

Fungimap Inc.

Submission in response to: Australia's Biodiversity Conservation Strategy 2010-2020, Consultation Draft From: Fungimap Inc.

Contents

This submission includes background information on:

- Fungimap Inc.
- Fungi
- Fungi in ecosystems and specific feedback on the draft Conservation Strategy in the areas of:
- Biodiversity
- Inventory
- Conservation strategy
- Threat assessment
- Datasets and monitoring
- Lack of specificity in the Strategy
- Minor corrections FUNGIMAP INC.

Fungimap Inc. is an Australia-wide non-government organization formed more than ten years ago (incorporated 2005) to address the widespread lack of knowledge and understanding of the distribution, diversity, ecology and conservation status of native Australian fungi. Fungimap currently has approximately 220 financial members throughout Australia.

The aims of Fungimap as set out in its constitution include:

- To stimulate and support the study of Australian macrofungi through the accumulation, storage, analysis and dissemination of information about fungi.
- To link those with an interest in Australian macrofungi, providing opportunities for sharing and learning.
- To promote the appreciation of fungi with a focus on macrofungi in the natural environment.
- To foster the conservation of Australian macrofungi.

The study of fungi is one of the areas of natural science where non-specialists can make a substantial contribution. One of the main activities of Fungimap is a mapping scheme that relies on a network of volunteers throughout Australia to report sightings of easily distinguishable target species. More than 28,000 records are stored in the Fungimap database. Data have been provided to researchers and agencies, such as National Parks services and the Australian Heritage Commission.

Distribution data collated by Fungimap have been summarised in maps published in *Fungi Down Under: the Fungimap Guide to Australian Fungi* and the Fungimap CD-ROM. The Fungimap Newsletter appears several times a year, and there is an extensive Fungimap website. Every two years, there is a national Fungimap Conference, and this will be held in New South Wales in 2009.

In addition to the collection and disseminating of information about fungi, Fungimap is active providing informed input to the development of policy. In recent years Fungimap has made submissions in response to the draft 100-Year Biodiversity Conservation Strategy for Western Australia and the Victorian Green Paper on Land and Biodiversity at a Time of Climate Change.

FUNGI

Fungi belong to a separate kingdom of the natural world: the Fungi. There are also some fungi-like organisms, such as slime moulds and water moulds, that belong in other kingdoms. Lichens are classified as fungi; they are a symbiosis between true fungi and algae or cyanobacteria. Fungi are not plants, and differ in significant ways from both plants and animals. They gain nutrients by breaking down dead organic matter, by forming partnerships (mutualisms) with other living organisms or by parasitism of other living organisms.

The most obvious Fungi are the macrofungi. These produce readily visible fruit-bodies, such as mushrooms, coral fungi, puffballs, stinkhorns and bracket fungi. There are also many microscopic

fungi, such as rust-fungi, smut-fungi, and numerous types of fungi that form leaf spots on a wide range of hosts. Microfungi also occur in the soil and in association with insects.

FUNGI IN ECOSYSTEMS

Fungi are crucial to healthy ecosystem functioning. They are nature's major recyclers of organic matter, from leaves to huge fallen trees. They play an important role in maintenance of soil structure. In addition, the majority of green plants, from orchids to forest trees, rely on mycorrhizal fungal partners for their continuing survival and wellbeing. Truffle-like fungi (of which Australia has more species than anywhere else in the world) provide almost all the dietary requirements of animals such as the Long-footed Potoroo and are also included in the diet of many other native mammals.

In addition, many invertebrates eat fungi. Lichens are important components of biological soil crusts, especially in drier vegetation. Fungi provide food and habitat for numerous invertebrates. Fungi are usually thought of as pests and diseases, and indeed exotic fungi can cause significant damage in agriculture and horticulture. Exotic fungal pathogens such as Cinnamon Fungus (*Phytophthora*) can also cause much damage in native ecosystems. However, there are a large number of native plant pathogenic fungi that are an integral component of healthy ecosystems.

BIODIVERSITY

Given that the Strategy is all about 'Biodiversity', the sections on 'What is biodiversity' (2.2) and 'Australia's biodiversity' (2.4) are far too short and lacking in detail. There needs to be a separate Appendix that gives a clear picture of all the different groups of animals, plants, fungi, protozoans and bacteria, and what they are doing in ecosystems and how they interact. At least several pages should be devoted to an overview of the diversity of life. For each major group, the number of known species should be provided, as well as the number yet to be described, and levels of endemism.

The facts quoted in 2.4 (such as in relation to the number of undescribed ants) are useful, but need to be more comprehensive. For each group, some examples (with pictures) should be provided. For fungi this might include mushrooms, coral fungi, truffles, rust fungi, smut fungi, yeast and examples of leaf-inhabiting fungi, so that readers have a clear picture of the variety of life across all group of the biota. It is this diversity that is the biodiversity that the Strategy is aiming to conserve.

Groupings such as micro-organisms (which presumably include all microscopic forms of life, from disparate groups such as bacteria, fungi and protozoans) should be explained, and a modern classification of life utilised that recognises Fungi as a separate group to plants and animals.

References to 'plants and animals' (such as in the opening paragraph on p. 9) should always state 'plants, animals and fungi'. The snapshots of biodiversity in Appendix 7 are really snapshots of habitats. The snapshots should include more specific examples of the biodiversity that occurs in these habitats, across all groups (not be biased towards better known groups) and indicate the key roles of different functional groups of organisms.

Vital components of terrestrial ecosystems such as ectomycorrhizal fungi are not mentioned at all. For fungi, there should be mention of their roles in decomposition, nutrient cycling, maintaining soil structure, mutualistic partnerships with trees and orchids, as food for mammals and insects, and so on. This explanation needs to emphasise the great interconnectedness of all biodiversity, which is essential for understanding how to conserve it (i.e. the best way to conserve biodiversity is as part of an intact, healthy ecosystem, rather than thinking about conserving individual species outside of the context of their natural ecosystem).

INVENTORY

In order to effectively conserve the biota, we need to have baseline information about what species there are and where they occur, and also on how many species are yet to be described. Available estimates for fungal biodiversity for Australia are extremely inadequate. There is no comprehensive national census nor censuses for each state. Comprehensive and up-to-date lists are available for some groups, such as larger Basidiomycota (The Interactive Catalogue of Australian Fungi), but the most recent lists for other groups are more than 100 years old.

Better estimates are needed of what proportion of fungi are yet to be formally named, where are the unknown species expected geographically and ecologically, and in what groups do they belong. The current estimates are all over the place – different documents give different figures, and there needs to be a rigorous analysis of available data in this area. In the light of the lack of comprehensive inventory data for fungi, the emphasis on gathering and disseminating knowledge, under Priority 3 (Knowledge for all) is a good feature of the Strategy. However, the 'knowledge' is not well defined.

To increase the likelihood of real progress against the actions, there needs to be more specific targets under Objective 3.1. as follows: Action: Create inventory of all known Australian species (with rigorous estimates of unknown species) by 2015 Results: Biodiversity conservation activities have access to the entire knowledge base and strategic planning can occur to fill gaps Some national and state biodiversity strategies have explicit targets for the naming of the biota.

For example, the draft A 100-year Biodiversity Conservation Strategy for Western Australia included specific targets for the formal description of invertebrates (many of which are similarly poorly known to fungi). Specific targets for descriptions of fungi and other poorly known groups should be established and funding put in place to expedite this process. Action: Describe 80% of the known species that lack formal names by 2020 Results: Biodiversity conservation activities can cover as many species as possible Tracking of progress against these specific targets can be included in Priority 6. Measuring success.

CONSERVATION STRATEGY

Most fungi are not yet even collected, documented and formally named. Those fungi that do have names are often known only from the original type specimen, and there is no information about their ecology and biology. In the light of this, how best can we conserve the fungal kingdom? There needs to be an explicit and coherent strategy for the conservation of fungi that is realistic about the level of knowledge and the prospects for gaining new knowledge over the next decade, and that attempts to maximise the chances that we are protecting the as much fungal diversity as possible along with their ecological functions.

In effect, at present, the entire fungal kingdom of tens of thousands of species (and possibly many more) is assumed to be adequately conserved by the approach of looking after habitat and vegetation. Another way of putting this is that fungi are conserved under the umbrella of looking after other organisms (or habitat). This notion is largely scientifically untested and needs to be tested urgently because it will be a long time before all species of fungi are formally described and well known as far as biology etc.

This notion of explicit strategies to cover lesser known groups does not fit exactly under the six priorities for change, but best fits under 1. Building ecosystem resilience. Action: Create, test and refine explicit strategies for conserving poorly known groups such as fungi. Results: Maximises the survival of individual species in these groups and also maximises benefits to the whole ecosystem (due to the great functional significance of such groups)

THREAT ASSESSMENT

The Conservation Strategy does not address the issue of threat status assessments. For some groups of the biota there are comprehensive threat assessments at state and national level, where all the known species have been assessed as far as their status as endangered, vulnerable etc. Given that much of the legislative framework to conserve species is based on formally listed species, it is essential that a comprehensive threat assessment be carried out across all known species.

Fungi are just not on the radar at the moment as far as conservation, and a large part of this is the lack of species on formal threat status lists. There has been no comprehensive threat assessment for fungi nationally or for individual states. No fungi (including lichenised fungi) appear to be listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Only a handful of species are listed under state legislation; the most being the nine individual species of

fungi and one fungal community formally listed under the New South Wales Threatened Species Conservation Act 1995).

There are some species already obvious candidates for threat listing, and many others that are now clearly secure. Many species would have to be classed as poorly known, but we need to make a start on this. Add under Objective 3.1 Action: Carry out a comprehensive threat assessments across all known species by 2015 Results: We know which species are endangered, and can direct resources appropriately, and track changes in threat status

DATASETS AND MONITORING

It is good that objectives are included for building baseline datasets (6.1.1) and for setting up a nationally representative set of long-term monitoring protocols and sites. Given the poor information base for fungi, there is a critical need to rapidly amass data on fungal distribution, habitat preference and response to management regimes. Such data have been collected for many years on other more prominent groups of the biota (such as vertebrate animals and flowering plants). However, fungi (and other poorly known groups such as invertebrates) are usually omitted from datasets compiled by government agencies, largely due to the difficulty of identification and the lack of specialists to make identifications.

It is essential for fungi to create a sufficient baseline upon which to make informed decisions. For selected species or groups (representative of the taxonomic and functional diversity of fungi) there is an urgent need to gain a deeper understanding of their population biology, genetic structure, breeding systems, life history, potential threats, responses to disturbance, and responses to climate change. It will be better to know a few groups very well, than to spread effort thinly across the numerous species. Thus at least some model groups of fungi can be understood at the same level of detail as some of plants and vertebrates that are well understood. This will help address the current level of ignorance about the conservation and management of fungi.

Fungi need to be included in established and new monitoring programs, such as for investigations of fire management and climate change. It is not going to be feasible to survey for all fungi, but including at least some fungi will generate general data about those species (which are often lacking) and those data can also be used in relation to the specific goals of the monitoring program. Monitoring often focuses on rare or endangered species. The lack of formally listed fungi in these categories means that fungi miss out. Fungi are also considered difficult to identify, and this is often the case. However, some species are quite distinctive and can be identified in the field (such as Fungimap target species).

A list of target fungi suitable for use in surveys needs to be developed, and refined so that fungi representative of taxonomic groups, nutritional modes, distributions and abundances are included. In Table 3.6: a phrase should be added under the results column for 6.1.1 so that reporting: "covers all major taxonomic and functional groups of the biota" Similarly, for 6.1.3: "Monitoring should cover all major taxonomic and functional groups of the biota"

VOLUNTEER CONTRIBUTION

We know from Fungimap that there is great potential to harness networks of volunteers to collect distribution and ecological information that is not otherwise available. The 28,000 or so records that have been submitted to Fungimap already by volunteers would have cost at least many hundreds of thousands of dollars to collect if this was done on a fee for service basis, such as by a consultant. Volunteers collect data across Australia, sometimes in relatively inaccessible locations, and at all times of the year, taking advantage of chance sightings. It would be very costly for paid survey teams to cover the same territory and time.

To maximise the input of volunteers and community groups in biodiversity monitoring there must, however, be a willingness to support these groups. The support must be in two areas (1) standards for data collection and management, and (2) financial. Government can play an important role in setting and supporting standards for data collection and management. The effort of community groups needs to be directed so as to produce high quality data that is of maximum use now and in the future to feed into the science of biodiversity management. Not only is there potential to improve data quality per se, but monitoring is much more satisfying for community group

volunteers if they know that the data they collect is of high quality and will be put to best use (and they are consequently more likely to put more effort into data collection).

Realistically, at least some of the support from Government to community groups needs to be financial, and this is an aspect that is not discussed at all in the Strategy. A relatively small investment from Government can catalyse a large return from community groups, in terms of the amount, quality and usefulness of data. Financial support from Government will need to be both directly for data management (such as for upgrades to database systems) and also for the general administrative costs of running organisations (and hence supporting the on ground volunteer efforts). The Strategy should provide more detail about the involvement of the community in biodiversity conservation, especially in terms of monitoring.

LACK OF SPECIFICITY IN THE STRATEGY

Overall, there is a lack of specifics in the Strategy. There is a distinct risk that general statements of objectives are met sufficiently over the life of the Strategy to tick them off as having been achieved, but only in a general sense that across all governments there is some progress in some areas. For objectives such as 3.1.1 'Assess knowledge needs, identify gaps and set priorities at national, state and regional levels' surely a national Strategy should be where some of the specifics of the priorities are set now, such as for targets for the number of species to be described, of the proportion of species that are covered by threat assessments.

MINOR CORRECTION

p. 18. Raupach et al. (2007) is given as the reference for the fact that less than 10% of fungi are formally described. There does not appear to be any reference in this paper to the number of fungi described from Australia.