

Palau Orchid Conservation Initiative

A collaborative project through the
North American Orchid Conservation Center

Background



Native epiphytic orchid in Ngardok Nature Reserve, Melekeok State, Palau

Tropical Pacific Islands support unique natural ecosystems of global importance, and human populations with diverse cultural heritages that rely heavily on healthy ecosystems for sustenance. The Pacific Island nation of the Republic of Palau is well known as an area of high plant diversity and is considered the most species rich island group within Micronesia. The Palauan archipelago covers only about 535 km² of land area and yet contains an estimated 730 native plants, including approximately 135 endemic species. To better understand this exceptional diversity, it is necessary to study the ecology and geographical distribution of plants across the island. Broader scientific interest in Palauan forest health and biodiversity is desired by residents and land managers who seek baseline information to inform resource management decisions.

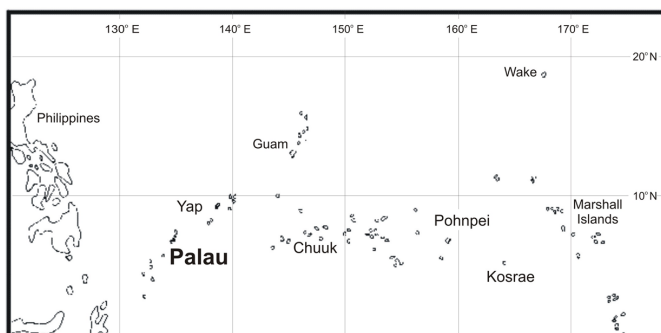
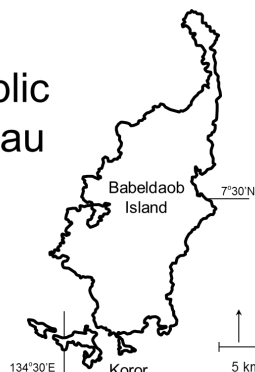


Orchids in Palau

Palau contains some of the most intact natural forested areas in the Western Pacific with approximately 70 native orchid species, of which 30 are endemic. There is only a very rudimentary understanding of the ecology of orchids of Palau, with knowledge being restricted to preliminary floristic studies that have not been comprehensive or quantitative in terms of orchid ecology. The structure of orchid communities, their biology and distribution across Palau, basic information on their co-occurrence with specific tree species, soils or sites, vegetation types, or environments is largely unknown. Given that the Orchidaceae is the most diverse family of flowering plants on earth, the unique role that epiphytes generally and orchids specifically play in forest ecosystems, the charismatic nature and high public appeal of orchids, and the apparent sensitivity of orchids to global change, there is a need to understand the biology, ecology and restoration of orchids and their associated fungi in support of conservation efforts. Studies of this component of the Palauan flora means that monitoring and management of Palauan plant biodiversity through efforts such as the Micronesia Challenge will be supported by quantitative data.

The Republic of Palau is located within the Pacific region of Micronesia. The Palauan Island of Babeldaob contains the largest intact area of native tropical lowland rainforest in the Pacific and contains the most diverse forests in Micronesia.

Republic of Palau



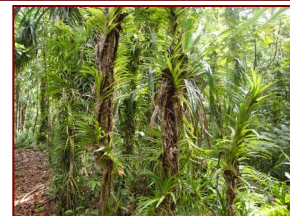
Project Collaborators

- USDA Forest Service
 - Pacific Southwest Research Station
 - Institute of Pacific Islands Forestry
- Smithsonian Institution
 - Smithsonian Environmental Research Center
 - North American Orchid Conservation Center
 - Center for Tropical Forest Science
- Ngardok Nature Reserve
- Palau Division of Forestry
- Illinois College
- University of Hawaii at Manoa

Research Objectives

Our proposed research has three specific objectives:

- 1) Develop a protocol for the inventory and distribution of orchid species and the abundance of associated mycorrhizal fungi within a permanent forest dynamics monitoring plot.
- 2) Conduct an inventory of orchids across various land use gradients & forest community types across Babeldaob Island.
- 3) Support a Palau-wide inventory of orchids.



Abundance and Distribution of Orchids and Associated Mycorrhizae

A permanent forest dynamics monitoring plot was established in Ngardok Nature Reserve in 2014. The plot is currently four hectares in size where all plant stems that are > 1cm width are identified, tagged, mapped, and followed over time within the plot. This very high resolution measurement program gives baseline information on forest changes and allows for detection of sensitivities of recruitment, growth and death to stressors like climate warming and drought. The plot is currently proposed for inclusion in the Smithsonian's Center for Tropical Forest Science global plot network known as ForestGeo (CTFS-GEO). CTFS-GEO work has led to remarkable insights into the composition, structure, function and dynamics of



The 4 hectare permanent forest dynamics monitoring plot in the Ngardok Nature Reserve.

tropical, temperate and boreal forests, however, it has not been used to consider the biodiversity of terrestrial or epiphytic orchids nor the fungi that associate with the herbaceous species. Orchids are of particular interest because their distribution is global and they occur in terrestrial and arboreal habitats. The CTFS network represents an ideal platform for tackling these needs, and so our goal is to use the Palau forest dynamics plot to establish a methodology to be used to inventory (**Year 1**) and monitor the distribution of orchids and their mycorrhizal fungi (**Year 2**) in the plot. We anticipate that this will lead to an expanded understanding of and appreciation for orchids and the fungi that they require for survival. This work will enhance the value of CTFS-GEO by expanding the scope of science addressed by the addition of research components in the plots, as well as providing a methodology and associated tools and lessons learned for taking on the least understood fraction of total plant diversity in CTFS plots.

Orchids across Forest Community Types



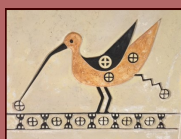
Land use can have a dramatic impact on plant biodiversity, especially activities that result in a state change between one type of vegetation cover and another. Ngardok Nature Reserve is a Protected Area, and contains a large range of forest conditions including: denuded bad-lands; open savanna dominated by herbaceous plants and shrubs; recovering savanna with small individual trees, larger individual trees or even tree islands; young secondary forest; and older secondary / mature forest. This rich diversity of habitats, occurring in a relatively small area, permits studies of how land use degradation and landscape restoration influence orchid and mycorrhizal fungi distribution and abundance and orchid population dynamics. We will inventory and quantify the distribution of orchids and orchid-mycorrhizal fungi across this land-use gradient (**Year 1**). The knowledge gained through this spatial study will provide a framework to develop protocols to assure effective restoration actions (**Year 2**) that can be used to accelerate orchid recovery following disturbance (**Years 3-5**).

For more information, please contact:

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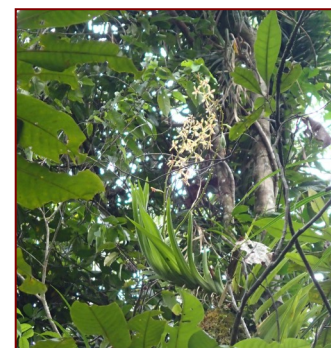
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Orchid Inventory of Palau

Our proposed research will also support a Palau wide inventory of orchids (**Years 2-5**) that results in the documentation of site attributes for native orchids that will support current efforts and future conservation initiatives (e.g., the Micronesia Challenge). Outcomes will include making core contributions to the Orchids of Palau and Micronesia and support for horticultural propagation of orchids for both conservation and commercial purposes. This effort will further the goals of the Smithsonian's global orchid conservation program, an outgrowth of their North American Orchid Conservation Center, as well as support the conservation and management of this charismatic plant taxa and promote economic development.



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