Table S1. Physiological categories to which we assigned OTUs identified in SIMPER analysis.

Physiology	Function	Taxa	Citations
White-rot and lignolytic litter decay[1]	Enzymatically decompose lignin	*Mycena*	(Worrall et al. 1997, Osono and Takeda 2002, Steffen et al. 2007, Liers et al. 2011, Cline and Zak 2015)
		Marasmius	(Osono and Takeda 2002, Steffen et al. 2007)
		Gymnopus	(Osono et al. 2003, Osono and Takeda 2006, Valaskova et al. 2007, Šnajdr et al. 2010, Cline and Zak 2015)
		Crepidotus	(Gutiérrez et al. 1999, Del Rıo et al. 2001, Martínez Ferrer et al. 2005)
		Sphaerobolus	(Robinson et al. 1993, Worrall et al. 1997, Baetsen 2013, Nagy et al. 2015)
		Hyphoderma	(Binder et al. 2013)
		Gomphales	(Ginns and Lefebvre 1993, Erden et al. 2009, Hibbett et al. 2014)
		Trechisporales	(Harkin et al. 1974, Nagy et al. 2015)
Soft-rot and cellulolytic litter decay	enzymatically decompose cellulose or hemicelluloses, but decay little to no lignin	Cantharellales	(Boberg et al. 2011, Floudas et al. 2015, Nagy et al. 2015)
		Ascomycota (except Xylariales)	(Worrall et al. 1997, Osono et al. 2006, Osono and Takeda 2006, Boberg et al. 2011, Nagy et al. 2015)
Brown-rot	demethoxylate ("modify") lignin but leave its phenolic and	*Antrodia* spp.	(Binder et al. 2013)
		Anomoporia spp.	(Niemelä et al. 2007)
		Ceriporia reticulata	(Floudas and Hibbett 2015)

	nonphenolic bonds intact		
Weakly lignolytic	exhibit either high laccase but no - low peroxidase activity or relatively low laccase and peroxidase activity	Xylariaceae	(Osono and Takeda 2001, 2002, Stephen and Parungao 2003, Liers et al. 2011)
		Psathyrellaceae	(Ruiz-Duenas et al. 2009, Oliver et al. 2010, Liers et al. 2011)
		Entolomataceae	(Gramss 1997, Casieri et al. 2010)
		Tubariaceae	(Okino et al. 2000, Machado et al. 2005)
Mycorrhizal/ biotrophic	In a mycorrhizal or biotrophic association with a host	*Russula*	(Kirk et al. 2008)
		Tomentella	(Kirk et al. 2008)
		Hygrocybe	(Seitzman et al. 2011)
		Sebacinales	(Kirk et al. 2008)

1. Please note that our definition of "white-rot and lignolytic litter decay" fungi for this analysis is broader than our rather conservative definition of "highly lignolytic taxa" which we used for relative abundance analyses; white-rot and lignolytic litter decay fungi include any taxa which we have described as highly lignolytic (Tables 2 and S2), as well as well as some additional Agaricomycete taxa which were excluded from our analysis of the relative abundance of highly lignolytic taxa.

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