Anthropogenic N deposition increases soil C storage by reducing the relative abundance of lignolytic fungi**.** Elizabeth M. Entwistle, Donald R. Zak, and William A. Argiroff. *Ecological Monographs*.

APPENDIX S4

Table S1. Top ten SIMPER results for each type of sample for each collection date. These ten operational taxonomic units (OTUs) had the highest dissimilarity scores between fungal communities under ambient and experimental N deposition, respectively. The low-lignin (LL), high-lignin (HL), and wood (W) substrates were collected after 7 and 18 months of decomposition, while forest floor (FF) and soil (S) were co-collected during the 7-month sampling date. For each OTU, we list its average dissimiliarity score, its dissimilarity over its standard deviation (SD), and its contribution (%) to total dissimilarity; we additionally list its average proportional abundance under ambient and experimental N deposition, as well the difference between treatments with declines in mean abundance under experimental N deposition denoted in bold. Furthermore, we list the top BLAST® match to an identified species with outdated nomenclatures retained in parentheses. Based on our knowledge of the biology of these taxa, we gave each OTU a functional assignment: white-rot and lignolytic litter decay (WRL), soft-rot and celluloytic/hemicelluloytic litter decay (SRCH), brown-rot (BR), weakly lignolytic (WL) and mycorrhizal/biotrophic (MB), with a question mark added (?) if the assignment was tentative. Taxa were assigned to the phyla Basidiomycota (B) and Ascomycota (A), subphyla Agaricomycotina (Ag) and Pezizomycotina (Pez), with assignments to to class, order, and family abbreviated by leaving off the -mycetes, -ales, and -aceae, respectively.

Sample type	months of decomposition	OTU	Average dissimilarity	Dissimilarity/SD	contribution (%)	average proportional abundance of each OTU	functional assignment	Top BLAST match for an identified species	taxonomic placement for that species

						ambient N	experimental N	change		name	GenBank ID #	sequence identity (%)	query coverage (%)	phylum	Subdivision	class	order	family	genus
F	-	4	1.5	1.5	4.8	0.101	0.030	**0.071**	WRL	*Mycena sanguinolenta*	AY207257	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
F	-	66	1.4	1.5	4.5	0.000	0.036	0.036	WRL (?)[1]	*Phaeoclavulina (Ramaria) abietina* [1]	JN649369	99	100	B	Ag	Agarico	Gomph	Gomph	*Phaeoclavulina*
F	-	19	1.3	1.5	4.1	0.059	0.101	0.042	SRCH	*Minimedusa polyspora*	KC176336	96	100	B	Ag	Agarico	Cantharell		*Minimedusa*
F	-	84	1.2	1.4	3.6	0.026	0.000	**0.025**	SRCH	*Sistotrema coroniferum*	AM259215	97	100	B	Ag	Agarico	Cantharell	Hydn	*Sistotrema*
F	-	13	1	1.5	3.0	0.100	0.172	0.072	SRCH	*Polyscytalum algarvense*	GQ303318	92	100	A	-	-	-	-	*Polyscytalum*
F	-	106	1	0.8	3.0	0.028	0.000	**0.028**	WRL	*Trechispora confinis*	AF347081	92	100	B	Ag	Agarico	Trechispor	Hydnodont	*Trechispora*

F	-	15	0.9	1	2.9	0.021	0.008	**0.014**	WRL	*Mycena plumbea*	DQ470813	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
F	-	20	0.8	3.4	2.5	0.003	0.020	0.017	WRL	*Mycena leptocephala*	HQ604773	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
F	-	42	0.8	1.4	2.4	0.014	0.001	**0.013**	WRL	*Marasmius pulcherripes*	FJ917601	99	96	B	Ag	Agarico	Agaric	Marasmi	*Marasmius*
F	-	79	0.7	2.3	2.3	0.016	0.004	**0.012**	WRL	*Mycena leaiana*	AF261411	98	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
LL	7	17	1.6	1.6	3.6	0.033	0.115	0.082	BR	*Antrodia infirma*	KC595895	91	100	B	Ag	Agarico	Polypor	Fomitopsid	*Antrodia*
LL	7	29	1.4	1.6	3.0	0.027	0.106	0.079	SRCH	*Phaeohelotium epiphyllum*	KJ472236	97	100	A	Pez	Leotio	Heloti	Heloti	*Phaeohelotium*
LL	7	8	1.2	1.6	2.8	0.060	0.016	**0.044**	MB	*Sebacina vermifera*	DQ983815	97	100	B	Pez	Agarico	Sebacin	Sebacin	*Sebacina*
LL	7	14	1.1	0.8	2.4	0.038	0.000	**0.038**	WL	*Anthostomella leucospermi*	EU552100	99	100	A	Pez	Sordario	Xylari	Xylari	*Anthostomella*

LL	7	77	1	2.6	2.3	0.026	0.023	**0.003**	SRCH	*Dactylella mammillata*	KT215290	100	100	B	Pez	Leotio	Orbili	Orbili	*Dactylella*
LL	7	100	1	1.7	2.2	0.024	0.019	**0.005**	SRCH (?)[2]	*Ceratosebacina calospora*	AF291304	98	83	B	Ag	Agarico	-	-	*Ceratosebacina*
LL	7	119	1	3.4	2.2	0.016	0.000	**0.016**	SRCH	*Hyalodendriella betulae*	EU040232	96	100	A	Pez	Leotio	Heloti		*Hyalodendriella*
LL	7	60	0.9	1.5	2.1	0.049	0.021	**0.028**	SRCH	*Arthrobotrys gephyropaga*	AY261168	99	97	A	Pez	Leotio	Heloti	Orbili	*Arthrobotrys*
LL	7	90	0.9	0.7	2.1	0.000	0.037	0.037	MB	*Piriformospora indica*	KF061284	97	100	B	Ag	Agarico	Sebacin	Sebacin	*Piriformospora*
LL	7	139	0.9	1	2.0	0.000	0.020	0.020	SRCH	*Craterocolla cerasi*	KF061265	94	100	B	Ag	Agarico	Sebacin	Sebacin	*Craterocolla*
HL	7	4	2.8	1.4	5.3	0.160	0.035	**0.125**	WRL	*Mycena sanguinolenta*	AY207257	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
HL	7	16	2.2	0.7	4.2	0.000	0.112	0.112	SRCH	*Minimedusa polyspora*	KC176336	98	100	B	Ag	Agarico	Cantharell	-	*Minimedusa*

HL	7	20	1.7	1.8	3.2	0.038	0.000	**0.038**	WRL	*Mycena leptocephala*	HQ604773	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
HL	7	30	1.5	0.7	2.9	0.000	0.052	0.052	BR[3]	*Ceriporia reticulata*[3]	KP135204	100	97	B	Ag	Agarico	Polypor	Phanerochaet	*Ceriporia*
HL	7	15	1.5	0.9	2.8	0.014	0.038	0.024	WRL	*Mycena plumbea*	DQ470813	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
HL	7	17	1.5	1.4	2.7	0.020	0.049	0.029	BR	*Antrodia infirma*	KC595895	91	100	B	Ag	Agarico	Polypor	Fomitopsid	*Antrodia*
HL	7	3	1.4	1.7	2.5	0.175	0.078	**0.097**	SRCH	*Hyaloscypha albohyalina* var. spiralis	AB546940	99	99	A	Ag	Leotio	Heloti	Hyaloscyph	*Hyaloscypha*
HL	7	8	1.3	1.6	2.4	0.025	0.022	**0.003**	MB	*Sebacina vermifera*	DQ983815	97	100	B	Ag	Agarico	Sebacin	Sebacin	*Sebacina*
HL	7	54	1.2	0.7	2.3	0.037	0.000	**0.037**	WRL	*Hyphoderma praetermissum*	DQ873597	99	100	B	Ag	Agarico	Polypor	Meruli	*Hyphoderma*
HL	7	18	1.1	3.3	2.0	0.024	0.022	**0.001**	SRCH	*Phaeohelotium epiphyllum*	KT876976	100	100	A	Pez	Leotio	Heloti	Heloti	*Phaeohelotium*

HL	18	10	3.1	1.1	5.0	0.115	0.120	0.004	WRL	*Fibrodontia brevidens*	KC928277	94	100	B	Ag	Agarico	Trechispor	Hydnodont	*Fibrodontia*
HL	18	56	2.3	1.7	3.7	0.043	0.000	**0.043**	WRL	*Trechispora alnicola*	AY635768	99	100	B	Ag	Agarico	Trechispor	Hydnodont	*Trechispora*
HL	18	4	2.3	1.5	3.7	0.044	0.045	0.001	WRL	*Mycena sanguinolenta*	AY207257	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
HL	18	11	2.2	1.8	3.4	0.137	0.123	**0.013**	SRCH	*Lachnellula willkommii*	KC492982	96	100	A	Pez	Leotio	Heloti	Hyaloscyph	*Lachnellula*
HL	18	55	2.2	1.6	3.4	0.038	0.000	**0.038**	WRL	*Trechispora alnicola*	AY635768	98	100	B	Ag	Agarico	Trechispor	Hydnodont	*Trechispora*
HL	18	72	1.8	1.3	2.9	0.031	0.000	**0.031**	WRL	*Trechispora confinis*	AY586719	97	100	B	Ag	Agarico	Trechispor	Hydnodont	*Trechispora*
HL	18	35	1.8	0.7	2.8	0.059	0.000	**0.059**	BR (?)[4]	*Ceraceomyces tessulatus*[4]	AY586642	99	100	B	Ag	Agarico	Amylocorticici	Amylocorticici	*Ceraceomyces*
HL	18	64	1.8	0.7	2.8	0.052	0.000	**0.052**	WRL	*Sphaerobolus stellatus*	HQ604795	97	100	B	Ag	Agarico	Geastr	Geastr	*Sphaerobolus*

HL	18	12	1.7	0.7	2.8	0.000	0.048	0.048	WRL (?)[1]	*Kavinia himantia*[1]	AY586682	99	100	B	Ag	Agarico	Gomph	Lentari	*Kavinia*
HL	18	14	1.6	0.8	2.6	0.043	0.000	**0.043**	WL	*Anthostomella leucospermi*	EU552100	99	100	A	Pez	Sordario	Xylari	Xylari	*Anthostomella*
S	-	43	1.9	1.3	3.4	0.078	0.000	**0.078**	MB	*Hygrocybe parvula*	KF291189	98	100	B	Ag	Agarico	Agaric	Hygrophor	*Hygrocybe*
S	-	115	1.2	1.4	2.2	0.039	0.001	**0.038**	WL	*Entoloma (Inocephalus) murrayi*	GU384620	99	99	B	Ag	Agarico	Agaric	Entolomat	*Entoloma*
S	-	81	1.1	1.5	2.0	0.033	0.015	**0.018**	SRCH	*Geoglossum difforme*	KC222137	100	100	A	Pez	Geoglosso	Geogloss	Geogloss	*Geoglossum*
S	-	101	1.1	0.7	1.9	0.000	0.052	0.052	MB	*Russula aeruginea*	HQ604837	98	100	B	Ag	Agarico	Russul	Russul	*Russula*
S	-	156	0.9	1.2	1.7	0.021	0.000	**0.021**	MB	*Russula atropurpurea*	AF325296	99	100	B	Ag	Agarico	Russul	Russul	*Russula*
S	-	171	0.9	1	1.6	0.001	0.027	0.027	WL	*Entoloma sinuatum*	EU522771	100	100	B	Ag	Agarico	Agaric	Entolomat	*Entoloma*

S	-	157	0.9	1.4	1.6	0.000	0.018	0.018	MB	*Tomentella botryoides*	AY586717	97	100	B	Ag	Agarico	Thelephor	Thelephor	*Tomentella*
S	-	141	0.9	1.2	1.5	0.002	0.023	0.021	WL	*Entoloma sericellum*	GQ289190	97	100	B	Ag	Agarico	Agaric	Entolomat	*Entoloma*
S	-	10	0.8	2.2	1.5	0.012	0.041	0.030	WRL	*Fibrodontia brevidens*	KC928277	94	100	B	Ag	Agarico	Trechispor	Hydnodont	*Fibrodontia*
S	-	97	0.8	0.7	1.5	0.030	0.000	**0.030**	MB	*Russula vinacea*	KT933824	100	100	B	Ag	Agarico	Russul	Russul	*Russula*
W	7	5	5.3	1.2	9.7	0.232	0.000	**0.232**	WRL	*Crepidotus versutus*	AF205683	100	100	B	Ag	Agarico	Agaric	Crepidot	*Crepidotus*
W	7	1	3	1.4	5.5	0.118	0.138	0.020	WL	*Rosellinia abscondita*	KF719208	99	97	A	Pez	Sordario	Xylari	Xylari	*Rosellinia*
W	7	2	2.6	1.8	4.8	0.036	0.140	0.104	SRCH	*Herpotrichia vaginatispora*	KT934252	99	98	A	Pez	Dothideo	Pleospor	Melanommat	*Herpotrichia*
W	7	7	2.1	1.2	3.9	0.026	0.053	0.027	WRL	*Crepidotus fragilis*	AF367931	99	100	B	Ag	Agarico	Agaric	Crepidot	*Crepidotus*

W	7	9	2.1	1.4	3.8	0.005	0.052	0.048	SRCH	*Herpotrichia vaginatispora*	KT934252	96	98	A	Pez	Dothideo	Pleospor	Melanommat	*Herpotrichia*
W	7	4	2	1.5	3.6	0.042	0.042	0.000	WRL	*Mycena sanguinolenta*	AY207257	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
W	7	22	1.9	0.7	3.5	0.061	0.000	**0.061**	WRL	*Gymnopus dryophilus*	NG_027632	100	96	B	Ag	Agarico	Agaric	Marasmi	*Gymnopus*
W	7	8	1.9	1.2	3.4	0.079	0.054	**0.025**	MB	*Sebacina vermifera*	DQ983815	97	100	B	Ag	Agarico	Sebacin	Sebacin	*Sebacina*
W	7	15	1.9	1.1	3.4	0.039	0.000	**0.039**	WRL	*Mycena plumbea*	DQ470813	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
W	7	25	1.8	0.7	3.3	0.000	0.058	0.058	WL	*Coprinellus radians*	KM246027	99	100	B	Ag	Agarico	Agaric	Psathyrell	*Coprinellus*
W	18	1	3.6	1.3	6.5	0.070	0.145	0.075	WL	*Rosellinia abscondita*	KF719208	99	97	A	Pez	Sordario	Xylari	Xylari	*Rosellinia*
W	18	2	3.4	1.5	6.2	0.092	0.189	0.096	SRCH	*Herpotrichia vaginatispora*	KT934252	99	98	A	Pez	Dothideo	Pleospor	Melanommat	*Herpotrichia*

W	18	7	3.1	1.5	5.6	0.107	0.025	**0.082**	WRL	*Crepidotus fragilis*	AF367931	99	100	B	Ag	Agarico	Agaric	Crepidot	*Crepidotus*
W	18	4	3.1	1.3	5.6	0.077	0.000	**0.077**	WRL	*Mycena sanguinolenta*	AY207257	99	100	B	Ag	Agarico	Agaric	Mycen	*Mycena*
W	18	12	2.8	0.9	5	0.055	0.077	0.022	WRL (?)[1]	*Kavinia himantia*[1]	AY586682	99	100	B	Ag	Agarico	Gomph	Lentari	*Kavinia*
W	18	14	2.4	0.9	4.3	0.064	0.000	**0.064**	WL	*Anthostomella leucospermi*	EU552100	99	100	A	Pez	Sordario	Xylari	Xylari	*Anthostomella*
W	18	9	2.2	1.4	4.0	0.028	0.109	0.081	SRCH	*Herpotrichia vaginatispora*	KT934252	96	98	A	Pez	Dothideo	Pleospor	Melanommat	*Herpotrichia*
W	18	33	2	1	3.5	0.002	0.045	0.043	WL	*Psathyrella candolleana*	KM030175	99	100	B	Ag	Agarico	Agaric	Psathyrell	*Psathyrella*
W	18	6	1.9	1.6	3.4	0.095	0.039	**0.055**	SRCH	*Herpotrichia macrotricha*	GU385179	98	98	A	Pez	Dothideo	Pleospor	Melanommat	*Herpotrichia*
W	18	28	1.8	0.7	3.2	0.000	0.045	0.045	WL	*Tubaria albostipitata*	EF051051	99	94	B	Ag	Agarico	Agaric	Tubari	*Tubaria*

[1] Isotopic analysis of *Phaeoclavulina (Ramaria) abietina* suggests it is a saprotroph (Agerer et al., 2012) and genomic analyses reveal it has dye-decolorizing peroxidases (Fernandez-Fueyo et al. 2015), which may be involved in lignin-decay (Liers et al. 2010). *Ramaria stricta*, a *Ramaria* species which grows on wood, has been observed to have high laccase and manganese-peroxidase activity (Erden et al. 2009). Gomphales species in the putatively saprotrophic genus *Kavinia* (Hosaka et al., 2006) are often found on wood (Kout & Hajšmanová, 2015; Nordén & Paltto, 2001), possess strong laccase activity (Harkin et al. 1974), and have been described as white-rot (Ginns & Lefebvre, 1993). Furthermore, the genus *Lentaria* has been described as white-rot (Hibbett et al. 2014). Therefore, we have tentatively considered all putatively saprotrophic Gomphales observed here to be white-rot.

[2] We have tentatively placed an OTU associated with *Ceratosebacina calospora* as SRCH. *C. calospora* could not be placed in any clade with confidence by Binder et al. 2005. *C. calospora* and two other species were placed in its own clade by Weiß & Oberwinkler (2001). Thus, *C. calospora* has not been definitively placed within any group subsequently determined to be white rot or soft-rot (Nagy et al., 2015). However, we could find no descriptions of it or its sister taxa (Weiß & Oberwinkler 2001) as white-rot. Because of this, we have tentatively described it as SRCH for the purposes of our study.

[3] Species in the genus *Ceriporia* are largely white-rot. However, brown-rot has been reported for the species *Ceriporia reticulata* (Niemelä, 1985). Additionally, *C. reticulata* was found to be closely related to another brown-rot species (*Leptoporus mollis*) in a recent phylogenetic analysis (Figure S5 *in* Floudas et al. 2015).

[4] *Ceraceomyces tessulatus* was phylogenetically placed in a clade with brown-rot species *Anomoporia bombycina*, *A. vesiculosa*, and *A. kamtschatica* (Niemelä et al., 2007). Additionally, this OTU had a high (94% sequenced identity) BLAST match for brown-rot species *Anomoporia kamtschatica* (GenBank AY586630).

REFERENCES

Agerer, R., Christan, J., Mayr, C., and Hobbie, E. (2012). Isotopic signatures and trophic status of Ramaria. Mycological Progress 11, 47-59.

Binder, M., Hibbett, D. S., Larsson, K.-H., Larsson, E., Langer, E., and Langer, G. (2005). The phylogenetic distribution of resupinate forms across the major clades of mushroom-forming fungi (Homobasidiomycetes). *Systematics and Biodiversity* **3**, 113-157.

Erden, E., M. C. Ucar, T. Gezer, and N. K. Pazarlioglu. 2009. Screening for ligninolytic enzymes from autochthonous fungi and applications for decolorization of Remazole Marine Blue. Brazilian Journal of Microbiology 40:346-353.

Fernández-Fueyo, E., D. Linde, D. Almendral, M. F. López-Lucendo, F. J. Ruiz-Dueñas, and A. T. Martínez. 2015. Description of the first fungal dye-decolorizing peroxidase oxidizing manganese (II). Applied Microbiology and Biotechnology 99:8927-8942.

Floudas, D., and Hibbett, D. S. (2015). Revisiting the taxonomy of Phanerochaete (Polyporales, Basidiomycota) using a four gene dataset and extensive ITS sampling. *Fungal Biology* **119**, 679-719.

Ginns, J., and Lefebvre, M. (1993). Lignicolous Corticioid Fungi (Basidiomycota) of North America. Mycologia Memoir No. 19. APS Press, St Paul, Minnesota.
Harkin, J. M., M. J. Larsen, and J. R. Obst. 1974. Use of syringaldazine for detection of laccase in sporophores of wood rotting fungi. Mycologia:469-476.
Hosaka, K., Bates, S. T., Beever, R. E., Castellano, M. A., Colgan, W., Domínguez, L. S., Nouhra, E. R., Geml, J., Giachini, A. J., and Kenney, S. R. (2006). Molecular phylogenetics of the gomphoid-phalloid fungi with an establishment of the new subclass Phallomycetidae and two new orders. Mycologia 98, 949-959.
Kout, J., and Hajšmanová, P. (2015). Kavinia alboviridis in the Czech Republic.
Liers, C., C. Bobeth, M. Pecyna, R. Ullrich, and M. Hofrichter. 2010. DyP-like peroxidases of the jelly fungus Auricularia auricula-judae oxidize nonphenolic lignin model compounds and high-redox potential dyes. Applied Microbiology and Biotechnology 85:1869-1879.
Nagy, L. G., Riley, R., Tritt, A., Adam, C., Daum, C., Floudas, D., Sun, H., Yadav, J. S., Pangilinan, J., and Larsson, K.-H. (2015). Comparative genomics of early-diverging mushroom-forming fungi provides insights into the origins of lignocellulose decay capabilities. *Molecular biology and evolution*, msv337.
Niemelä, T. (1985). Mycoflora of Poste-de-la Baleine, Northern Québec polypores and the Hymenochaetales. *Naturaliste Canadien* **112**, 445-472.
Niemelä, T., Larsson, K.-H., and Larsson, E. (2007). Anomoloma, a new genus separated from Anomoporia on the basis of decay type and nuclear rDNA sequence data. *Mycotaxon* **100**, 305-317.
Nordén, B., and Paltto, H. (2001). Wood-decay fungi in hazel wood: species richness correlated to stand age and dead wood features. Biological Conservation 101, 1-8.
Weiß, M., and Oberwinkler, F. (2001). Phylogenetic relationships in Auriculariales and related groups–hypotheses derived from nuclear ribosomal DNA sequences. *Mycological Research* **105**, 403-415.