

Fungal conservation in the 21st century: optimism and pessimism for the future

DAVID MOORE, MARIJKE M. NAUTA, SHELLEY E. EVANS & MAURICE ROTHEROE

This book has examined a variety of problems associated with fungal conservation. We have tried to go beyond mere debate by including constructive guidance for management of nature in ways favourable to fungi. The geographical range of the examples presented is from Finland in the North to Kenya in the South, and from Washington State, USA, in the West to Fujian Province, China, in the East. Our authors suggest solutions that are equally wide ranging: from voluntary agreements, through 'fungus-favourable' land management techniques and on to primary legislation. Taken together, the book offers practical advice on how to include fungi in conservation projects in a range of circumstances.

The book has its origin in a British Mycological Society Symposium at the Royal Botanic Gardens in Kew, UK, in November 1999, combined with a selection of papers delivered at the XIIIth Congress of European Mycologists, held in Alcala de Henares, Spain, in September 1999. There were lively discussions at both meetings but verbal discussion is difficult to represent in writing. We felt it was important, however, to attempt to convey some feeling of the discussions that occurred during the meetings, so we asked contributors to respond, briefly, to the question 'Are you optimistic or pessimistic about fungal conservation in the 21st century?'

Our contributors replied from their different standpoints and their replies are given here without editorial interference from us. The replies are arranged in the same order as the authors' chapters in this book and the opinions expressed are those of the individual authors.

‘Are you optimistic or pessimistic about fungal conservation in the 21st century?’*From Régis Courtecuisse, Lille, France*

I can say that I am reasonably optimistic, in the sense that more and more people, especially those involved in nature management (foresters, nature managers, officials from government or nongovernment organisations) turn out to be interested and concerned with the role of fungi in ecosystems. Some examples of positive impact of fungal conservation (in The Netherlands for example) are encouraging to go further in this research and activity. Of course, this good impression on the future of fungal conservation is counterbalanced by the global threat to the environment, especially to the forests world-wide. These global problems (forest cutting as well as global pollution on the other hand) must be also considered and addressed, even if it is evidently more difficult to hope for a serious improvement in the situation from this point of view. Local (I mean at nonglobal scale) actions for fungal conservation and for the conservation of their natural habitats may be successful, especially in the perspective of future improved collaborations with nature management professionals of any kind. That is encouraging, but the global environmental problems will probably go further in degradation and threat. What makes me still optimistic, despite this globally pessimistic remark, is the actual possibility to improve the collective and federated actions and efforts, among mycologists but also among naturalists and nature managers. That’s what I’ll try to do and organise in the near future, as chair of the ECCF and the Specialist Group for Fungi (SSC/IUCN).

From Randy Molina, Corvallis, Oregon, USA

Overall, I am optimistic regarding fungal conservation, but mycologists have a lot of work to do in educating the public, government management agencies, and other biologists as to why and how. One pitfall to avoid is advocating ‘single species management’ because there are simply too many fungal species for this approach. Instead, our focus should be on maintaining or building habitat at the appropriate scale to provide for the development and normal function of fungal guilds and communities. To do so we must aim our field research at questions and scales relevant to conservation issues. These include successional development of fungal communities, disturbance thresholds and adaptations, habitat preferences, and ecological amplitude. Fundamental work is also needed at the population

level to understand how we can incorporate genetic data into our concepts of fungal species viability. Mycologists must begin to think more broadly in scale and scope in regards to fungal conservation. We must become better versed in the quickly growing field of conservation biology, publish our work in international conservation journals, and look for opportunities to work with other conservation biologists and field ecologists in integrated studies with common goals. Mycology cannot stand alone in its pursuit of species conservation. Success will only come about when we demonstrate and communicate the great importance of maintaining fungal populations to the sustainability of our world's diverse ecosystems.

From Eef Arnolds, Beilen, The Netherlands

I am rather optimistic about the fungi in forest communities in Europe. There is an international trend to maintain remnants of old-growth forests and to create new strict reserves. The exploitation of forests tends to become less rigorous and more often based on ecological principles and durability. On the other hand, continued economic growth may have a negative impact on environmental quality that is harmful for many fungi by expansion of polluted areas. I am pessimistic about the future of fungi in other habitats. Intensification of agriculture will have a strong negative impact on the environmental quality and the existence of semi-natural habitats. Expansion of the EU will lead to great losses in the rural habitats in eastern Europe. These developments may be compensated by increased efforts for conservation of valuable habitats, but only in part. However, the greatest losses will take place in the tropics during an ever increasing process of habitat destruction, stimulated by the modern religion of the free market, invented in the rich countries. I have great concern about the future of field-mycology as a scientific discipline in Europe. Without experts we shall simply not know what happens to the mycota.

From Erast Parmasto, Tartu, Estonia

Very optimistic. Fungal species will be included in the European Red Data list soon—maybe some few species in the beginning, a few more later. Fungi will be mentioned in international conventions. It will take much more time (maybe, a dozen of years), but hopefully European mycologists will agree which species will be there in a European Red List (for 'internal use'); 25, 50 or 100 species will be selected then for distribution mapping. Actual or 'true' conservation is mainly possible in nature reserves. It

depends on mycologists themselves: are they interested to take part in all-species inventories of protected areas? Do they care to spend some time for discussions with managers of reserves? Have they something to propose to them for better protection of habitats rich in fungi? Do they quarrel with ornithocracy- or ornithologarchy-minded persons on equal rights of all endangered living beings to be protected? Do they dare to send articles on fungi to newspapers and popular scientific journals, to participate in TV shows in a studio or even in a forest stand? Are they ready to lobby MPs for selecting a State Mushroom (as we have State Flowers in many countries), using for this action of the legislature? Fate of fungal conservation is in our own hands.

From Leo Jalink & Marijke Nauta, National Herbarium of The Netherlands

We are moderately optimistic for the situation in The Netherlands. There is more and more attention for fungi in management plans now, and the general (changed) approach to nature conservation is usually beneficial for fungi as well. Of course, on the other hand there is an ongoing habitat destruction, and some habitats are still severely threatened (nutrient-poor grasslands, for example) but, at least, more attention is being paid to fungi.

From David Arora, Santa Cruz, California, USA

Since I didn't hear the discussion, and am about to leave for the airport, I will just have to leave it at, 'Optimistic, providing habitat is conserved . . . '.

From Siu Wai Chiu, Chinese University of Hong Kong, China

China is one of the megadiversity countries and is also one of the most highly densely populated countries by man. Another unique feature of China is its diverse geography and thus the fauna, flora and mycota are very rich. However, there is always a conflict between human interests and the protection of natural resources especially when the present status of China is still that of a developing and poor country. However, the Government plays an active role in policy making, practising and running the conservation plans. With the continual and expanding international effort in conserving the natural habitats in China, the international demand for natural products from sustainable industry, the open door policy in improving communication and education with the outside world, the open-

ness in accepting and assimilating favourable culture by the Chinese, China is expected to actively participate in environmental protection. As the Chinese have the oldest history of mushroom cultivation, with over 30 fungal species being used in traditional herbal medicines, and the country is now the champion mushroom producer and exporter, the Chinese people will definitely guard, protect and explore the native fungal diversity. For fungal diversity in this biosphere, although habitat loss is still a major problem for species extinction, fungi being mainly saprotrophs, could survive in various artificial habitats. With the increasing interest and recognition of the potential for exploitation of fungi, and a global view emphasising sustainable development, humans will definitely make greater efforts to conserve biodiversity, including fungal biodiversity, into the twenty-first century.

From Maurice Rotheroe, Lampeter, South Wales

Like some other contributors to this chapter, I am ambivalent. The 'cons' seem to be just as compelling as the 'pros'. I share many of my colleagues' misgivings about the global future of fungal conservation, and any possible stemming of the tide of 'progress'. But if I confine my remarks to the British Isles, then the outlook is considerably more optimistic. Conservation is now established as a priority on the agenda of the British Mycological Society. Since 1996, the Society has had a Conservation Special Interest Committee. The Conservation SIC is now one of the two most active committees of the Society. Closer co-operation with CABI Bioscience and with the Mycological Herbarium of the Royal Botanic Gardens, Kew, has played a part in the establishment of a BMS database which is rapidly increasing in size and is in constant use as a resource. Similarly, the Society has given its backing to the ambitious Kew project to produce a new Checklist of British fungi. Both of these products are essential tools to the fungal conservationist. Concurrently with these developments, the Society has forged a strong link with the new National Botanic Garden of Wales. It has given £5000 of its Conservation Fund to the creation and curation of a mycological herbarium at the new garden and the funding of work which will eventually lead to publication of a *Mycota Cymru* (Fungus Flora of Wales). Discussions are proceeding on the setting up of a so-called 'Mycodome' on the NBG Wales site, to interpret and celebrate the concept 'Fungi Mould Our Lives'. The BMS is well represented on the steering committee of this unique £2 million international initiative. If it becomes a reality, fungal conservation will be a major element in its brief. When I

became BMS Conservation Officer in 1996, my 'manifesto', was strongly based on the idea of communication—of greater collaboration and contact with other biological disciplines and with governmental and non-governmental environmental agencies, as well as between mycologists, within and outside the BMS. All of us appeared to be working towards a common goal but, with a few notable exceptions, there was little communication or co-operation between those involved, while routine information exchange was almost nonexistent. This situation has changed considerably in the past five years. Government agencies and NGOs are involved in a wide variety of different initiatives aimed at improving the representation of fungi in the biodiversity picture. There are now some 30 local recording groups well dispersed over the British Isles, who are not only recording and mapping but also liaising with local environmental agencies. In more recent times a new effective and extremely businesslike player has moved confidently into the fungus conservation arena. Plantlife, the wild-plant conservation society, set up Plantlife Link in 1992 in order to 'advance plant conservation by facilitating the exchange of information between groups involved in plant conservation and to provide the context for strategic planning and co-operative venture'. Fungi were regarded as 'honorary plants', so the forum included representatives from the BMS, the Association of British Fungus Groups and several individual mycologists. Because fungi began to feature more and more on agendas, an offshoot, the Fungus Conservation Forum was formed in 1999. This committee already has a large and active agenda and fulfils my 'manifesto' ambitions admirably because it puts fungal conservation at the heart of the thinking of so many different environmental agencies. I see Plantlife and its dynamic links as being a very important catalyst in advancing the cause of fungal conservation in Britain, certainly in the early years of the twenty-first century.

From Martin Allison, Bedfordshire, UK

Most fungal population declines and extinctions across Northern Europe are accounted for by problems deep-rooted in the fabric of modern society. The insatiable demand for fossil-fuelled energy produces unacceptable levels of atmospheric pollutants. The ever-increasing human population creates new housing schemes spilling onto green-field sites. Intensive farming regimes controlled by inappropriate agricultural policies cause massive declines of once-common farmland birds, insects, flowers and fungi. The logical conclusion might well be that the future looks dismal, for wildlife

and for us. Is there room for optimism within such a bleak landscape? I believe there is. Coming from a background of bird conservation I have heard many success stories over the years. The osprey's return to the Scottish Highlands, the avocets to Minsmere, red kites back in England. Extensive tracts of heathland and reedbed restored, increasing populations of rare species such as woodlark, Dartford warbler, Cetti's warbler, bittern and bearded tit. All this has been achieved through dedicated and enthusiastic conservationists, backed by sound scientific research and increasingly more meaningful legislation. Fungal conservation has progressed in leaps and bounds over a very short period of time. There are now Red Data lists for most European countries, the most-threatened fungi are appearing within biodiversity action plans, and in the UK the habitat and survival requirements of rare fungi are being addressed by bodies such as Plantlife, English Nature, the RSPB and of course the British Mycological Society. To cap this, early in the New Year the UK Government announced a long-needed new Bill to secure better legal protection for wild plants and animals. The mere fact that this volume on Fungal Conservation exists gives some hope for the future. Through research, education, lobbying and that all-important 'in-the-field' enthusiasm many of the mycological goals should eventually be within reach.

From Giuseppe Venturella, Palermo, Italy

I am really optimistic about the possibility that the safeguarding actions for the mycota that need to be done in many European countries will be achieved in the twenty-first century. If this desirable goal is to be achieved, though, I think it is necessary to co-ordinate planning among the different Associations and Institutions working towards the conservation of fungi, such as BMS, ECCF, OPTIMA, CEMM, Planta Europa, Amateur Mycological Associations, etc.

From Heikki Kotiranta, Finnish Environment Institute, Finland

The intensive survey of forests done in Finland over the last ten years led to protection of large areas of old-growth forests. Old-growth forests in National Parks, nature reserves and some other areas are now protected by law and incorporated in nature conservation programmes. The new forest cutting recommendations, that always some amount of wood (often old, large or already dead trees) is left to the managed area, may help some species to survive even in commercially managed forests. However, most

of the protected areas are situated in the northern part of the country, and the area protected in southern Finland is still too small, so further actions in southern Finland are required.

From Paul Cannon, CABI Bioscience, Surrey, UK

There are opportunities for both optimism and pessimism. On the positive side, conservation policy is changing dramatically from individual species-oriented approaches to ecosystem preservation, resulting in the conservation of many fungi by default. The value of fungi to the environment and ecological processes is being more widely appreciated, and the role of pathogenic species in the natural environment is being reassessed. The potential is bright for sensitive and efficient detection and monitoring of individual species during the next century, with ever more sophisticated molecular tools being developed. Pessimists are likely to be rewarded also. The dramatically increasing pressure on land, especially on natural habitats in the tropics, is probably causing fungal extinctions on a daily basis. Sustainable exploitation of natural resources will continue to be aspiration rather than reality as economic pressures force short-term decision-making. Global warming will pose added challenges for species survival. More specifically, funding for systematics shows little sign of reversing its downward trend, despite its critical role in identification and increased emphasis on the environment following the Rio conference. The continuing lack of interaction between fungal systematics experts and ecologists is also depressing, especially in areas such as sampling and monitoring procedures. Most fungal survey work is still carried out on an unscientific serendipitous basis, which makes comparison of results almost impossible. The key to ensuring a prominent role for fungi in conservation is to promote interdisciplinary links between scientists, and a holistic vision of fungi and their myriad roles in the ecosystem.

From Vincent Fleming, Peterborough, UK

We should be optimistic, for the UK anyhow. There is now increasing recognition that fungi are subject to the same pressures as, and are of equal worth to, other wildlife. This change in attitude can be attributed to the recent emphasis on biodiversity and it marks a radical shift from earlier assumptions that the conservation of fungi would, at best, have to depend on their chance representation in sites specially protected for other, more familiar, interests. The financial resources directed to fungi by conserva-

tion agencies have also increased, yet fungi still lag behind many other taxonomic groups. Realistically, they are likely to continue to do so: we have a shortage of specialists, a paucity of time-series data from which to estimate trends, and little knowledge of how to manipulate populations. To achieve maximum gain, we should seek to identify and highlight those circumstances where the needs of fungi differ from a 'normal' conservation approach. However, we should not expect to achieve total knowledge nor to delay action until we do so. We must use the best available information to guide and influence positive action and to stimulate public interest. For parallels and parity, we should look less to vascular plants and more to the conservation of invertebrates, with which fungi share many similarities: namely, the large numbers of taxa, difficulties of identification, and the transient appearance of observable life-stages. We have a considerable task ahead and optimism does not guarantee success, but to be pessimistic is not to try.

From Alison Dyke, Edinburgh, Scotland

From a Scottish perspective, and particularly on the subject of harvesting wild mushrooms, the future of fungal conservation seems fairly rosy. There is real interest in fungal conservation among all those involved in harvesting wild mushrooms—after all for some it is their livelihood and they do have a long term perspective. Effort is being made to survey important habitats and species groups, e.g. waxcap grasslands and tooth fungi. There are obviously some areas of concern, where important habitats are being lost, where the funds to do research are hard to come by, etc. It is these areas where it is important that positive action is taken and it is everyone's responsibility to ensure that this happens.

Fungal Conservation

Issues and Solutions

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