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Supplementary Materials for

Climatic warming destabilizes forest ant communities

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- table S2. Models of species associations at Duke and Harvard forests.
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Supplementary Materials

Levins' metapopulation, turnover, and persistence models

At Duke Forest, we found a strong concordance between the relationship of raw occupancy as a function of chamber temperature and equilibrium occupancy based on the Levins' metapopulation model. Like the raw occupancy results, the equilibrium occupancy showed *Crematogaster lineolata* significantly increasing with increasing chamber temperature, and a trend toward *Aphaenogaster* spp. decreasing with increasing temperature (fig. S12 and table S3). Turnover was largely insensitive to temperature except for *Brachyponera chinensis*, which exhibited significantly reduced turnover with increasing temperature; however, *B. chinensis* had overall few occurrences in the chambers, and more data are needed to confirm this result (fig. S13 and table S3).

At Harvard Forest, we found little concordance between the relationship of raw occupancy as a function of chamber temperature and equilibrium occupancy based on the Levins' meta-population model (fig. S14 and table S4). None of the relationships for any of the five focal taxa was significant, however, we note that there were fewer census points available for Harvard Forest compared with Duke Forest, limiting our ability to estimate these effects. Further, it is possible the Harvard Forest ant community was not at equilibrium, which violates the assumptions of the Levins' model, and could account for this difference between the results of the raw occupancy and the equilibrium occupancy as functions of chamber temperature. Turnover was insensitive to temperature for each of the five focal taxa at Harvard Forest (fig. S15 and table S4).

Although we observed weak trends of increasing persistence among thermophilic species in warmer environments (*i.e.*, *C. lineolata*, *Temnothorax longispinosus*, and *Camponotus* spp.), persistence in nest boxes was not significantly affected by chamber temperature for any of the species at either Duke Forest (fig. S14 and table S3) or Harvard Forest (fig. S15 and table S4); however, this result may reflect the high replication needed to detect persistence (see Materials and Methods).

Alternative demographic and transition matrix model specifications

Our primary analyses considered nest boxes to be empty for the focal species when occupied by a non-focal species. Alternatively, we can consider nest boxes to be unavailable for the focal species when occupied by a non-focal species. We refit our models of colonization, extinction, occupancy and persistence treating nest boxes as not available when a non-focal species inhabited the nest box, and found the results to be qualitatively similar to our focal analyses which treat nest boxes inhabited by the non-focal species as empty for the focal species.

To isolate the effects of warming on species interactions that involved usurpation of nest boxes (*i.e.*, as a subset of all species interactions ranging from usurpation of nest boxes to competition for resources near the nest sites), we recalculated the proportion of colonization and extinction events as those involving a change from a non-focal species to a focal species (colonization event) and vice versa (extinction event) in back-to-back census points. Although the number of colonization and extinction events were fewer using this definition, our findings were qualitatively similar to our main analyses using a broader definition of colonization and extinction that allowed for intervening periods when nest boxes were empty. Together, these results suggest that the mechanism of altered species interactions via nest usurpation plays an important role in the shifts in colonization and extinction we observed under experimental warming.

Although our census intervals were relatively frequent, on the order of monthly during the growing season, it is possible that transient colonization and extinction occurred between sampling intervals. We refit our Markov transition models where we replaced 0 count cells with a value of 1 to explore the effects of imperfect detection. This change created a small transition probability where originally no transition was permitted with a value of 0. We repeated our analyses of damping ratio, equilibrium frequencies for each species and the empty state for nest boxes, and the individual transition probabilities, and found our results to be qualitatively similar to our original analyses.

We also refit our Markov transition models with different numbers of focal species: initially we had 5 focal species (or species groups) at Harvard Forest, and refit our Markov models using the

4 and 3 most abundant species. We employed the same procedure for Duke Forest: initially we had 4 focal species (or species groups), and refit our Markov models using the 3 most abundant species. Regardless of the number of species included at either site, we found qualitatively similar results using the reduced numbers of focal species. Our results for occupancy, colonization, extinction and community stability therefore appear to be robust to potential issues with sampling and detection.

Linking altered community dynamics with changes in community composition

Our analyses explored the dynamical stability of communities under climatic change, and found evidence to suggest a loss of stability with increasing environmental temperature. Much more frequently when climate researchers quantify the effects of climatic warming on communities, metrics such as species abundances and community composition are reported, often for a single or limited number of time points (*26*). It is reasonable then to ask how well the results for dynamical stability align with these more commonly used metrics of community responses to climatic change (and relatedly, whether the dynamics of interactions among individuals in and around nest boxes scale up to higher-level community responses). At least in the forest ant communities we monitored, there appears to be a fairly strong congruence between the loss of stability with increasing environmental temperature, and shifts in individual species abundances and community composition. Across each of these metrics, thermophilic species appear to be driving ant community responses to warming: thermophilic species occupy nest sites for extended periods of time which, as our work in this study suggests, destabilizes communities; the abundances of thermophilic species tend to increase (*13*); and thermophilic species appear to drive compositional shifts in communities (*20*). Interestingly, there is more of a discrepancy among these metrics when we take geographic location into account. Despite the strong impact of warming on dynamical stability at both our lower (warmer) and higher (cooler) latitude sites, the impacts of warming on species abundance and community composition were much stronger at our lower latitude (warmer) site. Understanding the connections between dynamical community stability and community compositional changes under warming across different geographic locations is a prime area for future research efforts on biodiversity forecasting.

Supplementary Figures and Tables

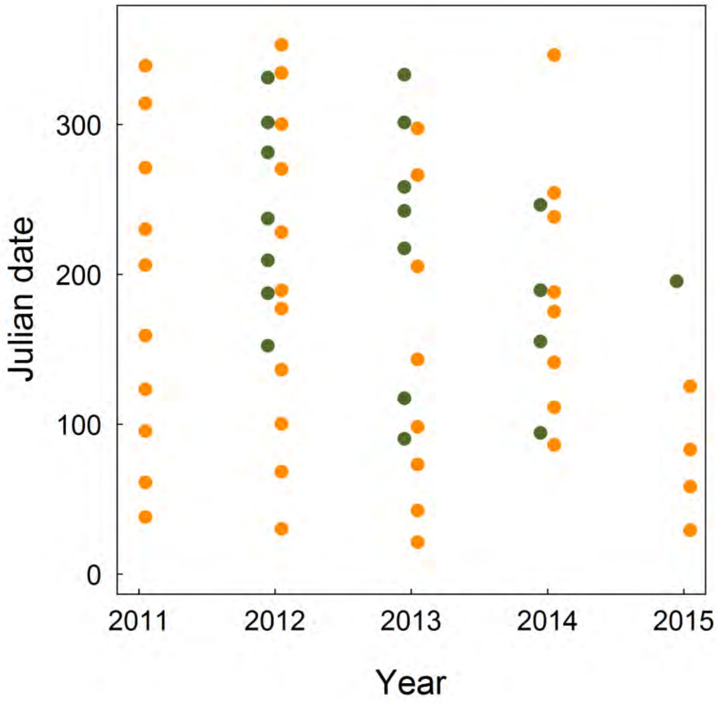

fig. S1. Frequency of nest box censuses at the two experimental warming arrays. Nest box census dates are given as the Julian dates from 2011 through 2015 for Duke Forest (orange) and Harvard Forest (green).

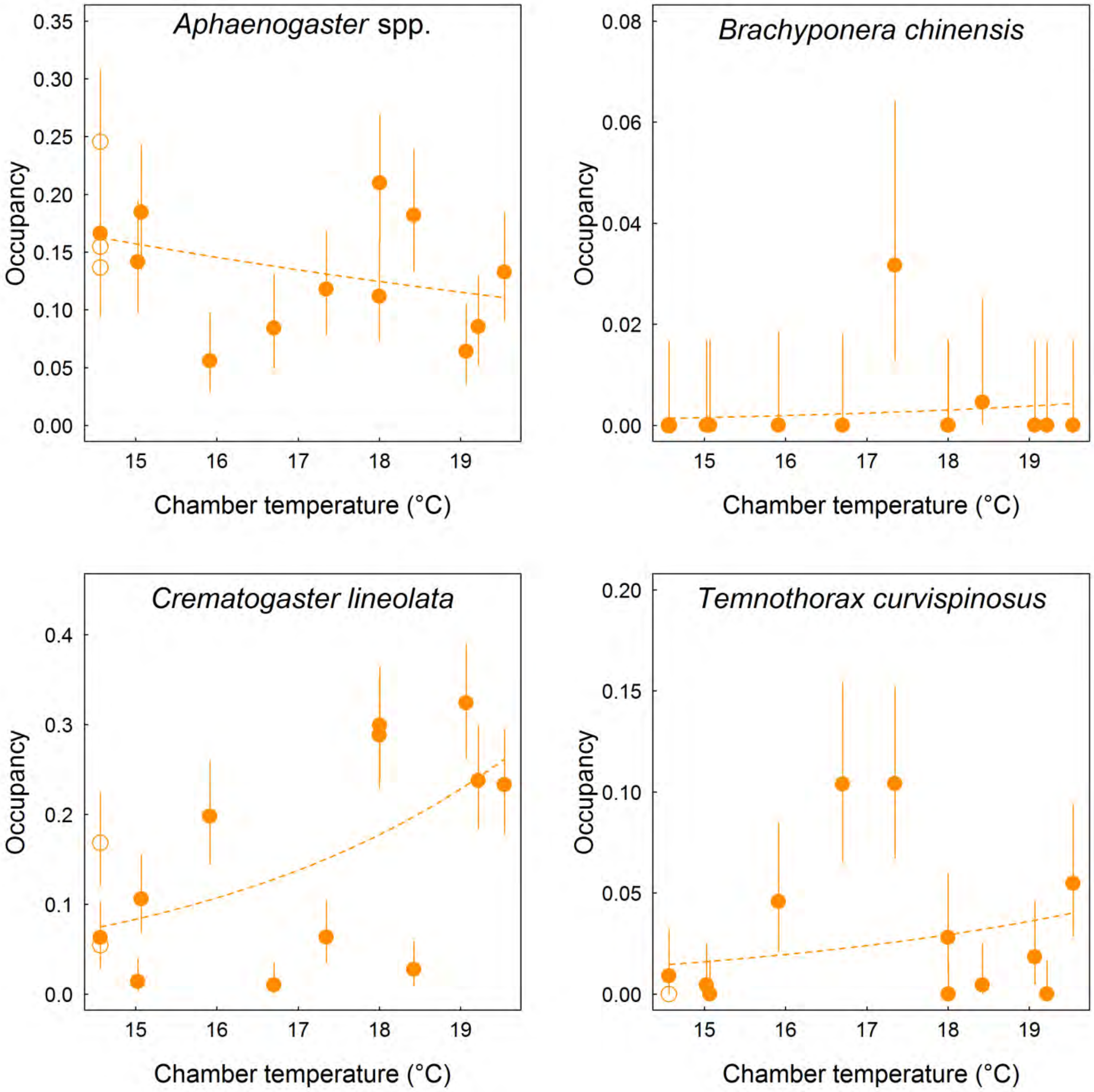

fig. S2. Mean proportion of nest boxes occupied per chamber at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S3 for model coefficients and statistics.

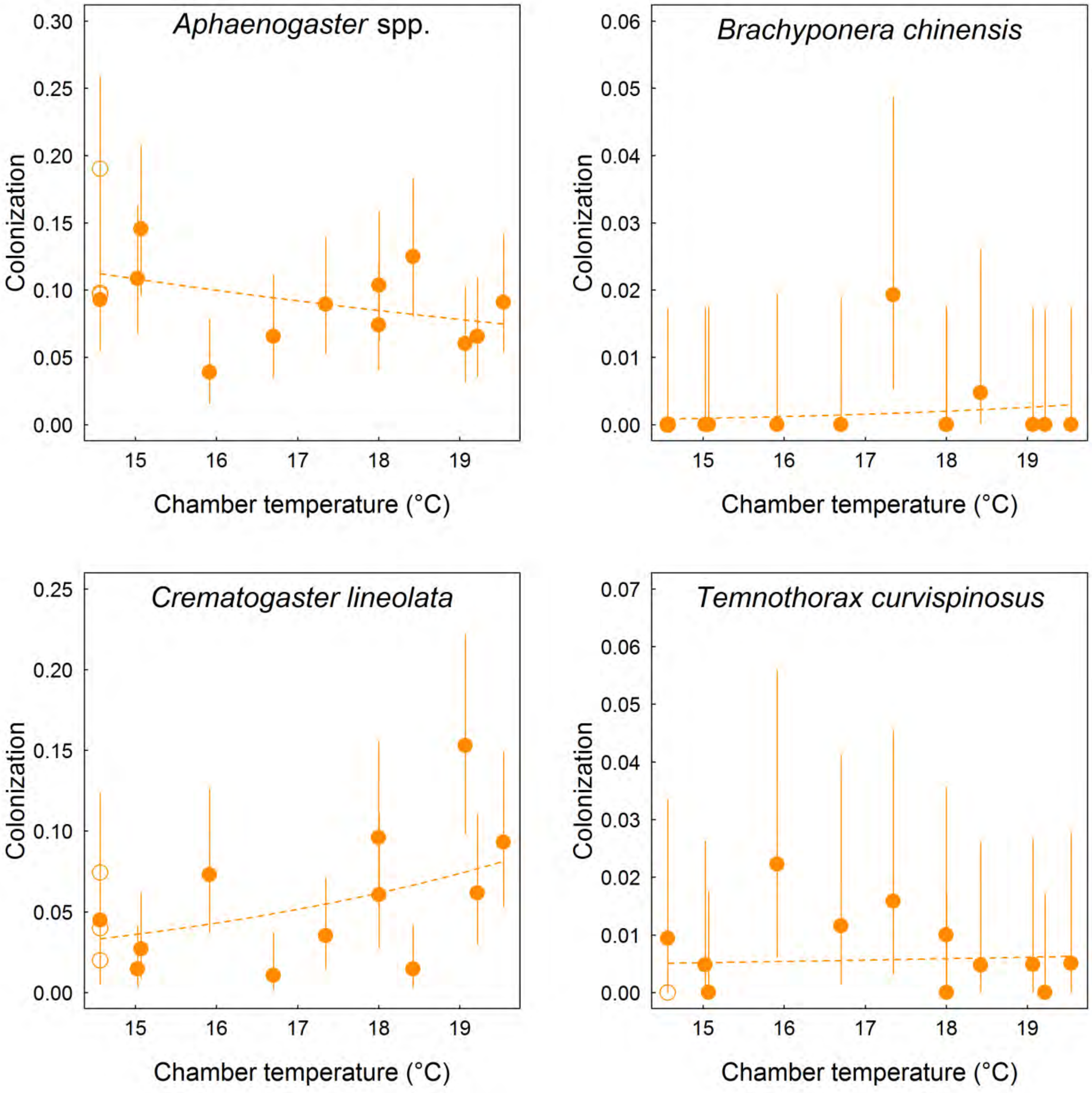

fig. S3. Mean proportion of nest boxes colonized per chamber at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S3 for model coefficients and statistics.

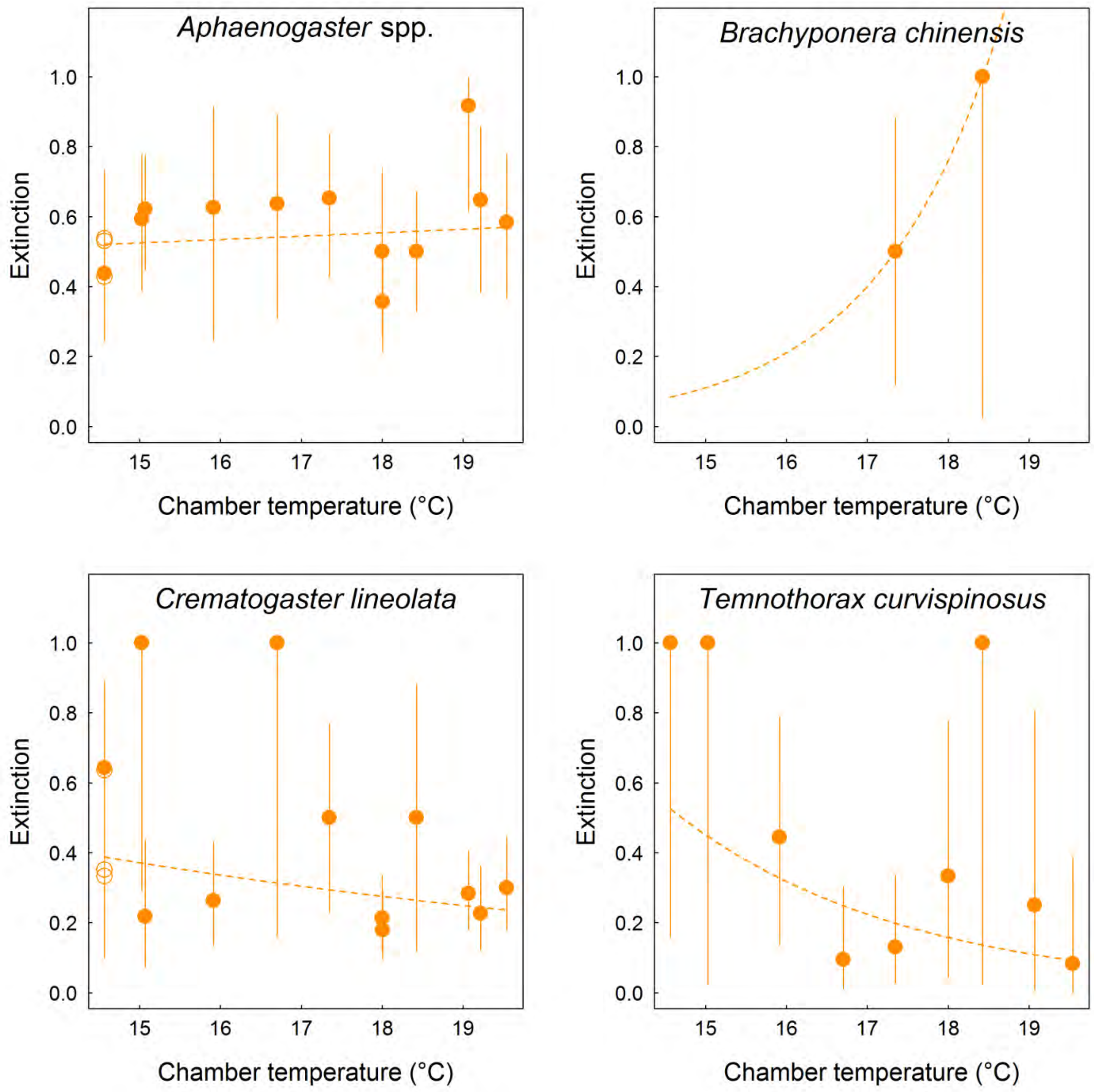

fig. S4. Mean proportion of nest boxes that went extinct per chamber at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S3 for model coefficients and statistics.

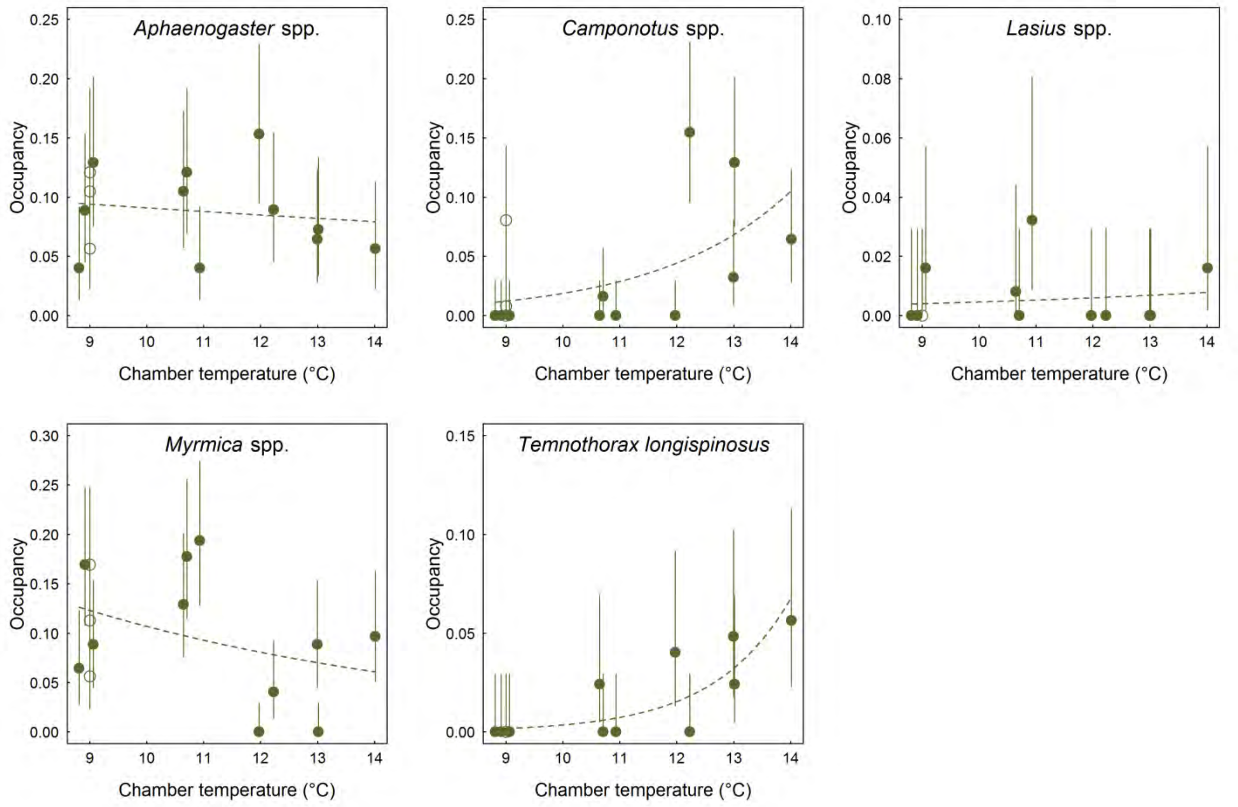

fig. S5. Mean proportion of nest boxes occupied per chamber at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S4 for model coefficients and statistics.

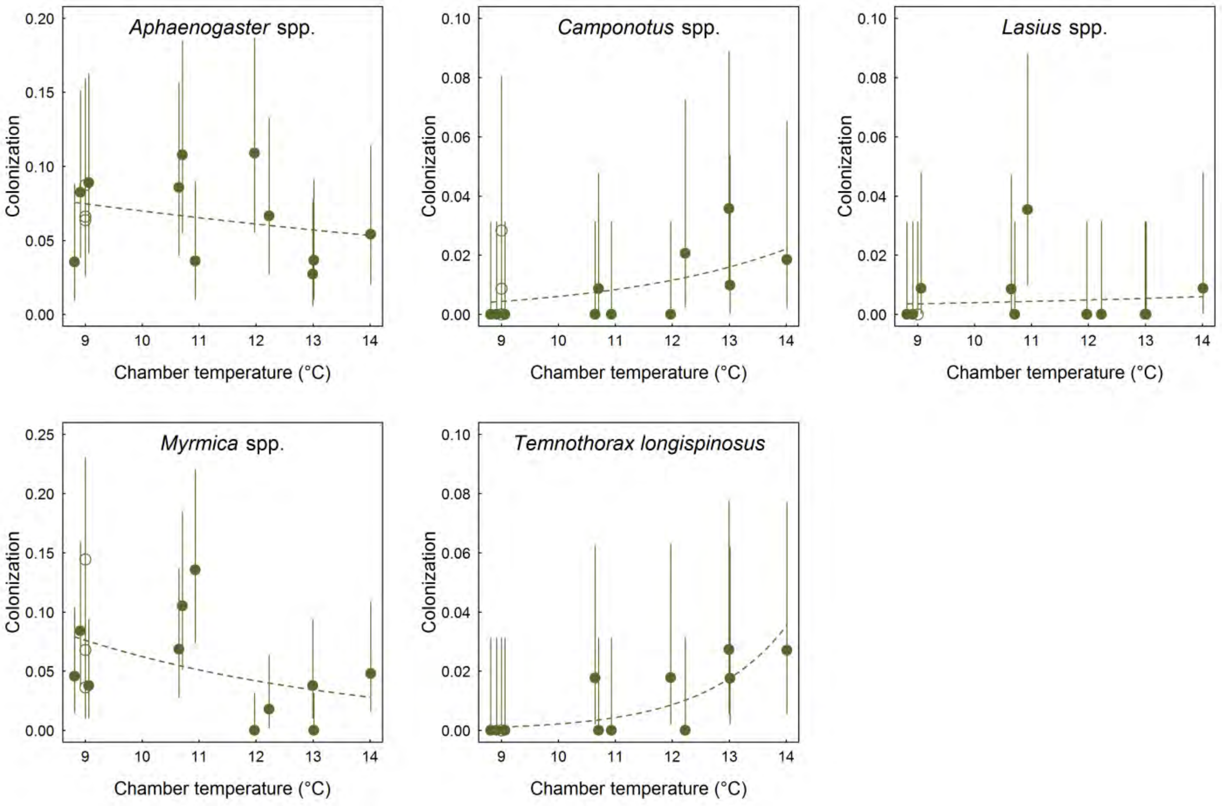

fig. S6. Mean proportion of nest boxes colonized per chamber at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S4 for model coefficients and statistics.

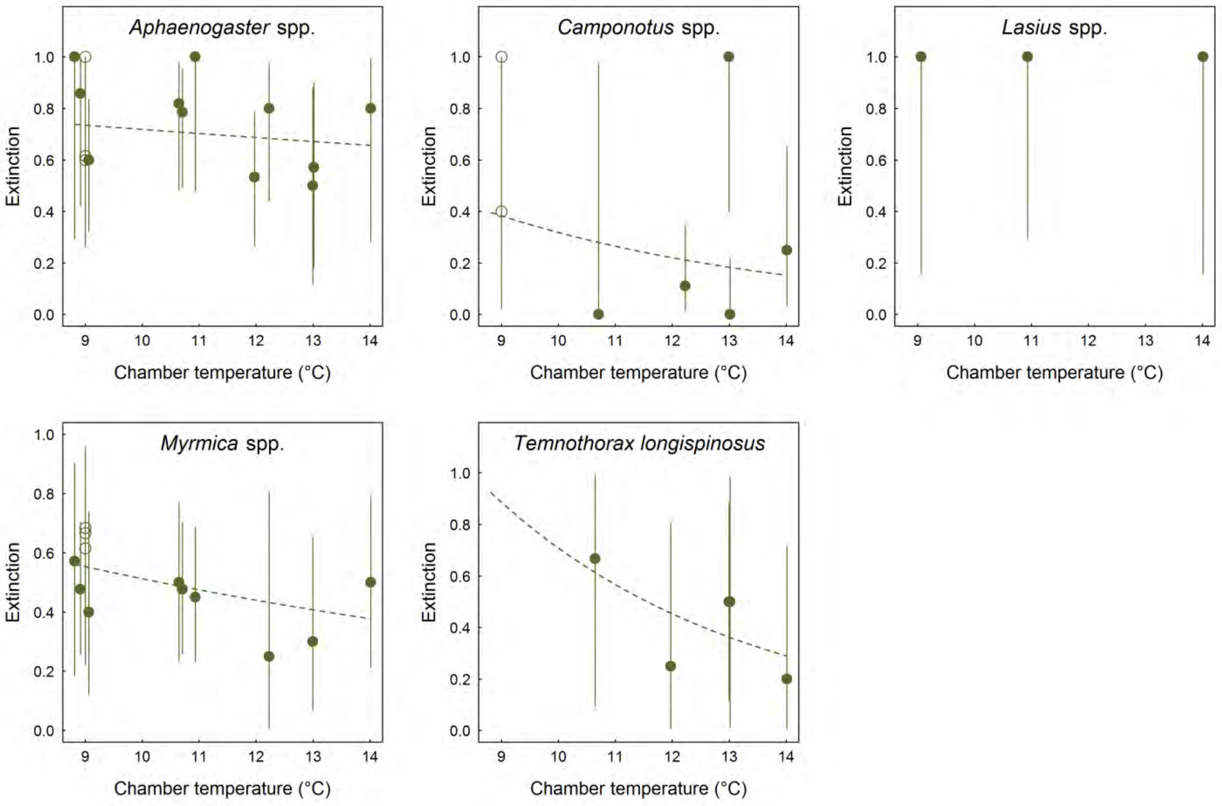

fig. S7. Mean proportion of nest boxes that went extinct per chamber at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S4 for model coefficients and statistics.

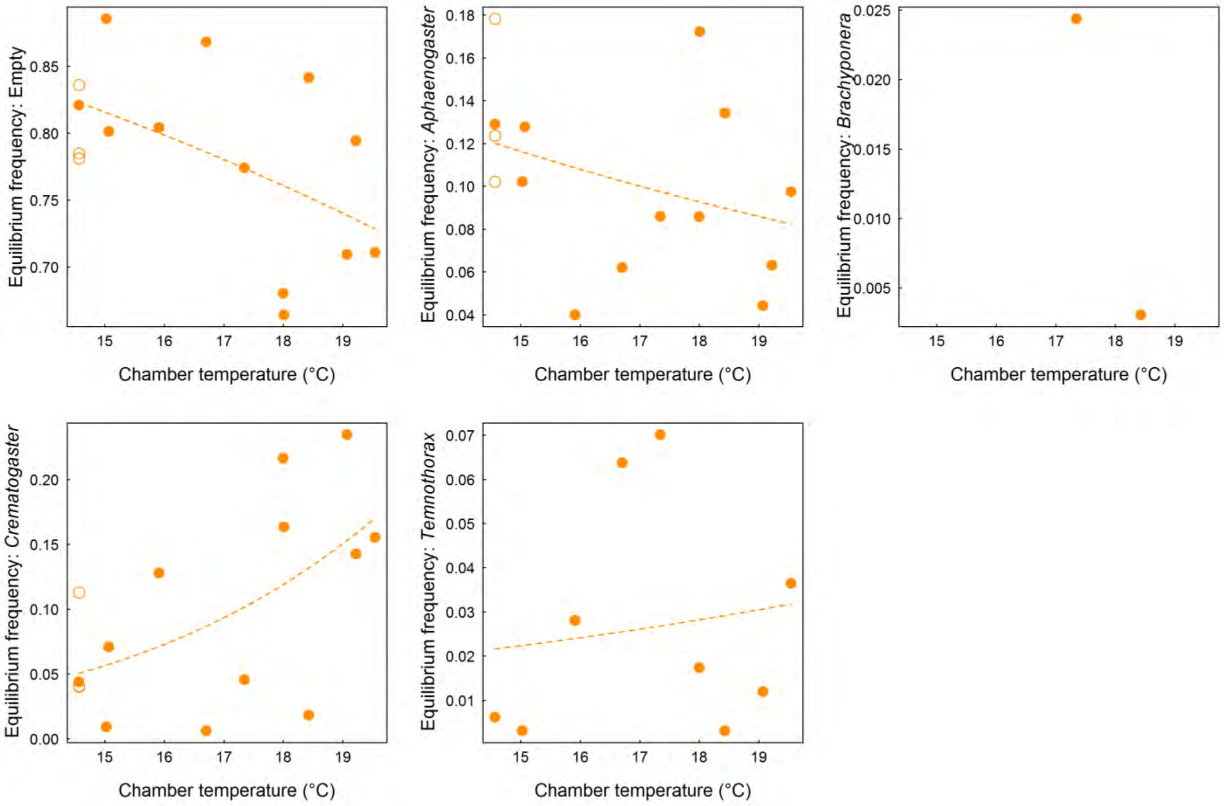

fig. S8. Equilibrium frequencies as a function of chamber temperature for each of the four focal species and empty nest boxes at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S6 for model coefficients and statistics.

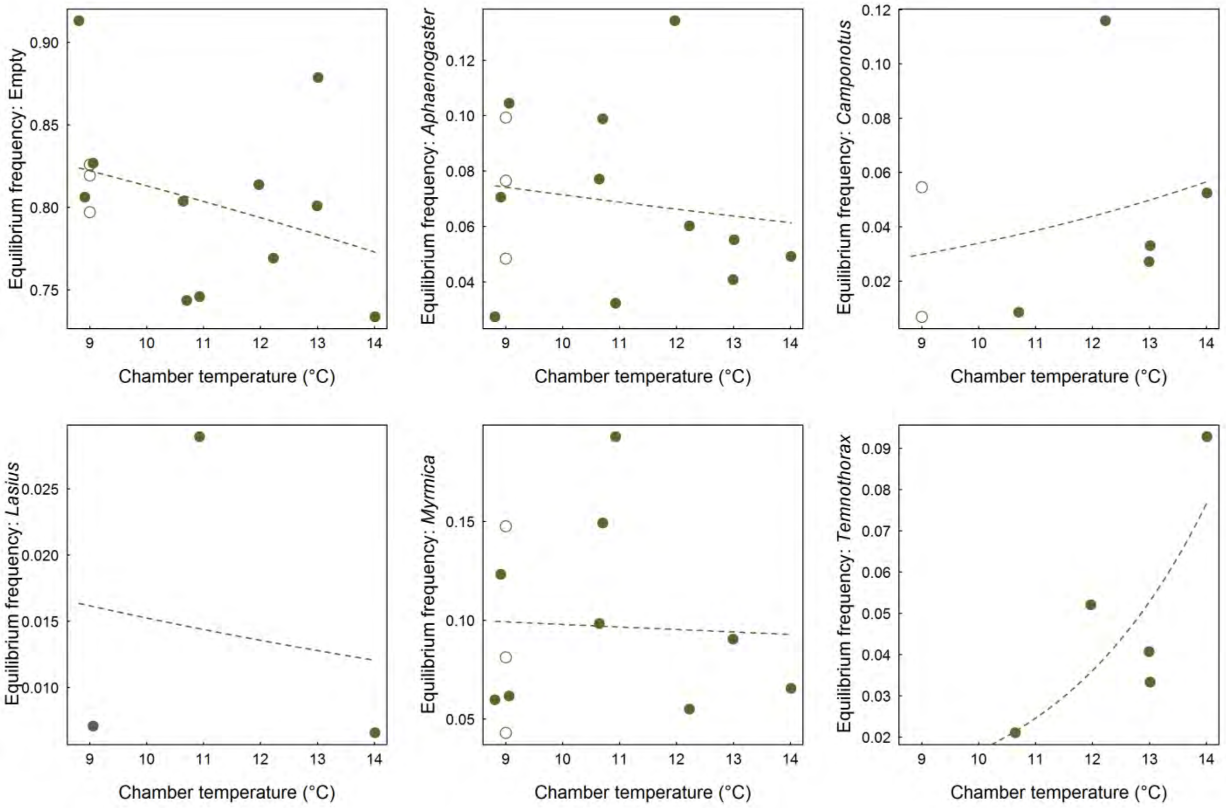

fig. S9. Equilibrium frequencies as a function of chamber temperature for each of the five focal species and empty nest boxes at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S6 for model coefficients and statistics.

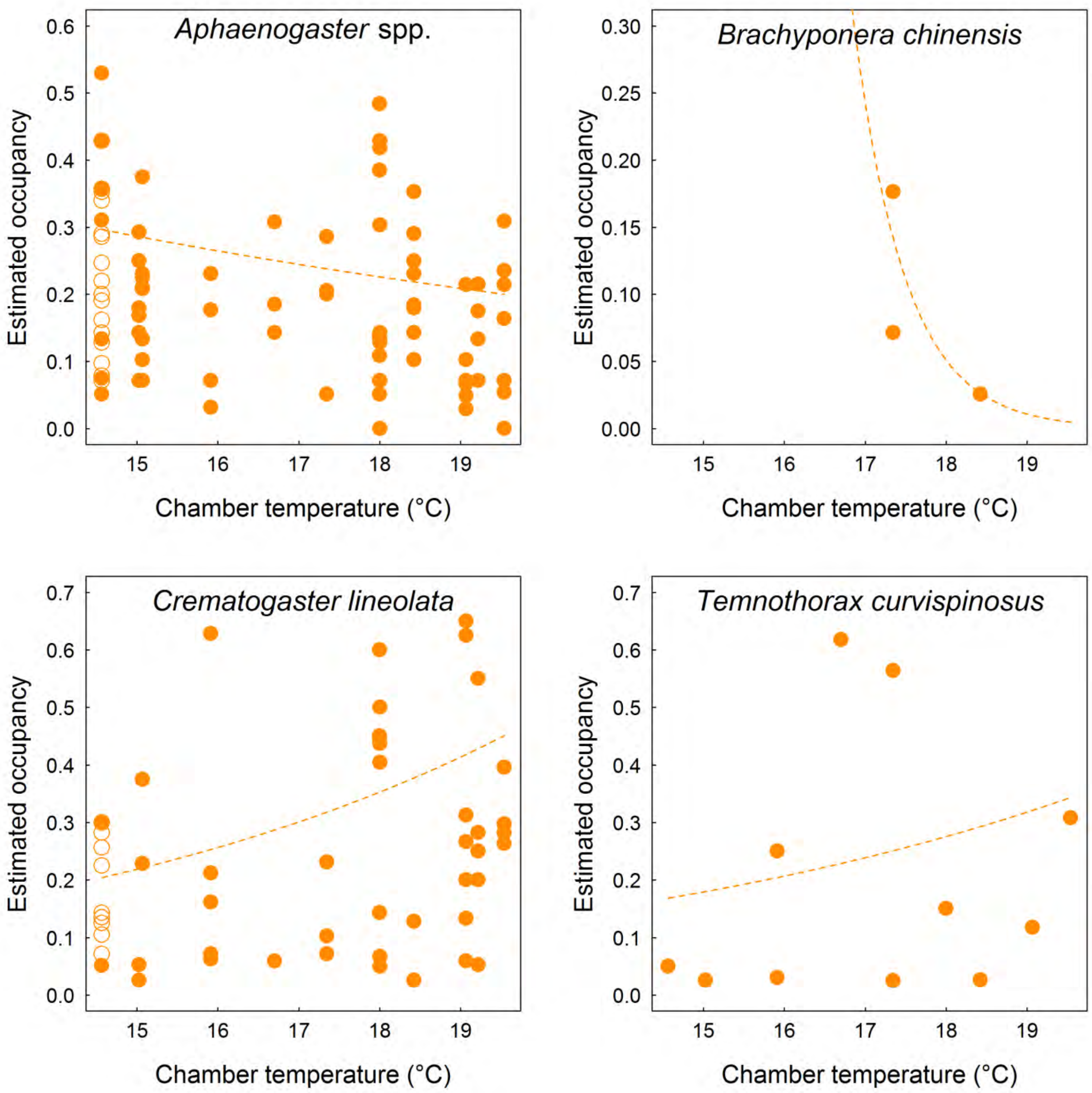

fig. S10. Mean proportion of nest boxes occupied at equilibrium using Levins' colonization-extinction formula at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S3 for model coefficients and statistics.

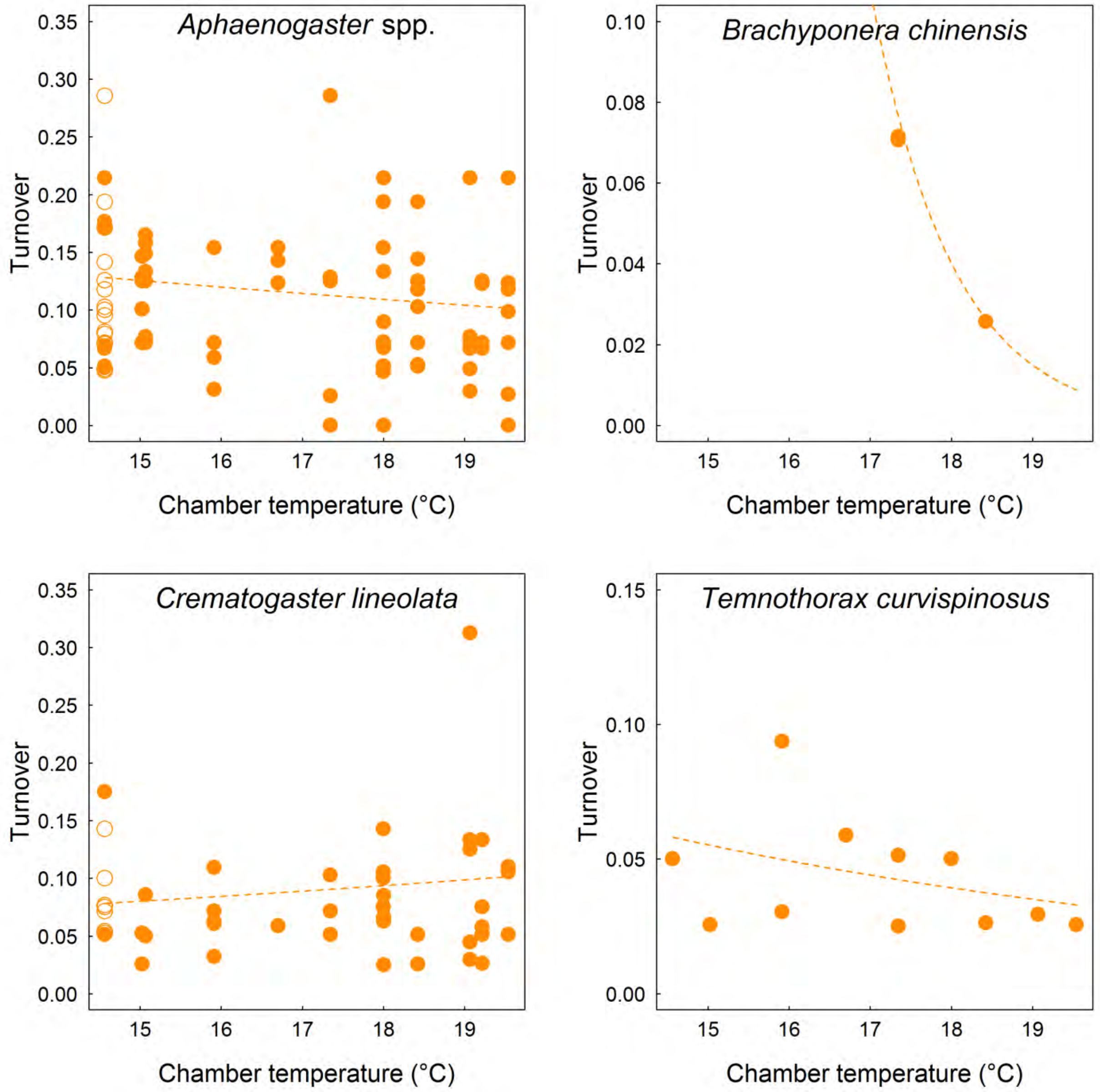

fig. S11. Mean proportion of nest boxes that turn over at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S3 for model coefficients and statistics.

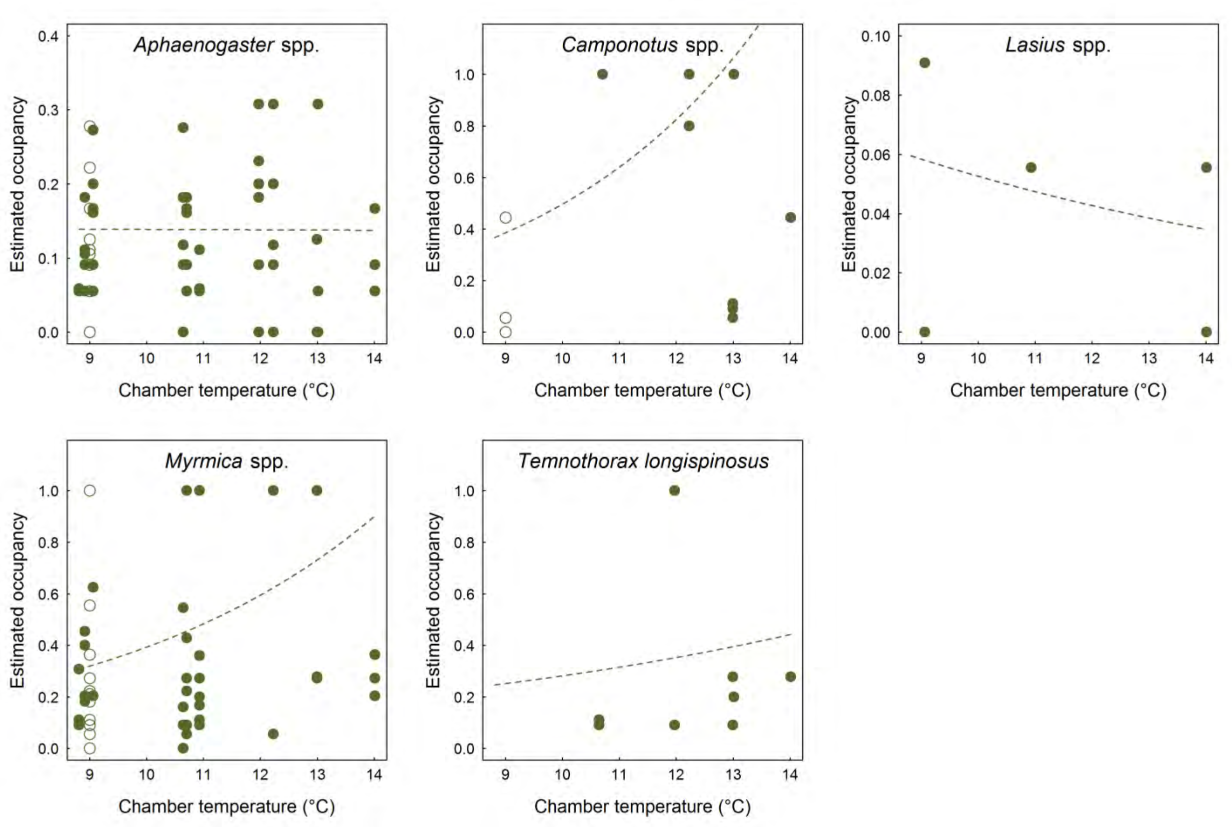

fig. S12. Mean proportion of nest boxes occupied at equilibrium using Levins' colonization-extinction formula at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S4 for model coefficients and statistics.

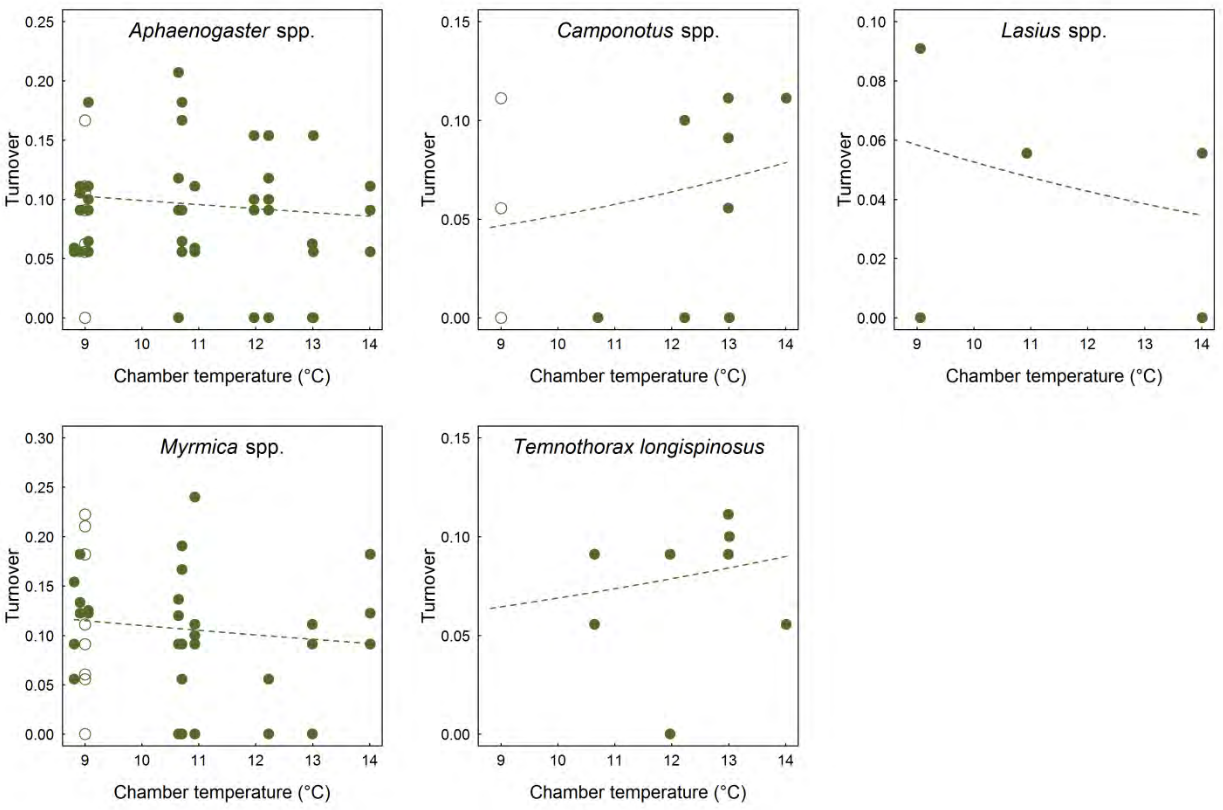

fig. S13. Mean proportion of nest boxes that turn over at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S4 for model coefficients and statistics.

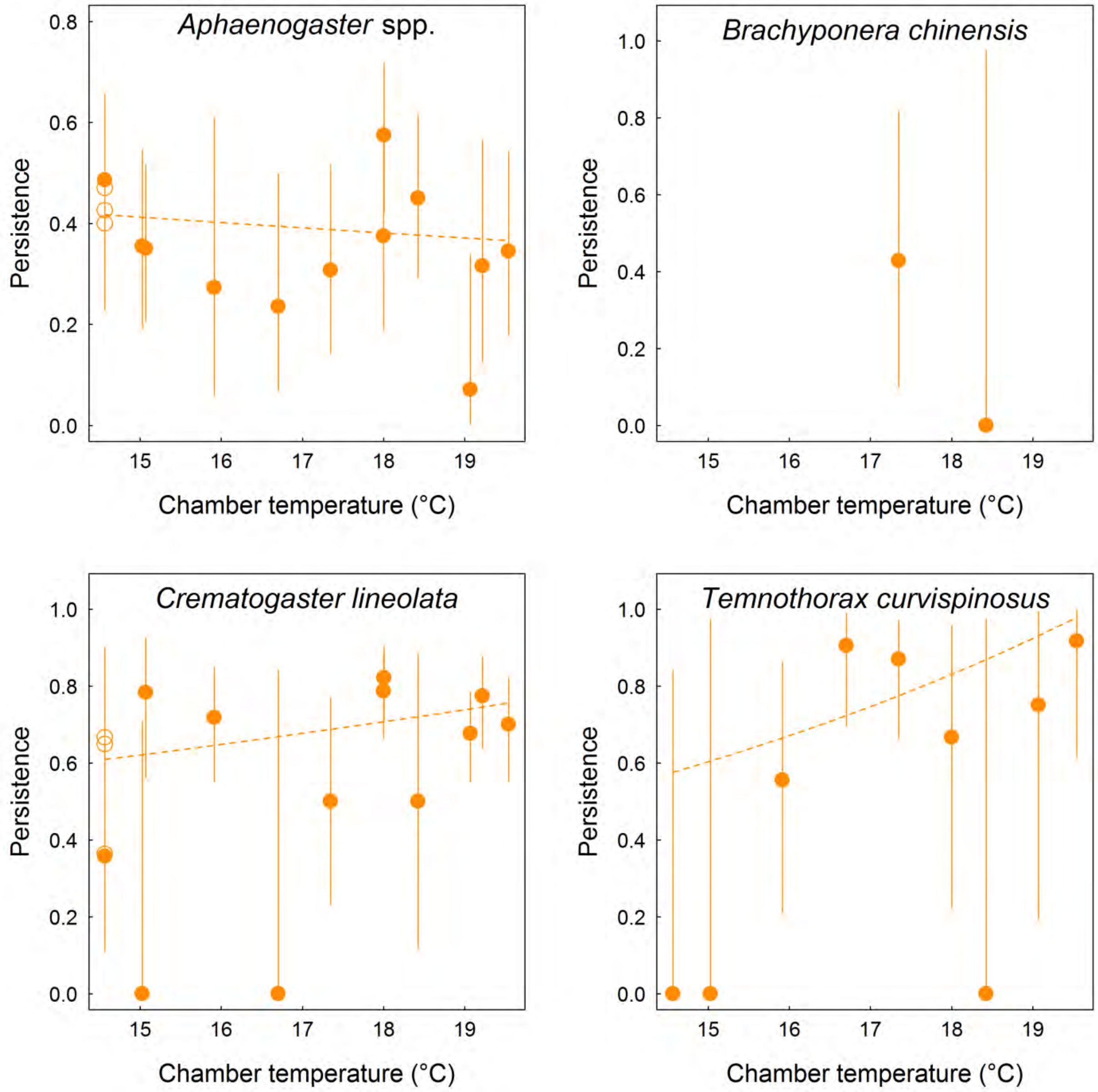

fig. S14. Mean proportion of nest boxes that persisted to the next census per chamber at Duke Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S3 for model coefficients and statistics.

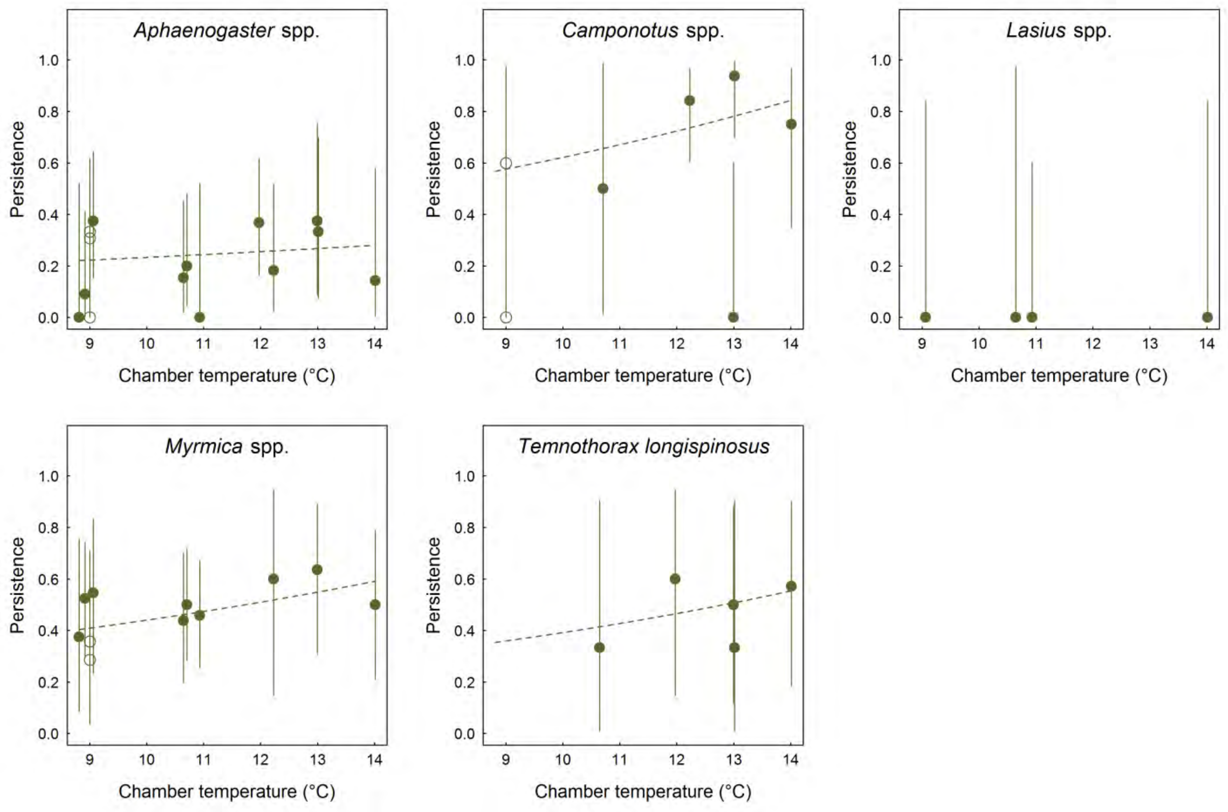

fig. S15. Mean proportion of nest boxes that persisted to the next census per chamber at Harvard Forest. Dashed lines indicate the fitted quasi-binomial generalized linear model: see table S4 for model coefficients and statistics.

table S1. Observed transitions in the nest boxes at Duke and Harvard forests. The number of transitions for a given state out of the total number of transitions for the transition matrices of each of the 15 chambers at each of the two sites.

Site	Chamber	Empty	Species 1	Species 2	Species 3	Species 4	Species 5
Duke Forest	1	211/320	42/320	0/320	67/320	0/320	NA
	2	289/320	27/320	0/320	3/320	1/320	NA
	3	237/320	12/320	0/320	67/320	4/320	NA
	4	286/320	11/320	0/320	2/320	21/320	NA
	5	272/320	32/320	0/320	14/320	2/320	NA
	6	265/320	8/320	0/320	38/320	9/320	NA
	7	254/320	23/320	6/320	14/320	23/320	NA
	8	250/320	17/320	0/320	53/320	0/320	NA
	9	234/320	24/320	0/320	50/320	12/320	NA
	10	276/320	36/320	1/320	6/320	1/320	NA
	11	260/320	37/320	0/320	23/320	0/320	NA
	12	235/320	18/320	0/320	61/320	6/320	NA
	13	260/320	49/320	0/320	11/320	0/320	NA
	14	280/320	28/320	0/320	12/320	0/320	NA
	15	257/320	26/320	0/320	37/320	0/320	NA
Harvard Forest	1	112/144	5/144	8/144	2/144	12/144	5/144
	2	118/144	6/144	4/144	0/144	10/144	6/144
	3	108/144	14/144	1/144	0/144	21/144	0/144
	4	117/144	15/144	0/144	2/144	10/144	0/144
	5	135/144	8/144	0/144	0/144	0/144	1/144
	6	116/144	7/144	0/144	0/144	21/144	0/144
	7	125/144	15/144	0/144	0/144	0/144	4/144
	8	116/144	11/144	0/144	0/144	14/144	3/144
	9	116/144	5/144	0/144	3/144	20/144	0/144
	10	120/144	7/144	15/144	0/144	0/144	2/144
	11	134/144	3/144	0/144	0/144	7/144	0/144
	12	112/144	10/144	18/144	0/144	4/144	0/144
	13	118/144	13/144	0/144	0/144	13/144	0/144
	14	118/144	10/144	10/144	0/144	6/144	0/144
	15	118/144	6/144	1/144	0/144	19/144	0/144

table S2. Models of species associations at Duke and Harvard forests. Slope estimates ± 1 S.E. from quasi-binomial generalized linear models for the chamber temperature and species association models. *F*-ratios and *P*-values indicate the statistical significance of chamber temperature (MAT) or species associations (abbreviated with the first letter of the genus and first letter of the species name).

Site	Relationship	Estimate	SE	***F***	***P***
Duke Forest	MAT → *Cl* Occupancy	0.257	0.0280	19.6	2.13e-05
	Bc → *Cl* Occupancy	−2.83	2.1	5.36	0.0224
	MAT → *As* Occupancy	−0.0581	0.0382	4.48	0.0364
	Cl → *As* Occupancy	−0.302	0.14	4.69	0.0324
	MAT → *As* Colonization	−0.0546	0.04	4.56	0.0348
	Cl → *As* Colonization	−0.411	0.145	8.03	0.00541
	MAT**Tc* → *Cl* Colonization				
	MAT → *Cl*	0.229	0.0677	8.04	0.00539
	Tc → *Cl*	9.16	3.91	0.149	0.7
	MAT**Tc* → *Cl*	−0.55	0.237	5.76	0.18
	MAT → *Cl* Extinction	−0.0999	0.0471	4.45	0.04
Harvard Forest	MAT → *Cs* Occupancy	0.296	0.144	10.7	0.00146
	Ms → *Cs* Occupancy	−2.03	0.843	9.23	0.00299
	MAT → *Ms* Occupancy	−0.123	0.0742	3.87	0.0518
	Cs → *Ms* Occupancy	−1.01	0.561	4.26	0.0415
	MAT → *Tl* Occupancy	0.741	0.18	24.3	2.91e-06
	MAT→ *As* Occupancy	−0.0838	0.0471	0.572	0.451
	Ms → *As* Occupancy	−0.608	0.171	13.1	0.000459
	MAT → *Ms* Colonization	−0.215	0.0864	5.78	0.0179
	As → *Ms* Colonization	−0.784	0.286	7.1	0.00888
	MAT → *Tl* Colonization	0.697	0.191	18.2	4.17e-05
	MAT → *As* Colonization	−0.109	0.0534	1.73	0.192
	Ms → *As* Colonization	−0.515	0.189	7.54	0.00708
	Cs → *As* Extinction	−0.235	0.115	4.22	0.0441

table S3. Models of temperature effects at Duke Forest. Slope estimates ± 1 S.E. from quasi-binomial generalized linear models for occupancy, colonization, extinction, persistence, equilibrium occupancy, and turnover as functions of chamber temperature at Duke Forest. *F*-ratios and *P*-values indicate the statistical significance of chamber temperature.

Response	**Species**	**Estimate**	**SE**	***F***	***P***
Occupancy	*Aphaenogaster* spp.	−0.0837	0.0354	5.69	0.0187
	Brachyponera chinensis	0.228	0.329	0.509	0.477
	Crematogaster lineolata	0.252	0.0599	18.9	2.99e-05
	Temnothorax curvispinosus	0.204	0.167	1.54	0.217
Colonization	*Aphaenogaster* spp.	−0.0892	0.0378	5.71	0.0185
	Brachyponera chinensis	0.254	0.324	0.655	0.42
	Crematogaster lineolata	0.18	0.0665	7.44	0.00735
	Temnothorax curvispinosus	0.0421	0.17	0.0612	0.805
Extinction	*Aphaenogaster* spp.	0.0167	0.0209	0.642	0.425
	Brachyponera chinensis	0.642	0.83	0.593	0.582
	Crematogaster lineolata	−0.0999	0.0471	4.45	0.04
	Temnothorax curvispinosus	−0.351	0.238	2.31	0.163
Persistence	*Aphaenogaster* spp.	−0.0281	0.0278	1.02	0.314
	Brachyponera chinensis	NA	NA	NA	NA
	Crematogaster lineolata	0.0435	0.0306	2.03	0.16
	Temnothorax curvispinosus	0.107	0.107	1	0.343
Equilibrium occupancy (Levins' model)	*Aphaenogaster* spp.	−0.0790	0.0489	2.64	0.108
	Brachyponera chinensis	−1.56	1.40	1.85	0.403
	Crematogaster lineolata	0.159	0.0704	5.29	0.0256
	Temnothorax curvispinosus	0.144	0.287	0.254	0.627
Turnover	*Aphaenogaster* spp.	−0.0468	0.0335	1.97	0.164
	Brachyponera chinensis	−0.988	0.0148	5510	0.008573
	Crematogaster lineolata	0.0521	0.0461	1.29	0.262
	Temnothorax curvispinosus	−0.114	0.0987	1.34	0.277

table S4. Models of temperature effects at Harvard Forest. Slope estimates ± 1 S.E. from quasi-binomial generalized linear models for occupancy, colonization, extinction, persistence, equilibrium occupancy, and turnover as functions of chamber temperature at Harvard Forest. *F*-ratios and *P*-values indicate the statistical significance of chamber temperature.

Response	**Species**	**Estimate**	**SE**	***F***	***P***
Occupancy	*Aphaenogaster* spp.	−0.0344	0.0471	0.538	0.465
	Camponotus spp.	0.431	0.167	7.46	0.00734
	Lasius spp.	0.135	0.167	0.645	0.424
	Myrmica spp.	−0.141	0.0737	3.82	0.0531
	Temnothorax longispinosus	0.741	0.18	24.3	2.91e-06
Colonization	*Aphaenogaster* spp.	−0.0674	0.0531	1.64	0.203
	Camponotus spp.	0.324	0.197	2.81	0.0964
	Lasius spp.	0.104	0.198	0.27	0.604
	Myrmica spp.	−0.2	0.086	5.83	0.0174
	Temnothorax longispinosus	0.697	0.191	18.2	4.17e-05
Extinction	*Aphaenogaster* spp.	−0.0225	0.0277	0.66	0.42
	Camponotus spp.	-0.184	0.194	0.879	0.371
	Lasius spp.	NA	NA	NA	NA
	Myrmica spp.	−0.0765	0.053	2.12	0.151
	Temnothorax longispinosus	−0.224	0.243	0.843	0.394
Persistence	*Aphaenogaster* spp.	0.0459	0.0671	0.466	0.497
	Camponotus spp.	0.0762	0.098	0.612	0.452
	Lasius spp.	NA	NA	NA	NA
	Myrmica spp.	0.0736	0.05	2.15	0.149
	Temnothorax longispinosus	0.0864	0.22	0.156	0.703
Equilibrium occupancy (Levins model)	*Aphaenogaster* spp.	−0.00190	0.0594	0.001	0.975
	Camponotus spp.	0.254	0.286	0.827	0.385
	Lasius spp.	−0.104	1.69	0.393	0.558
	Myrmica spp.	0.207	0.120	2.95	0.092
	Temnothorax longispinosus	0.113	0.542	0.0436	0.842
Turnover	*Aphaenogaster* spp.	−0.0358	0.0478	0.565	0.455
	Camponotus spp.	0.104	0.145	0.534	0.482
	Lasius spp.	−0.104	0.169	0.393	0.558
	Myrmica spp.	−0.0450	0.0704	0.418	0.521
	Temnothorax longispinosus	0.0667	0.178	0.142	0.72

table S5. Models of community-wide responses. Slope estimates ± 1 S.E. from generalized linear models using a quasi-binomial error structure to examine the main and interactive effects of mean annual temperature and site on community-wide occupancy, colonization, and extinction. *F*-ratios and *P*-values indicate the statistical significance of chamber temperature, site, and their interaction. The pseudo r^2 is calculated as 1 – (residual deviance/null deviance).

Response	**Term**	**Estimate**	**SE**	***F***	***P***	**Pseudo r^2**
Occupancy	MAT	0.0965	0.0267	18.1	3.04e-05	0.0767
	site	0.993	0.647	2.04	0.154	
	MAT*site	-0.0603	0.0497	1.48	0.225	
Colonization	MAT	0.0338	0.0348	0.0167	0.897	0.00646
	site	0.581	0.826	1.32	0.255	
	MAT*site	-0.0275	0.0639	0.186	0.667	
Extinction	MAT	-0.0834	0.0269	16.3	7.52e-05	0.0804
	site	-0.503	0.651	2.16	0.143	
	MAT*site	0.0208	0.0506	0.169	0.682	

table S6. Models of equilibrium frequency as functions of temperature. Slope estimates ± 1 S.E. from quasi-binomial generalized linear models for equilibrium frequency as a function of chamber temperature at Duke Forest and Harvard Forest. *F*-ratios and *P*-values indicate the statistical significance of chamber temperature.

Site	**Nest box state**	**Estimate**	**SE**	***F***	***P***
Duke Forest	Empty	−0.110	0.0473	5.47	0.036
	Aphaenogaster spp.	−0.0843	0.0633	1.8	0.203
	Brachyponera chinensis	NA	NA	NA	NA
	Crematogaster lineolata	0.272	0.106	7.05	0.0199
	Temnothorax curvispinosus	0.0800	0.215	0.14	0.72
Harvard Forest	Empty	−0.0612	0.0461	1.75	0.21
	Aphaenogaster spp.	−0.0407	0.0756	0.293	0.599
	Camponotus spp.	0.134	0.209	0.426	0.543
	Lasius spp.	−0.0596	0.367	0.0269	0.897
	Myrmica spp.	−0.0146	0.0932	0.0248	0.878
	Temnothorax longispinosus	0.397	0.181	5.39	0.103

table S7. Temperature dependence of individual transition probabilities. Slope estimates ± 1 S.E. from quasi-binomial generalized linear models for individual species and empty nest box state transition probabilities as a function of chamber temperature at Duke Forest and Harvard Forest. *F*-ratios and *P*-values indicate the statistical significance of chamber temperature.

Site	**Transition**	**Estimate**	**SE**	***F***	***P***
Duke Forest	Empty to Empty	−0.0395	0.0385	1.05	0.324
	Empty to *Aphaenogaster*	−0.0467	0.0525	0.797	0.388
	Empty to *Brachyponera*	NA	NA	NA	NA
	Empty to *Crematogaster*	0.188	0.0903	4.46	0.0545
	Empty to *Temnothorax*	−0.0192	0.113	0.0289	0.87
	Aphaenogaster to Empty	0.0435	0.0737	0.348	0.565
	Aphaenogaster to *Aphaenogaster*	−0.0845	0.0739	1.32	0.272
	Aphaenogaster to *Brachyponera*	NA	NA	NA	NA
	Aphaenogaster to *Crematogaster*	0.261	0.173	2.43	0.143
	Aphaenogaster to *Temnothorax*	4.64E-15	0.228	0	1
	Brachyponera to Empty	NA	NA	NA	NA
	Brachyponera to *Aphaenogaster*	NA	NA	NA	NA
	Brachyponera to *Brachyponera*	NA	NA	NA	NA
	Brachyponera to *Crematogaster*	NA	NA	NA	NA
	Brachyponera to *Temnothorax*	NA	NA	NA	NA
	Crematogaster to Empty	−0.0936	0.152	0.38	0.548
	Crematogaster to *Aphaenogaster*	−0.444	0.179	7.78	0.0153
	Crematogaster to *Brachyponera*	NA	NA	NA	NA
	Crematogaster to *Crematogaster*	0.216	0.153	2.06	0.175
	Crematogaster to *Temnothorax*	−1.47	0.552	19.5	0.00309
	Temnothorax to Empty	−0.0886	0.41	0.0467	0.835
	Temnothorax to *Aphaenogaster*	−1.35	0.933	4.55	0.0705
	Temnothorax to *Brachyponera*	NA	NA	NA	NA
	Temnothorax to *Crematogaster*	−0.205	0.505	0.167	0.695
	Temnothorax to *Temnothorax*	0.573	0.376	2.76	0.14
Harvard Forest	Empty to Empty	−0.00984	0.0526	0.00042	0.855
	Empty to *Aphaenogaster*	−0.0184	0.0699	0.000748	0.796
	Empty to *Camponotus*	0.225	0.227	0.0118	0.347
	Empty to *Lasius*	−0.0339	0.277	0.000201	0.922
	Empty to *Myrmica*	−0.0279	0.103	0.00127	0.79
	Empty to *Temnothorax*	−0.0739	0.156	0.000603	0.67
	Aphaenogaster to Empty	0.0622	0.157	0.0397	0.697
	Aphaenogaster to *Aphaenogaster*	0.159	0.145	0.211	0.294
	Aphaenogaster to *Camponotus*	−0.0324	0.235	0.00145	0.896
	Aphaenogaster to *Lasius*	2.72E-15	0.49	0	1
	Aphaenogaster to *Myrmica*	−1	0.755	1.29	0.0741
	Aphaenogaster to *Temnothorax*	−7.49E-15	0.506	0	1

Camponotus to Empty	−0.235	0.406	0.313	0.583
Camponotus to *Aphaenogaster*	−0.448	0.299	0.25	0.165
Camponotus to *Camponotus*	0.319	0.352	0.568	0.391
Camponotus to *Lasius*	NA	NA	NA	NA
Camponotus to *Myrmica*	−0.177	0.605	0.0179	0.78
Camponotus to *Temnothorax*	1.72	1.21	0.115	0.372
Lasius to Empty	0.723	0.318	0.765	0.211
Lasius to *Aphaenogaster*	2.72E-15	0.49	0	1
Lasius to *Camponotus*	NA	NA	NA	NA
Lasius to *Lasius*	2.72E-15	0.49	0	1
Lasius to *Myrmica*	−0.723	0.318	0.765	0.211
Lasius to *Temnothorax*	NA	NA	NA	NA
Myrmica to Empty	−0.139	0.0746	0.162	0.0887
Myrmica to *Aphaenogaster*	−0.383	0.229	0.172	0.0854
Myrmica to *Camponotus*	NA	NA	NA	NA
Myrmica to *Lasius*	−0.102	0.726	0.00204	0.909
Myrmica to *Myrmica*	0.182	0.0777	0.289	0.0388
Myrmica to *Temnothorax*	19.8	0.982	0.188	2.98E-05
Temnothorax to Empty	−0.459	0.27	0.316	0.179
Temnothorax to *Aphaenogaster*	−7.49E-15	0.506	0	1
Temnothorax to *Camponotus*	−1.48E-14	2.1	0	1
Temnothorax to *Lasius*	NA	NA	NA	NA
Temnothorax to *Myrmica*	0.262	1.15	0.0186	0.851
Temnothorax to *Temnothorax*	0.397	0.296	0.243	0.264

table S8. Transition matrix correlates of community stability. Spearman's rank correlations between damping ratio and transition matrix attributes for Duke Forest and Harvard Forest.

Site	Attribute	***r*S**	***P***
Duke Forest	Sample size	NA (all chambers had the same total number of samples)	
	Sample size without empty class	−0.379	0.164
	Disturbance	0.486	0.0662
	Disturbance without empty class	−0.0663	0.815
	Evenness	0.496	0.0623
	Evenness without empty class	0.0357	0.903
	Resistance	0.0680	0.810
	Resistance without empty class	−0.626	0.0125
	Return time	−0.929	< 0.0001
Harvard Forest	Sample size	NA (all chambers had the same total number of samples)	
	Sample size without empty class	0.113	0.701
	Disturbance	0.0334	0.910
	Disturbance without empty class	0.464	0.0947
	Evenness	0.266	0.357
	Evenness without empty class	0.125	0.669
	Resistance	−0.554	0.0401
	Resistance without empty class	−0.730	0.00307
	Return time	−0.777	0.00109