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Short Communication

About the scientific names of paraphyletic taxa

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Abstract: The 'naturality' of monophyletic taxa in comparison with that of paraphyletic ones is discussed, with examples from Clitellata. Regular scientific names for paraphyletic taxa are inevitable in a workable biological classification.

Key words: Paraphyly, monophyly, holophyly, Oligochaeta, Clitellata, Tubificidae, Naididae

"The road to hell is paved with good intentions," reads a French proverb. One such good intention has been the adjusting of the countless forkings of phylogenetic trees to fit the Linnaean-type classification of the living world, allegedly to make the latter more natural. The main principle is that all valid taxa should be monophyletic, i.e. representing a full clade. Many easily distinguishable and genetically uniform groups are paraphyletic (grades) and should, according to phylogenetic taxonomy, be deprived of scientific names. Replacement of Oligochaeta with the vernacular name "oligochaetous clitellates" (Martin et al., 2008), and the incorporation of the Tubificidae into the Naididae as "tubificoid Naididae" (Erséus et al., 2008) serve as 2 recent examples. However, many branches of biology, such as the registers of biodiversity, need a concise system of scientific names for all taxa (see also Schmelz and Timm, 2007).

A strictly phylogenetic system does not always satisfy this need. There are far too few formal and comprehensive ranks (classes, orders, etc.) available for denoting every node of the phylogenetic tree. For example, if we regard animals as remote successors of the Archaea, then every nominal genus of the latter would have a much higher rank than the whole kingdom of Metazoa.

Let us discuss the main stumbling block on the way to combining phylogenetic taxonomy with the practical needs of other branches of biology: the presumably unnatural status of paraphyletic taxa. Does a strict following of clades actually make the system more natural? The trouble is rooted in the extrapolation of Hennig's ideology. The cladistic method was introduced by Willi Hennig (1966), who limited it to extant taxa, leaving aside palaeontology. His theoretical assumption was that a parent taxon (species or any higher rank) principally diverges into 2 equally new taxa. This means that every bifurcation in the "river out of Eden" (sensu Dawkins, 1995), consisting of many individual populations, species, etc., is in a genetic sense Y-shaped. Both new units differ from the original stem and change with comparable speed. Unfortunately, this is only a particular case of phylogenetic divergence. Isolation per se will create only slow changes in the gene pools of the daughter clades.

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Most probably, new taxa are introduced by small runaway groups (populations) that are invading a new territory, 'inventing' a qualitatively new habitat or kind of food, or changing their reproductive behaviour. Directed natural selection will shortly introduce and develop new characters separating them from their parent taxon. The stem group, becoming formally paraphyletic, will remain in the 'mainstream'; its gene pool is largely controlled by stabilising selection. For example, the ancestors of Naididae and Pristinidae (or their common ancestor) separated from the Tubificidae as small populations, abandoning sediment depths and settling on the macrovegetation, a process followed by rapid morphological and physiological changes. Another example is one clade of Lumbriculidae that has become carnivorous and has specialised in this type of feeding to such a degree that it has acquired many new morphological adaptations (suckers, jaws, loss of chaetae, etc.), rendering them the founders of a new, quickly radiating taxon of Hirudinea + Branchiobdellida. Owing to these fundamental phenotypic changes, this clade has even been treated as a separate (sub)class, Hirudinea or Hirudinoidea. Both ancestral families, the Tubificidae and the Lumbriculidae, retained their previous way of life as principally sediment-eaters and maintained their general body structure. True enough, 2 lumbriculid genera, *Phagodrilus* and *Agriodrilus*, have also become predatory and developed a modified pharynx, but neither jaws nor suckers. If we were able to follow evolution over geological time, we would not notice any principal changes in Tubificidae and Lumbriculidae after the separation of the ancestral naidids or leeches. They were both genetically and ecologically homogeneous, with easily recognizable natural assemblages, and they have remained as such. Similarly, the European kingdoms did not change their names after their colonies gained independence.

The people of the former USSR had a proverb: "We, the Soviets, will heroically overcome difficulties created by ourselves." This meant that the ruling party tried to squeeze all social and economic activities into the framework of Marxist ideology, which led to the collapse of the state. In a similar way, the unreasonable application of Hennigian (correct!) ideas in biological nomenclature can make the latter impracticable for many purposes, such as for registers of biodiversity. I would suggest resolving the conflict between phylogeny and the practical needs of classification in a pragmatic way. No formal law compels us to ignore paraphyletic taxa as valid; this has merely been the result of a subjective decision. Let us accept the paraphyla as natural in so much as they have arisen from a single ancestor. They are genetically homogeneous and, essentially, they are often the most practical units for classification. Monophyletic taxa in the narrowest sense, or complete clades, can be called holophyla. This term has been successfully adopted by palaeontologists, whose study objects are often paraphyletic but still require scientific names (Valentine, 2004). Thus, we shall have 2 kinds of natural, monophyletic (s.l.) taxa: the holophyla and the paraphyla. With this conception, we save the regular system consisting of valid nominal taxa, all of them having their scientific names. There is no need to avoid the traditional scientific names of the Oligochaeta, Tubificidae, Rhyacodrilinae, Lumbriculidae, or even Annelida, replacing them with conditional names such as 'oligochaetes' and 'tubificids.' On the contrary, in a detailed phylogenetic scheme, besides regular scientific names and ranks of Linnaean hierarchy, we can use an unlimited number of conventional names or symbols.

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