Guidelines

Joint statement on best practices for the citation of authorities of scientific names in taxonomy by CETAF, SPNHC and BHL

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Abstract

This joint statement aims at encouraging all authors, publishers and editors involved in scientific publishing to give the bibliographic source of the authorities of taxonomic names. This initiative, written by members of the three communities, has been approved by the executive boards of the SPNHC (Society for the Preservation of Natural History Collections), CETAF (Consortium of European Taxonomic Facilities) and BHL (Biodiversity Heritage Library).

Keywords

Definition

The authorship of a taxonomic name refers to the publication in which the author validly and effectively proposed a new name, recombined it or changed its rank.

In zoology the scientific name is followed by the author(s) who described the species first (protonym) with the year when the said original description has been validly published. For instance, "*Turbo duplicatus* Linnaeus, 1758" indicates that *Turbo duplicatus* was first described by Linnaeus in a publication issued in 1758.

The parentheses added around Linnaeus, 1758 in *Turritella duplicata* (Linnaeus, 1758) indicates that the taxon species has been then transferred to the taxon genus *Turritella*. However, the mention of Linnaeus, 1758 remains, clearly indicating that it was described first by Linnaeus in a publication issued in 1758.

In botany and mycology, the practice is slightly different, since the name of the author(s) (most of the time in a standardized abbreviated form) of a taxon follows the scientific name but without mentioning the year of its first publication (all the author names and their abbreviations are held in internationally accepted databases – e.g. the International Plant Names Index (IPNI) kept and maintained in the Royal Botanic Gardens, Kew). When names are recombined or when the taxon changes rank, the author citation is composed of the author(s) of the basionym, given in parentheses, followed by the author(s) of the name itself (also without the year).
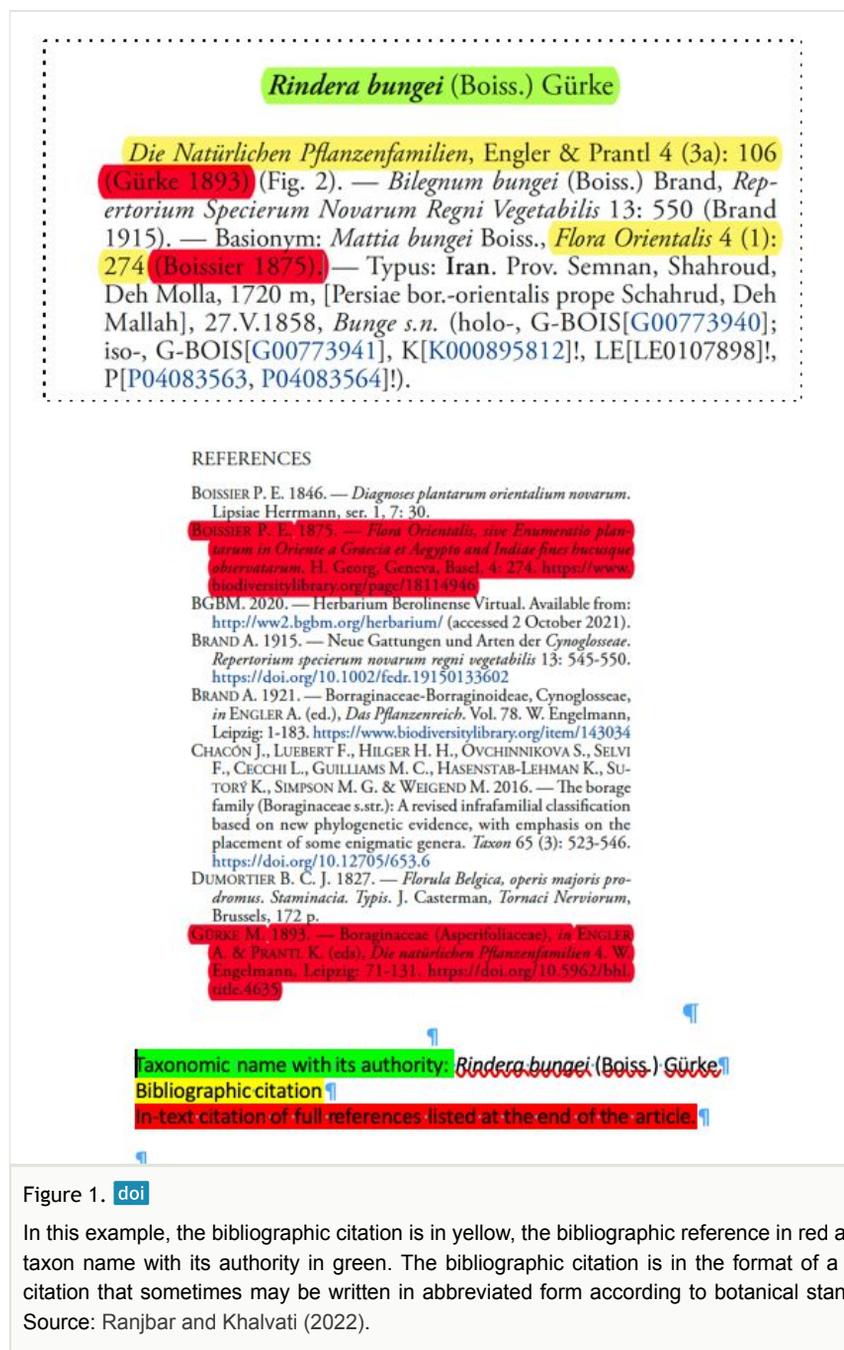
For instance, *Rindera bungei* (Boiss.) Gürke refers to a species *bungei* described first by Boissier (in 1875) in the genus *Mattia* and then moved into the genus *Rindera* by Gürke (in 1893) (Fig. 1).

What is the problem?

The authorship of a scientific name not only identifies the taxon behind the name, it is also considered by most people and recognized as such by most machines in data mining, as a bibliographic reference to the original publication in which the taxon was described, i.e. to its initial taxonomic treatment (Agosti et al. in press), or the section of the text in the publication related to this name. Yet these references are not considered to be valid citations by publishers who will not include them in the reference section of articles. Sometimes, it is even the author who does not consider it as a reference (Meier 2016) and does not provide the full reference to the journal.

Either way, the various inconsistent practices related to the citation of taxon authorships lead to inconsistencies and ultimately confusion (Fig. 2, from Bénichou et al. 2018). Such

inconsistencies lead to inconsistent linking in the article, with some authorities linked to their bibliographic reference while others for which the reference is not provided are left unlinked (Fig. 3, from Bénichou et al. 2018).
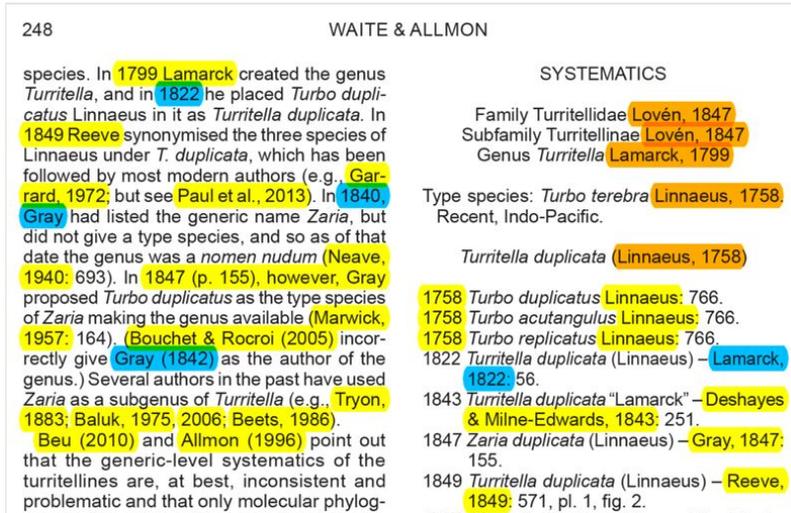

Figure 1. doi

In this example, the bibliographic citation is in yellow, the bibliographic reference in red and the taxon name with its authority in green. The bibliographic citation is in the format of a micro-citation that sometimes may be written in abbreviated form according to botanical standards. Source: Ranjbar and Khalvati (2022).

Figure 2. doi

In this article published in 2016 in *Malacologia*, the mentions highlighted in orange are only cited as authorship and yet listed under the references section; the references in yellow are unambiguous bibliographic references (as they also are followed by a page number for instance), thus they are listed under the references section; the blue references should have been listed in the bibliography list but are not (Waite and Allmon 2016, cited in Bénichou et al. (2018)).

Figure 3. doi

In the electronic version of this paper on bats, the authorships underlined in blue are linked to the bibliographic references while the others are not because the references are not given in the bibliography (Foley et al. 2017 cited in Bénichou et al. (2018)).

The original source is therefore somehow dissociated from its current taxonomic treatment (Agosti et al. in press), limiting and obscuring scientific discussions, the digital-automated

construction of citation networks or/and the development of relevant citation metrics (Nielsen et al. 2017). These practices often require substantial effort to not only discover the bibliographic reference implicit in the authorship of a taxon (Fawcett et al. 2022), but also to get a copy of the cited publication (Page 2016).

Why do we need to change our practices?

These practices, in concealing the authorship of the scientific concept to which they refer (i.e. the discovery and description of the taxon), impede and bias the results of new machine data-mining. In the digital age and the era of the semantic web, in which building a citation network by machine is one of the emerging properties (Berners-Lee et al. 2001; Nielsen et al. 2017), it becomes crucial to link the scientific name used to its original description, both in a human- and machine-actionable way (Bénichou et al. 2021). This link should resolve at least to the article, and ideally to the respective treatments, and be accessible in an open access FAIR format rather than only as a PDF which impedes highly accurate data extraction (Goodman et al. 2018). Ideally, it should also include further links via persistent identifiers to any other biological data (e.g. morphological, molecular, ethological) constituting the taxon cited, thus allowing the use of text and data mining tools to extract traits. This will allow immediate access to facts and their sources provided by the author(s) to the entire scientific community and the societal world making use of such taxonomic data.

Proposed solution for what should be changed: the recommendations

1.   Provide each scientific name of a taxon (at least at its first mention in the paper) with authorship (and date), and add corresponding entries to the publication's "Bibliographic references" section.
2.   If the publisher's guidelines do not allow you to list it as a reference, cite it properly as a bibliographic reference (by adding the page number after the date for instance). Make sure it is considered a valid bibliographic reference by the journal so you can list it in the bibliographic reference section. For instance prefer the notation *Infrantenna fissilis* Liu and Sittichaya 2022: 48 instead of *Infrantenna fissilis* Liu & Sittichaya, 2022 (for a species described in *EJT* http://dx.doi.org/10.5852/ejt.2022.828.1851 p. 48). Placed below the taxonomic treatment this mention will also refer unambiguously to the bibliographic reference and will have to be listed in the bibliographic references.
3.   Provide the corresponding persistent identifier (PID) to each of these references when they exist, i.e. a Crossref DOI minted by the publisher or minted by the Biodiversity Heritage Library (BHL) when the legacy publication has been digitized and provided a DOI, or a DataCite DOI minted by organizations digitizing legacy literature (e.g. e-Periodica at the Federal Institute of Technology Zurich) or

providing a repository for PDFs (Zenodo or the Biodiversity Literature Repository (BLR)).

4.   Provide the existing PID of the taxonomic treatment if any, using for instance the DOI of the treatment deposited in BLR, or for articles with primary taxonomic descriptions minted by BHL (for example: https://www.biodiversitylibrary.org/part/304567).

Acknowledgements

Funding program

References

- Agosti D, Benichou L, Catapano T, Dillien M, Döring M, Georgiev T, Gérard I, Groom Q, Kvacek J, Kroh A, Mergen P, Pauperio J, Sautter G, Penev L (in press) Recommendation for use of annotations and persistent identifiers related to publishing in taxonomy and biodiversity science. *Research, Ideas and Outcomes*.
- Bénichou L, Gérard I, Laureys É, Price M (2018) Consortium of European Taxonomic Facilities (CETAF) best practices in electronic publishing in taxonomy. *European Journal of Taxonomy* 475: 1-37. https://doi.org/10.5852/ejt.2018.475
- Bénichou L, Guidoti M, Gérard I, Agosti D, Robillard T, Cianferoni F (2021) European Journal of Taxonomy: a deeper look into a decade of data. *European Journal of Taxonomy* 782 (1): 173-196. https://doi.org/10.5852/ejt.2021.782.1597
- Berners-Lee T, Hendler J, Lassila O (2001) The Semantic Web. *Scientific American* 29-37.
- Fawcett S, Agosti D, Cole S, Wright D (2022) Digital accessible knowledge: Mobilizing legacy data and the future of taxonomic publishing. *Bulletin of the Society of Systematic Biologists* 1 (1): 1-12. https://doi.org/10.18061/bssb.v1i1.8296
- Foley N, Goodman S, Whelan C, Puechmaille S, Teeling E (2017) Towards Navigating the Minotaur's Labyrinth: Cryptic Diversity and Taxonomic Revision within the Speciose Genus *Hipposideros* (Hipposideridae). *Acta Chiropterologica* 19 (1): 1-18. https://doi.org/10.3161/15081109acc2017.19.1.001

- Goodman M, Georgi R, Xia F (2018) PDF-to-Text Reanalysis for Linguistic Data Mining. In: Calzolari N, et al. (Ed.) *Proceedings of the Eleventh International Conference on Language Resources and Evaluation (LREC 2018)*. Miyazaki, Japan. URL: https://aclanthology.org/L18-1116/
- Liu L, Sittichaya W (2022) The Oriental genera of *Xyloperthini* (Coleoptera: Bostrichidae: Bostrichinae), with a new genus and species from Thailand, and a key to the genera. *European Journal of Taxonomy* 828 (1): 45-60. https://doi.org/10.5852/ejt.2022.828.1851
- Meier R (2016) Citation of taxonomic publications: the why, when, what and what not. *Systematic Entomology* 42 (2): 301-304. https://doi.org/10.1111/syen.12215
- Nielsen FÅ, Mietchen D, Willighagen E (2017) Scholia, Scientometrics and Wikidata. *Lecture Notes in Computer Science* 237-259. https://doi.org/10.1007/978-3-319-70407-4_36
- Page R (2016) Surfacing the deep data of taxonomy. *ZooKeys* 550: 247-260. https://doi.org/10.3897/zookeys.550.9293
- Ranjbar M, Khalvati S (2022) Nomenclatural notes on *Solenanthus minimus* Brand (Boraginaceae). *Adansonia* 44 (17): 175-181. https://doi.org/10.5252/adansonia2022v44a17
- Waite R, Allmon W (2016) Observations on the Biology and Sclerochronology of " *Turritella*" *Duplicata* (Linnaeus, 1758) (Cerithioidea, Turritellidae) from Southern Thailand. *Malacologia* 59 (2): 247-269. https://doi.org/10.4002/040.059.0206