

BASIC RULES OF SCIENTIFIC NOMENCLATURE

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Background: As you will agree, to establish the correct name for most species of tropical Indo-Pacific Mollusca is often a complex challenge, particularly when resources are limited. Very few recent revisions or monographs are available for the region, so that identification usually entails searching through a large number of books and papers, mostly dealing with the fauna of countries other than one's own! For poorly studied groups one must extend one's search to the literature of the previous century. All too often one finds the same species under different names, even in contemporary literature! How does one establish which of these names is the correct one?

The first step is to establish whether the different names really do apply to the same species. For this, it is essential to consult the original description, and – wherever possible – actual type specimens. But what does one do if one establishes that several names have been given to the same species, or the same name to different species? Or, if one finds a name that has been overlooked or apparently ignored?

Guidance will be found in the International Code of Zoological Nomenclature, whose rules are followed by all modern zoologists.

Study of 19th century literature will reveal the benefits of such a universal system. Early zoologists used personal choice in selecting which name to use. For example, Lamarck often renamed a species if he thought its given name applied better to another! But of course there was often disagreement as to which name was in fact the better, and opinions were often divided along national lines.

In 1895 the 3rd International Congress of Zoology established the International Commission of Zoological Nomenclature, whose function was to develop a system of rules that would *stabilize* the use of scientific names. We are presently using the 3rd

(1985) edition of the Code, but at the beginning of year 2000, a new edition will apply, in which some of the rules have been changed to take recent practical developments into account. Some of the more important changes are included in these notes. Both the Code and the Commission are commonly abbreviated to the “**ICZN**”.

THE INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE

The Code is published as a small book, with the same text repeated in English and French. It consists of two types of rules: **Articles** and **Recommendations**. “Articles” are compulsory and **must** be strictly followed. “Recommendations” suggest the best process to follow where a situation is not covered by an Article, and should be followed if at all possible. Articles and recommendations are numbered, and can be quoted as, for example, “ICZN Article 13 (a)(I)”.

The Commission alone has the power to overrule the Code; they can be asked to use these “plenary powers” in cases where strict application of the rules would cause confusion or instability by upsetting a widely used name.

(Important : These notes include most of the more important Articles and some of the Recommendations, but should be seen as an introduction only.)

BRIEF HISTORY OF NOMENCLATURE:

(1) The **binomial** (or **binominal**) system (*bi* = two, *nomen* = name) was first introduced by Linnaeus (also called Linnè), and first used consistently for all animals in 1758, in the 10th edition of his *Systema Naturae*.

(2) Before Linnaeus, writers used names either in their own language (termed popular, vernacular or "vulgar" names), or a Latin name (really a short description) of several to many words (called a **polynomial**). Until the present century, Latin was the common language of western scientists.

(3) Linnaeus simplified the system by using two categories of names: a group name (or **genus**), and a **specific** name.

(4) Modern taxonomy recognizes other ranks such as the Family (and higher levels up to Phylum), Subgenus and Subspecies. We discuss these later.

(5) In the years after Linnaeus, zoologists found it practical to add the **author's name**. To this, taxonomists now add the date of publication, as an aid to tracing the original description. These are essential in taxonomic work, but are not compulsory under the Code, as they do not actually form part of the name of an animal. (They are thus often left out by ecologists, physiologists, etc.)

HOW SCIENTIFIC NAMES ARE FORMED AND WRITTEN:

Fonts

The name of a genus (and subgenus) and all higher ranks always begin with a capital (upper-case) letter, specific (and subspecific) names with a small (lower-case) letter, even if named after a person or place. It is standard to print these in italics (or underline them if hand-written) so that they stand out from the rest of the text. Examples *Erronea onyx* or Erronea onyx.

Gender

Scientific names follow the rules of Latin (and Greek) in that they have genders ("masculine", "feminine" or "neuter"). A genus name is always a noun in the singular, but if the specific name is an adjective (descriptive word) its ending must agree in gender with that of the genus. For example "*albus*" (Latin for "white") would be used after a

masculine genus (eg *Conus*), "*alba*" after a feminine one (eg. *Cypraea*), "*album*" after a neuter one (eg *Vexillum*). One can usually follow published examples to work out the correct gender, otherwise one must use a Latin dictionary. If the genus was not Latin or Greek in origin, one has to follow the example set by its describer or any clues he may have given as to the gender of his new name.

Personal names

if a species is named after a man, the specific name ends in "*i*" or "*ii*" [whichever spelling was used originally must be retained, but it is recommended that the single "*i*" be used for new names], if after a woman "*ae*", if after several people "*orum*", if after several women "*arum*".

Geographic names

If a species is named after a place or a region, the name usually ends in "*ensis*" or its neuter version "*ense*" (eg "*chinensis*"). However, the endings "*arum*" / "*orum*" (eg "*philippinarum*") and "*ae*" (eg. "*australiae*") also occur, or the name may be changed to an adjective (eg. "*indicus*" meaning "Indian").

Subgenera

The subgeneric name (a smaller grouping of more closely-related – or similar – species than a genus) is written after the genus but in brackets: eg *Erronea (Adusta) onyx*.

Subspecies

In cases where subspecies (morphologically distinguishable and geographically-separated populations or groups of populations) are recognised, the name becomes a **trinomial**: a third or subspecific name is added after the specific name: eg. "*Erronea onyx adusta*". The population inhabiting the type locality is called the **nominate** ("name-bearing" or "nominotypical") subspecies, and its subspecific name is the same as that of the species: eg. *Erronea onyx onyx*.

Author

The name of the person who first validly published a scientific name follows the name without any punctuation. Exception: when a species is transferred to another genus, the author's name is enclosed in brackets (parentheses). For example *Voluta mitra* Linnaeus, 1758, is now *Mitra mitra* (Linnaeus, 1758). Note that the date is always separated from the author's name by a comma.

In the rare case of a name published anonymously before 1951 (after this date such names are not available) and the author's name is known from another source, it is placed in square brackets (example: [Lightfoot, 1786]).

Sometimes the person originally responsible for a name may not be an author of the book or paper in which it appeared (the author may have used a name taken from someone else's manuscript or label), or may be only one of a group of authors. In such cases, authorship is shared: for example, much of the first draft of the text of the '*Conchological Illustrations*' was written by Gray, who then withdrew from the project, leaving it to be completed by the illustrator, G. B. Sowerby, who gave Gray credit for some of the new names: eg. *Palmadusta contaminata* (Gray in Sowerby, 1825).

It is not strictly necessary to give the author and date in the case of higher levels (eg families, classes), unless one has reason to do so.

Original spelling

The original spelling must be used unless proof can be found in the original publication that the name is accidentally misspelled. However, under the new (2000) rules, if a name "in prevailing use" is found to have been wrongly spelled, it should not be replaced by the correctly spelled name. In order to comply with Latin grammar, accents or hyphens are ignored (except for the German umlaut "ü" which is changed to "ue" in the case of names published before 1985).

Otherwise, the original spelling must be used unless proof can be found in the original publication that the name was accidentally misspelled.

A name that has been intentionally changed is called an **emendation**. An unnecessary change is called an "unjustified emendation" and becomes a synonym of the original name, but can be used if a replacement name is needed at a later date. An unintentional change to a name (in other words, an incorrect spelling or "laps. cal.") has no status.

VALID AND INVALID NAMES

Only names that are **available** under the ICZN rules may be used. Available names are not necessarily **valid** (that is, the correct name), but are the only ones that may be regarded as eligible for use:

MAIN CONDITIONS FOR AVAILABILITY:

When it was first proposed a name must have been:

(1) **Binomial** – that is, published in a consistently binomial work. Names published by non-binomial authors such as Chemnitz, Martini, Meuschen and Martyn are not available (unless the ICZN has specifically ruled otherwise).

(2) Properly published in a **widely available publication**, usually requiring multiple copies printed in ink on paper.

(3) Written in **Latin** (that is "western") **letters**. This does not mean that it has to be classical Latin (or even Greek) in origin – names such as *empressae* (English), *Nquma* (Zulu) and *Uzumakiella* (Japanese) still fulfill the Rules.

(4) Identifiable – there must have been an **indication** of its identity, either a description containing at least one distinguishing character, or a reference to a published de-

scription or figure. For example early authors such as Röding and Link published names without descriptions – instead they gave references to illustrations published by earlier writers such as Chemnitz; the actual characters will be found in these sources. For example, the name *Thais* [now *Purpura*] *panama* Röding, 1798, was proposed without description or even locality, but a reference was given to Chemnitz 1788: pl. 154, fig. 1467-8, which enables the species to be recognised. (Furthermore, as Chemnitz gave the locality Tranquebar for his specimen, this automatically becomes the type locality (see below) for *Thais panama*.)

A name published without any associated description or illustration is called a **nomen nudum**, and is not available. A name whose identity is uncertain because of an inadequate description or figure remains available and is termed a **nomen dubium**.

(5) After 1999 there must be an indication that the name is new ("sp. nov.", "new sp." etc), a holotype (or syntype series) must be designated, and the institute where they are housed must be given.

RULES OF VALIDITY

Synonymy

Synonyms are names that are spelled differently, but which apply to the same taxon. If they share the same type (see below), whether they are species, genera or higher, they are called **objective synonyms**. If the synonymy is a matter of opinion the names are called **subjective synonyms**.

The most basic rule is **Priority**: the first available name for a species should be used, unless the ICZN rules make it invalid. The earliest (valid) name is called the **senior synonym**, later names are called **junior synonyms**.

Even after a name has been rejected as a synonym, it remains available – if another author believes it to be valid he may restore it using a different interpretation (eg. al-

though *Conus gilchristi* Sowerby, 1903, was once synonymised with the earlier *Conus natalis* Sowerby, 1857, recent studies treat *C. gilchristi* as a valid species in its own right).

Synonyms published **at the same time**: when two names for the same species are published on the same date, even in the same work, the senior synonym is whichever name is used as the valid name by the **first reviser**. The first reviser is the first author to choose one of the names as the valid one. The same applies when a name is spelled in different ways in the same work. Although page priority was once used as the only criterion in selecting the senior synonym, it is no longer considered important.

Homonymy

A homonym is the same name proposed for different species. The later name to be published – the **junior homonym** – must be replaced, either by finding a later available name or by proposing a new name (see next section). Even a one-letter difference is sufficient to prevent homonymy, except for certain letters that are interchangeable in Latin (such as *i* and *ii*, or *c* and *k*).

At the specific (and subspecific) level there are two kinds of homonyms:

Primary homonyms are names that were identical when they were first published, even though based on different species: example, *Cerithium morus* Lamarck, 1822, was based on a different species to the earlier *Cerithium morus* Bruguière, 1792), and we must use a later name, *Cerithium bifasciatum* Sowerby, 1855, for Lamarck's species. We cite the first name as *Cerithium morus* Lamarck, 1822, **non** Bruguière, 1792. (The word **non** (meaning "not") is also used to indicate a misidentification.

A **secondary homonym** is created if a specific name is moved to a genus in which there is already another species with that name. As an example, *Conus torquatus* Martens,

1901, is a junior secondary homonym of *Cucullus torquatus* Röding, 1798, as both now belong in *Conus*. A name that was replaced because it was declared a junior secondary homonym before 1961 remains permanently invalid. If such a replacement happened after 1960, the original name must be reinstated if an author transfers it to another genus.

Unused names

As from year 2000, a name that has been used as a valid name by at least 10 authors in 25 publications over the past 50 years should not be rejected if it is found to be a junior synonym of an earlier name that has not been recognised as valid since 1899.

REPLACEMENT NAMES

If a name is invalid, the earliest of its junior synonyms should be used to replace it. If no such alternative name exists, a taxonomist may propose a new name. When published, this must be clearly marked "new name" or "**nom. nov.**" ("**nomen novum**", sometimes called a "*nomen substitutum*" or substitute name).

INFRA-SUBSPECIFIC NAMES

Since 1961, "varietal" or "forma" names have had no validity, and should not be used. (However, if a name originally proposed as a "var." before this date has previously been recognised as available (before 1985), we must treat it as having subspecies rank for the purposes of the Code

NAMES ABOVE THE GENUS-LEVEL

A family name is formed by writing the ending "idae" after the stem of the name of the

type genus designated by the describer. Subfamily names end in "-inae". Superfamily names end in "-oidea", although until a few decades ago, molluscan superfamilies were given an "-acea" ending.

DATE OF PUBLICATION

We must use the actual date given in the publication unless there is outside proof that it was incorrect. If different parts of a publication appeared over a period of time, without a precise date being available for each part, the final date known is to be adopted for the entire publication. If only the year of publication is known, then it is taken as 31st December of that year, and if only the month is known, publication is considered to have been on the last day of the month.

THE TYPE CONCEPT – FIXING THE IDENTITY OF A NAME

The basis for defining each taxon is its **type**. The type serves as a fixed reference point, although it need not be typical – to generalise, the characters of the taxon must include the most important characters of the type.

Family types

Each family takes its name from its type genus (example the Trochidae from the genus *Trochus*). Even if the name of the type genus falls into synonymy, we still retain the original family name, unless it threatens stability (eg. we still use the name Psammobiidae, even though *Psammobia* is now regarded as (at most) a subgenus of *Gari*)

Generic types

Each genus has a **type species**, which may have been fixed in various ways:

(a) formally designated by the original author ("by **original designation**", abbreviated to "**od**"). This is now required under ICZN rules for future generic names to be

available.

(b) designated in a later publication ("by **subsequent designation** "). The species must have been included in the genus when the genus was proposed; usually cited along the lines of "**sd** Gray, 1847".

(c) it was the only species included when the genus was proposed ("by **monotypy**", abbreviated to "**m**").

(d) a species originally included in a genus and sharing the same name ("by **absolute tautonymy** ")., eg. the type species of *Haustellum* Schumacher, 1817, is *Murex haustellum* Linnaeus, 1758.

Species-level types (type specimens)

The type series includes all the specimens that were studied by the author when a new species (or subspecies) is described.

There are several categories of types:

(a) the **holotype** : a single specimen (ideally the most typical) selected to represent a species, and specified as such in the original description..

(b) **paratypes** : the other specimens from the type series from which the holotype was chosen.

(c) **syntypes** : a series of type specimens of equal rank (once called "cotypes"), in other words, where a holotype was not designated..

(d) the **lectotype** : if it is necessary to clarify the use of a name, a subsequent worker may choose a specimen (preferably the figured example) from among the syntypes to be the name-bearing type. The remaining syntypes are called **paralectotypes**.

(e) the **neotype** : a specimen designated as such when all genuine types have been lost or destroyed. This should only be done as part of a taxonomic revision, in order to solve a dispute by permanently fixing the identity of the disputed name. The neotype should be from as close as possible to the type locality. However, if actual types are subsequently rediscovered, they will take

precedence over the neotype. If a type exists but lacks diagnostic characters (for example it is too badly damaged for certainty about its identity), the Commission may be asked to set the status of the existing type aside and designate a neotype. although this will only be done in exceptional cases.

Only holotypes, syntypes, lectotypes and neotypes have a name-bearing function, and are termed "primary" types. In other words they are the only specimens used to fix the usage of names. "Secondary" types - paratypes and paralectotypes - are useful in providing information on the author's concept of the amount of variation in his species, but have NO name-bearing functions. Until the 20th century, very few malacologists designated types and seldom even indicated which specimens they had examined. As types may be the only way in which we can conclusively determine the identity of a species, much modern taxonomic research has to be devoted to tracking down actual (or possible) types.

During the late 18th and early 19th centuries, few taxonomists published figures of their species, but instead gave references to previously published illustrations in non-binomial works. Study of these figures is crucial when actual type specimens are no longer traceable (for example Lightfoot, Link, Gmelin, Röding). The specimens from which such illustrations were drawn have the status of syntypes (or the holotype, if only one specimen was involved).

Other type categories are seldom used, other than **topotype** (any specimen from the type locality). Figured specimens, although not forming part of the type series, may have important status, as they have often been important in influencing interpretation of a species.

Type locality

This is the locality from which the holotype, lectotype, neotype or syntypes came. If several localities were given, or a very generalised one (eg. "China Seas"), a later writer

may restrict it to a more precise locality. If no type locality (or the wrong one) was originally given, one should designate a new one or emend the old, after carefully studying the historical sources of specimens available to the original describer.

It is essential to take into account the vague geographic concepts of early European writers! For example, "l'Océan indien" of Lamarck did not mean the modern Indian Ocean, but was anywhere from south-eastern India to Indonesia. The "China Seas" of Adams & Reeve and Hinds often meant modern Indonesia and Malaysia. However, very frequently such localities had no true basis and were little more than guesswork.

IMPORTANT LITERATURE

International Code of Zoological Nomenclature. 4th Edition. 1999. University of California Press: London.

Official journal of the ICZN: *The Bulletin of Zoological Nomenclature*, published 4 times a year by the International Trust for Zoological Nomenclature. Address: The Executive Secretary, ICZN, c/o Natural History Museum, Cromwell Road, London SW7 5BD, U. K.

However, it is possible to subscribe annually and get separates of all Applications, Comments and Opinions relating to Mollusca nomenclature.

Internet site: <<http://www.iczn.org>>

USEFUL SOURCES OF LATIN/GREEK WORDS:

BROWN, R. W. 1954. *Composition of Scientific Words*. Washington: Smithsonian Institution Press. [ISBN 0-87474. 186-2]

STEARN, W. T. 1983. *Botanical Latin*. London: David & Charles. [ISBN 0-7153-8548-8]