

SUPPORTING INFORMATION

Geographical variation in ant foraging activity and resource use is driven by climate and net primary productivity

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Appendix S1 – Figures

Comparison of WorldClim estimates of climate to nearest climatic station (NCS) weather data

We extracted weather data from the nearest climatic station (NCS) to each of our sites to understand whether our sampling periods experienced extreme weather, and how NCS data relates to WorldClim data. To do this, we obtained monthly average historical NCS data based on hourly measures from the Instituto Nacional de Meteorologia (<https://portal.inmet.gov.br/>) from 1970 to the present. WorldClim contains annual estimates of temperature and precipitation based on monthly averages from 1970-2000. We calculated analogous annual measures from NCS based on their monthly averages. Thus, we obtained NCS variables that corresponded with WorldClim variables: NCS mean annual temperature (C°), NCS annual precipitation (mm), NCS temperature seasonality (standard deviation of mean annual temperature), NCS precipitation seasonality (coefficient of variation of annual precipitation). We also obtained the NCS monthly mean temperature (°C), and NCS monthly precipitation for the exact month/year we carried out the sampling in each biome. In addition, we obtained the NCS temperature average for the hours of the specific sampling days and specific periods that we sampled (morning for all biomes except Caatinga which was afternoon, see Table S2.1 in Appendix 2). The range of sampling days varied from five to nine days, depending on the biome. Across a range of temperature and precipitation metrics, the time periods in which we sampled were not extreme relative to the past ~50 years (Fig. S1.1 in Appendix 1, Table S2.1 in Appendix 2).

Using Generalized Linear Models we also compared these NCS data to WorldClim estimates taken from the same locations and months. These measures were highly correlated, despite some over and underestimation at the extremes; for most relationships the 95% CI intercept did not differ from zero and the 95% CI slope did not differ from one (Fig. S1.2 in Appendix 1). Therefore, the weather during our sampling was typical relative to the variability experienced over the past 50 years, and WorldClim climate estimates closely match the NCS data. Further, WorldClim data are available for the precise locations of our sites, whereas NCS data is not. Consequently, we opt to use WorldClim data in our analyses as a good representation of both local weather during sampling and long term climatic trends and because WorldClim provides better spatial cover of the sampling sites.

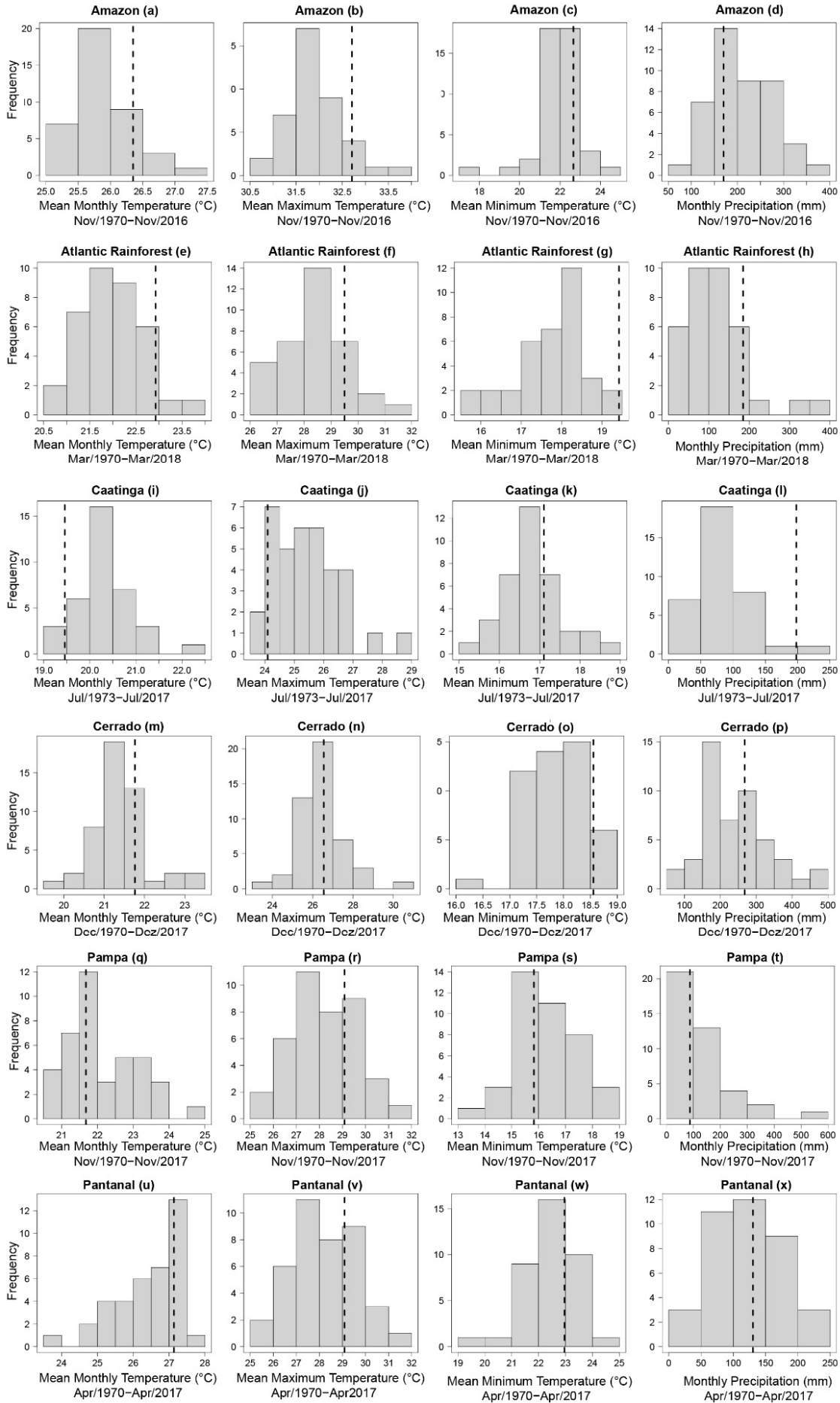


Figure S1.1. Histogram representing the nearest climatic station (NCS) historical data that was obtained based on hourly measures Instituto Nacional de Meteorologia (<https://portal.inmet.gov.br/>). Here we demonstrate NCS data of mean monthly temperature, mean maximum temperature, mean minimum temperature and monthly precipitation. Barr's sizes indicate the frequency of a given data for each month, referring to the month of samples in the biomes, from the years of 1970 (when available) to the exact month/year we carried our samples (vertical dashed lines). Amazon (a), (b), (c) and (d); Atlantic Rainforest, (e), (f), (g) and (h); Caatinga, (i), (j), (k) and (l); Cerrado (m), (n), (o) and (p); Pampa (q), (r), (s) and (t); Pantanal (u), (v), (w) and (x).

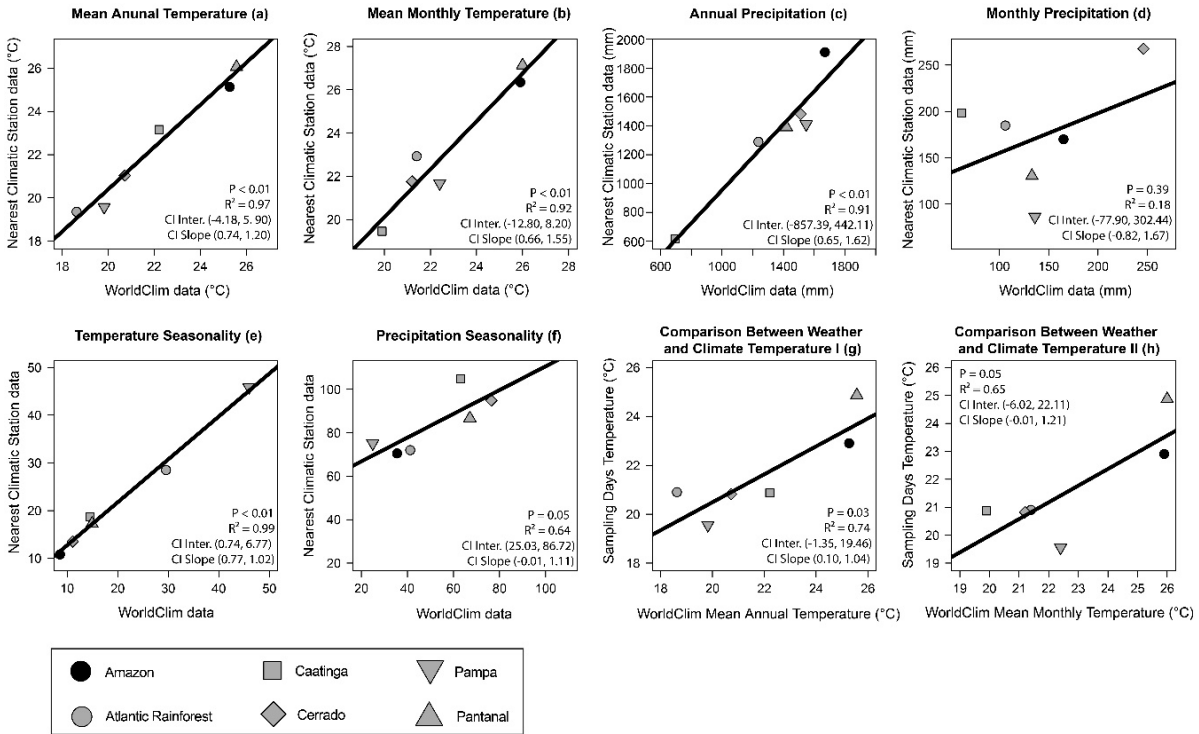


Figure S1.2. Generalized linear model (GLM) results relating climatic variables from the nearest climatic station (NCS) with the corresponding climatic variables from WorldClim 2 (Fick & Hijmans, 2017) for each of the six Brazilian biomes in which we sampled ants. Data from NCS were obtained in Instituto Nacional de Meteorologia (<https://portal.inmet.gov.br/>) from 1970 to the months the ant sampling was carried out. WorldClim 2 interpolation data were based on monthly measures from 1970 to 2000. Models were constructed for (a) mean annual temperature, (b) mean monthly temperature, (c) annual precipitation, (d) monthly precipitation, (e) temperature seasonality and (f) precipitation seasonality. Note that in (b) and (d), monthly NCS measures are the exact month and year that we sampled in each biome. We also compared the sampling days temperature from NCS, which is the mean hourly temperature for the sampling period, with WorldClim mean annual temperature (g) and mean monthly temperature (h). In each graph, we also present the P value, the coefficient of determination (R^2) and the 95 % confidence intervals of the intercepts (CI Inter.) and of the slopes (CI Slope) of the models.

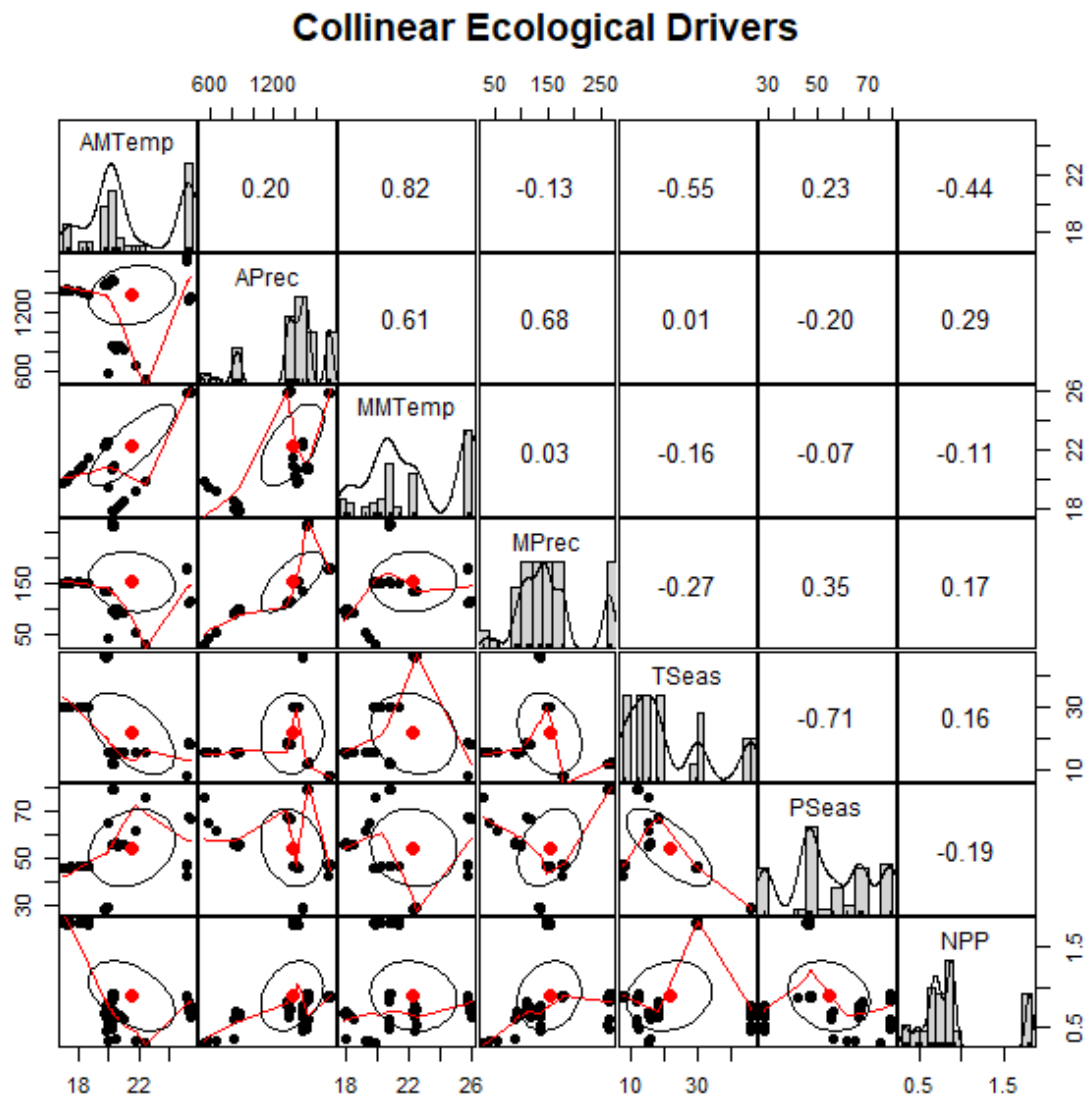


Figure S1.3. Collinearity between ecological drivers. AMTemp = annual mean temperature; APrec = annual precipitation; MMTemp = mean monthly temperature, MPrec = monthly precipitation; TSeas = temperature seasonality, PSeas = precipitation seasonality; NPP = net primary productivity.

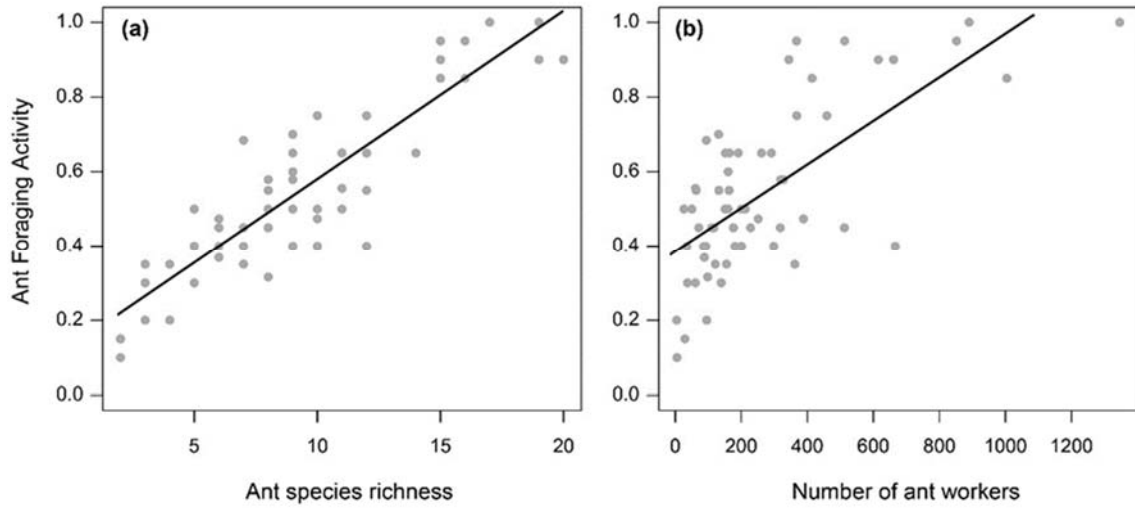


Figure S1.4. Relationships between the ant foraging activity (proportional occurrence of foraging ants) and (a) ant species richness and (b) number of ant workers across 60 transects in six biomes in Brazil ($n = 60$). Points show the mean proportions of visited tubes per transect and black lines represent significant relationships.

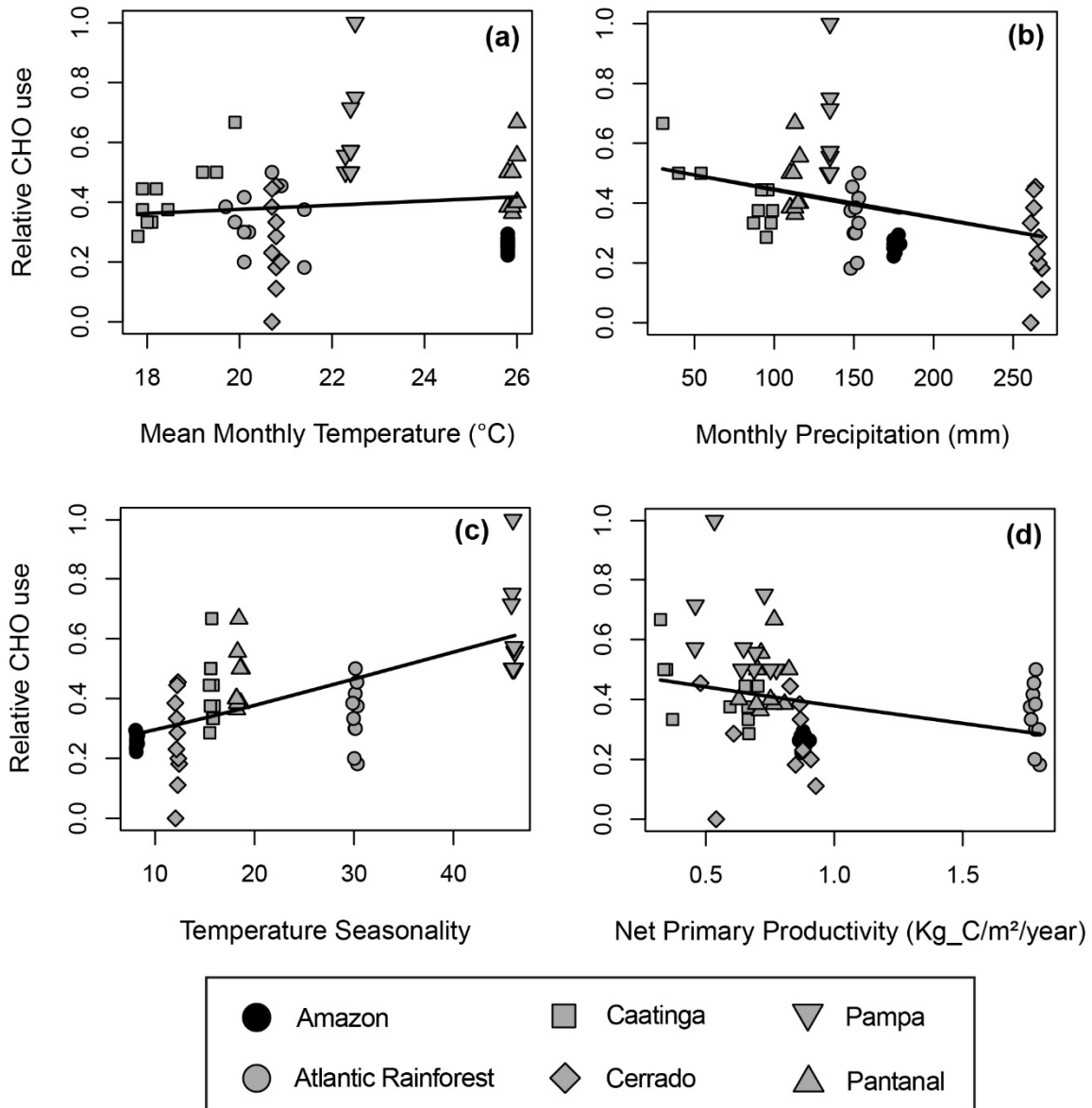


Figure S1.5. Relationship between relative use of sugar (CHO), and ecological drivers in the best models ($\Delta AICc < 2$): (a) mean monthly temperature, (b) monthly precipitation; (c) temperature seasonality (as a proxy for climatic stability) and (d) net primary productivity (NPP) across 60 transects in six biomes in Brazil. Points show the relative sugar use per transect and black lines represent relationships with ecological drivers. Lines are model predictions back transformed into the original variable scale based only in the fixed effects for best visualization.

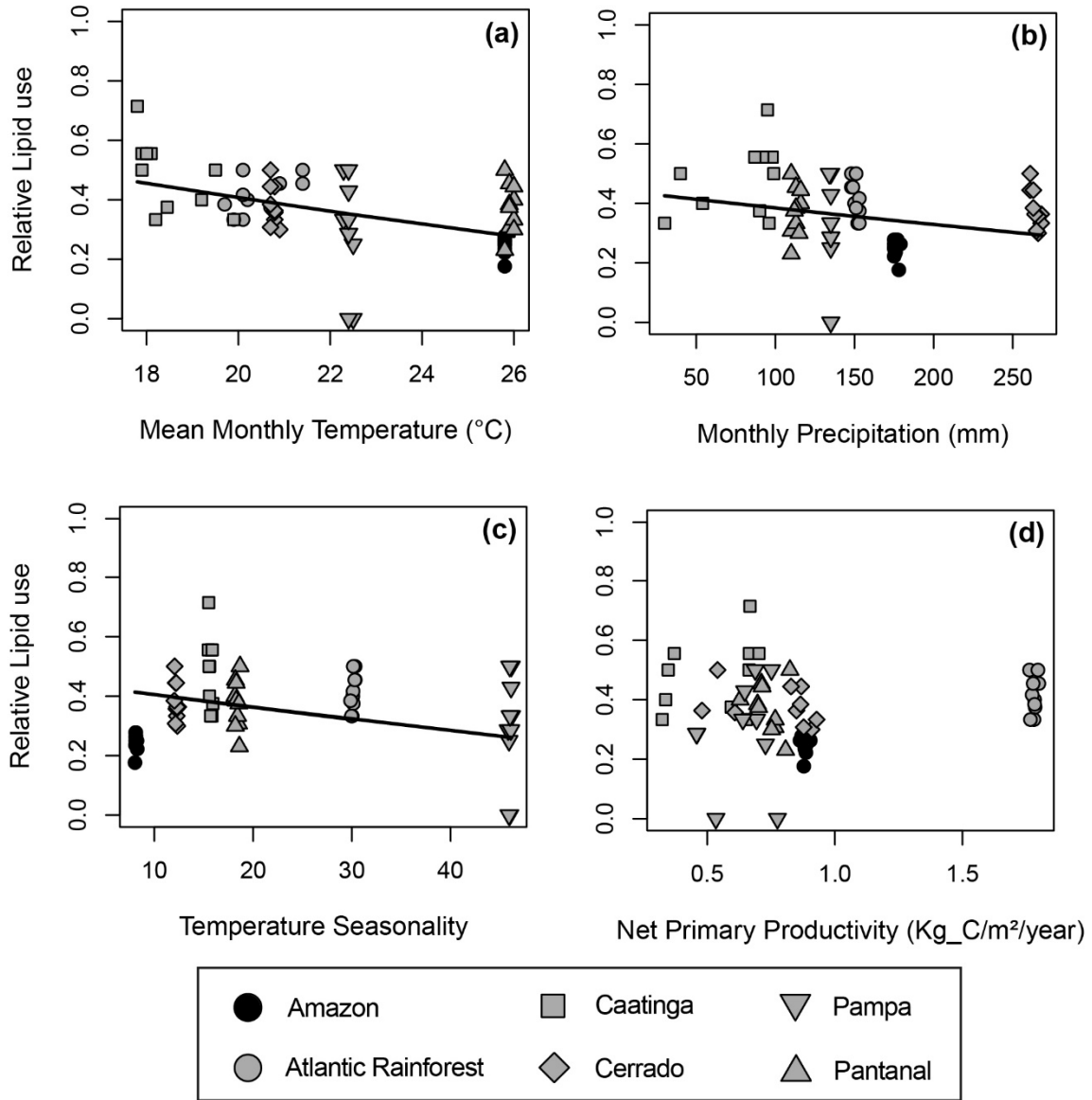


Figure S1.6. Relationship between relative use of lipids and ecological drivers in the best models ($\Delta AICc < 2$): (a) mean monthly temperature, (b) monthly precipitation, (c) temperature seasonality and (d) net primary productivity (NPP) across 60 transects in six biomes in Brazil. Points show the relative lipids use per transect and black lines represent relationships with ecological drivers. Lines are model predictions back transformed into the original variable scale based only in the fixed effects for best visualization.

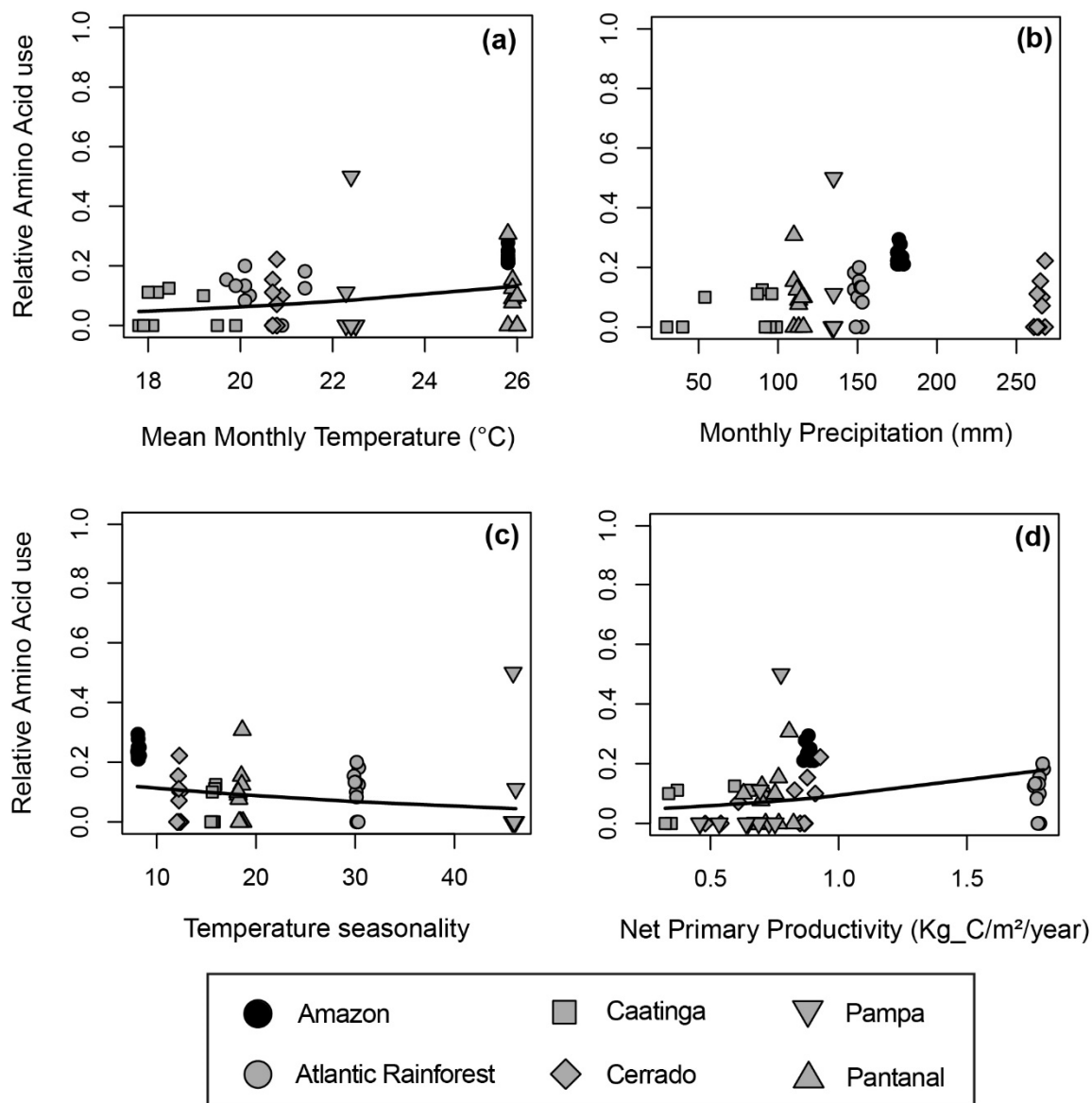


Figure S1.7. Relationship between relative use of amino acid and ecological drivers in the best models ($\Delta AIC_c < 2$): (a) mean monthly temperature, (b) monthly precipitation, (c) temperature seasonality and (d) net primary productivity across 60 transects in six biomes in Brazil. Points show the relative lipids use per transect and black lines represent relationships with ecological drivers. Lines are model predictions back transformed into the original variable scale based only in the fixed effects for best visualization.

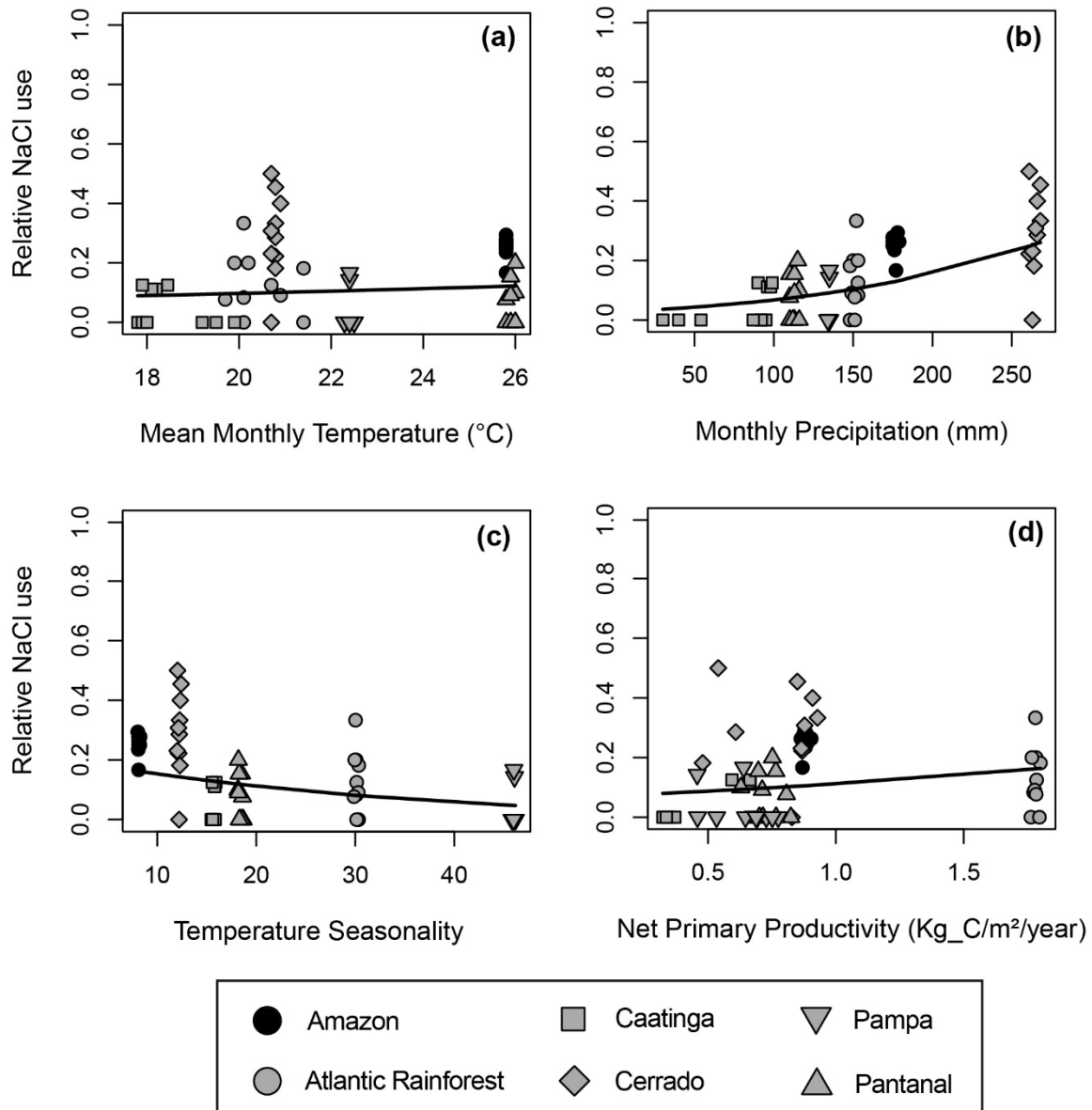


Figure S1.8. Relationship between relative use of sodium (NaCl) and ecological drivers in the best models ($\Delta AICc < 2$): (a) mean monthly temperature and (b) monthly precipitation, (c) temperature seasonality and (d) net primary productivity across 60 transects in six biomes in Brazil. Points show the relative sodium use per transect and black lines represent relationships with ecological drivers. Lines are model predictions back transformed into the original variable scale based only in the fixed effects for best visualization.