

琉球大学学術リポジトリ

Floristic plant geography in the Ryukyu Archipelago

メタデータ	言語: 出版者: 琉球大学21世紀プログラム 公開日: 2007-06-26 キーワード (Ja): キーワード (En): 作成者: メールアドレス: 所属:
URL	http://hdl.handle.net/20.500.12000/656

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Aim Takhtajan (1986) defined floristic areas based mainly on endemics; however, problems can occur with such a criterion because areas based on endemics do not provide information on affinity among floristic areas and also because any attempt to emphasize some groups could be arbitrary and misleading. We investigated whether the floristic demarcations proposed by Takhtajan are recognizable in the Ryukyu Archipelago by analyzing exhaustive distribution records of almost all species, genera, and families of seed plants. According to Takhtajan's system, the Ryukyu Archipelago is divided into three floristic provinces (Japanese–Korean, Ryukyu, and Taiwanese) by two demarcation lines that pass through the two oldest channels, the Tokara and Kerama gaps.

Methods We compiled distribution records of 1823 species on 26 islands. Floristic dissimilarity distances among the islands were calculated at the species, genus, and family levels, and the validity of the demarcations was assessed.

Results Based on species-level data, UPGMA clustering of the islands revealed two major clusters and one subcluster. Average dissimilarity distances between adjoining provinces were significantly larger than those within each province based on species and genus data. Floristic dissimilarity distance and geographic distance were correlated for the entire archipelago; however, local correlation patterns indicated an area where the two distances were not correlated, suggesting the existence of barriers that cause floristic differentiation without isolation by geographic distance.

Main Conclusions The UPGMA clusters almost agree with the segregation of the three provinces by Takhtajan. Moreover, larger dissimilarity distances between provinces than within each province support recognition of the floristic demarcations by Takhtajan at the species and genus levels. The area where floristic dissimilarity distance and geographic distance were not correlated almost overlaps with the demarcation of the Japanese–Korean and Ryukyu provinces. Therefore, the floristic differentiation between the provinces is likely attributable to barriers such as the formation of the Tokara Gap. Moreover, Some ecological factors are discussed.