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Ecosystem multifunctionality is determined by key plant traits: evidence from a salty grassland

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The assignment of different traits to ecosystem properties and to the species which express them most strongly contributes to the understanding of of loss of biodiversity, particularly against the background of global change and human induced habitat destruction. In our study, we explored the responses of morphological, chemical and allocation plant traits of salt marsh species on the community level to the environment and examined their effects on properties of the carbon cycle, i.e. aboveground biomass (AGB), ANPP (Above Net Primary Productivity), decomposition, and species richness as an indicator of biodiversity as ecosystem service.
We used path analysis to evaluate relationships between environmental parameters, functional traits and ecosystem properties and estimated total model fitness by structural equation modelling (SEM).
Keystone response and effect traits were belowground dry mass (BDM) responding to groundwater level and salinity, and leaf C:N ratio and specific leaf area (SLA) responding to inundation frequency. Inundation and salinity led to higher allocation in belowground biomass and adaptation to salt stress in leaves (low C:N ratio), which resulted in more rapid turn-over of resources by decomposition and facilitated species richness. Conversely, release from these strong abiotic controls resulted in accumulation of standing biomass, plant litter, and low species richness which was controlled by high leaf C:N ratios and aboveground allocation. Our study underlines the importance of multiple traits generating different response-effect relationships for maintaining carbon cycle properties and biodiversity.