

there is, at present, no consensus as to which system would offer the greatest stability of names. However, the general consensus that also emerged is that: (i) theoretical and practical consequences of phylogenetic nomenclature must be explored, (ii) exploratory names and definitions coined under the rules of the PhyloCode would not be valid, and (iii) the debate over the differences of approach between the PhyloCode and the traditional Codes might eventually improve biological nomenclature.

However, the future of biological nomenclature might be rather different with the announcement [10] of the forthcoming First International Phylogenetic Nomenclature Meeting in Paris (6–9 July, 2004). In the circular for this conference (see <http://www.ohio.edu/phylocode/>) it is stated that ‘Papers presented at the meeting will be assembled into a symposium volume...whose publication will coincide with the *implementation of the PhyloCode*. This volume will represent the *official* starting point of phylogenetic nomenclature as implemented in the PhyloCode...’ [our italics].

We welcome any effort that explores the extent to which phylogenetic principles can be implemented more effectively into the theory and practice of systematics. Phylogenetic revolutions of the past have invigorated the discipline of systematic biology. However, we deplore a situation in which two, very different, nomenclatural codes will compete to govern the rules for naming organisms. Every practicing taxonomist would be faced with the dilemma of having to choose which of the two nomenclatural codes to use in the definition of names. Furthermore, editors of scientific journals will have to decide whether to accept taxonomic papers defining names according to the PhyloCode or the traditional Codes. Some journals might decide to publish only names coined according to the traditional, Linnaeus-based codes, whereas others might accept only papers applying phylogenetic nomenclature. We feel that this state of affairs will be detrimental to

describing and cataloging the world’s biodiversity and that confusion will reign. There are already too few high-quality international journals willing to publish basic taxonomic research, in spite of the fact that the description and conservation of biodiversity is greatly dependent on such studies. The unilateral implementation of the PhyloCode might indirectly result in the number of journals publishing taxonomic studies being reduced yet again. We run the risk that agencies and public bodies who require, and are increasingly demanding, taxonomic information will look upon systematists as an assemblage of petulant quibblers.

References

- 1 International Commission on Zoological Nomenclature, (1999) *International Code of Zoological Nomenclature*, 4th edn, International Trust for Zoological Nomenclature
- 2 de Queiroz, K. and Gauthier, J. (1994) Toward a phylogenetic system of biological nomenclature. *Trends Ecol. Evol.* 9, 27–31
- 3 Bryant, H.N. and Cantino, P.D. (2002) A review of criticisms of phylogenetic nomenclature: is taxonomic freedom the fundamental issue? *Biol. Rev.* 77, 39–55
- 4 Pleijel, F. and Rouse, G.W. (2003) Ceci n’est pas une pipe: names, clades, and phylogenetic nomenclature. *J. Zool. Syst. Evol. Res.* 41, 162–174
- 5 Dominguez, E. and Wheeler, Q.D. (1997) Taxonomic stability is ignorance. *Cladistics* 13, 367–372
- 6 Nixon, K.C. and Carpenter, J.M. (2000) On the other ‘phylogenetic systematics’. *Cladistics* 16, 298–318
- 7 Benton, M.J. (2000) Stems, nodes, crown clades, and rank-free lists: is Linnaeus dead? *Biol. Rev.* 75, 633–648
- 8 Brochu, C.A. and Sumrall, C.D. (2000) Phylogenetic nomenclature and paleontology. *J. Paleontol.* 75, 754–757
- 9 de Queiroz, K. and Cantino, P.D. (2001) Phylogenetic nomenclature and the PhyloCode. *Bull. Zool. Nom.* 58, 254–271
- 10 Donoghue, M.J. and Gauthier, J.A. (2004) Implementing the PhyloCode. *Trends Ecol. Evol.* 19, 281–282

0169-5347/\$ - see front matter © 2004 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tree.2004.04.001

Implementing the PhyloCode

Michael J. Donoghue¹ and Jacques A. Gauthier²

¹Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT 06520, USA

²Department of Geology and Geophysics, Yale University, New Haven, CT 06520, USA

The First International Phylogenetic Nomenclature Meeting is scheduled to take place in Paris, 6–9 July, 2004. Its aim is to advance the implementation of the PhyloCode (<http://www.phylocode.org>), which governs a new system of nomenclature designed to name the parts of the Tree of Life by explicit reference to phylogeny [1]. The Paris meeting will bring into existence an International Society for Phylogenetic Nomenclature (ISPN), which will govern the use and further development of the PhyloCode and oversee the proposed name registration system. Contributed talks will highlight the application of phylogenetic

naming within many major groups of organisms, there being much still to be learned about how best to frame phylogenetic definitions to accommodate phylogenetic uncertainty, ensure continuity with the taxonomic literature, and so on. Ultimately, the plan of the Society is to produce a volume (or perhaps several) that would serve as the official starting point for the PhyloCode.

The PhyloCode provides an alternative to the rank-based nomenclatural system embodied in the current botanical, zoological and bacteriological Codes. Naming under the traditional Codes is tied to the assignment of categorical ranks (family, genus, etc.). Consequently, a clade whose composition and diagnostic characters have

Corresponding author: Michael J. Donoghue (michael.donoghue@yale.edu).

not changed might have its name changed solely owing to a shift in rank. This is especially unfortunate because rank assignment is subjective and of dubious value (e.g. [2]). Rank-based nomenclature might also provide a disincentive for naming clades one at a time, as they are discovered, for fear of introducing cumbersome new categories (Parvorder, Cohort, Infraclass, etc.) and/or causing a cascade of rank-related name changes [3]. Also importantly, spelling changes associated with changes in rank (e.g. -idae for zoological family or -inae for subfamily) will diminish the utility of taxonomic names in accessing online resources, as search engines see a world of difference between 'Iguanidae' and 'Iguaninae'.

The PhyloCode has provoked strong reactions (e.g. [4]) and counter reactions (e.g. [5]). One unfounded fear is that the PhyloCode will lead to the replacement of all existing taxonomic names. On the contrary, if the PhyloCode is followed, names that currently refer to clades will stay the same. The difference is that they will be given 'phylogenetic definitions' designed to tie them unambiguously and permanently to hypothesized clades.

Species names are another major concern. However, the PhyloCode applies only to naming clades, not species, although the aim is to include provisions for naming species once the associated issues have been thought through. A variety of options have been considered for the form of species names [6], but, in the final analysis, the PhyloCode is likely to have little effect on the way we speak and write about species, except that species names would become more stable [7].

Other criticisms are unsupported assertions. For example, Barkley *et al.* [8] contend that conversion to the PhyloCode could cost 'millions to billions of dollars'. But, in the absence of any analysis, this seems like a scare tactic. Some believe that the PhyloCode will cause nomenclatural chaos, thereby eroding the credibility of the taxonomic community. The issue of the coexistence of the PhyloCode with the traditional Codes requires a thorough analysis, but the PhyloCode already goes a long way toward anticipating and ameliorating possible problems. For example, because the membership associated with particular names sometimes differs between rank-based and phylogenetic systems, the PhyloCode recommends use of a convention to mark which names are governed by which system.

There is also the issue of how societies and journal

editors might react to the formal existence of the PhyloCode [9]. Will they accept names put forward under different Codes, or under only one? It is hard to say, but one assumes that intellectual freedom will be respected and that there will be venues for naming under both systems. Implementation of the PhyloCode might even open new and quicker outlets, which would be wonderful given the exponential rate of clade discovery.

It is time to stop fretting over what might happen and instead to study calmly how to manage the situation to benefit us all. After all, those who favor switching to rank-free classification are no less concerned about the biodiversity crisis and understand the urgency to discover and describe the variety of life. Supporters of the PhyloCode have raised legitimate concerns and might have found some better ways to proceed. This possibility deserves our serious attention.

These are exciting times for biological nomenclature, the likes of which could not have been anticipated. Who would have guessed that we would be fundamentally rethinking the rules for naming? The meeting in Paris is certain to be both enlightening and entertaining, and whether one favors or opposes the PhyloCode, it is also certain to be of historic significance for biology.

References

- 1 de Queiroz, K. and Gauthier, J. (1994) Toward a phylogenetic system of biological nomenclature. *Trends Ecol. Evol.* 9, 27–31
- 2 Donoghue, M.J. (2001) A wish list for systematic biology. *Syst. Biol.* 50, 755–757
- 3 Hibbett, D.S. and Donoghue, M.J. (1998) Integrating phylogenetic analysis and classification in fungi. *Mycologia* 90, 347–356
- 4 Benton, M.J. (2000) Stems, nodes, crown clades, and rank-free lists: is Linnaeus dead? *Biol. Rev.* 75, 633–648
- 5 Bryant, H.N. and Cantino, P.D. (2002) A review of criticisms of phylogenetic nomenclature: is taxonomic freedom the fundamental issue? *Biol. Rev.* 77, 39–55
- 6 Cantino, P.D. *et al.* (1999) Species names in phylogenetic nomenclature. *Syst. Biol.* 48, 790–807
- 7 Cantino, P.D. (2000) Phylogenetic nomenclature: addressing some concerns. *Taxon* 49, 85–93
- 8 Barkley, T.M. *et al.* (2004) Linnaean nomenclature in the 21st Century: a report from a workshop on integrating traditional nomenclature and phylogenetic classification. *Taxon* 53, 153–158
- 9 Sluys, R. *et al.* (2004) The PhyloCode: naming of biodiversity at a crossroads. *Trends Ecol. Evol.* 19, 280–281

0169-5347/\$ - see front matter © 2004 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tree.2004.04.004

The long history of the biotic homogenization concept

David M. Wilkinson

Biological and Earth Sciences, Liverpool John Moores University, Byrom Street, Liverpool, UK, L3 3AF

A recent paper in *TREE* [1] about the consequences of biotic homogenization claimed that 'it was first noted by Elton' in his 1958 book *The Ecology of Invasions* [2].

However, the realization that human activity has been causing the distribution of some organisms to expand greatly around the planet and, in consequence, lead to the extinction of other species, has a much longer history.

Corresponding author: David M. Wilkinson (D.M.Wilkinson@livjm.ac.uk).