

**EXPLORATION EXPEDITIONS IN THE TROPICS:
WHAT IS NO LONGER NEEDED, WHAT IS STILL NEEDED AND
WHAT IS URGENTLY NEEDED?**

A review of aims and goals

PETER S. ASHTON

Harvard University, Arnold Arboretum, Cambridge, Mass., U. S. A.

BACKGROUND

Priorities of workers *within* the tropics are likely to substantially differ from those *outside*.

Within much of the tropics, including Indonesia, Malaysia, and Papua New Guinea many biologists do not view logging, which is generally the primary cause of modification of residual primary forest, as a likely cause of extinction except when followed by immigration and cultivation as it so often is in the Philippines and Indochina (and also some parts of Indonesia). These workers therefore anticipate increasingly intensive and diversified use of the forest flora as the area of natural vegetation declines. They want better access to appropriate knowledge to this flora for users, in the form of manuals in simple language with good keys based on field characters, and with field descriptions and information about ecology as well as distribution, and known potential or actual useful attributes. This requires collection of extensive field knowledge beyond museum specimens.

An excellent example for this argument in the specific case of flora design was made by Dr. Francis Ng, F.R.I.M., Kepong, at the last Pacific Science Congress.

Extratropical workers frequently take the apocalyptic view that accelerating demands on residual natural areas, including for logging, is heralding imminent massive extinction throughout the region. Their objectives are often theoretical and specialized, and their priorities are likely to change over time. For current needs, and also to conserve options for the future, they want as comprehensive collection as practically possible of plant variation at and, increasingly, below species level including fixed or pickled material for cytogenetical, phytochemical and developmental studies.

This case was forcefully made by Peter Raven and his colleagues in the U.S. National Academy Science Report (Raven 1980).

This second view implies that time left is finite and limited. The emphasis must therefore be on collecting specimens rather than field information and, particularly, collecting variation so far not yet represented in the herbaria, be it new taxa or uncollected character states. Description can wait until later.

SOME OPINIONS

No-one would argue against the likelihood that massive extinction is already on us in the Philippines and in many areas of seasonal Southeast Asia, but how much of the Malayan flora has become extinct now that all but fragments of the old Lowland Dipterocarp Forest (LDF) has been converted to monospecific plantations? We don't know, but in relation to the richness of the flora Dr. Ng's recent list of potentially endangered species is rather short, particularly if only LDF species are considered. It is also rather remarkable that one 50 ha enumerated block on undulating and flat land in Negri Sembilan yielded slightly over one third of the known LDF tree flora, implying that much of the flora is widespread and constant; and only about ten taxa were unrepresented in the recently published Tree Flora. I would argue that most of the woody flora of Indonesia is in a similar state of survival. How much effort should we put then into the once collected LDF taxa from yesteryear?

But it is clearly absurd to argue that the whole flora follows the same pattern as trees. Shorter lived plants, notably epiphytes and ground herbs, especially saxicoles, are often habitat specialists, and their concentration in montane forests encourages geographic isolation and point endemism. We therefore need to work out a strategy based on the following criteria:

DISTRIBUTION

Biogeography

1. Where are the residual geographical areas of likely high diversity and high endemism yet little previous collection, where grab-all expeditions of the old type, frequently on the move and often without collectors knowledgeable about the regional flora, can do a worthwhile job? Parts of the island of New Guinea come to mind.
2. Where are those areas which are already known and collected, but where discriminating and experienced taxonomists would still likely yield new information?

Ecology

1. Where are the specialized habitats such as karst limestone, podsolic and ultramaphic areas, which are likely to be rich in endemic species and ecotypes, or unusual geographic distributions? Here, discriminating collecting is again desirable.
2. Which mountain areas are most likely to yield new taxa, particularly herbs and shrubs including epiphytes?

(1 and 2 have been discussed and prioritized for our region in Campbell & Hammond 1988.)

Special groups

Now, the woody flora is 'relatively' well known but some herbaceous groups are still urgently in need of more collecting. Epiphytes are an obvious example, but what about fungi?

Information about the plant — In all cases well trained collectors at least, and experienced taxonomists by preference are needed.

Character states

1. Character states poorly represented in museums include those of wood, bark (morphology as well as anatomy) cytogenetic characters and, especially, ephemeral characters including those manifested during shoot extension, and flower and fruit morphogenesis including embryogenesis. These materials require special preservation methods, as do soft tissues including delicate flowers such as those of orchids and gingers, which provide important taxonomic information. Also increasingly important are secondary metabolites, many of which are retained in specimens dried by supplementary heat alone, but which are lost where preservatives such as ethanol are used.
2. Character states not observable in herbarium or other museum specimens. These include the size of plants which are larger than an herbarium sheet, and gross characters of architecture, leaf arrangement, bark, buttresses and roots. On the whole, these have been recorded abysmally, and little attention has been paid to standardization of terminology in spite of Wyatt-Smith's valiant attempt (1951).
3. Natural history. The same comments apply. Plants are sometimes amazingly versatile, and more information is needed. Epiphytes can be terrestrial, and ecotypes of tree species can occur on a range of soils.

EXPLORATION PRIORITIES FOR CONSERVATION

All the above priorities are useful to the conservation biologist and manager, but what do they need to know most? Plant conservationists, like their zoological colleagues, are still of two minds, whether to push for sanctuaries to conserve beleaguered wild populations of exceptional plants such as *Sararanga* or *Rafflesia*, or whether to identify forests exceptional for their species diversity or point endemism. The expeditionary botanist tends to collect information which biases him towards the first approach, but is it really practical? The second requires systematic inventory, and the identification of those dreadful fallen leaves or sterile twigs, anathema to the extratropical herbarium-based botanist; but the approach is a practical one, and will likely conserve a high proportion of the flora overall.

Whatever is finally conserved will certainly be in forest fragments far smaller than the original forest extent, requiring active management. For this we will need to know far more about biological interdependencies such as those in pollination and fruit dispersal. The natural history of pollinators and seed dispersers, and plant breeding systems and demography must be understood, all requiring long term research at well chosen safe sites.

So, what sort of expedition?

There do remain a few places where the travelling expedition, collecting everything in its path, is worthwhile. Who has visited the peat swamps or the heath forests of Irian Jaya, for instance? But I would suggest that the priorities are now of a different nature, and recommend the two following:

1. Long-term research at permanent safe sites. Many of the least known plants are either inaccessible in the tree tops, requiring time-consuming collecting methods by skilled field personnel, or rarely flower and have consequently been missed. *Allantospermum*, one of the commonest trees along the coast of North-west Borneo but only described in the sixties, comes to mind. For this, the time-honored technique of Eduardo Beccari, who set up a base camp, Vallombrosa, on Gunong Matang, Sarawak for two years which yielded data for a lifetime of publication and countless types, is still the best investment. Certainly this is what is needed to gather field knowledge required for the practical Manuals demanded of our colleagues resident in the region. So is it also for the kind of careful observations in natural history, and the total censuses of forest samples, which the conservation scientist needs, and which we need in order to prise out those plants which rarely flower.
2. Small, highly equipped patrols of field collectors who can be sent out to logging concessions where major logging and forest conversion is taking place, with emphasis on areas of exceptional biogeography or ecology, in order to gather for the last time.

REFERENCES

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