Chapter 16

Collecting and Preparing Plant Specimens and Producing an Herbarium

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Reprinted From: Anderson, L. C. 1999. Collecting and preparing plant specimens and producing an herbarium. Pages 295-300, *in* Tested studies for laboratory teaching, Volume 20 (S. J. Karcher, Editor). Proceedings of the 20th Workshop/Conference of the Association for Biology Laboratory Education (ABLE), 399 pages.

Contents

Introduction

What is an herbarium? No, it is not a female mortician. Nor is it a garden of herbs and spices. The herbarium is both a collection of dried plants and an educational and research institution. It is a reference center for verification of identifications, a documentation facility, and a data storehouse.

An herbarium serves scientists, educators, government workers, and private citizens. Traditionally, the dried specimens are mounted on sheets of paper and filed in folders in cabinets. These specimens can last for hundreds of years when given proper care and protection from damage from insects, light, and humidity. Some collections also accommodate bulky materials such as pine cones, large fruits, or fossils that must be filed separately. Most fungi and algae present special problems because they must be preserved in liquid. Our discussion will focus on a traditional collection of vascular plants.

In this workshop, two major areas will be covered:

1. Preparation of plant specimens. Simple plant presses will be assembled. Field techniques, including collecting representative specimens and recording data, will be presented. Drying, mounting, and labeling specimens will also be discussed.
2. Plant identification. Classification and identification is accomplished by using published keys from appropriate floras and manuals. Many beginners identify plants by "matching" them with pictures in popular field guides, but two potential problems are: frequently different species can look similar (i.e., they may have similar flowers but different fruits) and, secondly, not all species of a given area are illustrated in such books. The preferred way to identify an unknown plant is to "key" it out in a manual or flora for the area. A little practice with keys builds one's confidence in using them. Specimens of fern species from the Florida State University Herbarium will be used for this workshop.

Materials

Supplies for assembling plant presses include: corrugated cardboard ventilators, felt drying blotters, and end boards--all cut 12 x 18 inches, plus buckled straps or suitable lengths of rope for tightening the press. The corrugated cardboard should be cut so that the flutes are oriented parallel to the width of the boards (this allows air passage through the plant press to facilitate drying of the specimens). The felt blotters are similar to the large ink blotters used on executive desks. End boards can be cut from

1/4 inch plywood, or lighter weight (more expensive) riveted-slat end boards can be purchased from one of the companies listed below. Each student should have two end boards and straps or ropes plus 10 to 20 corrugates and blotters.

Press materials can be obtained locally (from box companies, office supply stores, or stationers) or ordered from specialized supply companies such as one of the following:

Carolina Biological Supply Co., 2700 York Rd, Burlington, NC 27215
(assembled presses, herbarium paper, miscellaneous supplies)
Pacific Papers, P.O. Box 606, Cotati, CA 94931
(full range of herbarium papers and prices, folders, plant press materials).
St. Louis Paper and Box Co., 3843 Garfield Ave., St. Louis, MO 63113
(intermediate prices and quality paper, folders, cardboard).
University Products, Inc., P.O. Box 101, Holyoke, MA 01041-0101
(cheapest quality herbarium paper, genus folders, press materials).
Ward's Biology, P.O. Box 92912, Rochester, NY 27215
(assembled presses, herbarium paper, miscellaneous supplies).

Materials for the plant identification exercise can be either fresh specimens gathered locally or pressed specimens from your herbarium. The latter is generally easier to assemble and can focus on one plant family or group of closely-related plants, e.g., the ferns. Keys in floras and manuals can be abridged to the desired number of species to reduce confusion among beginning students. A subsequent exercise could be identifying one or more unknown plant species using an appropriate published state or regional flora.

Student Outline

How are plant specimens prepared?

The plant press A standard press plant is made of felt blotters, corrugated cardboards, end boards (for rigidity), and tightening straps (or ropes). The blotters and cardboards are traditionally 12 by 18 inches to accommodate specimens no larger than 11.5 by 16.5 inches (roughly the dimensions of a folded newspaper in which specimens are pressed). A press "unit" consists of a corrugate sandwiched between two blotters. A single, folded sheet of newspaper containing the specimen to be pressed is laid on the blotter, and another "unit" is added; this is repeated until the press size becomes too large or is limited by the strap or rope lengths (student presses are usually smaller because of logistics). Smaller, "field" presses (ca. 11 by 16 inches, with fewer corrugates and lighter weight end boards, like formica) are convenient for carrying into the field when operating far from one's base, but specimens placed in them should be transferred to a standard press at the end of the collecting activity to insure better quality drying and pressing.

The field book A field book should be maintained in which you record the location (state, county, town, etc.), date of collection, habitat, and associated plants, plus flower color, plant branching pattern and height in case those features won't be evident in the pressed sample. Every specimen should be given a collection number. Number your collections consecutively beginning with "1" or "98-01." All specimens of the same species collected at the same site on the same day receive the same collection number. Numbers and dates should be consistent, i.e., if #14 is collected on the 5th of the month, then #15 can't be from an earlier date.

Collection Obtain collecting permits for national forests, state parks, etc., and gain permission before going on private property. You will need something for digging (a trowel) and cutting (a knife or

clippers). A vasculum (a light weight metal container with hinged lid and handle on its side) can be used to store specimens taken in the field, but most collectors use large plastic bags (that can be closed) for carrying and storing specimens. Bags should be closed, folded, or tied so plants won't wilt excessively. Collect only specimens that have flowers and/or fruit (no "sterile" specimens!). For herbaceous plants, collect the entire plant including roots. Fragments of plants sometimes lack the "key" features for identification. Most fibrous roots may be trimmed, and all soil should be washed or shaken from the specimens. If the specimen is large, some leaves or even sections of stem may be discarded. For woody plants, clip branches that include several mature leaves and flower and/or fruit.

Do not collect specimens that appear to be very rare. Do not collect specimens growing in someone's yard. Collect in duplicates--press one specimen for your herbarium and use the second, fresh sample (for dissection if necessary) to key out and identify the species. Refrigeration keeps plants stored in air-tight bags fresh for days.

Pressing and drying The plant is placed within a folded newspaper. The plant should not extend beyond the paper; fold the stem into a "V" or "W" if necessary. The collection number is written on the margin of the newspaper in which the specimen is pressed (the number is, of course, also entered in the field book); this assures matching the specimen with the proper locality, date, etc., even if the identification and labeling is done many months after the collection was made.

The newspaper is placed between two blotters, which in turn are sandwiched between two corrugates. The blotters draw moisture from the plants, and the corrugates allow the moist air to pass from the press which expedites drying. The straps are tightened to insure the specimens will dry flat (without wrinkling). If the sample is bulky, i.e., thick woody stems or large fruits, a foam pad such as is used under carpeting can be placed between the newspaper and the blotter. This will "wrap around" the thicker plant parts and ensure a nice, flat press job. If the plant is a thin-leaved aquatic plant or has delicate flowers, it may be pressed better between pieces of waxed paper within the newspaper. This keeps the drying plant parts from sticking to the newspaper, but the waxed paper slows down the drying so it should be used only for these special cases.

After the day's collecting, the press is placed in a heated cabinet or in front of a fan to speed drying and air movement through the corrugates of the press. Generally, the more quickly a plant is dried, the truer its color preservation will be. Color retention is sometimes perfect, but some plants, such as Indian Pipes or certain members of the Scrophulariaceae will always turn black during the drying process.

Labels After the plant has been dried, a label is prepared to be attached to the specimen. The identity of the sample is determined and the remainder of the label data are obtained from your field book. If the plant size is greater than the pressed sample; its height can be given on the label. The label should always include at least the scientific name (binomial) of the plant, the location (state, county, precise area), collector's name, and collection number. Information about the abundance, habitat, and plant associations is also generally included.

Samples labels:

PLANTS OF GEORGIA ***Ceanothus microphyllus*** Michx. THOMAS CO.: Mature longleaf pine-wiregrass community (Wade Tract), 3.1 mi S of Hwy 319 on Rte 122 (toward Metcalf), turn W on dirt road for 0.6 mi then S for 0.6 mi further into tract in dry sandy loam. 14 April 1988 Loran C. Anderson no. 11,132	**PLANTS OF FLORIDA COUNTY:** GADSDEN ***Matelea flavidula*** (Chapm.) Woodson Frequent (locally) in drying sandy loam of mixed hardwoods at border of limestone glade, 2 mi drive W of Rte 269 on Dolan Rd then 1 mi N on trail and 0.5 mi hike through woods, ca. 1.5 air mi SW of Chattahochee. 29 April 1988 Loran C. Anderson no. 11,193

Paper and glue Standard herbarium paper is 11.5 X 16.5 inches and comes in various weights. Paper and labels should be of archival quality. Several kinds of glue are acceptable. Some use Elmer's "glue-all" or a tin-paste glue; others use fast-drying glues like "Duco cement."

A traditional way for mounting specimens is to paint a layer of glue on a large glass plate, press the plant onto the glue, and then place the plant on the paper for drying with a label glued in the lower corner. A piece of waxed paper and appropriate weights can be placed over the mounted specimen (to be removed after drying) to ensure maximum contact with the glue and a relatively flat finished product.

Storage procedures Specimens are filed in folders (called genus covers). Each folder may represent one species, a genus, or a family depending upon the size of the collection. The filing sequence is often alphabetical by plant family name or families are filed by some phylogenetic scheme. Air-tight filing cabinets should be used for storage to protect specimens from bugs, extreme temperatures, and direct light (which fades the specimens). Usually some sort of insect repellent (e.g., moth balls or napthalene) or poison (e.g., powdered rotenone) must be introduced into the storage area to prevent insect damage.

For further reading on field activity, mounting specimens, and herbarium operation, see Cullen (1984), Radford (1986), Radford et al. (1974), Stace (1989), Walters and Keil (1996).

Using keys Many beginners identify plants by "matching" them with pictures in popular field guides, but two potential problems are: frequently different species can look similar (i.e., similar flowers but different fruits) and not all species of a given area are illustrated in such books. The preferred way to identify an unknown plant is to "key" it out in a manual or flora for the area. The keys are generally constructed to first distinguish different plant families in the region, then genera within the family, and finally species within each genus. So, if you don't know the family to which your unknown plant belongs, you will use three sets of keys to find out the name of the species.

Keys are composed of a series of dichotomous couplets; that is there are always two choices at a time (two character states or combinations of character states). Couplets are either numbered so that your choice of one of the two statements directs you to the next numbered couplet, or the couplets are indented to guide you to the next couplet. The series of choices is made until you have no other options and end up with the name of a plant family, genus, or species.

Keys may be likened to a highway that has several forks in it; if you choose the wrong fork, you will probably not get to your correct destination. A common error involves overlooking a couplet because a subsequent statement "looks good." For example, if you have a plant with simple leaves and red flowers, and there is a couplet stating leaves simple versus leaves compound with a following couplet under leaves compound that says flowers white versus flowers red, you should not skip to the flower color couplet because your plant has simple leaves. A little practice with keys builds one's confidence in using them.

In the laboratory portion of this session, students will key out some species of Florida ferns. A glossary of technical terms used with ferns will be provided, and keys will be taken from Clewell (1985).

Literature Cited

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