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Editorial

Sharing earth with all life

The Anthropocene is marked by twin crises: climate change and loss of biodiversity. Climate change has dominated the headlines, reflecting, in part, the greater complexity that characterizes the biodiversity crisis (Corlett, 2020). Since the Convention on Biological Diversity (CBD) was adopted in 1993, the conservation of biological diversity has become a global concern. If we want a sustainable future, we must protect biodiversity. However, biodiversity loss remains one of the most challenges today.

To coordinate the conservation efforts of the parties to the Convention on Biodiversity, fourteen conferences have been held in different cities around the world, each with a different theme. The 15th Conference of Parties (COP15), with the theme “Ecological Civilization: Building a Shared Future for All Life on Earth”, was originally scheduled to be held this year in Kunming, China, but has been postponed to May 2021 due to the COVID-19 pandemic.

This special issue of *Plant Diversity* was intended to coincide with the COP15, entitled “Safeguarding our future by protecting biodiversity” and co-edited by professors Hongwen Huang, Hang Sun, and Zhekun Zhou. This special issue aims to share recent research on protecting plant diversity, effective measures and strategies for biodiversity conservation, and preparations for the “post-2020 global biodiversity conservation framework”. Nine articles from authors around the world are collected in this special issue, including three review papers, five research articles, and one commentary.

Humans are not only a part of our planet's ecosystems, but also overuse natural resources. Consequently, the Earth is currently experiencing a sixth mass extinction event. To maintain a sustainable future, Raven and Wackernagel (2020) propose three guidelines. First, and possibly most challenging, human demand must be curbed so it fits within the means of what Earth's ecosystems can renew. Without meeting this quantitative goal, efforts of preserve biodiversity cannot be scaled. Second, until human demand is curbed, we must focus on those locations and areas where most biodiversity is concentrated (‘hotspots’). Such a focus will help safeguard the largest portion of biodiversity with the least effort. Third, to direct biodiversity preservation strategies, we need to much better document the existence and distribution of biodiversity around the globe.

Biodiversity itself is a difficult concept. For example, land plants dominate the global biomass, while, in terms of numbers of species, terrestrial arthropods probably dominate. Furthermore, the use of remote sensing has encouraged a simplified view of the values of nature's contributions to people that is inconsistent with the way most people value nature. To safeguard our future effectively, Corlett (2020) suggests that researchers improve the inventory, with surveys focused on geographical areas and taxonomic groups which are under-collected; expand the protected area system and its representativeness; control overexploitation; manage invasive species; conserve threatened species *ex situ*; restore degraded ecosystems; and control climate change.

Our understanding of the evolutionary history of Asian biodiversity is still far from adequate to fully explain how this biodiversity came about. To understand the origins of this biotic richness, and its conservation value, Spicer and colleagues examined recent fossil finds and reviewed progress in understanding the orogeny of the Tibetan region. It is clear that the origins of modern biodiversity were established in the Eocene, concurrent with the formation of pronounced topographic relief across the Tibetan region. The valley system hosted moist subtropical vegetation influenced by an intensifying monsoon. After the middle Miocene (15 Ma) cooling, the further rise of central Tibet and the rain shadow cast by the growing Himalaya progressively led to more open, herb-rich vegetation as the modern high plateau formed with its cool and dry climate. In the moist monsoonal Hengduan Mountains, high and spatially extensive since the Eocene but subsequently deeply dissected by river incision, Neogene cooling depressed the tree line, compressed altitudinal zonation, and created strong environmental heterogeneity. This served as a cradle for the then newly-evolving alpine biota and favoured diversity within more thermophilic vegetation at lower elevations. This diversity has survived through a combination of minimal Quaternary glaciation, and complex relief-related environmental niche heterogeneity (Spicer et al., 2020).

In East Asia, the transition from tropical to subtropical (warm temperate) evergreen forest gives rise to distinct vegetation primarily defined by tree floristic change. The tropical-subtropical transition is uniquely significant in East Asia because here alone a tropical wet summer-dry winter monsoon extends to 35° north latitude, encompassing the subtropical evergreen forest, whereas subtropical evergreen forests elsewhere exist under drier temperate summer climate regimes. Ashton and Zhu (2020) summarize the primary climatic factors that mediate altitudinal and latitudinal zonation of forest formations in equatorial Asia to the tree line, in the Himalaya at the India-Indo-Burma northern tropical margin, and in South China. They report that the montane tropical-subtropical transition in the Himalaya is narrow but distinct in the mountains of southwest China. In addition, canopy species at the Himalayan ecotone change entirely, but subcanopy tropical species persist in decline for ca. 400 m in elevation. The latitudinal transition in South China is analogous, but here the tropical subcanopy component extends north over ten degrees latitude albeit in decline.

Yunnan, in southwest China, is home to more than 19,000 higher plants, representing 6% of the world's total diversity of

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higher plant species. However, plant diversity in Yunnan is under enormous threat today. Qian and colleagues report basic information on plant diversity in Yunnan and analyze the status of plant diversity based on the recent available data. Their results show that southern, southeastern, and northwestern Yunnan represent hotspots of total species, endemic species, specimens, new species, and threatened species, and that southern and southeastern Yunnan are hotspots for plant species with extremely small populations (Qian et al., 2020).

Myanmar is a region with very high plant diversity but with plant taxonomic groups that are under-collected and documented. Basic information on plant diversity in Myanmar is inadequate. Recently, botanical exploration and research in Myanmar has accelerated. Yang and colleagues therefore surveyed the literature of taxonomic contributions to Myanmar's vascular flora over the last 20 years (2000–2019) and compiled a list of new and newly described taxa. Altogether, they represent 91 families and 320 genera. Although this information reflects the incompleteness of our current knowledge of the flora of Myanmar and the urgent need for a greatly expanded effort (Yang et al., 2020), it will help manage and protect plant diversity in Myanmar.

Ethiopia is biologically rich, with more than 6500 vascular plant species. Of these species, 12% are endemic, mainly due to geographical isolation and unique climatic conditions. Asefa and colleagues provide an overview of Ethiopian vegetation and plant diversity. The diverse climate of various ecological regions in Ethiopia has driven the establishment of diverse vegetation, which ranges from Afroalpine vegetation in the mountains to the arid and semi-arid vegetation in the lowlands. In general, eight distinct vegetation types have been identified in Ethiopia. Some of the vegetation types are identified as centers of endemism and have subsequently been identified globally as the East African Afromontane hotspot. Currently, human-induced climate change and habitat fragmentation severely threaten the country's biodiversity, and the consequences of these effects have not been studied very well. For effective conservation in Ethiopian, ecologists, geneticists, evolutionary biologists, conservation biologists, and other experts are needed to investigate the country's biodiversity and the complex ecological processes that structure vegetation dynamics (Asefa et al., 2020).

Zhang and colleagues analyze the population genetics of *Rhododendron pubicostatum*, an endangered plant species with extremely small populations endemic to Yunnan, China. Genetic structure analysis of three *Rhododendron* species (*Rh. sikangense* var. *exquisitum*, *Rh. bureavii*, and *Rh. pubicostatum*) indicate a possible hybrid origin of the threatened *Rh. pubicostatum*. In areas where these *Rhododendron* species are sympatric, *Rh. pubicostatum* is predominant, suggesting that these areas represent a unimodal hybrid zone. Despite the fact that hybridization frequently occurs in Rhododendron, unimodal hybrid zones are uncommon in the genus (Zhang et al., 2020).

Plant conservation must focus on the long-term future of rare species, especially Plant Species with Extremely Small Populations (PSESP). In the last article of this special issue, Crane (2020) comments on the PSESP program, encouraging that the goal should be to save these species wherever and whenever possible in the wild, and thereby preserve the full range of ecosystem services provided by the communities of which they are part, but that *ex situ* conservation also provides some form of insurance.

We organized this special issue to commemorate the COP15 that was originally scheduled to take place in Kunming this year. Although the conference has been postponed until 2021 due to the COVID-19 pandemic, we decided to honor the work of our colleagues, done under difficult circumstances, by publishing the special issue without delay. We greatly appreciate their contributions and believe their work contains important knowledge that may encourage similar multifaceted research.

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