

## MUSHROOMS OF MAATSUYKER ISLAND

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### INTRODUCTION

Maatsuyker Island (southern tip GDA 441000E, 5166000N) is a small, remote and isolated island 10 km off the south-west coast of Tasmania. It is the second largest island of the Maatsuyker Group, a group of six rocky islands in the Southern Ocean. Part of the South West Wilderness Area and World Heritage Area, Maatsuyker Island is wild and beautiful.

For the last 10 years or so, the Parks and Wildlife Service have been running the Caretaker Program. The program involves the placement of two volunteers on the island for four month periods to aid with the ongoing maintenance and management of the islands cultural and natural heritage. I was lucky enough to be a part of the program from February to June 2006 which gave me the opportunity to conduct the first macrofungal survey of the island.

Maatsuyker Island is roughly triangular in shape and approximately 180 hectares in size being 3 km long and 1.5 km at the widest point. The highest point on the island is located in the central east of the island and is 284m above sea level. The island has a temperate maritime climate and due to westerly winds known as the 'Roaring Forties' experiences high wind exposure and frequent gales.

Maatsuyker Island is geologically similar to adjacent areas of the Tasmanian mainland. Precambrian mica schists and quartz veins are abundant, along with phyllite and quartzite outcrops (Parks and Wildlife Service and Australian Maritime Authority, 1993). Highly erodible grey clay loam or light clay gradational soils are widespread over the island with sand deposits on the cliff tops of southeast slopes, the base of steep slopes and on the saddle above the haulage way (Pemberton, 1990; Parks and Wildlife Service and Australian Maritime Authority, 1993).

The vegetation of Maatsuyker Island is similar to the southwest coast of Tasmania with floristic composition and structure affected by high winds and salt spray (Moscal and Bratt 1977). The island supports a number of vegetation communities with some developing in response to the burrowing activities of seabirds (Pemberton, 1992).

The dominant species, *Leptospermum scoparium*, often grows in association with *Melaleuca squarrosa* and *Banksia marginata*. These species form a dense canopy up to six metres in height in sheltered locations with stunted wind-pruned forms in exposed sites (White, 1981). *Eucalyptus nitida*, growing to a height of ten metres, occurs in a two-hectare stand near the summit (Parks and Wildlife Service and Australian Maritime Authority, 1993). Understorey species include *Acacia verticillata*, *Pittosporum bicolor*, *Billardiera longiflora*, *Pimelea drupacea*, *Monotoca glauca*, and *Tasmannia lanceolata* (White 1981). *Gahnia grandis* and various ferns grow in sheltered areas (White 1981). Dwarf forms of these species in association with *Carex impressa*, *Correa backhousia*, *Epacris impressa*, *Leucopogon parviflorus*, *Rhagodia baccata*, *Solanum vescum* and *Westringia brevifolia* occur in more exposed areas (White, 1981). A distinct vegetation type of *Poa poiformis* tussocks and creeping succulents such as *Carpobrotus rossii* and *Tetragonia impexicoma* occur on the steep slopes and sites used by seabirds for breeding.

## METHODS

The island was surveyed for macrofungi on 41 days during the period between February and May 2006. Survey effort was often increased after heavy rain and high humidity, conditions that often induce fungal fruiting.

Surveys consisted of walking along formed tracks on the island, foraging within 10 metres either side of the track and around other accessible parts of the island. Surveys were restricted to these locations to minimise disturbance to vegetation, soils and breeding seabirds.

Samples of fruiting bodies for the majority of species of macro fungi observed during the survey were collected. Specimens were described in detail before making a spore print and drying. Data recorded for each species consisted of location, habit, abundance, habitat, substrate, plant and fungi associations, description and measurements of fruiting body and photographs. This information was then used to assign a tentative identification while on the island. Identifications were later confirmed at the University of Tasmania.

## RESULTS

A total of 106 collections of macrofungal fruiting bodies was made, yielding 83 species of macrofungi (Table 1).

Table 1. Macrofungal species observed on Maatsuyker Island. Taxonomy is according to May *et al.* (2004). L-m: life-mode. Obs: number of observations.

Life mode categories: S-saprotroph, M-mycorrhizal, L-lichen forming, P-parasitic, U-unknown.

	L-m	Obs
<b>ASCOMYCETES</b>		
EUROTIALES		
<b>Trichocomaceae</b>		
<i>Paecilomyces tenuipes</i> (Peck) Samson Anamorphic <i>Byssochlamys</i> Westling	P	1
HELOTIALES		
<b>Bulgariaceae</b>		
<i>Bulgaria</i> sp. “green globular”	S	1
<b>Geoglossaceae</b>		
<i>Trichoglossum hirsutum</i> (Pers.) Boud.	S	1
<b>Helotiaceae</b>		
<i>Chlorociboria aeruginascens</i> (Nyl.) Kanouse	S	1
<b>Rustroemiaceae</b>		
<i>Lanzia lanaripes</i> (Dennis) Spooner	S	1
XYLARIALES		
<b>Xylariaceae</b>		
<i>Daldinia grandis</i> Child	S	2
<b>Unknown</b>		
Ascomycete “buff cup”	S	1
Ascomycete “green cup”	S	1
<b>BASIDIOMYCETES</b>		
AGARICALES		
<b>Agaricaceae</b>		
<i>Agaricus</i> sp. “brown field”	S	1
<i>Agaricus</i> sp. “Maatsuyker field”	S	5
<i>Agaricus</i> sp. “scaly”	S	4
<b>Amanitaceae</b>		
<i>Amanita</i> aff. <i>punctata</i> (Cleland and Cheel) D.A.Reid	M	3
<i>Amanita</i> sp. “copper top”	M	2
<b>Bolbitiaceae</b>		
<i>Descolea recedens</i> (Cooke and Masee) Singer	S	1
<b>Coprinaceae</b>		
<i>Coprinus</i> sp. “umbrella ink cap”	S	2

Table 1. (contd.)	L-m	Obs
<i>Paneolus</i> sp. "little brown"	S	5
<i>Psathyrella echinata</i> (Cleland) Grgur.	S	5
<i>Psathyrella</i> sp. "scaly brown cap"	S	1
<b>Entolomataceae</b>		
<i>Entoloma conferendum</i> (Britzelm.) Noordel.	S	3
<i>Entoloma</i> sp. "conical black cap"	S	3
<b>Hygrophoraceae</b>		
<i>Hygrocybe astatogala</i> (R.Heim) Heinem.	S/M	3
<i>Hygrocybe chromolimonea</i> (G.Stev.) T.W.May and A.E.Wood	S/M	8
<i>Hygrocybe firma</i> (Berk. and Broome) Singer	S/M	1
<i>Hygrocybe</i> aff. <i>conica</i> (Schaeff. : Fr.) P.Kumm.	S/M	3
<i>Hygrocybe</i> sp. "rainbow"	S/M	1
<i>Hygrophorus involutus</i> G.Stev. var. <i>involutus</i>	S/M	1
<b>Pluteaceae</b>		
<i>Pluteus atromarginatus</i> (Konrad) Kühner	S	1
<b>Strophariaceae</b>		
<i>Hypholoma fasciculare</i> (Huds. : Fr.) P.Kumm.	S	1
<i>Psilocybe subaeruginosa</i> Cleland	S	2
<b>Tricholomataceae</b>		
<i>Armillaria novaezelandiae</i> (G.Stev.) Herink	S/P	1
<i>Campanella olivaceonigra</i> (E.Horak) T.W.May and A.E. Wood	S	2
<i>Collybia eucalyptorum</i> Cleland	S	2
<i>Gymnopus</i> sp. "hairy stem"	S	7
<i>Laccaria</i> sp. "pink"	M	4
<i>Lepista</i> sp. "velvety recurved cap"	S	1
<i>Marasmius elegans</i> (Cleland) Grgur.	S	2
<i>Mycena interrupta</i> (Berk.) Sacc.	S	1
<i>Mycena sanguinolenta</i> (Alb. and Schwein. : Fr.) P.Kumm.	S	8
<i>Mycena vinacea</i> Cleland	S	1
<i>Mycena</i> sp. "brown umbrella"	S	1
<i>Mycena</i> sp. "cream umbrella"	S	1
<i>Mycena</i> sp. "pale brown cap"	S	1
<i>Mycena</i> sp. "pink cap"	S	3
<i>Mycena</i> sp. "small white stem"	S	1

Table 1. (contd.)	L-m	Obs
<i>Mycena</i> sp. "tiny white cap"	S	1
<i>Mycena</i> sp. "yellow stipe"	S	1
<i>Omphalina chromacea</i> (Cleland) T.W.May and A.E.Wood	S/L	2
<i>Panellus longinquus</i> (Berk.) Singer	S	2
Unknown "white decurrent gills"	U	2
<i>Loreleia marchantiae</i> (Singer and Cléménçon) Redhead, Moncalvo, Vilgalys and Lutzoni	S	2
<b>CANTHARELLALES</b>		
<b>Clavariaceae</b>		
<i>Clavaria amoena</i> Zoll. and Moritzi	S/M	3
<i>Clavaria miniata</i> Berk.	S/M	3
<i>Ramariopsis</i> sp. "orange branched"	S	1
<b>Clavinulaceae</b>		
<i>Clavulina rugosa</i> (Bull. : Fr.) J.Schröt.	S/M	2
<b>CORTINARIALES</b>		
<b>Cortinariaceae</b>		
<i>Cortinarius phalarus</i> Bougher and R.N. Hilton	M	1
<i>Cortinarius</i> sp. "purple cortina"	M	1
<i>Galerina patagonica</i> Singer	S	1
<i>Galerina</i> sp. "slimy striate cap"	S	2
<i>Inocybe</i> aff. <i>discissa</i> (Cleland) Grgur.	M	3
<i>Setchelliogaster</i> aff. <i>australiensis</i> G.W.Beaton, Pegler and T.W.K. Young	M	>10
<b>Crepidotaceae</b>		
<i>Crepidotus applanatus</i> (Pers.) P.Kumm.	S	4
<i>Tubaria rufofulva</i> (Cleland) D.A.Reid and E.Horak	S	2
<b>DACRYMYCETALES</b>		
<b>Dacrymycetaceae</b>		
<i>Calocera guepinioides</i> Berk.	S	3
<b>HYMENOCHAETALES</b>		
<b>Hymenochaetaceae</b>		
<i>Phellinus</i> sp. "brown ball"	S	>5
<b>PORIALES</b>		
<b>Coriolaceae</b>		
<i>Postia dissecta</i> (Lév.) Rajchenb.	S	1

Table 1. (contd.)	L-m	Obs
<i>Postia pelliculosa</i> (Berk.) Rajchenb.	S	1
<i>Pycnoporus coccineus</i> (Fr.) Bondartsev and Singer	S	1
<i>Trametes versicolor</i> (L. : Fr.) Lloyd	S/P	1
<b>Polyporaceae</b>		
<i>Polyporus melanopus</i> (Sw. : Fr.) Fr.	S	1
RUSSULALES		
<b>Russulaceae</b>		
<i>Gymnomyces</i> sp. "white earth ball"	M	2
<i>Lactarius clarkeae</i> Cleland	M	4
<i>Lactarius eucalypti</i> O.K.Mill. and R.N.Hilton	M	6
<i>Russula persanguinea</i> Cleland	M	5
<i>Russula</i> sp. "patchy yellow"	M	1
<i>Russula</i> sp. "purple cap"	M	1
<i>Russula</i> sp. "purple stipe"	M	1
STEREALLES		
<b>Meruliaceae</b>		
<i>Gloeoporus taxicola</i> (Pers. : Fr.) Gilb. and Ryvarden	S	1
<b>Stereaceae</b>		
<i>Stereum ostrea</i> (Blume and Nees : Fr.) Fr.	S	4
TREMELLALES		
<b>Exidiaceae</b>		
<i>Pseudohydnum gelatinosum</i> (Scop. : Fr.) P.Karst.	S	2
<i>Tremella mesenterica</i> Retz. : Fr.	S	2
<i>Tremella</i> sp. "black jelly"	S	5
<b>Unknown</b>		
Unknown "meadow wax cap"	U	1
Unknown "white polypore" aff. <i>Trametes hirsuta</i> (Wulfen : Fr.) Lloyd	S	1

Of the species recorded, eight were Ascomycetes spread through six families, and 74 species were Basidiomycetes representing 20 families. Five species were not identified to genus: two ascomycetes (Unknown "buff cup" and "green cup"), two gilled mushrooms (Tricholomataceae "white decurrent gills" and Unknown "meadow wax cap"), and a polypore (Unknown "white polypore" aff. *Trametes hirsuta*). Of the remaining 78 species, 45 were identified to species level.

Saprotrophic, mycorrhizal and parasitic fungi were sampled. Saprotrophs made up the majority of the records, numbering 53 species. 14 obligate mycorrhizal species were observed (*Amanita* spp., *Cortinarius* spp., *Inocybe* aff. *discissa*, *Laccaria* sp. “pink”, *Lactarius* spp., *Russula* spp., Russulaceae “white earth ball” and *Setchelliogaster* aff. *australiensis*). A further ten species were observed that can either act as saprotrophs or form symbioses. One of these species, *Omphalina chromacea*, forms a symbiotic partnership with algae as lichen, whereas the remaining species form mycorrhizas with higher plants. Two parasitic species were collected, *Armillaria novaezelandiae* and *Paecilomyces tenuipes*, and a third, *Trametes versicolor*, acting as either a saprotroph or parasite. The ecological roles of the two unknown gilled fungi were not determined.

Of the 83 species recorded, 43 species were observed more than once, in different locations while 40 species were observed only once during the survey. Of all species recorded, *Setchelliogaster* aff. *australiensis* was recorded the greatest number of times (>10 recordings) with only *Gymnopus* sp. “hairy stem”, *Hygrocybe chromolimonea*, *Lactarius eucalypti*, *Phellinus* sp. “brown ball” and *Mycena sanguinolenta* recorded more than 5 times throughout the survey.

## DISCUSSION

With 83 species of fungi recorded from one season it would be reasonable to assume that Maatsuyker Island is diverse considering its small size. Seven of the 100 Fungimap target species (Fungimap, 2006) were recorded: *Marasmius elegans*, *Mycena interrupta*, *Omphalina chromacea*, *Pseudohydnum gelatinosum*, *Stereum ostrea*, *Tremella mesenterica* and *Tubaria rufofulva*. Approximately half of the species recorded were distributed widely over the island and observed on numerous occasions. There were equally as many species that were observed only once. This is not uncommon in fungal surveys with numerous authors reporting many rare species (Taylor, 2002). The number of sightings of a particular species is by no means a reflection of the true abundance or distribution over the island as much of the island was not surveyed.

It is also reasonable to assume that many more species of macrofungi occur on the island than were recorded, with new records of species added to the list to the very last day. Also despite best efforts, not all species observed were recorded due to practicality and time constraints. The production of fungal fruiting bodies is known to be variable from year to year and dependant on a number of unknown factors (Bougher and Tommerup, 1996). This is highlighted by Straatsma *et al.* (2001), who after 21 years of surveying fungal sporocarps in Switzerland, were still recording new species.

In terms of ecology, the fungi recorded were also diverse with saprotrophic, mycorrhizal, parasitic and lichen forming fungi all represented. It was not surprising to record the 14 mycorrhizal species considering the dominance of Myrtaceous shrubs and trees on the island. *Setchelliogaster* aff. *australiensis* (Figure 1) was frequently encountered, and the most widespread species recorded, occurring all over the island. Interestingly, Bougher and Syme (1998) identify *Setchelliogaster* as a possible relict Gondwanan species that originally formed mycorrhizas with *Nothofagus* but has survived by switching to Myrtaceae. From the abundance of fruiting bodies, it would appear that this species would dominate the symbiotic relationship with *Leptospermum scoparium*, the dominant plant species. Despite the abundances of these species, only further study on the mycorrhizas would be able to confirm this. Many studies have found that the above and below ground mycorrhizal fungal community structure are vastly different (Peter *et al.*, 2001; Dahlberg *et al.*, 1997; Gardes and Bruns, 1996) and this may be the case with *Setchelliogaster* aff. *australiensis*. To consider mycorrhizal fungi further, both Epacridaceous shrubs and orchids occur on the island. Both families are known to form distinct mycorrhizas and thus their fungal partners would also occur on the island, albeit not macrofungi.



Figure 1. *Setchelliogaster* aff. *australiensis*. Photo: B. Horton.

One of the more interesting parasitic species encountered was *Paezilomyces tenuipes* (Figure 2), which is believed to be selectively parasitic on beetle larvae and noted as “uncommon” in Fuhrer (2005).



Figure 2. *Paecilomyces tenuipes*. Photo: B. Horton.

Another species of interest is *Cortinarius phalarus* (Figure 3). Unlike other *Cortinarius* species that have a cortina (partial veil covering the gills), this species has a distinct volva at the base of the stipe, which is unusual in this genus. *Cortinarius phalarus* may also be a Gondwanan fungus as it is thought to be closely related to a group of volvate cortinariii found in South America (Bougher and Syme, 1998).

Another interesting fungus was collected from Maatsuyker Island in 2005: the uncommon species *Hygrocybe stevensonii*, collected by Fiona Scott (27 May 2005).

Fungi are known to aid in soil structure, whereby hyphae act to bind sand and soil preventing erosion and providing stability (Forster, 1990; Tisdall, 1994). In such a climatically challenging environment as Maatsuyker Island, which also has highly erodible soils, fungi may play an important role in soil processes and may act to minimise erosion, especially in seabird rookeries that are severely disturbed and eroded.

The macrofungal survey has increased our knowledge of the biodiversity and ecology of Maatsuyker Island. While it is possible that some of the fungi recorded are exotic to the island, having been introduced via the activities of the lighthouse keepers over the last 116 years, the island's location

and inclusion in the South West World Heritage Area ensure that it currently receives only minimal disturbance and is managed in a way to conserve the cultural and natural heritage of the island, including its biodiversity. Further fungal studies on the island would certainly reveal more interesting species and provide an even greater understanding of their ecology and diversity.



Figure 3. *Cortinarius phalarus*. Photo: B. Horton.

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