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Editorial: Key determinants of biodiversity, ecosystem functioning and restoration in climate change sensitive ecosystems

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Editorial on the Research Topic
Key determinants of biodiversity, ecosystem functioning and restoration in climate change sensitive ecosystems

At the global scale, we are already past the planetary boundary of biodiversity loss (Montoya et al., 2018), and further declines are expected to occur (Tilman et al., 1994; Helm et al., 2006; Vellend et al., 2006). Therefore, ecosystems that contribute greatly to human well-being through the delivery of biodiversity and ecosystem benefits should be the focus of particular concern (Montoya et al., 2012; Seddon et al., 2016). To advance our understanding of biodiversity and ecosystem functioning in the changing world, we organized a Research Topic entitled "*Key Determinants of Biodiversity, Ecosystem Functioning and Restoration in Climate Change Sensitive Ecosystems*". This attracted 23 excellent articles, spanning multiple ecosystems including tropical/subtropical forests and alpine meadows, across several climate change sensitive areas and cover five themes (composition and function of tropical/subtropical forests, forest succession, complex trophic interactions, Biodiversity and ecosystems threats).

Six articles shed light on the composition and function of tropical/subtropical forests. Chai et al. test the influence of vertical structure on beta diversity, while Li et al. show how plant height and soil resources affect carbon gain and plant growth. Tian et al. find that the role of resources is again evident in the habitat preferences of vascular herbaceous plants. Su et al. report a comprehensive study using 1,773 species from 370 sites globally to show how a leaf hydraulic trait (leaf turgor loss point) can serve as a strong predictor of drought-induced tree mortality in a tropical forest. Wang et al. examine the question of sample size and show that the commonly recommended sample size is inadequate in many cases, particularly when the habitat is heterogenous like the karst forests they studied. Gong et al. report that carbon storage increased with recent land use changes in a river basin in China.

Four articles provide new findings on forest succession. Liu et al. report divergent intraspecific variation and functional strategies in aboveground and belowground functional traits, and Xing et al. report increase in soil organic carbon during succession from plantation to secondary and old-growth forest and that total root biomass was the important factor in predicting soil organic carbon. Yang et al. find that different successional stages show divergent effects on soil arbuscular mycorrhizal fungal communities, and this fungal association with plant roots contributes directly or indirectly to ecosystem functions at different successional stages. Yang et al. also find that species richness and spatial heterogeneity are accompanied by enhanced soil organic carbon in a 60-ha plot of an old-growth tropical montane rainforest.

Five articles describe new results for complex trophic interactions. Hou et al. demonstrate abiotic effects by showing how soil properties primarily drive nematode community assembly by habitat filtering, while Yang and Chen highlight the importance of biotic interactions in reporting that decreasing phylogenetic diversity in tree species led to decreased generalist herbivore richness, abundance and herbivory, while increasing specialist herbivores. Demonstrating higher level trophic interactions Rao et al. report how nest predation in the red jungle fowl, a ground-dwelling bird involves a wide range of predators including rodents, reptiles and bird species. Wang et al. show that resource availability measured in terms of food plant diversity affects home range area and formation of Hainan gibbon with forage plant diversity impacting survival and fitness. Zou et al. detected that gibbon population growth shows a positive relationship with improved habitat quality, however, changes in individual numbers do not show a significant change with improving habitat quality.

Eight articles provide new understandings of biodiversity and ecosystems threats (biological invasion, global change (nitrogen and phosphorus addition) impacts, infectious diseases and energy needs). Das et al. and Jia et al. provide the following new results on biological invasion threats: 1) the evidence for negative spatial dependence between native and invasive plant species and 2) a replacement control method for managing alien species using biological control. Two studies (Du et al. and Qi et al.) point to the contrasting responses of different biological groups (plant, soil microbial and nematode community) to both nitrogen and phosphorus addition in alpine ecosystems. Two new findings on infectious disease threat are attained by Chen et al. and Chen et al. Namely: 1) host community composition determines the direction and strength of the diversity–disease relationship and 2) adding vector preference and interspecific competition into the system altered the direction of diversity–disease relationship, while host competence, interspecific competition, and vector preference interact to determine the spread of infectious diseases for vector-borne diseases. Bonacic et al. and Zhang et al. report three new energy needs threats: (i) the ecological effects of radioactive leaks on both terrestrial and marine ecosystems, (ii) the rapid increase in construction of solar photovoltaic power stations, which is likely to eat into forest and agricultural lands and (iii) how solar photovoltaic power stations decreased the local air temperature but increased air humidity.

In short, all the studies included in this Research Topic undoubtedly contribute to enhancing our understanding of the biodiversity and ecosystem functioning in climate change sensitive areas. In the future, with the advancement of technology, including sequencing, proteomics, metabolomics, and transcriptomics at the molecular level on one hand, and landscape- and regional-scale analyses using developments in drone-based and satellite-based sensing on the other, studies focused on biodiversity and ecosystem function will gain greater power and impact in managing the global biosphere.

Author contributions

HZ: Conceptualization, Formal Analysis, Funding acquisition, Investigation, Methodology, Software, Supervision, Writing – original draft, Writing – review & editing. XL: Conceptualization, Formal Analysis, Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. RJ: Conceptualization, Formal Analysis, Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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