

Mosaic sympatry and frequent hybridization of ecologically divergent aquatic plants on the Qinghai-Tibetan Plateau

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Abstract

Hybridization has fascinated biologists in recent centuries for its evolutionary importance, especially in plants. Hybridization outcomes are greatly affected by the environment, and hybridization is most likely in bounded or novel habitats for the parent populations. The Qinghai-Tibetan Plateau (QTP) and its adjacent regions possess extraordinarily high plant diversity, and hybridization has been shown to be an important cause. The plateau also contains numerous wetlands, accommodating diverse aquatic taxa, and we have limited information on the regional hybridization rate and pattern in aquatic macrophytes. In this study We assessed the distribution of three related species pairs (*Myriophyllum*, *Stuckenia* and *Ranunculus*) and their hybrids (using chloroplast and microsatellite markers). We also evaluated the potential occurrence and niche similarity for relative parental species. The results revealed common hybridization in three pairs of ecologically divergent aquatic plants on the QTP. Obvious niche overlap and extensive cooccurrence regions were important for the frequent hybridization. The drainage basins, valleys and edges of the plateau enabled sympatry of divergent taxa and contained discrete hybrid zones. Hybrid superiority was implied in *Myriophyllum* but not in *Stuckenia* and *Ranunculus*, possibly because of differences in genetic incompatibility, niche overlap extent and phylogeographic history among species pairs. Our results suggested that the QTP is a hotspot for ecologically divergent aquatic species to contact and mate and implied that hybridization may be important for the adaptation of freshwater taxa to highlands.

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