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Water quality — Nomenclatural requirements for the recording of biodiversity data, taxonomic checklists and keys

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Qualité de l'eau - Exigences nomenclaturales pour l'enregistrement des données de biodiversité, les référentiels et les clés taxonomiques

Wasserbeschaffenheit - Anforderungen an die Nomenklatur für Aufzeichnungen über Biodiversitätsdaten, taxonomische Checklisten und Bestimmungsschlüssel

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Foreword

This document (EN 16493:2014) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2015, and conflicting national standards shall be withdrawn at the latest by February 2015.

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Introduction

Assessments of ecological quality of aquatic systems are generally based on the taxonomic composition of the available, most relevant communities like macro-invertebrates, phytobenthos and phytoplankton. Consequently, the recording of taxonomic names is a major activity in hydrobiological studies. Scientific names of animals and plants should be unambiguous and unique to ensure effective communication. To achieve this goal internationally accepted rules have been established in nomenclatural codes, the most important of which is the International Code of Botanical Nomenclature (ICBN [1], from 2012 renamed ICN: International Code of Nomenclature for algae, fungi, and plants [2]) and the International Code of Zoological Nomenclature (ICZN [3]). Various editions of each of these codes exist; a new edition of the Botanical Code is published every 6 years. The unfamiliarity of most technicians and ecologists with these codes is a major cause of the abundance of problems in ecological assessments and data storage. Unambiguous exchange of data between biological databases is often impossible and recorded names are often meaningless due to inaccurate application or the complete disregard for nomenclatural rules.

This European standard, therefore, aims at providing guidance to both technicians and ecologists on the proper writing, use and interpretation of taxonomic names to allow effective scientific communication at all levels.

1 Scope

This European Standard describes the most relevant rules of the Botanical and Zoological Codes necessary for unequivocal recording of biodiversity in the aquatic environment. Furthermore, guidance is given on how to deal with taxonomic changes in relation to recorded taxonomic names.

NOTE A Code only affects taxonomic changes carried out in the period covered by that particular edition of the Code.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
taxonomy
scientific discipline of identifying and naming species, and arranging them into a classification

2.2
taxon
taxa, pl
taxonomic entity (unit of determination) at any rank

2.3
taxonomic rank
relative position of a taxon in the taxonomic hierarchy

2.4
taxonomic entity
group or unit belonging to a certain taxonomic rank

2.5
epithet
part of the scientific name of a taxon at the level of Genus or lower

2.6
type
nomenclatural type is that element to which the name of a taxon is permanently attached

2.7
basionym
previously published legitimate epithet-bringing name from which a new combination is formed

2.8
homonym
name, spelled exactly like another name, published for a taxon of the same rank based on a different type

2.9
nominate variety
variety automatically generated when other varieties of a given species are described

2.10
homotypic synonym
nomenclatural synonym
objective synonym
<botany, zoology> synonym based on the same type as that of another name in the same rank

2.11
heterotypic synonym
taxonomic synonym
subjective synonym
<botany, zoology> synonym based on a type different from that of the accepted name

2.12
hybrid
offspring resulting from the interbreeding of two different taxa at the level of Genus or lower

3 Taxonomic names

3.1 General

Taxonomic names are scientific names of taxonomic entities. The most important entities (ranks) are written from low to high in the taxonomic hierarchy (in Latin, with common name given in brackets):

— Forma (form);

— Varietas (variety);

— Subspecies (subspecies);

— Species (species);

— Genus (genus);

— Familia (family);

— Ordo (order);

— Classis (class);

— Phylum (phylum, sometimes indicated as Divisio or division);

— Regnum (kingdom).

Taxonomic names shall meet the requirements set by the Codes, concerning correct (Latin or Latinized) spelling, gender, the use of punctuation marks, etc. (compare also Stearn 2004 [4]). In principle, only validly published and legitimate names should be used. Occasionally the only available name for a taxon does not meet the rules of the respective Code, but is still widely used. Where this is the case, the only available taxon should be used.

3.2 Taxon name

A distinction should be made between names at the level of genus and higher, species names and the names of infra-specific taxa. Scientific names of genera and higher taxa (family, order, class, etc.) are single (but occasionally compound) names, written with an initial capital letter. A genus may be subdivided. The name of such a subdivision is a combination of a generic name and an infra-generic name also written with an initial capital letter. A connecting term (subgenus, section, etc.) is used to denote the rank. When it is appropriate to indicate the name of a subdivision of the genus in question, the infra-generic name should be placed in parentheses between the two. For the subdivision of other taxonomic ranks, the respective Codes should be consulted.

The scientific name of a species is a combination of a generic name and a specific epithet (a "binomial"), the latter without an initial capital letter. Scientific names of infra-specific taxa (all taxa below the level of species,

such as subspecies, varieties, etc.) are combinations of three name parts (in zoology a trinomen and in botany a ternary name): a generic name and two epithets.

In infra-specific zoological taxon names the three component names are placed in succession, indicating that a subspecies is being referred to. In infra-specific botanical taxon names, an indication of the taxonomic level should be given between the second and third name by abbreviated linking terms as, e.g. “subsp.” for subspecies; “var.” for variety; or “f.” for forma. Epithets might be of very different origin; an important rule is that the gender of the genus name prescribes that of the epithets.

Names of taxa at the level of genus and lower should be written in italics. Names of higher taxa and terms of taxonomic rank should be written in Roman type. When a species name or different species names belonging to the same genus are repeatedly mentioned in the text of a publication, the genus name should be written in full the first time it is mentioned, but may be abbreviated elsewhere to its initial and followed by a dot.

Abbreviations of the genus name as mentioned above shall not be used when transferring data to databases.

3.3 Author citation

Since taxonomic names might have different interpretations, for publication and data storage, a name shall always (at least at its first record) be accompanied by the citation of the author(s), including initials, and year of publication of its original, valid description, both written in Roman type.

Unfortunately, the rules of correct citation in the prevailing codes are divergent. Unlike the Botanical Code, the Zoological Code requires that the year of publication is separated by a comma from the author's name.

When citing a botanical name including its author, the author's name is often abbreviated. To encourage consistency the Botanical Code recommends the use of Brummitt and Powell (1992) [5], where each author of a botanical name has been assigned a unique abbreviation. Their work is continued in the International Plant Names Index [6]. For absolute clarity, the author's name(s) and year of publication should be written in full. The impact of a typing error in abbreviations is larger than in the full name.

When an author decides to change the classification (and hence the name) of a taxon described previously by another author, the name of the original describing author (or combination of authors) should appear between brackets in the final combination. In botanical taxa this is followed by the name of the revising author(s) and year of publication. Both taxon names are now considered synonyms; the original name-bringing synonym is generally called basionym.

In general, the name (or combination of names) of the author(s) of a new taxon is the same as that of the paper in which the new name was published. In these cases, the original publication can easily be traced. However, sometimes an author has published a new taxon in the work of a different author, in which case the names of both the describing and the publishing author should be given, connected by the word “in”.

Due to inadequacies in the original description of a taxon, authors may give their own interpretation of previously published names. To clearly indicate which interpretation is meant, and which is not, a whole series of terms may be used (see Annex A; see also Granzow 2000 [7]).

In the exceptional case, that the same name was given to very different taxa (so-called homonyms), these names can only be distinguished by their publishing authors. When homonyms belong to different regna (plants and animals), and hence fall under different Codes, they are permitted; if not, the later homonym should be given a new name.

EXAMPLE

a) Two interpretations of the same species name (a freshwater diatom):

    1) *Cymbella helvetica* F.T. Kützing 1844 *sensu stricto*;

2) *Cymbella helvetica* F.T. Kützing 1844 *sensu* K. Krammer et H. Lange-Bertalot 1986.

b) Two homonyms belonging to different regna:

1) *Oenanthe* C. Linnaeus 1753 (a macrophyte, following the ICBN);

2) *Oenanthe* L.J.P. Vieillot, 1816 (a bird, following the ICZN).

3.4 Nominate variety

The species concept is an often neglected subject in the treatment of taxon names in publications and databases. The current, most widely accepted view, in accordance with the Codes, is the monothetic species concept.

In the monothetic concept a taxon comprises all related taxa of lower rank. Consequently, the definition of a family cannot conflict with that of any genus classified within it; the same holds for order and families, class and orders, etc. A special situation arises when a variety of a given species is described. The original species and its variety are considered of equal taxonomic value, both belonging to the original species. To emphasize this, the original species is now considered a "nominate variety", where the varietal epithet is the same as that of the species, without repeating the author(s) and year of publication.

The nominate variety (or subspecies or forma) is automatically generated when the first “true” variety (or subspecies or forma) is described.

EXAMPLE *Nitzschia sigma* (F.T. Kützing) W. Smith 1853 (a freshwater diatom) includes a number of varieties:

— *Nitzschia sigma* (F.T. Kützing) W. Smith 1853 var. *sigma* (nominate variety)

— *Nitzschia sigma* var. *diminuta* A. Grunow in H.F. van Heurck 1881

— *Nitzschia sigma* var. *intercedens* A. Grunow in O. Schneider 1878

— *Nitzschia sigma* var. *rigida* A. Grunow in H.F. Van Heurck 1881

— *Nitzschia sigma* var. *rigidula* A. Grunow in H.F. Van Heurck 1881

— *Nitzschia sigma* var. *sigmatella* (W. Gregory) A. Grunow in O. Schneider 1878

The diagnosis of a species should comprise all the characters distinguishing the different infra-specific taxa attributed to it. In such species the name of the species should only be used when the concerned infra-specific taxa (including the nominate) is unknown.

NOTE The species name is often mistakenly recorded when the nominate variety (or subspecies, or forma) is meant. This has been further complicated since, in algal taxonomy, many varieties have subsequently been classified as independent, separate species (Kouwets 2008, [8]).

3.5 Preferred names

Taxonomy is a highly dynamic science. Names of organisms should not be considered and treated as stable and permanent. Electron microscopy and especially molecular biology have significantly changed classification schemes. As a result, many taxa, especially at species level, have more than one valid name available. These names are considered nomenclatural synonyms. Names that reflect currently accepted taxonomic views, "preferred names", should be used. Current names and older synonyms can always be linked via the prevailing taxonomic literature. A different situation exists for names of taxonomic entities that were originally considered to represent different taxa, but are now generally regarded as taxonomically identical. Such names are treated as taxonomic synonyms. Where this is the case, the oldest (first described) valid synonym should be used, according to the principle of priority established in the Codes. Unlike nomenclatural synonymy, taxonomic synonymy cannot be reversed.

3.6 Hybrids

The term hybrid refers to the offspring of two different taxa. The prefix “notho-“ is used to denote the rank of a hybrid taxon: the principal ranks are nothospecies and nothogenus, the latter being the highest rank permitted.

A hybrid may be indicated by placing a multiplication sign “x” between the two names of the parental taxa.

A hybrid may also be given a separate name. The hybrid nature of a taxon is then indicated by placing an “x” before the name of an intergeneric hybrid or before the epithet in the name of an interspecific hybrid.

3.7 Storage of data

When storing data in a database, a number of precautions should be taken to guarantee correct and unequivocal future handling.

Information on taxa should be stored using their full scientific names, i.e. including author(s) and year of publication.

Numerical or alphanumerical codes should not be used for data exchange.

NOTE These codes are meaningless and not mnemonic, and lead to confusion and mistakes: the change of only one character results in a totally different taxon. These errors are frequently caused by incorrect manual copying of data, and can easily be missed. On the other hand, orthographic errors in the original taxon name result in an aberrant, but generally recognizable, record that can be corrected.

For the same reason, abbreviated names or acronyms should not be used for the exchange of data.

Local names are often too limited in their applicability to be useful for (international) data exchange. Infra-specific taxa frequently have no distinctive local names and, sometimes, similar or the same names are used for totally different taxa.

To make various selections from a database with (hydro)biological records possible, taxon names should be embedded in a system with “parent” and “child” names: the names of related taxa one rank higher, and one rank lower, respectively. In addition, synonyms should refer to their current preferred names.

The name of a taxon can be further specified with a status code, indicating its current status as a preferred name, synonym, dubious name, etc.

All scientific names proper, as well as (abbreviations of) the terms denoting infra-specific taxa, shall be uniform.

Indications referring to unidentified forms of a certain genus (“spec.”, “sp.”, “spp.”, etc.) should be omitted from fields containing scientific names in a database. The same holds for the indications “cf.” or “aff.” for species or infra-specific taxa that cannot be identified with certainty but that are supposedly similar or related to known forms. Records of all such taxa should be included in a database under the lowest taxonomic level to which they can be assigned with certainty. Suggestions for a possible identity at a lower level should be included in a separate, quality field.

EXAMPLE “Cf. *Chironomus plumosus* (C. Linnaeus, 1758)”, a chironomid midge, has a different meaning as compared to “*Chironomus* cf. *plumosus* (C. Linnaeus, 1758)”. In the latter only the species could not be ascertained, whereas in the former even the genus is uncertain.

The indications “aggregate”, “group” and “species complex” are a special case. These indications should only be included in a database when they can be unequivocally referred to an official publication which contains a definition of its content (i.e. a list of taxa).

Annex A
(informative)

Most important terms and their abbreviations used in nomenclature

Table A.1 — Terms and abbreviations used in nomenclature

Abbreviation[a]	Full term (in Latin)	Translation
aff.	affinis	related to …
auct. div.	auctorum diversorum	according to various authors
auct. nonn.	auctorum nonnulorum	according to a few authors
auct. non	auctorum non	not according to the authors …
comb. inval.	combinatio invalida	not validly published combination according to the rules of the Code
comb. nov.	combinatio nova	new combination
comb. nud.	combinatio nuda	combination published without (reference to a previously published) description
descr. nov.	descriptio nova	new description
cf. (cfr.)	confer	compare with …
emend. (em.)	emendavit	referring to the author who corrected the diagnosis
etiam v.	etiam vice	see also …
excl. gen.	excluso genere	to the exclusion of the genus …
excl. spec. (excl. sp.)	excluso specie	to the exclusion of the species …
excl. var.	excluso varietate	to the exclusion of the variety …
gen. nov.	genus novum	newly described genus
mut. char.	mutatis characteribus	with the characters changed
	nec	and not, nor
nom. alt.	nomen alternativum	alternative name
nom. ambig.	nomen ambiguum	ambiguous name
nom. confus.	nomen confusum	confused name
nom. cons.	nomen conservandum	name conserved in the Code for reasons of nomenclatural stability
nom. dub.	nomen dubium	dubious name of unknown systematic value
nom. err.	nomen errorum	erroneous name
nom. illeg.	nomen illegitimum	Illegitimate name: superfluous name or homonym
nom. inval.	nomen invalidum	not validly published name
nom. legit.	nomen legitimum	legitimate name, name in accordance with the rules of the Code
nom. nov.	nomen novum	new name for a previously published taxon

Abbreviation[a]	Full term (in Latin)	Translation
nom. nud. (n.n.)	nomen nudum	name published without (reference to a previously published) description
nom. obsc.	nomen obscurum	obscure name of unknown origin
nom. prov.	nomen provisorium	provisional name (invalid)
nom. rej.	nomen rejiciendum	rejected name, either by formal action (in favour of a conserved name) or because it was illegitimate
nom. sol.	nomen solum	name published unaccompanied by (reference to a previously published) description
nom. superfl.	nomen superfluum	name superfluous when published, hence illegitimate
nom. tant.	nomen tantum	name only
	non	not
p.p.	pro parte	in part
pro hyb.	pro hybrida	name mentioned as hybrid
pro sp.	pro species	name mentioned as species
pro syn.	pro synonymum	name mentioned as synonym
pro var.	pro varietas	name mentioned as variety
s. ampl.	*sensu* amplificato	in a wider sense
s. comb.	sine combinatione	epithet not decisively attributed to a genus
s. descr.	sine descriptione	without description (nomen nudum)
s. lat. (s.l.)	*sensu* lato	in a broad sense
s. str. (s.s.)	*sensu* stricto	in a strict sense
	sensu	in the sense of, according to …
spec. (sp.)	species	unidentified species of a certain genus
spec. nov. (sp. nov.)	species nova	new species
stat. nov.	status novus	new name based on previously published name, after change of taxonomic rank
sphalm.	sphalmate	by mistake, mistakenly
typ. cons.	typus conservandus	conserved type, deviating from the original type indicated by the author

[a] Less preferable abbreviations that are sometimes encountered in the literature are given between brackets.

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