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Nomenclatural convention versus taxonomic judgment: Linnaeus was unaware of monophyly - A response to the *point of view* of Gregory B. Pauly, David M. Hillis, and David C. Cannatella

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Abstract

In their *Point of View*, published in Herpetologica 65(2), GB Pauly, DM Hillis, and DC Cannatella discussed the destabilizing effect of species names lists in taxonomy exemplified by the sixth edition of the "Scientific and Standard English Names of Amphibians and Reptiles of North America" (Crother et al. 2008). Here I will show that these authors obviously mingled the two nomenclatural concepts of the International Code of Zoological Nomenclature and the International Code of Phylogenetic Nomenclature, and that some of the issued raised are unwarranted under the former nomenclatural concept.

Keywords

Nomenclature, taxonomy, PhyloCode, clades, common names.

Introduction

In their *Point of View*, published in Herpetologica 65(2), GB Pauly, DM Hillis, and DC Cannatella discussed the destabilizing effect of species names lists in taxonomy exemplified by the sixth edition of the "Scientific and Standard English Names of Amphibians and Reptiles of North America" (Crother et al. 2008). The primary criticism raised by these authors is that a species names list that incorporates recent taxonomic and thereby nomenclatural changes promotes taxonomic instability and hinders communication. Furthermore, concerns were raised that such lists endorsed by scientific societies would suppress 'taxonomic freedom'. Here I will show that species names lists cannot destabilize taxonomy and do not harm 'taxonomic freedom'. Furthermore, I will argue that Pauly et al. (2009) mingled taxonomy and nomenclature and confused the concepts of the International Code of Zoological Nomenclature (hereafter "*ICZN*") with those of the at least partly incompatible (Dayrat et al. 2008) concept of the International Code of Phylogenetic Nomenclature (hereafter "*PhyloCode*", and referenced as Cantino and de Queiroz 2007; e.g., de Queiroz and Gauthier 1990, 1992; de Queiroz 2006; Dubois 2007a). Hence, some arguments raised by Pauly et al. (2009) are incorrectly addressed regarding the *ICZN*, although, they may be valid under the *PhyloCode*.

Species names lists and stability

Species names lists like the aforementioned intend to map common names to the most recent scientific names, and *vice versa,* and are equally useful to professionals and amateurs for getting an overview and keeping track of taxonomic and nomenclatural changes. They bridge a gap to previous literature. Additionally, annotations given in the list provide the reader with the relevant citations. Thus, such lists indeed attempt to "standardize and stabilize common names and thereby promote efficient communication" (Pauly et al. 2009: 115). The fact that this list was sanctioned by three major North American herpetological societies, and is deemed the 'official names list' by these societies, has a stabilizing effect on the use of common names in journals published by these societies and elsewhere. As such, species names lists cannot destabilize taxonomy, as claimed by Pauly et al. (2009).

Taxonomy versus nomenclature

Taxonomy and nomenclature are two separate disciplines (de Queiroz 2006; Dubois 2005, 2007b, 2008). Taxonomy is the science of classification (Dubois 2008), whereas nomenclature, on the other hand, is not a science but a convention (Knapp et al. 2004) that serves taxonomy. However, these disciplines are tightly connected (e.g., De Queiroz 2006), which led Dayrat (2005: 410) to call taxonomy a "peculiar discipline". De Queiroz (2006) pointed out that failing to distinguish between these two disciplines is not uncommon but leads to considerable confusion (see Dubois 2007a, b for discussion).

Taxonomic stability and freedom versus nomenclatural stability

Pauly et al. (2009) raised concerns that the aforecited species names list would promote taxonomic instability. Such concerns are unwarranted because, unless we have found the one true 'Tree of Life' or intend to deny evolution, taxonomy *per se* cannot be stable. As our understanding of organisms increases (Knapp et al. 2004) and new methods and data become available (Dubois 2008), existing taxa will be revised and new ones will be described. Or as Padial and de la Riva (2006: 863) put it, "If the inventory of living species is far from finished then arresting any change in lists composition could only come from a similar arrest of taxonomic work". Furthermore, Pauly et al. (2009) argue that taxonomic freedom would suffer from names lists authorized by scientific societies and that are declared as official names list for the use of names in journals. The authors assert, "…no scientific society should suggest or imply that they are regulating scientific names because such regulation is counter to the spirit of Zoological Nomenclature (ICZN 1999)" and state that taxonomic freedom would allow individuals "…to ignore published proposals" (Pauly et al. 2009: 119). Contrary to these claims, the names list of Crother et al. (2008) does not regulate scientific names but common names. The authors' guidelines for journals of the supporting societies, if at all mentioned state that any name available under the *ICZN* may be used (e.g. Herpetologica, Herpetological Monographs). Nevertheless, the use of names deviating from the senior synonym or from the accepted taxon name may require explanation. However, the *ICZN* is designed as a universal framework for the creation and application of names to taxa that aims to "provide the maximum universality and continuity in the scientific names" (ICZN 1999) without ruling upon taxonomic judgment. Naming a taxon is therefore "independent of taxonomic opinion" (Knapp et al. 2004). The *PhyloCode* also claims to maintain the greatest possible separation between nomenclature and taxonomy (de Queiroz 2006: 161; 6th principle of the *PhyloCode* 2007). However, as demonstrated by de Queiroz and Cantino (2001: 824), neither the *ICZN* nor the *PhyloCode* are "entirely independent of taxonomy". While the *ICZN*, as a rank-based concept, requires a preliminary taxonomic judgment when assigning a genus name to a species (mandatory due to binominal principle) or a rank to a taxon (e.g., subspecies, species, genus, family), the *PhyloCode* "has adopted the unified or general lineage

species concept of de Queiroz" (Baum 2009: 84). Nevertheless, beyond these conceptual limitations, both nomenclatural systems grant taxonomic freedom. As pointed out by Pauly et al. (2009) taxonomic freedom also allows individuals to ignore taxonomic decisions (the hypotheses) made in proposals; however, contrary to Pauly et al. (200), and for the sake of nomenclatural stability, scientific names cannot be ignored. Once a new name is validly published under the provisions of the *ICZN*, it is available, regardless of acceptance or refusal of the taxonomic hypothesis (e.g., one may not accept the evidence provided, as stipulated in Art. 13.1.1, but see Art. 18, ICZN 1999) and, if considered a senior synonym, has priority (Art. 23, ICZN 1999). Nomenclature then is stabilized. Moreover, under the *PhyloCode* stability is one of the basic principles (4. principle, PhyloCode 2007). Thus, since scientific names and their application are governed by a set of rules that provide stability, taxonomic hypotheses cannot destabilize them and such hypotheses cannot be consistent with the rules of nomenclature beyond the conceptual limits already mentioned.

Confusing different nomenclatural concepts

Pauly et al. (2009: 117) argue that taxon names above the rank of species (e.g., genus and family group names) must refer to monophyletic groups (clades). This argument is inappropriate regarding the *ICZN*, as the Linnaean based nomenclature is "theory-free regarding taxonomy" (Dubois 2008: 52) and non-evolutionary (Bryant 1996; Hillis 2007) and says nothing about monophyly (e.g., de Queiroz and Gauthier 1992). Supraspecific names such as genus-group names of a genus-species combination (binominal name) are not necessarily assigned to clades under the *ICZN*. Nevertheless, the reason for Pauly et al.'s (2009) demand that existing genus-species combinations should remain stable unless the genera are found to be non-monophyletic is obvious from the viewpoint of phylogenetic nomenclature. Under the *PhyloCode*, existing genus-group names are treated as "*pronomen*", that is, the first part of a species name (Art. 21.2, *PhyloCode* 2007; Dayrat et al. 2008), thereby ignoring the rank. Consequently, any reassignment of a genus-species combination to another genus-group name under the *ICZN* would as well require a change of a species name under the *PhyloCode* (Wolsan 2007; Dayrat et al. 2008). Furthermore, some specifiers (a species that serves as reference point to specify a clade; Art. 11, *PhyloCode* 2007) would be replaced synonymously by other names (Dayrat et al. 2008). However, as already pointed out by Dayrat et al. (2008: 57), the *PhyloCode* provides information on how to deal with such name changes (e.g., Note 11.1.1, *PhyloCode* 2007) to avoid nomenclatural instability, and rules that only the "…second part of the species binomen may be treated as the name of the species… [and] may be combined with the names of clades other than the prenomen." (Art. 21.5, *PhyloCode* 2007). Furthermore, contrary to Pauly et al.'s (2009) opinion concerning the "Taxon Concept", scientific names are not mapped to publications under the *ICZN*. One of the basic principles of the *ICZN* is Typification. The name-bearing type concept permanently maps a name to a type specimen (for species-group names) or a type species (for genus-group names) that "provides the objective standard of reference for the application of the name it bears" (Art. 61, ICZN 1999) regardless of other information provided with the name (e.g., a diagnosis) (Baum 2009; Dubois 2007b). Under the *PhyloCode*, names are defined (*sensu* de Queiroz and Cantino 2001) for clades (de Queiros and Cantino 2001; de Queiroz 2006) and the publication in which the (reference) phylogeny is published in serves as reference for the clade name ("reference phylogeny", see glossary *PhyloCode* 2007).

It is apparent that Pauly et al. (2009) had in mind the *PhyloCode* rather than the *ICZN*, but only refer to the latter concept. The species names list, however, follows the rules of the Linnaean nomenclatural concept under which name changes may occur frequently for several reasons, as pointed out by Cantino et al. (1999).

Discussion and conclusion

It is obvious from previous published literature (e.g., Hillis 2007), and again from Pauly et al.'s (2009) *Point of View* that proponents of the *PhyloCode* often seem to confuse taxonomic and nomenclatural issues. This was already recognized by Dubois (2007b: 2), stating that it "…is basic to the *PhyloCode* philosophy and to the disagreements between the latter and that of the Code [ICZN]". The two nomenclatural concepts of the *ICZN* and the *PhyloCode* are partly incompatible to each other, and, although great efforts have been made to eliminate these incompabilities, uncertainties remain. In part, the *PhyloCode* refers to the *ICZN*, and for names to be available in both worlds, the latter has to be followed, at least for those taxa governed by the *ICZN*, for names to be widely accepted. However, as pointed out by Dubois (2007b), making names available under both concepts requires thorough knowledge of both Codes. Moreover, such an attempt may result in an undesirable massive synonym load under the *ICZN* since several supraspecific names for hierarchical nested clades (under the *PhyloCode*) will be treated as "division" (glossary, ICZN 1999) and hence, as subgeneric names under the *ICZN* (Art. 10.4, ICZN 1999, see discussions in Dubois, 2007a, b; Hillis 2007). Although such subdivisions are theoretically possible under the *ICZN* (Dubois 2007a; Hillis 2007) other rulings like the principle of priority (Art. 23., ICZN 1999), the 'First Reviser's action' (Art. 24.2, ICZN, 1999) or shifts of names from subgeneric to generic rank could drive *ad absurdum* the phylogenetic based intention of such names and would cause confusion under the *ICZN*. To avoid this, I suggest to consider nested clade names as "collective groups" under the *ICZN* (see Arts. 10.3, 10.4, 11.8, 42.2.1, ICZN 1999) due to the fact, that "collective groups" do not require designation of a type species and do "not compete in priority with other genus-group names" (Art. 23.7.1–2, ICZN 1999). These names would therefore remain available as equal synonyms and can be used under the *PhyloCode* as available clade names. Although the *PhyoCode* has a rapidly increasing number of proponents, it is yet not the official Code, and species names lists such as the aforementioned usually follow the concept of the *ICZN*.

Here I have shown that names lists, at least when considered under the provisions of the *ICZN*, cannot destabilize taxonomy and that taxonomy cannot be destabilized by name changes since taxonomy, as an ongoing process, can never be stable. In fact, name changes do occur, at least under the *ICZN*, but species names lists that cover the most recent changes can help to keep track of them. Further, I have shown that Pauly et al. (2009) have mingled the Linnaean and phylogentic nomenclatural concepts.

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