

Miscellanea nomenclatorica batrachologica

20. Class-series nomina are nouns in the nominative plural: Terrarana Hedges, Duellman & Heinicke, 2008 must be emended

Alain DUBOIS

Reptiles & Amphibiens, UMR 5202 CNRS OSEB,
Département Systématique & Evolution, Muséum National d'Histoire Naturelle,
CP 30, 25 rue Cuvier, 75005 Paris, France
<adubois@mnhn.fr>

Although their nomenclature is currently not governed by the *Code*, class-series nomina in zoology have always been nouns in the nominative plural, and this should become a formal Rule of the *Code*. About 600 nomina have been created since 1758 for taxa above the rank superfamily in the class AMPHIBIA, and they all followed this universal “implicit Rule”. An exception is the recently published nomen TERRARANA Hedges, Duellman & Heinicke, 2008, which is a noun in the nominative singular. Two possible emendations are here proposed for this nomen. As for many other nomina of higher taxa, the spelling that will be retained by the majority of authors will become the correct one. This paper also discusses briefly the problems created by the premature creation of class-series nomina, mostly based on quantitative criteria such as a high number of included species, in a group like the amphibians, whose phylogeny and taxonomy are still under frequent and important changes and not yet stabilized.

Typographical conventions. – In the text below, species-series and genus-series nomina (see DUBOIS, 2000) are printed, as usual, in lower case *italics*, whereas nomina of higher-ranked taxa are written in small capitals: family-series nomina are in *ITALICS*, and class-series nomina in **BOLD**. Nomenclaturally unavailable nomina (anoplonyms) (see DUBOIS, 2000) are presented “between quotation marks”. Vernacular nomina, i.e. nomina that are not Latin or latinized, are presented underlined. “The *Code*” refers to the fourth edition, currently in force, of the *International Code of Zoological Nomenclature* (ANONYMOUS, 1999), which is here quoted as “ANONYMOUS” for reasons explained in DUBOIS (2008b).

CLASS-SERIES NOMINA ARE NOUNS IN THE NOMINATIVE PLURAL

In order to communicate efficiently about organisms, biologists and non-biologists need a system of classification of the latter into taxa (taxonomy) and of nomination of taxa (nomenclature). Scientific nomina are not definitions of taxa, evolutionary or other theories, or praises for persons, but just neutral, meaningless labels pointing unambiguously and universally to taxa as defined within the frame of given taxonomies (DUBOIS & RAFFAELLI, 2009). To be able to play this role, biological nomenclature must follow a set of Rules, provided in zoology by the *Code*.

The current *Code* regulates the nomenclature of zoological taxa in three “groups of names” or *nominal-series* (DUBOIS, 2000): the *species-*, *genus-* and *family-series*. Except for a few general statements (Art. 1-4, 7-10, 11.1-11.3, 14, 27-28 and 32.5.2.6), it does not provide binding Rules for the nomenclature of higher taxa (above the rank superfamily), i.e., for *class-series* nomina. This is a potential source of confusion and miscommunication between scientists. It is particularly problematic at a time when, as a result of the various phylogenetic analyses that are regularly produced, numerous such taxa are recognized and named. To avoid the progressive development of a “nomenclatural chaos” in higher taxonomy, DUBOIS (2005a-b, 2005e, 2006a-b, 2007a) proposed a set of Rules to govern this nomenclature.

In the three nominal-series covered by its Rules, the *Code* states what kinds of nomina are acceptable. Thus, a family-series nomen must be “a noun in the nominative plural” based on an available generic nomen (Art. 11.7), a genus-series nomen “must be a word of two or more letters and must be, or be treated as, a noun in the nominative singular” (Art. 11.8) and a species-series nomen must be “a word of two or more letters, or a compound word”, and be, or be treated as, either an adjective or a participle in the nominative singular agreeing in grammatical gender with the generic nomen, a noun in the nominative singular standing in apposition to the generic nomen, or a noun or an adjective in the genitive case (Art. 11.9). These possibilities are limited: for example, a genus-nomen cannot be an adjective (but see DUBOIS, 2007b), and a specific epithet cannot be a verb, an adverb, or a noun or an adjective at a case other than nominative or genitive.

In contrast, the *Code* does not provide any Rule or recommendation for the formation of the nomina of higher taxa. However, it has been a universal practice since LINNAEUS (1758) to use, for such taxa, nouns in the nominative plural, or treated as such, just like in the family-series. The logic behind this is simple: lower ranked nomina (species, genera) are in the singular, and higher ranked nomina (tribes, families and above) are in the plural. In class-series nomina, the plural is easy to recognize for terms that were borrowed without change from classical Latin. This was often the case in early zoology, as can be exemplified by looking at some of the class-series nomina in LINNAEUS (1758) (see DUBOIS, 2007d). Thus, his nomen **FERAE** is the nominative plural of *fera* (“wild animal”), his **CETE** that of Plinius’ Latin noun *cetos* (“large sea animal, whale”) and his **AVES** that of the Latin noun *avis* (“bird”). It is sometimes less straightforward to ascertain the etymology of nomina that were not borrowed directly from classical Latin nouns, but based on terms from other languages including Greek, or from neologisms derived from combined Latin, including lower Latin, roots.

The nomina not directly borrowed from classical Latin are the overwhelming majority of class-series nomina in zoology. Regarding these nomina, given the possibilities offered by the Latin grammar, which are not unlimited (see e.g. DUBOIS, 2007*b*), it is usually rather easy to assume the nominative singular from which they were derived. Thus, many nomina ending in “-A” can be assumed to be derived from “neo-Latin” neuter nouns of the second declension, with nominative singulars in “-um” (or rarely in “us”, e.g., *virus*), but there are other possibilities (neuter nouns of the third and fourth declensions, with various endings in the nominative singular). Similarly, nomina ending in “-I” must be assumed to be derived from masculine or feminine nouns of the second declension (nominative singular in “-us” or “-er”), those ending in “-AE” from feminine or masculine nouns of the first declension (nominative singular usually in “-a”, with a few exceptions in “-as” or “-es”), those ending in “-ES” from masculine or feminine nouns of the third or fifth declensions (various kinds of nominative singulars), those in “-US” from masculine or feminine nouns of the fourth declension (nominative singular in “-us”), and the very rare ones in “-E” from neuter nouns of the second declension (e.g., *cetos* in Plinius). Despite the variability mentioned above, it should be noted that, if class-series nomina are to be Latin or latinized nouns in the nominative plural, only six endings (“-A”, “-AE”, “-ES”, “-I”, “-US” and exceptionally “-E”) are acceptable for them, whereas other endings (e.g., “-AS”, “-IS”, “-ON”, “-OS” or “-UM”) are not.

These “implicit Rules” of formation of class-series nomina have been followed until now by virtually all authors. This is the case for example for all class-series nomina created from 1758 to 2007 for animal taxa currently placed in the class AMPHIBIA, which are about 600 in number. Partial reviews of these nomina are to be found in KUHN (1967), DUBOIS (1984, 2004*a*, 2005*c-d*), FROST et al. (2006) and GRANT et al. (2006), and a complete review will soon be available (DUBOIS & FRÉTEY, in preparation). These nomina include: (1) nomina in the nominative plural directly borrowed from Latin language (e.g., CAUDATA Scopoli, 1777; NUDA Oppel, 1811; PEDATA Fischer, 1808; SIRENES Gray, 1825; TRITONES Gray, 1850); (2) nomina in the nominative plural ending in “-A”, assumed to be derived from “neo-Latin” neuter nouns of the second declension, or possibly from neuter nouns of the third and fourth declensions, with various endings in the nominative singular (e.g., AMPHIPNEUSTA Merrem, 1820; DIPNOA Leuckart, 1821; GYMNOPHIA Rafinesque-Schmaltz, 1814; NEOBATRACHIA Reig, 1958; SALIENTIA Laurenti, 1768); (3) nomina in the nominative plural ending in “-I”, assumed to be derived from “neo-Latin” masculine or feminine nouns of the second declension (e.g., ACERCI Wagler, 1828; CAUDATI Duméril, 1806; GEOPHILI Fitzinger, 1843; LACERTINI Gray, 1850; NEOBATRACHI Sarasin & Sarasin, 1890); (4) nomina in the nominative plural ending in “-AE”, assumed to be derived from “neo-Latin” masculine or feminine nouns of the first declension (e.g., AGLOSSAE Wagler, 1830; CALAMITAE Link, 1807; CRYPTOPLLEURAE Fitzinger, 1843; GEOMOLGAE Ritgen, 1828; PSEUDOSALAMANDRAE Bonaparte, 1850); (5) nomina in the nominative plural ending in “-ES”, assumed to be derived from “neo-Latin” masculine or feminine nouns of the third or fifth declension (e.g., BATRACHOPHIDES Latreille, 1825; BUFONIFORMES Cope, 1864; HELMINTHOPHES Wagler, 1824; MEANTES Linnaeus, 1767; SCOLECODES Ritgen, 1828). All these 600 or so nomina are therefore nouns in the nominative plural, including all the class-series nomina coined in the two recent works of FROST et al. (2006) and GRANT et al. (2006). So these “implicit rules” could have been considered shared by all taxonomists, even in the absence of a written statement in this respect in the *Code*.

THE NEED OF AN EMENDATION FOR **TERRARANA**

This is not true, as shown by the recent erection by HEGDES et al. (2008), in a well-known international refereed journal, of a new class-series taxon of **AMPHIBIA** which they called **TERRARANA**, a nomen which is clearly a noun in the nominative singular, as stated expressly by HEDGES et al. (2008: 21): “The name is derived from the Latin, *terra* (land) and *rana* (frog)”. For this nomen to be considered a noun in the nominative plural, it should have been derived from a neuter noun ending in “-um” in the nominative singular, thus “*Terraranium*”, which is clearly not the etymology indicated by the authors. The correct nominative plural for **TERRARANA** would be “**TERRARANAE**”.

Beside being in the nominative singular, the nomen **TERRARANA** is also ill-chosen for being formed exactly in the same manner as many genus-series nomina of **AMPHIBIA** that were built by adding a short root (usually of two syllables) before the generic nomen *Rana* Linnaeus, 1758: e.g., *Hylarana* Tschudi, 1838, *Nanorana* Günther, 1896 or *Chaparana* Bourret, 1939. Most of these nomina were created to designate taxa (genera or subgenera) of the family *RANIDAE* Rafinesque-Schmaltz, 1814 and related groups (DUBOIS, 1992; FROST et al., 2006), but some also exist in other amphibian groups, e.g., *Silurana* Gray, 1865, *Cyclorana* Steindachner, 1867 or *Rupirana* Heyer, 1999 (see FROST et al., 2006). For all amphibian taxonomists, the nomen **TERRARANA** will therefore evoke a genus, not a higher taxon. Besides, the spelling “*Terrarana*” not being preoccupied in the genus-series, it could validly be used in any zoological group to name a genus or a subgenus. Such cases of “hemihomonymy” (STAROBOGATOV, 1991), e.g., between the generic nomen *Ranoidea* Tschudi, 1838 and the superfamilial nomen *RANOIDEA* Rafinesque-Schmaltz, 1814, should preferably be avoided, as they are likely to cause confusions, in particular for candid users of electronic databases looking for zoological nomina (HILLIS, 2006; DUBOIS, 2007c). These statements are conform to the Recommendation 5 of Appendix B of the *Code*, which reads: “*New names (...) should not be liable to confusion with those of other taxa of any rank (...)*.”

Currently, class-series nomina not being covered by the *Code*, any author is entitled to use “his/her own nomenclature” for such nomina, without caring for priority or other criteria, and this is indeed what is being done in many cases (DUBOIS, 2004a; DUBOIS & OHLER, 2009). The only existing complete set of Rules for such nomina is that proposed by DUBOIS (2005a,e, 2006a). In fact, these Rules allow here to solve the two nomenclatural problems posed by the creation of the nomen **TERRARANA**.

According to the Rules (R8), (R21) and (R22) of DUBOIS (2006a: 229, 232), a class-series nomen may have received various spellings in its history, including its original one (*protonym*) and subsequent ones (*aponyms*). The term *aponym* is clearer than the ambiguous one of “emendation”, which can designate either a change in spelling of the nomen, in its rank or onymorph (hence a nomenclatural concept), or a modification of the definition of the taxon, either by intension (diagnosis) or by extension (content) (hence a taxonomic concept). Rule (R8) states that “*once created, any class-series nomen is deemed to preoccupy all possible spellings derived from the same root [my emphasis], and applying to taxa of any rank within the class-series*”, provided these taxa include the onomatophore (name-bearing type) of the original nomen. Thus, the various spellings that may have been used for a nomen by various

authors during the history of taxonomy are just to be considered aponyms of the same nomen, with the same author and date, and not different homonymous nomina with different authors and dates. Among these various spellings, under Rule (R22), the correct one nowadays, or *eunym* (DUBOIS, 2000), is not necessarily the protonym, but may be one of the aponyms, depending on subsequent usage, as spellings of universal or general usage must be conserved. Many examples of such situations in the class AMPHIBIA exist, as shown by a few examples: the aponym AMPHIBIA is the eunym of **AMPHYBIENS** De Blainville, 1816; **BATRACHIA** is that of **BATRACIENS** Brongniart, 1800 (first latinized as **BATRACHII**); **GYMNOPHIONA** that of **GYMNOPHIA** Rafinesque-Schmaltz, 1814; **ANURA** that of **ANOURES** Duméril, 1806 (first latinized as **ANURI**); **URODELA** that of **URODÈLES** Duméril, 1806 (first latinized as **URODELI**); **PERENNIBRANCHIA** that of **PÉRENNIBRANCHES** Latreille, 1824; etc. In all these cases, the author of the protonym remains the author of the nomen even if the eunym is an aponym. Many other examples could be given, in the whole animal kingdom: in class-series nomenclature, a large proportion of the nomina currently in use are aponyms (“emendations”), not protonyms (original spellings). It is therefore fully justified to emend such a nomen when it was clearly ill-formed from the start.

I propose to take advantage of the possibility offered by these proposed Rules to emend the ill-formed nomen **TERRARANA** before it is widely used in the literature. The new spelling should clearly be an aponym of the protonym, i.e., it should be derived from the same root, but being a nominative plural and non liable to be confused with a generic nomen based on the nomen *Rana*. The easiest way would be to transfer the original nomen to the nominative plural, as **TERRARANAE**. However, as a change is anyway necessary, one could go even one step further, and take this opportunity to suppress, for reasons of brevity and euphony, the unlucky sound repetition “RARA” in the original aponym, and to coin the shorter spelling **TERRANAE**. This nomen also includes the two terms used as roots for the protonym, “*terra*” and “*rana*”, although more compressed and “overlapping”. A similar compression of syllables can be found in other cases, e.g., in the rapid generic nomen *Pulchrana* Dubois, 1992. As analysed in detail in DUBOIS (1987, 2007b) and DUBOIS & RAFFAELLI (2009), the *Code* does not provide Rules or precise guidelines for the construction or for the latinization of nomina, so that such compressed spellings are fully acceptable as some possibilities among several that would derive from the same roots. As for many other class-series nomina, among the two spellings **TERRARANAE** and **TERRANAE**, the spelling that will be used by the majority of authors will become the correct one, but the spelling **TERRARANA** should not be used.

Therefore the new spellings are not new nomina, but aponyms of **TERRARANA**, which retains its original authors and date. They should be mentioned as “**TERRARANAE** Hedges, Duellman & Heinicke, 2008” or “**TERRANAE** Hedges, Duellman & Heinicke, 2008”.

UNWARRANTED CREATION OF NOMINA FOR HIGHER TAXA

It should be noted that the two aponyms above are proposed here purely on nomenclatural grounds (explained above) and for nomenclatural purposes: I suggest that, *if* this taxon is to be recognized and given this nomen, *then* the latter should be used under one of these two spellings. This does not mean that I consider warranted either this recognition or, and above

all, the fact of affording this taxon a rank above the family-series level. This action was justified by HEDGES et al. (2008: 11) mostly on the ground that this group “*is currently considered a single family, (...) that is larger than nearly any other family of tetrapods*” and would be made “*more manageable by splitting the group into four families*”. According to this strange philosophy, the rank of a taxon would be related to its size (number of included species), which means that it would be based on a quantitative criterion such as VAN VALEN’S (1973) “metataxonomic criterion” (see DUBOIS, 1988*a-b*). This idea is an old one, but, even with this taxonomic philosophy, it has long been acknowledged that important changes in the ranks of taxa should be done with care: “*What is altogether inadmissible (...) is the raising of a single taxon, say, a family, to the rank of order and the concomitant raising of all the subdivisions within this taxon without regard to the consequences for other families in this taxonomic group*” (MAYR & ASHLOCK, 1991: 273). HEDGES et al. (2008) avoided this discussion by failing to consider the consequences of their nomenclatural decision on the other related taxa of anurans.

As recently discussed in detail (DUBOIS, 2007*a*, 2008*c*), in modern taxonomies which are based on phylogenetic analyses, ranks express cladistic relationships between taxa and sister-group relationships, but they have no other biological or other meaning (MINELLI, 2000). This means that taxa sharing the same rank may include widely different numbers of taxa and of subordinate ranks. By itself, such an unbalanced situation is *very informative*. Thus, the existence of a high number of species in the group formerly known as the genus *Eleutherodactylus* Duméril & Bibron, 1841 was telling us something about the rate of speciation in this group, which appears much higher than in other groups of anurans and even of vertebrates, and might be related to their reproductive mode (DUBOIS, 2004*b*). Splitting this genus into several genera, and its family into several families, obscures this message. It is not at all justified by the fact that these taxa are considered as “clades”¹ as the latter can be recognized at any level in the taxonomic hierarchy, and knowing that a group is holophyletic provides no information on its rank (for more details, see DUBOIS, 2008*c*).

HEDGES et al. (2008) did not discuss the status and nomen of the hypothesized sister-group of their taxon, nor the possibility to still provisionally use higher ranks of the family-series, such as superfamily, epifamily, etc., as suggested by DUBOIS (2005*c*), in order to avoid the premature creation of class-series nomina. Despite the large amount of new molecular phylogenetic data recently published, the higher taxonomy of the AMPHIBIA is certainly still far from being stabilized (see e.g. WIENS, 2007), and it is premature to coin new nomina for higher taxa (all the more that many nomina already exist and can be used for some of these taxa). This problem is particularly strong within the frame of a “pseudo-ranked” nomenclature, such as that used by FROST et al. (2006), which does not provide by itself any information on the hypothesized cladistic relationships between taxa, and especially about sister-group pairs (see DUBOIS, 2007*a*: 34, 2008*c*). The reality of this problem was clearly

1. Although its has been spreading in the recent literature, the use of the term “clade” to designate taxa is questionable. A clade is a natural lineage in nature, but we never observe (or will observe) clades. We only build hypotheses about clades based on our analyses, and these hypotheses change regularly with new data and analyses. Taxa are *concepts* which, as all scientific concepts and theories, are refutable and abandoned once refuted. It is normal if taxa, which are scientific concepts, change, but “clades”, being natural entities, cannot change. We do not need this term in taxonomy. The terms “group”, “taxon” or “cladon” (MAYR, 1995) are appropriate to designate the groups suggested by our cladistic analyses.

highlighted by the fact that the same team which proposed many such new class-series taxa (FROST et al., 2006) published a few months later a new work (GRANT et al., 2006) with a new phylogenetic and taxonomic proposal, in which they abandoned one of the new higher nomina introduced just a few months earlier (DIPHYBATRACHIA), and introduced several new ones! However, several recent examples show that the community of taxonomists is apparently not prepared to take the time to wait for a stabilized higher taxonomy of the amphibians before proposing well-thought, and also well-formed, short and euphonious nomina for the higher taxa (see DUBOIS & RAFFAËLLI, 2009). Taking this time would indeed certainly have a terrible “psychological” drawback, as it could prevent some taxonomists from “*attaching their names to the new nomina*” (DUBOIS, 2008a).

CONSEQUENCES IN CLASS-SERIES NOMENCLATURE

A final note must be added here regarding the Rules for class-series nomenclature proposed by DUBOIS (2006a: 227-233). When these Rules were elaborated, I considered it “obvious” that all taxonomists would consider that a class-series nomen should be a noun in the nominative plural, so this was not even mentioned in the proposed Rules. This was a mistake, as nothing is ever “obvious” to all. This severe omission should be corrected in the proposed Rules (R2) and (R3) (DUBOIS, 2006a: 227). In Rule (R2), the end of the sentence “*to be available in zoological nomenclature (...), a class-series nomen must have been published (...) as a uninomen*” should be replaced by “*as a uninomen being, or being treated as, a Latin noun in the nominative plural (ending in ‘-A’, ‘-AE’, ‘-ES’, ‘-I’, ‘-US’ or exceptionally ‘-E’)*”. The parallel change should be made in Rule (R3), where “*a new class-series nomen should be a Latin or latinized nomen*” should be replaced by “*a Latin or latinized nomen being, or being treated as, a Latin noun in the nominative plural (ending in ‘-A’, ‘-AE’, ‘-ES’, ‘-I’, ‘-US’ or exceptionally ‘-E’)*”.

LITERATURE CITED

- ANONYMOUS [International Commission on Zoological Nomenclature], 1999. – *International code of zoological nomenclature*. Fourth edition. London, International Trust for zoological Nomenclature: i-xxix + 1-306.
- DUBOIS, A., 1984. – La nomenclature supragénérique des Amphibiens Anoures. *Mémoires du Muséum national d'Histoire naturelle*, (A), **131**: 1-64.
- 1987. – Again on the nomenclature of frogs. *Alytes*, **6** (1-2): 27-55.
- 1988a. – Some comments on the genus concept in zoology. *Monitore zoologico italiano*, (n. s.), **22**: 27-44.
- 1988b. – The genus in zoology: a contribution to the theory of evolutionary systematics. *Mémoires du Muséum national d'Histoire naturelle*, (A), **140**: 1-123.
- 1992. – Notes sur la classification des Ranidae (Amphibiens, Anoures). *Bulletin mensuel de la Société linnéenne de Lyon*, **61** (10): 305-352.
- 2000. – Synonymies and related lists in zoology: general proposals, with examples in herpetology. *Dumerilia*, **4** (2): 33-98.
- 2004a. – The higher nomenclature of recent amphibians. *Alytes*, **22**: 1-14.
- 2004b. – Developmental pathway, speciation and supraspecific taxonomy in amphibians. 1. Why are there so many frog species in Sri Lanka? *Alytes*, **22** (1-2): 19-37.

- 2005a. – Propositions pour l'incorporation des nomina de taxons de rang supérieur dans le *Code international de nomenclature zoologique*. In: A. DUBOIS, O. PONCY, V. MALÉCOT & N. LÉGER (ed.), *Comment nommer les taxons de rang supérieur en zoologie et en botanique?*, *Biosystema*, **23**: 73-96.
- 2005b. – Proposed Rules for the incorporation of nomina of higher-ranked zoological taxa in the *International Code of Zoological Nomenclature*. 1. Some general questions, concepts and terms of biological nomenclature. *Zoosystema*, **27**: 365-426.
- 2005c. – *Amphibia Mundi*. 1.1. An ergotaxonomy of recent amphibians. *Alytes*, **23** (1-2): 1-24.
- 2005d. – *Amphibia Mundi*. 1.3. Recent amphibians: suprageneric taxonomic additions (1967-2002). *Alytes*, **23** (1-2): 70-80.
- 2005e. – Proposals for the incorporation of nomina of higher-ranked taxa into the *Code*. *Bulletin of zoological Nomenclature*, **62**: 200-209.
- 2006a. – Proposed Rules for the incorporation of nomina of higher-ranked zoological taxa in the *International Code of Zoological Nomenclature*. 2. The proposed Rules and their rationale. *Zoosystema*, **28**: 165-258.
- 2006b. – Incorporation of nomina of higher-ranked taxa into the *International Code of Zoological Nomenclature*: some basic questions. *Zootaxa*, **1337**: 1-37.
- 2007a. – Phylogeny, taxonomy and nomenclature: the problem of taxonomic categories and of nomenclatural ranks. *Zootaxa*, **1519**: 27-68.
- 2007b. – Genitives of species and subspecies nomina derived from personal names should not be emended. *Zootaxa*, **1550**: 49-68.
- 2007c. – Naming taxa from cladograms: some confusions, misleading statements, and necessary clarifications. *Cladistics*, **23**: 390-402.
- 2007d. – Nomina zoologica linnaeana. In: Z.-Q. ZHANG & W. A. SHEAR (ed.), *Linnaeus tercentenary: progress in invertebrate taxonomy*, *Zootaxa*, **1668**: 81-106.
- 2008a. – A partial but radical solution to the problem of nomenclatural taxonomic inflation and synonymy load. *Biological Journal of the Linnean Society*, **93**: 857-863.
- 2008b. – Authors of zoological publications and nomina are signatures, not persons. *Zootaxa*, **1771**: 63-68.
- 2008c. – Phylogenetic hypotheses, taxa and nomina in zoology. *Zootaxa*, **1950**: 51-86.
- DUBOIS, A. & OHLER, A., 2008. – Nomina Amphibiorum. 1. The status of the amphibian nomina created by Merrem (1820) and Ritgen (1828), with comments on the nomenclatural standards of integrative taxonomy. *Zootaxa*, accepted pending modifications.
- DUBOIS, A. & RAFFAELLI, J. 2009. — A new ergotaxonomy of the family Salamandridae Goldfuss, 1820 (Amphibia, Urodela). *Alytes*, **26** (1-4): 1-85.
- FROST, D. R., GRANT, T., FAIVOVICH, J., BAZIN, R. H., HAAS, A., HADDAD, C. F. B., DE SA, R. O., CHANNING, A., WILKINSON, M., DONNELLAN, S. C., RAXWORTHY, C. J., CAMPBELL, J. A., BLOTTO, B. L., MOLER, P., DREWES, R. C., NUSSBAUM, R. A., LYNCH, J. D., GREEN, D. M. & WHEELER, W. C., 2006. – The amphibian tree of life. *Bulletin of the American Museum of Natural History*, **297**: 1-370.
- GRANT, T., FROST, D. R., CALDWELL, J. P., GAGLIARDO, R., HADDAD, C. F. B., KOK, P. J. R., MEANS, D. B., NOONAN, B. P., SCHARGEL, W. E. & WHEELER, W. C., 2006. – Phylogenetic systematics of dart-poison frogs and their relatives (Amphibia: Athesphatanura: Dendrobatidae). *Bulletin of the American Museum of natural History*, **299**: 1-262.
- HEDGES, S. B., DUELLMAN, W. E. & HEINICKE, M. P., 2008. – New World direct-developing frogs (Anura: Terrarana): molecular phylogeny, classification, biogeography, and conservation. *Zootaxa*, **1737**: 1-182.
- HILLIS, D. M., 2006. – Constraints in naming parts of the tree of life. *Molecular Phylogenetics & Evolution*, **42**: 331-338.
- KUHN, O., 1967. – *Amphibien und Reptilien*. Stuttgart, Gustav Fischer: i-vii + 1-124.
- LINNAEUS, C., 1758. – *Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Editio decima, reformata. Tomus I. Holmiae, Laurentii Salvii: [i-iv] + 1-824.
- MAYR, E., 1995. – Systems of ordering data. *Biology & Philosophy*, **10**: 419-434.

- MAYR, E. & ASHLOCK, 1991. – *Principles of systematic zoology*. Second edition. New York, McGraw-Hill: i-xx + 1-475.
- MINELLI, A., 2000. – The ranks and the names of species and higher taxa, or a dangerous inertia of the language of natural history. In: M. T. GHISELIN & A. E. LEVITON (ed.), *Cultures and institutions of natural history: essays in the history and philosophy of sciences*, San Francisco, California Academy of Sciences: 339-351.
- STAROBOGATOV, Y. I., 1991. – Problems in the nomenclature of higher taxonomic categories. *Bulletin of zoological Nomenclature*, **48**: 6-18.
- VAN VALEN, L., 1973. – Are categories in different phyla comparable? *Taxon*, **22**: 333-373.
- WIENS, J. J., 2007. – Review of “The amphibian tree of life”. *Quarterly Review of Biology*, **82**: 55-56.

Corresponding editor: Annemarie OHLER.