



Integrated prediction of species distribution: The range shift and management scheme of endangered Himalayan yew (*Taxus wallichiana* Zucc.) in the Himalaya-Hengduan Mountain region

Peixian Li (1,2), Wenquan Zhu (1,2), Zhiying Xie (1,2), Kun Qiao (1,2)

(1) Faculty of Geographical Science, Beijing Normal University, Beijing, China (peixianli@mail.bnu.edu.cn), (2) State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, Beijing, China (peixianli@mail.bnu.edu.cn)

The Himalaya-Hengduan Mountains (HHM) region is located in the world's Third Pole. It is a biodiversity hotspot and home to *Taxus wallichiana* Zucc. (Himalayan yew), a relict tree, that has survived since the Quaternary glaciation. It is well-known because it contains taxol, which is one of the most successful anticancer drugs derived from natural sources. Although widely distributed in the region, *T. wallichiana* is subject to international and national conservation measures because of its dramatic over-exploitation and decline over the last 30 years. It is crucial to accurately determine the impact of climate change on *T. wallichiana*'s distribution in order to further protect the wild population (in-situ or ex-situ) and plan effective cultivation measures. Considering the super complexity of Earth climate systems and the high uncertainty in climate models input data from mountainous areas, we integrated three Representative Concentration Pathways (RCPs) (i.e., RCP2.6, RCP4.5, RCP8.5) based on datasets from 14 Global Climate Models (GCMs) of CMIP5 (Coupled Model Intercomparison Project, Phase 5) to 1) predict the potential distribution of *T. wallichiana* under current (1960–1990) and future (2050s and 2070s) scenarios with the Species Distribution Model (SDM) MaxEnt, and 2) to detect the major bio-climatic influencing factors. We found there were significant differences in the distribution and area of potentially suitable areas under the future scenarios from 14 GCMs. Based on the values from statistical averages, highly suitable areas for *T. wallichiana* decreased by 30.61–55.06% at a rate of 3.22–7.34% per decade, and moderately suitable areas decreased by 19.88–30.34% at a rate of 2.09–4.05% per decade. Moreover, the average altitude of potentially suitable areas of *T. wallichiana* would shift upwards extremely significantly by 390 m (14.81%) to 948 m (36.01%) at a rate of 42–100 m per decade in the future climate scenarios. The annual average temperature and its seasonal variation and annual precipitation were the main bio-climatic variables affecting *T. wallichiana* habitats. These findings demonstrate the importance of protecting seedlings and scattered mature individuals in marginally suitable areas. Priority protected areas and suitable planting area may be delimited from the current and future potential distribution.