Zootaxa 4139 (1): 128–130
http://www.mapress.com/j/zt/

Correspondence

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://doi.org/10.11646/zootaxa.4139.1.8
http://zoobank.org/urn:lsid:zoobank.org:pub:BBF08312-53A6-4B3B-A3BF-A91D4D78B2FB

Warning: potential problems for taxonomy on the horizon?

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Whether or not a species might reasonably be described without the preservation of a type specimen is a matter of ongoing discussion among taxonomists (Dubois & Nemésio 2007; Minteer *et al.* 2014; Krell & Wheeler 2014; Löbl *et al.* 2016; Marshall & Evenhuis 2016; Santos *et al.* 2016). Here, we attempt to make our own contribution to the topic.

Marshall & Evenhuis (2015) recently described a new species of Bombyliidae fly based only on photographic evidence. In the paper, they reiterated the obvious reasons why collecting specimens is highly desirable, but they also stated that "even in the absence of a collected type specimen, current technologies such as high-resolution photography can often provide enough information for a proper description resulting in a readily recognizable and unequivocally distinct newly named species". They also "expect that descriptions unsupported by existing physical type specimens will be subject to especially critical scrutiny by skeptical editors and responsible peer-reviewers before accepting such papers".

There has recently been some debate within the scientific community regarding the collection of specimens in the field. Minteer *et al.* (2014) stated that while biologists traditionally collect voucher specimens to confirm a species' existence, this practice could nowadays increase the risk of extinction, particularly among small and often isolated populations. They claimed that the availability of adequate alternative methods of documentation, including high-resolution photography, could provide an opportunity to reconsider field collection practices, and concluded that "collecting specimens is no longer required to describe a species or to document its rediscovery". On the other hand, Krell & Wheeler (2014) replied that "describing a new species without depositing a holotype when a specimen can be preserved borders on taxonomic malpractice. Even given good photographs and a tissue sample, there are reasons to collect one or more complete specimens".

The International Code of Zoological Nomenclature both in the general "Principles" and in "Principle of Typification" (ICZN 1999) (Art. 61.1.2) uses the term "specimens" to denote name-bearing types, but also uses "extant specimens" (Art. 16.4.2), which essentially allows the description of new taxa without formally requiring the preservation of collected specimens (Art. 73.1.4). Thus—according to the zoological Code—the position taken by Marshall and Evenhuis would seem formally correct, although the illustration should be treated as a representation of the type and not as the type itself (see Dubois & Nemésio 2007).

Several species of birds and mammals have recently been described without the authors referring to material deposited in collections (Dubois & Nemésio 2007). It is well known the recent description of *Conolophus marthae* Gentile & Snell, 2009, the Galápagos pink land iguana, whose holotype is a free living individual, but that is permanently branded, with a transponder inserted in one of its legs, and from which blood samples have been collected and sequenced (Gentile & Snell 2009; see Dubois 2009 for a comprehensive discussion).

The description of new taxa pertaining to the nomenclatural domain of the International Code of Nomenclature for algae, fungi, and plants (McNeill *et al.* 2012), without preservation of specimens is (after 2006) excluded, with the exceptions of fossils (Art. 8.1, 40.4) or "if there are technical difficulties of preservation or if it is impossible to preserve a specimen that would show the features attributed to the taxon by the author of the name". These latter cases refer to "microscopic algae or microfungi" for which "the type […] may be an effectively published illustration" (Art. 40.5).

The International Code of Nomenclature of Bacteria (Lapage *et al.* 1992) allows the use of descriptions or illustrations solely for prokaryotic microorganisms which have "not so far been maintained in laboratory culture or for which a type strain does not exist" (Rule 18a). If "later a strain of this species is cultivated, then the type strain may be designated […]. This type strain shall then replace the description, illustration, or preserved specimen as the

Accepted by A. Minelli: 9 Jun. 2016; published: 19 Jul. 2016

nomenclatural type" (Rule 18f). A similar problem exists with those protistan taxa that workers treat as animals for the purposes of nomenclature, and for which neither type culture collections nor permanent microscope slide mounts were yet available. Therefore due to difficulties in preservation, illustrations have been sometime designated as holotypes (Aescht 2008).

Thus while for algae, fungi, plants, and bacteria the name-bearing types can be an illustration, for animals on the other hand the onomatophore is the specimen figured and not the illustration itself (see Dubois and Nemésio 2007). Marshall and Evenhuis are renowned experts and we do not doubt the status of *bona species* of their new taxon, but in our opinion it is never possible to predict whether cryptic species with similar characteristics may or may not exist, and therefore to reasonably define an "unequivocally recognizable" new species (see Marshall & Evenhuis 2015). We can also adduce the case of future genetic analysis: how can the phylogenetic position of a taxon be ascertained when a "real" type specimen is missing? The same problem arises if we take into consideration morphological features not shown in the photo, or internal structures (e.g. the genitalia, often used in insect taxonomy). In future, it would also become very hard or even impossible for scientists to check the identity of these new taxa. In taxonomy, the discovery of a "new" characteristic and the subsequent need to go back and reexamine all the other related species to determine whether it is present or absent is a common occurrence, a process which frequently involve dissection, higher magnification, etc. Likewise features which are considered as unimportant at the time of description may later become decisive taxonomic characters for comparison with new species (Foissner 2002; Aescht 2008). Such growth in knowledge of the characters will be stifled—and phylogenetic placement limited—without specimens. Furthermore, the study of photographs for taxonomic work implies the risk of misinterpreting some characters (see Dubois & Nemésio 2007).

It is true that even holotypes can be lost or destroyed (as happened in the case of the German Natural History museums bombed during World War II), but these can be replaced by a subsequently designed neotype (ICZN 1999 - Art. 75). In the case of a photograph, there is no explicit rule in the zoological Code that deals with this eventuality. However, the problem would seem to be solved by joint application of Art. 72.5.6 ("In the case of a nominal species-group taxon based on an illustration […] the name-bearing type is the specimen […] illustrated […] and not the illustration or description itself") and Art. 75.1 ("[…] when no name-bearing type specimen is believed to be extant […] an author considers that a name-bearing type is necessary to define the nominal taxon objectively") (see ICZN 1999). Among the "qualifying conditions" (Art. 75.3) the zoological Code states that "A neotype is validly designated […] when" "data and description [are] sufficient to ensure recognition of the specimen designated" (Art. 75.3.3).

We believe that designating new species based on photographic evidence alone will in future lead to very serious taxonomic and systematic problems. Despite Marshall and Evenhuis' recommendations that great care should be taken when using photos for descriptions (Marshall & Evenhuis 2015), we are concerned by the fact that many scientific journals are not peer-reviewed and that some authors might be ready to start using such procedures. These new practices would make it much easier to describe new species, and this in turn would contribute to the increasing involvement of unsuitably qualified people. A number of inexperienced naturalists or even nature photographers with no biological training could begin to submit descriptions to journals, based only on photographs. It would certainly be negative if any such texts were ever published, but even if they didn't reach the publishing stage it would be a burden on editors/ reviewers to process this type of submission. Moreover, photographs have always been liable to be falsified, and indeed fake photographs have been used on many occasions (Dubois & Nemésio 2007).

Dubois & Nemésio (2007) also suggested, however, as implementation of the zoological Code, to foresee the use of indirect evidence, including photographs, but only in exceptional cases (taxa threatened to extinction, difficulties or impossibilities to collect specimens, etc.) approved by the International Commission on Zoological Nomenclature (ICZN). In such instances, the killing of a specimen (and this would mainly apply to vertebrates) suspected of representing a new species might be deemed undesirable from a conservation standpoint, but it does not seem applicable to invertebrates.

We thus renew the invitation to the ICZN to take a clear position on this issue. We ask that they define whether the designation of a type based on a photograph alone is acceptable (and, if so, where and how the image must be saved) and under what circumstances, or if the existence of a preserved specimen (preferably deposited in a public institution) or at least tissue sampling (when fixation is not possible) as the name-bearing type of a new species is unequivocally demanded.

Acknowledgements

We wish to thank Alberto Ballerio (Brescia, Italy) and Maxwell Barclay (Natural History Museum, London, UK) for the useful comments on the manuscript. We are grateful to Juliet Strachan (Florence, Italy) for the revision of the English text.

References

Aescht, E. (2008) Annotated catalogue of "type material" of ciliates (Ciliophora) and some further protists at the Upper Austrian Museum in Linz, including a guideline for "typification" of species. *Denisia*, 23, 125–234.

Dubois, A. (2009) Endangered species and endangered knowledge. *Zootaxa*, 2201, 26–29.

Dubois, A. & Nemésio, A. (2007) Does nomenclatural availability of nomina of new species or subspecies require the deposition of vouchers in collections? *Zootaxa*, 1409, 1–22.

Foissner, W. (2002) Neotypification of protists, especially ciliates (Protozoa, Ciliophora). *Bulletin of Zoological Nomenclature*, 59, 165–169.

Gentile, G. & Snell, H. (2009) *Conolophus marthae* sp.nov. (Squamata, Iguanidae), a new species of land iguana from the Galápagos archipelago. *Zootaxa*, 2201, 1–10.

ICZN [International Commission on Zoological Nomenclature] (1999) *International code of Zoological Nomenclature*. Fourth edition. International Trust for Zoological Nomenclature, London, XXIX + 306 pp.

Krell, F.T. & Wheeler, Q.D. (2014) Specimen collection: plan for the future. *Science*, 344, 815–816. http://dx.doi.org/10.1126/science.344.6186.815

Lapage, S.P., Sneath, P.H.A., Lessel, E.F., Skerman, V.B.D., Seeliger, H.P.R. & Clark, W.A. (1992) *International Code of Nomenclature of Bacteria (1990 Revision). Bacteriological Code*. American Society for Microbiology, Washington (DC).

Löbl, I., Cibois, A. & Landry, B. (2016) Describing new species in the absence of sampled specimens: a taxonomist's own-goal. *Bulletin of Zoological Nomenclature*, 73, 83–86.

Marshall, S.A. & Evenhuis, N.L. (2015) New species without dead bodies: a case for photo-based descriptions, illustrated by a striking new species of *Marleyimyia* Hesse (Diptera, Bombyliidae) from South Africa. *ZooKeys*, 525, 117–127. http://dx.doi.org/10.3897/zookeys.525.6143

Marshall, S.A. & Evenhuis, N.L. (2016) Proxy types, taxonomic discretion, and taxonomic progress: a response to Löbl et al. *Bulletin of Zoological Nomenclature*, 73, 87–92.

McNeill, J., Barrie, F.R., Buck, W.R., Demoulin, V., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Marhold, K., Prado, J., Prud'homme van Reine, W.F., Smith, G.F., Wiersema, J.H. & Turland, N.J. (2012) *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011*. Koeltz, Königstein, XXX + 240 pp.

Minteer, B.A., Collins, J.P. & Puschendorf, R. (2014.) Avoiding (re)extinction. *Science*, 344, 260–261. http://dx.doi.org/10.1126/science.1250953

Santos, C.M.D., Amorim, D.S., Klassa, B., Fachin, D.A., Nihei, S.S., De Carvalho C.J.B., Falaschi, R.L., Mello-Patiu, C.A., Couri, M.S., Oliveira, S.S., Silva, V.C., Ribeiro, G.C., Capellari, R.S. & Lamas, C.J.E. (2016) On typeless species and the perils of fast taxonomy. *Systematic Entomology*, 41, 511–515. http://dx.doi.org/10.1111/syen.12180