



## Recommendations about nomenclature for papers submitted to *Zootaxa*

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The rapid success of *Zootaxa* has been due in part to the decentralization of its editorial process and to the taxonomic specialization of members of the editorial board (Zhang 2010). Both these factors allowed a quicker publication of papers than in many other journals, after an appropriate review by editors well acquainted with the taxa covered and the relevant literature.

This success also has some drawbacks. In 2009, for example, *Zootaxa* published 1488 papers occupying more than 27,000 pages, a volume that few persons, if any, could read exhaustively. Therefore, neither the chief editor nor any other member of the editorial board was able to check in a timely manner the correct application of the Rules of the *International Code on Zoological Nomenclature* (the “Code”: International Commission on Zoological Nomenclature 1999) in all papers published in the journal. The expertise of the subject editors of *Zootaxa* in this domain is varied, so the journal publishes some papers which are not *Code*-compliant in some respects. This can result in new nomina (scientific names) published in *Zootaxa* being either nomenclaturally unavailable or invalid, or new nomenclatural acts being invalid, which requires the publication of a correction or addition. To limit the occurrence of such unfortunate situations, we provide here some guidelines about nomenclature for manuscripts submitted to *Zootaxa*, concentrating on the most often encountered problems.

The so-called fourth edition of the *Code* (International Commission on Zoological Nomenclature 1999), which is currently in effect, changed some articles from the so-called third edition (International Commission on Zoological Nomenclature 1985). It is essential to follow the edition of the *Code* now in force. Authors and editors of *Zootaxa* are strongly advised to have their own copy of the current *Code*, which is also available freely on line (<http://www.nhm.ac.uk/hosted-sites/iczn/code/>).

We provide below a survey of some major Rules of the *Code* that must be followed for a new nomen or nomenclatural act to be available and/or valid. We also provide some advice about recommendations of the *Code* and good practices that, if followed, facilitate the interpretation of nomenclatural matters or the future nomenclatural acts of subsequent authors.

### Rules of the *Code* that must be followed in any paper submitted to *Zootaxa*

#### *Compulsory designation of name-bearing types or onomatophores*

For a new nomen to be nomenclaturally available (and therefore potentially valid), its name-bearing type (International Commission on Zoological Nomenclature 1999) or onomatophore (Simpson 1940) must be explicitly designated in the original publication. If this is missing, the nomen is nomenclaturally unavailable and cannot be used in zoology. It can be made available later on by the same or another author, by providing the missing information, but then it will date from the subsequent publication. This Rule applies in the three groups of names (or nominal-series) recognized by the *Code*, those of families, genera and species.

For the nomina of species and subspecies, a holotype or syntypes must be explicitly fixed in the original publication (Art. 16.4). Nomina of new species described after 1999 without this information are unavailable. Deposition of type specimens in a permanent collection such as a museum is not compulsory (see Dubois &

Nemésio 2007: 7–9) but is recommended (Rec. 16C) and should usually be done. Whenever these onomatophores are extant specimens (i.e., specimens permanently conserved), Art. 16.4.2 prescribes providing “a statement of intent that they will be (or are) deposited in a collection and a statement indicating the name and location of that collection”, which means that, for the nomen to be available, the country and city of the repository of the specimens must be stated.

For nomina of genera and subgenera, since 1931 a type species must be fixed in the original publication (Art. 13.3). The absence of this information also makes a new generic or subgeneric nomen unavailable. The original combination, author, date and bibliographic reference of the nomen of the type species must be given in full; it is not enough simply to list it under the new combination.

For nomina of families, subfamilies, tribes, subtribes, etc., the nomen of the type genus must be explicitly cited (Art. 16.2). Under the current edition of the *Code*, failure to do so results in unavailability of the nomen.

### ***Type locality***

According to Art. 76.1 of the *Code*, the type locality of a nominal species or subspecies is the geographical (and, where relevant, stratigraphic) place of origin of the name-bearing specimen(s). Therefore, any designation or restriction of type locality that is not associated with a specimen of known origin is null and void under the *Code*. Whenever a lectotype or neotype is designated, its locality of origin becomes the type locality, despite any previously published statement about it (Art. 76.2–3).

### ***Preventing the publication of junior homonyms***

In the early days of zootaxonomy, junior (and hence invalid) homonyms were often published, which was unavoidable as it was difficult for any zoologist to be aware of all published nomina. This is no longer true, and zootaxonomists have many tools to help them avoid this problem.

The *Nomenclator Zoologicus*, which is freely accessible on line (<http://uio.mbl.edu/NomenclatorZoologicus/>), provides the vast majority of zoological genus-group nomina created up to the year 2004. A small proportion of nomina are missing and a few mistakes are present, but on the whole it is a very reliable source of published nomina. Another useful source of nomina is the *Index to Organism Names*, which is based on the *Zoological Record* and is freely available online (<http://www.organismnames.com/>). It includes nomina published since 1864 and is not limited to genus-group nomina.

Before creating a new genus-group nomen, a zoologist should check whether a nomen with the same spelling already exists in zoology. Whether a nomen is currently considered valid or invalid by taxonomists is of no relevance here: as soon as a nomen is available, it preoccupies its spelling forever. A single-letter difference is enough to prevent homonymy between generic nomina, so it is possible to create a nomen that closely resembles another one, especially if the latter belongs in a widely distant zoological group, which greatly limits the possibilities of confusion. However, to avoid doubts and discussions, it is preferable that nomina differ by more than one letter.

In the family-group or series, homonymy results from identity of the stems of the generic nomina on which the familial nomina are based. Thus, *CAECILIIDAE* based on *Caecilius* (**INSECTA: PSOCOPTERA**) and *CAECILIIDAE* based on *Caecilia* (**AMPHIBIA: GYMNOPTERA**) are homonyms. It is possible to prevent the creation of such homonyms. When creating a nomen for a family-group taxon including several genera, an author should choose, if possible, a generic nomen that does not have the same stem as another available generic nomen, even in a very distant zoological group, and even if no family-series nomen based on it is already available. The *Nomenclator Zoologicus* is also helpful for such surveys. In some cases however, it may be impossible to avoid homonymy in family-series nomina, for example if both taxa contain only one genus. In such cases, the *Code* now provides for the possibility to base one of the two nomina at stake on the whole generic nomen used as stem as though it were an arbitrary combination of letters (Art. 29.4.2). This allows it to be spelled differently from the other one based on the real stem of the generic nomen: e.g., *CAECILIIDAE* based on *Caecilia* and *CAECILIUSIDAE* based on *Caecilius* (International Commission on Zoological Nomenclature 1996).

Finally, in the species-group, homonymy applies at the level of the combination, i.e., the association between a genus substantive and a final epithet (either specific or subspecific). Primary homonyms (identical final epithets originally introduced combined with the same genus substantive) are permanently invalid (Art. 57.2). In contrast, the homonymy between secondary homonyms (identical final epithets eventually combined with the same genus substantive but originally introduced in different generic combinations) is reversible—except for secondary

homonyms invalidated before 1961 (Art. 59.3). Any author creating a new specific or subspecific nomen should therefore ascertain that its epithet has never been used in any *original* combination proposed in this nominal genus—even if this epithet has later been transferred to another nominal genus, or if this nomen is currently considered invalid. It is also advisable to avoid creating potential homonyms, through creation in a genus of an epithet identical to one already available in closely related genera, as both nomina might become secondary homonyms in case of a subsequent lumping of genera. Any zoologist planning to describe a new species or subspecies within one genus should be expected to have a good knowledge of the literature concerning this genus and to know how to trace this information.

Editors can provide help in discovering homonyms or potential homonyms, but this is not their duty; it is the work of the authors. Having to change a nomen because of homonymy shortly after its publication consumes more time, energy and paper than searching for potential homonyms initially.

### ***Preventing the publication of junior synonyms***

Having a nomen synonymized shortly after its publication is not uncommon. This could be avoided in many cases by a more careful study of the literature before coining and publishing new nomina. Before describing a species as new, an author should check whether a nomen is already available for it, but hidden as a subjective synonym of a related (or not so related!) species. In some instances, what at first sight may seem to be a new species in genus A turns out to have been described as a member of a different genus B. Subjective synonyms remain available and should be used again as valid as soon as a new taxon is recognized that includes their onomatophore. The same applies to genus- and family-group nomina. Of course, avoiding this kind of problem requires one to be well acquainted with the name-bearing specimens and the literature of a group—but, isn't it what should be expected from an author who decides to publish a new nomen for a taxon?

### ***Principle of Coordination***

The *Code's* Principle of Coordination (Art. 36, 43, 46) states that, in a nominal group or series, any nomen created for a taxon at any rank is deemed to be simultaneously created, with the same nomenclatural author and date, for all taxa at other ranks that include its onomatophore (name-bearing type). This Principle is usually followed by taxonomists in the species and genus nominal series: whenever two (or more) subspecies are recognized in a species, one bears the same nomen as the species, and the same applies to two (or more) subgenera in a genus. However, still now, some taxonomists do not respect this Principle in family-group nomenclature, crediting for example a so-called nominotypical subfamily (bearing the same nomen as its family) with a different author and date. This should be avoided, as it spreads faulty nomenclatural practices in zootaxonomy.

### ***Spelling problems and Latin grammar***

Attention should also be paid to using the correct spelling for new or old nomina. This includes the need to respect grammatical gender agreement between the genus substantive and the epithet when the latter is an adjective or participle in the nominative singular, but to keep the epithet invariant if it is a noun in the genitive or in apposition.

In most cases, the original spelling of a nomen is considered its correct original spelling and should not be modified (Art. 32.2). The only exception is when the spelling can be demonstrably shown, on the basis of the original publication itself, to be an inadvertent error, such as *darxini* for a species explicitly dedicated to Darwin. It is important to note that an incorrect transliteration or latinization, or use of an inappropriate connecting vowel, should not be corrected. This applies in particular to nomina of taxa dedicated to persons: the nomen of a species dedicated to a man but ending in *-ae* (such as *Rana lessonae*), or to a woman but ending in *-i* (such as *Lithodytes gaigei*), should not be modified (Dubois 2007).

Particular problems are posed by nomina that appear under several spellings, either originally or subsequently. Different spellings (e.g., multiple original spellings), are not the same as different nomina (e.g., unjustified emendations), which have distinct authors and dates. These complex problems were addressed in detail in a work (Dubois 2010) that should be consulted by any author meeting difficulties in this respect. In particular, the Rules concerning first reviser actions among multiple original spellings have been modified in the current edition of the *Code* (Art. 24.2.3–4) which has unexpected consequences on the correct spellings of some nomina (David *et al.* 2009; Dubois 2010).

### ***First reviser actions***

Usually the status of a nomen is fixed in the original publication where it is created. However, ambiguity may remain: e.g., between different spellings, or concerning the relative precedence among homonyms or synonyms published at the same date. In such cases, the ambiguity can be removed only through a first reviser action. Except in the special case of Art. 24.2.4 mentioned above, the term “first reviser action” must be rigidly understood, as corresponding to the case in which a subsequent author expressly selects one of alternative nomina or spellings as having priority (Art. 24.2.1). In no case does the so-called page or line priority apply (see Nemésio 2007).

In selecting a lectotype among syntypes or a type species among several species originally included in a new genus, explicit designation of the selected specimen or species in a subsequent publication is required to obtain a valid nomenclatural act, “fixation by elimination” being excluded (Art. 69.4). In each nominal series, designation of a name-bearing type must follow a hierarchy of criteria which cannot be modified. For example, for the designation of the type species of a genus, original designation has precedence over tautonymy, and the latter over subsequent designation, etc. (Art. 68–69). Because the literature contains rather numerous cases of ill-identified designations of name-bearing types, when dealing with such a situation it is not enough to mention the name-bearing type (e.g., the type species of a genus): this information should always be accompanied by precise information on the mode and source of designation. This makes easier for subsequent authors to discover an earlier or alternative designation (e.g., a type species designation by tautonymy for a genus, or a lectotype designation for a species) overlooked by previous authors, allowing the correction of the mistake. The later such a mistake is discovered, the more disturbing this may be for nomenclatural stability.

### **Recommendations of the *Code* and advice for good nomenclatural practice**

Whenever describing a new species or subspecies, an author should provide a complete list of the material examined which served as the basis for the underlying taxonomic decision.

The type locality of a new species-group taxon should be given as precisely as possible, using GPS coordinates if these are available. A map indicating the type locality (and other localities where examined specimens were collected) is also useful.

The requirement to state the author’s intention to create a new nomen (Art. 16.1) avoids inadvertent creation of nomina, which was possible until 2000. Nonetheless, an author should never mention in a paper, a talk, or a document distributed electronically, an unavailable nomen, whether in press or still in a manuscript stage. This will avoid potential mistakes and discussions in the future.

It is not advisable to cite the nomen of a taxon followed by the name(s) of its author(s) but not its date. This is especially true in the title of a publication. This practice is based on a misunderstanding of the function of the presence of the author’s name in the nominal-complex: “*It is not, as many detractors would have it, merely to promote the reputation of a scientist or simply an egotistical exercise. The value of knowing the author’s name so as to be able to track down the original reference which describes the species is much more important than merely knowing who the person responsible for the name is.*” (Ng 1994). Citing the author without the date provides a grossly incomplete reference and may be confusing or misleading (Dubois 2008a).

Whenever publishing a new generic nomen, an author should provide its grammatical gender. It is also useful to provide this information when established *a posteriori* for an existing genus nomen, and to explain the rationale of this clarification.

To be available, generic nomina must be nouns in the nominative singular or be treated as such, and family group nomina nouns in the nominative plural. Although they are not formally regulated by the *Code*, nomina of taxa above the rank of superfamily should also be nouns in the nominative plural, as they have been in virtually all publications since 1758. It is only in the very recent years that nomina of higher taxa in the nominative singular (thus indistinguishable from nomina of genera, such as **TERRARANA**) appeared in the literature. For the clarity of communication in zoological nomenclature, this should be strongly discouraged in the future.

Finally, also for the clarity of communication through nomenclature about the status of taxa in a taxonomy (and in a phylogenetic tree), taxa that are considered sister-taxa should always be referred to the same rank (Dubois 2008b).

## References

- David, N., Dickinson, E.C. & Gregory, S.M.S. (2009) Contributions to a list of First Reviser actions: ornithology. *Zootaxa*, 2085, 1–24.
- Dubois, A. (2007) Genitives of species and subspecies nomina derived from personal names should not be emended. *Zootaxa*, 1550, 49–68.
- Dubois, A. (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.
- Dubois, A. (2008b) Phylogenetic hypotheses, taxa and nomina in zoology. In: Minelli, A., Bonato, L. & Fusco, G. (Eds.), *Updating the Linnaean heritage: names as tools for thinking about animals and plants*. *Zootaxa*, 1950, 51–86.
- Dubois, A. (2010) Retroactive changes should be introduced in the *Code* only with great care: problems related to the spellings of nomina. *Zootaxa*, 2426, 1–42.
- Dubois, A. & Nemésio, A. (2007) Does nomenclatural availability of nomina of new species or subspecies require the deposition of vouchers in collections? *Zootaxa*, 1409, 1–22.
- International Commission on Zoological Nomenclature (1985) *International Code of Zoological Nomenclature*. Third edition. International Trust for Zoological Nomenclature, London, i–xx + 1–338.
- International Commission on Zoological Nomenclature (1996) Opinion 1830. Caeciliidae Kolbe, 1880 (Insecta, Psocoptera): spelling emended to Caeciliusidae, so removing the homonymy with Caeciliidae Rafinesque, 1814 (Amphibia, Gymnophiona). *Bulletin of zoological Nomenclature*, 53, 68–69.
- International Commission on Zoological Nomenclature (1999) *International Code of Zoological Nomenclature*. Fourth edition. International Trust for Zoological Nomenclature, London, i–xxix + 1–306.
- Nemésio, A. (2007) “Page priority” does not exist in the *Code*: *Neomegalotomus parvus* (Westwood, 1842) has precedence over *Neomegalotomus simplex* (Westwood, 1842) (Hemiptera, Heteroptera, Alydidae). *Zootaxa*, 1524, 57–59.
- Ng, P.K.L. (1994) The citation of species names and the role of the author’s name. *Raffles Bulletin of Zoology*, 42, 509–513.
- Simpson, G.G. (1940) Types in modern taxonomy. *American Journal of Science*, 238, 413–431.
- Zhang, Z.-Q. (2010) Reviving descriptive taxonomy after 250 years: promising signs from a mega-journal in taxonomy. In: Polaszek, A. (Ed.), *Systema Naturae 250—The Linnaean Ark*, London, Taylor & Francis, pp. 95–107.