

The Conservation of the Extinct Toromiro Tree

The following text was first published in The [Curtis's Botanical Magazine](#), Vol. 14, Part 4, pp. 226-231.

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Summary

One of the extinct flowering plants of Easter Island (Rapa Nui) is the Toromiro Tree, *Sophora toromiro* Skotts. (Leguminosae) which is, however, maintained in cultivation in several Botanic gardens. An outline of the history of the flora of the island, and the Toromiro in particular, are given. The efforts of the Toromiro Management Group to secure its future, and its successful re-introduction to the island, are described.

Conservation of the Extinct Toromiro Tree

Easter Island (Rapa Nui), has been described as the most remote piece of inhabited land on the planet; located about 2250 km from Pitcairn, the nearest inhabited island. This tiny island, an area of 166 sq. km or 64 square miles, shares with St Helena (South Atlantic) and Rodrigues (Indian Ocean) the fate of having suffered the complete transformation of its terrestrial ecology, virtually no natural habitat survives. Such islands are characterized by high levels of environmental degradation and species extinction. The main phase of environmental destruction on Easter Island (Rapa Nui) has passed, the opportunity now exists to restore degraded habitats and re-introduce lost components of the biota.

One lost element of Easter Island's biota is the Toromiro tree, *Sophora toromiro*, now only surviving in cultivation. The conservation of this threatened legume is being co-ordinated by the Toromiro Management Group a collaborative consortium of botanic gardens, geneticists, foresters and archaeologists.

A prolonged history of habitat destruction has resulted in the loss of the island's original scrub and forest. Initial Polynesian and subsequent colonial settlement has resulted in profound changes to the island's ecology. An endemic palm *Paschalococos dispersa* is extinct and the Toromiro only survives in cultivation. There are 3 surviving endemic flowering plant species, *Axonopus paschalis*, *Danthonia paschalis* and *Paspalum forsterianum*. There are 25 indigenous species, a number of these survive at very low population numbers, for instance *Triumfetta semitriloba* and *Caesalpinia major*. The fern flora has been researched by Professor R. Rodriguez of Concepcion and will be reviewed in a forthcoming volume of the Flora of Chile.

The first European visitors commented on the island's treeless state; Roggeveen noted in 1722 that the island was "destitute of large trees", Gonzalez in 1770 commented "not a single tree is to be found capable of furnishing a plank so much as six inches in width." The causes of the island's complete loss of original terrestrial habitats can be traced to ecological and social change following colonization by Polynesians around 400 AD.

Palynological data suggests that the island was covered by a low scrub and woodland with palm thicket. The grassland areas have expanded as a result of forest clearance, cultivation and associated soil erosion. By the seventeenth century the island was a man-made landscape of agricultural plots with only small patches of the original scrub surviving. This process of degradation was completed in 1866 with the introduction of rabbits, sheep, pigs, horses and cattle.

The first scientific collections of *Sophora toromiro* were made in 1774 by J.R. and G. Forster during the Cook voyage. This specimen is still held in the Herbarium of the British Museum of Natural History (NH). Notes at the time suggest that the species survived as scattered thickets, e.g. Forster wrote that Hanga Roa "was covered with a shrubbery of the *Mimosa*, (= *Sophora toromiro*) which grew here to the height of 8 or 9 feet." In the late 1880s Thomson recorded "small clumps of the *Edwardia* (= *Sophora toromiro*), *Broussonetia* and *Hibiscus* but all were dead, having been stripped of their bark by the flocks of sheep." The last surviving wild specimen was photographed by the 1934-35 Metraux-Lavachery Mission, this small tree was growing in the inner slopes of Rano Kau crater. Protected by rock scree from predation by introduced livestock this specimen survived until 1960 when it was chopped down for firewood. This tree provided the neotype specimen collected by Skottsberg in the 1920s and was the source of the seeds collected by Thor Heyerdahl during the 1955-56 archaeological expedition to Easter Island (Rapa Nui). This collection was presented to the Naturhistoriska Riksmuseet in Stockholm. In the autumn of 1958 seed was transferred to the Göteborg Botanical Garden and six or seven seeds were sown.

The species was listed as "probably extinct" in the IUCN Red Data Book for Plants in 1978. The first records for cultivation date back to the early years of the twentieth century. RBG Kew distributed plants raised from seed collected by Routledge in 1917. Stock was cultivated at the Göteborg Botanic Garden, in 1919-1920, derived from seed collected by Skottsberg. Neither introductions have apparently persisted in cultivation. The Toromiro was subsequently rediscovered in cultivation in European botanic gardens. The European stocks of Toromiro currently in cultivation are descended from the Heyerdahl collection

made in 1958. In 1959, 4 seedlings germinated at the Göteborg Botanic Garden. This initial stock was derived from one tree and was likely to have arisen as a result of self-pollination. During the period from the late 1970s Göteborg distributed stock to a number of botanic gardens. *Sophora toromiro* is also cultivated at the National Botanic Garden, Viña del Mar, Chile. It is thought to derive from seed collected by Efraim Volosky on Easter Island. Efraim Volosky donated the seed to Patricio Montaldo who was the Director of the garden from 1952 to 1959. Although there is no documentation on the collection there is a herbarium specimen of *Sophora toromiro* in the Santiago Herbarium (SGO) collected by Volosky in 1953.

In addition to the plants growing in the National Botanic Garden, Viña del Mar, there are a number of trees growing in private gardens and nurseries. None of these specimens have any documented origin. On one site one of the trees was killed by an irate neighbour frustrated by the level of trespassing from visitors to the trees. In 1994 seed was sent from one of the Santiago trees to Missouri Botanical Garden, with the seedlings subsequently being established at the Waimea Arboretum and Botanical Garden, Hawai'i. In 1996 a new cultivated population was located in the Royal Botanic Gardens Melbourne, Australia. The origin of this stock is unknown.

The Toromiro Management Group (TMG) is a group of collaborating agencies committed to the conservation of *Sophora toromiro* and to the recovery of this species and associated island habitats within the ecology and culture of Easter Island (Rapa Nui). The primary objective for the Toromiro Management Group is to secure the toromiro tree from extinction. The first priority is to secure the species in cultivation, then the re-introduction of a genetically and demographically viable population to Easter Island (Rapa Nui). The TMG has undertaken a global search and located all available toromiro trees in cultivation, and a global directory of trees is held at RBG Kew and with associated data from genetic fingerprinting. It is evident that very little genetic diversity exists within the surviving population. Using this data a propagation programme is being designed to establish plantations of trees in Europe, Chile and Easter Island. The TMG is working with the Corporación Nacional Forestal (CONAF) on the repatriation of Toromiros to Easter Island (Rapa Nui). In 1995 an experimental re-introduction, utilising plants from Bonn Botanischer Garten and Göteborg Botanic Garden, was undertaken.

The future of the Toromiro lies in promoting and maintaining collaboration between the botanic gardens holding stock and the conservation authorities in both mainland Chile and Easter Island (Rapa Nui). A single species conservation project will only succeed if integrated within the broader issues of protected area planning and habitat restoration. This in turn needs to be put into the context of the island's prevailing social and economic requirements. The Toromiro is not only an endangered species it is an important part of the Rapa Nui cultural heritage. The planned re-introduction and restoration programme will work within the following constraints:

- (1) Easter Island's ecology has been permanently altered as a result of human occupation, this is manifest through changes in landscape process, and species associations (habitats) as well as by species extinction;
- (2) Easter Island has a population of *circa* 2,800 people, any planned re-introduction and restoration programme must take into account the views and

opinions of the islanders; (3) Currently the island has a insufficiently developed infrastructure for conservation planning and management, i.e. facilities are required on the island for the propagation of threatened plants (including indigenous crop cultivars); and (4) The nature of habitat degradation has been so profound that restoration (*sensu strictu*) is no longer feasible, efforts will initially focus on establishing cultivated field gene banks for Toromiro and assessing the ability of the island to support reintroduced populations of the Toromiro.

The Toromiro has moved from presumed extinction to being a botanical novelty on the nursery benches of European botanic gardens. At least two leguminous species have been lost in cultivation, the last individuals of the Norfolk Island Glory Pea, *Streblorrhiza speciosa*, and *Vicia dennesiana* from the Açores appear to have died in botanic garden collections. With this in mind the Toromiro is the focus of an international project that is attempting to re-establish the species to Easter Island. This is not just a theoretical exercise in population genetics but an experiment in bridge building between European botanic gardens and the people of a remote Pacific island. The successful reintroduction of the Toromiro will reinstate lost components of the biological and cultural heritage of one of the planet's most famous World Heritage sites.

The Royal Botanic Gardens, Kew, is working with partners around the world to conserve threatened plant species, amongst these are survey and conservation projects for threatened legumes in East Africa, Madagascar and the Mascarenes. Few of these species are as threatened as the Toromiro, for many species and associated habitats the opportunity still exists to establish viable protected areas and in-country projects to secure threatened legumes. However this will be increasingly dependent upon a sound knowledge of taxonomy, distribution and status.

Acknowledgments

This article is in part derived from meetings of the Toromiro Management Group. The author wishes to recognise the contributions of fellow TMG members; Alberto Bordeu of CONAF, Chile; Wolfram Lobin, Botanischer Garten, Rheinische Friedrich-Wilhelms-Universität Bonn; Georg Zizka, the Senckenberg Institute, Frankfurt; Björn Aldén, Göteborg Stad Botaniska Trädgården; Marcia Ricci, Viña del Mar, Chile; Catherine Orliac, Laboratoire D'Ethnobiologie - Biogeographie, Muséum National D'Histoire Naturelle, Paris; Alastair Culham, Botany Department, University of Reading; Gerardo Velasco, Easter Island; and Yves Monnier, Jardin Exotique, Menton.

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