Supplementary Materials

S1: Site characteristics

In the dataset of deadwood decay, 22 sites (from 102) are in regions within the geographic distribution of fungus-growing termites (FGT) (subfamily Macrotermitinae) including Afrotropical, Oriental, and Malagasy realms. Sites outside of these realms included 80 sites and were characterised as sites with non-fungus-growing termites (NFGT). Differences in site characteristics, including mean annual temperature (MAT, ºC), mean annual precipitation (MAP, mm), mean annual aridity, richness of all termite genera and richness of wood feeding genera (which includes FGT), are shown in Table 1 and Figure S1.1. Values for richness were extracted from (Woon, 2022) using latitude and longitude coordinates for each site. While the range of aridity values for NFGT sites spans from arid to humid climates and includes 3 of the 4 dryland categories, decay of deadwood has not been sampled within the most arid regions of FGT realms and includes only 2 of the 4 dryland categories (not arid or hyper-arid) (Figure S1.2).

Deadwood was discovered by termites in all FGT sites apart from one (Stone Gorilla, Lope, Gabon) which recorded no wood-feeding termites in transect surveys and no discovery of wood blocks by termites. Of the 21 FGT sites with termites, data on termite species composition were available for 16 sites (see Table S1). Macrotermitinae were present at all 16 sites (15 in Africa and 1 in Asia) and accounted for 64% of all termite encounters in transect surveys (mean 63.7% ± SD 33.1). Two additional sites in Ghana (Mole and Bobiri) had confirmed records of the presence of Macrotermitinae either in the literature (e.g. Woon et al., 2022) or from personal observations. We hypothesised that if FGT were contributing more to deadwood decay than NFGT then decay rates of deadwood would increase with higher encounter rates of FGT in transect data. To check, we fitted log-transformed k-values to a linear regression using encounter rate of FGT as a predictor. To help balance out the impact of large differences in sample size among sites, sites with higher sample sizes (i.e., number of discovered wood blocks) were given greater weight in the regression ($\log_e(k) \sim$ encounter, weight = sample size). As most sites were African sites, we ran the regression twice, on all FGT sites and on only African FGT sites (Table S2.1 and Table S2.2). We found that decay rates significantly increased with encounter rates of FGT, particularly in African sites (Figure S1.4a). We hypothesised that FGT are more dominant in arid environments and so we carried out an additional bivariate analysis to examine if encounter rates of FGT (response) changed with aridity (predictor). We found that as sites became more arid, encounter rates with FGT from transect data significantly increased (Table S2.3 and Figure S1.4b).

Of the 102 sites in the dataset of deadwood decay, 44 sites recorded the presence of sheeting on wood blocks (33 NFGT sites and 11 FGT sites). While foraging, some termite taxa translocate soil and produce temporary structures referred to as sheeting as a protective layer and to cover substrates for consumption. Although sheeting is formed by a range of termite taxa, sheeting is best studied and most recorded for fungus-growing termites (Macrotermitinae) (Harit, Shanbhag, Chaudhary, Cheik, & Jouquet, 2017; Jouquet et al., 2022). Therefore, it may be expected that sheeting would be more likely to be present on wood blocks following decay by fungus-growing termites. Indeed, sheeting has been used by a previous study as an indicator of decay by FGT (Veldhuis, Laso, Olff, & Berg, 2017). Although it was not possible to determine which species of termites produced the sheeting recorded on wood blocks, the presence of sheeting was significantly greater on discovered wood blocks in FGT sites compared with NFGT sites (Wilcoxon test W = 92, p= 0.013) (Figure S1.3).

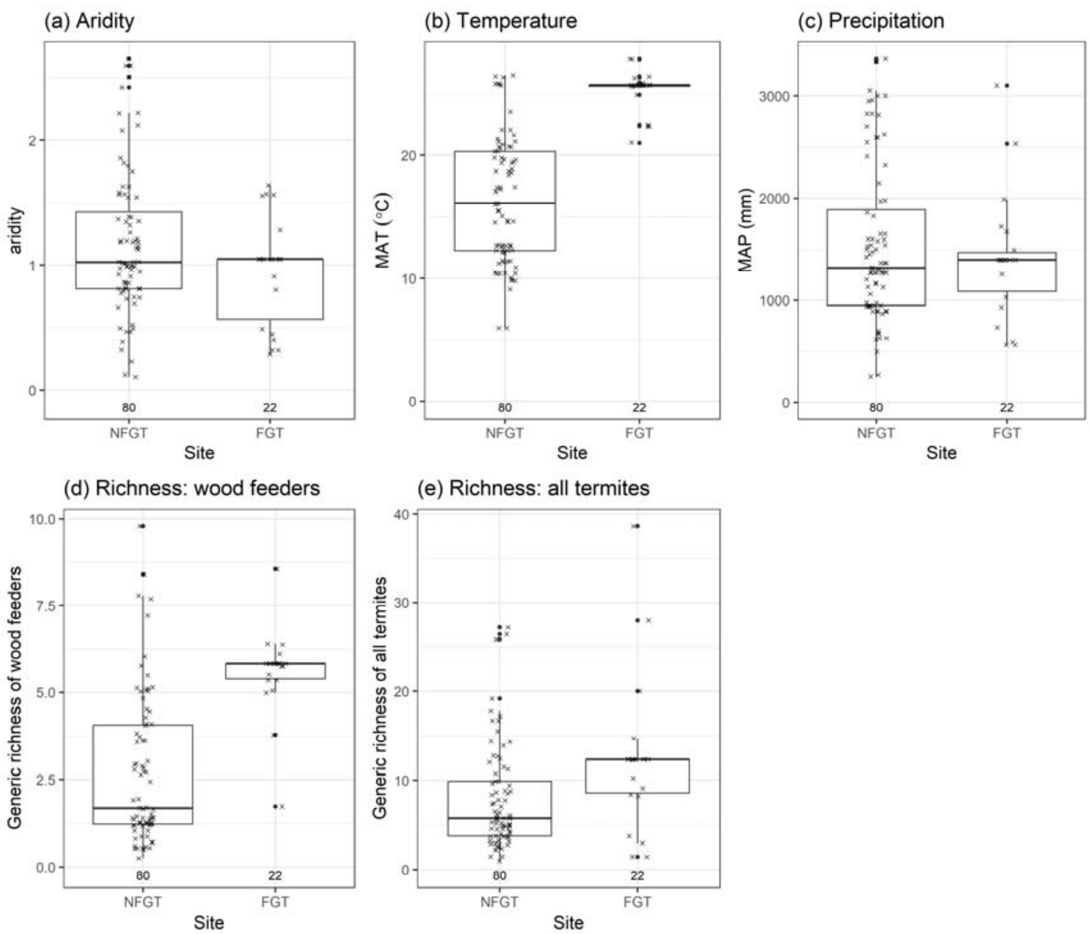

Figure S1.1: Boxplots showing mean annual aridity (lower values indicate greater aridity), mean annual temperature (MAT, ºC), mean annual precipitation (MAP, mm), richness of wood-feeding termite genera and total richness of all termite genera for sites with fungus-growing termites (FGT, n= 22) and sites without fungus-growing termites (NFGT, n= 80).

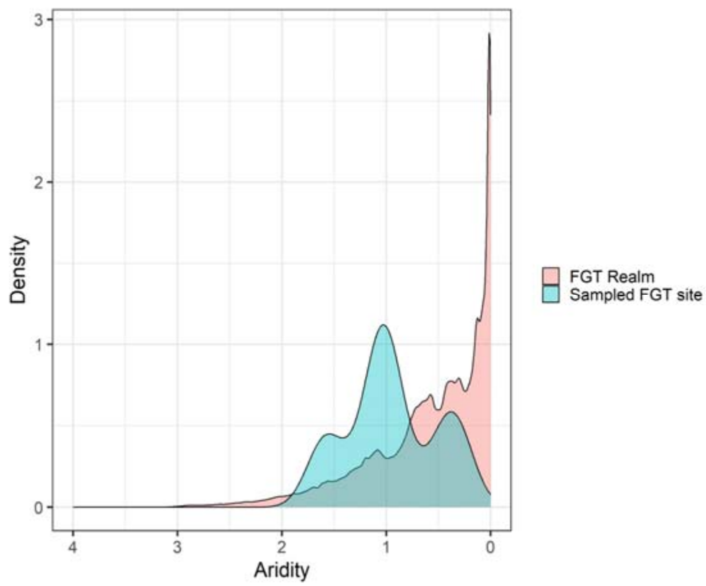

Figure S1.2: Density plot showing the distribution of aridity values found across all fungus-growing termite (FGT) realms (red) (Afrotropical, Oriental, and Malagasy realms*) and the distribution of aridity values from sampled FGT sites (blue) (n = 22) in this dataset. All aridity values were extracted from the Global-Aridity Index database (Zomer, Xu, & Trabucco, 2022) at 30 arc-seconds spatial resolution (~1km at the equator). Aridity values decrease with increasing aridity. Climate classification according to aridity values is as follows: ≤0.03 hyper-arid, 0.03-0.2 arid, 0.2-0.5 semi-arid, 0.5-0.65 dry sub-humid and >0.65 humid (UNEP, 1997). A large proportion of the FGT realm (red) has low aridity values (high aridity), however very low aridity values were not sampled in this study as shown by the distribution of aridity values for FGT sites (blue). *FGT realms are shown in Figure 1, realms include potential distribution not presence and absence of FGT).

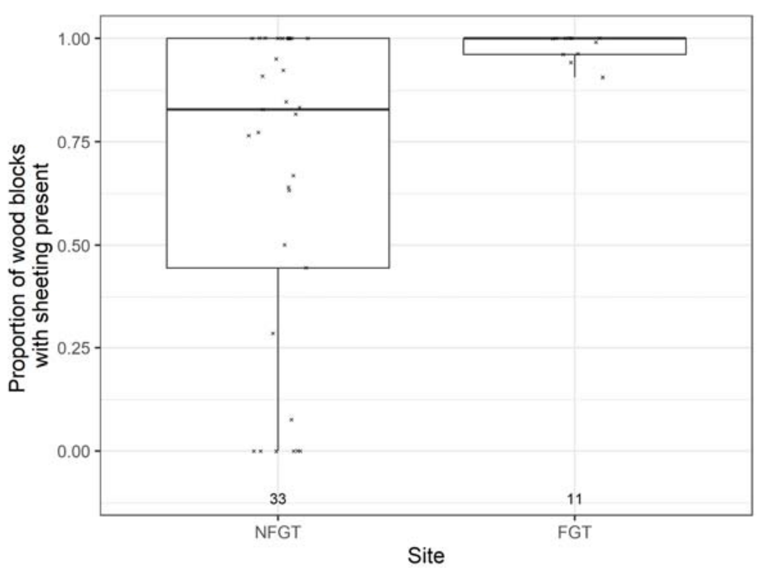

Figure S1.3: Proportion of discovered wood blocks with sheeting recorded at sites with fungus-growing termites (FGT) and sites without fungus-growing termites (NFGT). Figures at the bottom indicate the number of sites that recorded the presence of sheeting.

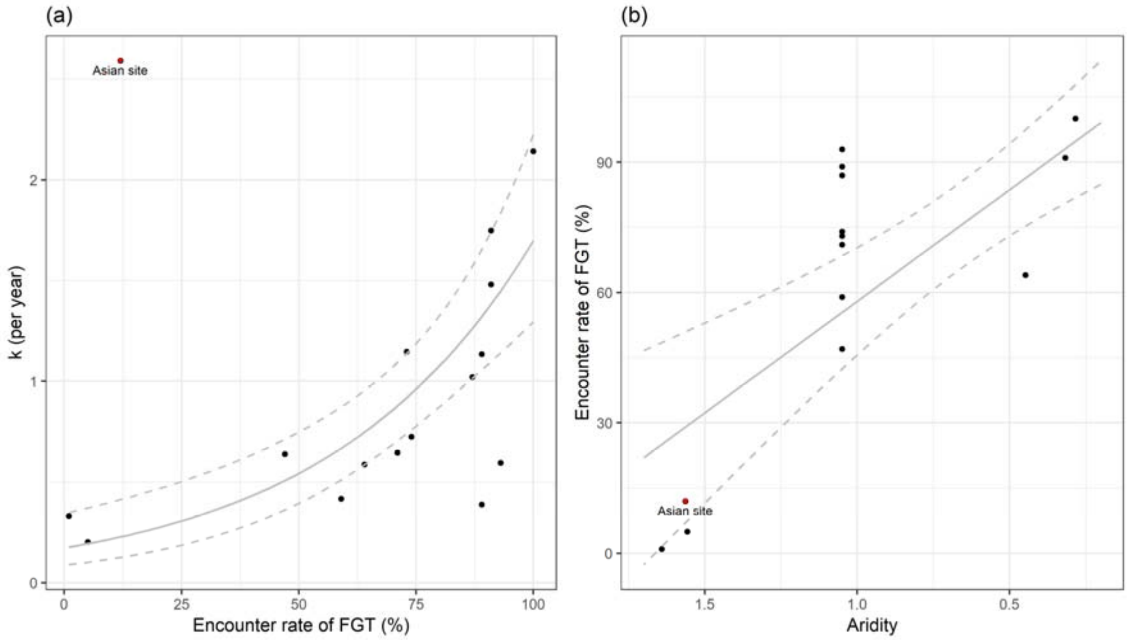

Figure S1.4: Panel (a) shows the relationship between mean decay rate of deadwood in fungus-growing termite (FGT) sites with rate of encounters with FGTs (%) from transect data. Solid lines indicate predictions for decay rates from bivariate regression for FGT sites in Africa. Dashed lines represent 95% confidence intervals around predictions. Panel (b) shows encounter rate of FGT by mean annual aridity for FGT sites, lower aridity values indicate more arid regions. Solid lines indicate predictions from bivariate regression and dashed lines represent 95% confidence intervals around predictions.

S2: Shade cloth effect

All seven sites in the new additional data were sites with FGT and did not use shade cloth in the decay experiment, six of these sites had termite discovery of wood blocks and one site had no wood blocks discovered by termites (site = Stone Gorilla). We have no reason to believe that the presence or absence of shade cloth influences termite discovery, however shade cloth may influence decay rates by altering microclimate and protecting from solar degradation (Cheesman, Cernusak, & Zanne, 2018). To test if the absence of shade cloth in six of the FGT sites with termite discovery influenced our results on decay we ran separate analyses. First, we included shade cloth as a predictor (lm($\log_e$(k) ~ aridity + presence of FGT + presence of shade cloth, weights = sample size). Second, we ran the same model without shade cloth as a predictor (lm($\log_e$(k) ~ aridity + presence of FGT, weights = sample size) but decay rates in sites with no shade cloth were reduced by an arbitrary 50%. The latter assumed that the absence of shade cloth in FGT sites was leading to greater decay rates, consequently these sites might have had greater weight in the regression leading to a type I error and the false conclusion of greater decay in FGT sites compared with NFGT sites. And third, we compared decay rates of pine blocks with and without shade cloth in the same sites (rainforest (DRO) or savanna (PNW)) in northeast Australia. Data on decay rates of pine blocks without shade cloth was taken from Duan et al., (2023) (dataset named pine_CO2_clean, n = 47) and pine blocks with shade cloth in the same sites from Law et al., (2024, n =40). We only compared pine blocks that were deployed and harvested at the same time; blocks were deployed in June 2018 and harvested in June 2019, December 2019, and July 2020 (some pine blocks with no shade cloth were also harvested in June 2020). One pine block was removed from the analysis as it gained more than 10% in weight. Pine blocks were categorised as discovered by termites if any termite presence or damage had been noted. We ran a linear model on log transformed decay rates with termite discovery, harvest date and an interaction between site and the presence of shade cloth as predictors (lm($\log_e$(k) ~ discovery + harvest date + site*shadecloth).

First, when shade cloth was included as a predictor in the model the variance explained by the model did not change (Adj. R^2 with and without shade cloth = 0.46) (Table S5.1 and S6.1). Furthermore, shade cloth was not a significant predictor of decay rates (Table S6.1). Second, when decay rates of FGT sites without shade cloth were reduced by 50%, mean decay rates of FGT sites fell, however remained significantly greater than NFGT sites and did not alter the relationship between aridity and decay rates (Figure S2.1 and Table S6.2). And third, although decay rates of pine blocks with shade cloth were higher than blocks without shade cloth in the same sites (Figure S2.2), this difference was not significant (Table S6.3).

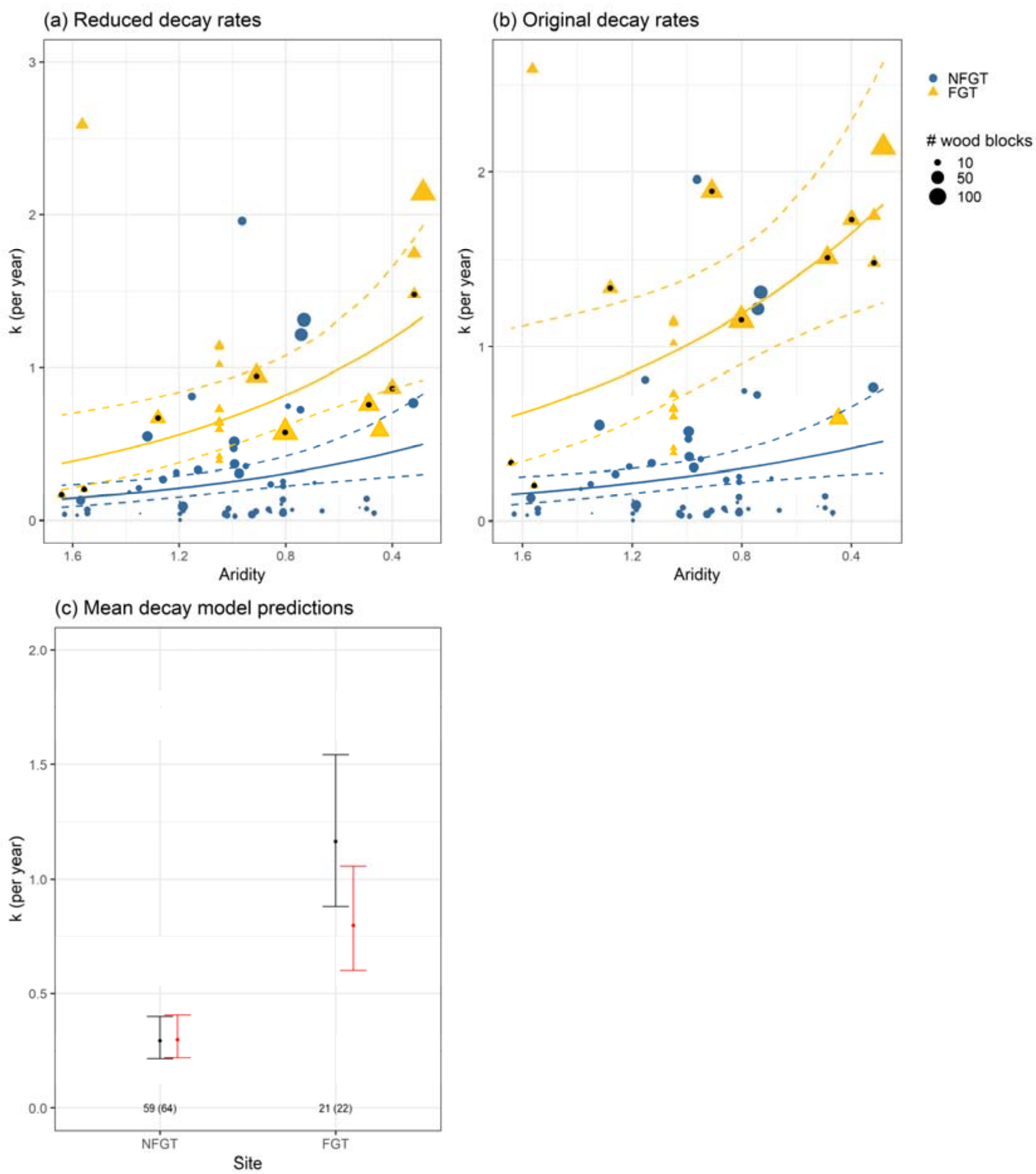

Figure S2.1: Panel (a) and (b) show model predictions for decay rates of discovered deadwood by mean annual aridity for sites with fungus-growing termites (FGT) and sites without fungus-growing termites (NFGT). Panel (a) shows predictions when decay rates for sites without shade cloth have been reduced by 50% and panel (b) shows model predictions made with the original data. Points represent sites (n = 80), scaled in size by number of wood blocks discovered at each site, orange triangles indicate FGT sites and blue circles NFGT sites. Sites with no shade cloth are indicated by a black mark at the centre of points (n = 6 sites). Solid lines indicate predictions for decay rates from multivariate linear regression for NFGT sites (blue) and for FGT sites (orange). Dashed lines represent 95% confidence intervals around predictions. Panel (c) shows marginal mean estimates (with 95% confidence intervals) for termite-driven decay in NFGT sites and FGT sites. Black bars represent model predictions made from the original dataset and red bars are predictions made when decay rates of sites with no shade cloth have been reduced by 50%. Figures at the bottom indicate the number of sites. No wood blocks were discovered in six sites where wood blocks were deployed (five NFGT sites and one FGT site).

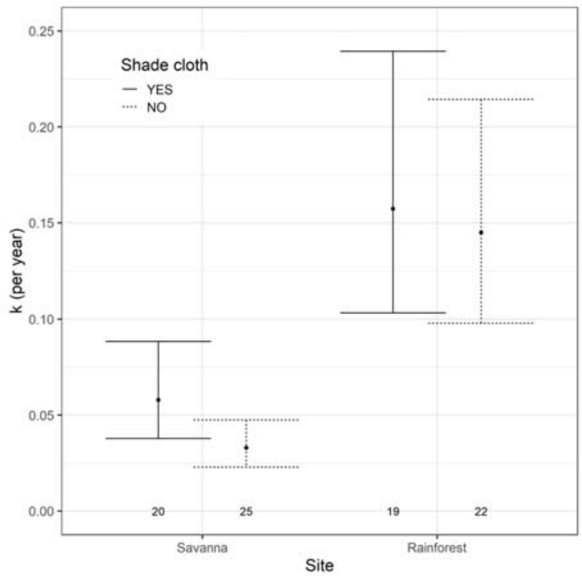

Figure S2.2: Plot shows marginal mean estimates (with 95% confidence intervals) for termite-driven decay of experimental pine blocks in savanna and rainforest sites in northeast Australia . Solid bars represent pine blocks with shade cloth and dashed bars show pine blocks without shade cloth. Figures at the bottom indicate the number of pine blocks in each site.

S3: Decay rates

Undiscovered wood blocks (i.e. microbial decay)

To check that any differences in decay of discovered blocks between FGT and NFGT sites (that shared the same range of aridity values) was due to termite decay and not microbial decay we examined decay rates of undiscovered blocks using the same predictors (aridity and presence of FGT). Like the decay model for discovered blocks, we used mean decay rates of undiscovered blocks for each site and ran a multivariate linear regression model to log-transformed k-values. An interaction between aridity and presence of FGT was tested but was insignificant and dropped from the model. Sites with higher sample sizes (i.e., number of wood blocks) were given greater weight in the regression. The presence of FGT was a significant predictor of microbial decay (undiscovered blocks) ($\beta = 0.80$, $t = 5.77$, $p < 0.001$) (Figure S3.1). However, the difference in mean decay between NFGT sites and FGT sites is approximately tenfold smaller for undiscovered blocks than for discovered blocks (0.08 vs. 0.87), indicating that termites are responsible for the additional decay observed in discovered blocks.

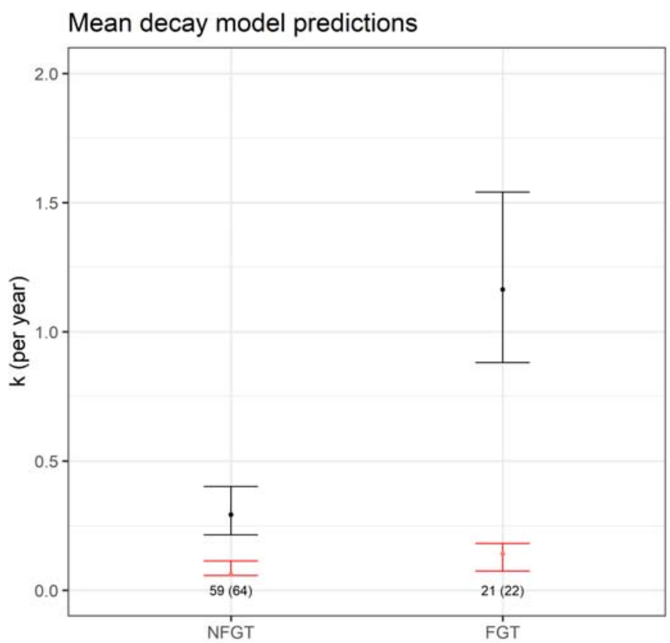

Figure S3.1: Mean decay rates for discovered blocks (termite and microbial decay: black) and undiscovered blocks (only microbial: red) for sites without fungus-growing termites (NFGT) and sites with fungus-growing termites (FGT) within the same range of aridity values. Plots show marginal mean estimates (with standard error bars) from respective decay models. Numbers at the bottom of the panel show the number of sites for discovered blocks and undiscovered in parenthesis; numbers differ as six sites had no blocks discovered by termites in NFGT sites and one site had no blocks discovered in FGT sites.

Discovered wood blocks (microbe and termite decay)

To test if decay rates of discovered blocks increased beyond the range of aridity values in FGT sites we examined decay rates of discovered blocks for all NFGT sites (n = 75); 13 NFGT sites had aridity values more humid than FGT sites and only 3 sites were more arid. We fitted log-transformed k-values to a bivariate linear regression using aridity as a predictor ($\log_e(k) \sim$ aridity, weight = sample size). We checked for any curvature in the relationship by fitting a second order polynomial but there was no significant difference in fitting a polynomial function to the model. Although the three more arid NFGT sites all had low mean rates of decay for discovered wood blocks, we found no statistical evidence of a decline in the most arid sites (Table S5.4)

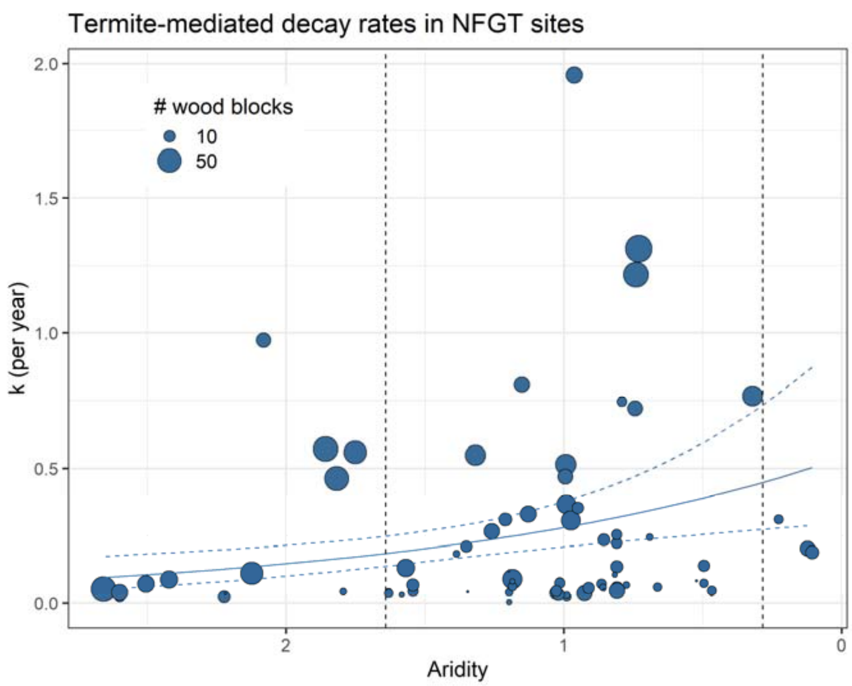

Figure S3.2: Plot shows termite-driven decay rates (discovered wood blocks) by mean annual aridity for all sites without fungus-growing termites (NFGT, n = 75). Lower aridity values indicate more arid regions. Points represent sites scaled in size by number of wood blocks discovered at each site. Solid lines indicate predictions for decay rates from bivariate linear regression and dashed lines represent 95% confidence intervals around predictions. Vertical dashed lines indicate the range of aridity values also found in sites with fungus-growing termites (FGT).

S4: Richness

We tested for a relationship between mean annual aridity and termite richness using separate bivariate linear regressions with either total generic richness of termites or richness of wood-feeding genera as the response and mean annual aridity as the predictor (lm(richness (all termites or wood-feeding) ~ poly (aridity,2)). Due to the small range of richness values for FGT sites we did not explore the effect of the presence of FGT on richness and so used the whole dataset (n =102 sites). Additionally, we tested for a relationship between decay rates of discovered deadwood and richness of wood-feeding genera by fitting a separate bivariate linear regression using log-transformed mean k-values as the response variable and gave greater weighting to sites with higher sample sizes (lm($\log_e$(k) ~ poly (richness, 2), weights = sample size). We checked for any curvature in the relationship of all models by fitting a second order polynomial and used AIC for model selection.

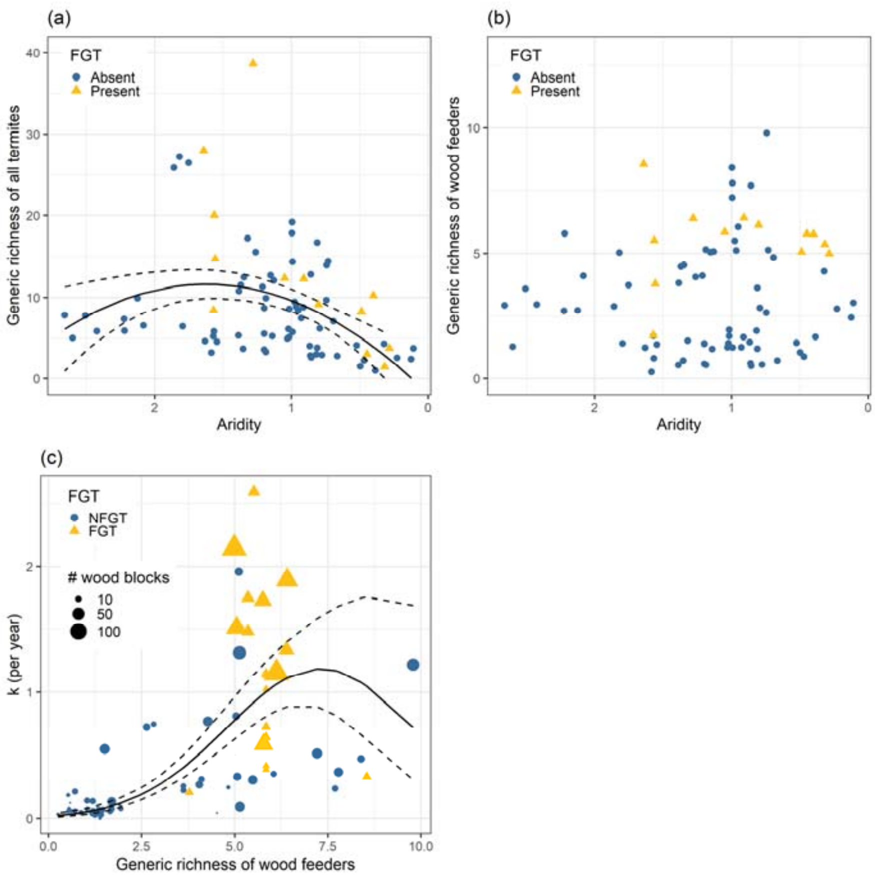

Figure S4: Plots depict termite richness against mean annual aridity values for all sites (n =102) for (a) all termite genera and (b) wood-feeding termite genera. Panel (c) shows the relationship between mean decay rate of discovered blocks at each site (n = 96, six sites had no termite discovery) against richness of wood-feeding termites. Solid lines indicate predictions from bivariate linear regressions and dashed lines represent 95% confidence intervals around predictions. Sites with fungus-growing termites (FGT) are indicated by orange triangles and without fungus-growing termites (NFGT) by blue circles. For panel (c) points are scaled in size to show the number of wood blocks discovered at each site.

S5: Temperature and precipitation on termite-driven decay

Patterns in termite discovery and decay of discovered wood against climatic predictors (mean annual temperature (MAT, ºC) and mean annual precipitation (MAP, mm)) was examined for all wood blocks regardless of the presence of FGT. For termite discovery we ran a multivariate logistic regression at the wood block level (using all wood blocks that allowed termite access) with termite discovery coded as a binary variable (discovered or undiscovered). We included an interaction between the predictors MAT and MAP. To account for variation in deployment length of wood blocks we included an offset in the model for time since deployment (glm(termite discovery (yes or no) ~ MAT*MAP, offset = deployment length, family = binomial(link = "logit")). For decay of discovered blocks, we first calculated a mean k-value (decay rate) of termite discovered wood blocks for each site. All k-values for wood blocks had been estimated using a negative exponential model of decay (i.e., $k = -(\log_e(\text{final mass} / \text{initial mass}))/ \text{deployment length}$). We then fitted log-transformed k-values to a linear regression using the same predictors as the discovery model. To help balance out the impact of large differences in sample size among sites, sites with higher sample sizes (i.e., number of discovered wood blocks) were given greater weight in the regression ($\log_e(k)$ ~ MAT*MAP, weight = sample size). For both models (discovery and decay) values for MAT and MAP were scaled and centred to reduce collinearity. As expected, and in line with Zanne et al., (2022), there was a significant interaction between MAT and MAP for termite discovery with discovery highest for hot sites with low precipitation (Figure S5 and Table S8.1). However, with the inclusion of additional data, decay of discovered blocks increased not only with greater MAT but also with lower MAP (Figure S5 and Table S8.2). Model outputs (shown in Table S8.1 and S8.2) are based on transformed values of MAT, MAP and decay rates (k) while all values have been back transformed to original values for plotting (Figure S5).

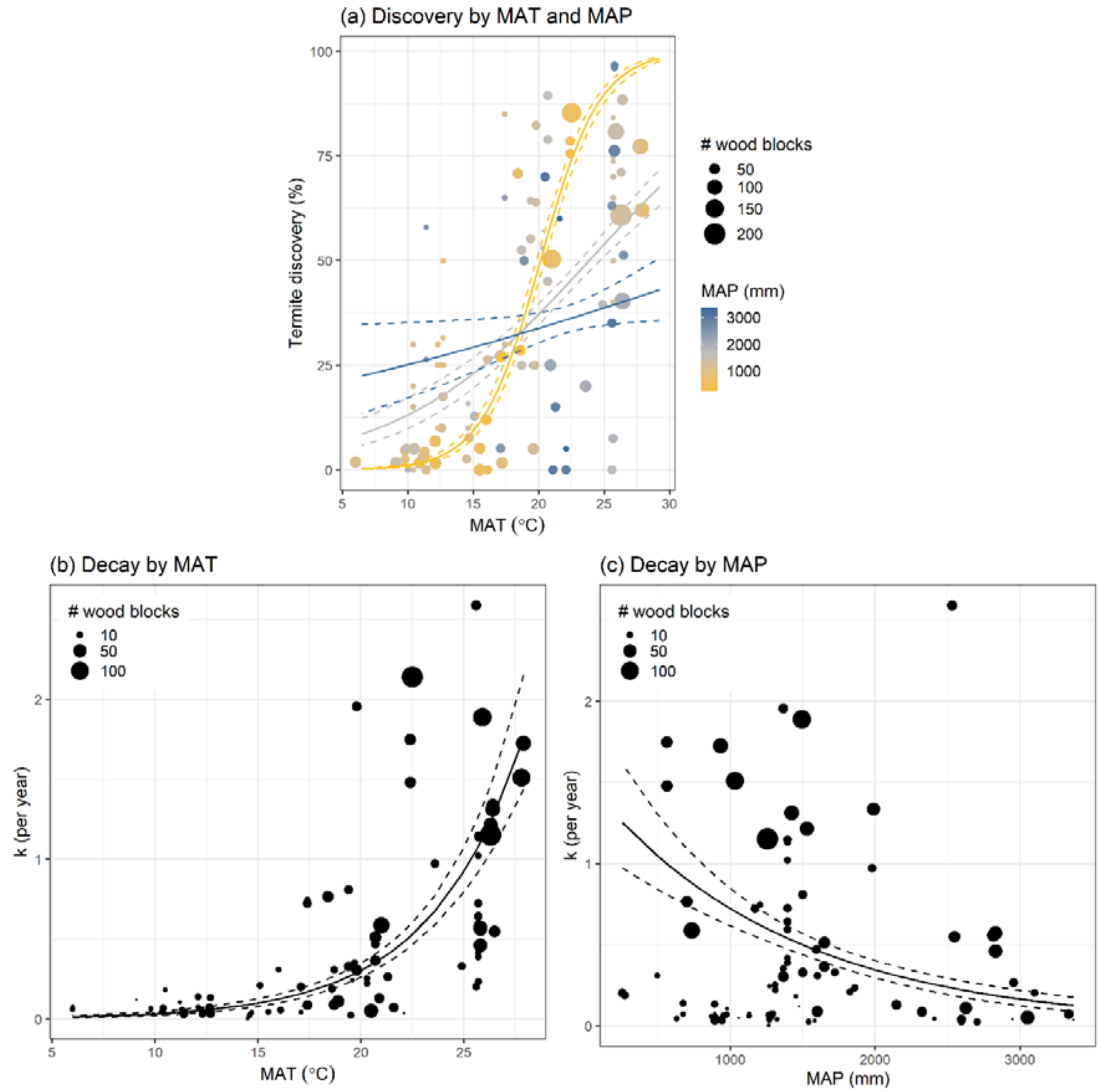

Figure S5: Plots show how climatic predictors affect termite discovery (a) and decay of discovered wood with climatic predictors, mean annual temperature (MAT) and mean annual precipitation (MAP). In panel (a) points show percentage of blocks discovered at each site (n =102) scaled in size by the number of wood blocks that allowed termite access. Solid lines indicate predictions for termite discovery across MAT from logistic regression, predictions are shown for 270 mm MAP in yellow (arid), 2150 mm MAP in grey (temperate) and 2700 mm MAP in blue (humid). Dashed lines represent 95% confidence intervals around predictions. In panels (b) and (c) points represent sites (n = 96 as 6 sites had zero termite discovery), scaled in size by number of wood blocks discovered at each site. Solid lines show predictions from multivariate linear regressions and dashed lines indicate 95% confidence intervals around predictions.

S6: All Tables

Table S1: Occurrence of fungus-growing termites (FGT) (Macrotermitinae) at FGT sites. Percentage is the proportion of termite encounters from termite transect surveys that were Macrotermitinae.

Country	**Site**	**Biome**	**%**	**Method / Notes**	**Source**
Gabon	Stone Gorilla	Savanna	0 *	Active searching using standardised transect methods for savannas (Davies, Eggleton, van Rensburg, & Parr, 2013; Davies, Parr, & Eggleton, 2021)	(Evouna Ondo et al., 2023; Rcwhytock, 2022)
	Boucle Vitex	Savanna	5 **		
	GEM Plot Angak	Forest	1	Active searching using standardised transect method for forests (Jones & Eggleton, 2000)	
Ghana	CocoaF1	Agroforest	74	Active searching using standardised transect method for forests (Jones & Eggleton, 2000)	(Quansah et al., 2022a, 2022b)
	CocoaF2	Agroforest	59		
	CocoaF4	Agroforest	47		
	CocoaF7	Agroforest	89		
	CocoaF8	Agroforest	73		
	CocoaF9	Agroforest	93		
	ForestF3	Forest	87		
	ForestF5	Forest	71		
	ForestF6	Forest	89		
	Ankasa	Forest	No data		
	Bawku	Savanna	No data		
	Bobiri	Forest	Present ¥	Macrotermes mounds observed	Personal Observation
	Kogyae	Mixed Savanna-Forest	No data		
	Mole	Savanna	Present ¥	Macrotermes mounds observed / Direct searching of mounds	Personal Observation (Woon, 2022)
South Africa	Nwanedi	Savanna	100 ¥ ¥	Active searching using standardised transect method (Davies et al., 2013, 2021)	(Bunney, Robertson, Eggleton, Archibald, & Parr, 2023)
	Wits Rural	Savanna	64		
	Satara Burnt	Savanna	91		
	Satara Unburnt	Savanna			
Malaysia	Maliau	Forest	12 ‡	Active searching using standardised transect method for forests (Jones & Eggleton, 2000)	(Ashton, Griffiths, Parr, Evans, & Eggleton, 2018)

Single 100 m x 2 m transects were carried out at each site unless stated otherwise. * No termite discovery at this site (Stone Gorilla). ** Mean of two transects conducted at Boucle Vitex. ¥ No occurrence data but samples of Macrotermitinae were either collected at this site or Macrotermes mounds were observed. ¥¥ Mean of four transects at Nwanedi, 17 at Wits Rural Facility and six transects at Santara, surveys were completed across burnt and unburnt savanna regimes in Satara, but occurrence data is reported for Satara as a whole. Burning regimes should not affect sampling techniques of termites. Only transect data in control plots and treatment plots before treatment were included in estimates of occurrence. ‡ Mean of eight transects conducted on control plots in Maliau.

Model Outputs

Encounter rates of FGT

Table S2.1: Bivariate linear regression model for deadwood decay rates (response) versus encounter rate of FGT (predictor) for all FGT sites with transect data (n =16, Table S1). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.217$, $F_{1,14} = 5.16$, $p = 0.039$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	-0.81	0.43	[-1.74, 0.12]	-1.87	0.083
Encounter rate	0.01	0.006	[0.00, 0.02]	2.27	0.039 *

Table S2.2: Bivariate linear regression model for deadwood decay rates (response) versus encounter rate of FGT (predictor) for all African FGT sites with transect data (n =15, Table S1). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.712$, $F_{1,13} = 35.57$, $p < 0.001$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	-1.75	0.32	[-2.44, -1.06]	-5.51	<0.001***
Encounter rate	0.02	0.004	[0.01, 0.03]	5.96	<0.001***

Table S2.3: Bivariate linear regression model for encounter rates of FGTs (response) versus aridity of FGT sites for all FGT sites with transect data (n =16, Table S1). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.622$, $F_{1,14} = 25.66$, $p < 0.001$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	109.38	8.19	[91.82, 126.94]	13.36	<0.001***
Aridity	-51.39	10.15	[-73.16, -29.63]	-5.07	<0.001***

Fixed-effects versus mixed-effects models - Akin to the analysis used by Zanne et al., 2022 we chose not to include either site or wood species identity as random terms for the following reasons: (1) including site in models would make it difficult to estimate coefficients associated with climate variables, and (2) variation in wood species was limited, 86% of sites used a common substrate, and wood chemistry was not found to influence results in the original analysis by Zanne et al., 2022. However, using lmer and glmer functions from ‘lme4’ (Bates et al., 2015) we have also fit mixed effects models on the response (discovery or decay) at the wood block level including each ‘site’ and ‘wood species used’ as random terms.

Decay of undiscovered blocks (microbial decay models)

Table S3: Multivariate linear regression model for microbial decay (undiscovered blocks). Predictors include mean annual aridity and presence of fungus growing termites (FGT), the interaction between aridity and presence of FGT was insignificant and dropped from the model. Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.270$, $F_{2, 83} = 16.99$, $p < 0.001$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	-3.01	0.17	[-3.35, -2.66]	-17.33	<0.001***
Aridity	0.28	0.16	[-0.04, 0.61]	1.72	0.089
FGT [1]	0.80	0.14	[0.52, 1.08]	5.77	<0.001***

Termite discovery models

Fixed effects model:

Table S4.1: Multivariate logistic binomial regression for termite discovery (glm(termite discovery (yes or no) ~ aridity*presence of FGT, offset = deployment length, family = binomial(link = "logit")). Predictors mean annual aridity and presence of fungus growing termites (FGT). Output includes parameter, odds ratio, SE, z-values and P-values (Nagelkerke's pseudo $R^2 = 0.397$).

Parameter	**Odds Ratio**	**SE**	**95% CI**	**z**	**p**
(Intercept)	0.06	0.0088	[0.04, 0.08]	-18.42	<0.001***
Aridity	1.02	0.16	[0.76, 1.38]	0.15	0.884
FGT [1]	38.90	7.86	[26.23, 57.93]	18.11	<0.001***
Aridity*FGT [1]	0.29	0.06	[0.19, 0.43]	-6.02	<0.001***

Mixed effects models:

Table S4.2: Multivariate logistic binomial mixed effects regression for termite discovery. Predictors include mean annual aridity and presence of fungus growing termites (FGT) with site and wood species as random terms (glmer(termite_discovery ~ aridity*FFpresent + (1|site) + (1|wood_used), offset=date_diff_years, family=binomial(link = "logit")). Output includes parameter, odds ratio, SE, z-values and P-values. ($R^2m = 0.32$, $R^2c = 0.70$).

Parameter	**Odds Ratio**	**SE**	**95% CI**	**z**	**p**
(Intercept)	0.24	0.25	[0.02, 2.39]	-1.21	0.226
Aridity	0.39	0.28	[0.09, 1.61]	-1.31	0.192
FGT [1]	62.79	73.13	[6.40, 615.59]	3.55	<0.001***
Aridity*FGT [1]	0.51	0.58	[0.06, 4.68]	-0.59	0.555

Table S4.3: Bivariate logistic binomial mixed effects regression for termite discovery in FGT sites with mean annual aridity as the predictor and site as a random term. All FGT sites used the same wood species (*Pinus radiata*) (glmer(termite_discovery ~ aridity + (1|site), offset=date_diff_years, family=binomial(link = "logit")). Output includes parameter, odds ratio, SE, z-values and P-values. ($R^2m = 0.09$, $R^2c = 0.22$).

Parameter	Odds Ratio	SE	95% CI	z	p
(Intercept)	3.09	1.36	[1.31, 7.31]	-2.57	0.010*
Aridity	0.24	0.10	[0.10, 0.55]	-3.35	<0.001***

Table S4.4: Bivariate logistic binomial mixed effects regression for termite discovery in NFGT sites with mean annual aridity as the predictor and site and wood species as random terms (glmer(termite_discovery ~ aridity + (1|site), offset=date_diff_years, family=binomial(link = "logit")). Output includes parameter, odds ratio, SE, z-values and P-values. ($R^2m = 0.01$, $R^2c = 0.62$).

Parameter	Odds Ratio	SE	95% CI	z	p
(Intercept)	0.24	0.30	[0.02, 2.80]	-1.15	0.252
Aridity	0.38	0.31	[0.08, 1.88]	-1.19	0.234

Table S4.5: Bivariate logistic binomial mixed effects regression for termite discovery with presence or absence of FGT as the predictor and site and wood species as random terms (glmer(termite_discovery ~ FFpresent + (1|site) + (1|wood_used), offset=date_diff_years, family=binomial(link = "logit")). Output includes parameter, odds ratio, SE, z-values and P-values. ($R^2m = 0.28$, $R^2c = 0.69$).

Parameter	Odds Ratio	SE	95% CI	z	p
(Intercept)	0.09	0.07	[0.02, 0.43]	-2.98	0.003
FGT [1]	34.67	15.74	[14.24, 84.39]	7.81	<0.001***

Decay of discovered blocks models (termite-driven: microbe and termite decay)

Fixed effects models:

Table S5.1: Multivariate linear regression for termite-driven decay (discovered blocks). Predictors include mean annual aridity and presence of fungus growing termites (FGT) . The interaction between aridity and presence of FGT was insignificant and dropped from the model ($\log_e(k)$ ~ aridity + presence of FGT, weight = sample size). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.458$, $F_{2,77} = 34.43$, $p < 0.001$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	-0.55	0.33	[-1.20, 0.10]	-1.69	0.096
Aridity	-0.82	0.30	[-1.42, -0.22]	-2.74	0.008**
FGT [1]	1.38	0.22	[0.95, 1.81]	6.35	<0.001***

Table S5.2: Multivariate linear regression for termite-driven decay (discovered blocks) without including weighting the regression by sample size. Predictors include mean annual aridity and presence of fungus growing termites (FGT). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.427$, $F_{2,77} = 30.4$, $p < 0.001$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	-1.36	0.39	[-2.13, -0.58]	-3.48	<0.001***
Aridity	-0.80	0.36	[-1.53, -0.08]	-2.20	0.031*
FGT [1]	2.01	0.28	[1.46, 2.57]	7.24	<0.001***

Mixed effects models:

Table S5.3: Multivariate linear mixed effects regression for termite-driven decay (of discovered blocks). Predictors include mean annual aridity and presence of fungus growing termites (FGT) (lmer(log(k_value +1) ~ aridity+FFpresent + (1|site) + (1|wood_used)). Output includes parameter, coefficient, SE, t-values and P-values ($R^2m = 0.21$, $R^2c = 0.38$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	0.50	0.12	[0.27, 0.74]	4.15	<0.001***
Aridity	-0.22	0.08	[-0.37, -0.07]	-2.89	0.004**
FGT [1]	0.43	0.06	[0.31, 0.54]	7.41	<0.001***

Decay of discovered blocks across a wider aridity range (termite-driven: microbe and termite decay):

Table S5.4: Bivariate linear regression model for termite-driven decay (discovered blocks) of all sites without fungus-growing termites (NFGT, n = 75). Response variable was mean log transformed k-values for each site and the predictor was mean annual aridity. Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.11$, $F_{1,73} = 10.43$, $p = 0.002$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
(Intercept)	-0.62	0.30	[-1.21, -0.02]	-2.08	0.041 *
Aridity	-0.66	0.20	[-1.06, -0.25]	- 3.23	0.002 **

Testing for a shade cloth effect on decay of discovered blocks (termite-driven: microbe and termite decay)

Table S6.1: Testing for any effect of the inclusion of shade cloth by including shade cloth as a predictor. Multivariate linear regression for termite-driven decay (discovered blocks) including mean annual aridity, presence of fungus growing termites (FGT) and the presence of shade cloth as predictors (lm(log_e(k) ~ aridity + presence of FGT + presence of shade cloth, weights = sample size). Output includes parameter, coefficient, SE, t-values and P-values (Adj $R^2 = 0.456$, $F_{3,76} = 23.09$, $p < 0.001$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	-0.28	0.46	[-1.09, 0.64]	-0.61	0.542
Aridity	-0.86	0.30	[-1.46, -0.25]	-2.83	0.006**
FGT [1]	1.24	0.28	[0.68, 1.79]	4.45	<0.001***
Shade cloth [1]	-0.23	0.28	[-0.79, 0.33]	-0.83	0.411

Table S6.2: Testing for any effect of the inclusion of shade cloth by reducing measured decay rates in sites without a shade cloth by 50%. Multivariate linear regression for termite-driven decay (discovered blocks) including mean annual aridity and the presence of fungus growing termites (FGT) as predictors (lm(log_e(k) ~ aridity + presence of FGT, weights = sample size). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.359$, $F_{2,77} = 23.11$, $p < 0.001$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	-0.43	0.33	[-1.08, 0.22]	-1.32	0.191
Aridity	-0.94	0.30	[-1.54, -0.35]	-3.14	0.002**
FGT [1]	0.99	0.22	[0.55, 1.42]	4.52	<0.001***

Table S6.3: Testing for any effect of the inclusion of shade cloth on pine blocks with and without shade cloth in the same sites (rainforest and savanna). Linear regression for decay rates including the termite discovery, time since deployment of block and the interaction between site and the presence of shade cloth as predictors (lm(log_e(k) ~ discovery + harvest date + site*shadecloth). Output includes parameter, coefficient, SE, t-values and P-values (Adj $R^2 = 0.442$, $F_{5,80} = 14.48$, $p < 0.001$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	-2.75	0.41	[-3.55, -1.94]	-6.77	<0.001***
Site [PNW]	–1.48	0.27	[-2.01, -0.95]	-5.52	<0.001***
Shade cloth [YES]	0.08	0.29	[-0.49, 0.65]	0.29	0.775
Discovery	1.34	0.29	[0.77, 1.92]	4.69	<0.001***
Time	0.001	0.0006	[0.00, 0.00]	1.78	0.079
Site [PNW] * Shade cloth [YES]	0.48	0.40	[-0.32, 1.28]	1.20	0.235

Termite richness effects

Table S7.1 Bivariate linear regression model for termite-driven decay (discovered blocks) (response) versus richness of wood-feeding termites (generic richness) for all sites (n = 96, six sites had zero termite discovery). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.571$, $F_{2,93} = 64.08$, $p < 0.001$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	-1.47	0.11	[-1.69, -1.25]	-13.29	< 0.001 ***
Richness	12.05	1.07	[9.93, 14.16]	11.31	< 0.001 ***
$Richness^2$	-4.11	0.80	[-5.70, -2.53]	-5.14	< 0.001 ***

Table S7.2: Bivariate linear regression model for richness of wood-feeding termites (generic richness) (response) versus mean annual aridity values (predictor) for all sites (n =102). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.00$, $F_{1,100} = 0.793$, $p = 0.376$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	3.74	0.51	[2.72, 4.76]	7.26	< 0.001 ***
Aridity	-0.37	0.41	[-1.18, 0.45]	- 0.89	0.375

Table S7.3: Bivariate linear regression model for richness of all termites (generic richness) (response) versus mean annual aridity values (predictor) for all sites (n =102). Output includes parameter, coefficient, SE, t-values and P-values (Adj. $R^2 = 0.159$, $F_{2,99} = 10.52$, $p < 0.001$).

Parameter	Coefficient	SE	95% CI	t	p
(Intercept)	8.76	0.60	[7.58, 9.95]	14.67	< 0.001 ***
Aridity	16.28	6.03	[4.31, 28.24]	2.70	0.008 **
$Aridity^2$	-22.36	6.03	[-34.33, -10.40]	-3.71	< 0.001 ***

Temperature and Precipitation models

Table S8.1: Multivariate logistic binomial regression for termite discovery. Predictors mean annual temperature (MAT) and mean annual precipitation (MAP). Output includes parameter, odds ratio, SE, z-values and P-values. (Nagelkerke's pseudo $R^2 = 0.46$).

Parameter	Coefficient	SE	95% CI	z	p
Intercept	0.15	0.006	[0.14, 0.16]	-45.95	< 0.001***
MAT	4.78	0.22	[4.37, 5.25]	33.29	< 0.001***
MAP	0.96	0.04	[0.88, 1.05]	-0.87	0.385
MAT*MAP	0.48	0.03	[0.43, 0.54]	-12.25	< 0.001***

Table S8.2: Multivariate linear regression for termite-driven decay (discovered blocks). Predictors mean annual temperature (MAT) and mean annual precipitation (MAP). Output includes parameter, coefficient, SE, t-values and P-values (Adj $R^2 = 0.764$, $F_{3, 92} = 103.6$, $p < 0.001$).

Parameter	**Coefficient**	**SE**	**95% CI**	**t**	**p**
Intercept	-1.55	0.09	[-1.72, -1.38]	-18.19	< 0.001***
MAT	1.31	0.08	[1.15, 1.47]	16.17	< 0.001***
MAP	-0.55	0.09	[-0.72, -0.38]	-6.50	< 0.001***
MAT*MAP	0.03	0.09	[-0.15, 0.21]	0.30	0.761

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