

2024_70_Kew_EN: Extinction risk and threatened evolutionary history in epiphytic flowering plants

Supervisors: Dr Eimear Nic Lughadha (<mailto:E.NicLughadha@kew.org>); Dr Tarcisco Leao; Dr Felix Forest; Dr James Rosindell (Department of Life Sciences, Imperial)

Department: Royal Botanic Gardens, Kew

Epiphytes are plants that germinate and root non-parasitically on other plants. They comprise c. 8% of all angiosperm species and are particularly important elements of plant communities in tropical biodiversity hotspots, in some places accounting for up to 50% of the flora. Epiphytes also provide important habitats for countless organisms. While the epiphytes have been recorded in over 60 angiosperm families, the vast majority of species exhibiting this habit are found in just a few speciose lineages, with the orchid family alone containing 75% of all known angiosperm epiphyte species, followed distantly by the Bromeliaceae with 7% of epiphytic angiosperms.

Epiphytes are under-represented on the IUCN Red List of Threatened Species, despite being significantly more likely to be threatened with extinction than are annual or perennial plants (woody or herbaceous). However, recent research has demonstrated that the relatively high extinction risk faced by epiphytes is not associated with the epiphytic habit per se. The proposed research will dig deeper into the nature of the association between epiphytism and extinction risk, developing and testing hypotheses in both phylogenetic and spatial frameworks.

Datasets to be analysed will include existing extinction risk assessments (e.g., IUCN Red List) and predictions of extinction risk generated by a variety of methods, complemented by subsets of these data enriched by the student to allow more in-depth analyses to inform effective conservation action. One line of research will be the identification of global Epiphyte EDGE Zones, areas rich in epiphyte species which are both Evolutionarily Distinct and Globally Endangered. The EDGE approach combined phylogenetic information and extinction risk data to identify threatened species that contribute proportionally more to the overall evolutionary history present in the Tree of Life.

Anticipated outputs from the project include:

- 1) A comprehensive understanding of the association between extinction risk and the epiphytic habit, including an evaluation of the other intrinsic and extrinsic factors that may be playing a role in this relationship.
- 2) The production of an EDGE Species list for epiphytes and a detailed global distribution of Epiphyte EDGE zones.
- 3) Shortlist of Epiphyte EDGE species considered to be the most promising candidates for introduction into horticulture with a view to enhancing their chances of survival.

Because the large number of recorded epiphyte species are assigned to just a few families, which could result in biases in the results obtained from global analyses, these analyses should be repeated at shallower taxonomic scales (e.g. orchids, bromeliads).

The student will be encouraged to develop their project in the direction that best suits their personal interests, including phylogenetics, large scale data mining, spatial analysis, and machine learning, but will most likely comprise a combination of the above

For more information on how to apply to us please visit: <https://www.imperial.ac.uk/grantham/education>