High within-stream replication is needed to predict litter fluxes in wet?dry tropical streams

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Streams draining forested landscapes are fuelled by terrestrial plant litter, which can be transported downstream or retained and broken down locally. However, fluxes of plant litter in streams can vary at multiple spatio-temporal scales, affecting the availability of this key resource in heterotrophic stream food webs. To explore this question we quantified several processes related to litter dynamics (i.e. litter inputs, storage, losses by transport and losses by breakdown) by sampling litter at multiple sites in three streams of the Brazilian Cerrado biome (which has a tropical wet?dry climate) for 2 years. We assessed the relative contribution of different spatial (among and within streams) and temporal scales (annual, seasonal and monthly) to total variability of these processes (hereafter fluxes). Spatial and temporal variability of fluxes were both high, but spatial variation was 1.67-fold greater than temporal variation (61 versus 37%, respectively), especially at the within-stream scale (50% overall); an exception was litterfall, which varied less spatially than temporally (24 versus 76%). Temporal variation of litter storage (and hence availability to consumers) was mostly seasonal and due to differences in net transport. Inputs and transport were higher in the wet than the dry season (wet versus dry season, 1.45 versus 0.92 and 1.43 versus 0.06 g litter m?2 day?1), while breakdown was similar between both seasons (0.88 versus 0.94 g litter m?2 day?1). Storage (i.e. accumulation) rate was positive and negative in the dry and wet season, respectively, indicating that litter was stored in the dry season and exported in the wet season. The transitional dry?wet season showed the highest inputs, breakdown and storage (3.21,

1.63 g litter m?2 day?1 and 145 g litter m?2), while the wet?dry season showed lower inputs (as in the dry season), higher transport (as in the wet season) and lower breakdown and storage than the other seasons (0.93, 0.65, 0.31 g litter m?2 day?1 and 24 g litter m?2). Our results underscore the role of variation in biophysical drivers of litter fluxes within streams (e.g. pool?riffle configuration, substrate features, biological communities), and suggest that high within-stream replication is necessary to study litter fluxes at larger scales and over time. The seasonal patterns suggested potential changes in litter dynamics under future climate scenarios in the tropics, including increased storage due to reduced transport in a drier climate.

Brazil

decomposition

riparian forest

spatial scale

temporal scale