

# Addressing the conundrum of unavailable name-bearing types

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**Abstract:** Access to name-bearing type material can be a particular frustration for those mycologists in the tropics, or working outside established institutions, where the specimens are known to exist but cannot be examined. They can be inaccessible because of loans policies and the inability of mycologists to make personal visits. Each case has to be considered separately, but a pragmatic nine-point approach is presented which may provide some guidance as to what can be done in such instances. A postscript draws attention to 12 points to consider when designated or handling name-bearing types.

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## BACKGROUND

Many fungi have yet to be collected and named, and it appears that the number of undescribed species is at least 1.4 million and probably as many as 3 million (Hawksworth 2012a). It is anticipated that many of these species are to be found in the tropics, and this poses particular constraints to their formal description. Until the 1990s, tackling this task was generally by opportunist, short-stay visits to the tropics by European and North American mycologists; something that can be likened to “smash-and-grab” raids. The material is often retained in the collector’s institution though, where possible, some mycologists have split, and diligently repatriated, at least some of the specimens. As there were few centres anywhere in the tropics where fungal material could be deposited and safeguarded for examination by future generations of mycologists in the 18<sup>th</sup> and 19<sup>th</sup> centuries, this situation was unavoidable in those times. In the last few decades in particular, the situation has changed. There has been a remarkable expansion in systematic mycology in universities, research institutions, and museums located in some tropical regions, especially in parts of Asia, South America, and southern Africa.

## THE PROBLEM

In endeavouring to check if a previously named fungus is the same as one recently collected, or when undertaking revisionary work or preparing monographs, it is often necessary to consult material at institutions in Europe and/or North America. This is particularly so in the case of the name-

bearing type material where original descriptions, especially from the 19<sup>th</sup> century, are meagre and lack information on characters essential for interpretation today; and they may not be accompanied by photomicrographs or line drawings. Personal visits to the holding institutions are ideal, but may be prohibitively expensive for those lacking secure funding. At the same time, collection curators are increasingly reluctant to dispatch material around the world. This is understandable as there are instances where irreplaceable types have been lost or damaged in the postal systems, or even destroyed at points of entry by customs officials. Also, the problems of loss or damage in transit are not confined to tropical countries; for example, I know of cases where type material, dispatched to the UK from institutions in Poland and Russia, failed to arrive at all.

In the case of microfungi in particular, there is often an additional problem of few or even single sporocarps being present on a specimen. There are concerns at their being destroyed in examination, with no permanent preparations having been made, or being used in abortive attempts to extract DNA. Some institutions have developed a policy of sending only a portion of the material at one time, with the remainder sent only when the first part has been returned. Further, to minimise destructive sampling, whenever slides had been prepared, these were often also included and loaned with the type material to preclude the necessity for more preparations. The splitting of samples and slides was a practice adopted at the former International Mycological Institute (Kew and Egham, UK) in the 1980s and 1990s. That Institute was anxious to promote the study of tropical fungi in universities and other institutions in tropical regions. Many European and North American institutions, however,

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have policies of only lending material to other established institutions, and not to individuals or institutions lacking collections or curators. Others, especially ones with collections dating from the early 19<sup>th</sup> century and before, will no longer lend material under any circumstances, generally as a result of unfortunate experiences in the past. However, in some cases, where the lending of type material is not allowed, curators of collections have been pleased to supply photographs, and prepare microscopic preparations instead which may be sufficient in some cases. An increasing number are actively preparing digital images of the specimens they hold, and making the images available through the worldwide web. However, although digital macroscopic images can be excellent for studying vascular plants, they are of limited value for studying most fungi.

There is also a category of institutions that are willing, in principle, to lend material, but have neither the appropriately experienced staff to look out, pack, and dispatch material, nor the funds to cover the costs of secure postal services.

The loan issue is particularly acute and frustrating where it is known that the desired name-bearing type material is in existence in a collection, but which cannot be examined for any of the reasons summarized above. What is a mycologist waiting to complete a publication to do? This is a conundrum that has the potential to shackle, frustrate, and delay progress in systematic studies in regions with the highest proportions of yet undescribed fungi – and where many of those able to undertake that work are now located.

This is not a new situation, indeed the mycologist and botanical polymath Corner (1946) observed that “there is no reason why research should be held up because the [mycologist] is unable to consult earlier investigations”. He advised “young [mycologists] brazenly to face the situation and to ignore, of necessity, what they cannot possibly obtain, through distant libraries”. He went on to remark that following the destruction of so many libraries and collections in World War II, “Few will be able to consult the early periodicals, the early books, and the type specimens”. His suggestion was to produce encyclopaedic works and, in effect, treat those as new starting points for future work. I suspect he would have been a strong supporter of the changes enacted in July 2011 to establish protected lists of names of fungi (Hawksworth 2012b, McNeill *et al.* 2012). He would also be pleased to see that increasing amounts of early mycological literature are becoming available free of charge through the *Biodiversity Heritage Library* (BHL; <http://www.biodiversitylibrary.org/>) and *CyberLiber* (<http://www.cybertruffle.org.uk/cyberliber/>) initiatives. The issue of access to name-bearing types unfortunately remains a constraint almost seven decades on.

## A PRAGMATIC APPROACH

A pragmatic approach has to be adopted to alleviate this particular constraint on systematic mycology, especially in the tropics. Each case must be considered individually, and no generalization can be made, but some guidelines may prove helpful to mycologists when confronted with the frustrating situation of not being able to examine name-bearing type material which is known still to exist in some collection.

(1) Request either a member of staff in the collection (or the institution in which it is housed), or another mycologist living near the holding institution, or a visiting mycologist, to take high-power digital images, make measurements or notes, or prepare microscopic slides that can be sent on loan.

(2) See if any duplicate material (isotypes) of the desired name-bearing type is available in collections of other institutions known to house material of the author or the collector, as these might be willing to lend material. Information on where material of deceased authors of fungal names is held is included in Hawksworth (1974) and *Taxonomic Literature* (TL-2; Stafleu & Cowan 1976–2009).

(3) In some cases, there will be evidence in the published literature that later mycologists have examined a specimen, and these may have provided a detailed description and/or illustrations. In such instances the type collection may be cited but with “n.v.” (*non vide*; i.e. not seen), added after the collection acronym to show it was not examined. This is a common practice where a taxon is well established, and the circumscription is not controversial.

(4) Request photocopies of the labels to verify the status of the located specimens to confirm that they qualify as holotypes, or be potential material for lectotypification. The label should give locality and date of collection, or other indications on the packets, such as “Orig. mat.”, “Sp. nov.”, or “Typus”, in the author’s handwriting. If there is no such evidence, it is possible that material which had been previously considered to be the name-bearing type, proves not to be when the provenance is studied more critically. For example, a specimen with no date, even though made by the describing author and from the original locality, may have been collected after the date of effective publication of the name. This would mean that there was no obstacle to designating some other collection that was available for study as a neotype. A neotype does not have to be of material ever seen by the original author but, ideally, should be from the same geographical area of collection and, where appropriate, from the same host or substrate.

(5) In cases, where it is really necessary to clarify an ambiguous situation and fix unequivocally the application of a name, and where a holotype/lectotype/neotype<sup>1</sup> exists, but cannot be studied, an interpretative type, termed an “epitype” could perhaps be justified. This would be a broad interpretation of the phrase “cannot be critically identified for purposes of the precise application of the name of a taxon” (McNeill *et al.* 2012: Art 9.8).

That epitype would stand unless, and until, it was “shown that an epitype and the type it supports differ taxonomically”

<sup>1</sup>As an epitype is an interpretive type linked to the name-bearing type, if there are syntypes that are not accessible it would be necessary first to select one of those as a lectotype and to base the epitype on that.

(Art. 9.20<sup>2</sup>). When designating an epitype, the extant name-bearing type which it acts as an interpretative type for has to be stated. This is, however, a somewhat controversial interpretation of the *Code*, where the material might be identifiable were it studied. Consequently, such a step should not be undertaken without the most careful consideration, and this issue will be explored further in a separate paper currently being prepared by Kevin D. Hyde and colleagues. However, this may be the most appropriate solution, and justifiable, where cryptic species (ones that are morphologically indistinguishable) are involved, and where DNA sequence data are not available for the extant (but unexamined) name-bearing type, but are for the proposed epitype.

(6) For names that are NOT in current use, the name can simply be listed as of uncertain application, and not be adopted – but this procedure should not be followed for names in use today as that could lead to new undesirable names having to be adopted. Now that mechanisms for the protection of fungal names through the adoption of lists of Accepted Names (i.e. protected names) and Rejected Names (i.e. suppressed names) have been incorporated into the *Code* (Arts 14.13, 56.3), the importance of fixing the application of all proposed names is reduced. While it is desirable that all names are typified and discussed in systematic work, older names subsequently discovered to pre-date ones in use may be listed either as synonyms in an Accepted list, or alternatively added to a Rejected list.

(7) For names in current use, where it is not clear whether any name-bearing type material definitely exists, for example because of uncertainty of the provenance of a specimen previously considered as the type, or not being able to check the describing author's collections, designate a particular, freshly studied specimen and use a phrase such as "representative specimen" or "proxy type"; this is a practice sometimes used in zoology. "Pragmatype" and "protype", as used in zoology, are both better avoided as their meaning is closer to that of epitype (Hawksworth 2010). A proxy type, although an unofficial designation, would remain available for selection in the future as a neotype if it later became clear that no holotype or original material eligible for lectotypification was extant.

(8) Where there is no holotype, a lectotype has not previously been designated, and the name was introduced prior to 1 January 2007, in some cases an illustration may be available for use (Art. 40.4). This situation arises where the original material consists of both one or more candidate specimens that cannot be studied and also an illustration, there is no obstacle under the *Code* to selecting the illustration as lectotype, and not the specimen. The illustrations can be unpublished, or published either before or with the validating diagnosis (Art. 9.3). It would then be possible to designate another specimen or metabolically inactive culture as epitype.

(9) Where a name is sanctioned for use by either Fries or Persoon (Art. 13.1(d)), no holotype of the name-bearing epithet exists, and a lectotype has not previously been designated from amongst existing original material

(which cannot be studied), a lectotype which is available for examination may be selected from among elements associated with either the original protologue or the sanctioning treatment (Art. 9.10). This is only likely to be a potential solution in a small number of cases as all specimens cited in sanctioning works may also be unavailable for examination. However, if one or more illustrations are cited in the sanctioning work they may be available for designation as lectotypes in which case the procedure noted in (8) above could be considered.

## POSTSCRIPT

Bearing in mind the current problems over access to name-bearing types addressed here, mycologists can take some action to preclude, or at least minimise any future difficulties when designating a holotype, or any other official category of type.

(1) Deposit the name-bearing type ("holotype") in a public collection in the country of origin where there is a fungal curator. Many types of fungi are deposited in collections located in countries other than that in which they were collected; this was the case for 41 % of the name-bearing types of fungi described in the period 1991–94 (Hawksworth & Kirk 1995). This situation should not be exacerbated where alternative public collections exist in the countries of origin.

(2) Deposit duplicates ("isotypes") of the name-bearing type in one or more different public collections located in other countries where the specimens are sufficiently large to enable them to be subdivided. Where material cannot be split, where possible deposit duplicates of other collections cited in the original publication ("paratypes") instead.

(3) Where a name-bearing type ("holotype") is a permanently preserved and metabolically inactive culture, it is prudent to deposit subcultures prepared from that ("ex-type" cultures) in at least three service collections of fungal cultures from which they can be obtained.

(4) Provide as detailed and comprehensive description as possible of the fungus and accompany it with photomicrographs and line drawings, and note the advice in Seifert & Rossman (2010).

(5) Along with the designated type material, deposit permanent microscopic slide preparations which show essential features.

(6) Where DNA sequence data have been obtained, deposit them in GenBank, or a similar public repository.

<sup>2</sup>The Article (Art.) numbers of the *Code* used in this contribution are those of the Melbourne *Code* (McNeill *et al.* 2012), some of which differ from those allocated to the same points in previous editions.

(7) When designating a lectotype, neotype, or epitype of a name, remember that this, as other nomenclatural acts, has to be published; an annotation on a label attached to a specimen does not constitute effective typification.

(8) Mention any designations of a lectotype, neotype, or epitype in the abstract of the paper in which these are published. Such later typifications are otherwise easily overlooked by other mycologists. Also, record such published typifications in a nomenclatural database if possible. I understand that this facility will be available in MycoBank shortly, and in the future I personally would wish to see this become mandatory for the recognition of later typifications under the *Code*.

(9) In view of the scant and fragile nature of many older type specimens, it is recommended that they never be consulted unless absolutely necessary. Examination of types is essential in the course of revisionary or monographic studies, or to confirm differences from a newly discovered taxon, but inappropriate in the case of routine identifications – except where ex-type cultures are available. Remember that holotypes in particular are irreplaceable and so always merit treatment with respect. Mycologists today sometimes need to consult specimens collected in the 18<sup>th</sup> and even the 17<sup>th</sup> centuries; unnecessary handling and slide-making may jeopardize the value of the specimens to future generations.

(10) Any microscopic preparations from specimens should only be made when essential, and the slides made from the material should be permanently preserved along with the type material from which they were derived.

(11) Destructive sampling of dried specimens for DNA extraction should only be undertaken with the prior permission of the curator concerned. This is not, however, a problem where ex-type cultures are available.

(12) Any type material received on loan should always be packed carefully and returned using secure delivery services – and within the specified period of the loan.

## DISCLAIMER

The recommendations in this contribution are based on my personal opinions and experience, good taxonomic practice, and questions which I have been asked by other mycologists, particularly ones based in the tropics. The recommendations do not necessarily reflect the views of the Nomenclature Committee for Fungi (NCF), the International Commission on the Taxonomy of Fungi (ICTF), or the International Mycological Association (IMA). Further, the options presented

are not claimed to be exhaustive and other possibilities may be appropriate in some instances. In each case mycologists should consult the *Code* (McNeill *et al.* 2012) to ensure their actions are in accordance with its provisions. As the *Code* is now such a complex and even forbidding document, a valuable guide to it and its operation has recently been prepared by Turland (2013); that work merits a place on the shelves of all systematic mycologists.

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