

European Association of Science Editors

Science Editors' Handbook 2nd edition

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2.5: Best practice in the use of the scientific names of animals

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The *International Code of Zoological Nomenclature* (the Code) is the internationally agreed set of rules for the scientific names of animals that ensures the stability and universality of zoological names. This chapter is a brief overview of selected topics of special relevance to editors, based on their mention in the Code or prevalence in enquiries to the Commission and Secretariat.¹ We cannot cover all the issues you might encounter, but more detail can be found in the following documents published by the International Commission on Zoological Nomenclature, which together comprise the authoritative, current, amended text of the Code: The 4th edition of the Code², Declaration 44³ and the Amendment of Articles.⁴ We suggest that your journal's Instructions to Authors state that nomenclature must follow the current (4th) edition of the Code, taking into account later amendments, and give the web address of the Commission where the online Code, amendments and a selection of FAQs addressing common problems can be accessed (<http://iczn.org/>).

The Commission and the Code

The International Commission on Zoological Nomenclature (ICZN or 'the Commission') acts as adviser and arbiter for the zoological community by producing the Code and by resolving nomenclatural problems that cannot be solved by application of the rules of the Code by authors themselves. The Code gives a general overview in its introductory sections, and provides mandatory rules through its 'Articles' (here represented by 'Art.' for brevity). These are supplemented by advisory 'Recommendations'. In specific cases where the precise application of the rules would threaten stability of nomenclature or cause confusion, the Commission has the power to issue rulings, called 'Opinions' or 'Declarations', suspending or modifying the rules to resolve the problem. These are implemented through the ICZN technical journal, the *Bulletin of Zoological Nomenclature*, with summary results available online (iczn.org/).

General advice

To ensure effective peer review of taxonomic papers, we recommend journals include expertise in zoological nomenclature among their editorial boards or at least among the reviewers. ICZN Commissioners can be approached to assist editorial boards: iczn.org/commissioners.

As recommended for all journals, editors should avoid publishing material which appears to contain any potentially offensive behaviour or language (Appendix A: Code of Ethics).

The Commission does not recognize the Phylocode and, to avoid confusion, recommends that Phylocode is not used for publishing zoological names and nomenclatural acts.

The Code does not regulate vernacular (common) names, nor does it regulate taxonomists in subjective matters of taxonomic judgement. For example, the choice of which classification is correct for a particular group of animals, or how best to characterize a taxon, is entirely a matter of taxonomic judgement not subject to rules of the Code.

Key concepts

Some words used in nomenclature have technical definitions which differ from their everyday meanings; definitions are in the Glossary of the Code. Key concepts are:

Binominal names (sometimes called binomial names) – Editors should ensure scientific names of animals are written following the Principle of Binominal Nomenclature (Art. 5) so they can be easily recognized as such.

Availability – Taxonomic papers commonly include descriptions of new taxa and the establishment of new names for them. 'Availability' is a technical term in zoological nomenclature which means a name has gained a formal status through publication, and only then can be taken into account as a part of zoological nomenclature (ch. 4). Names that are not available effectively do not exist for the purposes of zoological nomenclature and should not be used. Names should be unique, unambiguous and universal and formed following precise rules (ch. 7).

Types – Available names for species and subspecies are based on name-bearing type specimens, the objective

standard of reference for the application of scientific names of animals (Art. 61) (see below). We recognize four kinds of name-bearing types with different properties: holotypes, syntypes, lectotypes, and neotypes. Currently fixation of types must be explicit (Art. 16.4).

Publication – For the purposes of the Code, publication is the issuing of a work: a) as a permanent scientific record; b) obtainable free of charge or by purchase; and c) produced simultaneously either in numerous durable identical copies or widely accessibly electronic copies with fixed content and layout (Art. 8, 9). Valid publication is a requirement for the availability (i.e. Code-compliance) of names. Authors, editors or publishers may disclaim their own published works for the purpose of nomenclature (Art. 8.3) if they do not wish new names to become available. Establishing publication dates is essential to determine the precedence of names that are synonyms or homonyms.

Format of names – how to write names correctly

Standard formats for names

- Following the Principle of Binominal Nomenclature (i.e. composed of two names) a species name or 'binomen' is a combination of a genus name (such as *Apis*) and a specific name (such as *mellifera*). The genus name is first, and must start with an upper-case letter, the specific name second, starting with a lower-case letter (Art. 28; Appendix B.6). A genus may include a number of different species. If a subspecies is recognized, the subspecific name follows the specific name. If a subgenus is recognized, the subgenus name is placed in parentheses between the name of the genus and the specific name.
- Citing the author and date of publication is optional but often advisable (Art.51) and is added after the binominal name – *Apis mellifera* Linnaeus, 1758.

Use of italics

The genus, subgenus, species and subspecies names are conventionally written in italics; this is advisable but not mandatory (Appendix B.6). Family-group names, including superfamily, family, subfamily, tribe and subtribe, are not italicized.

Permissible alphabets and symbols

Only the 26 letters of the Latin alphabet (a to z) are used for scientific names of animals (Art. 11.2). Usually the spelling in the original description is followed (Art. 32), but accents or other marks must be changed to the regular Latin alphabet by later users. Gaps, apostrophes and hyphens are removed (except where the first element is a Latin letter used to describe a character of the taxon, e.g. *c-album*, Art. 32.5.2.4.3) and numbers spelled out in letters (Art. 32.5.2).

Shortening names to save space

- After its first mention in a work (excepting the title) the genus name in a binominal name can be shortened to one or more letters (Appendix B.11) for example, *Apis mellifera* can be written as *A. mellifera*. Two (or

more) letter abbreviations may be used when using two genus names with the same initial letter(s), e.g. *Ae.* for *Aedes* and *An.* for *Anopheles*.

- It is advisable to write a species name with its author(s) and date at least once in a work (Recommendation 51A; Appendix B.10), usually on first mention. The author and date can be omitted elsewhere if this will not cause confusion.
- The names of authors of scientific names are not usually abbreviated, however when a name is published by more than two authors, the name of the first author may be cited alone and followed by the term 'et al.' (meaning 'and others') with the full names of all the authors cited in the bibliography (Appendix B.12) when practical.

Use of brackets around author name

If a species has been transferred to a genus other than the one in which it was originally described, the original author's name and date are put in parentheses. The lion, for example, was originally described by Linnaeus as *Felis leo*, in full *Felis leo* Linnaeus, 1758, but as knowledge of the cat family developed the genus *Felis* was split, the lion was placed in the genus *Panthera*, and so the name is now *Panthera leo* (Linnaeus, 1758) (Art. 51.3).

Punctuation of names

Apart from a parenthesis there must be no other punctuation between the species name and the name of the original author (Art. 51.2). However, punctuation can be used to indicate a citation (Art. 51.2.1), for example, *Apis mellifera* Linnaeus, 1758 was originally named by Linnaeus in a book published in the year 1758, whereas *Apis mellifera*: Michener, 2000 or *Apis mellifera*, sensu Michener, 2000, means the bee species *Apis mellifera* as later referred to by Michener (2000), thus helping to avoid confusion over who is the original author of a name.

Gender agreement

A specific name that is a Latin/Latinized adjective must change ending to agree in gender with its genus name (nouns and genitives are unchanged). Genus names can be masculine, feminine or neuter – to determine which see Art. 30 and dictionaries. This can become apparent when such a species is transferred to a new genus, e.g., the bee *Apis calceata* (-a ending with a feminine genus) when transferred becomes *Lasioglossum calceatum* (-um ending with a neuter genus). Irregular adjectives are sometimes found and some specific names which are nouns have endings which look like adjectives, so we recommend checking a dictionary if in doubt (Art. 31.2).

Basing a specific name on a personal name

A specific name based on a personal name should follow Latin grammar; it may be a noun in the genitive case, a noun in apposition (nominative case) or an adjective (Art.31).

ZooBank and the registration of names

ZooBank is the online version of the *Official Register of*

Zoological Nomenclature (zoobank.org) for the registration of the following:

- Publications – publications that contain nomenclatural acts.
- Nomenclatural Acts – published proposals and usages of scientific names of animals, which affect the nomenclatural status of a scientific name or the typification of a nominal taxon.
- Authors – names of authors of publications.
- Type Specimens – the registration of type specimens is under development at the time of writing.

Electronic works must be registered in ZooBank before publication and include registration information in the text to meet criteria for valid publication; physical works may also be registered. We also strongly recommend the registration of new names; while not mandatory this assists with wide dissemination of the name. Anyone can create a ZooBank account and a tutorial is available, thus journals can decide if they will take on the responsibility for ZooBank registration themselves, or require this from their authors. Journal-level editorial access is available through correspondence with ZooBank administrators.

Publication of works

Authors, editors and publishers are responsible for ensuring that works containing new names or nomenclatural acts are clearly published within the rules of the Code. Works should contain the date of publication, and information about where copies may be obtained (Recommendation 8F).

Wide dissemination

Authors and editors should widely publicise new scientific names, nomenclatural acts, and information affecting nomenclature. This can be by publication in appropriate scientific journals or well-known monographic series, by registering new names and acts in the Official Register of Zoological Nomenclature (ZooBank) and by sending a copy of the work to the Zoological Record (Recommendation 8A; Appendix B.9).

Inclusion of disclaimers

Works that are not issued for public and permanent scientific record (such as symposium abstracts, or notices of papers to be delivered at a meeting, minutes, etc.) are not valid publications and do not make names and taxonomic acts available (Art. 9.10). If such works contain new names and acts a disclaimer should be clearly included (at the beginning of the work) (Art. 8.2) so that the names and acts are clearly not available and do not enter zoological nomenclature unintentionally (Recommendation 8G).

Completeness of descriptions of new taxa

Editors should ensure that the whole of the description and illustrations of a new nominal taxon, and particularly any nomenclatural acts or data needed to confer availability on its name, are published in the same work on the same day (Recommendation 10A). This is particularly important where supplementary information is removed from

hard-copy publications and published only in electronic publications which do not meet the criteria for valid publication, when the availability of a name will depend only on what is published in the hard copy.

Date

For journals comprising both electronic and paper editions, a name or nomenclatural act takes its date of publication from the edition that is first validly published (Art. 21.9).

Publication of works issued as physical copies

After 2012 printing on paper is the only recognized format for works issued as physical copies; publication on optical discs is no longer allowed (Art. 8.4).

Specification of date

The day of publication of a work must be stated, including that of each component part of serial publications (Recommendation 21C).

Bibliographic information on separates and preprints

Separate publications (reprints or offprints) must contain a complete bibliographic citation of the original work and have the same pagination as the complete work. Preprints, with their own date of publication, should be identified clearly as such (Recommendation 21E).

Publication on specified date

No publication or distribution must take place prior to the specified date of publication (Recommendation 21A).

Publication of works issued and distributed as electronic copies

Following the recent published amendment to the Code, electronic publication is allowed after 2011 under certain conditions (ICZN, 2012), provided that: the work is in a form which guarantees fixed content and layout (Art. 8.1); the work has the publication date stated in it; and the work is registered in ZooBank and contains evidence of that registration (Art. 8.5). The entry in ZooBank must contain details of: an organization other than the publisher that is intended to permanently archive the work, and an ISBN or ISSN for the work.

We recommend that:

- electronic works are structured to allow automated indexing and data extraction, and contain hyperlinks to ZooBank where appropriate (Recommendation 8C);
- the content of an electronic work should be immutable once published; corrections should be made in separate publications (Recommendation 8D);
- electronic works should be archived with more than one archiving organization and such archiving organizations must have a permanent licence to make a work accessible should the publisher no longer do so (Recommendation 8H).

The following electronic works are not validly published: (a) preliminary versions of works accessible electronically in advance of publication; (b) works distributed by

electronic signals (e.g., via the internet) but not fulfilling the requirements of Art. 8.1 and 8.5 (Art. 9).

The Commission supports open access to electronic publications, e.g., following the principles of the Creative Commons license (creativecommons.org).

Publication of new species names

Authors, editors and publishers are responsible for ensuring that names are self-evidently made available within the rules of the Code. To become available, new names must be published following the criteria in Art. 1.3 and 10–20. The criteria have become stricter over time, reflecting improved standards. Some of the main criteria currently are:

- Names must be formed of the 26 letters of the Latin alphabet (Art. 11.2);
- Binominal nomenclature must be used (Art. 11.4);
- Specific names must contain two or more letters (Art. 11.8-9);
- A specific name must be published in combination with a genus name (Art. 11.9);
- There must be a description that is intended to distinguish the taxon from other taxa, or a reference to a previously published description, or the name must be expressly proposed as a new replacement name for an older available name (Art. 13);
- Anonymously published names are not available (Art. 14);
- Names published for varieties or forms are not available (Art. 15);
- New names must not be proposed conditionally (Art. 15);
- New names must be indicated as new (Art. 16);
- Types must be fixed for species names (Art. 16);
- Names are not available (Art. 1.1, 1.2, 1.3, 10.2, 13.6) if proposed for: things which are not animals (or their fossils or works); hypothetical concepts; teratological specimens as such; hybrid specimens; taxa below the rank of subspecies; temporary reference (not for formal taxonomic use); the works of extant animals, such as nests and tracks.

A name should not be cited before its intended establishment (see also Appendix A, the ‘Code of Ethics’), and should not be called ‘new’ except at the time of its establishment (Appendix B10).

For general advice on the establishment of new names please refer to Appendix B of the Code. For further advice on describing new species see Taylor et al.⁵ and Winston⁶.

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References

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- 2 International Commission on Zoological Nomenclature. *International Code of Zoological Nomenclature*. 4th Edn. 1999. <http://www.nhm.ac.uk/hosted-sites/iczn/code/> (accessed 5 May 2013).
- 3 International Commission on Zoological Nomenclature. Declaration 44. Amendment of article 74.7.3. *Bulletin of Zoological Nomenclature* 2003; 60: 263.
- 4 International Commission on Zoological Nomenclature. Amendment of Articles 8, 9, 10, 21 and 78 of the International Code of Zoological Nomenclature to expand and refine methods of publication. *Bulletin of Zoological Nomenclature* 2012; 69: 161-169. (Also published in *ZooKeys* 2012; 219: 1-10; and *Zootaxa* 2012; 3450: 1-7).
- 5 Taylor, M. et al. Checklist for new zoological genus and species names. SP-POW! Blog. 2011. svpow.wordpress.com/checklist-for-new-zoological-genus-and-species-names-draft/ (accessed 5 May 2013).
- 6 Winston, J.E. *Describing species: Practical taxonomic Procedure for Biologists*. New York Columbia University Press, 2000, p. 518.