Biological nomenclature terms for facilitating communication in the naming of organisms

John David1, George M. Garrity2, Werner Greuter3, David L. Hawksworth4, Regine Jahn5, Paul M Kirk6, John McNeill7, Ellinor Michel8, Sandra Knapp9, David J. Patterson10, Brian J. Tindall11, Jonathan A. Todd12, Jan van Tol13, Nicholas J. Turland14

1 Royal Horticultural Society Garden Wisley, Woking, Surrey, GU23 6QB, UK 2 Microbiology and Molecular Genetics, Michigan State University, Biomedical and Physical Sciences, 567 Wilson Road Room 6162, East Lansing, MI 48824-4320 USA 3 Botanischer Garten und Botanisches Museum Berlin-Dahlem, Freie Universität Berlin, Königin-Luise-Straße 6-8, D-14195 Berlin, Germany; and Herbarium Mediterraneum, c/o Orto Botanico, via Lincoln 2/A, I-90121 Palermo, Italy 4 Departamento de Biología Vegetal II, Facultad de Farmacia, Universidad Complutense de Madrid, Plaza Ramón y Cajal, 28040 Madrid, Spain; & Department of Life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK 5 Botanischer Garten und Botanisches Museum Berlin-Dahlem, Freie Universität Berlin, Königin-Luise-Straße 6-8, D-14195 Berlin, Germany 6 CABI UK, Bakeham Lane, Egham, Surrey TW20 9TY, UK 7 Royal Botanic Garden, Edinburgh, EH3 5LR, Scotland, UK; and Royal Ontario Museum, Toronto, Canada 8 International Trust for Zoological Nomenclature, The Natural History Museum, Cromwell Road, London SW7 5BD, UK 9 Department of Life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK 10 Marine Biological Laboratory, 7 MBL Street, Woods Hole MA 02543, USA 11 Leibniz-Institut DSMZ-Deutsches Sammlung von Mikroorganismen und Zellkulturen GmbH, Inhoffenstraße 7B, 38124 Braunschweig, Germany 12 Department of Earth Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK 13 Leiden University, National Museum of Natural History (Naturalis), P.O. Box 9517, NL-2300 RA Leiden, The Netherlands 14 Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299, USA

Corresponding author: Sandra Knapp (s.knapp@nhm.ac.uk)

Academic editor: Lyubomir Penev  |  Received 4 May 2011  |  Accepted 7 May 2012  |  Published 8 May 2012

Citation: David J, Garrity GM, Greuter W, Hawksworth DL, Jahn R, Kirk PM, McNeill J, Michel E, Knapp S, Patterson DJ, Tindall BJ, Todd JA, van Tol J, Turland NJ (2012) Biological nomenclature terms for facilitating communication in the naming of organisms. ZooKeys 192: 67–72. doi: 10.3897/zookeys.192.3347

Copyright John David et al. This is an open access article distributed under the terms of the Creative Commons Attribution License 3.0 (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Abstract
A set of terms recommended for use in facilitating communication in biological nomenclature is presented as a table showing broadly equivalent terms used in the traditional Codes of nomenclature. These terms are intended to help those engaged in naming across organism groups, and are the result of the work of the International Committee on Bionomenclature, whose aim is to promote harmonisation and communication amongst those naming life on Earth.

Keywords
Nomenclature, Code, terminology

The International Committee on Bionomenclature (ICB, http://www.bionomenclature.net/) met in Berlin from 26–28 April 2012. As a part of this meeting it reviewed the status of communication between and change in the various international sets of rules that biologists follow when naming organisms – the Codes of nomenclature. The group exchanged updates on the status of the Codes (see Table 1 for abbreviations used for the various Codes of nomenclature) and discussed how to enhance inter-community communication with the aim of bringing together those concerned with naming life on Earth.

Recent progress on developing a Global Names Architecture (http://www.globalnames.org) has meant that the communities working on the various indices for a variety of organism groups are not only working in their own domains, but are increasingly developing technological solutions to enable more efficient retrieval of names of all organisms, along with information pertaining to their first publication. As groups focused on the nomenclature of various organisms work more closely together, efficient communication becomes ever more important. Recent changes in the rules governing the naming of prokaryotes (Labeleda 2000; and for example Labeleda and Oren 2011) and of algae, fungi and plants (see Hawksworth 2011; Knapp et al. 2011; McNeill and Turland 2011), in addition to those proposed for zoology (e.g., International Commission on Zoological Nomenclature 2008), are bringing the terminology used in and practices of the Codes closer together, and the Committee felt that agreement on a basic set of terms to be used when engaging in inter-community communication would greatly assist this on-going process. Naming of organisms is so critical that it is important that we work together on a greater consistency in nomenclatural practices to enable a swifter, more efficient documentation of biodiversity and help meet the global challenges of understanding Earth’s genetic diversity and resources.

This table of terms is not comprehensive, but includes those terms that differ (or have differed in the past) significantly and have the potential to cause confusion. It is based on the table of equivalence of technical terms arising from discussions on harmonisation of nomenclature (Hawksworth 1995) and that accompanying the first Draft BioCode (Greuter et al. 1996). These early attempts have here been updated to reflect current usage of terms in the various Codes. As with the early tables, the
Table 1. Recommended terms for use in biological nomenclature with a comparison of equivalents across six current Codes of nomenclature

| Bionomenclature | ICN¹ | ICNCP² | ICNP³ | ICVCN⁴ | ICZN⁵ | PhyloCode⁶ |
|-----------------|------|--------|-------|--------|-------|------------|
| Publication and precedence of names | | | | | |
| published | effectively published | published | effectively published | [none] | published | published |
| precedence/priority | priority | priority | priority | [none] | precedence/priority | precedence |
| earlier | earlier | earlier | earlier | [none] | senior | earlier |
| later | later | later | later | [none] | junior | later |
| Nomenclatural status | | | | | | |
| established | validly published | established | validly published | established | available | established |
| compliant | legitimate | acceptable | legitimate | valid | potentially valid | acceptable |
| non-compliant | illegitimate | [none] | illegitimate | [none] | permanently invalid | [none] |
| registered | [deposited] | registered | validly published | [none] | registered | registered |
| Taxonomic status | | | | | | |
| accepted | correct | accepted | correct | accepted | valid | accepted |
| Synonymy and homonymy | | | | | | |
| homotypic | homotypic | [none] | homotypic | [none] | objective | homodefinitional |
| heterotypic | heterotypic | [none] | heterotypic | [none] | subjective | heterodefinitional |
| replacement name | replacement name | replacement name | replacement name | [none] | new replacement | replacement name |
| Conservation and suppression | | | | | | |
| conserved | conserved | conserved | conserved | [none] | conserved | conserved |
| protected | listed | [none] | listed | accepted | protected | [none] |
| sanctioned (fungi only) | sanctioned (fungi only) | [none] | [none] | [none] | [none] | [none] |
| suppressed/rejected | rejected | rejected | rejected | [none] | suppressed | suppressed |
| Types of names | | | | | | |
| name-bearing type | nomenclatural type | nomenclatural type | nomenclatural type | [none] | name-bearing type | [none] |
| nominal taxon | name and type | name and type | name and type | [none] | nominal taxon | [none] |

¹ International Code of Nomenclature for algae, fungi, and plants (ICN) or Melbourne Code (McNeill et al. 2012). It is expected to be available online in 2013 at http://www.iapt-taxon.org ² International Code of Nomenclature for Cultivated Plants (ICNCP) or Cultivated Plant Code, 8th edition (Brickell et al. 2009); http://www.acta-hort.org/chronica/pdf/sh_10.pdf ³ International Code of Nomenclature of Prokaryotes (the name adopted for the International Code of Nomenclature of Bacteria (ICNB) or Bacteriological Code (Lapage et al. 1992), see Labeda 2000): http://www.ncbi.nlm.nih.gov/books/NBK8817/) ⁴ The International Code of Virus Classification and Nomenclature (ICVCN), in Virus Taxonomy (ed. King et al. 2011) ⁵ International Code of Zoological Nomenclature (ICZN), 4th edition (International Commission on Zoological Nomenclature 1999): http://www.nhm.ac.uk/hosted-sites/iczn/code/ ⁶ International Code of Phylogenetic Nomenclature or PhyloCode, version 4c (Cantino and Queiroz 2010): http://www.ohio.edu/phylocode/ ⁷ Listed in the sense of appearing on The Approved Lists of Bacterial Names
terms in each row are not perfectly congruent. We recommend the use of these terms to facilitate communication between those working with the nomenclature of different groups of organisms without necessarily displacing those used by tradition within the various communities. These terms can be employed where considered of value in presentations, publications, and teaching, as well as in discussions between the communities who use the different Codes. We invite and welcome comment on the commended terms, and suggestions for other terms that have caused confusion that might be added – our aim is not to impose practice, but to facilitate communication among all involved in the naming of organisms of all kinds.

Acknowledgements

We thank the International Union of Biological Sciences (IUBS) for financial support for our through the 2009-2012 IUBS “BioCode Programme”.

References

Brickell CD, Alexander C, David JC, Hetterscheid WLA, Leslie AC, Malecot V, Jin XB, Cubey JJ (2009) International Code of Nomenclature for Cultivated Plants (ICNCP or Cultivated Plant Code) incorporating the Rules and Recommendations for naming plants in cultivation. Eighth Edition. Adopted by the International Union of Biological Sciences International Commission for the Nomenclature of Cultivated Plants. Regnum Vegetabile 151; Scripta Horticulturae 10. Leuven: International Society for Horticultural Science.

Cantino PD, Queiroz K de (2010) International Code of Phylogenetic Nomenclature, version 4c. http://www.ohio.edu/phylocode/.

Greuter WG, Hawksworth DL, McNeill J, Mayo MA, Minelli A, Sneath PH, Tindall BJ, Trehan P, Tubbs P (1996) Draft BioCode: the prospective international rules for the scientific names of organisms. Taxon 45: 349–373.

Hawksworth DL (1995) Steps along the road to a harmonized bionomenclature. Taxon 44: 447–456.

Hawksworth DL (2011) A new dawn for the naming of fungi: impacts of decisions made in Melbourne in July 2011 on the future regulation and publication of fungal names. MycoKeys 1:7–20. doi: 10.3897/mycokeys.1.2062

International Commission on Zoological Nomenclature (1999) International Code of Zoological Nomenclature, fourth edition, Ride WDL, Cogger HG, Dupuis C, Kraus O, Minelli A, Thompson FC, Tubbs PK (eds.). Adopted by the International Union of Biological Sciences. London: International Trust for Zoological Nomenclature.

International Commission on Zoological Nomenclature (2008) Proposed amendment of the International Code of Zoological Nomenclature to expand and refine methods of publication. Zootaxa 1908: 57–67.
Biological nomenclature terms for facilitating communication in the naming of organisms

International Committee on Taxonomy of Viruses (2011) The International Code of Virus Classification and Nomenclature of ICTV. Pp. 1273–1277 In: King AMQ, Lefkowitz EJ, Adams MJ, Carstens EB (Eds) Virus taxonomy: ninth report of the International Committee on Taxonomy of Viruses. Amsterdam: Elsevier Academic Press.

Knapp S, McNeill J, Turland N (2011) Changes to publication requirements made at the XVIII International Botanical Congress in Melbourne - what does e-publication mean for you? PhytoKeys 6: 5–11. doi: 10.3897/phytokeys.6.1960

Labeled DP (2000) International Committee on Systematic Bacteriology. IXth International (IUMS) Congress of Bacteriology and Applied Microbiology. Minutes of the meetings, 14 and 17 August 1999, Sydney, Australia. International Journal of Systematic and Evolutionary Microbiology 50: 2245–2247. http://ijs.sgmjournals.org/content/50/6/2245.full.pdf+html

Labeled DP, Oren A (2011) International Committee on Systematics of Prokaryotes XIIth International (IUMS) Congress of Microbiology and Applied Bacteriology Minutes of the Meetings, 3, 4, 5 and 7 August 2008, Istanbul, Turkey. International Journal of Systematic and Evolutionary Microbiology 61: 2781–2789.

Lapage SP, Sneath PHA, Lessel EF, Skerman VDB, Seelöger HPR, Clark WA (Eds) (1992) International Code of Nomenclature of Bacteria and Statutes of the International Committee on Systematic Bacteriology and Statutes of the Bacteriology and Applied Microbiology Section of the International Union of Microbiological Societies. Bacteriological Code (1990 Revision). Washington, DC: American Society for Microbiology.

McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Marhold K, Prado J, Prud’homme van Reine WF, Smith GF, Wiersema JH, Turland NJ (Eds) (2012, in press) International Code of Nomenclature for algae, fungi, and plants (Melbourne Code). Adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. Regnum Vegetabile. Ruggell: Gantner.

McNeill J, Turland N (2011) Major changes to the Code of Nomenclature – Melbourne, July 2011. Taxon 60: 1495–1497.

Current membership of the International Committee on Bionomenclature

(ICB – contact details for all members are available at http://www.bionomenclature.net/)

Michael J. Adams, Rothamsted, UK
Philip D. Cantino, Athens Ohio, USA
John David, Wisley, Surrey, UK
George Garrity, East Lansing, Michigan, USA
Daphne Fautin, Lawrence, Kansas, USA
Werner Greuter, Berlin, Germany and Palermo, Italy
David L. Hawksworth, London, UK and Madrid, Spain
Regine Jahn, Berlin, Germany (Deputy Secretary)
Paul M Kirk, Egham, Surrey, UK
John McNeill, Edinburgh, Scotland, UK and Toronto, Canada
Ellinor Michel, London, UK (Vice-Chair)
Sandra Knapp, London, UK (Chair)
David Patterson; Woods Hole, Massachusetts, USA (Secretary)
Richard Pyle, Honolulu, Hawa‘i, USA
David Remsen, Copenhagen, Denmark
Gary Rosenberg, Philadelphia, Pennsylvania, USA
Brian Tindall, Braunschweig, Germany
Jonathan A. Todd, London, UK
Jan van Tol, Leiden, The Netherlands
Nick Turland, St. Louis, Missouri, USA