The Quest for Understanding – Just What Makes it a 'New' Species?

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ABSTRACT

An overview of some of the skills, experience and thought processes involved in undertaking taxonomic and nomenclatural research is provided

INTRODUCTION

The availability of reliable interrogable internet-based data resources of effectively and validly published scientific names (notably the 'International Plant Names Index' – *www.ipni.org* – the 'Kew World Checklist of Selected Plant Families' - *http://www.kew.org/wcsp/* – and 'The Plant List' - *www.theplantlist.org*) prompted me to investigate how many new and re-combined aroid names have been published in *Aroideana* since the inaugural issue in 1978. The answer was an unexpectedly high 303, among which are a new subfamily (Zamioculcadoideae Bogner & Hesse), two new genera (*Anaphyllopsis* A. Hay & *Hottarum* Bogner & Nicolson), 26 *Amorphophallus*, 105 *Anthurium*, 8 *Arisaema*, 13 *Chlorospatha*, 41 *Philodendron*, and 29 *Typhonium*.

Araceae currently has about 3,800 published accepted species (of a putative total of ca. 5,400 - Croat & Boyce, unpubl. data). This means that *Aroideana* has to date contributed almost 8% of all published accepted names in Araceae. By way of comparison, *Novon* (inaugurated in 1991), and the *Annals of the Missouri Botanical Garden* (first published in 1914), have 130 (i.e. ca. 3.4%) and 204 (i.e. ca. 5.4%) taxa, respectively. In short, *Aroideana* is a major scientific resource for the aroid community.

These insightful data, backed by gentle prompting from our Editor, set me to trying to explain the process by which botanists make decisions as to the identity and novelty, or otherwise, of plants they encounter in the wild. Which abilities and experience enable someone to 'know' that a particular plant is something never before seen by anyone, at least anyone with a scientific interest in the particular group, has never been formally assigned a name, nor allocated a place in an assemblage that most biologists refer to as a genus?

So, how to do this? The slick (but for that no less accurate) answers are:

1. Repeated exposure to lots of taxonomic units ('species') and 'species' groupings ('genera'),
2. A good memory for scientific names,
3. Similar memory for shapes, and their terminology,
4. An ability to compare *and* contrast structure, and
5. The ability to form a composite mental picture of all the plants characters.

The above skills, combined with a comprehensive knowledge of the literature, especially the fundamental early literature (e.g. Blume, Schott, Engler, Brown, Ridley, Sodiro, etc., which incidentally are almost all now available to download free as pdfs), comprise the basic botanical aroid toolbox.

To return to the first item on the list, anyone who regularly undertakes fieldwork and spends much time examining herbarium collections, builds up a mental checklist of the main floristic elements for

areas in which they work. For example, those of us working in and on the aroids of the Asian humid tropics soon grasp that *Homalomena* and *Schismatoglottis* are far and away the most commonly encountered mesophytic genera; that rheophytic species are more abundant and more diverse on Borneo than anywhere else; that species of *Rhaphidophora* are the most frequently encountered lianes in moist, humid areas, but that in well-drained and less humid sites, such as along ridgetops, *Rhaphidophora* are usually 'replaced' by species of *Pothos* and *Scindapsus*. And so on.

Homalomena and *Schismatoglottis*, despite similarities in overall appearance, are readily distinguished from each another by a few simple morphological characters. At the 'coarsest' level of differentiation, vegetative tissues of most *Homalomena* when cut or crushed are strongly aromatic, while those of *Schismatoglottis*, with a few exceptions we shall return to, are not. Another vegetative character, veins, are also useful since all veins of *Homalomena*, even the finest, are parallel pinnate whereas *Schismatoglottis* has the higher order (that is to say the finest) venation forming a network of either tessellate (regularly netted) or reticulate (irregularly netted) veinules.

To delve further into *Homalomena*, with experience it becomes apparent that while most larger-growing *Homalomena* encountered in Borneo have a spathe with a marked constriction between the lower portion and the spathe limb, those in Peninsular Malaysia are for the most part *without* a spathe constriction. In recent years this strikingly simple difference has resulted in the 'instant' recognition of several new species in Borneo and Peninsular Malaysia.

So, what do we know so far? That mesophytes in Borneo with aromatic tissues and a spathe with a marked constriction in all probability belong to *Homalomena*. I say in all probability because you'll recall that there are *Schismatoglottis* with aromatic tissues. So how to be sure? As we have already seen, *Schismatoglottis* venation differs diagnostically from that of *Homalomena*. In addition, while the entire spathe limb of *Homalomena* persists after the flowering period, although the lower spathe of *Schismatoglottis* persists as a barrel- or rarely cup-like structure, the spathe *limb* is almost invariably shed before the end of the flowering phase.

You'll have noticed that it is noted above that *most* Bornean *Homalomena* have a spathe with a constriction. That being so, then how to distinguish between those species with constricted spathes that have been assigned a name, and those that have not? This is the point that the remainder of the toolbox comes into play, in particular the knowledge of already published species names. Fortunately for Borneo there are rather few published names, and rather many species, so there is a better than average chance that even species with a constricted spathe are undescribed. Clearly, however, this cannot be taken for granted. Even with good knowledge of relevant earlier published names, and a working knowledge of what taxa are present in any given area, it is necessary to check carefully the identities of the plants encountered. Access to the original publication and nomenclatural Type becomes vital, although the further back in time one travels the more often than not the Type proves to be less than informative. Aroids in particular are often poorly served by fragmentary and time-degraded specimens with scant ecological and geographical data. The last mentioned is a serious encumbrance when attempting to match species from a genus with a high percentage of highly localized taxa with potential Types. A 160–year-old specimen localized as 'South Borneo' could originate from a geographical area of anything between 36,985 km^2 (ca. 130,254 sq mi – slightly less than Switzerland or well exceeding the state of Maryland) and 337,356km^2 (ca. 15,438 sq mi – slightly larger than Finland or markedly larger than New Mexico) depending on whether one considers historical 'South Borneo' to equate only to the modern province of Kalimantan Selatan, or also to include Kalimantan Tengah, or to include also

Kalimantan Barat, and thus cover all of southern Borneo.

The geographically and ecologically acutely localized nature of many aroid species poses an additional problem – albeit an exciting one – in that it is not unusual to encounter in an area several closely similar species, which are in fact **separate** species. These so-called 'cryptic' taxa are oftentimes all but impossible to distinguish from herbarium material alone unless one is already familiar with them in the wild. *Homalomena* comprises several species-complexes that display exactly this situation. For example, one such complex comprises plants with brilliant glossy green, somewhat rubbery leaves with rather few primary lateral veins, spathes with the lower part exceeding the spathe limb in length, and with the persistent spathe turning emerald green on fruiting. With experience herbarium material is immediately recognizable as belonging to the *complex* but only exceptionally is herbarium material of sufficient quality for it to be determined to species without recourse to a critical checklist of taxa and their localities. This may sound suspiciously as though the species are poorly differentiated from each other, but in fact the 10 species known to date – of which only a few are formally named and with at least another 11 suspected species awaiting investigation – are readily distinguished by inflorescence characters during female anthesis, floral odor, and by pollinator, as well as by more subtle vegetative differences, and highly localized and ecologically discrete distributions.

The forgoing, I hope, provides a small taste of how the process of detecting and rationalizing plant names is undertaken. The whole of the above is of course greatly concertinaed and pruned due to space and also in order not to discourage readers who are completely new to this subject. In particular it ignores much of the deeper science – notably that dealing with phylogeny – which is to say elucidating the evolutionary *relationships* between taxa as opposed to their visible similarities and differences – and the now inescapable and fascinating debate on how best to marry the demands for phylogenetic rigor with the pre-evolutionary 'rules' governing Nomenclature. These perhaps can be the subject for a future offering.