Oikos

OIK-05874

Just, M. G., Dale, A. G., Long, L. C. and Frank, S. D. 2019. Urbanization drives unique latitudinal patterns of insect herbivory and tree condition. - Oikos doi: 10.1111/oik.05874

Supplementary material

Appendix 1

Table A1. Tree condition classification and was determined by the degree of branch dieback, leaf condition, and other factors as described in Dale and Frank (2014).

Tree condition	Tree characteristics
Good	Strong main leader(s); no or minimal dead branches; no visible external injuries; dense canopies
Poor	Broken, weak, or damaged main leader(s); exposed roots; major injuries; numerous dead branches; sparse canopies and/or wilting, discolored, or scorched leaves as compared to trees classified as being in Good condition

Dale, A. G. and Frank, S. D. 2014. The effects of urban warming on herbivore abundance and street tree condition. - PLoS One 9: e102996.

Table A2. Results (parameter estimates) of modeling (binomial logistic regression) *Acer rubrum* condition as a function of latitudinal temperature, herbivore abundance, impervious surface (Imp20), and their interactions. A separate model was evaluated for each temperature variable (Winter: mean minimum winter temperature (December, January, February); Summer: mean maximum summer temperature (June, July, August); DiffTemp: difference between Winter and Summer).

model	term	estimate	SE	z	p
Temperature Difference	(Intercept)	2.709	8.281	0.327	0.744
	Imp20	0.073	0.196	0.374	0.708
	Herbivory	-32.108	25.81	-1.244	0.213
	DiffTemp	-0.202	0.28	-0.721	0.471
	DBH	-0.006	0.014	-0.394	0.694
	Imp20:DiffTemp	0.001	0.007	0.088	0.93
	Herbivory:DiffTemp	1.036	0.822	1.26	0.208
	Imp:Herbivory	0.556	0.592	0.939	0.348
	Imp:Herbivory:DTemp	-0.017	0.019	-0.911	0.362
Winter	(Intercept)	-3.361	0.855	-3.932	0
	Imp20	0.089	0.017	5.377	0
	Herbivory	-0.428	1.335	-0.32	0.749
	Winter	0.107	0.181	0.59	0.555
	DBH	-0.005	0.014	-0.349	0.727
	Imp20:Winter	0	0.004	-0.094	0.925
	Herbivory:Winter	-0.715	0.536	-1.333	0.183
	Imp20:Herbivory	0.029	0.032	0.906	0.365
	Imp20:Herbivory:Winter	0.012	0.012	0.979	0.327
Summer	(Intercept)	-7.737	13.713	-0.564	0.573
	Imp20	0.114	0.311	0.365	0.715
	Herbivory	52.445	37.25	1.408	0.159
	Summer	0.147	0.446	0.328	0.743
	DBH	-0.005	0.014	-0.329	0.742
	Imp20:Summer	-0.001	0.01	-0.085	0.933
	Herbivory:Summer	-1.721	1.229	-1.399	0.162
	Imp20:Herbivory	-0.794	0.769	-1.032	0.302
	Imp20:Herbivory:Summer	0.027	0.025	1.055	0.292

Table A3. Results (parameter estimates) of modeling (binomial logistic regression) *Acer rubrum* condition as a function of latitudinal temperature, herbivore abundance, impervious surface (Imp125), and their interactions. A separate model was evaluated for each temperature variable (Winter: mean minimum winter temperature (December, January, February); Summer: mean maximum summer temperature (June, July, August); DiffTemp: difference between Winter and Summer).

Model	term	estimate	SE	*z*	p
Temperature Difference	(Intercept)	-0.567	4.77	-0.119	0.905
	Imp125	0.078	0.136	0.572	0.567
	Herbivory	-1.33	9.17	-0.145	0.885
	DiffTemp	-0.018	0.159	-0.116	0.908
	DBH	-0.003	0.012	-0.263	0.793
	Imp125:DiffTemp	-0.001	0.005	-0.203	0.839
	Herbivory:DiffTemp	0.08	0.296	0.27	0.787
	Imp125:Herbivory	0.048	0.282	0.17	0.865
	Imp125:Herbivory:DiffTemp	-0.002	0.009	-0.178	0.859
Winter	(Intercept)	-1.171	0.553	-2.115	0.034
	Imp125	0.051	0.011	4.533	0
	Herbivory	1.168	0.543	2.153	0.031
	Winter	0.024	0.104	0.228	0.82
	DBH	-0.003	0.012	-0.257	0.797
	Imp125:Winter	0.001	0.003	0.18	0.857
	Herbivory:Winter	-0.02	0.199	-0.101	0.919
	Imp125:Herbivory	-0.003	0.015	-0.191	0.849
	Imp125:Herbivory:Winter	-0.001	0.006	-0.096	0.924
Summer	(Intercept)	-4.09	7.973	-0.513	0.608
	Imp125	0.033	0.217	0.153	0.879
	Herbivory	-2.575	16.893	-0.152	0.879
	Summer	0.095	0.258	0.368	0.713
	DBH	-0.003	0.012	-0.281	0.778
	Imp125:Summer	0.001	0.007	0.089	0.929
	Herbivory:Summer	0.122	0.55	0.223	0.824
	Imp125:Herbivory	0.263	0.503	0.524	0.601
	Imp125:Herbivory:Summer	-0.009	0.016	-0.531	0.595

Table A4. Herbivore abundance ($log_{10}[x+1]$) as a linear function of human population (model: Herbivory). Tree condition ($log_{10}[x+1]$) as a binomial generalized linear function of human population

		overall model						
Model	n	adj. R^2	AIC	term	estimate	SE	*t*	p
Herbivory	263	-0.003	621.6	intercept	0.71	0.10	7.10	<0.001
				human population	-0.00	0.00	-0.48	0.635
		marginal R^2	AIC	term	estimate	SE	*z*	p
Tree Condition	263	0.029	301.4	intercept	1.63	0.30	5.40	<0.001
				human population	-0.00	0.00	-2.31	0.021

Human population is the total human population from the census tract in which a study tree was located (population data is from the U.S. Census Bureau (2018). Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml)

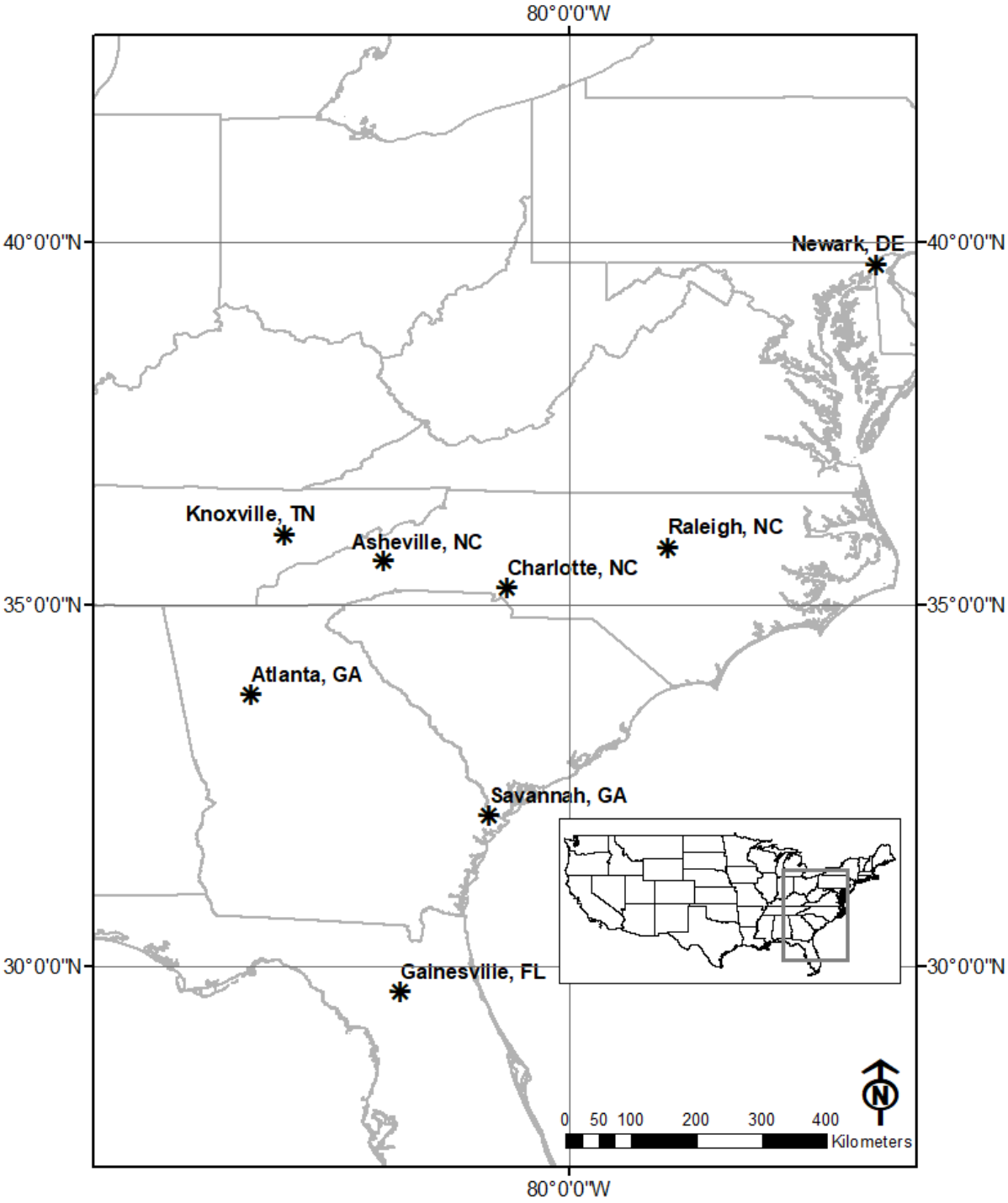

Figure A1. Map displaying the relative location of study cities.

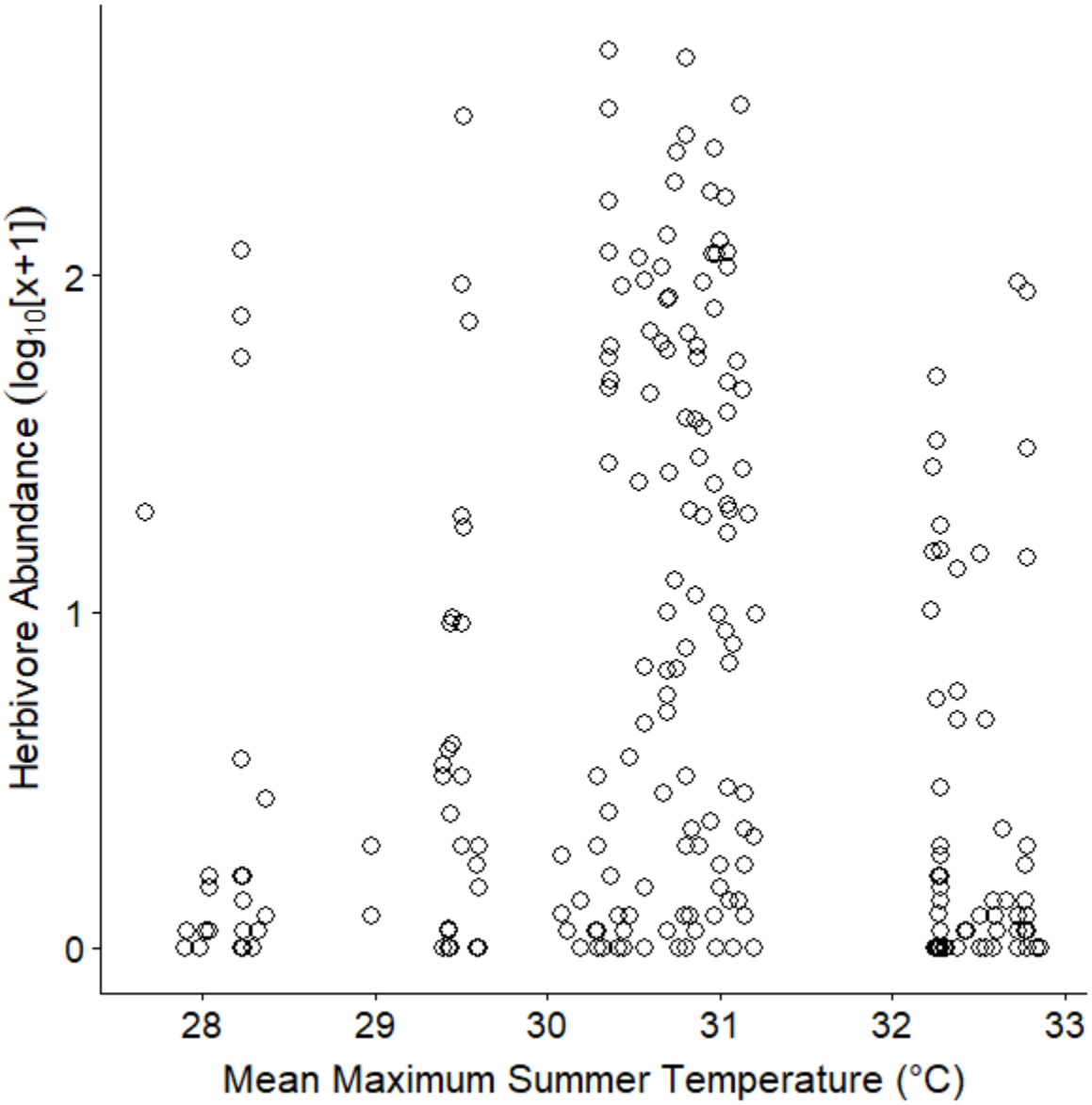

Figure A2. Scatterplot of study tree herbivore abundance by mean maximum summer temperate (°C) of the location of the tree.

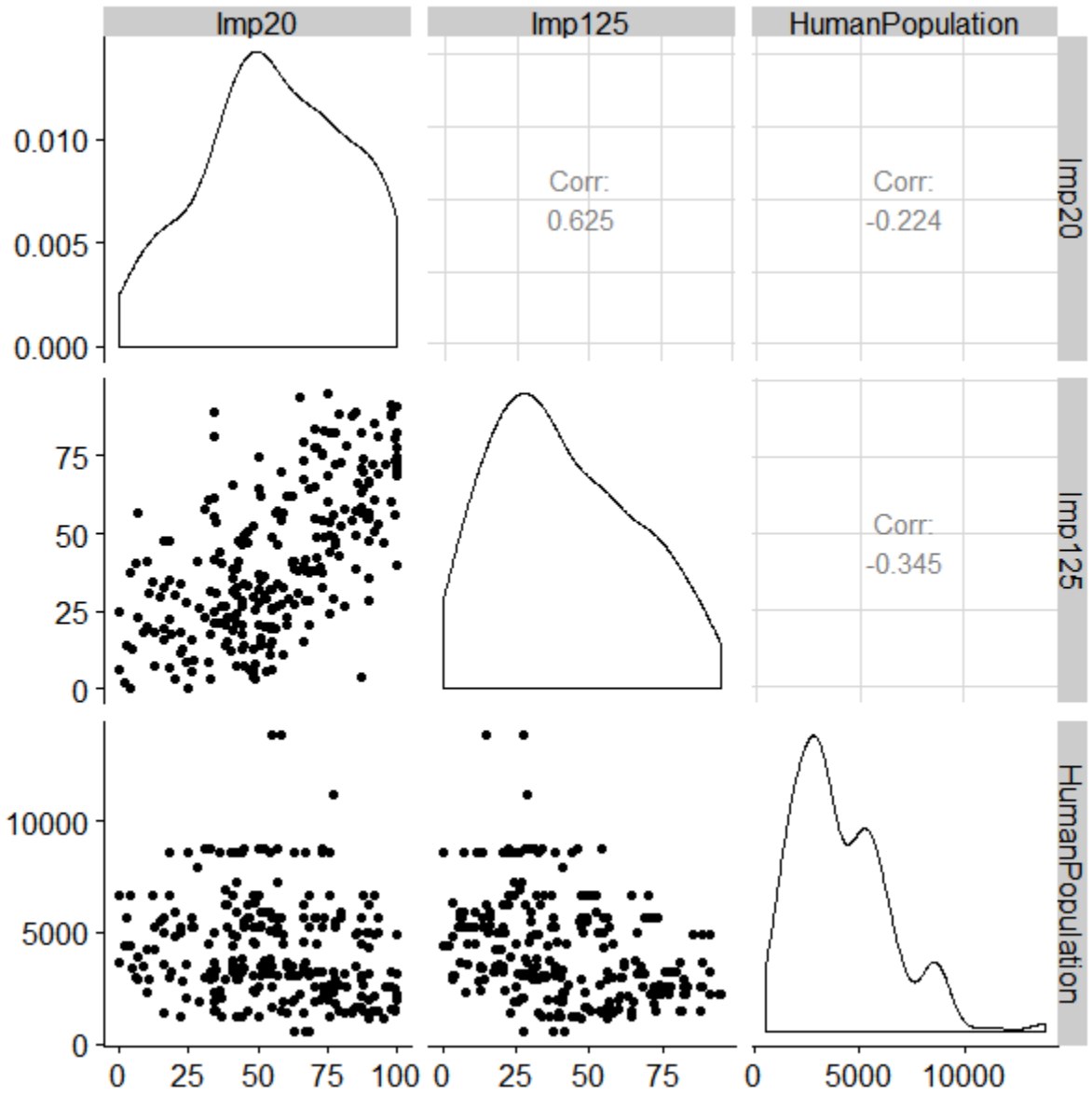

Figure A3. Scatterplots and Pearson's correlation statistic (ρ) values (Corr) between parings of Imp20, Imp125, and Human Population. Density plots (on the diagonal) are also presented for each term. Human population is the total human population from the census tract in which a study tree was located. Human population data is from the U.S. Census Bureau (2018). Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml