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Editorial

Understanding Plant Diversity from Ecological and Evolutionary Perspectives

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Nowadays, we are living in a world that is benefiting from biodiversity, although environmental change is dramatic and biodiversity has been influenced by climate changes and human activities. As is known, biodiversity, as an important pillar of ecosystem balance, is playing a crucial role in human well-being [1]. In particular, it is too difficult to use plant diversity to evaluate the related indirect value, except the direct value of food, clothing, and shelter. Also, our life is closely bound up with various plants from their functions and primary productivity. Hence, plant diversity is important for the ecosystem service to human beings, playing a significant role in sustaining the equilibrium of global biosphere. However, biodiversity loss has continued to impact people throughout human history, and a sixth mass extinction in Earth's history is coming [2,3].

It is worth noting that plants, as one of the most important globally distributed types of biodiversity, occupy a major proportion of land on our planet. This means that evolutionary and ecological mechanisms are incredibly successful during evolutionary processes, and such mechanisms really determine the plant diversity. In recent decades, there have been increasing numbers of studies on ecological and evolutionary mechanisms for plant diversity, like mushrooms after rain, and scientists from different fields have tried to explore the relationship of plant diversity between ecological and evolutionary approaches. Here, we aim to understand how plant diversity has been enhanced by the establishment of ecological and evolutionary approaches, which had, has, and will continue to have a far-reaching effect on many fields of the basic and applied research within natural science.

In such a context, the Special Issue "*Ecology, Evolution and Diversity of Plants*" has been launched to explore plant diversity from ecological and evolutionary viewpoints. Thus, the published articles have focused on broad key topics in plant diversity, from species to populations and vegetation; as well as from past to current taxa [4,5]. Also, different types of reviews, research articles, and commentaries have been collected to explore the ecology, evolution, and biodiversity conservation of plants [4–6]. Therefore, this Special Issue has published more than 30 articles to understand plant diversity from many angles using ecological and evolutionary approaches.

Plant diversity is primarily recognized using the species, and species delimitation and taxonomic revision are fundamental issues [7]. In the renowned book, *The Origin of Species* by Charles Darwin, published in 1859 [8], the concept of species was proposed and the related approaches to recognize species, i.e., the relationships of species or systematics, were advanced with an unique illustration in such a famous book. As is known, such a simple illustration is also called the Tree of Life (TOL). Accordingly, phylogeny has been become a discipline and even a powerful tool in recognizing plant diversity, which is constantly popular, and many analyses and references have been put forward [9]. Therefore, the topic of phylogeny in plant diversity in relation to species, taxonomy, and geographic distribution, from tropical to subtropical temperatures, as well as alpine plants, has boomed in recent years [10–15]. The ensuing rapid development of phylogeny is accompanied by the development of sequencing technology, transformed from DNA spacers to genomes in recent years.

Here, we considered plant diversity from an ecological point of view on the basis of the ecological processes of past, current, and future. In particular, climate change and human activity were included. In such a context, the concept that habitat suitability has been altered by climate change at the regional scale or global scale, which is causing local extinctions of biodiversity, seems possible [1]. Thus, the notion of whether adaptive genetic variation can keep pace with future climate change is a very critical factor in developing conservation management strategies when the genetic vulnerability of species is assessed [16]. And now, climate change and human activity have been considered to be major drivers of biodiversity loss and species range shifts [17]. However, the response of mountain plant communities has not kept up with climate warmings, especially in the background of global change [18]. Thus, the warming climate may benefit tropical plants, but will be significantly disadvantageous to the alpine plants, and so mountaintops were proposed as climate refugia in tropical rainforests for cold-adapted plants because the warming climate has triggered alpine plants to climb higher altitudes [19]. Different taxa will respond individually to environmental changes, so the identification of refugia from spatial dimensions is important, due to the large number of taxa that are identified in a similar manner, and these factors will be affected by various environmental parameters [20]. Thus, the firm historical insights will provide a better understanding of future climate refugia based on robust predictions [19], especially taxa from regions with dense populations [15]. Notably, the modification of precipitation should also be considered as determinants of plant diversity under the background of climate change. For example, enhanced precipitation has influenced the evolution of subtropical evergreen broad-leaved forests since the early Miocene in East China [21].

At present, the Earth is entering a new geological era, the Anthropocene. Biodiversity will face an unprecedented challenge when the Anthropocene comes, although biodiversity brings essential benefits of nature to human beings and enhances the value of eco-service to human beings [17]. In recent decades, the conservation of plant diversity is an urgent issue, and the related studies of ecological and conservation have developed significantly, due to the large-scale use of DNA spacers, EST-SSR, single-nucleotide polymorphisms (SNPs), and even whole genomes, in order to illuminate the conservation implications of different taxa (especially rare and endangered taxa) from their natural habitats and to evaluate the conservation managements of anthropogenic disturbances [22–24]. Regardless of the different approaches, i.e., genetics or genomic analyses, even the Data Portal (e.g., the *Paris polyphylla* Data Portal, PPDP, which integrates related functional genomics analyses, molecular data resources, and morphological identification points [25]), have provided useful information, both genetic and genomic, for the further molecular breeding and improvement of resources in economic plants.

Although we are living under the conditions of global change, the warming climate and regional poverty are still urgent issues, so the topic of economic forests has boomed in recent decades [26]. It seems that booming afforestation can bring benefits to eliminate poverty from economic growth, and is the most effective strategy for mitigating climate change [26,27]. However, afforestation is causing the disappearance of species, but this fact tends to be ignored [27]. Thus, it can be argued that economic values to eliminate regional poverty using economic forests and photosynthetic carbon captured by the afforestation for climate change are blinding the shifts of biodiversity patterns, which even change the distribution pattern of biodiversity, such as the latitudinal diversity gradient [27,28].

Generally, ecology and evolution have played, are playing, and will continue to play significant roles in shaping plant diversity. However, specific studies on ecology or evolution suggest that plant diversity has two separate parts, and some research topics are not linked to each other. Actually, everything is connected in the natural world. Thus, studies on plant diversity will be facilitated by the flourishing development of ecology and evolution disciplines, just as plant diversity has boomed on a global scale throughout the endless history of the Earth.

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