

International Commission on the Taxonomy of Fungi (ICTF) Code of Practice for Systematic Mycologists

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Fourteen points which mycologists dealing with the systematics of fungi (including yeasts) are encouraged to adhere to in their work are presented as a Code of Practice for Systematic Mycologists. Adoption of these will encourage both stability in nomenclature and uniformity in approaches to the descriptions of fungi.

The IUMS International Commission on the Taxonomy of Fungi (ICTF) has recently started a series of articles on 'Name changes in fungi of microbiological, industrial and medical importance' (2). These articles bring to the attention of workers in applied fields important nomenclatural changes of strains of applied value. Nomenclatural changes arise either through reclassification of certain groups of fungi, or through the correction of errors in identification of specific isolates. As noted in the first article in that series, there is a great responsibility placed on the taxonomist to ensure that changes in classification of fungi and ensuing name changes are based on sound taxonomic practices. Disagreements among systematists on the appropriate name for a fungus usually arise when arguments for name changes are ill-conceived or poorly documented, and these disagreements do little to enhance the reputation of taxonomic work in applied fields.

Although guidelines to good taxonomic practice have been presented elsewhere (4, 7), the Commission has identified particular problem areas and presents here some practical guidelines to en-

courage both stability in nomenclature and some uniformity in the descriptions of fungi.

1. Before describing a new genus or species, authors should wherever possible consult other specialists in the group concerned.

It is a salutary thought that over half the fungi described have been described previously, and that of those almost the same proportion are placed in genera later considered as inappropriate (1). The literature on mycology is already too full of names that were not required and authors should take great care that unnecessary names are not created.

2. Where possible, genera in families and species within genera should be separated by similar types of characters.

In describing a new genus, mycologists should endeavour to ensure that the types of characters separating it are comparable to those distinguishing other genera in the same family. For example, if in one family ascospore ornamentation is generally diagnostic at the generic level while ascospore septation varies within genera, it could be unwise to accept a new genus on this basis of differences in ascospore septation alone; in contrast a distinct ornamentation type might merit recognition as a separate genus. The same principle also applies to descriptions of species within a genus. It is therefore necessary to study the taxonomic

criteria in use in a particular group before describing as new any fungi within it.

3. New taxa should be described only after a direct comparison with a range of material of allied taxa.

Particularly for individuals working away from major mycological centres, there is a tendency to rely on published descriptions rather than on comparison with actual specimens or cultures. Published reports alone can be misleading and may not be representative or include the full range of variation seen in a taxon. There is no adequate substitute for the direct comparison of collections or cultures.

4. The type of a nomenclatural synonym is represented by the type specimen of the basionym and this specimen should be examined prior to proposing a transfer.

Occasionally the name of a fungus is changed either by transfer of a species to a different genus or by transfer of an infraspecific taxon to a new rank. When a new combination is proposed, the author must provide a full bibliographic citation for the basionym, which is the name on which the new combination is based (the epithet-bringing synonym). The type of a nomenclatural synonym is represented by the type specimen of the basionym. An author proposing a new combination should ensure that his proposal is based not on a study of material named as that taxon by workers other than the original author of the name, but on actual examination of the type material, in conjunction with study of the original description. Authors should satisfy themselves that material labelled as the type specimen is actually the material on which the original description has been based, particularly in the case of dried cultures (see no. 6).

Information on the type specimen, including its source, nature (i.e. holotype, isotype, etc.) and herbarium location should also be considered mandatory. If the type material has not been examined by a recent author, illustrations of its microscopic features are also highly desirable.

Implementation of this procedure will avoid the transfer of taxonomic inaccuracies from one genus to another.

5. Proposals for taxonomic synonyms should be justified by adequate documentation.

Taxonomic synonyms are created when names based on different nomenclatural types are judged to refer to the same taxon. There appears to be an increasingly common practice of proposing synonymy of taxa without supporting evidence of examination of the type material. Although this practice is not prohibited in the Code, it can lead to unstable nomenclature since proposals for taxonomic synonymy are based solely on the judgement of the taxonomist. For this reason, authors should always provide documentary evidence, including illustrations of the relevant type materials, to support arguments for synonymy. This would provide other workers with an opportunity to evaluate the merits of the proposal and to determine whether the proposal was based on a misinterpretation or misidentification. If no evidence is provided, no evaluation can be made by other mycologists unless relevant types are obtained for examination by them.

This results in uncertainty as to whether particular changes should be accepted or not.

This documentation will also reduce the number of subsequent examinations (with consequent destruction) of the type material other mycologists need to make.

6. The type of a species is a specimen; the designation of living cultures as nomenclatural types for fungi is not allowed under the Code.

Art. 9.1 of the Code states 'The type (*holotype*, *lectotype*, or *neotype*) of a name of a species or infraspecific taxon is a single specimen...'

Despite arguments (17) in favour of allowing living type material for fungi, the recommendations were not endorsed by the Sydney Congress (6, 8). Designation of living material as a nomenclatural type constitutes invalid publica-

tion of a new taxon. Cultures derived from isolates which have been dried to form nomenclatural types are best referred to as 'ex-type' (16).

Mycologists should note that in publishing taxa difficult to preserve, photographic illustrations or drawings can be designated as holotypes, a practice workers with cultures of freshwater algae frequently adopt.

Where cultures are obtained, they should be preserved in the living state when possible (see no. 7).

7. The nomenclatural type specimen must be permanently preserved, and should be deposited in a recognized institutional herbarium. Isotype specimens and 'ex-type' living cultures should be deposited in several service culture collections.

One cause of instability in fungal nomenclature is the loss or destruction of preserved type material. A description of a new taxon should indicate the nature of the material (i.e. whether a dried colony derived from a culture, or some other material), and location of the herbarium in which the holotype has been preserved. If sufficient material is available, isotype specimens (duplicates of the holotype) should be distributed to several major herbaria on different continents.

Holotype material should always be lodged in a recognized institutional herbarium, rather than in a personal private collection where its future is uncertain and from which loans may not be easily available to outside workers (6, 15).

In addition, wherever practicable, holotype specimens should be deposited in national collections in the country from which they originated. The absence of type material of native species in herbaria of less developed countries is a constraint to the development of mycological knowledge in these countries. In 1965 UNESCO adopted a recommendation to Governments in which type specimens were regarded as a part of the 'cultural heritage' of all nations (3).

Cultures obtained from the holotype also

should be deposited in several culture collections and the location of these deposits indicated in the original description. For fungi of importance to workers in applied fields, this practice is particularly to be recommended.

In some instances, workers at different institutes have prepared dried colonies from cultures received for deposit as 'type strain' or 'type culture'. These dried colonies have then been labelled as 'type specimen'. However, since specimens prepared in this way are not isotypes verified by the original author, this practice is to be avoided since it can be misleading to other workers. Such specimens can advantageously be labelled 'derived from a subculture of the type'.

It should also be cautioned here, that widespread distribution of the specific epithet applied to a new taxon, prior to its valid publication, is to be discouraged.

8. Type material should always be treated with care and retained intact.

Many type specimens have been damaged beyond recognition by indiscriminate use. These are an irreplaceable resource and so must always be handled with the greatest of care. Repeated slide preparation may destroy a specimen and some mycologists remove fragments (with or without authorization) and retain them in their own personal or institute collections. The stolen fragments can also cause problems for monographers needing to research several places. See Pfister & Rossman (15) for a more detailed consideration of the 'kleptotype' problem.

Slide preparations, and where appropriate also semi-thin sections and SEM stubs, should also be preserved and retained with the type. Where several sections are made a few can often be retained in other institute herbaria.

9. In descriptions of new taxa, the Latin diagnosis should be accompanied by comprehensive descriptions and good quality illustrations of the important microscopic characteristics.

The importance of comprehensive descrip-

tions, rather than short diagnoses distinguishing the new taxon from previously published ones, cannot be overemphasized.

Although line drawings are acceptable and probably easier to prepare, good quality photographs are less subject to interpretation. The use of both types of illustration is to be recommended especially for Hyphomycetes (11).

10. The starting point date for *all* fungi is now 1 May 1753.

The application of names of fungi is governed by a set of principles outlined in the International Code of Botanical Nomenclature. The latest edition of the Code (6), adopted at the Sydney International Botanical Congress in 1981, introduced 1 May 1753 as the starting point date for all fungi and not only Myxomycetes and lichen-forming taxa as had previously been the case. This superceded the later starting point date of Persoon's *Synopsis Methodica Fungorum* (1801) for Uredinales, Ustilaginales and Gasteromycetes and Fries' *Systema Mycologicum* (1821–32) for all other non-lichenized fungi. With the earlier starting point date, the valid publication of a name now reverts to the date of its original publication. This change should provide greater stability in fungal nomenclature especially for names introduced prior to the old starting point dates, since it is no longer necessary to search sometimes obscure literature to determine which author first took up usage of the name after the critical date.

Where reversion to the earlier starting point date could result in nomenclatural changes of taxa sanctioned in the works of Persoon or Fries, the new Code allows these 'sanctioned names' to take priority over earlier published names. Sanctioned names can be indicated by use of ':Fr.' or ':Pers.' following the citation of the original author of the name when this is felt to be desirable as in formal nomenclatural papers (9).

The effects of the changes in the starting point date have been discussed in detail in recent articles (8, 12, 13, 14).

11. Before unfamiliar or new generic names are introduced, particularly for names in common use, the use of conservation procedures should be investigated.

Under the principle of priority, for taxa from family to genus inclusive, the discovery of an earlier valid name must take priority over another name applied to the same taxon of equal rank (except for sanctioned names as described under no. 10). The principle of conservation allows for retention of a well-established generic or family name against replacement by a less well-known name. Applications for conservation are published in *Taxon*, considered by the Special Committee for Fungi and Lichens and approved at meetings of the International Botanical Congress.

Under the new Sydney Code, conservation procedures can now also be applied to the names of species of industrial or commercial importance and this should be applied to some fungi (16).

12. Under the provisions of the Code, epithets for anamorphs are not normally transferable to teleomorphic genera.

The exception to this rule occurs when a taxon has been named in an anamorphic genus, but the type specimen and original description includes elements of both the sexual (teleomorphic) and asexual (anamorphic) phases. Where *both* these conditions are satisfied the Code allows for the transfer of the epithet to a teleomorphic genus. A new epithet must then be created for the anamorphic phase. (For further discussion see (18, 19).)

13. Teleomorph-anamorph connexions should be established by single-spore isolations wherever practical.

Co-occurrence is no substitute for proving connexions by the culture of anamorphs from single ascospores or basidiospores. Teleomorph-anamorph connexions, where these are known, should be emphasized, and the evidence for the connexions discussed.

14. The application of generic names to pleoanamorphic fungi with distinct conidial types should be based on the conidial type which is the most distinct and stable.

Problems in establishing anamorphic genera based on pleomorphic anamorphs have been discussed elsewhere (2, 5, 11, 12). It is now generally recognized that it is undesirable to apply a different generic epithet to each different developmental type. For pleoanamorphic fungi with conidia of distinct types, the scientific name should be applied to the conidial type which is the most distinct and/or stable (2, 4, 5, 10).

15. Publish new taxa and name changes in journals with an international circulation, wherever possible, and ensure reprints and copies of other publications are sent to the major indexing publications (*Biological Abstracts*, *Index of Fungi*).

All too frequently important changes are not picked up quickly by indexing publications because they are published in unusual places and this can delay appreciation of them by the mycological community at large. Authors bear some responsibility for ensuring the current awareness of their works.

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