

**(376) Amend Art. 9.2 as follows (new text in bold, deleted text in strikethrough) and add a new Article in Art. 40:**

“9.2. If a designation of holotype **(or indication of type under Art. 40)** made in the protologue of the name of a taxon is later found to contain errors (e.g. in locality, date, collector, collecting number, herbarium code, specimen identifier, or **incorrect** citation of an illustration), these errors are to be corrected provided that the intent of the original author(s) is not changed. ~~However, omissions of required information under Art. 40.6–40.8 are not correctable.~~”

“40.n. Except as expressly provided in this *Code* (e.g. Art. 9.14), a name of a new taxon is not validly published if external evidence reveals that the internal evidence in the protologue failed to meet the requirements for valid publication (i.e. Art. 32–45, F.4, F.5, and H.9). For example, even if not apparent from the protologue, a name of a new taxon is not validly published if the indicated type consists of more than one gathering, or for names published on or after 1 January 2007, is an illustration (except as permitted by Art. 41.5),

or if the purported validating description or diagnosis in a referenced earlier publication is inadequate under Art. 38. In contrast, errors in the indication of the type described in Art. 9.2 do not prevent the valid publication of the name of a new taxon. However, omissions of the required information to validly publish a name (e.g. Art. 40.6–40.8) are not correctable.”

It is worth noting that two Examples in the *Shenzhen Code* involve the opposite fact pattern: while the protologue might suggest that the type is more than one gathering, a review of the referenced materials reveals that they are in fact a single gathering. See Art. 40 Ex. 4 and Art. 46 Ex. 22. We have offered appropriate amendments to the Editorial Committee.

#### Acknowledgements

We thank Nicholas J. Turland and John H. Wiersema for their assistance.

## (377–378) Proposals to improve the indexing and exchange of digital nomenclatural data

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DOI <https://doi.org/10.1002/tax.13044>

First published as part of this issue. See online for details.

The use of agreed-upon standards is one of the foundations of effective scientific communication. In some cases, those standards come about organically as researchers converge on a set of best practices. In other cases, standards may need to be rigorously imposed in order to guarantee adherence. Both examples exist in the *International Code of Nomenclature for algae, fungi, and plants* (“*Code*”; Turland & al. in *Regnum Veg.* 159, 2018) and either might be applied in the case under discussion. In addition, there is precedence in the *Code* for recommending certain “identifiers” meant to stand in for richer data. See for example, Rec. 46A Note 1, which recommends using standard forms for the authors of plant names. Even more directly applicable is Art. 40 Note 4, which recommends the use of standard herbarium codes when citing institutions. These codes are widely used in digital datasets to unambiguously identify where a specimen resides. A precise statement of the problem we are trying to solve is important here, because it is clear to us that at least three issues are involved: registration, indexing and data exchange. When we discuss this topic with our peers, we find that these issues are often conflated, while in our minds they must be discussed separately.

#### Registration

Registration as an end unto itself (i.e. as a way to block “bad” names from ever being published) has been summarily rejected by

the botanical community and need not be discussed further. However, registration is now offered as a way to achieve two other, more desirable goals – namely rapid indexing and efficient data exchange. It should be pointed out that both indexing and data exchange are already occurring in the absence of registration of plant names. The merits of registration can therefore only be considered in the context of its *marginal* improvement upon these two activities and must be weighed against the extra overhead it introduces to the process.

#### Indexing

Advocates of mandatory proactive registration suggest that it will improve indexing by either (1) alerting human indexers to the imminent publication of a name, or (2) allowing the AI robots of the future to identify and flag new names in digital (and digitized) publications. Arguments that claim mandatory proactive registration will entirely solve the indexing problem are misguided. That is because the most important data needed by the indexers cannot be required at the time of proactive registration and in most cases are beyond the control of the authors anyway. As indexers and authors, we must already visit and revisit these data at least twice in the case of many electronic publications. First, when the version of record appears and again when it gains final pagination. To add yet another layer on top of this does not make the process any easier and only

introduces more opportunities for error. Furthermore, while these potential new names may be known to the registrar, they cannot be released to the public until the version of record has in fact been effectively published. Because that is the point where indexing would normally proceed anyway, any advantage gained by proactive registration is minimal.

Indexers often face the problem of clarifying to users how to provide feedback, updates and new data to the system. The General Committee could improve the situation immensely by authorizing recognized repositories for these data and encouraging botanists to provide those repositories with the information required to properly index names and other nomenclatural acts. The International Association for Plant Taxonomy (IAPT) could also play a significant role by communicating the importance of timely indexing to its members and by providing logistical support to facilitate this process. Most authors want wider visibility for their work, and getting their names indexed and connected to the digital infrastructure is an effective way to achieve that. There has never been an “official” way to do this for plant names, and botanists (not to mention other stakeholders) are justifiably confused by this lack of standardization. Perhaps all that is needed is to direct people to a portal (like the one the International Plant Names Index [IPNI] has already set up) and provide them with the tools for effective input and feedback? It is even possible to incentivize this activity by, for example, offering bounties in the form of credit towards open-access publication fees in botanical journals. We believe that we should at least try this route before resorting to more drastic measures.

#### Data exchange

One of the primary principles of modern database design is to eliminate duplication of data and consequently the effort required to keep multiple copies of the *exact same* data in sync. In the jargon of relational database systems this is called normalization. When it comes to cataloguing nomenclatural data, there is still considerable duplication of effort in the botanical community that could be avoided if we were to pool our efforts. However, we should be clear about precisely which information we are trying to normalize/de-duplicate as well as the mechanism that would best achieve that goal. That is because there are two other principles to consider that usually require us to maintain multiple copies of the same or similar data anyway – namely redundancy and diversity. Redundancy will always be necessary because the daily operations of any one of our institutions cannot be dependent on internet connectivity to a central source. Likewise, there is a diversity of uses for these data that cannot be provided for by any single database. The way to provide for normalization, redundancy *and* diversity is by using a single, unique identifier that follows the data from its source to every copy that exists on the internet. This allows for clean, de-duplicated data to be provided by an authorized source, copied to databases where it is required but not altered, and also copied to other sites where it might be mutated or have additional value added by combining it with other data. All these different uses can then be connected back to the source through a single identifier.

For hundreds of years, we have used the Linnaean name as this “identifier” sometimes in combination with its authorship as needed. However, the members of the Registration Committee are keenly aware that, because of homonyms and orthographical variants, using the Linnaean name on its own is inadequate for the purposes of digital data exchange. What is less clear is which identifiers should be used and how they should be established. There is no shortage of unique

identifiers for plant names. That is, in fact, precisely the problem. The GBIF page for *Poa annua* L. (<https://www.gbif.org/species/2704179>, accessed 4 Jun 2023) lists at the bottom no fewer than 83 identifiers (GBIF’s own included) and references a Wikidata page where they are catalogued. This is a prime example of the redundancy and diversity that the internet provides, but it is also paralyzing progress on a number of fronts. We contend that the best way out of this situation is not to *create* yet another identifier, but to simply *choose* one that is already established and suitable for our purposes. We also contend that there is very little about having the identifier present in the protologue that makes it somehow any “better” than an identifier assigned later. Instead, it only sets up a situation where it might later become obsolete. Even if we started tomorrow, for the remainder of the lifetimes of every botanist now alive, plant names with identifiers present in the protologue would be only a fraction of the total number of names. By almost any measure, the data problems we face both now and for the foreseeable future mostly concern names that already exist. We should focus our efforts on fixing those problems, first by authorizing nomenclatural repositories as the source and official caretakers of these data, and second by encouraging botanists and particularly members of the IAPT to help those repositories improve the quality of the information that we share with the larger biodiversity data community. To this end, we propose the following changes to Art. 42 of the *Code*, mostly patterned after the current Art. F.5.2, F.5.3 and F.5.5. For the history and results of the Registration Committee’s votes on these proposals, see the accompanying report in this issue.

#### (377) Add three new Articles and three new Notes to Art. 42:

“42.4. For an identifier to be issued by a recognized repository for a nomenclatural novelty (Art. 6 Note 4) applied to an organism treated as an alga or plant under this *Code*, the minimum elements of information that must be provided to the repository by either the author(s) or other user(s) of these scientific names are proof of effective publication (Art. 29–31) of the name itself along with those elements required for valid publication under Art. 38.1(a) and 39.2 (validating description or diagnosis) and Art. 40.1 and 40.7 (type) or Art. 41.5 (reference to the basionym or replaced synonym) and for algae Art. 44.2.”

“Note 2. In contrast to registration of fungal names, registration of algal and plant names is retrospective and accomplished only after valid publication (Art. 42.3).”

“Note 3. Proof of effective and valid publication for the purposes of issuing an identifier may be provided to the repository in a variety of forms including (but not limited to) PDFs, scanned page images, and/or URL/DOIs that lead to free and publicly accessible websites where these may be obtained.”

“42.5. The General Committee (see Div. III Prov. 7) has the power to (a) appoint one or more localized or decentralized, open and accessible electronic repositories to accession the information required by Art. 42.4 and issue identifiers; (b) cancel such appointment at its discretion; and (c) set aside the requirements of Art. 42.4 and 42.6, should the repository mechanism, or essential parts thereof, cease to function. Decisions made by this Committee under these powers are subject to ratification by a subsequent International Botanical Congress.”

“42.6. For an identifier to be issued by a recognized repository for the purposes of specifying the designation of a type of the name of an organism treated as an alga or plant under this *Code*, the minimum elements of information that must be provided to the repository by either the author(s) or other user(s) of these type designations are

proof of effective publication (Art. 29–31) of the name being typified, along with the author(s) designating the type and those elements required by Art. 9.21, 9.22, and 9.23.”

“Note 4. For organisms treated as algae or plants under this *Code*, issuance of an identifier by a recognized repository has no effect on valid publication of a name (Art. 32–45) or effective type designation (Art. 7.8–7.11). Instead, these simply serve as stable digital references to the information present in the actual place of publication.”

**(378) Add two Recommendations to a new Rec. 42A:**

“42A.1. Following the effective and valid publication of new names and nomenclatural acts, authors should report them to a recog-

nized nomenclatural repository (Art. 42.1) for indexing and assignment of a unique identifier (Art. 42.4 and 42.6). While it is in the interest of the authors to do this promptly, any other party may present proof of effective and valid publication to these repositories for the purposes of both indexing and identifier assignment. In groups where proactive registration is mandatory (see Art. F.5), additional publication details (e.g. final pagination, precise date of publication, etc.) should be provided to the registrar at this time.”

“42A.2. Specification of names and nomenclatural acts for the purpose of exchange of digital information should include the unique identifier for those entities as established by a recognized nomenclatural repository (Art. 42.1).”

## **(379–382) Proposals to amend the *International Code of Nomenclature for algae, fungi, and plants* to ensure that the names of algae and fungi are not subject to uncertainty on the applicability of the rules of any other *Code* and to further clarify Art. 45.1**

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**DOI** <https://doi.org/10.1002/tax.13045>

First published as part of this issue. See online for details.

*Alexandrium* was published by Halim (in Vie & Milieu, Sér. A, Biol. Mar. 11: 102. 1960). The name applies to a group of thecate dinoflagellates, of which some 30 species are currently recognized (AlgaeBase; [https://www.algaebase.org/search/genus/detail/?genus\\_id=44609](https://www.algaebase.org/search/genus/detail/?genus_id=44609)). Members of the genus are economically important in forming large blooms, producing so-called red tides, with several species producing toxins that cause Paralytic Shellfish Poisoning when the shellfish are eaten. Halim (l.c.), who was primarily an oceanographer, had returned to his position in the Département d’Océanographie in Alexandria (Egypt) after completing doctoral studies at “la Station zoologique Villefranche” in France. Although his publication lacked any explicit statement as to which *Code* was being followed, it has long been assumed that, given his background, Halim was using the zoological *Code* and that the generic name *Alexandrium* was therefore “available” under the *International Code of Zoological Nomenclature* (ICZN; Ride & al., Int. Code Zool. Nomencl., ed. 4. 1999; <https://www.iczn.org/the-code/the-code-online/>) and hence validly published under the provisions of Art. 45.1 of the *International Code of Nomenclature for algae, fungi, and plants* (ICN; Turland & al. in Regnum Veg. 159. 2018; see footnote to Art. 45.1).

The recent interest in the nomenclatural status of *Alexandrium* arose when Elbrächter & al. (in Taxon 68: 589–590. 2019), considering that the type material of *Blepharocysta splendor-maris* (Ehrenb.) Ehrenb. was referable to a species of *Alexandrium* (sensu lato),

proposed conservation of *Alexandrium* against *Blepharocysta*. In its report on the proposal (Andersen in Taxon 70: 1125. 2021), the Nomenclature Committee for Algae (NCA) stated that “The name ‘*Alexandrium*’ Halim (*Dinophyceae*) could not be recommended for conservation because it is not a validly published name.” The rationale given for this conclusion was advice from Francisco Welter-Schultes, Chair of the Editorial Committee for the next edition of the ICZN, to the effect that Halim (l.c.) failed to indicate he was describing an animal (ICZN Art. 1.1.1).

The rationale for this decision surprised the members of the NCA and, importantly, the wider audience of users of dinoflagellate names. It also generated extensive correspondence on, among other matters, this particular interpretation of Art. 1.1.1 of the ICZN. Discussion also arose as to whether Silva’s opinion (Index Nominum Algarum; <https://ucjeps.berkeley.edu/cgi-bin/porp.cgi?160711>) that it was “not possible to tell whether author uses ICBN or ICZN” was correct or if there was enough internal evidence to show Halim was using the ICZN. This is not the place to pursue this matter, except to recognize that the existence of divergent opinions on such a case shows that rules should be devised so as to avoid such controversy, and to address the more fundamental issue, implicit in the current wording of Art. 45.1 of the ICN, that, currently, names of algae and fungi may be subject to uncertainty in the interpretation of the rules in *Codes* other than the ICN. As the mycological and phycological communities have no say in such interpretation, this seems