

Fieldwork For Atlas 2000

2. COLLECTING AND PRESSING SPECIMENS

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Summary

Specimens may need to be collected so that correct identifications can be made and a checkable voucher preserved for posterity. Specimens are also often valuable in especially difficult groups so that they can be used for taxonomic study. As a general rule, collect only when you can take a good representative specimen without doing significant harm to the population, preserve it well so as to show the diagnostic features, label it properly, and if possible deposit it in a secure and well-curated herbarium.

Introduction

Collecting herbarium specimens has gone out of fashion. This is probably connected with the increasing emphasis on conservation and the decline of taxonomic teaching at all levels. Private herbaria are largely things of the past, and students are unlikely nowadays to be asked to collect a hundred specimens as part of their courses. Specimens, if collected at all, tend to be taken apologetically and there is often little common knowledge of what to do with them. Yet in many cases collecting is necessary for identification, and hence for conservation. The Society's instructions for County Recorders state that vouchers are essential for records of critical genera and that they may be desirable in other cases (see also BSBI News 52: 10-11 (1989)), and the instructions on submitting specimens to specialists in the Yearbook indicate in many cases the sort of specimens that need to be collected for identification. This article is not necessarily meant to encourage members to collect more specimens, but to plead that if they do collect a plant they should do it properly so that it is identifiable and useful for taxonomic research, is not wasted and does not have to be re-collected.

What plants to collect, and how to do least harm

It is illegal to uproot or collect any part of certain plants which are listed in the Society's Code of Conduct leaflet. It is sensible to familiarise yourself with this list, and if you think you have found one of these species in a new site inform the Vice-county Recorder (see

BSBI News 44: 13 (1986)) who should know whether it is new and what action to take. There should be no reason to collect any rarity from a well-known site, and it is certainly not right to pick a bit of such a plant just to satisfy one's-self that it is the rarity one hopes it is. The more constructive approach is to familiarise one's-self in advance with the likelihood of finding rarities in a locality, and to do one's homework on the characters to look out for.

It is also illegal to uproot any wild plant without the permission of the owner or occupier of the land, and this must be taken into account when one is faced with the problem of getting plants such as annuals identified. Many annuals occur in sizeable populations, and for example with *Euphrasia* the recommended five specimens can often be collected with a clear conscience. The same comment applies to arable weeds and casuals which may be locally abundant, but think twice about solitary casuals as they may be pioneers of new colonies, which may or may not be a good thing for the environment.

Orchids have of course reached the evolutionarily enviable status of being unpickable, except for single flowers to accompany photographs and notes.

On the other hand, collecting does no harm to a substantial proportion of the difficult British plants that need to be submitted to specialists for identification and that are most in need of further research. As every gardener knows, brambles, roses and willows are positively encouraged by pruning, and no harm is done to elms or indeed to the great majority of trees and shrubs. Herbaceous perennials need more consideration, though taking single fronds of a male fern or polypody, or stems of pondweeds and other submerged aquatics will do no harm. Much more care needs to be taken with such plants as hawkweeds or lady's-mantles, which should be collected only if there is a sufficiently large population, and should not be uprooted; the stem required can be cut off below the basal rosette, leaving the stock to regenerate. Dandelions too will regenerate, and often proliferate, if cut off below the rosette; most species can be collected with impunity, but great care should be taken with the rarer ones of native sites (*Sect. Palustria* and *Taraxacum*). Perennating organs such as bulbs, corms or rhizomes should as a rule not be collected except where the plant is very abundant or where these organs are of diagnostic importance, and even then they may be better described on the label than collected. In sedges and grasses however basal sheaths and even rhizomes are usually needed for identification and should be collected, but only when the population is large enough.

If one decides to specialise in a particular group, such as *Carex* or *Festuca* for example, it is very helpful to make a collection of the commoner and more difficult species, which can then be examined, dissected and compared at leisure. The expertise gained in this way is essential for both taxonomy and conservation. Otherwise there is no point in collecting common or easily identifiable species. There is a great need in most herbaria for good collections of aliens, the very plants which can usually be collected with impunity, especially trees and shrubs and recently introduced horticultural species.

The balance between conservation, recording and collecting can be very delicate. Conservation depends on recording, which depends on correct identification, which may in turn (at least in some groups, and for some recorders) depend on collecting. Unwillingness to collect may lead to the presence of a rare species in a site being unrecognised, and the site may be lost because its importance is not known. Vastly more rare plants are lost because of site destruction than because of collecting. In the past botanists often selectively collected rare plants, and thus further reduced or even exterminated already precarious populations. The current emphasis on collecting difficult

rather than rare species is likely to have very much less harmful effect, and responsible collecting will usually have much less impact than grazing animals and other natural processes. Unwillingness to collect a specimen should not of course be an excuse for giving one's-self the benefit of the doubt about an identification; unless one is absolutely certain of the identity of a plant one should not record it. Even then, certainty in the field can be followed by doubts at home, and a specimen can reassure one and be used to convince others. The justification for collecting depends entirely on circumstances. One may with equally good reason pick a *Dactylis* inflorescence to dissect it and learn about grass structure, or an unknown marsh orchid when the bulldozer is at the gate and its identification may save the field, but the area in between requires nice judgement.

What bits to collect

Appendix 1 lists some of the special features that need to be collected in various difficult groups, and reading through these before the field season each year to familiarise yourself with what is needed and permissible in each group may save a marsh orchid from being dug up, or you from pressing 20 specimens of roses in flower, and will make it more likely that you will get an identification. The Society's Handbooks on Roses (Graham & Primavesi, 1993), Pondweeds (Preston, 1995), Charophytes (Moore, 1986) and the forthcoming one on Dandelions explain in detail what is needed for these groups. For Brambles refer to Edees & Newton (1988). Effective collecting is chiefly a matter of common sense, in that one needs to collect a specimen that will show as many as possible of the diagnostic features of the genus or group. The more one knows about a genus, the better the specimens one is able to collect, and the more likely one is to get it identified. It is no accident that the best specimens are usually collected by the best authorities on the group in question.

A large proportion of specimens are sent to specialists simply because they lack the prime diagnostic features. A non-fruiting *Atriplex* collected on a once-in-a-lifetime visit to Rockall, or a non-flowering sedge dominant over ten hectares of fen, may be worth trying on the referee, but these should be the exception and not the rule. It is generally better to leave the plant until it is in a fit state for identification. Some referees enjoy these challenges, but others may not have the time to puzzle out inadequate material which they will anyway be unlikely to identify with any certainty.

Try to collect typical specimens, or several to show the range of variation; if in doubt, indicate the limits of variation on the label. Collect fruits as well as flowers if both are available. Remember that the lower leaves can differ from the upper ones, and do not just collect the top of the stem or the inflorescence. For hybrids, as well as collecting the range, it is often helpful to collect the supposed parents from the same area.

Labels

It is impermissible to press a plant, let alone to send it to anyone else, without a proper label, preferably in permanent ink, dark pencil or typed, giving as an absolute minimum the habitat, locality, grid reference, vice-county, date, collector's name, flower colour and habit. Ideally altitude, associated species, notes on underground parts, smell and anything else liable to be lost or missing in the pressing should be included. (The name of the plant is the least essential item, as it is the only one that can be deduced from the specimen itself.) One owes a good label both to the plant one has sacrificed and to the referee or specialist whose time and expertise one is going to call on. Always assume that your specimen is going to be interesting enough to end up in a herbarium, so write or type your

labels neatly; posterity is more likely to remember most of us by our herbarium labels than by anything else we write. The label is at least as important as the specimen. A specimen without a label is useless, but a label written by a trustworthy botanist can be a valuable record.

Pressing

Most higher plants are best preserved by pressing. The purpose is to dry and flatten the plant so that it is preserved indefinitely and can be stored in a small space. For best results the material needs to be dried as quickly as possible without discolouring, and to be pressed tightly enough while it is drying to prevent shrivelling. There are two chief methods. For both, the specimen should first be arranged in a folded sheet of newspaper (a flimsy), in which it is kept throughout the pressing process and in which it can be temporarily stored afterwards. For permanent storage mounting on good quality acid-free paper is desirable. Arrange the specimen to show as many features and diagnostic characters as possible. Arrange leaves to show both surfaces. If branches or leaves are too crowded, cut some off but in such a way that the cut ends are visible and the original habit can be deduced. If the specimen is too long to fit in the flimsy it is usually better to fold it than to cut it, so that it is clear what fits where. Large specimens will sometimes need two or more flimsies. Thick or fleshy stems or fruits can be cut in half lengthways to speed drying. Thorns can be bent into one plane or carefully stamped on. It is helpful to include extra flowers, fruit, etc., in a packet so that they can be dissected without spoiling the main specimen. Delicate organs such as petals are often best displayed by detaching some and putting them in small folds of paper or packets in the flimsy. Seeds which fall out should also be packeted. For Boraginaceae, Liliaceae, Orobanchaceae, Calystegia, etc., it is useful to press opened-out corollas separately in this way.

Arranging the specimen, and ensuring that it remains properly arranged while it is being put into the press, can be an extremely fiddly and time-consuming business, as anyone will know who has tried to persuade all 30 leaves in a dandelion rosette to lie flat while simultaneously trying to press the capitula sideways. It is encouraging to be complimented on one's specimens, and salutary when the referee writes 'Yuk!' on one instead of a species name. Allowing the specimen to wilt somewhat before arranging it may make the operation easier with some plants (but not dandelions which curl before they wilt). The best method is often to collect the specimens directly into flimsies carried in a simple portable press in the field. This gives them a preliminary light pressing and controlled wilting by the time one gets home and makes final arrangement much easier. On the other hand, it can sometimes allow delicate organs on bulky specimens, such as bramble petals, to shrivel too much, and can distort the orientation of organs such as the sepals on rosehips. Care and proper field notes should always be taken.

Delicate aquatics are among the most difficult plants to make good specimens of, and the instructions given in Appendix 1 under Potamogetonaceae and in Preston (1995) apply to most groups, including Charophytes and Callitriche.

Flimsies, drying paper and presses should all be no larger than a herbarium sheet, and 24-27 × 38-42 cm (9 1/2-10 1/2 × 15 1/2-16 1/2 in.) is about right. (A rectangular aluminium or other metal sheet can be useful for quickly tearing flimsies from one's daily paper). Drying paper needs to be porous or absorbent, with a good wet strength and fairly thick. It can be bought from biological suppliers, or begged or borrowed from a herbarium. Industrial filter paper is good, blotting paper less so as it has a poor wet strength. At a pinch half a dozen sheets of newspaper can stand in for one of drying paper.

Conventional pressing

The first method of pressing is to make a pile of flimsies containing the specimens, separated from each other by a wodge of 3 or 4 sheets of drying paper. This pile, if carefully balanced, can be put on the floor with large books or other heavy weights on top; it is better to put the pile between two wooden lattice or rigid metal frames and strap it up tightly with webbing or leather straps. The moisture from the plants is absorbed by the drying paper, which needs to be changed daily; the damp paper is spread out to dry for re-use the next day. Leave the specimen in its flimsy throughout the process. The specimen is dry enough when it is no longer limp or pliable, and when it no longer feels cold to the lips. This may take only 2 or 3 days for grasses or small annuals, but a week or more for some perennials or fleshy plants. Do not apply heat to the press as this will cause the specimens to blacken or even ferment. (Heat though can be applied if corrugated cardboard sheets are used along with the drying paper between the flimsies, as these allow good circulation of air). In extreme cases fleshy or resilient specimens may be killed before pressing by boiling, steaming or fumigation, but this is rarely necessary with British plants.

Polish pressing

The second method works on a quite different principle. Instead of water from the plant being absorbed by the drying paper, it is allowed to evaporate through the drying paper. The flimsies are separated by single sheets of drying paper, and not more than 5 bulky or 8 or 10 thin specimens are put in each press. The frames are of springy steel mesh (1/2 inch BRS Weldmesh), tied up with nylon or terylene cord, and this allows much greater pressure to be applied if this is required. The full press is then heated, and because it is only 1 or 2 cm thick there is free circulation of air and water vapour. Even when the presses are almost too hot to touch the specimens will not be damaged. The papers do not need to be changed, and the specimens will mostly be dry in 12 to 24 hours. Heat can most conveniently be applied by putting the presses on a radiator, or by suspending them down the middle of a double radiator, by laying them out in the sun, by putting them under a car bonnet, or standing them up in front of a fire. Too prolonged heating at too high a temperature will make some specimens brittle, as one will discover by trial and error. If one is doing large scale collecting of, say, brambles or dandelions, it is worth constructing a drying box to contain 5 or 10 of these presses, using an electric bar heater in the bottom and a frame to support the presses. I have used this method for over 30 years since I was introduced to it by its deviser, Professor Josef Madalski of Wroclaw, and there are now many hundreds of these Polish presses in use in Britain. Technical details are given in Appendix 2. A pair of frames plus cord costs about £4 in materials. The only drawback is that some heat or sunshine is required, and the specimens need to be arranged properly in the flimsy before pressing starts (in the first method rearrangement can usually be made when the paper is changed after the first day).

Fate of the specimens

When taken out of the press the specimens can be kept in their flimsies until they reach their final resting place in a herbarium and are mounted. The flimsies can have names or notes written on them, most conveniently on the outside bottom right hand corner. If they are to go to a referee or are to end up in an official herbarium, the specimens are best left unmounted; they are easier to examine loose, and herbaria have their own preferred paper and mounting techniques, and may want to poison or fumigate the specimens first. If you do want to mount them, use strips of paper with water soluble gum (not sellotape or

any other self-adhesive tape), and sheets of stiff paper or card 27 × 42 cm or less. If one's specimens became infested by beetles or booklice at home, a few days in the deep freeze, wrapped in a polybag, will solve the problem. Mothballs and other chemicals, though effective in deterring pests, are not good for humans.

Some referees ask the collector to retain duplicates when submitting specimens. Be very careful that your duplicate really is a duplicate of the same taxon. This is easy enough if it is cut from the same rose bush or elm tree, but it requires an expert to tell whether two dandelion plants are the same species, or which vegetative stem belongs with which flowering stem in a bramble thicket. Label dandelion specimens as duplicates only when they are the divided parts of one plant.

Although few members are likely to want to build up a private general herbarium nowadays, as mentioned earlier voucher collections of expertly named specimens of critical groups from one's own area can be extremely useful for comparing future material with. The ultimate fate of one's collections can be a problem. It is well worth developing a relationship with a particular herbarium, which may be able to loan pressing equipment, advise and guide one towards filling gaps in their collections, and provide a permanent home for your material. It is much better to present your material and get it incorporated while you are still alive and can sort out any problems. If you give instructions in your will, the herbarium of your choice may when the time comes be full up, moribund or even dispersed. Some national herbaria claim to be full and will accept only very special categories of specimens, while others are still very acquisitive. Herbaria in local museums and in universities may be especially subject to changes in fashion and funding, which can kill off an active herbarium or bring a moribund one back to life. Referees, or the BSBI Records Committee may sometimes be able to advise.

A great advantage of having one's collections in a major herbarium is that the specimens will be seen by specialists who may either visit the herbarium or get specimens on loan. In this way the specimens may get checked or re-identified, and cited in publications, very much a two-way benefit to both collector and specialist. For this reason, while it is often sensible to give a general collection from an area to the local herbarium, material of critical groups such as brambles or dandelions, etc., may be wasted here and is much better placed in a national herbarium.

Finally, it is very well worth collecting genera such as fescues or elms for which there is currently no referee, or in which the taxonomy is still being worked out. If the specimens are good and well-labelled and put into a major herbarium they will get named sometime in the future, and even more importantly they will contribute to the taxonomic understanding of these genera.

References and further reading

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Appendix 1

Notes on what to collect and make notes on, and how to preserve specimens, in particular groups. For convenience, relevant notes to the panel of referees and specialists in the Yearbook are repeated here.

- CHAROPHYTA: See Moore (1986). The current referee prefers material to be pressed rather than in spirit. Specimens should be floated out on good quality paper (see Potamogetonaceae) and if possible be complete with gametangia and basal parts.
- PTERIDOPHYTA: For the larger species such as *Dryopteris*, *Polystichum* and *Polypodium* whole fronds with mature sporangia (at least some showing dark brown or black) are required. Collect the petiole right to the base. Big fronds should be cut rather than folded, and the separate parts given tag labels to avoid confusion. It is permissible to trim one side of a frond if it is too big for the press, but fern specialists prefer to use larger presses. (N.B. the current *Dryopteris affinis* referee prefers fresh fronds, folded).
- PINOPSIDA: Cones usually need to be dried and kept separately from the pressed foliage, preferably in envelopes or bags as many disintegrate or shed seeds. Label these separately, with a cross reference, as they will be kept separate in a herbarium. Press side shoots plus a terminal shoot and bud, and photograph or describe bark and shape of crown. It is virtually impossible to prevent needles of *Picea*, etc., from falling during drying.
- RANUNCULACEAE: For Water Crowfoots collect mature fruits, press some petals separately, and collect enough stem to show the full range of leaves.
- FUMARIACEAE: Include mature fruits and describe flower colour carefully.
- ULMACEAE: Collect short lateral shoots with 3 - 7 mature but not deteriorating leaves (mid-June to September), avoiding terminal, epicormic or sucker shoots, and describe the habit of the tree or photograph it and say whether it is suckering or not. If collecting fruits, be certain they are from the same tree by tagging it.
- BETULACEAE: Collect catkins, mature leaves and if possible, photograph tree to show bark and shape.
- CHENOPODIACEAE: For *Chenopodium* include mature fruits with seeds and make colour notes. For *Atriplex* include mature fruits and if possible some lower leaves. For *Salicornia* the referee requires several fresh plants in early fruit or later; permanent collections are best pickled and the referee can advise.
- AMARANTHACEAE: Include mature fruits and colour notes.
- PORTULACACEAE: Ripe seeds are essential for *Montia* specimens.
- CARYOPHYLLACEAE: Mature fruits and seeds are required especially in *Stellaria*, *Cerastium*, *Sagina*, *Spergula* and *Spergularia*. Press a few petals separately. Describe orientation of sepals and relative sepal/petal length in *Sagina*.

- POLYGONACEAE: Mature fruits are required in *Polygonum aviculare* s.l. and *Rumex*.
- CLUSIACEAE: Mature fruits are required for *Hypericum perforatum/maculatum* group.
- TILIACEAE: Specimens should be of flowering or fruiting twigs from the exposed part of the crown, not from sprouts or from deep shade; photos of tree shape can be useful.
- SALICACEAE: *Salix* specimens should include both catkins and mature leaves and in the *S. caprea/cinerea* group and their suspected hybrids a peeled 2-year old twig is useful. For *Populus* (Except for *P. tremula*, *P. alba* and *P. × canescens*) collect short lateral shoots with mature leaves, photograph the tree (preferably in winter), including detail of the trunk and its bark, sex it (by dissecting flower buds if catkins are not out), and say on label when it comes into leaf in relation to other poplars in the area, and what colour the young foliage is.
- BRASSICACEAE: Mature fruits are essential for many genera, including *Barbarea*, *Rorippa*, *Erophila*, *Cochlearia* and *Raphanus*. *Erophila* and *Cochlearia* specimens should show the basal leaf rosettes.
- CRASSULACEAE: *Sedum* specimens should include sterile shoots.
- SAXIFRAGACEAE: *Saxifraga* specimens ditto
- ROSACEAE:
 - *Rubus* (cf. Edees & Newton, 1988): a proper specimen consists of a complete flowering spray showing buds, fully open flowers, and flowers where the petals have fallen but the young fruit has hardly begun to grow; and a piece of the current year's vegetative stem some way back from the apex to show two mature leaves (reverse one leaf or leaflets so both surfaces can be seen when the specimen is mounted); press a few petals separately and describe colour of petals, filaments and styles.
 - *Potentilla*: For *P. erecta/anglica/reptans* and hybrids collect a complete stem or stems with at least three withered flowers behind an open one or bud so that seed set can be assessed; describe range of petal number on plant.
 - *Alchemilla*: Radical leaves are essential.
 - *Aphanes*: Mature fruits are essential.
 - *Rosa* (cf. Graham & Primavesi, 1993): A fruiting spray with fully developed (not necessarily ripe) hips is essential and flowers are of little diagnostic value; if sepals are falling press some in a packet; also collect a piece of mature leading stem to show leaves and prickles, splitting the stem lengthways or cutting off slivers with prickles and leaves if necessary. Collect or note variation in leaves, prickles and hips on different parts of the bush. Note on label the orientation of sepals as hips ripen and how wide the aperture is in relation to the whole width of the disc at the apex of the fruit,

any coloration of stems and leaves, and size and colour of petals but only if available from the same bush.

- Sorbus: Collect short shoots, in leaf, and mature fruits with note on colour, size, and shape.
 - Cotoneaster: If possible collect both flowering and fruiting sprays, always from the same bush, and note colour and orientation of petals, number of stamens and styles or nutlets, as well as colour, size and shape of fruit; also collect a young vegetative shoot, and note height and habit of bush and whether evergreen or deciduous.
 - Crataegus: Collect mature fruits, and flowers if possible.
 - Prunus: In the *P. spinosa*/*domestica* groups record on label size, shape, colour and taste of fruit, and packet some stones after extracting them by boiling.
- FABACEAE: For Anthyllis record flower and calyx colours and include some mature basal leaves. Mature fruits are essential in Medicago and much of Vicia in particular, and flowers or mature fruits are essential in Ulex.
- ONAGRACEAE:
- Epilobium: Particularly where hybrids are suspected it is advisable to describe the stigma and give petal size, as well as indicating what possible parent species are present.
 - Oenothera: specimens should include flowers and mature fruits, with colour notes on stem and inflorescence and petal measurements.
 - Circaea: Flowers and if possible mature fruits should be collected.
- OXALIDACEAE: Underground parts should always be collected, rarely a problem with these weedy aliens.
- GERANIACEAE: In Erodium collect mature fruits and describe petal colours. In Geranium press a few petals separately, with colour notes, and include mature fruits if possible.
- APIACEAE: In most genera it is important to collect both basal leaves and mature fruits.
- BORAGINACEAE: Always record flower colour and size.
- SCROPHULARIACEAE:
- Verbascum: Press a few corollas opened out in a separate packet, and note colour of corolla and filament hairs.

- Euphrasia: Collect about 5 well-developed undamaged specimens, preferably with both flowers and fruit and measure length from base to apex of upper lip of corolla and describe colour.
- OROBANCHACEAE: As honorary orchids, these may best be identified from fresh flowers, detailed notes and photos; pressed material should be accompanied by a drawing of corolla shape in side view and colour notes on stigma and corolla; record host plant only when certain, and say why you think it is the host.
- LENTIBULARIACEAE: Specimens may be preserved in 70% alcohol as an often preferable alternative to pressing, but herbaria may be reluctant or unable to curate such material adequately.
- VALERIANACEAE: Ripe fruit is essential in Valerianella.
- ASTERACEAE: In general capitula should be pressed sideways so that the phyllaries show; note diameter of open flowering capitulum. Include extra capitula, at least one cut in half, in a packet.
 - Arctium: Both mature fruits and flowers should be collected.
 - Taraxacum: Cut off the specimen below the leaf rosette at the top of the stock and press the rosette open if there is room. Include flowers and ripe fruits (unripe heads can be kept, with tag labels, in a jam jar of water and packeted when the achenes are ripe). Record colour of petioles, midribs, scapes, phyllaries, underside of ligules, and styles.
 - Hieracium: Collect a typical undamaged specimen at first flowering, or two if the population is large enough, cutting it off below the basal leaves at the top of the stock. Note diameter of open flowering capitulum, colour of styles, and colour and texture of leaves. Arrange the specimens to show both surfaces of leaves and full outline of both basal and middle stem leaves (if present), general shape of the inflorescence, and of course press the capitula sideways to show shape and clothing of phyllaries.
 - Aster: Note flower colour always.
 - Senecio: Both mature fruits and basal leaves should be collected, and colour notes made.
- POTAMOGETONACEAE: Cf. Preston (1995), the instructions on collecting and pressing being applicable to many other aquatic groups. If possible collect a whole stem from the base. Flowers or fruits are usually not essential in Potamogeton, but collect a few additional separate ones to supplement the specimen if they are available. For broad-leaved species try to collect main-stem leaves as well as branch leaves. For narrow-leaved species, ensure that the material includes enough young shoots to permit dissection of young stipules. Shape of stem in cross-section and of leaf apex should be noted before pressing, as well as characters of stipules including whether open or closed and presence or absence of keels. Narrow-leaved species, along with all other delicate aquatics, are best floated out before pressing. The specimen is arranged under water on a sheet of paper in a tray (plastic photographic

trays are ideal); the sheet is slowly lifted out from one end, minor rearrangements being made with forceps if the specimen is disturbed by the flowing water. Fine nylon curtain mesh is even easier to use as the water drains through the mesh and leaves the specimen undisturbed. The paper or mesh is then placed in a flimsy and dried in the usual way, but remember that aquatics dry rapidly and overheating can make the specimens very brittle.

- CYPERACEAE: Mature fruits and underground parts are essential in almost all genera. If the population is too small, record whether the plant is creeping, tufted or tussock-forming. If hybrids are suspected, say what species are present. Arrange specimens so that the ligules can easily be examined, or press a few detached leaves for this purpose.
- GRAMINEAE: Complete specimens should be collected, including non-flowering shoots if present and basal parts to show stolons or rhizomes and roots. In the *Festuca ovina* and *F. rubra* groups collect enough material for measurements of ten spikelets to be made, with plenty left over for others to repeat the exercise and still leave adequate material.
 - Bamboos: Collect enough main stem to show the branching pattern, and younger parts to show details of intact sheaths and leaves.
- SPARGANIACEAE: Sparganium fruits usually fall as soon as they are ripe enough to show their proper characters and usually need packeting, and very careful timing in their collection.
- ORCHIDACEAE: For all normal purposes herbarium specimens are replaced by colour photographs, one of the whole plant and one close-up of a flower.
 - In *Epipactis* and *Dactylorhiza* one or two individual flowers along with their accompanying bract and the lowermost leaf of the former or the longest sheathing leaf of the latter, should be pressed to supplement the photos. Slug-felled or mown plants may of course be pressed, and dry more quickly if cut in half lengthways. If killed by fumigation in a tin by means of a sulphur candle they will again dry more quickly, but usually with rather luridly distorted colours; the same technique can be used when pressing other succulent plants, but is unpleasant and can be dangerous.

Appendix 2: The use of Polish Presses for plant-collecting

The method of drying plants developed by Professor J. Madalski of Wroclaw in Poland has been used by the great majority of Polish plant collectors for the last 50 years. The method was demonstrated to me in 1962 by Professor Madalski and I have used it successfully since then in a wide variety of conditions and climates. For British readers, the best introduction to the method is a paper by Madalski entitled 'A new Method of Plants' Drying for Herbarium' in *Fragmenta Floristica et Geobotanica* (Krakow) 3(2): 69-76 (1958). For my interest in and knowledge of the methods I am entirely indebted to Madalski. The following account describes a modification of his method, making use of materials readily available in Britain and introducing a few new elements.

Theory

Conventional drying techniques generally involve pressing the plant between sheets of absorbent paper in a thick press. The moisture from the plant is absorbed by the paper, which is replaced at intervals by dry paper until the plant is sufficiently desiccated. In Madalski's method the plant is pressed between porous sheets (either paper or sacking) in a thin press. The moisture from the plant evaporates through the sheets, and there is no need to change the sheets. Because of the easy circulation of air and evaporation, heat can be applied without any danger of the plants blackening.

The presses described below are designed to dry plants that will be mounted on Kew-size (10 1/2 × 16 1/2 inches) sheets. For no logical reason it has been the practice to use presses, the paper of which is substantially larger than that on which the plants are to be mounted. However, since a small press dries more quickly than a large one, and a space must be left on the mounting-sheet for a label, a press is more efficient if it is slightly smaller than the mounting paper. It is also lighter and easier to transport.

Materials

1. Press

The framework of the presses is made of welded steel mesh (BRS Weldmesh - galvanised, with a 1/2-inch square mesh, in rolls 1.2m or 47 inches wide). This is cut into rectangles 9 1/2 × 15 1/2 inches (24.3 × 39.3 cm), the sides of which contain 19 and 31 squares. The long axis of such a rectangle fits exactly 3 times into the width of a roll. The mesh is cut off flush with the wire along the edge and filed smooth. The mesh has a natural curvature when supplied and the rectangles are cut out so that the long wires are on the convex side. The convexity is then somewhat flattened out by hand so that when the press is tied up an even pressure is obtained over the whole surface. (The convexity should not be more than 1/2-inch at the middle of the rectangle).

2. Binding of edges

For comfortable handling the edges can be bound with self-adhesive tape. 260 cm of tape 2.5 cm wide is needed for each press (Bondfast tape 5 cm wide, needing to be cut down the middle, is available at hardware shops). The strip is folded over the edges of the mesh and pressed together and stapled between the wires.

3. Cord

Nylon or preferably terylene cord 1/12-in. (2 mm) diameter (available from hardware or camping shops) is used for tying up the presses. 3 metres are needed for one press, and the cut ends are sealed in a flame.

4. Porous sheets

Ten or a dozen sheets of porous paper or sacking are needed for each press. They are $9\frac{3}{5} \times 15\frac{3}{5}$ inches (24 × 39 cm), fractionally smaller than the framework of the press. Normal drying-paper is as effective as anything, and should be thick with a rough surface. (Sheets or folded zigzags of sacking are as good, and I have found that scrim, sold at drapers and used for window-cleaning, is the best sort. However, it is troublesome to seal the edges, and experiments show that little is gained over drying-paper either in lightness or in speed of drying).

5. Flimsies

Newspaper is effective and convenient; the sheets when folded should be exactly the same size as the drying paper. When travelling, it is useful to have a rectangle of very thin aluminium sheeting with sharp edges, of the same size, which can be used as a mask for quickly tearing newspapers to size.

Method

The plants are best collected straight into flimsies in a collecting press (of the same size as the drying press or slightly larger) and need never be removed from these flimsies until they are to be mounted. The specimens must be carefully arranged in the flimsies before they are put in the drying press, since they will be dried before they are looked at again.

About five to ten flimsies, separated from each other (and from the mesh) by only single sheets of drying paper, are placed in each press. Fewer should be used if the plants are succulent, and more if they are already very dry. The frames are placed on the top and bottom of the pile so that their concave sides face outward. They are then tied up as tightly as possible with the terylene cord in the manner shown in the accompanying diagram, so that the pressure is evenly spread out and maintained. No further tightening is needed during drying.

In a suitable climate the presses are laid out in the sun, preferably supported at one end so that they are positioned to catch the rays of the sun at right angles (a simple bent wire support is convenient). If possible the presses are turned over at half-time. They can, in the Mediterranean sun, become too hot to hold and the contents dry in 3-9 hours. Allowing for an average proportion of more succulent plants, one can rely on drying thoroughly 80% of a day's collection in one day in such climates. In cooler climates the outermost sheets of drying paper can be painted black and this greatly increases the speed of drying in the sun.

If drying chambers are available, the presses are stacked upright in them and drying is extremely rapid.

For small-scale collecting while travelling the method is also ideal, since the presses are light and compact and can be dried overnight or in a few hours on radiators, in airing cupboards, in front of fires, or propped up inside a sunny window. An especially efficient method is to tie the press on to the outside of a car. Madalski claims that plants can be dried in such presses by hanging them up in the steam of a cooking-stove. The only obvious drawback is that with such speedy drying there is a greater danger of the

specimens being over-dried than there is in conventional methods. Accidental soaking of the presses when they are laid out to dry seems to do no harm and they dry out again very rapidly.

Advantages

A great deal of labour is saved since there is no need to change drying papers. For collecting a given number of specimens in a given period of time, the equipment needed weighs about half as much as conventional equipment. It is extremely adaptable and can be used out of doors, indoors, in conjunction with drying-chambers, or can also be used for pressing plants in the conventional manner if this is required. The presses are rustproof and virtually indestructible.

One press, complete with eleven sheets of drying paper, weighs 1 lb. 11 ozs.