

Guidelines on Biological Nomenclature

1. Introduction

Biological nomenclature is a tool that enables people to communicate about plants and animal without confusion. For example, a Magpie in Europe is different from a Magpie in Australia, but *Gymnorhina tibicen* refers to just one of them and is unambiguous. On the other hand there is no difference between a Magpie-lark, a Murray Magpie or a Peewee – they all refer to the same bird.

The terms, *taxonomy* and *nomenclature* are often confused, but have quite distinct meanings. *Taxonomy* is the science of classifying, describing and characterising different groups (taxa) of living organisms. *Nomenclature*, on the other hand, is about giving names to those different entities or groups.

Most *common names* (including English, Aboriginal, colloquial and trivial names) are not governed by rules. For some groups, such as birds, guidelines and recommended English names are available (see Christidis & Boles 1994). In SPRAT (Environment Australia's Species Profiles and Threats Database), guidelines for common names are followed in the interests of consistency. See Section 4 below for more details.

2. Scientific names

Scientific names of plants, animals, fungi, etc. follow internationally agreed rules which are published as their respective "Codes of Nomenclature". These rules are largely the same for the different groups of organisms, but there are some differences. Where these are significant, they are mentioned below.

Each scientific name is tied to a type specimen (see glossary for definition) and thus its application can always be traced.

Scientific names are essentially 'binomials' consisting of the name of a genus followed by the name of the species (which for plants is called the specific 'epithet'). This system of naming plants and animals has remained largely unchanged since Linnaeus developed it in the mid 18th Century. The convention is that scientific names are written in italics with an initial upper-case letter for the genus and all lower case letters for the species name. The rank is not italicised. Species names are essentially adjectival in nature and thus must agree with the gender of the generic name to which they are attached. This is reflected in the endings of the names. When a species is transferred from one genus to another, the ending of the species name may also have to be altered to agree with the new genus name. For example, see the *Melaleuca nervosa* / *Callistemon nervosus* example below. A genus name may be used on its own. Species name, however, cannot, and must always follow a genus name or its initial. A genus name should be spelt out in full the first time it is used and then may be abbreviated to an initial letter and full stop when it is unambiguous to do so. For example,

Eucalyptus miniata
(may be abbreviated to *E. miniata*).

A third level or rank can be applied to further delineate taxa into *subspecies*, *varieties*, etc. In animals only one level or rank is formally recognised – that of subspecies, and is often written without indication of rank as a "trinomial".

Stipiturus malachurus parimeda
Stipiturus malachurus subsp. *parimeda*

In plants, there are several levels below species that may be used. These infraspecific ranks are *subspecies*, *variety*, *subvariety*, *forma* and *subforma*. The last three are seldom used. In spite of there being a hierarchy, any taxon can be characterised by just using the trinomial (genus, species and infraspecies) with indication of the rank. Names must be unique within a species (that is, one cannot have a subspecies and variety in the same species with the same name but with different circumscriptions). With plants the rank must always be cited – usually as an abbreviation - and is not italicised.

Eucalyptus globulus subsp. *bicostata*
Eucalyptus globulus var. *compacta*

Occasionally the hierarchy is included, but this is unnecessary to unambiguously define the taxon.

Leucochrysum albicans subsp. *albicans* var. *tricolor* (= *Leucochrysum albicans* var. *tricolor*).

The **authors of a species name** may be included, but more often than not, their inclusion can lead to error as they are seldom thoroughly checked before inclusion. They are only really necessary where the same name may have inadvertently have been given to two different taxa (homonyms) within the same genus. The inclusion of the author's name following the species (or infraspecies) name can then distinguish the two names. With animal names the author name is always followed by a year; with plants, the author name or abbreviation is given alone.

Animals:

Emydura signata Ahl, 1932
Macrotis lagotis (Reid, 1937)
(the bracket indicates that Reid ascribed the species to a different genus)

Plants:

Melaleuca nervosa (Lindley) Cheel
synonym: *Callistemon nervosus* Lindley
(Lindley originally described it as a *Callistemon*; Cheel later transferred it to the genus *Melaleuca*).

With plants – for the type subspecies or variety, etc. where the infraspecific name is the same as the species name (autonym), the author of the species name is used and follows the specific epithet.

Leucochrysum albicans (A.Cunn.) Paul G. Wilson subsp. *albicans*

For plants, abbreviation of authors' names follow an international standard (Brummitt & Powell 1992).

A.Cunn. = Allan Cunningham
L. = Linnaeus
L.f. = Linnaeus filius (son of-)

Sometimes, a space is given between Initial and Surname, others not. It is a matter of preference. We recommend that the space be omitted in abbreviations.

3. Unpublished names

Unpublished names can take many forms. In the interests of conservation management, threatened species often have to be listed long before they have a formal name. Sometimes, these are listed as manuscript names (e.g. *Genoplesium vernalis* D.L.Jones ms.) if they are about to be published. Alas, in some cases these manuscript names remain unpublished for years or even decades.

In the 1980s, Australian botanists agreed on a formula (Croft 1989, Conn n.dat.) for use with unpublished names to avoid the confusion that was arising through the use of such things as “*Verticordia* sp.1”, “*Verticordia* sp.2” etc. There was no guarantee that what was called “sp.1” in one institution was identical to “sp.1” in a second.

The agreed formula is in the form of: “Genus sp. <colloquial name or description> (<Voucher>):

Prostanthera sp. Somersbey (B.J.Conn 4024)
Elseya sp. nov. (AMS – R140984)

A similar convention is used by some zoologists, but it is not done so universally.

Where animal populations need to be identified, they are often done by inclusion of a form or population identifier in brackets following the species name.

Rhinonictus aurantius (Pilbara form)

4. Common names

There are no hard and fast rules for ‘common’ names. In some groups, for example birds (see Christidis & Boles 1994), agreed conventions and recommended English names have been developed. In most groups, and especially plants, one taxon may have a number of common names with these often being region specific. A good example is the species *Echium plantagineum* which is known variously as ‘Paterson’s Curse’ in New South Wales and ‘Salvation Jane’ in South Australia. Where a taxon has more than one common name, or the one common name may refer to more than one species, this is usually reflected in the SPRAT database.

Often what are called ‘common’ names are in reality colloquial names (especially in botany) and may have just been coined from a translation from the scientific name.

The legal standing of common names is problematic as only the scientific name can unambiguously be defined through its requirement to be tied to a voucher (type) specimen. We don’t recommend the use of Common names in legal instruments other than for clarification purposes.

In SPRAT, guidelines have been developed to support consistency throughout the database. These include beginning each word in the name with an initial capital.

Sunset Frog

With generalised or grouped names a hyphen is recommended. The word following the hyphen is generally not capitalised, except for birds where the word following the hyphen is capitalised if it is a member of a larger group.

Yellow Spider-orchid

Double-eyed Fig-Parrot ('Parrot' has an initial capital as it is a member of the Parrot group).

For use in publications, common names should be cited as above and not italicised. (NB some institutions, including ABRS, generally only capitalise the first word in a common name).

5. Synonyms

Synonyms are names that have previously been applied to a taxon, but are now generally superseded. They may be names originally ascribed to a different genus and have the same specific epithet or name - these are based on the same voucher or type specimen and are known as *nomenclatural synonyms*.

Melaleuca nervosa
synonym: *Callistemon nervosus*

Alternatively, they may have once been described as a separate taxon, but later studies have determined them to be the same taxon - these generally have different type specimens and are known as *taxonomic synonyms*.

Dromaius ater
synonym: *Dromaius minor*

In SPRAT, synonyms are linked through an old-name/new-name convention with the old name or synonym (called a junior synonym in zoology) being marked as non-current, and the new name (the senior synonym in zoology) being marked as the Current Name. In SPRAT, where there is a difference of opinion as to what should be regarded as the 'Current' name, we have relied upon advice from ABRS, an accepted recent revision, or advice received through scientific peer review.

Previously listed unpublished names and manuscript names (see Section 3 above) are included in SPRAT in the same manner as other synonyms.

6. Abbreviations and Contractions

There are a number of important abbreviations and contractions used in nomenclature:

cf.	- <i>confer</i> (compare with ...)
cv.	- cultivar
f.	- form/ <i>forma</i>
fam.	- family
gen. nov.	- <i>genus novus</i> – a newly described genus
ined.	- <i>ineditus</i> (unpublished)
ms.	- manuscript (unpublished manuscript name - generally follows an author name)
p.p.	- pro parte (in part)
sect.	- section/ <i>sectio</i>
s. lat.	- <i>sensu lato</i> (in the broad sense)
s. str.	- <i>sensu stricto</i> (in the narrow or strict sense)
sp.	- species
sp. aff.	- species with affinity to ..., or close to ... (NB. 'aff. sp.' should not be used)
sp. nov.	- <i>species novus</i> – a newly described species (NB. 'nov. sp.' should not be used)
spp.	- species (plural)
ssp.	- (not preferred - see subsp.)
subg.	- subgenus
subsp.	- subspecies

subsp. - subspecies (plural)
syn. - synonym
var. - variety

Abbreviations of italicised words may be italicised, however they are often better not italicised in order to provide a contrast with the (italicised) genus and species names.

e.g. *Eucalyptus smithii* s. lat.

Note that in cases where a generic name has been spelt out in full in a paper and it is unambiguous to do so, it is acceptable to abbreviate the genus to its initial capital letter. This form of abbreviation should, however, be used sparingly and only where unambiguous and never in a database or spreadsheet.

e.g. *M. uncinata* for *Melaleuca uncinata*.

7. Pronunciation of Species Name

This is a large topic too difficult to fully cover here. In general, scientific names are derived from Latin or Greek, and strictly speaking, their pronunciation should follow strict Latin or Greek pronunciation rules. General usage has, however, often anglicised or corrupted true grammatical pronunciation and more and more, names are being derived from languages other than Greek or Latin. As stated by Stearn (1983), "How they are pronounced really matters little provided they sound pleasant and are understood by all concerned". For further guidance we suggest consulting Strahan 1981, Stearn 1983 and Sharr 1978.

8. Looking for species names not in SPRAT

There are a number of places where species names not in SPRAT may be found. Be careful using these names uncritically as they may contain errors. The following references may be of value in finding or checking such names.

General:

Species 2000 Checklist. Catalogue of Life. <http://www.sp2000.org/AnnualChecklist.html>

Animals:

Australian Faunal Directory: <http://www.environment.gov.au/abrs/abif-fauna>

Zoological Catalogue of Australia. Australian Biological Resources Study. Many volumes published from 1983 onwards. Being superseded by the Australian Faunal Directory cited above.

Mammals:

Smithsonian Natural History Museum (Division of Mammals): <http://www.nmnh.si.edu/msw>

Australian Faunal Directory: <http://www.environment.gov.au/abrs/abif-fauna>

Birds:

Clements, J. (2000). *Checklist of the Birds of the World*. Ibis Publishing.

Zoonomen: <http://www.zoonomen.net/>

Australian Faunal Directory: <http://www.environment.gov.au/abrs/abif-fauna>

Reptiles:

The EMBL Reptile Database: <http://www.embl-heidelberg.de/~uetz/LivingReptiles.html>

Cogger, H.G. (1983). *Zoological Catalogue of Australia* 1 Amphibia and Reptilia. Canberra: AGPS.

Crocodylian, Tuatara, and turtle species of the World. An online taxonomic and geographic reference: <http://www.flmnh.ufl.edu/natsci/herpetology/turtcroclist/>

Frogs:

The American Museum of Natural History Department of Herpetology Amphibian Species of the World: <http://research.amnh.org/herpetology/amphibia/index.html>

Cogger, H.G. (1983). *Zoological Catalogue of Australia* 1 Amphibia and Reptilia. Canberra: AGPS.

Fish:

ICLARM's FishBase: <http://www.fishbase.org/home.htm>

Australian Museums and Galleries Online (AMOL) Australian Fish Collections: http://www.amol.org.au/collection/hostedwebs/fish/key/fish_species_list.html

Aquatic and other Animals:

CSIRO Codes for Australian Aquatic Biota (CAAB) (includes marine reptiles, fish and invertebrates): <http://www.marine.csiro.au/caab/index.html>

Australian Faunal Directory: <http://www.environment.gov.au/abrs/abif-fauna>

Higher Plants:

Australian Plant Name Index: <http://www.anbg.gov.au/cgi-bin/apni>

International Plant Names Index : http://www.ipni.org/searches/query_ipni.shtml

Chapman, A.D. (1991). Australian Plant Name Index pp. 1-3053. *Australian Flora and Fauna Series* Nos 12-15. Canberra: AGPS.

Flora of Australia. Vol 48:Ferns, Gymnosperms and Allied Groups. Melbourne: CSIRO

Mabberley, D.J. (1997). *The Plant-Book. A portable dictionary of the higher plants*. 2nd edn. Cambridge, UK: Cambridge University Press (Families and Genera only).

Mosses:

Catalogue of Australian Mosses: <http://www.anbg.gov.au/cgi-bin/mossearch>

Lichens:

Checklist of Australian Lichens: <http://www.anbg.gov.au/abrs/lichenlist/introduction.html>

Algae:

Checklist of Freshwater Algae in Australia:

<http://plantnet.rbgsyd.gov.au/PlantNet/fwalgae/index.htm>

Australian Marine Algae Names List: (Maintained by Murdoch University – not yet available)

Fungi:

ABRS (1997). *Fungi of Australia Volume 1A Introduction – Classification*. Canberra: ABRS.

ABRS (1997). *Fungi of Australia Volume 2A Catalogue and Bibliography of Australian Macrofungi 1. Basidiomycota p.p.* Canberra: ABRS.

Systematic Botany and Mycology Databases. Fungal Databases. <http://nt.ars-grin.gov/fungaldatabases/all/GenericSelectionFrame.cfm>

Glossary:

circumscription: the characters and other information used to describe and define a given taxon and which separates that taxon from all other taxa.

class: a major taxonomic rank, between order and division.

division: the major taxonomic rank within the Plant Kingdom. Alternative name for phylum. The major taxonomic rank below kingdom.

epithet: the second (or species) portion of a binomial name consisting of generic name and a species epithet; or the infraspecific portion of a trinomial consisting of a generic name, a species epithet and an infraspecific epithet, etc.

genus: a group of related species usually clearly separable from other such groups, or a single species without close relatives; the major taxonomic rank between species and family. Plural: *genera*.

family: a group of one to many related genera, usually clearly separable from other such groups; the major taxonomic rank between genus and order. With plants, usually takes the ending *-aceae* with animals, *-idae*.

kingdom: the highest rank in the taxonomic hierarchy.

nomenclature: the science of giving a name to a taxonomic entity.

order: a taxonomic grouping of families believed to be closely related (sometimes a single family with no apparent close relatives); the major taxonomic rank between family and class.

phylum: the major taxonomic rank within the Animal Kingdom. Alternative name for division, the major taxonomic rank below kingdom.

rank: the position or level in the taxonomic hierarchy.

species: a taxon comprising one or more populations of individuals capable of interbreeding to produce fertile offspring. Plural: *species*.

SPRAT: Species Profile and Threats Database. Environment Australia species and communities database.

subspecies: the main rank below species in plants, and the only formal rank below species in animals.

taxon: a group or category, at any level, in a system for classifying plants or animals (e.g. an entity at a species level, a genus level, a family level etc. all may be called a *taxon*). Plural: *taxa*.

taxonomy: The science of classifying, describing and characterising different taxa of plants, animals and other organisms.

type: a designated representative (voucher) for a plant or animal name. Various classes of types exist, including: holotype, isotype, syntype, lectotype, neotype, etc. (see Australian Museum definitions at <http://www.amonline.net.au/invertebrates/type.htm>, Eschmeyer 1998, and definitions in the various International Codes of Nomenclature).

variety: a taxonomic rank below the rank of subspecies used for plants.

Further Reading

- Australian Biological Resources Study (1981-). *Flora of Australia*. Volumes 1+ (especially Volume 1)
- Australian Biological Resources Study (1983-). *Zoological Catalogue of Australia*. Volumes 1+
- Brummitt, R.K. & Powell, C.E. (eds) (1992). *Authors of plant names : a list of authors of scientific names of plants, with recommended standard forms of their names, including abbreviations*. Kew, England : Royal Botanic Gardens
- Bureau of Flora and Fauna (1985). *Zoological Catalogue of Australia. Notes for Compilers*. Canberra: Bureau of Flora and Fauna.
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- Chapman, A.D. (1991). Australian Plant Name Index pp. 1-3053. *Australian Flora and Fauna Series* Nos 12-15. Canberra: AGPS
- Christidis, L. & Boles, W.E. (1994). *Taxonomy and Species of Birds of Australia and its Territories*. Royal Australasian Ornithologists Union, Melbourne. 112 pp.
- Conn, B.J. (ed.) (n.dat.). HISPID3. *Herbarium Information Standards and Protocols for Interchange of Data*. Version 3. Sydney: Council of Heads of Australian Herbaria. Also available electronically at: <http://www.rbg Syd.gov.au/HISCOM/HISPID/HISPID3/h3.html>].
- Croft, J.R. (1989). *HISPID - Herbarium Information Standards and Protocols for Interchange of Data*. Canberra: Australian National Botanic Gardens.
- Eschmeyer, W.N. (1998). *Catalog of Fishes*. Special Publication No. 1 of the Centre of Biological Research and Information. California Academy of Sciences. Vols 1-3: pp. 2905.
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- International Code of Botanical Nomenclature (2000). *International code of botanical nomenclature : adopted by the International Botanical Congress*. Utrecht : Bohn, Scheltema & Holkema. [see <http://www.bgbm.fu-berlin.de/iapt/nomenclature/code/>].
- International Code of Zoological Nomenclature (1999). *International code of zoological nomenclature adopted by the International Union of Biological Resources International Commission on Zoological Nomenclature*. 4th edn. London : International Trust for Zoological Nomenclature. [see <http://www.iczn.org/code.htm>].

- Sneath, P.H.A. (ed.) (1992). *International Code of Nomenclature of Bacteria*, 1980 Revision. Washington: International Committee on Systematic Bacteriology (ICSB). [see <http://www.biosis.org/zrdocs/codes/icnb.htm>].
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