Guidelines No. 1 **GUIDELINES**

Guidelines on Biological Nomenclature

Brazil edition

Modified from Chapman *et al.* 2002

Prepared by: Arthur D. Chapman,
17 June 2003

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, Portuguese, indigenous, colloquial and trivial names) are not governed by rules. For some groups, such as birds and mamals, guidelines and recommended English names are available (see Christidis & Boles 1994 for birds and Wilson and Coles 2000 for mammals). Similar guidelines and recommended Portuguese common names exist for birds in Brazil (Willis and Oniki 1991). Unfortunately, similar guidelines do not appear to exist for Spanish names. Where possible, in the interests of consistency, it is recommended that basic guidelines be followed for common names. 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" (see list under Technical References below). 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 names, 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, occasionally the terms "ex" or "in" may be found in author names. The author in front of the "ex" - the pre-'ex' author is one who supplied the name but did not fulfil the requirements for valid publication or who published the name before the nomenclatural starting date for the group concerned. A post-'in' author is one in whose work a description or diagnosis supplied by another author is published. For a further explanation of pre-'ex' and

post-'in' authors and their use see Arts 46.2 and 46.3 of the International Code of botanical Nomenclature (2000). If author names are used within databases (but see above where I recommend this not be done), it is recommended that neither the pre-'ex' nor the post-'in' authors be cited.

> Green (1985) ascribed the new combination *Tersonia cyathiflora* to "(Fenzl) A.S. George"; since Green nowhere mentioned that George had contributed in any way, the combining author must be cited as "A.S.George ex J.W.Green" or preferably as just "**J.W.Green**".
>
> *Tersonia cyathiflora* (Fenzl) J.W.Green
>
> In W.T.Aiton's 2nd edition of *Hortus Kewensis* (1813), many of the descriptions are signed Robert Brown, and thus it can be assumed that Brown described the species. The author of the names is often cited as "R.Br. in Ait." It is recommended, however that the author be cited as just "**R.Br**."
>
> *Acacia acuicularis* R.Br.

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 follows 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. I 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 manuscripts names remain unpublished for years or even decades.

In the 1980s in Australia, botanists agreed on a formula (Croft 1989, Conn 2000) 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)

Some zoologists use a similar convention, 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.

> *Rhinonicteris 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, Wilson and Coles 2000), agreed conventions and recommended English or Portuguese 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 one State of Australia and 'Salvation Jane' in another. Many brazilian examples can be seen at http://www.recor.org.br/publicacoes/plantas-nativas.html. Where a taxon has more than one common name, or the one common name may refer to more than one species, it is usual to reflect this in the 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. I don't recommend the use of Common names in legal instruments other than for clarification purposes.

In the Australian Environment Department, guidelines for use of English common names have been developed to support consistency throughout its database. A similar approach could be adopted elsewhere if thought appropriate. These include beginning each word in the name with an initial capital. Common names in Spanish, can be made to follow a similar pattern.

> 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).

In Portuguese, however, common names are given all in lower case, generally with hyphens between all words if a noun, or separated if a noun and adjective;

> mama-de-cadela,
> fruta-de-cera
> cedro vermelho

One explanation on the use of common names in Portuguese may be found at http://www.afarmacia.hpg.ig.com.br/index.html.

For use in publications, common names should be cited as above and not italicised.

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*

It is the practise in some databases to link synonyms 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. There may sometimes be a difference of opinion as to what should be regarded as the 'Current' name. In these cases, one can only rely on an accepted recent revision or advice received through scientific peer review.

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

6. Abbreviations and Contractions

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

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

There are a number of places where species (or common) names 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. Where possible on-line resources have been sited. This list is by no means meant to be an exhaustive and is oriented toward World or South American resources. I also find that the Google search engine (www.google.com) is a valuable tool when looking for unusual names.

General:

Species 2000 (2002). *Catalogue of Life- Indexing the world's known species. Year 2002 Annual Checklist*. http://www.sp2000.org/AnnualChecklist.html [Accessed 27 Jan. 2004].

Global Invasive Species Database http://www.issg.org/database/welcome/ [Accessed 27 Jan. 2004].

The Tree of Life http://tolweb.org/tree/phylogeny.html [Accessed 27 Jan. 2004].

IABIN: Links to various databases for the Americas http://www.iabin.net/links.htm [Accessed 27 Jan. 2004].

Animals:

Nature World Wide. World Institute for Conservation and Environment, WICE http://www.birdlist.org/index.htm [Accessed 27 Jan. 2004].

Biosis. Index to Organisms. http://www.biosis.org.uk/ion/ion.html [Accessed 27 Jan. 2004].

Mammals:

Mammal Species of the World - Smithsonian Natural History Museum (Division of Mammals): http://www.nmnh.si.edu/msw [Accessed 27 Jan. 2004].

Animal Info – Brazil. http://www.animalinfo.org/country/brazil.htm [Accessed 24 Jan. 2004].

Eisenberg, J.F. (1989). *Mammals of the Neotropics. The Northern Neotropics: Panama, Colombia, Venezuala, Guyana, Suriname, French Guiana*, Volume 1. Chicago: University of Chicago Press

Redford, K.H. and Eisenberg, J.F. (1992). *Mammals of the Neotropics. The Southern Cone: Chile, Argentina, Uruguay, Paraguay,* Volume 2. Chicago: University of Chicago Press

Eisenberg, J.F. and Redford, K.H. (1999). *Mammals of the Neotropics. The Central Neotropics: Ecuadore, Peru, Bolivia, Brazil,* Volume 3. Chicago: University of Chicago Press

Warp Zone: Mammals http://www.funet.fi/pub/sci/bio/life/ [Accessed 27 Jan. 2004].

Birds:

Clements, J. (2000).*Checklist of the Birds of the World*. Ibis Publishing. http://www.zoonomen.net/avtax/frame.html [Accessed 27 Jan. 2004].

Zoonomen - Zoological Nomenclature Resource: http://www.zoonomen.net/ [Accessed 27 Jan. 2004].

Ridgely, R.S. and Tudor, G. (1989). The Birds of South America. Volume 1: the Oscine Passerines. Univerity of Texas Press and Oxford University Press.

Ridgely, R.S. and Tudor, G. (1994). The Birds of South America. Volume 2: the Suboscine Passerines. Univerity of Texas Press and Oxford University Press.

Ridgely, R.S. and Gwyne, J. (1992). A Field Guide to the Birds of Panama, 2nd edn. Princeton: Princeton University.

Reptiles:

The EMBL Reptile Database: http://www.reptiliaweb.org/ [Accessed 27 Jan. 2004].

King, W.F. and Burke, R.L. (1989). Crocodilian, Tuatara, and turtle species of the World. An online taxonomic and geographic reference: http://www.flmnh.ufl.edu/natsci/herpetology/turtcroclist/ [Accessed 27 Jan. 2004].

Herpscope Herp Field Guide for South America http://www.herpscope.com/fieldguide/south_america.html [Accessed 27 Jan. 2004].

VaHerper's International Directory - Reptile and Amphibian Resources http://www.vaherper.com/pages/world.htm [Accessed 27 Jan. 2004].

McDiarrmid, R.W., Campbell, J.A. and Toure, T.A. (1999). Snake Species of the World. A taxonomic and geographic reference. Published by the herpetologists' league.

Amphibians:

The American Museum of Natural History Department of Herpetology Amphibian Species of the World: http://research.amnh.org/herpetology/amphibia/ [Accessed 27 Jan. 2004].

Amphibiaweb. http://elib.cs.berkeley.edu/aw/index.html [Accessed 27 Jan. 2004]

VaHerper's International Directory - Reptile and Amphibian Resources http://www.vaherper.com/pages/world.htm [Accessed 27 Jan. 2004]

Fish:

ICLARM's FishBase: http://www.fishbase.org/home.htm [Accessed 27 Jan. 2004].

Mongabay (a country index to Fishbase) http://www.mongabay.com/fish/biotope_countries.htm [Accessed 27 Jan. 2004].

Crustacea:

World List of Marine, Freshwater and Terrestrial Isopod Crustaceans http://rathbun.si.edu/iz/isopod/isolist/isolist_search.cfm [Accessed 27 Jan. 2004].

Checklist of the Amphipods of the Southern Ocean http://www.naturalsciences.be/amphi/carcilist.htm [Accessed 27 Jan. 2004].

Cephalopods:

CephBase A database-driven web site on all living cephalopods (octopus, squid, cuttlefish and nautilus). http://www.cephbase.utmb.edu/ [Accessed 27 Jan. 2004].

Gastropods:

Hardy's Internet Guide to Marine Gastropods http://www.gastropods.com/ [Accessed 27 Jan. 2004].

Arachnids:

N.I.Platnick. The World Spider Catalog. http://research.amnh.org/entomology/spiders/catalog81-87/INTRO3.html [Accessed 27 Jan. 2004].

Insects:

Iowa State Entomology Index: Databases http://www.ent.iastate.edu/list/Databases.html [Accessed 27 Jan. 2004].

Warp Zone – Insects http://www.funet.fi/pub/sci/bio/life/insecta/index.html [Accessed 27 Jan. 2004].

Thomas, M.C. (2000). Preliminary Checklist of the Flat Bark Beetles of the World Checklist of the Collembola of the World http://www.collembola.org/taxa/collembo.htm [Accessed 27 Jan. 2004].

Hymenoptera Name Server http://atbi.biosci.ohio-state.edu:8880/hymenoptera/nomenclator.home_page [Acceessed 27 Jan. 2004].

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List of Odonata of the World http://www.ups.edu/biology/museum/worldodonates.html [Accessed 27 Jan. 2004].

Michener, C.D. (2000). The bees of the World. Baltimore, MD: John Hopkins University Press.

Orthoptera Species File Online http://140.247.119.145/Orthoptera/ [Accessed 27 Jan. 2004].

A Preliminary checklist of Flat Bark Beetles of the World. http://www.fsca-dpi.org/Coleoptera/Mike/chklist.htm [Accessed 27 Jan. 2004].

Amphipods:

The Subterranean Amphipod Database http://web.odu.edu/sci/biology/amphipod/blist.htm [Accessed 27 Jan. 2004].

Higher Plants:

International Plant Names Index : http://www.ipni.org/searches/query_ipni.shtml [Accessed 27 Jan. 2004].

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).

Catalogue of the Flowering Plants of Peru http://mobot.mobot.org/W3T/Search/peru.html [Accessed 27 Jan. 2004].

Catalogue of the Vascular Plants of Ecuador http://www.mobot.org/MOBOT/research/ecuador/search.shtml [Accessed 27 Jan. 2004].

Pereira, B.A. da S. and Silva, M.A. da (2002). Lista de Nomes Populares de Plantas Nativas da Região Geoeconômica de Brasília, DF. http://www.recor.org.br/publicacoes/plantas-nativas.html [Accessed 27 Jan. 2004].

Mosses:

A Checklist of the Mosses of Chile http://www.mobot.org/MOBOT/moss/Chile/list.shtml [Accessed 27 Jan. 2004].

Mosses of the Andes http://mobot.mobot.org/W3T/Search/andes/projsandes.html [Accessed 27 Jan. 2004].

Biosis. Index to Organisms. http://www.biosis.org.uk/ion/ion.html [Accessed 27 Jan. 2004].

Lichens:

Checklist of lichens and lichenicolous fungi of South America http://www.biologie.uni-hamburg.de/checklists/southamerica_l.htm [Accessed 27 Jan. 2004].

Algae:

Wynne, M.J. (1998). A checklist of benthic marine algae of the tropical and subtropical western Atlantic *Nova Hedwigia Beihefte*, Beiheft 116

Hoffmann, A. and B. Santelices. 1997. *Flora Marina de Chile Central*. Santiago: Ediciones Universidad Católica de Chile. 434 pp.

Biosis. Index to Organisms. http://www.biosis.org.uk/ion/ion.html [Accessed 27 Jan. 2004].

Fungi:

Systematic Botany and Mycology Databases. Fungal Databases. http://nt.ars-grin.gov/fungaldatabases/all/GenericSelectionFrame.cfm [Accessed 27 Jan. 2004].

Biosis. Index to Organisms. http://www.biosis.org.uk/ion/ion.html [Accessed 27 Jan. 2004].

Microorganisms:

World Data Centre for Microorganisms http://wdcm.nig.ac.jp/ [Accessed 27 Jan. 2004].

9. 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*.
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 Nomencalture).
variety: a taxonomic rank below the rank of subspecies used for plants.

10. Technical References

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International Code of Botanical Nomenclature (2000). International Code of Botanical Nomenclature (St Louis Code). *Regnum Vegetabile* 138. Königstein: Koeltz Scientific Books [Electronic version: http://www.bgbm.fu-berlin.de/iapt/nomenclature/code/SaintLouis/0001ICSLContents.htm - accessed 27 Jan. 2004].

International Code of Zoological Nomenclature (2000). *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 - accessed 27 Jan. 2004].

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11. Further Reading

Australian Biological Resources Study (1981-). *Flora of Australia*. Volumes 1+ (especially Volume 1)

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Bureau of Flora and Fauna (1985). *Zoological Catalogue of Australia. Notes for Compilers*. Canberra: Bureau of Flora and Fauna.

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Conn, B.J. (ed.) (1996). *HISPID3. Herbarium Information Standards and Protocols for Interchange of Data.* Version 3. Sydney: Royal Botanic Gardens.

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Willis, E.O. and Oniki, Y. (1991). Nomes gerais para as aves Brasileiras. Brazil: Gráfica de Região, Américo Brasiliense.

Wilson, D.E. and Cole, F.R. (2000). Common names of mammals of the world. Washington, DC: Smithsonian Institution.