

SIGNIFICANCE OF THE HYGROCYBEAE COMMUNITY OF LANE COVE BUSHLAND PARK IN LISTINGS UNDER THE NSW THREATENED SPECIES CONSERVATION ACT 1995 AND UNDER THE AUSTRALIAN HERITAGE COMMISSION ACT 1975

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Abstract

Lane Cove Bushland Park (LCBP) is a site in the middle of a high-density residential area and about 4 km from the Sydney G.P.O. Centred about a tributary of Gore Creek, the warm temperate gallery forest is the location of at least 25 species in the tribe Hygrocybeae. Among these are holotypes of more than six taxa. The Hygrocybeae Community of LCBP has been legislated under the *NSW Threatened Species Conservation Act, 1995* as endangered. A Final Determination to list the holotype species under the appropriate section of the Act is in progress. In addition, a nomination to list the LCBP on the Register of the National Estate has been recommended by the Heritage Commission, with final gazettal now being undertaken. These successful initiatives have depended upon collaborative efforts between amateur mycology enthusiasts and a professional taxonomic mycologist to synergise initiative, analytical insight and expertise to bring about landmark decisions for mycology and conservation of fungi in Australia.

Introduction

While it is true that our knowledge of factors for the decline of vertebrate species such as birds and mammals has improved in recent years our knowledge of fungi—which have a vital role in maintaining the ecosystem—remain extremely limited. More often trodden on or overlooked than studied and conserved, fungi are even less well known than other cryptogams such as mosses, liverworts, lichens and algae.

In general, a surprising number of plant and animal species have become endangered by default—through inefficient administration, ignorance of their ecology, or simply because nobody seems to have the interest, authority or responsibility for taking constructive action to safeguard them. Fungi are no less threatened and endangered.

The following account illustrates how initiative and analytical insight of amateur mycology enthusiasts when coupled with the skills and experience of the professional taxonomic mycologist can work together to achieve landmark decisions for the conservation of fungi as well as to recapture true values of mycology at State and Commonwealth levels of Government. In this case, the synergism between the amateur and the professional has been the formula for success in these listings.

Lane Cove Bushland Park (LCBP)

LCBP measures approximately 800 metres long and about 300 metres at its widest section and can best be described as a warm-temperate wet sclerophyll forest. It is evergreen, hygrophilous in character in the upper portion and rich in thick stemmed lianes. The vegetation is a mixture of open forest and rain-forest species, but not luxuriant. In some sections as little as ten percent of the sunlight shining on the crown of the trees reaches the ground in the understorey. Epiphytes are relatively common on many of the tree trunks, especially in the upper catchment area of the tributary of Gore Creek. The water course that runs the length of LCBP is the location of a 'gallery rainforest' at the bottom of the valley surrounded by often steep-sided ridges and gullies which carry run-off rainwater into the tributary of Gore Creek and empties into the Sydney Harbour at Gore Cove.

In the lower or southern more open section of LCBP, grasses exist as ground cover amid the various species of eucalypt, angophora and coachwood. Several species of ground orchids abound in the more sheltered sections in the mid and southerly aspect of the LCBP.

The area records a rainfall of more than 1200 mm, the wettest months being January to July. Extremes of temperature are infrequent: average maximum summer temperature is around 24°C and the average minimum 18°C. Average winter temperatures are: maximum 16°C, minimum 7°C.

The diverse landscape in the LCBP comprises a wide variety of vegetation complexes. It is in the gallery rainforest that has a north-south aspect between sloping hillsides, which govern shade and heat in autumn and winter, where the majority of species in the family Hygrophoraceae are found. The galleries add to the richness of the eucalypt open forest, which essentially becomes a buffer zone of dry sclerophyll between the gallery core-zone and the residential area around the perimeter of the LCBP.

The two major rock types in LCBP are Wianamatta shale and Hawkesbury sandstone that give rise to two distinctly different types of soil. The shale produces deeper and more fertile clay soils, which also hold more water easily. The sandstone produces sandy, stony soils, which dry out readily and tend to be associated with steep slopes and rock outcrops over which drip water into leaf litter below—ideal conditions for certain species of *Hygrocybe*. The unusual combination of both soil types, coupled with the topography of the site in a north-south aspect, has created a range of unique habitats and ecosystems, which support the different colourful species in the family of Hygrophoraceae.

For more than a decade, members of the Sydney Fungal Studies Group (SFSG) (now incorporated) had recorded a diverse range of fungal species, including many in the genus *Hygrocybe*. However, most of the later species were unclassified, although photographic and field records were made. By 1997, more than 20 different species of *Hygrocybe* had been documented photographically by amateur mycologists Ray Kearney and his wife Elma to add to previous records kept by Mr Van Klaphake, Bush Regenerator of Lane Cove Council and also a member of the SFSG. Indeed, some species of *Hygrocybe*, given to a local resident and artist Julie D. Morris by Van Klaphake are recorded in her paintings.

Scientific documentation in the applications

In 1998, Dr Tony Young received grants from the Australian Biological Resources Study (ABRS) to undertake studies on Hygrophoraceae along the eastern seaboard of Australia, including Tasmania. In 1998 his attention was drawn to the unofficial records and sightings of the species of Hygrophoraceae in LCBP. A follow-up on-site visit marked the beginnings of the formal identification and classification of the collections from the LCBP that culminated in his publication (Young 1999). With further assistance from Ray and Elma Kearney, it became clear that the number of species would easily exceed 20 and possibly reach 30. This collaborative association between the analytical insight of amateur mycology enthusiasts and the skills and experience of a professional taxonomic mycologist, of international reputation, was the foundation upon which the initiative to seek listing under both State and Commonwealth Legislation was launched. In January 1999, two applications were submitted by Ray and Elma Kearney, on behalf of the SFSG, to the Scientific Committee established under the *NSW Threatened Species Conservation Act, 1995*.

A Final Determination of the Scientific Committee to list the Hygrocybeae community of LCBP as an endangered ecological community

The first application, in pursuance of Division 3 of Part 2 of Schedule 1 of that Act sought a determination to list the Hygrocybeae Community of LCBP as an Endangered Ecological Community. The species in the community were listed as formally identified and classified by Dr A.M. Young (1999), together with additions arising from the classification of further specimens sent to him. The Final Determination as legislated on 3 March, 2000 is reproduced as follows:

NSW SCIENTIFIC COMMITTEE Final Determination

The Scientific Committee established by the Threatened Species Conservation Act, has made a Final Determination to list the Hygrocybeae Community of Lane Cove Bushland Park as an Endangered Ecological Community under Part 3 of Schedule 1 of the Act. Listing is provided for under Part 2 of the Act.

The Scientific Committee has been found that:

1. The Hygrocybeae Community of Lane Cove Bushland Park is an assemblage of more than 20 species of fungi in the family Hygrophoraceae (Fungi, Basidiomycota, Agaricales, Hygrophoraceae).

2. The Community is restricted to a core zone along the Gore Creek catchment in the Lane Cove Local Government Area in Sydney. The majority of species occur in the warm temperate gallery rainforest centred on the banks of the north-eastern arm of Gore Creek and its tributaries in Lane Cove Bushland Park. This core zone also extends to the wet sclerophyll catchment, north of the tributary junction with Gore Creek. A minority of the species in the assemblage is found in a buffer zone of dry sclerophyll between the perimeter of Lane Cove Bushland Park and outer edges of the gallery canopy and along Gore Creek in Osborne Park.

3. The following species have been recorded in the community

<i>Camarophyllopsis kearneyi</i>	<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>
<i>Hygrocybe astatogala</i>	<i>Hygrocybe aurantiopallens</i>
<i>Hygrocybe aurantipes</i>	<i>Hygrocybe austropratensis</i>
<i>Hygrocybe cantharellus</i>	<i>Hygrocybe cheelii</i>
<i>Hygrocybe chromolimonea</i>	<i>Hygrocybe erythrocala</i>
<i>Hygrocybe graminicolor</i>	<i>Hygrocybe helicoides</i>
<i>Hygrocybe involutus</i>	<i>Hygrocybe irrigata</i>
<i>Hygrocybe kula</i>	<i>Hygrocybe lanecovensisi</i>
<i>Hygrocybe lewellinae</i>	<i>Hygrocybe mavis</i>
<i>Hygrocybe miniata</i>	<i>Hygrocybe reesia</i>
<i>Hygrocybe sanguinocrenulata</i>	<i>Hygrocybe stevensoniae</i>
<i>Hygrocybe taekeri</i>	<i>Hygrocybe virginea</i>

Other species in the Community have been collected but remain undescribed and unclassified, and other Hygrocybeae may be present.

4. Lane Cove Bushland Park is the holotype site for *Hygrocybe aurantipes*, *Hygrocybe austropratensis*, *Hygrocybe lanecovensisi*, *Hygrocybe anomala* var. *ianthinomarginata*, *Camarophyllopsis kearneyi* and *Hygrocybe reesia*. [Young, A.M., 1999, The Hygrocybeae (Fungi, Basidiomycota, Agaricales, Hygrophoraceae) of the Lane Cove Bushland Park, New South Wales. *Austrobaileya* 5: 535–564].

5. The assemblage is not known to occur outside the Lane Cove Local Government Area. Furthermore, the number of species of *Hygrocybe* is very high compared with other known sites in Australia and overseas. Species will not have above-ground fruiting bodies at all times of the year. There may be differences depending on seasonal conditions and other factors.

6. Within Lane Cove Bushland Park, different species of Hygrocybeae have been reported from one to several specific locations. More species occur at the southern than at the northern end of the Park. The ecological requirements of most species are poorly known, but are likely to be associated with a dense tree canopy and sandstone rocks.

7. The Community is threatened by water-borne pollutants. Industrial pollutants occur particularly in the upper reaches of Gore Creek catchment and domestic contaminants arise from residential properties on the perimeter of Lane Cove Bushland Park. The Community is also at risk from encroachment by exotic weeds, dumping of rubbish and garden refuse, excess pedestrian traffic in areas sensitive to erosion, and inappropriate bush regeneration measures that disturb the forest canopy and native understorey plants.

8. In view of the small area occupied by the Community and the threats to its integrity identified in 7 above, the Scientific Committee is of the opinion that the community is likely to become extinct in New South Wales unless the circumstances threatening its survival cease to operate.

Dr Chris Dickman
Chairperson
Scientific Committee'

Application for a Determination to list Rare Native Species of Hygrocybeae (Fungi, Basidiomycota, Agaricales, Hygrophoraceae) of LCBP, under the *Threatened Species Conservation Act, 1995*.

The second application to the Scientific Committee sought to nominate the five holotypes of Hygrocybeae and *Camarophyllopsis kearneyi* as Rare Native Species of LCBP within the meaning of Schedule I (endangered), Part I of the *Threatened Species Conservation Act, 1995*. The nominees believe that the holotype species to which further new additions would be made are eligible for listing as endangered and vulnerable species within the meaning of Section 10 and Section 14 and all of their subsections, as well as Section 28 and all of the subsections of the *Threatened Species Conservation Act, 1995*.

The holotype species are:

Hygrocybe anomala var. *ianthinomarginata* A.M Young

Hygrocybe aurantipes A.M Young
Hygrocybe austropratensis A.M Young
Hygrocybe lanecovensisi A.M Young
Hygrocybe reesiaae A.M Young
Camarophyllopsis kearneyi A.M Young

The addition of at least three new holotype species for approval by the Scientific Committee will be requested. The nomination is, at present, before the Scientific Committee for a Final Determination.

**Nomination of Lane Cove Bushland Park for listing on the Register of the National Estate,
 under the Australian Heritage Commission Act, 1975.**

The initiative to prepare an Application on behalf of the SFSG for Lane Cove Council (the owner and manager of LCBP) to submit to the Heritage Commission was based upon the conservation value ranked, according to Rald's system, of national significance. Thus, on the basis of the total number of species of *Hygrocybe*, known unofficially to exceed 25, LCBP would easily be ranked in Europe of heritage value, as seen in Table 1.

Table 1. Rald's Classification for Conservation

Conservation Value	Total Number of <i>Hygrocybeae</i> species
National importance (i)	17-32 (11-20 during a single visit)
Regional importance (ii)	9-16 (6-10 during a single visit)
Local importance (iii)	4-8 (3-5 during a single visit)
No importance	1-5 (1 or 2 during a single visit)

D. Boertmann 1995

The Australian National Estate which now has more than 11,000 entries is made up of cultural and natural heritage places which have special value. Compiled by the Australian Heritage Commission, the Register includes national estate places defined in the *Australian Heritage Commission Act, 1975* as

'those places, being components of the natural environment of Australia, or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations, as well as for the present community' Section 4(1).

Entry to the Register alerts planners, decision makers, business interests, researchers and the community at large to the existence and location of National Estate places and to their heritage value. The Commission does not manage places on the Register. That is the responsibility of Commonwealth, State and Local Government bodies. Being listed on the Register simply means it has been identified as a place worth keeping for the benefit of future generations. Each place is examined on the basis solely of National Estate value measured against specific criteria.

The Commonwealth Government has particular obligations under the *Australian Heritage Commission Act, 1975* for places entered in the Register of the National Estate. For example under Section 9 (2) and Section 30 Commonwealth Government can assist the Commission in providing funds to other bodies to undertake programs of research to protect places in the Register of the National Estate. Commonwealth Government funding is available for the conservation of places listed on the Register through the National Estate Grant Program, the Commonwealth's major heritage funding program, which is co-ordinated by the Australian Heritage Commission. Grants may be awarded to non-profit bodies such as community, professional, academic, State and Local Government bodies.

In preparing the application, Ray and Elma Kearney, on behalf of the SFSG, assisted Lane Cove Council in its nomination. The following criteria, used by the Commission for assessment of nominations, were identified as being relevant.

CRITERION A: ITS IMPORTANCE IN THE COURSE OR PATTERN OF AUSTRALIA'S NATURAL OR CULTURAL HISTORY

CATEGORY: A1—importance in evolution of Australian flora (fungi)

- Introduction
- Birth of Australia
- Lane Cove Bushland Park—and its ecotome

- Importance of Lane Cove Bushland Park in the evolution of Australian fungi
- Significance of genetic diversity in Lane Cove Bushland Park
- Extent of diversity among species of Hygrocybeae
- Factors that contribute to the genetic diversity of fungal species of Hygrophoraceae in Lane Cove Bushland Park
 - a Mode of reproduction
 - b Diversity among fungi species per unit area in Lane Cove Bushland Park
 - c Fungal species with homologous and/or analagous structures in Lane Cove Bushland Park
 - d Types of natural selection among species of fungi in Lane Cove Bushland Park
 - e Patterns of evolution in fungal species in Lane Cove Bushland Park
 - Divergent evolution
 - Convergent evolution
 - f Population dynamics and life-history of fungal species in Lane Cove Bushland Park
 - g Interactions in the fungal communities of Lane Cove Bushland Park: competition, predation and symbiosis

CATEGORY: A2—importance in maintaining existing processes or natural systems in Lane Cove Bushland Park

- Introduction
- Species variation, gene pools and environmental factors
- Natural systems and processes that contribute to the unique ecosystems in the Lane Cove Bushland Park
- Topography and a north-south aspect
- Key factors for sustained development in Lane Cove Bushland Park
- Examples of different natural processes unique to Lane Cove Bushland Park
- Lane Cove Bushland Park – a site for other unique fungi
- Lane Cove Bushland Park – a refugia
- Key threats to sustainable biodiversity in Lane Cove Bushland Park include:
 - a Effects of human population
 - b Condition of the ecosystem
 - c Distribution and abundance of fungal species
 - d Changes in genetic diversity
 - e Land clearance and related activities
 - f Impacts of introduced species
 - g Bushwalking and other human activities
 - h Lack of knowledge of biodiversity
 - i Effectiveness of conservation measures
 - j Adequacy of protected areas
 - k Adoption of integrated ecosystem-based management of Lane Cove Bushland Park
- The criteria for National Environmental indicators (NEI) apply to species of *Hygrocybe* in Lane Cove Bushland Park
 - a NEI should serve as a robust indicator of environmental change
 - b NEI should be sensitive to environmental change
 - c NEI should reflect a fundamental or highly valued aspect of the environment
 - d NEI should be either national in scope or applicable to regional environmental issues of national significance
 - e NEI should provide an early warning of potential problems
 - f NEI should be capable of being monitored to provide statistically verifiable and reproducible data that show trends over time and preferably, apply to a broad range of environmental regions
 - g NEI should be scientifically credible
 - h NEI should be easy to understand
 - i NEI should be monitored regularly with relative ease
 - j NEI indicator should be cost-effective
 - k NEI should be as aggregative as possible (*i.e.* amenable to combination with other indicators to produce more general information about environmental conditions)
 - l NEI should have relevance to policy and management needs
 - m NEI should contribute to monitoring progress towards implementing commitments in nationally significant environmental policies
 - n NEI should where possible and appropriate, facilitate community involvement
- A study of natural selection and genetic variation by DNA sequencing

CATEGORY: A3—importance of exhibiting unusual richness or diversity of flora (fungi) and landscapes in Lane Cove Bushland Park

CRITERION B: ITS POSSESSION OF UNCOMMON, RARE OR ENDANGERED ASPECTS OF AUSTRALIA'S NATURAL OR CULTURAL HISTORY

CATEGORY: B1—importance for rare, endangered or uncommon species (fungi), communities, ecosystems and natural landscapes

CATEGORY: B2—preservation and promotion of variability among species of *Hygrocybe* in Lane Cove Bushland Park

- Natural selection and variability in Lane Cove Bushland Park
 - a Balanced polymorphism of species of fungi
 - b Geographic variation in Lane Cove Bushland Park: clines and ecotypes
 - c Frequency-dependent selection of species of fungi in Lane Cove Bushland Park

CRITERION C: ITS IMPORTANCE TO YIELD INFORMATION THAT WILL CONTRIBUTE TO AN UNDERSTANDING OF AUSTRALIA'S NATURAL OR CULTURAL HISTORY

CATEGORY: C1—importance for information contributing to wider understanding of Australian natural history—research site, teaching site, type locality or bench-mark site

CRITERION D: ITS IMPORTANCE IN DEMONSTRATING THE PRINCIPAL CHARACTERISTICS OF:

- (I) A CLASS OF AUSTRALIA'S NATURAL OR CULTURAL PLACES; OR
- (II) A CLASS OF AUSTRALIA'S NATURAL OR CULTURAL ENVIRONMENTS

CATEGORY: D1—importance in demonstrating the principal characteristics of the range of landscapes, environments, ecosystems, the attributes of which identify it as being characteristic of its class

CRITERION E: ITS IMPORTANCE IN EXHIBITING PARTICULAR AESTHETIC CHARACTERISTICS VALUED BY A COMMUNITY OR CULTURAL GROUP

CATEGORY: E1—importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community

- To save the endangered and threatened community of fungi in Lane Cove Bushland Park
- Gaps in our knowledge

The nomination, received early in 2000, by the Heritage Commission was enthusiastically entered on a temporary or Interim List in March 2000. In June, *i.e.* at the end of three months of the publication of the statutory notice, a recommendation in the Commission's final decision was made on the National Estate significance.

Final approval for entry in the Register has been made during the Commission's formal meetings and the process of incorporating the entry into Commonwealth Legislation is expected to be completed in October 2000.

Whilst the mycological component of the application was its major section, the Lane Cove Council, in its nomination included certain botanical and zoological features unique to Lane Cove Bushland Park.

Discussion

Each of these three initiatives was strengthened by the supporting scientific documentation and was accompanied by good quality photographs as well as site-location maps. Simply meeting a criterion does not of itself establish the significance of LCBP. It is the *degree* to which LCBP exhibits characteristics which are rare, influential within its type, endangered or threatened, particularly fine in exemplifying its type, particularly valuable for research, or which mark major stages for its type that the Heritage Commission and the Scientific Committee determined conferred significance.

The significance of these initiatives is that mycology has now been officially recognised, for the first time, at all levels of government *i.e.*, Commonwealth, State and Local, as integral to conservation. Scientists accept that extinction is an integral part of the process of natural selection. Species have a finite life span and, since life first appeared on this planet, fungi, plants and animals have evolved into different forms. The assemblage of fungi in Lane Cove Bushland Park is threatened and endangered. Some species are rare. Assemblages of species in different genera are likely to be documented for other sites throughout Australia and, in time, similarly listed.

The best way to safeguard the rare species is to ensure the conservation of the biotic community of which they are a part. Rarity is not of itself a cause for concern. Some species are inherently rare, often because they occupy a highly specialised ecological niche. But few species can survive outside their natural habitat.

Scattered remnants of a species can sometimes be brought together and concentrated in one part of the natural range to create a viable breeding nucleus and provide more efficient protection. Clearly, the aim for LCBP should be to forestall emergencies such as to translocate a species from its original habitat and establish it in an entirely new area. Rather, the solution is to accord LCBP effective protection.

In the knowledge that the Scientific Committee had made a Preliminary Determination, another precedent was about to be set. The Lane Cove Council successfully prosecuted not only the developer of a building site, but also the foreman who allegedly permitted spoil to wash from the building site into the tributary of Gore Creek. This landmark court case was influenced by a determination that a community of macrofungi were threatened and in danger of extinction by possible adverse impacts on their habitat.

A purpose of the application for LCBP to be registered on the National Estate was to give it the status of a sanctuary for these endangered fungal species in this unique community. Responsibility for ensuring that the LCBP on the heritage listing is adequate for the purpose of preservation of the fungal species rests squarely with Federal, State and Local governments and their relevant regulatory authorities.

It is also vitally important that this conservation project, in setting this precedent, should enlist the support of the local people, without whose active collaboration—and, wherever possible, participation—little of permanence will be achieved. It is quite ironic in this so called 'age of science and materialism' that probably never before have ordinary individual men and women, including scientists, been confronted with so many moral and ethical problems. Scientists stress and seek objectivity whilst in the arts, by contrast, the emphasis is on subjectivity, *i.e.*, experience through the individual conscious.

Science is thus limited to what is observable and measurable. Theories may be shattered, new names found and taxonomic adjustments changed—but the observations endure, and moreover, they are used over and over again. Because of this emphasis on objectivity, value judgements cannot be made in science in the way such judgements are made in religion, philosophy and the arts. Thus, whether or not something is good or beautiful or right in a moral sense, for example, cannot be determined by the scientific method. Most of the problems we now confront can be solved only by value judgements. Being active participants in these collective processes is only a beginning to give mycology a quality resonance.

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