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Professional plant collection

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Introduction

A good plant collection is versatile for generations of botanists and therefore extremely valuable. The collection can be optimized between the poles of effort and yield. It will not always be possible to do everything in an ideal way, but if you do not want to follow the following advice, it is better to leave it at all. This is only about collecting 'land plants' (embryophytes), i.e. mosses, pteridophytes, gymnosperms and angiosperms.

Preparation

Given all your mental agility, you do well to determine the purpose of your collective journey beforehand in wise restriction. Even if you collect for molecular studies, a voucher specimen belongs to every sample. It is collected according to the same criteria as other herbarium specimens. It can only fulfill its purpose if it is determinable in the end.

In addition to your personal equipment, you will need one or two **plant presses** with absorbent paper (e.g. newspapers) and some stronger intermediate layers (e.g. corrugated cardboard), as well as small **hangtags** and a **field book** with a pen. **Maps** of the collection area are very important, if possible get good topographic maps with a grid of coordinates. These must be ordered early, as it can take months to get them.

The rest depends on what you want to collect. So take with you:

- A pair of pruning shears and (or) a knife for woody plants;
- a very robust hand shovel and a knife for perennials (perennial herbs);
- sturdy gloves for prickly, thorny, burning or otherwise skin-irritating plants;
- an algae hook (or swimming trunks) for aquatic plants;
- Envelopes or paper for folding bags for mosses [also very useful for easily falling off parts of other plants].

For collecting in the tropics, there are other important aspects that are not covered here, just as we cannot provide legal advice here on the collection of organisms in the various countries. It will vary greatly from country to country, and you need to learn about it at a very early stage.

Efficiency

Scientifically sound collection takes time. How do you save time and space?

- In general, collect as little as possible, but as much as necessary;
- Collect only the important parts of large plants (see below);

- collect in as few places as possible, but as many species as possible in the same place (saves a lot of paperwork);
- don't collect any rarities from the classic collection sites (the herbaria already flow over with them), unless you need them for investigations on fresh material that nobody before you has done;
- collect only after you are sure that you are not endangering the affected population (conservation);
- collect more often duplicates of large populations of the same species for exchange, instead of many other species (saves a lot of identification work).

Surely you will find further possibilities to increase efficiency yourself.

Ten Commandments

The best results are achieved if the collected plants are placed in the press right in the field. To flatten the plants, little pressure is needed. Only very bulky or thorny material has to be flattened between boards beforehand. Some pressure is needed to prevent the drying leaves from crimping. Each collection should be placed individually in double-folded paper.

1. Give each collection a **collection number** that is unique along with your name. Hang it on a label directly on the plant in your press. Under the same number, enter the following in the field book bearing your name:
    - Provisional determination (e.g. genus), trivial or fantasy name;
    - the current date;
    - the place of discovery (country, province, etc.) with coordinates and height above sea level (to be determined directly in the field by means of GPS; to enter the place of discovery with the corresponding collection numbers in the map is an additional insurance against errors);
    - (ecological) information on the site (habitat, soil or substrate, possible inclination and exposure, accompanying plants, parasites, pollinators, etc.);
    - transient characteristics (e.g. flower colour, odour, latex);
    - possible quantity at the place of discovery (local frequency);
    - additional information (habitus, growth habit, size, sketch, sex distribution, variability).

    Whatever is repeated, of course, you write down only once for all applicable numbers.

2. Collect **fertile material** if you can! Flowering plants (incl. gymnosperms) can usually only be identified well with flowers; it may also work with fruits or seeds. Of course, it is best if both are present, which occurs simultaneously in many species. Sterile pteridophytes are often a problem, so make sure that sporangia are present. Mosses are an exception here. Many identification keys also treat sterile material, because very often only the gametophytes are found. You will not be able to determine all sterile samples, and spore capsules shorten the procedure considerably. Try to find at least gametangias while collecting (magnifying glass); they can also help.

3. Collect **completely**, whenever possible, whole plants with subterranean parts or at least shoots where all organs are present! Roots are not quite as important, but it is always good to see where the roots start. Many plants are too big to be placed in the press and later on a herbarium sheet (usually 436 x 260 mm). If they are slim and simply too long, you can zigzag them to a suitable length (Fig. 1). If this is not possible, you have to cut them up. Designate interfaces that belong together (Fig. 2), if you don't have to separate parts in between for space reasons. However, in some cases this will be necessary. Then make sure that the base, tip, widest part and transition areas (e.g. transition from the leaf sheath to the leaf spread) of each organ that is too large are present (Fig. 3). In the case of symmetrical organs, you can cut away almost half of them anyway. Collect all parts from the same plant. Consider the possibility of filling two or more herbarium sheets with one plant, but only if there is no other way. For each not completely collected plant, there is a short description of the habitus with size information. The best thing is a sketch with a

scale showing the origin of the collected pieces (Fig. 3).

4. See to it that the **upper and lower sides** of leaves or other flat organs are visible, also when the plant is later mounted on a herbarium sheet.

5. Collect **transparently**, i.e. no dense tufts, but single plants or shoots! If these are still too dense, reduce the collected material by cutting away parts until you can see through them, i.e. only one layer remains when pressing. The interfaces must be clearly visible so that you can see how much has been cut.

6. Cut thick organs (fruit, tuber, onion, rhizome, succulent shoot) **in half lengthwise**, if they grow plagiotropically, in the vertical plane).

7. Ripe fruits and seeds in particular detach easily from the plant and are often lost during or after collection. Pack such **loose parts** in bags, give them the same collection number as the plant and add them.

8. Pay attention to the **sex distribution**! In monoecious species, collect flowers of both sexes and add the distribution if they are not on the same shoot. From diocious plants, the males and females are to be collected under different numbers. Are there unisexual flowers (e.g. gynodioecious) as well as hermaphrodites?

9. Note that certain life forms or taxonomic groups require **special treatment**:
   - Woody plants should survive gathering. A piece of bark enriches the collection. Do not cut to the cambium because of the risk of infection. In the case of Salicaceae, a piece of bark must be removed from a collected perennial branch so that you can see any striae on the wood. Watch out for heterophylly!
   - Dwarf shrubs offer hardly any problems.
   - Large perennials are the most difficult customers (see point 2).
   - Annuals and other relatively short-lived plants are often so small that you can collect several specimens to give you an idea of the variability.
   - Water plants should be arranged under water on a piece of paper so that they do not collapse again when pulled out carefully.
   - Succulents must be cooked. Only when dead do they dry within a useful period of time.
   - You can analyze heady inflorescences of composites (Asteraceae) and other taxa much more easily later, if you halve some of the heads lengthwise during collection and arrange them on the head stems so that one half can be seen from the outside and the other half from the inside.
   - Scrophulariaceae (sensu olim) and relatives tend to lose their crowns when collecting. Collect them separately and put them in a bag with the same collection number.
   - Branches of gymnosperms (at least of conifers) lose all their leaves when they dry unless you have dipped them in boiling water beforehand.
   - Treat large-leaved ferns with special care! They are often fragile and tend to curl. You should cut leafed fern-rhizomes lengthwise in half.
   - Mosses are the easiest to collect. Put them in envelopes, lay them out and let them dry without pressure! If you squeeze the water out of wet cushions beforehand, they dry quickly and without having to change the envelopes.

10. Develop your own **imagination** to solve problems that are not covered here.

The rest is routine: Check the drying plants every day and exchange the wet with dry paper. Lay out the wet paper for drying and reuse. Of course, it's faster in a heated dry press, but you usually don't have it available. The notes in the field book must be transferred to labels and the plants identified, preferably before they are mounted on herbarium sheets. Have fun!

Literature

L. Forman and D. Bridson, 1989. The Herbarium Handbook. Royal Botanic Gardens, Kew.

Illustrations