

Forum

How to rectify the misuse of scientific names in bioscience?

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Abstract

The misuse of scientific names for species of organisms is a widespread and long-standing academic phenomenon; however, its negative impacts to scientific community and the public have been largely overlooked all along. Here we exemplified two research cases in seaweeds to highlight the extent and dimension of misused scientific names of species in bioscience, and present a few feasible measurements to rectify such a situation. Our ultimate goal is to create a discussion platform and to draw deserved attention of scientific name to taxonomy-related scientists.

Keywords Species name – Taxonomy – Bioscience

“It is the role of nomenclature to provide labels for taxa at all levels, in order to facilitate communication among biologists. The scientific names for species of organisms and for the higher taxa in which they are placed form a system of communication, a language; they must fulfill the same

basic requirements as any other language.”

That was nearly half a century ago how Ernst Walter Mayr, one of the twentieth century’s leading evolutionary biologists, appreciated the unique position of taxonomy in bioscience in *Principles of Systematic Zoology* [1]. Nowadays, the interaction and permeation of multiple disciplines have placed taxonomy a cornerstone position in modern bioscience systems. The current status is that the identification and classification of species have merged not only into a great diversity of basic biological investigations, including (but not restricted to) ecology, genetics, phylogenetics, biogeography, biological invasion, molecular evolution, and biodiversity conservation, but also into many applied fields (e.g., food, medicine, costume, cosmetic, and environmental monitoring) [2, 3]. In reality, for some studies related to applied science (e.g., bioactivities isolation from seaweeds), the misidentification of species’ name always led to the inconsistency between research material and target molecule of interest, which will subsequently cause misinterpretations of experimental results, spread confusion among communities and mislead future researches [3]. Such a broadly recognized consensus demands all scientists and researchers, whether specialized in taxonomy or not, to convey to the public and society an empirical knowledge and invention, not only about the approach, theory, and technique, but also the correct scientific names of organisms involved.

To our surprise, the biological community has not faithfully followed this basic but essential principle all along. Frankly, there is a striking tendency that biologists working in areas other than taxonomy (sometimes in taxonomy too) pay scant respect to properly use the correct names of organisms while publishing their results in journals. Such bias has been exemplified on the misused seaweed names during two of our biological investigations.

The first case is the Kelp (*Laminaria japonica*), a brown seaweed widely used in China, Japan, and Korea for food, feed, and hydrocolloid. This name was first established by Areschoug in 1851, and had been used for over one and a half centuries. In April 2006, Lane et al. [4] proposed to split the genus *Laminaria* with a resurrected genus *Saccharina* Stackhouse that contains *L. japonica*. This landmark taxonomic revision

yielded considerable impact on phycological community as it has been cited 111 times until the end of April 2013 (<http://scholar.google.com>). However, when we used the old *L. japonica* and revised *S. japonica* as the objective word to search in Web of Science (<http://apps.webofknowledge.com>) between 2007 and 2013, it is ironical to find that the number of literatures including the outmoded *L. japonica* is nearly four times that of the widely accepted *S. japonica* (Fig. 1a). Popular researches such as Biochemistry & Molecular Biology, Pharmacology and Plant Science (Taxonomy not included) almost account for three quarters. Exceptionally, literatures with the key authors from China and published in Chinese journals take up 54 and 77 percent of all 339 misused species names, respectively (Fig. 1a).

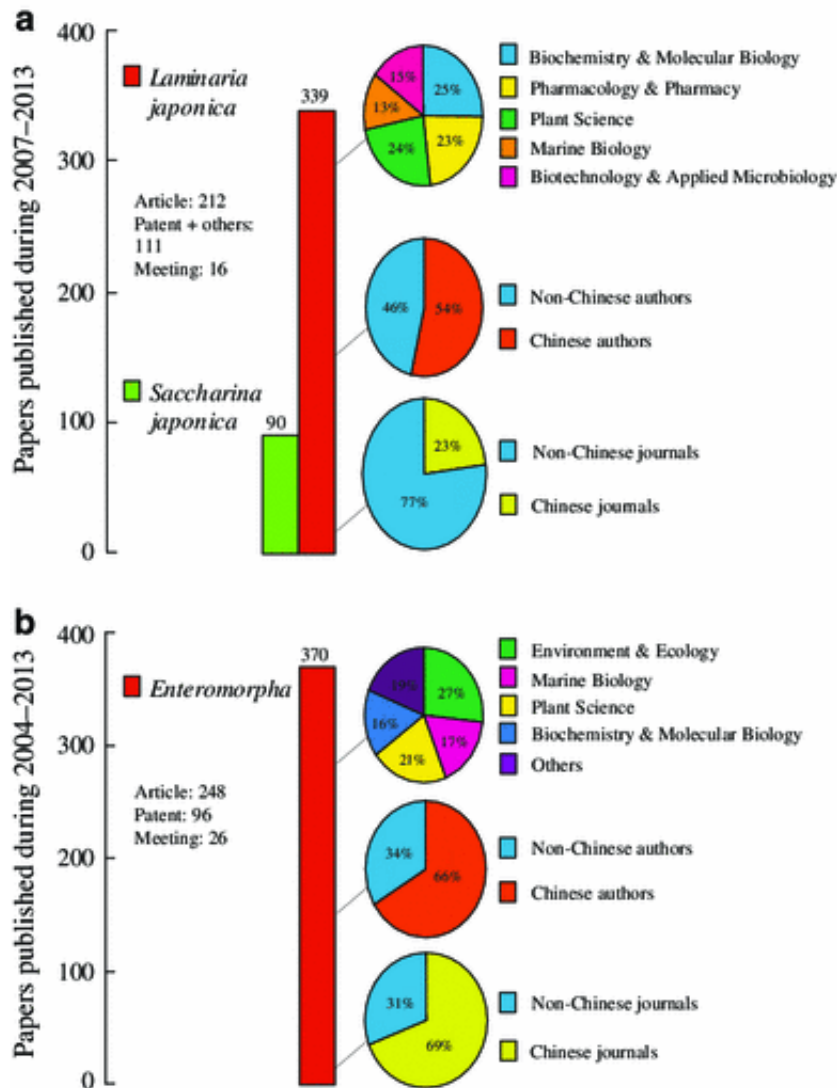


Fig. 1

Collected papers from Web of Science (<http://apps.webofknowledge.com>)

containing the misused scientific name of species for the brown seaweed *Laminaria japonica* (a) and the green genus *Enteromorpha* (b). The pie charts (up to down) show the distributed proportion of these papers in non-taxonomy research fields, mainly contributed by Chinese authors or not, and published in Chinese or non-Chinese journals, respectively

Another case is the green seaweed *Ulva*, which was initially named by Linnaeus in 1753. This genus has 567 species names in the database at present owing to the high degree of phenotypic plasticity [5]. In the early 19th century, green seaweeds with distromatic blades taxonomically were maintained in the genus *Ulva*, whereas the tubular forms were moved to a different genus *Enteromorpha* [6], which provided convenient morphological criteria for species recognition in the following 180 years. In August 2003, Hayden et al. [7] demonstrated that the genus *Enteromorpha* should be merged within *Ulva*, which means that *Enteromorpha* species should be reclassified back into the genus *Ulva*. This significant work has been broadly recognized by phycologists as well and has been cited 303 times to date. Again, when scrutinized the Web of Science during 2004–2013 using *Enteromorpha* as the key objective, we obtained 370 literatures (Fig. 1b). Some universal researches occupied up to 80 % of the total literatures with misused names, including Environment & Ecology, Plant Science, Marine Biology, and Biochemistry & Molecular Biology. Still, among these references, two-thirds were contributed by Chinese authors, and almost 70 % was published in Chinese journals (Fig. 1b). This disproportional ratio clearly shows that there is a much worse situation of misused scientific names by Chinese researchers studying seaweeds. By continuing the application of erroneous nomenclature, they have not realized the significance to use the correct taxonomic names in their work and the potential negative impacts to the scientific community.

The misuse of seaweed names probably appears much more prevalent than those in land plants and animals, but we believe this anachronistic phenomenon can also be found in other biological studies. One decade earlier, in order to emphasize the importance of nomenclature in taxonomy and current bioscience, taxonomist Vasudeva Rao [8] mentioned that “The ignorance or careless attitude to nomenclature issues by taxonomists themselves does more harm to the subject than non-taxonomists can cause”; this comment can be extended as “The ignorance

or careless attitude to misuse of scientific names of species by biologists themselves do more harm to the public and society than non-biologists can cause” when we pay specific attention on the impact of the misused scientific names of organisms on academic communication and dissemination. It is therefore essential and urgent to take some applicable measures to mitigate or reduce the overflow of wrong scientific names of organisms in future.

To avoid the recurrence of such misused scientific names of species or organisms in biological journals, we propose some efficient and applicable approaches as follows: (i) Establish electronic and accessible databases to provide a variety of taxonomic information for different taxa (e.g., algae, plankton, Fungus, insect). For example, already there exists real-time update online database widely used by the people worldwide working with algae (www.algaebase.org). By the end of May 15, 2013, it has collected the key taxonomic information as far as possible for more than 133,321 algal species [5], including 219,343 records of geographic distribution, 49,184 bibliographic items, and 16,455 images.

(Unfortunately, it seems that this database source has been severely ignored by Chinese researchers.) Similar databases are also newly established for plants and animals (e.g., Chinese Virtual Herbarium www.cvh.org.cn), but any taxonomic changes for each taxa in these databases should reflect real-time update upon new results or records published.

This work can be tedious and time consuming, but it will be highly useful for researchers who want to seek the newest taxonomic advances of the target species or organisms. (ii) The scientific publishing group can make specific requirement for manuscript submission in relation to nomenclature of organisms. Just like the explicit guidelines how to prepare a format manuscript in each journal, the ‘Instructions to Authors’ can compulsively demand the authors of each paper to provide the correct names of target taxa, and offer linkage to online database resources such as www.algaebase.org for phycologists to facilitate the correct nomenclature and current usage of scientific names of species.

From our own experience, many authors of applied phycological researches often reported bioactive molecules from seaweeds with only describing the species name used, not presenting any detailed taxonomic identification such as morphological description, picture, and voucher

information. Under this circumstance, there is no possibility whatsoever to verify if the species applied was identified incorrectly. Therefore, the reviewers and editor of journals should be adamant about refusing papers without providing taxonomic evidence or deposition information (e.g., silica-gel permanently conserved material or genomic DNA, which can allow for future verification and replication) [3]. This mode can be specifically required as a mandatory standard for some taxonomy-related journals. (iii) Before manuscripts are accepted, the Editorial Board of each journal should seek assistance of professional taxonomists (including taxonomists in their editorial boards), particularly when the referees of this manuscript are not experienced taxonomists. We found the last criterion strictly applied in some specialized journals, including the official *Journal of Phycology* of Phycological Society of America. For example, the red seaweed name *Porphyra yezoensis* had been replaced by a new name, *Pyropia yezoensis*, in October 2011 [9], since then the former name has just appeared in this journal twice (references not shown), as they were previously accepted in July and August 2011. Despite the recognized importance of scientific names of organisms in biological investigations, this issue has not received the attention that it deserves. Biologists should ask themselves (or be asked) if they are using the correct scientific species names in their publications. Although taxonomists have the responsibility to deliver the right names of species to scientific groups, all of us (including the non-taxonomists) have the same responsibility and obligation to convey the correct knowledge and information to the society.

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