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Remnant logs in old clear-cuts and old-growth stands in the H J Andrews Experimental Forest

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Introduction

Background

The growing concern for the decline of many forest species has called for changes in management. One main approach to limit the negative influence of forestry is to retain old-growth structures (e.g. large old trees and a coarse woody debris) after harvesting. The hope is that this will conserve some of the processes and species connected to old-growth conditions. Obviously there is a cost associated with this type of management and ideally this cost should be compared to its value for biodiversity. Such evaluations are however rare on the species level and the design of cost-effective biodiversity management is thus hampered.

The large number of species associated with coarse woody debris is of particular interest. Clear-cutting tends to create large temporal and spatial gaps in the availability of dead trees. Creating and leaving logs after felling may shorten these gaps and provide habitat for at least parts of the original fauna and flora. Two species groups with a fairly large number of species confined to coarse woody debris are epixylic hepatics and polyporous fungi. These groups may also be good representatives for other species as they include a preference for large and highly decayed logs (hepatics) and an important food resource for invertebrates (polypores).
liverworts

The aim of the present report is to compare results from comparisons of the flora of hepatics and polypores on downed dead trees in clear-cuts a few decades old and non- clear-cut areas. The data includes sites from both high and low elevation stands and the role of elevation is also considered.

Methods

During the period October 9th – 13th 1998 we studied fungi and hepatics on logs in and around the H. J. Andrews Experimental Forest. After our stay at 'Andrews' we continued on a tour of forest types in Oregon and northern California. *Pinus ponderosa*, *Sequoia sempervirens* or *Picea sitchensis* dominated these additional stands.

The species were surveyed on a stand basis to provide a total list of species within the stand. This implied spending a 2 - 3 hours in each stand surveying logs as we came across them, and compiling a cumulative species list as we went. The fraction of the total number of species actually found in each stand is not known, but sampling continued as long as new species were found at a reasonable rate. Thus, we do not claim that our species lists are complete but that they at least cover the majority of species in each stand.

Study area

Sites within and adjacent to the H.J. Andrews experimental forest.

McRae creek (stand L505), 9th October 1998. A high altitude old clear-cut stand at about 3100 ft asl. Many of the remnant logs showed fire scar signs. This was presumed to be a postelear cutting treatment as they were considerably aggregated.

McRae creek (adjacent stand, area due south of L505), 13th October 1998. This old-growth stand (high altitude: ca 3100 ft asl) held a greater number of large diameter logs than L505, none of which showed fire scars. Due to weather and lack of time the sampling intensity in this stand was lower in comparison to other stands.

Cold creek, SSE of Carpenter mtn, east of the road between L305 and L306, 10th October 1999. This high elevation stand on a steep slope (4400-4800 ft asl) held considerable numbers of logs. No data on bryophytes was collected in this stand.

Lookout creek at "Concrete bridge", 11th and 13th October. This low altitude (ca 1750 ft asl) old-growth stand is situated immediately west of route 1506, just south of the bridge over Lookout creek. The stand is very dense, with numerous large diameter logs in late decay stages.

Outside the Andrews forest (12th October). Two stands on the western bank of Blue River (near Mona Campground) were studied. Both were situated at about 1600 ft asl. The one had been burnt by wildfire in the 1940's whilst the other remained unburned. The latter had more logs in late decay stages.

Watershed 1 (12th October), 1600 ft asl. and Watershed 2 (12th October), 1600- 2000 ft asl. These stands were originally similar. WS 1 was cut about 35 years ago while WS 2 is still old-growth forest. Both sites however have a fair amount of woody debris.

Additional sites visited for epixylic hepatics and polyporous fungi in different forest types of Oregon and northern California

Ochoco Mountains, Wildcat Mountain, 15th October. A mixture of Ponderosa pine and Douglas fir. The stand has been cut but today it is dominated by old trees. Traces after several fires were present and the abundance of downed logs was low.

Jedidiah Smith Redwood State Park, Stout grove. Old growth redwood forest with high abundance of very large logs. The survey of species was incomplete and no data on polypores were collected.

Loeb State Park – "Redwood trail", 19th October. The stand is a mixture of Redwood and Douglas fir with a component of Tanoak. Sampling was done along the trail that covered a large portion of the stand.

Gwynn creek north of Florence, 19th October. A coastal, old-growth Sitka spruce forest with a mixture of conifers. Sampling was done along the trail and coarse woody debris was abundant.

Cascade head, Harts Cove trail, 19th October. Sampling mainly done in the part of trail close to Harts Cove in a c. 240 year old Sitka spruce forest.

Epixylic hepatics in Andrews experimental forest

Minor differences between old-growth forest stands and previous clearcut stands

A total of 29 epixylic hepatics were found in 9 sites within the HJ Andrews experimental forest (Table 1). Of these, 3 species (*Cephalozia leucantha*, *Lophozia ciliata*, and *Scapania glaucocephala*) have not previously been reported from Oregon. In addition *Cephalozia lacinulata* was previously known only from one old dubious record (David Wagner; Eugene pers. comm.). In old-growth sites 26 species (4 sites) occurred while 23 species (5 sites) occurred in young areas. Of these, 3 species where unique for young stands and 6 unique to old-growth sites. All 3 species new to Oregon occurred only in old-growth sites. The differences among the two site types were low in terms of species richness but indicate a tendency for more species to occur in old-growth sites. The higher density of and variability among logs in old-growth sites did also result in a higher number of species per site at most old-growth sites compared to the three clear-cut sites. In terms of species composition the difference between old sites and young sites were limited. The only species showing a clear preference of natural forests was *Douinia ovata* (listed for special management in the FEMAT-process) that occurred in two of the old-growth areas and in the natural fire area but in none of the clear-cut stands. This species usually grows as an epiphyte on branches of large old-growth conifers (Sillett 1995) and its occurrence on logs may thus be an effect of larger populations in old-growth stands.

The results indicate that many epixylic hepatics are able to utilize remnant logs on clear cuts when the surrounding tree layer has closed. Their abundance and long-term viability in managed forest landscape may thus depend on the amount and quality of dead trees left after forest harvest. However, the present data is too small to exclude the possibility that some highly specialized species occur only in old-growth forest. It is notable that several regionally rare species were only found in the old-growth sites. Some of these species are known to be decreasing as a result of forestry in other parts of their distribution range (e.g. *Lophozia ciliata*, *L. longiflora*, and *Cephalozia lacinulata*).

Although we focused mainly on epixylic hepatics the occurrence of a few wood-dependent mosses was also noted. Of these *Buxbaumia piperi* (listed for special management in the FEMAT-process) mainly occurred on burnt logs in clear-cuts. Thus, this species may bea good example of an otherwise declining species that may be benefited by remnant logs.

Strong effects of elevation on species composition

The most pronounced difference among the studied sites was the difference between high altitude sites (Cold Cr. and McRae Cr.) and low altitude sites (Blue River, Concrete bridge, WS1, and WS2). Species richness was generally higher at low altitudes both as regards to total number of species observed and to species per site. Species such as *Ptilidium californicum* and *Lophozia longiflora* were more abundant at high elevations while *Lepidozia reptans* and *Calypogeia* spp. were more common at low. It was also noted that some moss species showed similar pattern. Epixylic mosses such as *Aulacomium androgynum*, *Rhizomnium glabrescens* and *Tetraphis pellucida* were more or less absent at high altitudes. These results correspond well with previous studies on altitudinal differences among riparian bryophyte (Jonsson 1996).

Partly different epixylic species found in other forest types

In addition to the studies at H.J. Andrews experimental forest, occurrence of epixylic hepatics was also noted in other forest types (Table 2). This resulted in an addition of 5 new epixylic hepatics (*Calypogeia azurea*, *C. integristipula*, *Diplophyllum albicans*, *Pellia neesiana*, and *Riccardia multifida*). Of these only *Calypogeia azurea* was found in more than one site. This species is likely to be more common in the Coast Range of Oregon and northern California. Other species showing higher abundance on wood in the coast range is *Cephalozia bicuspidata* and *Hookeria lucens* (a moss species). In general the abundance of epixylic hepatics is strongly dependent on site humidity and the most luxuriant growth is observed in sites with high air humidity. At dry sites, for instance ponderosa forest, epixylic hepatics are more or less absent.

Table 1. Epixylic hepatics found at the study sites in H.J. Andrews experimental forest.

Species	Old-Growth	Young	High	Low
Blepharostoma trichophylla	X	X	X	X
Calypogeia fissa	X	X	X	X
Calypogeia muelleriana	X	X		X
Cephalozia bicuspidate	X	X	X	X
Cephalozia catenulate	X			X
Cephalozia lacinulata		X		X
Cephalozia leucantha	X			X
Cephalozia lunulifolia	X	X	X	X
Cephaloziella divaricata var scabra	X	X		X
Cephaloziella rubella var elegans	X			X
Chiloscyphus profundus	X	X	X	X
Diplophyllum albicans				
Douinia ovata	X	X		X
Frullania nisquallensis	X	X		X
Geocalyx graveolens	X			X
Jungermannia leiantha		X	X	
Lepidozia reptans	X	X	X	X
Lophozia ciliata	X			X
Lophozia incisa	X	X	X	X
Lophozia longiflora	X	X	X	X
Plagiochila porelloides		X		X
Porella navicularis	X	X	X	X
Ptilidium californicum	X	X	X	X
Radula bolanderi	X	X		X
Radula complanata	X	X		X
Riccardia latifrons	X	X	X	X
Scapania bolanderi	X	X	X	X
Scapania glaucocephala	X			X
Scapania umbrosa	X	X	X	X
Total	26	23	15	28

Table 2. Epixylic hepatics found at other forest sites

	Wildcat Mtn Pinus pondersa forest	Jedidiah Smith Redwood State park, Stout grove	Loeb State Park, Mixed Redwood forest	Gwynn Cr., Sitka spruce forests	Cascade Head, Harts Cove trail, Sitka spruce forest
Blepharostoma trichophylla			X	X	X
Calypogeia azurea		X		X	X
Calypogeia fissa		X			
Calypogeia muelleriana					X
Calypogiea integristipula				X	
Cephalozia bicuspidata		X	X	X	X
Cephalozia lunulifolia		X	X	X	X
Cephaloziella divaricata var scabra		X			X
Cephaloziella rubella var elegans	X				
Chiloscyphus profundus		X	X	X	X
Diplophyllum albicans					X
Frullania nisquallensis					X
Geocalyx graveolens		X	X		
Lepidozia reptans		X	X	X	X
Lophozia incisa			X		X
Pellia neesiana				X	
Porella navicularis		X	X		
Radula complanata			X		
Riccardia latifrons			X	X	X
Riccardia multifida				X	
Scapania bolanderi		X	X	X	X
Scapania umbrosa		X	X		X

Polypores in Andrews experimental forest

More species in old-growth forest stands compared to previous clearcut stands

A total of 39 species of polypores were found in H.J. Andrews experimental forest (Table 3). Four of these are to our knowledge new to Oregon, namely *Antrodia radiculosa, Gloephyllum abietinum, Oligoporus placentus* and *Skeletocutis subincarnata.* In the old-growth patches 32 species were recorded compared with 20 in the clear-cuts. Nineteen species were solely found on old-growth logs whereas 7 species were only found on remnant logs.

Especially *Phellinus*-species and species with pileated annual fruitbodies were lacking in the clear-cuts. Of the *Phellinus*-species, 4 were found on old-growth logs compared with 1 on remnant logs. For species with pileated annual fruitbodies 9 were found on old-growth logs compared with 2 on remnant logs. Annual pileated fruitbodies have high water content, and are thus probably vulnerable to drought. Remnant logs in young forest stands are probably drier than logs in old-growth stands as logs in young stands generally are more exposed to wind and sun. Therefore, remnant logs may be unfavourable to these species.

The characters of the logs as a substrate or habitat are much more diverse in the old-growth stands; diffrent decay classes and log diameters. The difference in species number between old

and young forest stands may therefore have arisen from the skewness that exists in the decay class distribution in the young stands. Late-decay, remnant logs highly dominate while logs in the early decomposition stages are poorly represented. As polypore species have different preferences regarding the decomposition stage of a log (Renvall 1995, Bader et al. 1995), early decayers are probably not favoured in young stands. In fact, *Ganoderma applanatum, Laetiporus sulphureus, Leptoporus mollis, Oligoporus guttulatus* and *Phellinus hartiigi,* that all prefer fresh logs (Renvall 1995, Gilbertson and Ryvarden 1987), were only found in the old-growth stands.

No major effect of elevation on species composition

Regarding elevation, it does not seem to have any major impact on the species number of polypores in the study area. In high elevation forest patches 27 species were found compared with 28 at low elevation (Table 3). In addition, the species composition was fairly similar among high and low elevated patches. Noteworthy is, however, that *Ganoderma applanatum* and *Perenniporia subacida* that occurred frequently at low elevation, were not recorded at all at high elevation.

Twelve species on charred wood on the previous clear cut stands

In total, 12 species were found with fruitbodies on charred wood (Table 4). All these species except *Antrodia xantha,* which was only found twice, were however fruiting on unburned wood as well. For *Antrodia carbonica* (n=18), *Diplomitoporus lindbladii* (n=4) and *Hapalopilus salmonicolor* (n=4) half of the specimens were collected on charred wood. This may indicate that these species are favoured by fire. At least it tells us that these species are able to utilize burnt wood as a resource. Under natural conditions fire is considered as the dominating disturbance regime in boreal forest landscapes (Zackrisson 1977, Engelmark 1984), and consequently, many organisms are adapted to a fire proned environment (Evans 1966, Ehnström 1991, Granström 1991, Thor 1998). The knowledge about how wood-living fungi are adapted to fire is however scarce, but one known example of a fire dependent polypore is *Gloephyllum carbonarium* that prefer burnt or charred wood (Gilbertson and Ryvarden 1987).

Mostly similar species composition in other conifer forests types.

Most of the species of Polypores that were found in Andrews experimental forest were also found in the 4 other conifer forests localities that we did surveys in during our trip in Oregon (Table 3). Only three new species were found outside Andrew's experimental forest, which indicates that there is common species pool for the different conifer forest types in Oregon.

Table 3. *Species found in old-growth-, young-, high elevation- and low elevation forest stands in Andrews experimental forest.*

Species	Old-growth	Young	High	Low
Anomoporia albolutescens (Rom.) Pouz.	X		X	
Antrodia carbonica (Overh.) Ryv.& Gilbn.	X	X	X	X
Antrodia radiculosa (Pk.) Gilbn. & Ryv.	X			
Antrodia sitchensis (Baxt.) Gilbn. & Ryv.	X			X
Antrodia xantha (Fr.) Ryv.		X	X	X
Ceriporiopsis mucida (Pers.:Fr.) Gilbn. & Ryv.		X	X	X
Ceriporiopsis rivulosa (Berk. & Curt.) Gilbn. & Ryv. comb. nov.	X	X	X	X
Diplomitoporus lindbladii (Berk.) Gilbn & Ryv.		X	X	X
Fomitopsis cajanderi (Karst.) Kotl. et Pouz.	X	X	X	X
Fomitopsis officinalis (Vill.:Fr.) Bond et Sing.	X	X	X	X
Fomitopsis pinicola (Swartz:Fr.) Karst.	X	X	X	X
Ganoderma applanatum (Pers.) Pat.	X			X
Gloephyllum abietinum (Fr.) Karst.	X			
Gloephyllum sepiarium (Fr.) Karst.	X	X	X	X
Gloeporus dichrous (Fr.) Fres.	X		X	X
Hapalopilus salmonicolor (Berk. & Curt.) Pouz.		X		X
Heterobasidion annosum (Fr.) Bref.	X		X	X
Ischnoderma resinosum (Fr.) Karst.	X		X	X
Laetiporus sulphureus (Bull.:Fr.) Murr.	X		X	
Leptoporus mollis (Pers.:Fr) Pil.	X		X	
Oligoporus guttulatus (Pk.) Gilbn. & Ryv.	X		X	X
Oligoporus cf perdelicatus (Murr.) Gilbn. & Ryv.	X			
Oligoporus placentus (Fr.) Gilbn. & Ryv.	X			X
Oligoporus sp.	X			X
Perenneporia medulla-panis (Jacq.:Fr.) Donk		X		X
Perenniporia subacida (Pk.) Donk	X	X		X
Phaeolus schweinitzii (Fr.) Pat.	X	X	X	X
Phellinus ferreus (Pers.) Bourd. & Galz.		X		
Phellinus hartigii (Allesch. & Schnabl.) Bond.	X		X	
Phellinus nigrolimitatus (Rom.) Bourd et Galz.	X		X	
Phellinus pini (Thore.:Fr) A. Ames	X			X
Phellinus repandus (Overh.) Gilbn.	X		X	
Physisporinus sanguinolentus (Alb. & Schw.:Fr.) Pilát.	X	X	X	X
Pycnoporellus alboluteus (Ell. & Ev.) Kotl. & Pouz.	X		X	X
Pycnoporellus fulgens (Fr.) Donk	X	X	X	X
Skeletocutis lenis (P. Karst.) Niem.	X	X	X	X
Skeletocutis cf subincarnata (Pk.) Keller	X	X	X	X
Trechispora mollusca (Pers.:Fr.) Liberta		X	X	
Trichaptum abietinum (Pers.:Fr.) Ryv.	X	X	X	X
Total	32	20	27	28

Table 4. *Species found on burnt or charred wood.*

Species
Antrodia carbonica
Antrodia xantha
Ceriporiopsis rivulosa
Diplomitoporus lenis
Diplomitoporus lindbladii
Fomitopsis cajanderi
Gloephyllum sepiarium
Hapalopilus salmonicolor
Perenniporia medulla-panis
Perenniporia subacida
Physisporinus sanguinolentus
Trechispora mollusca

Table 5. *Species found in the Sitka spruce forest on Cascade Head, the Ponderosa forest of the Wild Cat Mountain , the mixed Redwood forests of the Loeb State Park and Sitka spruce forests of the Harts Cove trail*

Species	Cascade Head	Wild Cat Mountain	Loeb State Park	Harts Cove trail
Antrodia carbonica			X	
Antrodia /Dichomitus		X		
Antrodia heteromorpha				X
Antrodia serialis				
Diplomitoporus lindbladii		X		
Fomitopsis cajanderi			X	
Fomitopsis officinalis		X		X
Fomitopsis pinicola	X	X	X	X
Ganoderma applanatum				X
Ganoderma lucidum	X			X
Heterobasidion annosum	X			X
Laetiporus sulphureus	X			
Oligoporus floriformis	X			
Oligoporus placentus	X			
Perenniporia subacida	X		X	X
Phaeolus schweinitzii	X			
Phellinus ferreus		X		
Physisporinus sanguinolentus	X			X
Pycnoporellus fulgens				X
Trichaptum abietinum	X	X	X	X

Comments on species new to Oregon

Hepatics

Cephalozia lacinulata (Jack) Spruce – Very small species of whitish to yellowish white color. It has previously been reported only once for Oregon but the affinity of this old specimen has been doubted (cf. Schuster 1974). The present observation is a range expansion of the former distribution limit in Minnesota. Found on a large log in shady but relatively young forest stand regenerated after a natural forest fire. Close to the Blue River reservoir on a east-facing slope.

Cephalozia leucantha Spruce – Small delicate whitish species, not strictly epixylic as it also grows on peaty substrates. An expected species from Oregon as it has a wide distribution and is

known from both British Columbia and Washington in similar habitats. The present specimens collected from an old-growth stand above the Blue River reservoir on an east-facing slope.

Lophozia ciliata - A newly described species that previously was misinterpreted as a form of Lophozia ascendens. L. ciliata is a small delicate and creeping species with red clusters of gemmae in many shoot apices. It seems to be strongly restricted to large logs in closed forests. The present collection was from an old-growth forest site close to the concrete bridge over Look-Out Cr. A second observation of the species was however done in a managed forest stand east of Medford. This indicates that the species may not be restricted to old-growth forests, but further studies on its distribution and ecology is needed.

Scapania glaucocephala (Tayl.) Aust. – Very small species with erect shoots that often have reddish-brown gemmae. Apparently confined to moist shaded sites with coniferous logs. The species seems to be rare in all of its distribution range and most collections predate 1900. Considering its habitat demands it is a species that is likely to be decreasing due to forestry. The present collection was from an old-growth forest site close to the concrete bridge over Look-Out Cr., and the specimen grew on a large highly decayed conifer log.

Polypores

Antrodia radiculosa (Pk.) Gilbn. & Ryv.–An annual and resupinate species with rather large and bright orange yellow colored pores. This species has not been found in Oregon according to Gilberson and Ryvarden (1987) but is probably overlooked since it occurs in North America from Jamaica and Costa Rica to Eastern Canada and in west to Washington and California. It grows on gymnosperms and in our survey it was found on a hemlock trunk in the old-growth forest near concrete bridge, H.J. Andrews experimental forest.

Gloephyllum abietinum (Fr.) Karst. – A perennial and pileate species with a zonated deep umber brown upper surface. The lamellated hymenophore consists of brown, thin and wavy lamellae. It is an extremely rare species in North America where it is only known from Arizona (Gilberson and Ryvarden 1987). Probably overlooked as it is very similar to G. sepiarium. The substrate is dead conifers and in our survey it was found once in the old-growth forest near concrete bridge, H.J. Andrews experimental forest.

Oligoporus placentus (Fr.) Gilbn. & Ryv. - An annual and resupinate polypore with a salmon-pink colored pore surface. This species has not been found in Oregon according to Gilberson and Ryvarden (1987) and is probably overlooked since it occurs throughout the Rocky Mountain conifer region and the Pacific Northwest. It fruits on dead wood of several conifer genera. In our survey it was found in the old-growth forest of Blue River (near Mona Campground).

Skeletocutis cf subincarnata (Pk.) Keller - An annual and resupinate polypore with small and white pores. This species is widely distributed in the coniferous forest of North America and have probably been overlooked in Oregon, where it has not been found (Gilberson and Ryvarden 1986). It occurs on dead wood of conifers and in our survey it was found in three old-growth stands and in one previous clear cut stand (Appendix).

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References

Bader, P., Jansson, S., and Jonsson, B. G. 1995. Wood-inhabiting fungi and substratum decline in selectively logged boreal spruce forests. *Biol. Conserv.* 72:355-362.

Ehnström, B. 1991. Många insekter gynnas. Skog och Forskning 4:7-52.

Evans, WG 1966. Morphology of the infrared sense organs of Melanophila acuminata (Buprestidae, Coleoptera). Ann. Ent. Soc. Am. 59:873-877.

Engelmark,O. 1984. Forest fires in the Muddus National Park (northern Sweden) during the past 600 years. Can. J. Bot. 62:893-898.

Gilbertson, R.L., Ryvarden, L. 1987. North American Polypores vol. 1 and vol2 .Fungiflora, Oslo, Norway.

Granström, A. 1991. Elden och dess följeväxter i södra Sverige. Skog&Forskning 4:22-27.

Jonsson, B.G. 1996. Riparian bryophytes of the H. J. Andrews Experimental Forest in the Western Cascades, Oregon, USA. Bryologist 99:226-235.

Renvall, P. 1995. Community structure and dynamics of wood-rotting Basidiomycetes on decomposing conifer trunks in northern Finland. *Karstenia* 35:1-51.

Schuster, R.M. 1974. The Hepaticae and Anthocerotae of North America, vol. III, Columbia University Press, New York

Sillett, S. C. 1995. Branch epiphyte assemblages in the forest interior and on the clearcut edge of a 700-year-old Douglas Fir canopy in Western Oregon. The Bryologist 98:301-312.

Thor, G. 1998. Red-listed lichens in Sweden: habitats, threats,p rotection, and indicator value in boreal coniferous forests. Biodiversity and Conservation 7:59-72.

Zackrisson, O. 1977. Influence of forest fires on north Swedish boreal forests.*Oikos* 29:22-32.

Appendix: Species found in different areas in H.J. Andrews experimental forest

Species	Mac Rae		Cold creek		WS 1&2		Blue river		Concrete	Carpenter
	Old	Cut	Old	Cut	Old	Cut	Old	Cut	Bridge Old	Mtn. Old
Anomoporia albolutescens			X							
Antrodia carbonica	X	X		X	X	X	X	X	X	X
Antrodia radiculosa									X	
Antrodia sitchensis							X			
Antrodia xantha				X		X				
Ceriporiopsis mucida						X		X		X
Ceriporiopsis rivulosa	X	X			X	X		X	X	X
Diplomitoporus lindbladii				X		X				
Fomitopsis cajanderi			X		X	X				
Fomitopsis officinalis	X	X		X			X		X	
Fomitopsis pinicola	X	X	X	X	X	X	X	X	X	X
Ganoderma applanatum					X		X		X	
Gloephyllum abietinum									X	
Gloephyllum sepiarium				X		X			X	
Gloeporus dichrous	X						X			
Haplopilus salmonicolor						X		X		X
Heterobasidion annosum	X				X				X	
Ischnoderma resinosum									X	
Laetiporus sulphureus	X									
Leptoporus mollis			X							
Oligoporus guttulatus	X									
Oligoporus cf perdelicatus							X			
Oligoporus placentus.							X			
Oligoporus sp.							X			
Perenneporia medulla-panis						X				
Perenniporia subacida					X	X	X		X	
Phaeolus schweinitzii	X	X	X	X		X	X		X	
Phellinus ferreus		X								
Phellinus hartigii			X							
Phellinus nigrolimitatus										
Phellinus pini							X			
Phellinus repandus	X									
Physisporinus sanguinolentus	X	X	X		X	X			X	
Pycnoporellus alboluteus			X		X					
Pycnoporellus fulgens	X			X	X		X		X	
Skeletocutis lenis	X				X	X		X		X
Skeletocutis cf subincarnata	X			X			X		X	
Trechispora mollusca		X								
Trichaptum abietinum	X	X	X	X				X		X

SITE	PLOT	MONTH	DAY
28	10	06	29
28	8	07	01
28	14.5	07	08
28	19	07	14
28	18	07	19
28	17	07	20
295	1	07	26
28	2	07	28
29	0	07	29
275	2	08	
49	4	08	03
49	1	08	04
28	12	08	09
49	3	08	10
31	10	08	11
31	12	08	12
31	17	08	17
44	7	08	18
31	14	08	23
299	4	08	25
48	1	08	26
27W		09	01
47	2	09	08
28	16	09	09
24	2	09	10
	51	09	13
	58	09	14
	49	09	15
	45	09	20
	41	09	22
	33	09	27
	31	09	29
	8E	09	30
	25.5	10	06
	5.5	10	11
	7	10	13
	55	10	18
	36	10	20