

HINTS FOR HARD-PRESSED COLLECTORS

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“Anybody can collect” is an opinion that trips too readily from the biologist’s tongue. Anyone, it is true, *can* collect herbarium specimens – after a fashion. And a quick look at our great herbaria will show how badly people have often done it : plants snatched on the way to Lhasa, or decapitated by British Consuls riding fast to Trebizond. But that is not good enough. If our collections are to be of lasting scientific value, we need to enrich our herbaria, not to fill them with scraps. The herbarium still provides the foundation for practical classification and nomenclature. The techniques of experimental taxonomy cover a very limited part of the World’s flora. Population studies undertaken in a limited area give us less idea of the variability of a widespread species than we can obtain by going through the material in a big herbarium. It is only in the herbarium that we can usually compare all the related species of a genus in the same place, in the same state, and at the same time. The collector can play an important part by seeing that his herbarium specimens provide as much information as possible, and thus form a sound basis for further research.

Many biologists who are not professional collectors get abroad these days, and are often willing (or can be persuaded) to collect herbarium material. It is for them that these notes are primarily intended. My own collecting experience has been acquired mainly in the Middle East, by trial and error, and I hope to provide a few hints that may not be found in other published work on the subject. Those who intend to collect in the tropics, or to specialise in certain groups, should read *Instructions for Collectors No. 10, Plants*, a handbook produced by the British Museum (1957) that contains much staid and valuable information. The Royal Botanic Gardens, Kew, distribute to their collectors a duplicated sheet of more concise hints. A useful article on drying by artificial heat (including references to earlier papers) has been written by J. A. Steyermark in *Rhodora*, **49**, 220-277 (1947).

HOW AND WHAT TO COLLECT

Even in relatively well-botanised countries there are often regions, or habitats, that have been neglected, or only visited at particular seasons. Often the commonest plants (particularly if they are inconspicuous or difficult to press) are poorly represented in herbaria, so that it may be difficult for the botanist to obtain reliable information about their distribution or variability. In little-known regions good material of all species is usually welcome, but if time is a limiting factor it is advisable to seek advice from our National Herbaria (Kew, British Museum and Edinburgh) on what is most required from the area you intend to visit. It is a great deal better to collect a little material well than to press a large amount of scrappy, poorly annotated specimens. It is when one attempts to collect nearly everything (as I do myself) that one is apt to get into difficulties. The limit to the amount one can collect, if one devotes full time to it, is usually set by the number of plants one can successfully press, label and dry. And that will depend not only on the weather, but also on one’s stamina and constitution. Some collectors get up at dawn, others label and change their presses late into the night, but few can do both

for long. As the painter Fuseli remarked, "Damn Nature, she always puts me out!"

Herbarium specimens should, as far as possible, be representative of their populations. Collect to show the range of variation, but if any particular variant is unusual this fact should be indicated in your field notes (e.g. "shade form"). If this is not done an aberrant specimen may mislead the systematist. Whenever possible, specimens should be collected in flower and fruit from the same place – if possible even from the same plant. In some families (e.g. Compositae, Cruciferae, Chenopodiaceae) the fruit is generally more useful for identification than the flower. In herbaceous plants the rootstock should be collected whenever possible – and the bulb, corm or tuber if it has one. Fleshy underground parts can be sliced open to facilitate drying. Bulbs can be killed by plunging them in boiling water, or by immersion in alcohol. Boiling water, however, is unsuitable for most corms (e.g. *Colchicum*). These store starch which swells up and gives birth to a fine crop of mildew in the press; it is like trying to press a boiled potato. Thick stems can be slit open vertically. Tall bulky plants like *Verbascum* and *Onopordion* will have to be sectioned before they can be pressed, the basal leaves, and the middle and upper portion of the stem (with leaves attached) being placed on consecutive sheets. Paper pads can be inserted to even up the pressure on leaves and flowers. On bulky specimens, however, delicate corollas usually shrivel unless they are separately pressed. This can be conveniently done between sheets of diaphanous toilet paper which acts as a miniature "flimsy" (see below).

Showy Monocotyledons deserve special treatment which will improve their state of preservation and facilitate examination in the herbarium. When perfectly fresh, the flowers of *Iris* (which are readily reduced to a grey mush in the press) can be taken to pieces and their parts pressed separately, their form and even colour being quite well preserved by this means. Flowers of *Crocus* and *Tulipa* can be opened out to expose the diagnostic genitalia. In Orchids and other groups in which flower shape is very important for identification, pressed specimens should be supplemented by flowers preserved in tubes of "spirit." Succulents (e.g. *Sedum*) can be conveniently identified if leafy flowering shoots are preserved in the same way. The preservative used at Kew is made up of industrial spirit (11 parts), 40% formalin (1 part), water (8 parts) and glycerine (1 part). "Pickled" material should bear the same number as the dried specimens and it is essential that full colour notes should be taken. Colour photography should become increasingly useful to the taxonomist, especially in the petaloid Monocotyledons, but, like spirit material, the transparencies should be closely correlated with herbarium specimens. Advice on collecting special groups (including aquatics and Cryptogams) will be found in the British Museum handbook.

A vasculum, if one is collecting a large amount, is of little use except for sandwiches. In hot countries it turns into an oven, and when climbing rocks it can swing round to electrocute your elbow. A good method is to collect into a portfolio with cardboard covers holding newspaper folders or flimsies. A portfolio is more conveniently carried than a sharp-angled wooden press, and the plants will not get a chance to wilt if pressed as soon as collected. If webbing straps are attached to the portfolio, it can be carried on the back like a rucksack. It is essential to press at once if the petals are to be retained in such genera as *Papaver*, *Helianthemum* and *Linum*. It is usually possible to collect several species at the same spot, and these can be enclosed in a common folder and a written slip inserted to remind us of their locality, habitat and altitude which should be entered in the field note book at the end of the day. If a great deal of ground is covered, some form of field labelling is essential; how much will depend on the collector's experience and visual memory. Collectors previously unacquainted with the flora, or who are concentrating on critical genera, would be well advised to label as much as they possibly

can in the field. Often, however, it is not practicable to stop and press every plant as we collect it; the weather may be against it, or we may be pushed for time. In that case I would strongly recommend the use of a large, strong, plastic bag about 3 ft. deep. When empty this can be folded into the pocket. If closely wrapped round the plants we put in it, the specimens will remain fairly fresh all day – and even all night as well. A little water can be sprinkled inside to raise the humidity.

A word about collecting tools will not be out of place here. Although a steel fern-trowel is a time-honoured implement, I prefer a small “chopper” for collecting in the Mediterranean where soils are very stony and baked hard during the summer. The blade, about 9 in. long, has a cuneate cutting edge at one end and two prongs at the other, a 1 ft. handle of strong wood being wedged in the hole in the middle. This makes a very efficient tool which can be used with the minimum of effort: the cutting edge can be used for digging, chopping up portions of spiny cushion plants, or cutting up the stems of thistles and mulleins into suitable lengths for the press; the prongs are very useful for prizing up stones and for collecting bulbs without slicing them in half. Iron choppers of this type are used by Turkish peasantry but the metal is too readily blunted; it is preferable to get them made of steel in Britain. A large strong knife is always a handy tool, and a small pair of secateurs is advisable for cutting branches – thorny Rosaceae are painful to tackle without it.

FIELD NOTE BOOKS

Many National Herbaria provide collectors with their own field note books, but when one is attempting to press a great deal I find that these take too long to fill up. I have adopted the use of a large, ledger-sized book (17 $\frac{3}{4}$ in. \times 12 $\frac{1}{2}$ in.) with stiff covers. In this columns are ruled to accommodate the following data:

1. *Number of plant.* This should preferably be a straight serial number, so that it is not necessary for a taxonomist to give the country or date when he needs to cite your specimen. (When the labels come to be typed, the name of the country will be placed at the head of the label, and the collector's name will precede the number.)
2. *Name of plant.* When the species is not known, the genus or family should be given whenever possible.
3. *Province* – or whatever the major divisions of the country are that you wish to use.
4. *Locality.* This should be as precise as possible, and should include a place name that is readily found on the map.
5. *Altitude* (preferably in metres). The altitude at which the gathering was actually made should be given here. If you wish to indicate the species' altitudinal range, this should be given in parenthesis after the altitude of the gathering, or be transferred to the heading 'Remarks.'
6. *Habitat*, which should include the type of terrain (e.g. sandy fallow fields) and preferably some indication of the community (e.g. *Quercus coccifera* maquis).
7. *Remarks.* These should include notes on any feature of the gathering that may not be apparent from the dried specimen in years to come. Flower colour should be given and notes on the plant's duration and habit (e.g., biennial or perennial, height if a tree or shrub, stems erect or ascending). Notes on frequency and variability can be given here, and remarks on properties and the vernacular name if correctly ascertained.
8. *Date of collection.*

The advantage of this type of note book is that it saves a great deal of time because, instead of repeating the details for many plants collected in the same place, "ditto" signs can be given. If one's writing is legible, anyone can type labels directly from the field book. The book should be written in pencil (not indelible), and must have very stiff covers if it has to be pushed into a rucksack. The only disadvantage of this type of note book is that, if it is lost, all your data are lost and the collection will be almost useless. Never be parted from your note book till both collection and book are safely home!

Useful though it is to have biological information about each gathering, we must restrict the amount that is entered in the main note book; if we do not, the labels compiled from it may be so large that they will not leave room for the mounted specimen.

PRESSES, STRAPS AND PAPER

I have always used wooden lattice presses containing drying paper of the standard Kew size. The latter, when folded ready for use, is about the size of the sheet on which the specimen will be mounted, i.e. $16\frac{1}{2}$ in. \times $10\frac{1}{2}$ in. It is very important, if you are travelling rough, that the press should be scarcely bigger than the paper which it contains. This not only insures safer transport of the specimens, but also curbs a temptation to press specimens that will be too big for the mounting paper.

There is no doubt that thick, hand-made paper (as used by the Kew Herbarium) is by far the best drying material for use in the field. The life of ordinary blotting paper is very much shorter. It is preferable to use the drying paper folded double and to take much more than you think you will need. There is nothing more thwarting for a keen collector than a shortage of dry paper – it is much commoner than a shortage of specimens. The paper should be changed every day (to remove the moisture absorbed from the plants), and it is advisable to have enough for at least two complete changes in case bad drying conditions form a bottle-neck from which only mouldy specimens may return. In the case of a crisis, newspaper can be successfully used for drying. It is preferable, however, to alternate this with drying paper, because newspaper lets through much less air than the latter and is less absorbent. Cardboard can be used to separate thick specimens which can also be laid head to tail to even out the pressure in a bulky press. The type of corrugated cardboard with a flat surface on both sides is ideal for the purpose; it is very light and allows air to circulate through the press. One should preferably carry enough presses to avoid having them more than 3 in. thick; the thinner they are the quicker they dry. If short of presses, a single lattice placed in the middle of a fat press helps drying very considerably, and so does the moving of wet specimens from the middle of the press to near the outside.

Webbing straps with reliable spiked buckles are probably best, but unless the webbing is strong and of a close weave the straps may tear and allow the press to fly open if carelessly handled. Irreparable chaos can result from a broken strap or buckle, and herbaria should never provide collectors going abroad with any but the best straps. In dry climates leather straps are apt to snap unexpectedly, and are not infrequently stolen.

The transport of presses always needs care. At such times the straps should always be tight – but not so tight as to risk snapping. Sometimes a press tumbles off the top of a bus, or falls from a horse scared on a steep mountain side. If the lattice is much bigger than the paper, the press will be smashed and the contents scattered over the countryside. There is much to be said for carrying one's presses in hessian sacks – indeed, on horseback it is almost essential to enclose them in some way and to cover them with tarpaulins in rainy weather.

I am often asked how many presses and how much paper a collector should take with him. A full-time collector, especially if he has assistance with changing and drying

papers, can collect at least 1,000 numbers a month in triplicate – say 3,000 sheets. In fine Mediterranean weather the average drying time per specimen is about a week, but 10 days or so in wet weather. (Succulents and many bulbs, unless killed before pressing, will take longer). That means that there may be as many as 1,000 sheets of specimens in the press at the same time. This will necessitate the use of at least 2,000, preferably 3,000, sheets of drying paper. At least 20 presses will be required, and up to 30 during the summer months when species tend to be bulkier than in the spring.

DRYING THE PRESSES

Whenever possible the presses should be stood in the sun or wind to dry, or be placed near any gentle artificial heat available. Stand them on end. The straps should be kept tight for the first few days, though not so tight that organs are crushed. When the specimens are almost dry, the pressure can be slackened to “finish them off.” The drying paper should, of course, be changed every day, especially during the first few days. If time allows, a double change the first day is desirable. If for some reason it is impossible to change the paper for a day or two, the press should *not* be exposed to strong heat – either from the sun or fire. The result is likely to be a compost heap! Presses, if they are stood in hot sun, should be turned round from time to time to prevent unilateral drying. There comes a moment, when one’s specimens are nearly dry, when they easily “go back” if they are not changed into really dry paper. Fleshy halophytes should be dried in a separate press as they tend to keep other specimens moist. If travelling by bus or car, drying is speeded up if the presses are securely tied to the luggage rack; or a press may be wedged between the mudguard and the bonnet.

Quick drying, to avoid decay of the tissues, is the secret of good pressing, and everything should be done to achieve it. It is, however, possible to overdry specimens so that they become so brittle that they break up when handled.

I most strongly advocate the use of *fimsies* for drying all plants except the bulkiest or most spiny specimens. These are folders, the same size as the drying paper, and made of very thin, absorbent paper. Newspaper is a good substitute. The specimen is pressed straight into the flimsy and need not be handled again until it is dry – except that, at the first change, many folded leaves or even petals can be straightened out, a process which makes all the difference to the appearance of the finished article. The freshly collected specimen should have its field number put in the flimsy with it. The safest method is to write the number on a jeweller’s tag so that it can be readily attached to the specimen by the cotton loop it bears. When changing papers, only the thick papers need to be changed, the specimen being moved on to dry paper in its original (still damp) flimsy. To begin with, when specimens are very damp and provided they are not so delicate that they stick to the paper, drying will be accelerated if drying paper is slipped inside the flimsy as well as placed between successive flimsies. The use of flimsies cuts out the handling of specimens which can seriously damage plant material. It also means that the changing can be done in half the time, and can be safely carried out by any careful person who will lend a hand. It does, however, add to the boredom of the chore, because one sees little of the specimens until they are dry. One should resist peeping at thin, delicate corollas during paper-changing; the petals of *Iris* and *Crocus*, for instance, curl up as soon as the flimsy is opened.

When the specimen is dry there is no need to remove it from the flimsy. Its number should be written on the outside of the folder in case the numbered tag should go astray. Several sheets of the same dried gathering, provided the specimens are neither bulky nor very brittle, can be stored in a single flimsy without damage. They can be finally

tied up in bundles about 3 in. thick, the outer folders being protected by extra sheets of newspaper. The bundles should be tightly packed into cases and liberally sprinkled with powdered naphthalene or paradichlorobenzene. It is essential that the specimens should be completely dry before they are packed in the case; in damp weather mildew quickly spreads from a slightly damp specimen – *Heracleum* is a genus to watch in this respect.

No certificate is required from the British agricultural authorities to import herbarium material into this country – or to export it.

DRYING THE PAPER

Drying the plants ultimately depends on drying the paper used for the daily change. This presents no great problem on a fine day. The paper should be spread out, preferably on a sheltered slope facing the sun. In the Mediterranean summer, paper will dry in ten minutes at 1 p.m., whereas it may take a couple of hours if put out at 7 a.m.; after 4 p.m. it often absorbs moisture instead of losing it. Paper will dry quicker on bare earth or gravel than on grass. Gusts of wind are the chief difficulty. Under these conditions stones should be placed on the paper – a dried-up, gravel river bed, provided a flood does not come down from the hills, is a convenient place. There is a certain kind of Mediterranean *phrygana*, composed of low *Cistus* bushes and the prickly domes of *Poterium spinosum*, that is an ideal community for drying paper on a windy day, particularly if it can be found in the lee of a wood. The paper can be spread over the bushes or propped up between them. Small boys can often be bribed to collect dry paper, but if they are not watched may draw crude pictures on it or make off with it altogether. When staying in towns, the collector should look out for a hotel with a flat roof or large balcony. A ground sheet is useful to spread on the bed while changing the presses.

Our troubles really begin, however, when wet weather prevents us from drying a thousand sheets of paper out of doors. There are various remedies, some of them desperate. I am assuming that radiators or heating cupboards are not available. A small, very simple paraffin stove can be used, and if only a foot or so high can be fairly easily transported. You can put the stove under the hotel bed (having first removed the mattress) and spread out the damp paper on the springs; it will dry in a minute or two. Or you can thread metal "Bulldog" clips on a length of string and suspend them between two chairs above the stove. Several pieces of drying paper can be pushed into each clip, and the convection current rising between the vertical sheets will dry a larger quantity of paper in less time than it takes on the bed. These clips can also be useful for drying sheets in windy weather outside. In a tent a collapsible table with a skeleton top can be used to support presses or paper above the stove.

I have used an iron in Greece, but the process is slow and not to be recommended. The iron puts a patina on the paper and cuts down its power of absorption. My favourite method in Turkey is to find a suitable bakery. Some of the more modest bakeries have a low room above the oven in which wood for the furnace is stored in winter. The floor gets extremely hot, and so does the botanist as he crouches down in the dark, tickled by silverfish that thrive in the inferno, and spreads out his precious paper. It gets beautifully warm and dry, a thickness of 8 or 10 sheets being dried in an hour or so. The drier presses can be put in the bakery overnight, but it is usually too hot for the wetter ones; even with frequent changing the wetter specimens darken perceptibly. Some genera react differently, however. We found that some petaloid Monocotyledons responded well to strong heat; gatherings of *Scilla* and *Ornithogalum* dried in this way made far better specimens than those dried without artificial heat. The oven of a kitchen range, slowly cooling off throughout the night, can also be an effective aid; the presses, however, must be supported on

bricks to raise them off the hot floor of the oven. The charcoal brazier provides a method of drying that does not require liquid fuel, and can prove very useful in a room or tent if one is not overcome by the fumes.

These and other methods must be resorted to if bad weather persists, but in the mountains I always take enough dry paper to last for several days. This may require an extra pack-animal, but is more than worth it in the time it saves. Collecting plants is more enjoyable – and profitable – than crouching over a stove.

ADDENDUM : THE RIGHT FOOTWEAR

Though the object of this article has been the welfare of the collection, it may not be out of place to consider one point in the welfare of the collector. Many an expedition has been interrupted or curtailed by the collector not being suitably shod. More accidents are probably caused by wearing the wrong shoes than from any other cause. Un-nailed walking shoes can be deadly on steep dry grass; boots or shoes studded with nails are often little better on dry rocks. There is a great deal to be said for wearing good mountaineering boots with rubber "Commando" soles – or even gym shoes for short excursions, provided your feet are hardened and your ankles sturdy. Only on wet slimy rocks are nails safer than rubber. If the writer had always taken his own advice and worn rubber-soled boots, he would not have broken his finger, fractured his spine and sustained various wounds that considerably reduced his collecting power.