Scientific Nomenclature: What's in a Name?¹

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Homo sapiens, what an appropriate name for man. It sounds impressive and has a regal quality about it. However, our satisfaction with our scientific name may diminish somewhat if we compare it with those of other creatures such as *Hadrotettix magnificus* (a grasshopper), *Hylocomium splendens* (a moss), *Zienkowiezyktodermogammarus zienkowiezi* (an amphipod crustacean), or even *Carmenlectra shechisme* (a fossil moth).

Why Use Scientific Names?

Living things are given scientific names in order to avoid confusion. Animals and plants have different common names in different languages, and often have different names in the same language depending upon the geographic area. For example, the gray snapper (Figure 1) can also be known in English as gray silk, mangrove snapper, mangrove pargue, mango snapper, pargue, black pargue, black snapper, lawyer, silk, and snapper; in Spanish it can be called caballerote, cubereta, pargo de mangel, pargo dentón, pargo manglero, and pargo prieto; in French it is known as carde gris, pagre, parguette, and vivaneou sarde gris.

Figure 1. *Lutjanus griseus* Credits: Florida Keys National Marine Sanctuary

Imagine the confusion in a discussion about the gray snapper if people from different regions used their favorite common name.

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Another source of confusion is that different organisms often have the same common name, for example, names like robin, bluejay, tadpole shrimp, mourning dove, badger, and many others are applied to two or more different species which often are not even closely related.

The scientific name, however, is the same regardless of your native language. In the case of the gray snapper, the scientific name, *Lutjanus griseus*, is the same whether you come from Argentina, Taiwan, or Denmark, and (in theory) no other organism has the same scientific name. This can be accomplished because there are sets of international rules on naming living things; The International Code of Zoological Nomenclature (ICZN) which deals with animals and heterotrophic protozoans, The International Code of Botanical Nomenclature (ICBN) for plants, fungi, algae, and photosynthetic protozoans, and The International Code of Nomenclature of Bacteria (ICNB) for bacteria and archaea. Scientists try to adhere to these codes closely.

History

Scientific nomenclature was proposed by the Swedish biologist Carl von Linné (usually latinized to Carolus Linnaeus). In 1758 he published his first classification, *Systema Naturae*, which he continued to revise in subsequent editions and grew from a 13 page pamphlet to more than three thousand pages in the final (13th) edition in 1770. In this work, Linnaeus not only presented classifications of living things, but also rules for naming organisms. In 1901, the tenth edition of the book formed the basis for the formal International Code of Zoological Nomenclature.

Scientific "Grammar"

Scientific names consist of two parts sometimes known as the binomial epithet; the generic name and the specific name. Linnaeus originally proposed that the scientific names be composed of Latin words. However, many of the words used for names are not really Latin. Many are classical Greek, others are just "latinized" versions of words in other languages; some names imitate sounds or noises made by the organisms in question, and some are just made up. Nevertheless, generic names are required to have the

form of a Latin noun, with a defined gender, and the specific names are required to decline according to the rules of Latin adjectives (in Latin, nouns come before adjectives). Normally, scientific names are italicized or underlined, with the generic name capitalized and the specific name all in small case letters. Some older texts capitalize the specific name if it refers to a person or place name.

What do they Mean?

The first part of the name, the generic (genus) name, tells us something about the organism's relationship with other organisms. In current "phylogenetic" biological classification, organisms are grouped into narrower and narrower groups supposedly according to how closely related, in evolutionary terms, they are. At the top, there are broad divisions, such as animals separated from plants at the Kingdom level. The generic level (genus) is close to the bottom and groups closely related organisms (Table 1).

The second part of the scientific name is the specific (species) name. This part of the name is often descriptive, for example in our snapper example, the specific name "*griseus*" describes the grayish color of the animal and distinguishes it from other member of the *Lutjanus* genus such as the red snapper (*Lutjanus campechanus*), the mahogany snapper (*Lutjanus mahogoni*), the dog snapper (*Lutjanus jocu*), the schoolmaster (*Lutjanus apodus*), and many others. Other descriptive terms used as the specific name are not as straightforward as the above. For example, the yellow fever mosquito *Aedes aegypti* is so named because the adult mosquito has a pattern of gold scales in the dorsal side of the thorax that resemble a lire, a musical instrument that was popular with the ancient Egyptians (Figure 2).

The specific name is often used to reflect the name of the scientist that discovered or classified the species or to honor people. So, *Mastagophora dizzydeani* (spider) is named after baseball player Dizzy Dean, whereas *Equus grevyi* (zebra) is named after Jules Grevy, president of France from 1879-1887. Other species named after people include:

- *Pachygnatha zappa* (orb-weaver spider). It has a black marking under its abdomen that

Figure 2. Allegorical depiction of *Aedes aegypti*. Credits: Greg Mills

reminded the authors of Frank Zappa's moustache.

- *Norasaphus monroeae* (trilobite). After Marilyn Monroe; part of the "head" is shaped like an hourglass.
- *Preseucoila imallshookupis* (gall wasp). After Elvis Presley, specifically after one of his songs.
- *Greeffiella beatlei* a shaggy nematode named after...guess who?

Some species are named after geographic locations. Such is the case for the topminnow *Gambusia baracoana*, which is named after a city in Cuba (Baracoa). Specific and sometimes generic names may originate from sounds made by the organisms in question. For example, the generic name *Gekko* refers to the loud croaking mating call of some gecko species. Local common names are also often incorporated into the scientific names such as in the scientific name of the garden warbler, *Sylvia borin*, where borin, is an Italian local name for a type of warbler.

Other Conventions

Author and date: Often the name of the author that named the species follows the species name, and if the name was changed then the author's name is in parentheses. Additionally, the date when the species was named is often appended. For example the gray snapper may be listed as follows: *Lutjanus griseus* (Linnaeus, 1758) which means that the species was originally described by Linnaeus in 1758 and that the original name has been changed.

Subspecies and varieties: Populations of a species sometimes differ from other populations in morphology, physiology, behavior, and other characteristics that may warrant separate identification without actually assigning them to a new species. Practices for assigning subspecies or variety status vary widely between different fields such as botany, zoology, bacteriology and others. In some cases, e.g., bacteria, subspecies and variety are usually interchangeable. The biological significance of these subspecies or varieties is often questionable and there is active debate whether they should even be used at all. A full discussion of the subject is beyond the scope of this publication so we will just note some of the conventions involved in naming subspecies and varieties.

A subspecies is usually identified with a trinomial, which includes the usual genus and species name and the subspecies name immediately following. For example: the eastern yellow-rumped warbler is *Dendroica coronata coronata* Linnaeus, and the western yellow-rumped warbler is *Dendroica coronata auduboni* Townsend. In plants, the system can get complicated, as often authors of the original species name and authors of the subspecies name are listed, the fact that the name is subspecific is often identified by the abbreviation "subsp.", and name changes are followed throughout. For example, in the scientific literature one may run into the following name: *Pinus nigra* J.F. Arnold, 1758 subsp *salzmannii* (Dunai) Franco. This name identifies J.F. Arnold as the author who first described the species *Pinus nigra*, Dunai, as the author who described the species *Pinus salzmannii*, and Franco as the author who somehow showed that *Pinus salzmannii* was only a subspecies of *Pinus nigra*!

Varieties are usually denoted by the abbreviation "var.", for example, *Bacillus thuringensis* var. *israelensis* denotes the variety *israelensis* of the bacterium *Bacillus thuringensis*, an insecticidal bacterium, marketed worldwide for control of many important pests. The variety *israelensis* is particularly effective against mosquito larvae. Botanical complications also apply to variety nomenclature.

Abbreviations: Most scientific journals require that the full scientific name, including author be spelled out upon first mention of a species, but the name can be abbreviated to the first letter of the genus and the species name in subsequent mention. Also, lists of species from the same genus can be abbreviated by writing the full name of the first species in the list and then abbreviating the rest. For example, the list of snappers from a previous section can be abbreviated to: "...the red snapper (*Lutjanus campechanus*), the mahogany snapper (*L. mahogoni*), the dog snapper (*L. jocu*), the schoolmaster (*L. apodus*)...". Names are always spelled out if abbreviations can lead to confusion of species with similar names. In some cases, particularly in the mosquito literature, the genus name abbreviation consists of two letters, *Ae.* for *Aedes*, *An.* for *Anopheles*, *Cx.* for *Culex*, *Cs.* for *Culiseta*, and so on.

Sp. and Spp.: Sometimes we must deal with organisms for which, for various reasons, we know the genus, but not the species. In such cases the organism is identified by the generic name followed by the abbreviation "sp" e.g., *Lutjanus* sp. to refer to some type of common snapper, or *Lutjanus* spp. to refer to several species of common snappers. These abbreviations can also be used when the names of the specific species is not important to the subject under discussion.

Additional References

Animal Diversity Web -
http://animaldiversity.ummz.umich.edu/site/animal_names/scientific_name.html.

Curiosities of Biological Nomenclature -
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<http://www.saltspring.com/capewest/pron.htm>.

Scientific Bird Names Explained -
<http://www.xs4all.nl/~sbpoley/scinames.htm>.

World Biodiversity Database -
<http://www.eti.uva.nl/tools/wbd.php>.

Table 1. Classification of the gray snapper and yellow fever mosquito.

	Gray snapper	Yellow fever mosquito
Kingdom	Animalia (animals)	Animalia (animals)
Phylum	Chordata (chordates)	Arthropoda (crustaceans, insects, spiders, and relatives)
Class	Actinopterygii (ray-finned fishes)	Insecta (insects)
Order	Perciformes (perch-like fishes)	Diptera (flies)
Family	Lutjanidae (sea-perches and snappers)	Culicidae (mosquitoes)
Genus	<i>Lutjanus</i> (common snappers)	<i>Aedes</i> (Aedes mosquitoes)
Species	<i>griseus</i> (gray snapper)	<i>aegypti</i> (yellow fever mosquito)