Residence time, a master variable of ecology, physiology, and natural selection

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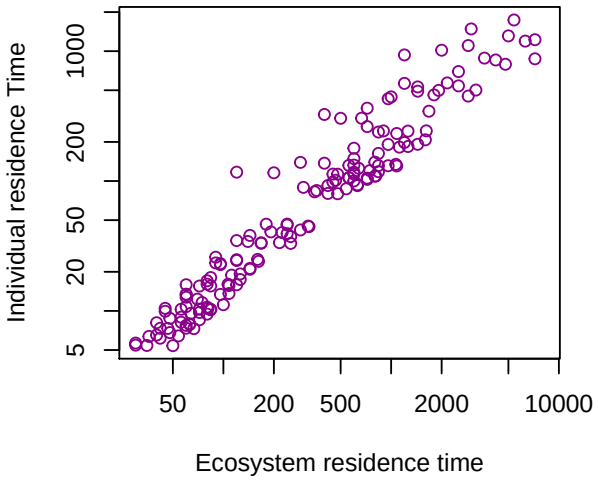
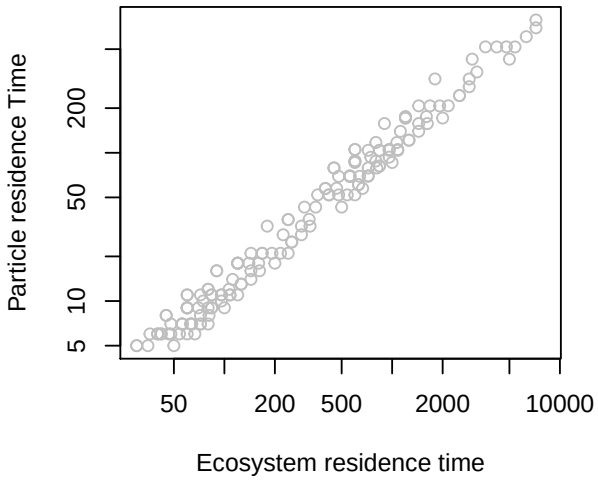
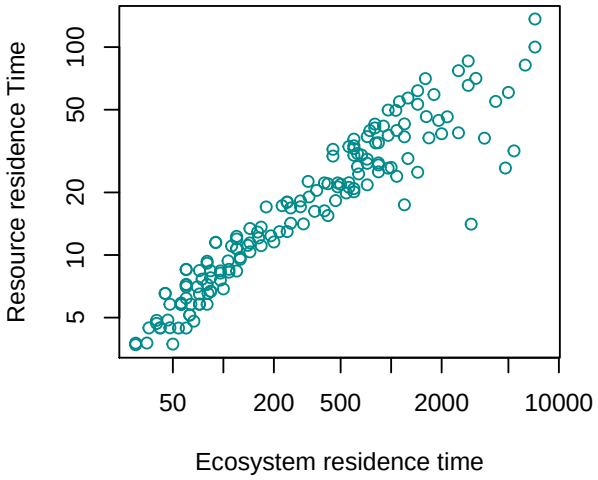
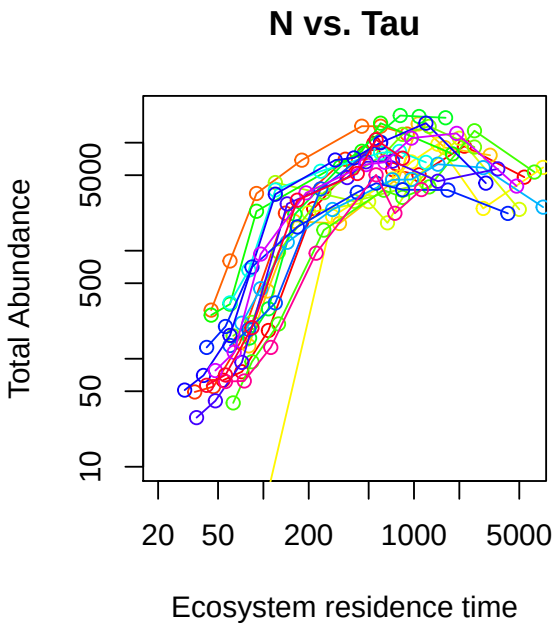
We expected mean residence times for individuals, inert tracers, and resource particles to reflect ecosystem residence time.

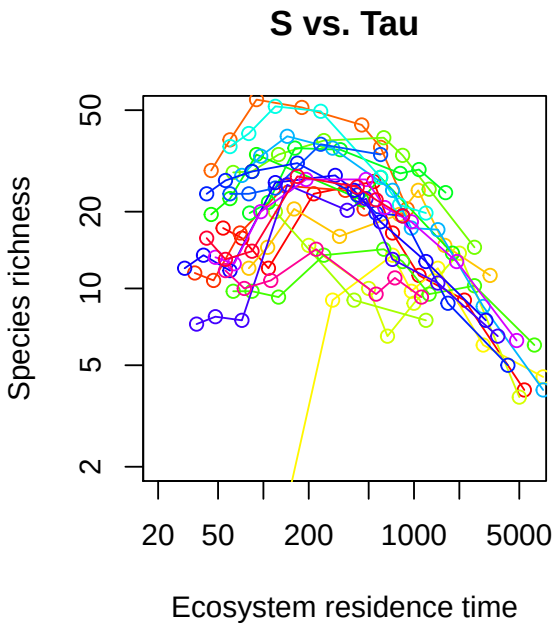




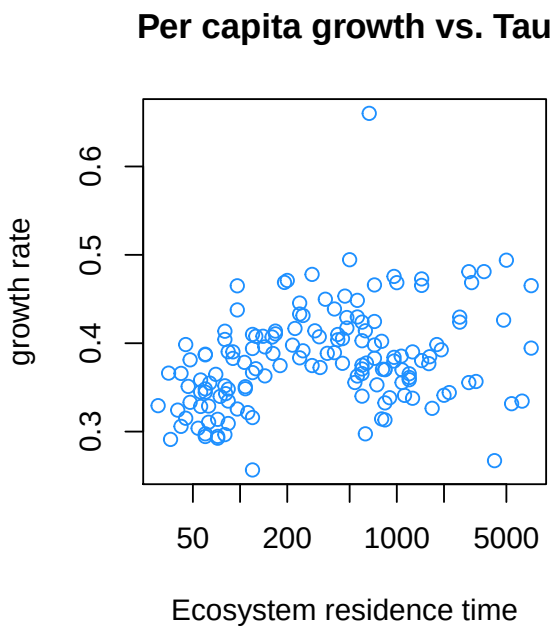


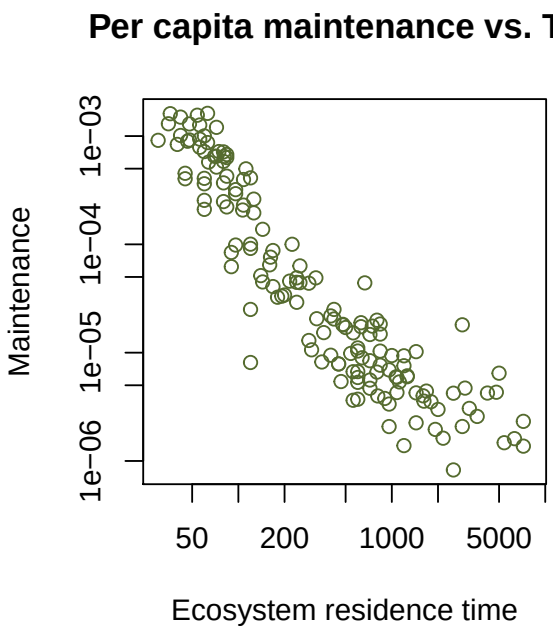
We hypothesized that total abundance (N) and species richness (S) shared humped-shaped relationshiped with residence time, reflecting chemostat theory.



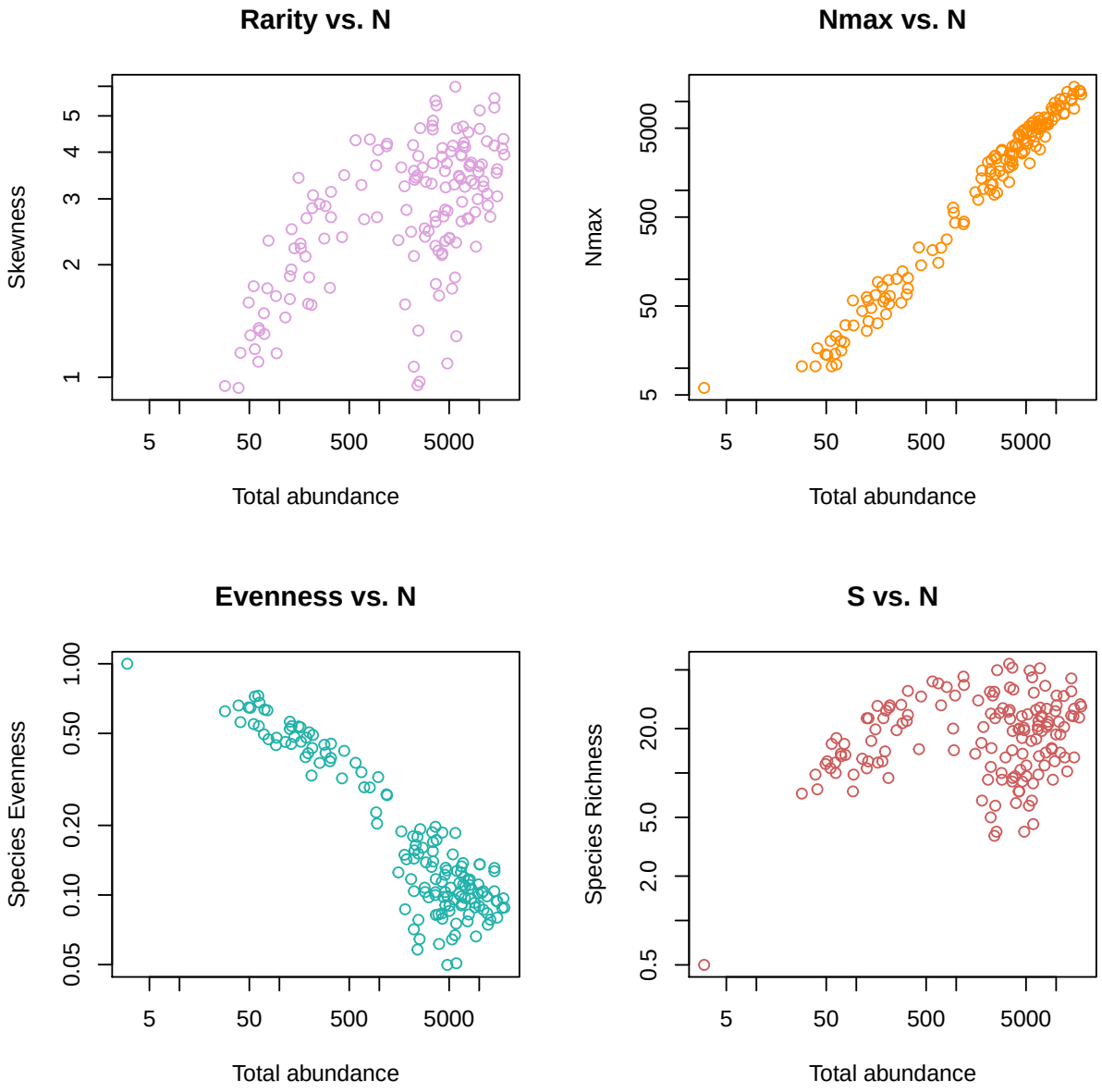


We expected lower maintenance requirements at higher residence times, where individuals could grow quickly, scrambling to consume available resources, or have an overall slow life history.

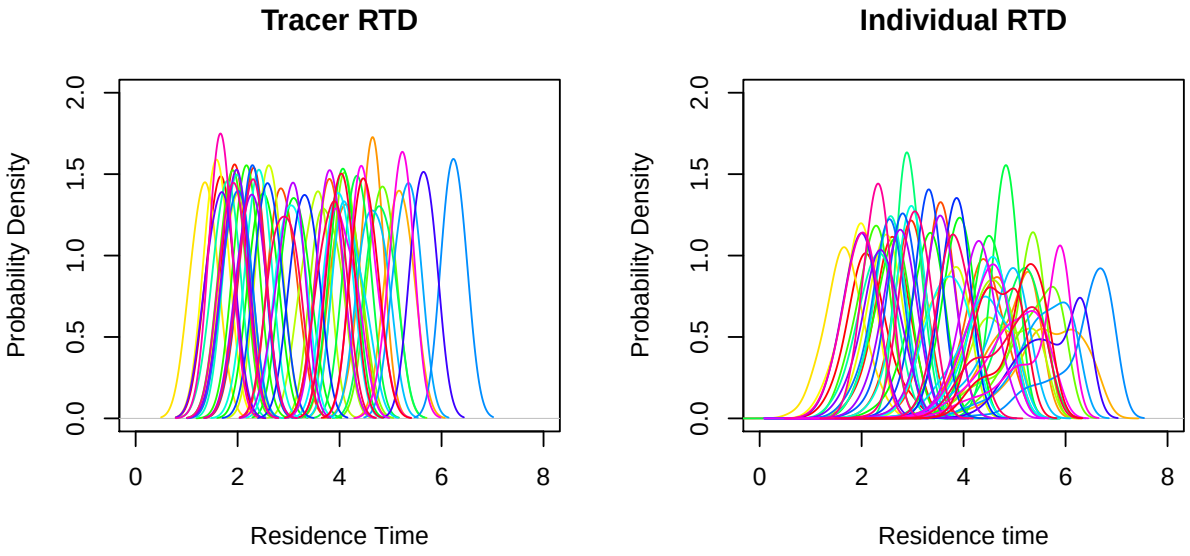




We hypothesized that aspects of diversity would be related to total abundance (N), reflecting the feasible set and the influence of residence time.



We hypothesized that, as often observed for tracers in real systems, residence time distributions (RTDs) for individuals and resource particles would be lognormal-like curves, which appear normal or left-skewed on a log x-axis. Colors correspond across plots.



Increasing ecosystem residence time shifts the mean of the RTD to higher average values (older individuals). But, it also changes the skewness of the RTD from asymmetrically young to asymmetrically old. No significant effect is seen among tracers.