

## **Workshop: Collecting in Wet Tropical Forest: Preserving Plant Material for Herbaria and Scientific Research – notes and references**

Quentin Cronk, 17 April 2014

### **Introduction**

In this workshop knowledge of standard herbarium collection methods will be assumed. If you need to acquire this knowledge you should do UBC course BIOL 324 (Seed Plant Taxonomy), which specifically teaches this, or consult the UBC herbarium. The standard method dries plants by using frequent changes of drying paper or artificial heat sources. However, for the last 100 years or so it has been recognised that the standard method does not work in tropical rain forest (TRF) for the following reasons: (1) the humidity is high and it may rain every day, making drying near impossible (2) on expeditions that require camping in remote forests for many days it is impracticable to take enough drying paper into the forest; the drying paper is difficult to keep dry, and once used is impossible to re-dry without heat (3) various methods of drying using field propane heaters or camp fires have been worked out but are cumbersome and laborious.

If you are collecting from a vehicle, or near to a field station with electricity, then the standard method will work using electric drying apparatus. Also, if you are collecting in the dry season (in areas with a pronounced dry season) and are always in the vicinity of forest clearings, then presses and drying paper can be dried in the sun. Otherwise the standard method is impossible and specimens will rot in the press. Under these conditions the Schweinfurth (alcohol) method is used.

### **The Schweinfurth method**

The first publication in English:

Schrenk, J. (1888). Schweinfurth's method of preserving plants for herbaria. *Bulletin of the Torrey Botanical Club* 15: 292-293.

A recent description of the method by Tony Miller can be found at:

<http://croptenebank.wikispaces.com/Chapter+27+-+Collecting+manual>

“Chemical treatment using alcohol is particularly useful in areas of high humidity such as tropical rain forests. The spirit prevents fungal attack and not having to dry the plants immediately saves time in the field and generally requires less equipment. However, specimens often dry black and alcohol-soluble substances are lost. Also, alcohol can be difficult to obtain [*QC: Isopropanol, rubbing alcohol is available almost everywhere*].

Specimens are collected into the press as described above and left overnight. Still in their flimsies, they are then removed from the press and piled into conveniently sized bundles (about 12-15 cm thick). A length of polythene tube about 1.5 m long is cut and the bundle inserted into it. One of the opened ends of the tube is then folded over and sealed with non-alcohol-soluble tape. The tube is now stood upright with

the opened end uppermost and about 0.5 to 1 litre of 60-70% (higher concentrations can be used on particularly succulent material but tend to make the specimens brittle) industrial alcohol or methylated spirits ...The opened end of the plastic tube can now be folded over and sealed.

The spirit fills the bag with vapour and if air is excluded preserves the contents for weeks. If specimens are going to be dispatched by air, excess spirit must be poured off (airlines do not allow the carriage of alcohol). The most important thing to remember is that the process depends on the exclusion of air, so great care must be taken to ensure that the polythene tube is not punctured..."

## **Reference List**

### **(1) General Tropical Collecting**

D Bridson, L Forman (1992; reprinted 2010). *Herbarium Handbook* (now in 3rd Edition). Kew Publishing.

The standard work on all matters connected to the herbarium.

Scott A Mori, Amy Berkov, Carol A Gracie, Edmund F Hecklau (2011). *Tropical Plant Collecting: From the Field to the Internet*. TECC Editora.

A readable and personal account, intended to inform and inspire.

### **(2) Expedition Fieldcraft**

As human populations increase, reaching pristine tropical rainforest is increasingly difficult, often involving hiking and living in the forest for days or weeks at a time. There are numerous guides to how to do this safely and efficiently. Most are out of print but available on the web. Many are out of date politically but still give good practical information. Examples are:

Anon. (1957) Instructions for Collectors No. 10. Plants. British Museum (Natural History), London.

Hollis, D., A.C. Jermy and R.J. Lincoln (1977) Biological collecting for the small expedition. *Geographical Journal* 143:251-265.

Jermy, Clive and Roger Chapman (last revised 2002) *Tropical Forest Expeditions*. Royal Geographical Society, London

### **(3) Special collecting techniques**

Most TRF plants can be collected very simply, provided good field notes are taken (and photographs help – these can be printed out and mounted with the specimen). If the Schweinfurth method is used particular attention needs to be paid to colour notes as this method does not preserve colour. However, there are some groups that are problematic because of their size or the complexity or delicacy of their parts, or because specialist knowledge is required to know which parts are important. These include palms, bamboos, bananas and fleshy plants. Specimens of these plants are

particularly valuable because the challenges make them under-collected. However, these should not be attempted by the beginner as there is a high risk of (at best) poor and (at worst) useless specimens may be collected. Consult the “Herbarium Handbook” for specific information. The following references may be useful.

Croat, T.B. (1985) Collecting and preparing specimens of Araceae. *Annals of the Missouri Botanical Garden* 72:252-258.

Dransfield, J. (1986) A guide to collecting palms. *Annals of the Missouri Botanical Garden* 73:166-176.

Fosberg, F.R. and M.-H. Sachet (eds) (1965) *Manual for Tropical Herbaria*. *Regnum Vegetabile* 39. International Bureau for Plant Taxonomy and Nomenclature, Utrecht. [Gives guidance for the collection of several tropical plant groups including Musaceae]

Soderstrom, T.R. and S.M. Young (1983) A guide to collecting bamboos. *Annals of the Missouri Botanical Garden* 70:12-136.

Stone, B.C. (1983) A guide to collecting Pandanaceae (Pandanus, Freycinetia and Sararanga). *Annals of the Missouri Botanical Garden* 70:137-145.

#### **(4) Silica gel, DNA cards, dry shippers (vapour shippers)**

Liston, A., L.H. Rieseberg, R.P. Adams, Nhan-Do, G.L. Zhu and N. Do (1990) A method for collecting dried plant specimens for DNA and isozyme analyses and the results of a field test in Xinjiang, China. *Annals of the Missouri Botanical Garden* 77:859-863. [The first description of the “silica gel method”: more recent instructions may be found at:

<http://botany.si.edu/projects/dnabarcodes/sample2.htm> ].

Allgeier L, Hemenway J, Shirley N, LaNier T, Coyle HM. (2011) Field testing of collection cards for Cannabis sativa samples with a single hexanucleotide DNA marker. *J. Forensic Sci.* 56: 1245-9. [an example of the use of FTA cards]

Champigny, MJ et al. (2013). RNA-Seq effectively monitors gene expression in *Eutrema salsugineum* plants growing in an extreme natural habitat and in controlled growth cabinet conditions. *BMC Genomics* 14:578 [An example of how dry shippers can be used to bring RNA from the field]

Dick CW, Webb CO (2012). Plant DNA Barcodes, Taxonomic Management, and Species Discovery in Tropical Forests. *Methods in Molecular Biology* 858: 379-393 [Tropical Rain Forest goes molecular]