

## Contributions to the Discussion on Electronic Publication III

### Introduction

This is the third instalment of comments on the ICZN proposed amendment on electronic-only publication, which would allow publication of nomenclatural acts on exclusively electronic media to be valid and available. The 30th General Assembly of the IUBS, in Capetown on 11 October 2009, approved the proposals, as outlined in the following resolution:

#### **Resolution: Proposed amendment of the International Code of Zoological Nomenclature**

This General Assembly of the IUBS approves the principles underlying the proposed amendment of the International Code of Zoological Nomenclature to expand and refine methods of publication, as published in *Zootaxa* (1908: 57–67) on 9 October 2008, recognising that the final wording of the amendment will require formal approval by the International Commission on Zoological Nomenclature after consideration of the input received from the zoological community over the past year. If approved by the Commission, the final wording of the amendment will be referred to the Officers of the IUBS for their endorsement, and for subsequent implementation.

The proposed amendment is available in the BZN 65: 265–275, several other sources, and online at [http://www.iczn.org/electronic\\_publication.html](http://www.iczn.org/electronic_publication.html). We have sought input from all stakeholders in this process, including taxonomists, publishers, archivists, database experts and the wide range of users of nomenclatural information.

The date for the Commission's vote has not yet been set, thus we are not certain whether there will be a further opportunity for input through the BZN, however we encourage continued debate through listservers (e.g. ICZN listserver (<http://list.afriherp.org/mailman/listinfo/iczn-list>) and Taxacom (<http://mailman.nhm.ku.edu/mailman/listinfo/taxacom>)) and the various journals that have published the proposed amendment.

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**Comments on the ICZN proposed amendment on electronic-only publications**

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My comments were first drafted following two days of thought-provoking discussions on harmonisation of the major Codes of Nomenclature, at a meeting held at the Natural History Museum in June 2009, in which I served as the representative of the International Committee in the Systematics of Prokaryotes (ICSP) and the *International Code of Prokaryotic Nomenclature* (ICPN). Overall, I found the proposed amendments to be exceptionally well thought out and am largely in agreement with the authors of the proposal. The observations I offer here are based on past experience with the ICPN and trends on electronic publishing.

In the abstract, I note that there is mention about difficulties in determining if an article was actually published, and when. While this may be problematic for publications with very small print runs, those that carry an ISSN and a DOI can be verified independently based on the date in which registration of the identifier occurred. In the case of DOI (or Handles), the Handle records can be interrogated directly. While this works reasonably well going forward, there may be some problems as legacy content is added into these global systems as a result of large-scale digitisation efforts. I am aware of at least one instance in which a large number of DOIs were issued to back content, but were not registered at the time the content was published on the Internet. Even with the best designed systems, there are chances that human errors result in problems that are unpredictable and difficult to fix.

Although I cannot state with absolute certainty that electronic publication does not cause difficulties in some parts of the world, I think that much of the discussion on the subject is centered more on perception about the developing world rather than statement of fact. We recently looked at this issue in response to comments we received from the Government of Sweden on a white paper that was commissioned by the Secretariat of the UN Convention on Biological Diversity (UNEP/CBD/WG-ABS/7/INF/2). We found that Internet availability statistics (including those published by UNESCO) show that accessibility is growing in all parts of the world, with the highest rates of increase occurring in Africa and Latin America. While coverage may be limited in some places, one could argue that access to print publications is as well. In fact, print publication is nothing more than a way of packaging and distributing information. Publishers held a monopoly on this for a long time because publishing was a capital intensive business. That is not the case any more. The Public Knowledge Project provides some indication as to how quickly our colleagues in developing nations are adopting electronic publishing as means of distributing their own works.

I find the point in the introduction about vanishing paper archives similarly questionable when examined in light of what is known about citation statistics in both the taxonomic and general scientific, technical and medical (STM) literature. Most of the biological names in use are cited only once or a few times in the literature,

and oftentimes those citations tend to be self-citation or citation limited to a small group of collaborators or competitors. This pattern follows the general trend that occurs in the STM literature. Likewise, most of the names that are cited appear in the Western literature (historically) because of its wider availability. That availability is a function of distribution trends by publishers, language barriers, and professional biases. These all have some bearing on the argument that there are relatively few instances in which no known copies exist. Without knowing *a priori* the number of names proposed, the references in which those proposals were made, and which individuals or institutions acquired those publications, there is no way to establish whether or not a publication still exists. All that exists is a small amount of anecdotal information.

With regard to the discussion on PDFs (proposed Article 8.1.3.2), this is an attractive target format, but it is questionable as to whether or not this is the optimum format for archival purposes. Backward compatibility is problematic and current versions of PDF readers are unlikely to handle versions prior to Version 2.0 (Adobe's current version is Version 9.0). Perhaps a better solution is to opt for XML output based on a version of the NLM DTD as that is widely accepted by a number of publishers. As all XML is in ASCII (but supports a variety of character encodings, including Unicode), it will remain readable, long into the future. Style sheets used for rendering XML are also in ASCII, along with the XSL and XSLT used in the transformation process. The NLM also has an archive version of the DTD. Since the vast majority of STM publishers in the US now comply with the requirement of posting acceptable XML to PubMedCentral, this seems to be a reasonable approach for other communities to follow. The other advantage of XML is that it can contain a wealth of metadata in the file header that can be readily extracted, and can include various publisher IDs (ISSN, DOI, Pubmed ID), publication dates, and could include a checksum to verify that the article has not been tampered with post-publication.

The issue of archiving supplementary data (including graphics used in the publication) remains a problem, especially in some fields such as genomics, where sequence trace files can be measured in gigabytes to terabytes. Graphic files can also be problematic, both from the perspective of size, file types, and rendering software. While images can be incorporated into a PDF file during creation, the question about backwards compatibility is unchanged. If one relies entirely on XML files, the image files must be held by the archive as these are merged into the human readable formats (e.g. MTML, PDF) during transformation.

I have some problems with the delay in submitting content to an archive (dark or otherwise) (Proposed Article 8.5.3.3). I suspect that this approach is likely to cause some difficulties in the future and the Commission could be in the position of ruling on names that were included in one or more publications but were not archived by the publisher. While such failures could work against publishers in the future (because authors would be reluctant to submit to those journals), it would punish the current authors for actions that they themselves had no part in. It seems that the more prudent approach would be to require publishers to agree to submit to an archive at the time of publication, with independent verification to both the author and ICZN.

Proposed Article 10.9.2.1 could become problematic over time as it requires an Internet address. Internet addresses are not permanent, nor are domain names. An

alternative approach should be considered that is consistent with current publishing standards. An obvious approach would be to incorporate this information into the DOI record for each article that is published.

Proposed Article 10.9.4 is perplexing. While I can appreciate the political complications of registration, it makes no sense to register only those names that are published electronically. It fragments the record and will only lead to further confusion on the part of the end-users of zoological nomenclature. Why not simply register each nomenclatural event at the time of publication?

Proposed Article 78.2.4 includes language that allows the Commission to establish and maintain an official register of names. As written, the Commission could also cease to maintain such a register at some point in the future. As an outsider, it seems to me that the Commission needs to either decide to take on this task in an official and responsible manner, using proven technology, or suffer the consequences of allowing others to take on the task outside of their control.

Proposed Article 8.1.3.2. PDFs still provide the best option for fixed content, including pagination. PDFs also address the issue of incorporating images directly into the content, and can be locked, signed and certified to insure that changes have not been introduced post-production, and can include some metadata. The issue with PDF files is, and will be, backward compatibility in the future.

Proposed Article 8.4.1. The issue of toner and paper quality has not been adequately addressed. I am unaware of any studies that have been done regarding archiving material produced by this method. This could become problematic in the future, especially in tropical countries.

Article 8.5. The issue of archiving content in XML format should be discussed. This approach is already in widespread use by STM publishers, as noted above. The Commission should also consider redundancy in archives as some will undoubtedly fail to receive adequate financial support to be sustainable in the future.

Recommendations for Article 8 provide a mechanism for an author to submit an electronic article to an archive, but do not provide any guidance as to the nature of the archive or the time constraints in the event that a publisher either chooses not to do so or fails to do so. The language in the article tends to weaken the overall importance of both the registration process and the value of electronic publication. I am mystified as to the reasoning why the Commission would support a system in which only some nomenclatural events would have to be registered while others would not. What possible purpose does this serve? Who benefits from such a system?

## References

ICZN. 2008. Proposed amendment of Articles 8, 9, 10, 21 and 78 of the International Code of Zoological Nomenclature to expand and refine methods of publication. *Bulletin of Zoological Nomenclature*, **65**: 265–275.

Proposed Articles discussed above (text in italics indicates proposed changes, text in normal font indicates existing articles of the Code):

**Article 8. What constitutes published work.** A work is to be regarded as published for the purposes of zoological nomenclature if it complies with the requirements of this Article and is not excluded by the provisions of Article 9.

- 8.1. **Criteria to be met.** A work must satisfy the following criteria:
- 8.1.1. it must be issued for the purpose of providing a public and permanent scientific record,
  - 8.1.2. it must be obtainable, when first issued, free of charge or by purchase, and
  - 8.1.3. it must have been produced in an edition containing simultaneously obtainable copies by a method that assures
    - 8.1.3.1. numerous identical and durable copies (*see Article 8.4*), or
    - 8.1.3.2. *widely accessible electronic copies with fixed content and format (e.g. PDF/A, ISO Standard 19005–1:2005) (see Article 8.5).*
  - 8.4.1. **Works printed on paper.** *After 2009, the only acceptable means of producing physical copies is by printing on paper using ink or toner.*
  - 8.5. **Works issued and distributed electronically.** *To be considered published, a work issued and distributed electronically must*
    - 8.5.1. *have been issued after 2009,*
    - 8.5.2. *state the date of publication in the work itself, and*
    - 8.5.3. *be archived with an organization other than the publisher in a manner compliant with ISO standard 14721:2003 for an Open Archive Information System (OAIS), or the successors to that standard. (For documentation of the location of the archive, see Article 10.9.2.1.)*
      - 8.5.3.1. *The archiving organization's website must provide a means to determine which works are contained in the archive.*
      - 8.5.3.2. *The archiving organization must have permanent or irrevocable license to make the work accessible should the publisher no longer do so.*
      - 8.5.3.3. *If it is found that the work was not deposited in an archive within one year after the work's stated date of publication, or that after the publisher or its successor no longer supports distribution of a work it cannot be recovered from an archive, the case must be referred to the Commission for a ruling on the availability of any names and nomenclatural acts contained in the work.*
  - 10.9.2. *at least the following information must be recorded in the OFFICIAL REGISTER:*
    - 10.9.2.1. *for the name of a taxon at any rank, sufficient bibliographic information to identify the work in which the name is proposed, and the name and Internet address of the archiving organization,*
  - 10.9.4. *Names and nomenclatural acts published on paper may be registered voluntarily and retrospectively; such registration does not affect their availability.*
  - 78.2.4. *The Commission may establish and maintain an OFFICIAL REGISTER OF ZOOLOGICAL NOMENCLATURE, to record essential information about names and nomenclatural acts. The OFFICIAL REGISTER may be maintained in electronic or paper form. The OFFICIAL LISTS and OFFICIAL INDEXES may be maintained in the OFFICIAL REGISTER.*

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It is clear that a tighter ruling on publication methods in the proposed amendment will be helpful. Whether abandoning the CD-ROM support beginning in 2010 will reduce debate about validity of publications in the future is unclear to me. Vandalism in nomenclature is a matter of personal attitude, and quite independent of the medium assaulted.

In addition, it is becoming clear that laser disks are not as reliable for long-term storage as once thought, but this can also be said of many paper and electronic publications. The proposed limitation of a CD-ROM or DVD as published for the

purposes of zoological nomenclature only to the period between 2000 and 2009 (proposed Article 8.4.2.1) is a reasonable compromise between improving technologies and the deeply historical nature of zoological nomenclature. Likewise, the proposed wording for Article 8.4.2.2 is beneficial, because it solves potential problems arising from factors beyond authors and publishers acting in good faith. This is timely indeed, given that cases of taxonomic vandalism affect the reputation of zoological nomenclature and threaten its central role in comparative biology (e.g. Anonymous, 2007; Daniels, 2008; Altaba, 2009).

It is also clear that paper and PDF versions of a publication are nowadays frequently released simultaneously, potentially creating problems with the perceived compliance to the Code. Thus, the wording of the proposed Article 21.9 is adequate but should be modified in order to encompass situations where both the paper copies and the PDF version are available at the same time. I propose the following wording:

21.9. Works issued on paper and electronically. A name or nomenclatural act published in a work issued in both print and electronic editions is available from the one that first fulfils the relevant criteria of availability. In case both editions are available simultaneously, the physical (paper) version is to be considered available first.

Most importantly, controversies in nomenclatural priority highlight the urgent need for a centralised Official Register (proposed Article 10.9) to avoid unnecessary, time-consuming debate.

## References

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- Anonymous.** 2007. Taxonomic vandalism. *Koleopterologische Rundschau*, **77**: 38.
- Daniels, R.J.R.** 2008. Taxonomic vandalism: the case of the giant wrinkled frog. *Current Science*, **94**: 158–159.

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Without wishing to be unpleasant, I find the attitude expressed by Francisco Welter-Schultes and co-signatories archaic and retrograde. It also seems highly selfish, with almost all the signatories coming from ‘Western’, i.e. rich, countries. Having lived and worked in some of the more remote areas of the world and now having a cohort of enthusiastic e-mail correspondents, I can testify to the success of the internet in bringing taxonomy out of the closed world of the major museums and libraries. For my much appreciated website *The Ants of sub-Saharan Africa*, I have been able to access some 461 papers of an essentially taxonomic nature, the earliest being published in 1767 and the most recent in 2008. I have developed the website with very little other than personal funding and it was the tremendous effort of Donat Agosti and colleagues in making the source papers available on <http://www.antbase.org/> that made my archival research possible. The fact mentioned by

Welter-Schultes that almost all those files, in PDF format, are copies from printed books is no more than a fact of history. It does not have value as a demerit of the electronic medium.

Whilst it surely is true that 'Long-term preservation of electronic information continuously requires high financial inputs' the same applies, probably at even higher cost, for the maintenance of a major library storing printed materials under the optimum conditions of security and climate. As a member of the Royal Entomological Society Library Committee, I have some insight into such matters. They refer also to a requirement for a minimum of 100 paper copies. I cannot envisage there being more than perhaps 20 major libraries that would or could conserve paper copies for posterity. Further, a problem facing many, if not all, academic libraries is the cost of subscribing to ever more expensive journals.

I agree with David E. Hill that peer review arguably is unnecessary. Revisionary studies by taxonomists always have excised errors simply by synonymy and will continue to do so. He urges the merits of digital photography to back up, indeed to form an integral and essential part of, descriptions. There is a problem here with say, *Zootaxa*, where the online version is accompanied by a print version. The journal itself has limited funding and cannot support colour photographs in the print version and, at present, appears to limit the number of photographs.

To go back to my earlier comment on rich countries, there is an irony in Michael P. Taylor's contribution where he wrote of a nominal fee of \$10 by mail order. For anyone not employed under a relatively well financed grant or whatever, a number of such \$10 fees might be prohibitive and many journals charge far more than that for copies of individual papers, even when accessed online.

On a technical note much reference is made to the PDF format. The true ubiquitous text format is the RTF, with the proprietary Microsoft Word not far behind. The images can be stored in the standard JPG or JPEG formats. It is the web page, however, that provides the most useful format for taxonomy and the, clearly oft forgotten, users of taxonomic information, such as ecologists and population biologists. Links to and from keys and, so, to comparable species provide an enormously effective tool and images can be provided on the page without need to flick back and forth through a paper or book.

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I fully support the comments of Francisco Welter-Schultes and would like to add the following on the problem of an Official Register. For 12 years I have been involved in writing a Catalogue of Palaearctic Coleoptera, in collaboration with 160 specialists. This project covers some 100,000 valid taxa and about 200,000 available taxonomic names. In addition, primary references are given to each of the genus- and species-group names (at the moment, 5 volumes with some 4000 printed pages are published; one following volume may yet be completed this year).

While working on this project we met a large number of difficulties; among the more common ones were poor understanding of nomenclature (professionals

included), poor knowledge of published sources and inconsistencies at all levels. Alpha-taxonomists, who are responsible for recognition of essential parts of the diversity of life, commonly have never consulted the Code and have poor knowledge of Opinions. For instance, names published as varieties of subspecies or as aberrations are used for/as valid taxa and genus-group names were published even in the 80s without having been fixed by type species (again by professionals).

The poor knowledge of the Code was illustrated in an interesting way by French phylocodists (again professional zoologists) who ignored the fact that names above family-group are not regulated, and believed that types define the contents of taxa.

Experience suggests that if we introduce an Official Register, some workers will base their work on it while others may ignore it. Thus, in subsequent work on one and the same taxon, some authors will use only registered names while others may use also the unregistered ones. It is perfectly predictable that an Official Register, however useful it may seem to be, will result in a major mess in taxonomy.

Alpha-taxonomy is not adequately supported in most countries. One of the secondary effects of the present situation may be seen in the fact that many taxonomists in Europe work with ideas of the past typologically and cannot even distinguish available and unavailable names. Misspellings are commonly considered as synonyms. The same is true for nomina nuda.

Efforts should be redirected to other issues than Official Registers and similar ambitious projects. To improve the actual situation in taxonomy we need to deal with very different issues such as the reintroduction of systematics (with alpha- and beta-taxonomy and nomenclature) in universities, where it has been downsized in the last 30 years, and a re-evaluation of the role of natural history museums in which popularisation has become one of the most important criteria.

### **Archiving & records management perspectives on electronic-only publications for nomenclature**

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I fully support the establishment of taxonomic names in electronic-only publications and would like to make some recommendations based on my professional experience in archival sciences, as a Scholarly Communications Librarian. The proposed amendment to the Code needs only to be explicit in what is required of authors and publishers for electronic-only publication, and all contingencies can be covered. In this generation we have one foot in the world of paper and the other now firmly planted in the electronic realm. This special position will be relatively short-lived, and we would be doing a great service to our successors if we were to establish some viable guidelines for authoritative naming of taxonomic units early on in this transition to digital media.

My recommendations are as follows:

As discussed in the draft proposed amendment there must be a requirement that electronic-only publications containing nomenclatural acts have archival integrity.

This means they should be accredited by, authenticated by, or registered with, services such as Portico (<http://www.portico.org>), or be a part of large taxonomic archiving efforts such as the Biodiversity Heritage Library (<http://www.biodiversitylibrary.org/About.aspx>). To determine whether to publish in any given publication, authors may ask editors if the publication participates in any such initiatives. If the publication does not participate in an established archival initiative, the author may inquire if the publication is available in its entirety in an institutional repository. Ultimately, the author must decide whether he or she believes the publication meets this requirement.

The amendment should recommend that authors submit their work to publishers who do not restrict access to the published work. Authors should be allowed to freely post the final, published version of the article or chapter in any scholarly repository and on the author's personal website (with no restrictions other than a possible short embargo, and preferably with no fees attached to this agreement). It is important that authors should be able to post the final, published version, in its exact original form, not merely pre-prints. Without this caveat, myriads of issues arise regarding authoritative name due to availability of various versions of an article. Pre-print versions of an article are manuscripts, and therefore are not authoritative in terms of name establishment.

Akin to the U.S. National Institutes of Health (NIH) initiative (requiring deposition of articles in PubMed Central by funded authors), authors who publish taxonomic names in electronic-only format should be required by the Code to have their published, peer-reviewed paper uploaded in a scholarly repository that is freely accessible to anyone with a web connection.

To avoid confusion as grey literature becomes more readily available online, I recommend wider use of disclaimers. With theses and dissertations increasingly being made freely available online, as well as abstracts and conference proceedings, authors should be directed to clearly disclaim first-time use of names in all non-peer reviewed, manuscript-like, grey literature-type online publications. Examples of proposed wording should be provided on the ICZN website so that authors and editors can unambiguously and consistently incorporate appropriate language into such works. In addition, libraries can begin to prominently display blanket disclaimers on their repository websites regarding the non-availability of names in posted documents that might be mistaken for available published works.

Until another format emerges supplanting it, suggesting that articles be deposited in PDF is a good idea, to ensure the accuracy of presentation in every viewing instance of a document, article or chapter.

CD-ROMs and DVDs should be disallowed as mechanisms of valid publication. Their archival stability is uncertain. The content of these media is easily converted to PDF and uploaded in a repository.

There should be no requirement for authors who publish names in electronic-only publications to also somehow place a paper version of the article in any number of libraries. However, authors should be required to state explicitly in the publication that they have abided by the requirements of the Code for depositing of names and to state which electronic repositories the article will reside in, in perpetuity.

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The proposed amendment states (in summary) that: 'Electronic-only publications should be allowed, if mechanisms can be found that give reasonable assurance of the long-term accessibility of the information they contain.' From a records management perspective, you cannot guarantee long term accessibility, you should guarantee digital continuity and put plans in place to deliver. I doubt you will find a mechanism until you define a time period and continuity plan.

Digital obsolescence also needs to be considered for both historical content and formats and for the future. CD-ROM is hardly a durable medium. Neither is paper.

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I think that one thing no scientific (or any other) community can risk is failure to make best use of the communications technologies that we now have at our command. Online publishing provides opportunities for very broad dissemination of new ideas and results findings, providing increased opportunities for global peer review.

Here in Australia, the National Library of Australia has been collecting significant Australian online publications since 1996. The National Library of Australia (and the International Library Community) has also been doing work in relation to legal deposit, and its application to online publications. Collecting libraries develop their selection guidelines attempting to identify items that best support their mandate and meet the needs of their user community. Having passed this selection review the collected e-publication is likely to have some level of 'substance'.

If the Code permitted new animal names to be published in online publications that could demonstrate that they were subject to deposit with a national library or other established collecting body, this should ensure longer-term accessibility of the publication as the collecting institution would address the issue of long-term preservation formats and storage. This would be likely, of course, to exclude the small 'self-published' e-publications, some with only a very short life-span, and perhaps reduce the risk of accepting taxonomy published within publications with less rigorous editorial review or publishing standards.

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Australia is a Federation so there are jurisdictional differences across the country but the Commonwealth and the majority of States have, over the last decade or so, enacted uniform Evidence Acts which remove the medieval definitions of documents and give equivalence to digital and physical records. These have been supplemented by Electronic Transaction Acts which amend all current laws in those jurisdictions by stating that electronic communication constitutes written communication and that recording something in a digital medium is recording it in writing. That is a simplistic description but the point of the two Acts taken together is to abolish, at least in most of Australia, the distinction you currently make between printed and digital only journals. Whether this will spread internationally is a moot point. Lawyers seem to regard it as the end of civilisation as we know it and one State, South Australia, has rejected the uniform Evidence Act.

I would also support the exclusion of anything published only on CD-ROM or DVD as these are not permanent media.