

# Names of fungal species with the same epithet applied to different morphs: how to treat them

David L. Hawksworth<sup>1</sup>, John McNeill<sup>2</sup>, Z. Wilhelm de Beer<sup>3</sup>, and Michael J. Wingfield<sup>3</sup>

<sup>1</sup>Departamento de Biología Vegetal II, Facultad de Farmacia, Universidad Complutense de Madrid, Plaza Ramón y Cajal, Madrid 28040, Spain; Department of Life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK; Department of Biology and Chemistry, Birkbeck University of London, Malet Street, Bloomsbury, London WC1E 7HX, UK; corresponding author e-mail: [d.hawksworth@nhm.ac.uk](mailto:d.hawksworth@nhm.ac.uk)

<sup>2</sup>Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 2LR, UK; Royal Ontario Museum, Toronto, Canada

<sup>3</sup>Department of Microbiology and Plant Pathology, Forestry and Agricultural Biotechnology Institute, University of Pretoria, Pretoria 0002, South Africa

**Abstract:** The abolition of the separate naming of different morphs of the same fungal species in 2011 will inevitably result in many name changes in some genera. The working practices commended here are intended to minimize one category of these changes, that which can arise as a consequence of an author using the epithet of an asexual morph when describing the sexual morph of the same species. We consider that name proposed for the sexual morph in such cases should be treated as a formal error for a new combination and not as a new species, and so be corrected. This is interpreted as applying even where the author indicated that a new species was being described and designated a type. We argue that those formalities were a result of the requirements of the rules then in force, as the author recognized that a morph of a named species was being described, and not a new hitherto unnamed species was being reported – but was barred from making a new combination so used the same epithet for the new morph name instead. Where a type with the sexual morph was designated for the sexual morph, under this interpretation that no longer has nomenclatural status, the type being that of the basionym. The material for the sexual morph indicated as a type, would be available for designation as an epitype, though a modern sequenced sample with both sexual and asexual morphs would be more informative as an epitype in many cases. A proposal to regularize the working practice commended here, and also the converse situation where the sexual morph typified name is the earlier, will be made to the 2017 Shenzhen Congress.

## Key words:

Anamorph  
Article 59  
Epitype  
New combinations  
Pleomorphic fungi  
Teleomorph  
Typification

**Article info:** Submitted: 24 March 2013; Accepted: 1 April 2013; Published: 4 April 2013.

## INTRODUCTION

From 1912 until 2011, the various editions of the *Rules* and *Codes* that regulated the names of fungi, provided for the separate naming of asexual and sexual morphs of the same species. The detailed requirements varied markedly under different sets of provisions, especially before and after the decisions of the 1981 Sydney Congress. While the mycologists present at the Melbourne Congress in 2011 worked to provide rules that would minimize the disruption of well-established and familiar names, now included in the *International Code of Nomenclature for algae, fungi, and plants* (ICN; McNeill *et al.* 2012)<sup>1</sup>, not all situations could be resolved satisfactorily at that time. Here we draw attention to one of those situations, and propose a possible solution.

<sup>1</sup>For summaries of these changes, and discussion of pertinent issues, see Braun (2012), Gams *et al.* (2012b), Hawksworth (2011, 2012), Norvell (2011), and Wingfield *et al.* (2012).

## NAMES OF MORPHS OF A SPECIES WITH THE SAME EPITHET

Some of the previous sets of rules governing the names of different morphs of a single fungus species, include one that stated that species names typified by an asexual morph could not be combined legitimately into a genus, the name of which was typified by a sexual morph. However, under later versions of the rules, such a combination would be legitimate but only apply to the morph of the basionym, regardless of the generic name used. For many years, where new combinations were made under a generic name with a sexually typified type, they were ruled instead as names of new species provided that the other requirements of valid publication were met. This was so even though the author had clearly indicated that a new combination was being made and not a new species described.

That situation can be illustrated by a case given in various editions of the *Codes*. *Mycosphaerella aleuritidis* (Miyake) S. H. Ou 1940, published as a new combination on

© 2013 International Mycological Association

You are free to share - to copy, distribute and transmit the work, under the following conditions:

**Attribution:** You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).

**Non-commercial:** You may not use this work for commercial purposes.

**No derivative works:** You may not alter, transform, or build upon this work.

For any reuse or distribution, you must make clear to others the license terms of this work, which can be found at <http://creativecommons.org/licenses/by-nc-nd/3.0/legalcode>. Any of the above conditions can be waived if you get permission from the copyright holder. Nothing in this license impairs or restricts the author's moral rights.

discovery that the fungus had a sexual morph belonging to *Mycosphaerella*, but with the asexually typified *Cercospora aleuritidis* Miyake 1912 as basionym, was nevertheless treated as a new species *Mycosphaerella aleuritidis* S. H. Ou 1940, attributed to Ou alone, as a Latin description of the sexual morph had been included (e.g. *Vienna Code* Art. 59 Ex. 6; McNeill *et al.* 2006). With the changes effected at the Melbourne Congress in 2011, enabling names to compete regardless of the morph represented by their name-bearing types, Ou's combination can be accepted as legitimate and the original citation has to be reinstated as *Mycosphaerella aleuritidis* (Miyake) S. H. Ou 1940 (*Melbourne Code* Art. 59 Ex. 2).

Some mycologists, especially ones working with plant and human pathogens, were conscious of the importance of minimizing the disruption of names when sexual morphs were discovered and sought to retain a thread of familiarity. They achieved this by using the same species epithet in the sexually typified generic name, but with a sexual morph designated as type of that name. Indeed, this was commended as good-practice by many mycologists, and became the norm in the case of plant pathogens. Examples are: the coffee pathogen *Gibberella stilboides* W. L. Gordon & C. Booth 1971, introduced for the sexual morph of the asexually typified *Fusarium stilboides* Wollenw. 1924 (*Vienna Code* Art. 59 Ex. 3); and *Neosartorya fumigata* O'Gorman *et al.* 2009 introduced on discovery of a sexual morph in the asexually typified *Aspergillus fumigatus* Fresen. 1863, the primary agent of sometimes fatal human aspergillosis. In these and similar cases, the sexual morph names are accompanied by a Latin description or diagnosis and designation of a name-bearing type in which the sexual stage is present.

Under the *Melbourne Code* (McNeill *et al.* 2012), names typified by a sexual or an asexual morph compete on an equal footing for priority. As names such as *Gibberella stilboides* and *Neosartorya fumigata* have different types than *Fusarium stilboides* and *Aspergillus fumigatus* respectively, they are nomenclaturally independent and have priority only from 1971 not 1924, and 2009 not 1863, respectively. This means that it would not be possible to recombine the earliest epithet in the same rank into a genus considered appropriate on taxonomic grounds as it would be pre-occupied. A problem arises in these two examples if there is an asexual morph-typified and legitimate name with a different epithet, which is a synonym published before 1971 and 2009, respectively. Under the *Melbourne Code*, such a name would be priorable and have to be combined into the desired genus. This is irrespective of how unfamiliar that name might be and, unless it is formerly proposed for rejection or included in one of the proposed lists of protected fungal names, it would have to be taken up. The following two examples illustrate these different situations.

(1) An instance where two identical epithets are involved, but where a type was not explicitly designated for the sexual morph, is provided by *Ceratocystis paradoxa* (Dade) C. Moreau 1952, a species which causes stem and other rots in banana, cocoa, coconut, oil palm, pineapple, sugarcane and other mainly tropical plants. Moreau's combination was based on *Ceratostomella paradoxa* Dade 1928, a name introduced on discovery of the sexual morph of *Sporoschisma paradoxum* De Seynes 1886 (syn. *Chalara*

*paradoxa* (De Seynes) Sacc. 1892; *Thielaviopsis paradoxa* (De Seynes) Höhn. 1904) in artificial culture. De Seynes's name was listed as a synonym (i.e. as the asexual morph), a Latin description was provided, and Dade did not include "De Seynes" in his ascription. It is also clear that he was only introducing a new taxon name without "De Seynes" as that was required by the rules in force at the time (*Brussels Rules*, Briquet 1912). Dade used a single isolate for his experiments, but he did not use the word "type". But under the current rules, in which names of pleomorphic fungi must in general conform to the same provisions as other names, Dade should indeed have published a new combination based on *Sporoschisma paradoxum* De Seynes. However, because Dade used "the epithet that ought to have been adopted" (Art. 52.1), he did not create a superfluous name; consequently, as no other provisions of the *Melbourne Code* apply, his supposed new species name can be treated as a new combination. This would apply regardless of the organism involved, for example whether a plant or fungus

A problem would arise, however, had Dade designated a different type, because under Art. 9.1 and Note 1, the author's designation of a type "is final", the name cannot simply be treated as a new combination homotypic with De Seynes's name. Moreover, if De Seynes's and Dade's names are treated as nomenclaturally separate with different types, although the earliest name for the species under the ICN is that of De Seynes, it could not be combined into *Ceratocystis* as the binominal is pre-occupied by Moreau's heterotypic name. Thus the epithet "*paradoxa*" in *Ceratocystis* would date from 1928 and not from 1886. As there is a pre-1928 synonym available, *Stilbochalara dimorpha* Ferd. & Winge 1910, that would mean that the correct name for this fungus would be a new combination based on *S. dimorpha*, unless that name was proposed formally for rejection or suppression.

(2) A case in which a species has two identical epithets, one with a sexual morph type and one with an asexual morph type, and the new rules would mean that a different unfamiliar name would have to be used, is that of *Venturia carpophila* E. E. Fisher 1966. That fungus is responsible for freckle or scab diseases in almonds, apricots, peaches, and plums. Fisher discovered the sexual morph on overwintering leaves, and designated a type with the sexual morph, while listing *Cladosporium carpophilum* Thüm. 1877, typified by the asexual morph, as if a synonym. In this instance, Thümen's name, although the earliest for the fungus, cannot be combined into *Venturia* because it is preoccupied there by that of Fisher. A consequence of this situation is that the earliest available epithet at species rank for this plant pathogen in *Venturia* becomes the almost unused *Fusicladium pruni* Ducomet 1907. Ducomet's name would have to be combined into *Venturia* by a strict application of the *Melbourne Code* as it has priority of 59 years over Fisher's name, unless Ducomet's name was proposed for rejection or suppression.

## THE PROBLEM AND A PRAGMATIC SOLUTION

In principle it would be possible to deal with such cases under the *Melbourne Code*, either through the conservation/rejection

or protected/suppressed lists. However, formal proposals for conservation and rejection under the ICN are time-consuming to prepare, involve voting by the Nomenclature Committee for Fungi (NCF), and often take more than a year to a recommendation. The adoption of lists of protected and suppressed names will similarly be a protracted one, to judge from experience to date. Against this background, mycologists working in diverse applied aspects of the subject are becoming impatient to desperate to know now what names should be used in their current publications, and in plant quarantine, health and safety, and other legal documents.

We consider that an alternative approach that could be applied automatically and immediately is required, and would not require any committee action or the publication of separate proposals. In cases where a different morph is being described, the authors recognize that they are not describing a new species, only a morph of an already known species, even where different types were designated. We suggest that the principles adopted in the *Mycosphaerella aleuritidis* case in previous *Codes*, noted above, are extrapolated to ones where a name was introduced as a new species using the same epithet as that of a previously named different morph listed as a synonym. That is, that names such as Dade's and Fisher's which were originally cited with them as the sole authors, have to be treated as errors to be corrected to that of new combinations and not independently typified new species names. Implementation of this proposal in the principle nomenclatural databases, MycoBank and Species Fungorum, will necessarily be a piecemeal process given the limited resources available, and it would be helpful if mycologists encountering such cases altered the curators so that they could implement the changes.

The principle argument in support of this interpretation is that such names were introduced not because the author considered that a new species had been found, but because this was a requirement of the *Code* then in force. However, unless limited by date, it is a regular practice for rules adopted by one Congress to be retroactive. Indeed, in the case of mycology, this has been the situation with regard to issues such as the starting point dates for nomenclature, the acceptance of metabolically inactive cultures as name-bearing types, and the different versions of Art. 59.

We consider, therefore, that an author's use of the same epithet is evidence which, had the possibility to make a combination been permitted by the rules in force at the time, a combination would have been made. Indeed, it must be viewed as ironic that the consequence of an author using the same epithet for a newly found sexual morph with the intention of avoiding a change in epithet of a species previously known only as an sexual morph, can lead to that epithet no longer being available under the *Melbourne Code*. The proposal made here must, therefore, be seen as in line with the intent of the author of the later name. In particular, it is also in accord with the thrust of the *Code* as expressed in Art. 41.4, in which "if no reference to a basionym is given but the conditions for its valid publication as the name of a new taxon or replacement name are fulfilled, that name is nevertheless treated as a new combination or name at new rank when this was the author's presumed intent and a potential basionym applying to the same taxon exists."

## PROPOSALS

Formal proposals for changes to the Melbourne ICN are not being accepted for publication in *Taxon* until 2014, and even if then supported by the Nomenclature Committee for Fungi (NCF) and the General Committee on Nomenclature, any rule change would not be ratified until the 2017 Shenzhen Congress<sup>2</sup>. We consider that interim action is necessary to avoid the disruption of familiar epithets in such instances. Consequently, in anticipation of approval of an eventual change in the ICN at the Congress in 2017, we suggest that mycologists now confronted with this situation adopt the following working practice:

***If, prior to 1 January 2013, an author in introducing a new species name for the sexual morph of a fungus which had an earlier name typified by an asexual morph, adopted the same species epithet as that of the previously described asexual morph, the author's name is to be treated as a new combination and not that of a new species with a separate type. Designations such as "sp. nov." and ascriptions excluding the earlier asexually-typified name are to be treated as formal errors requiring correction. We further propose that this same practice be adopted in the converse situation, i.e. where the name typified by a sexual morph was the first published and the same epithet was used for the subsequently named asexual morph.***

In cases where an author designated a holotype, lectotype, or neotype, as the name is being treated as a new combination under the working practice proposed here, that designation would have no nomenclatural standing. The type would be that of the basionym (Art. 7.3). In some cases it may be convenient to designate the type indicated by the author introducing the new name, or that of a later author in the case of a lecto- or neo-typification, as an epitype to show the sexual morph of the basionym. However, in perhaps a majority of cases, it would be more helpful to designate a modern culture or specimen, especially one that has been sequenced and also has the sexual morph, as an epitype for the type of the basionym. Each case will have to be examined individually with respect to the issue of epitypification.

This proposal would go some way to addressing the legitimate concern of Gams *et al.* (2012a) that established and much-used combinations under the generic name now of choice may be liable to disruption, because of priorable names hitherto treated as being restricted to asexual morphs of the same species.

We regret that this particular case was not covered in the changes made with respect to the naming of pleomorphic fungi at the Melbourne Congress in 2011, and that a final decision will now have to await the 2017 Shenzhen Congress.

<sup>2</sup>There could be advantages in the formal proposal to be made to the Congress not being restricted to fungi, as there are some cases in plants where such a provision would also be beneficial. The proposals to be formulated in due course, therefore, could be general ones applying to all similar cases in organisms governed by the ICN.

## ACKNOWLEDGEMENT

This contribution was completed while D.L.H. was in receipt of funding from the Spanish Ministerio de Ciencia e Innovación project CGL2011-25003. We are also indebted to Werner Greuter, Nicholas J. Turland, and John H. Wiersema for stimulating and insightful exchanges on the issues addressed in this contribution and their positive suggestions as to how to resolve them, as well as for the thoughtful comments of two referees.

## REFERENCES

- Braun U (2012) The impacts of the discontinuation of dual nomenclature of pleomorphic fungi: the trivial facts, problems, and strategies. *IMA Fungus* **3**: 81–86.
- Briquet J (1912) *Règles internationales de la nomenclature botanique . . . deuxième édition mise au point d'après les décisions du Congrès International de Botanique de Bruxelles 1910*. Jena: Gustav Fischer Verlag.
- Gams W, Baral H-O, Jaklitsch WM, Kirschner R, Stadler M (2012a) Clarifications concerning the new Article 59 dealing with pleomorphic fungi. *IMA Fungus* **3**: 175–177.
- Gams W, Humber RA, Jaklitsch WM, Kirschner R, Stadler M (2012b) Minimizing the chaos following the loss of Article 59: suggestions for a discussion. *Mycotaxon* **119**: 501–512.
- Hawksworth DL (2011) A new dawn for the naming of fungi: impacts of decisions made in Melbourne in July 2011 on the future publication and regulation of fungal names. *MycKeys* **1**: 7–20; *IMA Fungus* **2**: 155–162.
- Hawksworth DL (2012) Managing and coping with names of pleomorphic fungi in a period of transition. *Mycosphere* **3**: 52–64; *IMA Fungus* **3**: 15–24.
- McNeill J, Barrie FR, Burdet HM, Demoulin V, Hawksworth DL, Marhold K, Nicolson DH, Prado J, Silva PC, Skog JE, Wiersema JH, Turland NJ (eds) (2006) *International Code of Botanical Nomenclature (Vienna Code)*. [Regnum vegetabile no. 146.] Ruggell: ARG Gantner Verlag.
- McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Marhold K, Prado J, Prud'homme van Reine WF, Smith GF, Wiersema J, Turland NJ (eds) (2012) *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code)*. [Regnum vegetabile no. 154.] Königstein: Koeltz Scientific Books.
- Norvell LL (2011) Fungal nomenclature. 1. Melbourne approves a new Code. *Mycotaxon* **116**: 481–490.
- Wingfield MJ, de Beer ZW, Slippers B, Wingfield BD, Groenewald JZ, Lombard L, Crous PW (2012) One fungus, one name promotes progressive plant pathology. *Molecular Plant Pathology* **13**: 604–613.