, e.g., a few leaves, a little soil, etc.), or by taking a photo of each collection site [*Old school mycologists just trained themselves to remember the habitat for each specimen so that they didn't have to waste time writing in the field*].
 - b. The collection locality (the general area of the collection site). Documenting the collection site includes a text description of where you are (e.g., U.S.A, California, Santa Cruz County, on route x, 2 mi from intersection with route y), as well as geocoordinates for the site and its elevation, if a GPS device is available (see the document entitled, *Introduction to Georeferencing*). **How:** This information is ultimately recorded in a fieldbook (see the document entitled, *Preparing and Maintaining a Fieldbook*), but some people do not like to take their permanent fieldbook into the field, but instead carry a small temporary notebook with them into the field to record data. They copy the information into their permanent fieldbook at the end of the field trip.
 - c. Field Photograph(s). See the Halling Guide for information on how to photograph fungi. There are also many other sources for information on field photographs.
- 3) Complete the documentation at the end of the collecting day
 - a. Specimen Label Data. We recommend entering these data into Mushroom Observer or the MycoPortal (see the document entitled, *Using the MycoPortal*). This information includes where, when and by whom the specimen was collected, as well as the collector's name and number, and, eventually, the name of the fungus.
 - i. **Name of the fungus.** This includes the genus, species, and the authority for the species, e.g.: *Boletus edulis* Fr. Note that in the MycoPortal it is not necessary to enter the authority – this information is automatically provided upon entry of a recognized genus + species combination.
 - ii. **Name of the determiner of the collections and the date.** Some

collections are determined right away, others may sit for years awaiting determination; in the latter case, this information cannot be entered right away

- iii. **Collection Locality information.** This is the information discussed in 2b. above. If it was not possible to record the geocoordinates and elevation in the field using a GPS device, these values can be obtained from Google maps (see separate document about georeferencing collection localities)
 - iv. **Collector name, number and date.** This information is critical for re-locating a particular specimen (since the collector and collector combination should be a unique identifier for a specimen), and the collection date is important for documenting when fungi produce mushrooms, which is important for understanding their life cycles, and how climate change may affect life cycles and ultimately fungal health.
- b. Notes on the fresh condition of the specimen. Take notes on the characters that get lost on drying. See the Halling Guide for a detailed explanation of what features to note and how. Ideally these notes are taken electronically, but it is acceptable to write notes by hand, as long as they are legible. Some people find it useful to record information on a form that is pre-printed with the characters to be noted, in order to save time, ensure that characters are not forgotten, and that they are recorded uniformly. We will try to build a library of different types of forms that are used for note taking on the MycoPortal – look for this feature in the next month or so.
 - c. Photographic portrait(s) of the living specimen. These images are generally taken after the field trip, at the time that the notes on the fresh condition are compiled, in order to document those features. See the Halling Guide for tips on specimen portraits.

4) Making a permanent herbarium specimen

- a. Dry the specimen. See the Halling Guide for information on how to dry specimens. Be sure to place a small label with each specimen on the dryer that indicates the collector's name and number, and be careful not allow the contents of the drying tray to shift, which might disassociate a specimen from its dryer label. The drier label is a temporary item, so there are no stipulations about the type of paper used. The dryer label should be large enough to write the collector name and number legibly, but not so large that it interferes with airflow on the drier.
- b. Make a label for the specimen. See the document entitled, *Herbarium Specimen Labels for Macrofungi*.
- c. Store the specimen
 - i. *The specimen container.* Traditionally, cardboard boxes are used to store specimens. Usually the specimen label is folded and placed inside the box, along with spore prints, and sometimes hand-written notes. Often the name of the fungus and the collector name, number and some locality information is included on a small label that is glued

to the box top. See the document entitled, *Herbarium Supplies, Equipment and Sources* for a sources for boxes. Warning—they are not cheap!. Other alternatives are plastic boxes (also not cheap, and may lead to molding, in humid environments), or plastic bags that are ziplocked, or better, heat-sealed, with the label inside.

- ii. *Storing multiple specimens.* Most herbaria store sets of specimens (generally grouped taxonomically) into boxes or trays that are sized to fit in the cubbyhole of an herbarium cabinet. Herbaria use special steel cabinets that are specially made for this purpose – they have a seal or gasket to keep bugs and moisture out of the cabinet, and the interior of the cabinet is divided into 20-26 cubbyholes, in which the trays or cubbyhole-sized boxes are placed. Usually the cubbyhole box bears a label that describes the contents, and the herbarium case also bears a label indicating the contents
- iii. *Pest management.* Unfortunately, macrofungal specimens are highly susceptible to infestation by the cigar or cigarette beetle (*Lasioderma serricornis*). These can completely destroy all the fungi in a box, and they can move from box to box to eat an entire cubbyhole’s worth of specimens. Controlling these pests requires diligence. Freezing is the best and safest way to control infestations. A chest freezer that reaches a temperature of -20F is ideal. Specimens should be frozen for a week, if possible, but at least three days. Specimens should always be frozen before being added to an existing herbarium, and collections should be checked regularly for evidence of beetles, such as damaged specimens, live beetles, or beetle frass. If evidence of insect presence is found, you should freeze the contents of the entire cabinet. To aid in the detection of an infestation, you can buy pheromone traps to monitor the presence of insect pests in a collection – see the Supplies list.
- iv. *Humidity management.* In humid environments, dried fungi will absorb water and can mold, which will ruin the specimen. It is very important to keep herbarium specimens in a dry area – at the New York Botanical Garden, we keep our fungus herbarium at a relatively humidity of about 50%. A room dehydrator will help keep the area dry. Inexpensive humidity monitors are available as listed below.

5) Sharing the results of your scientific vouchering work:

- a. Using Mushroom Observer
- b. Using the MycoPortal. See the document entitled, *Using the Mycoportal*
- c. Donating specimens to an already established herbarium. See the document entitled, *Established Mycological Herbaria in the U.S.*
- d. Publishing a paper in a scientific journal. These vary widely in their policy on citing specimens – be sure to check their instructions to contributors to find out the format, and whether specimen citations will be part of the actual paper, or part of supplemental material that will be posted to a website. Descriptions of new species must always be accompanied by a citation of the collection

information, usually arranged as follows: Country. State/Province. City/Municipality. Precise Collection Information. Geocoordinates. Date. Collection. Collection Number (herbarium where specimen is deposited. Use standard code if an established herbarium (see <http://sweetgum.nybg.org/ih/> for database of codes), or if a private herbarium, give the name of the person responsible for the herbarium, e.g., B. Jones, private herbarium.

*Prepared by Barbara M. Thiers
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