

A preliminary strategy for conserving non-lichen-forming ascomycetes and their anamorphs

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Abstract. Ideas for a preliminary strategy for conserving non-lichen-forming ascomycetes and their anamorphs are presented and discussed under four main headings: infrastructure, politics, education and science.

Key words: conservation, non-lichen-forming ascomycetes

Introduction

In 2009, the *Species Survival Commission* [SSC] of the *International Union for Conservation of Nature* [IUCN] established a new specialist group called the *Cup Fungi, Truffles and their Allies Specialist Group* [referred to in this paper as the *Cup Fungi Group*]. Its job is to promote conservation of non-lichen-forming ascomycetes and their anamorphs. This paper discusses some challenges the new group faces, and preliminary plans for facing them (the list of challenges is far from complete). Much of the content of this paper may, however, also be relevant and applicable to other fungal groups. The challenges are conveniently discussed under four main headings: **infrastructure** (nothing can be done without fund raising, societies, pressure groups and organized information), **politics** (conservation has a political dimension and will fail unless political issues are addressed), **education** (the public and the governments which work for them must be aware of the importance of fungi and the need for them to be protected) and **science** (successful conservation must be based on hard scientific evidence).

It cannot be emphasized too strongly that this paper represents a very preliminary attempt to define a strategy for the group. That strategy is still very much under discussion at the time of writing. Within this text, therefore, phrases like “the group will...” or “the group endorses...” should be understood as being proposals or ideas for action rather than fully discussed and agreed policies.

Infrastructure

The first infrastructural priority for the *Cup Fungi Group* will be to start raising money for its work. Ideally, this will be through funds donated directly to the group, although for this to be possible, it may be necessary for the group to establish a legal personality. An alternative will be, at least in the early stages, to handle money through an already established body sympathetic to the aims of the group. The group will prepare project proposals for donor organizations willing to support its general aims. It will seek to improve project proposal writing skills among its members so that the success rate of proposals is optimized. Possibilities for other revenue-earning activities, such as merchandizing of regalia (T-shirts, souvenirs etc.), will also be explored.

The infrastructure for conservation of birds and larger mammals is long-established and highly developed. Different societies fill different functions at many different levels: learned societies, for example, are the source of scientific evidence, and are generally distinct from non-governmental organizations [NGOs] devoted to conservation, which of necessity work in the political arena. This is a prudent arrangement, because it protects the scientific basis for conservation from contamination by political mud-slinging. Both types - learned societies and conservation NGOs - can be found at global, regional, national and local levels. There is, furthermore, a spectrum of NGOs representing a wide range of approaches to the politics of conservation, from high

profile public demonstrations through to behind-the-scenes negotiation. These learned societies and NGOs have a lot of experience in working together, in organizing fund-raising, handling publicity, attracting volunteers, and capturing the interest of the young.

By comparison, there was no body of any sort anywhere in the world dealing with fungal conservation until 1985, when the *European Council for Fungal Conservation* [ECCF] was set up. By the end of 2009, it had been joined by similar conservation groups for Africa, Asia, Australasia and North America, with a further group in preparation for South America. All of these bodies function as specialist groups within the learned mycological society representing each continent and, to date, their scope has been largely scientific. They are now matched by five IUCN SSC specialist groups, of which the *Cup Fungi Group* is one. There has clearly been progress, but equally there is much to do.

The fungal conservation groups in each continental-level learned society are mostly recently formed and very inexperienced. In only a very few instances are they matched by equivalent groups in national-level learned societies. Fungal conservation groups within local societies are virtually unknown. At the time of writing, there is no society anywhere in the world at any level explicitly dedicated to fungal conservation. Not global, not regional, not national, not local. That means a total absence of societies with a specific remit to work in the political arena. The *Cup Fungi Group* intends to encourage and promote establishment of such societies, starting with a global body. Plans are in place, a constitution for such a society is being drafted, and a meeting will be held in Edinburgh, in August 2010, at which it is hoped this first society will be set up [this has, in fact, now happened]. As such societies begin to appear, the *Cup Fungi Group* will work with them and with learned societies to develop infrastructure for fungal conservation using as a model the infrastructures which already exist for birds and vertebrates. The *Cup Fungi Group* will also seek to form alliances with other conservation bodies working with neglected organisms, such as insects and other invertebrates, to share experiences and resources.

At present, there seems to be little awareness of the important rôle of fungal culture collections in *ex situ* conservation. These collections are sometimes regarded by mycologists working with fungal conservation as existing only for commercial purposes, for example, to supply pharmaceutical companies. The *Cup Fungi Group* will seek to raise awareness among administrators, curators and staff of these collections of their importance for conservation, and will encourage them to include *ex situ* conservation as a goal for the collections. At the same time, the *Cup Fungi Group* will encourage mycologists working with conservation to establish positive connexions with those collections.

Information is another very important infrastructural element, and the group will in the first instance update its own website, and liaise with other fungal groups to ensure their websites are similarly updated, where possible in a compatible style. For conservation work, it is necessary to have easy access

to information about species, and about where, when and on what they grow. This means on-line databases, currently a very rapidly changing field. In general terms, the *Cup Fungi Group* will encourage a pluralistic rather than a monolithic approach to on-line information. It will also encourage free and open access to biodiversity data. The following bullet points discuss different websites.

- **Scientific names of fungal species, and information about their taxonomic position.** The Cybernome [www.cybertruffle.org.uk/cybernome], IndexFungorum [www.indexfungorum.org], Landcare [<http://nzfungi.landcareresearch.co.nz/html/mycology.asp>], Mycobank [www.mycobank.org], SpeciesFungorum [www.speciesfungorum.org] and United States Department of Agriculture [USDA] fungal databases [<http://nt.ars-grin.gov/fungalatabases>] websites are key resources. The *Cup Fungi Group* will endorse these websites and will collaborate with their curators to promote their development.
- **Scientific names of organisms associated with fungi, and information about their taxonomic position.** The *Cup Fungi Group* will maintain a list of recommended web resources which it will review periodically. At present, the Cybernome, Global Biodiversity Information Facility [GBIF, www.gbif.org] and International Plant Names Index [IPNI, www.ipni.org] websites are recognized as key resources.
- **Information about where, when and on what fungi grow.** The *Cup Fungi Group* will maintain a list of recommended web resources which it will review periodically. These will form part of a resource list defining an acceptable minimum level of information to be accessed for evaluating the conservation status of non-lichen-forming ascomycetes and their anamorphs. At present, the Fungus Records Database of the British Isles [FRDBI, www.fieldmycology.net/FRDBI/FRDBI.asp], GBIF, Landcare, Robigalia [www.cybertruffle.org.uk/robigalia] and USDA websites are recognized as key resources. A system will be set up to encourage organizers of similar websites to notify the group and apply to have their website endorsed. The handling of information about substrata and organisms associated with fungi is inadequate in many on-line databases, and the *Cup Fungi Group* will encourage changes in information storage structures to improve coverage of this aspect. The *Cup Fungi Group* will also encourage development of standards and software to improve interoperability of these various databases. The *Cup Fungi Group* will also encourage preparation of an updated, digital edition of the *International Mycological Directory*, with the aim of producing an on-line equivalent of the botanical *Index Herbariorum*, providing information about the location of different fungal reference collections.
- **Digital libraries for mycological literature.** The *Cup Fungi Group* endorses Cyberliber [www.cybertruffle.org.uk/cyberliber] and LibriFungorum [www.librifungorum.org], the two main on-line digital libraries

for mycological information. It will also encourage organizers of the Biodiversity Heritage Library website [www.biodiversitylibrary.org] to include mycologists in their structure at an appropriate level, ensuring their participation is meaningful and mycological literature is adequately covered by the website.

Politics

In the context of this paper, the term “politics” refers to the broader process whereby citizens interact with their governments and with various other official bodies. It does not refer to party politics. At present, the *Cup Fungi Group* has virtually no experience of working in politics, and the present strategy therefore prioritizes efforts to develop necessary skills. The following bullet points highlight some areas where, given resources, the group will be active. In general, these activities represent the continuation and development of processes which have already started, and are being inherited by the group.

- **Develop policy.** Without policies, political activity lacks direction. The group will develop and then regularly review policies to guide it in promoting fungal conservation, for which this strategy represents a start. Particular attention will be directed to policies for promoting conservation of animal and plant pathogens, and other groups with ecological rôles which make their case for conservation difficult to communicate to the general public. Efforts will be made to reverse the prevailing position of treating such organisms as another problem in conserving their hosts rather than as organisms with their own right to be considered for conservation.
- **Develop political expertise.** To deliver a message in the political arena and achieve the desired result, the group must have understanding of political processes relevant to the conservation movement and experience of how to use them. The *Cup Fungi Group* will seek to build its expertise by searching for people interested in fungal conservation, for example amateur mycologists, with professional skills in appropriate areas, and encouraging them to use their skills on behalf of fungal conservation. It will also seek to raise general levels of expertise within the group by identifying and learning from already established conservation groups willing to help and advise. Typical skills and activities needed include public relations, publicity and advertising, writing and sending out press releases, lobbying, campaign management, and establishing positive relations with sympathetic individuals in positions of influence.
- **Raise the profile of fungi.** At present, few people outside mycology are aware that fungi are different from plants. For fungal conservation to progress, the profile of fungi must be raised. This requires not only education, but also changing of public attitudes. This problem has also been identified by learned societies for mycology, and accordingly the group will liaise with those societies in

pursuing this objective. In carrying out this activity, the group will seek to learn from the experiences of under-privileged or under-valued groups in other spheres of politics, drawing lessons from, for example, the civil rights movement, the suffragettes, feminism, and nationalist movements in small countries adjacent to or dominated by a larger neighbour.

The group will seek to engage the interest and patronage of famous and influential people, such as religious leaders, royalty, senior politicians, artists, popular musicians, sports personalities etc., and will attempt to set up “newsworthy” events relating to fungal conservation, including reports of interesting discoveries, exhibitions, and other public events. The group will also respond where news items or other published information present a misleading and negative view of fungi.

Language (i.e. the words used to describe fungi and mycology) will be an important feature of this campaign. Starting with mycologists themselves, progressing to bodies sympathetic to this group’s aims, then decision makers, and finally the general public, efforts will be made to encourage use of language likely to promote fungi, and to discourage language which results in confusion of fungi with plants and other organisms. Examples of confusing language include the use of “fauna and flora” as shorthand for “biodiversity”, “biodiversity” as shorthand for “botany and zoology”, “botany” as shorthand for “botany and mycology”, “microbiology” as shorthand for “bacteriology, mycology and protozoology”, “herbarium” as a term to describe a “dried reference collection of fungi”, “lower plants” instead of “fungi”, “flora” instead of “mycota” etc. The group will also discourage language prejudicial to fungal conservation. Phrases like “animals, plants and fungi”, for example, are often offered in response to a request explicitly to mention fungi, but are not acceptable, because by placing fungi last, there is an implication that they are somehow less important. Where appropriate, the group will encourage the use of alphabetical order in citing biological kingdoms, to remove that implication.

Use of “biodiversity” without further qualification is a common source of problems for biodiversity conservation. Many project proposals with titles using “biodiversity” have been approved over recent years, having given the funding body the impression that all aspects of life are being covered. Unfortunately, many such projects have subsequently completely overlooked fungi. Imagine, for example, a project entitled “Biodiversity of the Danube Delta”, which when funded only works with animals and plants. Mycologists, approaching the same fund a few years later, with a proposal entitled “Fungi of the Danube Delta” are likely to be sent away empty handed with the comment that the work has already been done. The group will encourage funding agencies and decision makers to recognize this problem and to insist that such project proposals either have a mycologist on the planning team from the earliest stages, or are resubmitted with a

more precise title (e.g. “Animal and plant diversity of the Danube Delta”).

- **Promote representation of mycology in bodies involved with biodiversity and conservation.** At present, mycology is frequently unrepresented, with the result that there is no voice for fungi when decisions are made about allocating resources, and grant proposals relating to fungi are not judged by peers. In comparison with flowering plants and vertebrates, fungal diversity is still very poorly known: inventories and checklists are still urgently needed and remain a high priority for fungi. Proposals for such work are regularly graded as low-priority by reviewers and funding committees composed of botanists and vertebrate zoologists, who do not accept that priorities for mycology may be different. The cumulative effect is that fungal diversity research receives a disproportionately small amount of funding.
- **Communicate with national focal points of the Rio Convention on Biological Diversity [CBD].** Working with other IUCN fungal specialist groups, this group will contact each national focal point for the CBD, attempting to establish a dialogue on the topic with the aim of obtaining recognition that the CBD is hugely deficient in terms of its handling of fungal diversity, and that most CBD national biodiversity action plans are inadequate in their treatment of fungi and need to be revised to rectify this. The long-term aim is to stimulate improvements in the CBD, to cultivate recognition of fungi separate from animals and plants in national conservation legislation of different countries, and to encourage demand for work on fungal conservation. Through the CBD national focus points and, where possible through other channels, the group will encourage each country to produce national fungal red lists separate from animal and plant red lists, and to ensure that non-lichen-forming ascomycetes and their anamorphs are evaluated for those red lists.

Education

In many, probably most countries of the world, fungi are either very poorly covered or not covered at all by curricula of primary and secondary education. There are also few courses specifically for mycology in tertiary education, and the number of those courses is declining. The group will work with learned societies for mycology to encourage balanced teaching about fungi, including scientific, cultural, social and artistic elements, with the aim of ensuring that the importance and value of these organisms is properly understood, and will seek to halt the decline, and then promote establishment of new tertiary level mycology courses.

Where appropriate, this will include development of educational websites, with the long-term aim of making their information available in at least all six of the world languages recognized by the United Nations. It will also include the fostering of cultural publicity in the form of exhibitions,

festivals, monuments and commemorations of famous mycologists, and interpretation of mycology through the arts and crafts. Lastly, it will be necessary to strengthen among mycologists the already existing awareness that their work is valuable and a source of pride.

Science

For historical reasons, awareness of the importance of fungal conservation is highest among field mycologists, less so among fungal ecologists, and generally low among experimental mycologists. The *Cup Fungi Group* will seek to raise awareness among all these categories that they each have an important rôle to play in fungal conservation.

The group will carry out training courses in use of IUCN categories and criteria for evaluating the conservation status of fungi, and will use experiences gained and feedback from those courses to identify and address problems in applying those categories and criteria (which were initially devised for animals and plants) to fungi. If necessary, the group will then liaise with the IUCN to adapt those categories and criteria so that they also work in a satisfactory manner for fungi.

The group will also encourage mycologists to make IUCN-compatible conservation status evaluations of non-lichen-forming ascomycetes and their anamorphs both globally and at national levels, recognizing that even data deficient evaluations represent significant progress. To promote this work, the group will produce and keep updated a list, available on-line, of recommended information sources for evaluation of different taxonomic and ecological fungal groups. As soon as possible, the group will introduce clear separation between its functions of carrying out evaluations and submitting them for peer review. There will be liaison with IUCN to ensure that evaluations of non-lichen-forming ascomycetes and their anamorphs are available on-line in a suitable format. To this end, the group will assist IUCN in extending its database facilities to cover fungal names. If suitable funding can be obtained, the group will also carry out a second and subsequent evaluations of the 1500 ascomycetes randomly selected for the IUCN's sampled red list index project, and will seek project funding to begin evaluating high-profile ascomycetes such as morels and truffles.

Efforts will also be directed to identifying, classifying and publicizing threats to fungi, and to identification of important fungus areas globally and nationally, important fungus hosts, biodiversity hotspots for fungi, and biodiversity coldspots for fungi. The group will, furthermore, promote the message that without taking fungi into consideration, the ecosystem approach to conservation is so severely compromised as to be invalid. This will entail raising awareness that fungi are essential components of ecosystems. Finally, the group will encourage research into the mechanisms by which threats operate, particularly in respect of habitat destruction and climate change, and basic inventorying to catalogue the estimated over 90 % of fungal species not yet discovered.

Conclusions

The present paper forms a manifesto for political action rather than a wish-list for science. The objectives are ambitious and will undoubtedly be difficult to realize. It is likely that in the near future it will be possible to address only a small part of the activities outlined. It is also clear that there will be many other activities not yet identified which will be necessary if fungi are to be conserved. The prospect is both daunting and exciting.

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