Temperate bamboo names

CHRIS STAPLETON surveys the long road to nomenclatural stability and correct identification in cultivated bamboos

Phyllostachys aureosulcata 'Aureocaulis' in SW France

IT IS NEARLY a quarter of a century since David McClintock pondered the difficulties caused by what he called the 'shifting sands of bamboo nomenclature' in this publication (McClintock 1992).

Since then considerable progress has been made in our understanding of relationships within the bamboos, and a relatively stable system of generic names has now been in use for several years, formalised in flora accounts and online databases. There have been a wealth of new species introductions from the wild to try to identify, many of which continue to cause some problems, but several misidentifications have been cleared up, and on the whole we are in an era of much more reliable and stable bamboo names.

Conflicting names

As an example of the confusion that used to prevail, we have had multiple names in use in the UK for the pretty little yellow-leaved bamboo that the cognoscenti know to prune back hard in late winter to encourage a flush of brilliant yellow spring shoots. Genus, species & cultivar names have all varied on displayed and marketed plants. I have seen genera *Arundinaria*, *Bambusa*, *Pleioblastus* and even *Phyllostachys* used, with the species epithets, *viridistriatus auricoma*, *nana* and *aureospicata*, and a few cultivar names added for good measure.

The genus *Pleioblastus* is now considered appropriate on the grounds of morphology and molecular data, and in that genus it is now correctly known as *Pleioblastus viridistriatus*. The generic name is a reflection of the different bud and branch characters that distinguish this genus from *Arundinaria*. The species name reflects the fact that there is so much variegation on the leaves that it seems as though a yellow leaf has become striped with green, rather than vice-versa.

Pleioblastus viridistriatus

To understand how we came to be in such a mess with muddles and misapplications rife, we have to look back at how our knowledge of temperate bamboos has grown over the last 200 years or so, and consider some revelations from recent molecular research.

Bamboos are admittedly quite difficult to classify or identify, because groups are not always separated clearly. Taxonomic groups at all levels can have rather vague boundaries with overlapping characters. In addition, our understanding of the characters has been poor. This has often made it difficult to separate and define groups, even when substantial differences were evident.

Temperate bamboos are by far the most important for horticulture in Europe. These bamboos have evolved out of the windless and mild tropical forest understorey. The main morphological character that they have in common is possession of 3 rather than 6 stamens. Maybe they do not need to produce so much pollen where there is more wind. Unfortunately there are some temperate bamboos that have 6 stamens, so even this distinction is not consistent. This is typical of bamboos--there are exceptions to every rule. Characters are rather plastic, often under physiological control, and boundaries are hard to pin down, making the separation and recognition of groups somewhat arbitrary at times.

3-stamened temperate flowers

Why is this? From recent research (Triplett et al. 2014) it seems that one reason may be pervasive hybridisation. Even the major groups of bamboo, the tropicals, temperates, and herbaceous bamboos, originated by hybridisation themselves. Our current polyploid groups apparently arose as hybrids between previous diploid lineages. Hybridisation has probably obscured distinctions between groups of bamboos ever since they first evolved.

Generic discoveries

Looking at the temperate bamboos, Tribe Arundinarieae, there has clearly been a lot of confusion at the generic level. It is interesting to see how our knowledge of the variation and relationships within the tribe has grown, and how attitudes to generic recognition have changed as a consequence.

Arundinaria was found in the USA by French plant collector André Michaux, while looking for American trees to reafforest France after long wars with England took their toll on the forests. It was the first temperate genus to be named, in 1803, and so is the benchmark for temperate bamboos.

The inflorescence is open with well separated spikelets, and without basal sheaths or bracts.

Borinda - open panicles

Many cultivated temperate bamboo genera have very similar flowers, all looking much the same. They include *Yushania*, *Chimonocalamus*, *Sarocalamus*, and *Borinda*. They differ radically from the compact spicate or capitate, and densely bracteate inflorescences of tropical bamboos often obscured by dense masses of stamens, and those with dense spathes bearing small leaf blades, found in Japan

6-stamened tropical flowers

by a German military doctor with the Dutch Navy, Phillip Siebold, and named *Phyllostachys* in 1843.


Phyllostachys - leafy flowers

A Bristol soldier from the 39th (Dorsetshire) Regiment of Foot was the next to describe new bamboo genera, discovering another kind of compressed temperate inflorescence in the Himalayas. William Munro could be considered the Father of Bamboo Taxonomy. He devoted his spare time to plants, especially bamboos. He classified and described all 219 bamboos known at the time, adding many new ones, in the first global bamboo account in 1868.

Munro established botanic gardens and vegetable gardens at the military stations where he served, but more importantly for us he pioneered the revolutionary use of vegetative characters to separate bamboo genera--not just their flowers. Munro was brave enough to distinguish genus *Phyllostachys* by a vegetative character, its distinctive semi-flattened internodes.

He described several important new bamboo genera, mostly


Phyllostachys - flat culms

tropical, and named many new bamboo species. From the Himalayas he described *Thamnocalamus*, a genus of temperate bamboos with compressed inflorescences, like those of *Phyllostachys* in having bracts, but without leafy blades, and the culms were round, not flattened. By the time he had


Thamnocalamus - spathed flowers

retired, as General Munro, he had described 14 new plant genera in total, not bad for an amateur taxonomist.

Within the temperate Asian bamboos there is still more variation. As well as differences in compression of the inflorescence and the presence and nature of spathes they can also vary in other ways. Open inflorescences with bunching (fasciculation) at the nodes could have been seen by Munro in *Drepanostachyum khasianum* from Assam for example.


Drepanostachyum - delicate flowers in bunches

Thus there is substantial variation within the inflorescences of temperate bamboos, and differences in vegetative characteristics were also being discovered. Nevertheless a conservative approach was taken by institutional grass taxonomists when bamboos were included in the next major grass treatment, putting the clock back. Bentham & Hooker rejected Munro's *Thamnocalamus*, and it was back to 2 genera, *Arundinaria* and *Phyllostachys* for temperate bamboos in their Genera Plantarum of 1883. Different opinions on bamboo genera are nothing new.

Moving on towards and through the 20th Century, many more botanists stepped forward, looking at more bamboos in much more depth, describing further genera from a wider range of characters. The genus *Fargesia*, which includes several of our horticulturally important species, was first collected by French missionary in China Father Paul Guillaume Farges, and published


Fargesia - unilateral racemes

in 1893. Even denser inflorescences than those seen in *Thamnocalamus* are found in *Fargesia*, as a result of extreme compression and confinement.

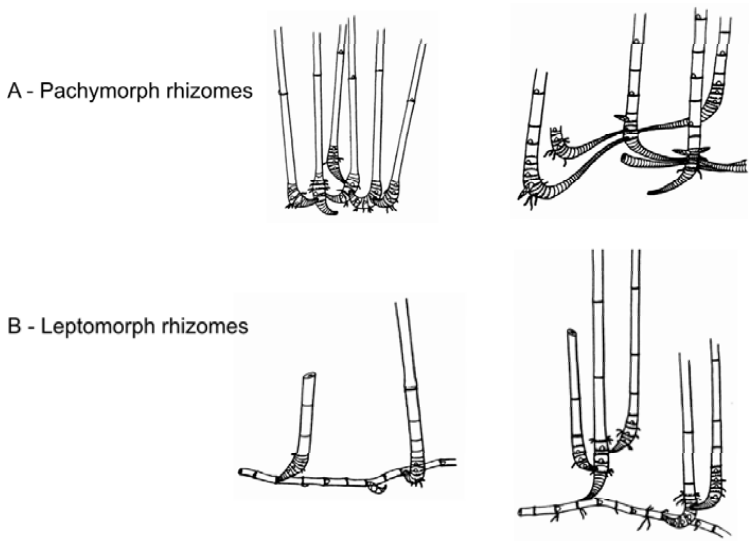
These bamboos with their dense toothbrush-like flowers are usually found in the mountains of C China, while those of *Borinda* with open inflorescences come from W China and the E Himalayas. *Thamnocalamus* is from even further west, right across the Himalayas.

Takenoshin Nakai was a Japanese botanist looking at bamboos in the 1920s and 30s. He described many of our cultivated running bamboo genera, including *Pleioblastus*, *Shibataea*, *Semiarundinaria*, *Indocalamus* and *Sinobambusa*, as well as the ill-fated *Sinarundinaria*. The leptomorph-rhizomed genera that he described have been more useful than *Sinarundinaria*. This is now a synonym of *Fargesia*, because its type species, the Fountain Bamboo *Fargesia nitida*, was found to have dense inflorescences when it eventually started to flower in the 1990s. Thus use of the name *Sinarundinaria* for the bamboos with open inflorescences including those now placed in *Yushania* could no longer be justified.

Vegetative characters

In this way more characters were being studied, and more understanding of morphology was being gained. Rhizomes were looked at in more detail, four distinct patterns of growth being discovered.

Leptomorph rhizomes could lead to separate culms, as in *Phyllostachys* in a favourable site, or in clusters of culms as in *Semiarundinaria fastuosa*.



There are 4 different forms of rhizome in temperate bamboos

Pachymorph rhizomes could be short-necked, forming tight clumps as in *Bambusa*, *Thamnocalamus*, *Borinda* and *Fargesia*, or long-necked in *Yushania* in a favourable site.

Just before and then after the Cultural Revolution, botanists in China from several universities described useful generic names for temperate bamboos. First *Yushania* was described for spreading bamboos differing from *Arundinaria* in having long-necked pachymorph rhizomes rather than leptomorph ones.

Several other genera with pachymorph rhizomes were described later, all forming clumps. *Chimonocalamus* was described for species with thorns at the nodes, just like those of the leptomorph-rhizomed *Chimonobambusa*. These hardened aerial roots develop through the base of the culm sheath in a ring around the node.


Chimonocalamus - root thorns

Two subtropical genera, *Drepanostachyum* and the larger *Himalayacalamus*, have multiple branches that break through the culm sheath base, and thin spikelet glumes. The former having open inflorescences, while the latter has condensed ones.


Himalayacalamus - branch shoots

Ampelocalamus has pendulous culm tips, long branches that can scramble through trees, and swollen nodes to catch on tree branches for support.

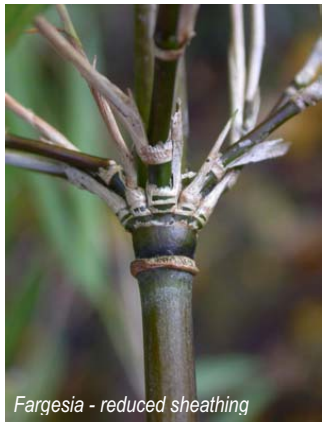
Buds and branching patterns have been found to show great variability. Several characters are involved, and the different patterns are still being investigated in depth. Progressive loss of sheathing and the inclusion of a larger number of central branch internodes and lateral branches produces distinguishable patterns. *Thamnocalamus* has complete sheathing and relatively few branches. *Fargesia* has lost some sheaths and incorporated more laterals into the complement. *Himalayacalamus* includes even more laterals to produce a more complex layout.

Drepanostachyum and *Chusquea* lose more sheaths still, and produce branches all around the culm.

Character prioritisation

It is clear that in the temperate bamboos there is plenty of variation in vegetative morphology as well as inflorescences. However, there


Thamnocalamus - full sheathing


Fargesia - reduced sheathing


Himalayacalamus - many branches

was room for controversy over which characters were most important.

By the mid 1980s 10 genera had been described in the pachymorph-rhizomed temperate bamboos. These have met with varying receptions however. Lumping of the genera has been common, but with different authorities prioritising different characters and lumping either according to the inflorescence--whether open or compressed, or by using other, vegetative characters that cut right across this distinction. Essentially a conflict was starting between those who favoured floral characters, especially grass taxonomists and their followers, and those who favoured vegetative characters, those for whom field identification was more important.

The grass taxonomists' perspective prioritised flowers and avoided some vegetative characters. Very large groups were used based on whether the inflorescence was open and Arundinaria-like (*Sinarundinaria*, including *Yushania* and other genera) or compressed (*Thamnocalamus*, including *Fargesia* and other genera). Not only was this revealed as unnatural and unjustifiable lumping when DNA evidence became available, it also assumed that the type species of *Sinarundinaria*, *Arundinaria nitida*, has open inflorescences. Unfortunately, when it flowered in the 1990s, it was found to have compressed inflorescences instead, which is why it is now called *Fargesia nitida* and *Yushania* is used instead of *Sinarundinaria* for temperate spreading bamboos with long-necked pachymorph rhizomes.

Molecular information

DNA has been most informative at the level of tribes and subtribes, rather than genera, because bamboo DNA is particularly slow to differentiate, but it is useful to reveal convergent evolution, where similar species are not closely related. Species of large groupings such as broadly defined *Arundinaria*, *Sinarundinaria* and *Thamnocalamus* were shown to be less closely related than expected. More, smaller genera are now recognised. Isolated bamboos such as *Thamnocalamus tessellatus* from S Africa, and


Bergbambos - fine bristles

Arundinaria densifolia from Sri Lanka, were shown by their DNA to be unrelated to others such as *Thamnocalamus spathiflorus* from the Himalayas and *Arundinaria gigantea* from the US. New genera were required, e.g. *Sarocalamus*, *Bergbambos*, *Oldeania* and *Kuruna*. This explained some unusual characters, such as the particularly delicate oral setae of the widely cultivated *Bergbambos tessellata*, formerly *Thamnocalamus tessellatus*.

Combining the DNA data with our better understanding of floral and vegetative characters has led to a more stable classification. Development of this collaborative and consensual approach took a while, but use of generic names for cultivated bamboos has become much more stable over the past 15 years.

Several important publications have helped along the way. *Bamboos of the World* (Ohrnberger 1999) compiled all published names, following advice from bamboo taxonomists around the world. It became a benchmark, and started a sense of stability. The *Flora of China* bamboo account (Li et al. 2006), supported by molecular phylogeny, covered only half the bamboos of the world but added descriptions. The Species & Sources List of the American Bamboo Society has documented bamboos for sale since 1980, like a Bamboo 'Plant Finder' for the US, and now has nearly 500 entries. It standardises names of bamboos in cultivation across the US. Our own RHS Plant Finder serves a similar function in the UK. Many internet reference sources are available, mostly following standardised names.

Misapplied species names

Clarifying the proper application of species names is an important part of sorting and stabilising bamboo nomenclature. Names need to be tied to the right species or there is no end of confusion. Bamboos in cultivation for a long time have often been incorrectly named. An example was *Himalayacalamus hookerianus*. It was grown in the UK as *Sinarundinaria falcata*, while the name *Arundinaria hookeriana* was applied to *Himalayacalamus falconeri* 'Damarapa' (Stapleton 1994).

An introduction with red sheaths, misidentified as *Fargesia rufa*, has distinct auricles that reveal its true identity as the bamboo named *F. dracocephala* in China, Dragon-head Bamboo

Incorrect identification of recently introduced bamboos has also caused considerable problems. As one example, a very handsome bamboo with orange sheaths was introduced and sold as *Fargesia rufa*, but that was not the right name for this species. It was actually *Fargesia dracocephala*, Dragon-head Bamboo. When it was first introduced the red-coloured sheaths made the name *Fargesia rufa* seem appropriate, but that name really belongs to a different species altogether, best placed in *Borinda*.

Dragon-head bamboo has long orange leaf sheath auricles with twisted setae, all reminiscent of a dragon's head, complete with flames.

The name *F. rufa* should not have been applied, but it was, and to keep the association we now call this cultivar of Dragon-head Bamboo *Fargesia dracocephala 'Rufa'*.

Conclusion

Plenty of new species are yet to be discovered in the wild, and the prospects for finding exciting new horticultural introductions are very good. Much work remains to be done on recently introduced bamboos as well, but the road ahead looks much straighter now that the generic framework for cultivated bamboos has been stabilised, and the sands are no longer shifting.

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ONLINE RESOURCES

Flora of China bamboo account
http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=20753

American Bamboo Society Species List
http://www.bamboo.org/BambooSourceList

Bamboo Identification website
http://www.bamboo-identification.co.uk

TROPICOS database of plant names
http://www.tropicos.org

IPNI database of plant names
http://www.ipni.org/ipni/plantnamesearchpage.do

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