

## **Vegetation and flora of 'Atiu (Cook Islands)**

by

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The vegetation is sharply divided into two main types corresponding to the position of the makatea (i.e. the raised/elevated limestone rim) and the volcanic central area. Indigenous vegetation predominates on the coastal and inland makatea and modified communities, often largely composed of introduced naturalized plants, in the gulches, slopes and plateau of the central volcanic area. The latter is the site of agricultural activity on Atiu and, unlike the situation on the other makatea islands, it is where all the villages are. The species composition in the makatea vegetation types varies according to the island side (wind exposition), the substrate (sand, limestone, soil sediments), topography (plateau, sea-cliff, inland-cliff), light and hygrometry (shaded and moist versus open and sunny). Rare native and endemic species are often restricted to one side of the island (roughly divided into North, West, East and South sides).

### **Makatea Vegetation**

This is divided into coastal and inland communities which are, however, not sharply delimited. Thus many of the coastal species grow inland as well, excluding the common shrub “ngangie” *Pemphis acidula*, and a few others, such as the subshrub *Hedyotis foetida*, or the vine *Ipomea pes-caprae*.

### **Coastal makatea**

There is makatea all round the coast of 'Atiu and sometimes in some stretches of the eastern and south-eastern coasts the modern fringing reef is very narrow or almost non-existent. In such places plants do not grow as close to high water as where a wide reef is present because of the effect of greater exposure to storm tides. There are few sandy beaches of any consequence. Apart from a few species of herbs scattered in front of it, the main coastal vegetation begins with a narrow band of “ngangie”, which on 'Atiu is often a shrub only a few cm high, unlike the tall shrubs or small trees of this species on the coral atolls to the west and north. Amongst the *Pemphis* and behind it two small subshrubs, *Hedyotis foetida* and *Heliotropium anomalum* are very common as well as the tufted sedge *Fimbristylis cymosa* in limestone crevices.. The creeping stems of the grasses *Lepturus repens* and *Stenotaphrum micranthum*, the hemi-parasitic liana *Cassytha filiformis*, the creeping vines *Ipomoea macrantha* and *Vigna marina*, and the creeping herb *Triumfetta procumbens* are likewise important on sandy substrates, with

more rarely *Boerhavia tetrandra* and *Lepidium bidentatum*. The shrub *Suriana maritima* is only found on the north shore of the island on the tallest limestone plateau.

A few metres further in the *Pemphis* disappear and is replaced by three shrubs, most importantly “nga’u” *Scaevola taccada*, but also abundant is the shrub *Timonius polygamus* (both species which size varying between a few centimeters to a couple of meters) and especially in more sheltered areas, the semi-trailing composite, *Wedelia biflora* and more rarely the vine *Capparis cordifolia* and the small trees *Heliotropium (Tournefortia) argentea*. The “nga’u” is variable on ‘Atiu, many plants corresponding to var. *tuamotuense* in more exposed habitats. This variety is smaller and lower and has pale yellow instead of white flowers. Amongst these shrubs, “akoko” (or “totototo”) *Achyranthes velutina*, *Chamaesyce (Euphorbia) fosbergii*, and *Phyllanthus societatis* are common erect shrublet on open makatea with a stunted creeping form in a scrubland vegetation on the southern tip of the island mixed with the shrub *Jossinia (Eugenia) reinwardtiana* and dwarfed *Pisonia grandis*, and more rarely *Corchorus torresianus* only restricted to the north side of the island

A few metres inland from the “nga’u” band trees commence. First and most abundantly is “ara” *Pandanus tectorius*, then “au” *Hibiscus tiliaceus*, “puka” *Hernandia nymphaeifolia*, “ano” *Guettarda speciosa*, and in places “toa” or ironwood *Casuarina equisetifolia*, become abundant. Through this coastal forest emergent tall coconut trees, *Cocos nucifera*, are common. In modified vegetation north of Te Matai Landing on the S.E. coast there is a small forest of *Casuarina* with little else except for a dense carpet of the grass *Lepturus repens* below. Also, near parts of the eastern coast, are dense stands of “utu” *Barringtonia asiatica*, which cast dense shade and exclude most other plants. Elsewhere this species is of scattered occurrence. Just inland and behind the above trees, rare or “kuana” *Elaeocarpus tonganus*, comes in and is abundant or very common through all the rest of makatea forest. On the more sheltered west side of Atiu “pukatea” *Pisonia grandis*, is sometimes dominant in the coastal forest.

Beneath these trees is an understorey of various shrubs and a few herbs. *Hibiscus tiliaceus* is often an understorey shrub are very common; *Schleinitzia insularum* and “utukava” *Sophora tomentosa*, whilst the liane, *Jasminum didymum*, becomes very common in the subcoastal habitat.

#### Inland makatea

As already mentioned, there are few species in the coastal makatea which do not also grow in the inland makatea. However, generally the dominant coastal species, apart from *Hibiscus tiliaceus* in western areas, are less common inland. Conversely, there are a number of inland species which never grow near the coastal nearly all the extensive inland makatea is forested although where the makatea is very rough, e.g. en route to Oneroa Landing and around the cave Ana Takitaki, it is little more than scrub. *Elaeocarpus tonganus*, is a dominant species and where the soil is sufficient there are large buttressed trees. “ano” *Guettarda speciosa*, and “puka” *Hernandia nymphaeifolia* are joined by “turina” *H. moerenhoutiana*, and the latter becomes the commoner of the

two species through much of this inland makatea, with few large *Pouteria grayana*. “tuitui” or candlenut *Aleurites moluccana*, is very common on the more accessible and sheltered parts of the makatea, and “tamanu” *Calophyllum inophyllum*, is also fairly common in this area. The last-named has been extensively cut for timber and is now becoming quite uncommon, especially on the north shore near the new airport.

Below the canopy is a variety of smaller woody plants (in very rough makatea they may form the canopy itself). Chief amongst them, especially in open or semi-open areas are “aoa”, *Ficus prolixa* (very rarely a large tree on Atiu), “mati” *F. tinctoria*, “makai” *Glochidion ramiflorum* agg., “orongo”, the thorny liana *Caesalpinia major*, *Pipturus argenteus*, “orotea” *Jasminum didymum*, *Morinda umbellata* var. *forsteri* and *Xylosma suaveolens*, and in the more shaded areas “matira” *Cyclophyllum barbatum* is very common. More rarely the small trees *Celtis pacifica* on the east side of the island, *Allophyllus timoriensis* on makatea cliff edges, *Pisonia umbellifera* and *Fagraea berteriana* in wetter habitats on the west side. A few individuals of *Ximenia Americana* in the inner makatea in open habitats where small groves of the small-fruited *Pandanus* cf. *arapepe* are found. A few herbs are very common; two *Peperomia* species, *Procris pedunculata* in the most shaded and sheltered areas, and mats of the creeping *Geophila repens* localized near trails and abandoned cultivated areas with the vine *Abrus precatorius*. Several ferns are abundant in the inland makatea; *Asplenium nidus*, *A. australasicum*, *Davallia solida*, *Nephrolepis hirsutula*, “maire” *Microsorium* (*Phymatosorus*) *grossum/scolopendria* (also common in some coastal forest) and *Psilotum nudum*, and in shaded and moist areas *Tectaria jardinii*, *Davallia epiphylla* and *Asplenium robustum*, and when more open and modified by people, *Sphaerostephanos invisus*. *Pyrrosia serpens* is locally abundant epiphytic fern, but *Ophioglossum pendulum* is restricted to moist and shaded areas and the mistletoe, *Korthalsella playcaula*, is very common parasite, especially on rare “kuana” *Elaeocarpus tonganus*. The epiphytic orchid *Taeniophyllum fasciola* is less common. *Vittaria elongata*, although abundant on Mangaia island is extremely rare, found on large *Barringtonia asiatica*.

A few naturalized alien plants is found in the makatea forest including the large trees *Adenanthera pavonina*, sometimes dominant, and *Cedrella odorata* locally naturalized, and the ornamental shrub *Clerodendron buchananii* along roadsides and trails, and

### **Volcanic central area**

A few small patches of secondary forest are still present but very little, if any, of the original forest remains. The plateau area forming the tip of ‘Atiu is either under pineapples (1974) or forms the sites of the villages. The collapse of the pineapple industry and the abandonment of the plantations has resulted in them now being densely covered by weeds, especially legumes (1991). The cultivated ornamentals and fruit trees give an indication of the great potentialities for growing these categories of plant, judging from the wide range now present. It is very clear also that many species grow even better on the lower volcanic slopes towards the swamps. This is presumably due to increased available moisture as well as increased soil fertility. Apart from crops and gardens, the only plant community of note on and near the plateau summit of Atiu is the “staghorn

fern” *Dicranopteris linearis* (*Gleichenia linearis*) fernland which presumably covered much or all of the pineapple area originally, and now reforested with Carribean pines *Pinus caribaea*, *Acacia* spp. and locally with *Santalum australo-caledonicum*. Little grows in this dense fernland except for patches of the clubmoss, *Lycopodium cernuum* (now very rare after reforestation) [It should be noted that the staghorn fernland is itself the result of human destruction of the original indigenous forest, presumably by repeated fires long ago in pre European times.] Near the fernland and invading it in places is “toa” or ironwood, *Casuarina equisetifolia*, of which there are large stands in places near the plateau summit.

### **Scrub on the lower volcanic slope**

On the lower volcanic slopes below the staghorn fernland the vegetation is mostly very modified, often with signs of past cultivations. *Citrus*, coffee, *Coffea arabica*, and bananas, along with some of their original “nurse”, trees, “‘arapitia” *Paraserianthes falcataria* (*Albizia/Falcataria moluccana*), and “madre de cacao” *Gliricidia sepium*, grow in this area, as well as *Gmelina arborea* planted as a fence post, *Cedrella odorata* now naturalized on roadsides. Slopes are covered by dense forests with closed-canopy of the large tree *Syzygium cumini* with very few understory plants.

Patches of secondary forest and scrub occur down to the makatea unless prevented by swamps. “au” *Hibiscus tiliaceus*, is often the dominant species and *Elaeocarpus tonganus* is also common with some *Cyclophyllum barbatum*. Coconut trees are common on these slopes and there are large trees of “i’i” *Inocarpus fagifer*, and mango, *Mangifera indica*, growing singly or in these small secondary forest remnants. There is little understorey, probably mainly due to grazing goats, and several low or mat-forming grasses often comprise the dominant ground cover; *Cyrtococcum trigonum* and *Paspalum conjugatum* mainly, but *Centotheca lappacea* is locally very common too, and *Zingiber zerumbet* more localized. The composite weed “elephant’s foot” *Elephantopus mollis*, is almost invariably present. Very rare large native ferns *Amphineuron opulentum* and *Blechnum orientale*.

Around such stands of trees, along plantation margins, by tracks, a dense scrub largely composed of lantana, *Lantana camara* (less common since the introduction of a biological control leaf-eating insect) , and common guava, *Psidium guajava*, grows. With such shrubs grows a luxuriant weedy herbaceous flora with several large grasses prominent: Guinea grass, *Panicum maximum*, “tarapi” *Sorghum bicolor* and “kaka’o” *Miscanthus floridulus*, often being dominant (less common since the reforestation of the central volcanic area). Tall dicotyledonous herbs, especially *Ocimum gratissimum*, *Sida rhombifolia*, *Triumfetta rhomboidea*, as well as the almost ubiquitous elephants foot, *Elephantopus mollis*, are abundant. The ferns *Sphaerostephanos invisus* and *Nephrolepis hirsutula* are also abundant. In addition, most stands of trees or shrubs, as well as neglected plantation trees, are festooned with lianes, “mile-a-minute” *Mikania micrantha*, and “red-passionfruit” *Passiflora rubra*. These lianes are amongst the worst weeds on the high islands of the Southern Cooks. Along roadsides, and near human occupied areas (sea landings, airport), other common pantropical weeds include *Ageratum conyzoides*, *Bidens*

*pilosa*, *Cenchrus echinatus*, *Desmodium*, *Eragrostis*, *Hyptis pectinata*, *Pilea microphylla*, *Portulaca oleracea*, *Plantago*, *Spermacocce*, *Crotalaria pallida*, *Ruellia prostrata*, and more localized the shrubs *Stachytarpheta urticifolia*, *Ricinus communis* and *Leucaena leucocephala*.

Potential weeds and invaders include the planted ornamental *Clerodendrum quadriloculare*, *Dissotis rotundifolia*, *Flemingia strobilifera*, *Justicia betonica*, *Kalanche pinnata*, *Tecoma stans*, *Turnera ulmifolia*.

## Swamps

“Taro” *Colocasia esculenta*, and to a much lesser extent, “puraka” *Cyrtosperma merkusii*, are cultivated in the swamps at the base of the volcanic slopes and adjoining the makatea. Much of this swampy area was once under cultivation but has long been abandoned. The flora is a herbaceous one, with sedges and grasses mainly dominant. In many marginal areas *Commelina diffusa* forms dense mats (this species also generally forms the ground cover of the lowest plantations above the swamps where the soil is fairly moist and in places there are dense stands of *Mariscus javanicus* (the last in marginal areas), *Torulinium odoratum*, *Kyllinga brevifolius* (newer and more open places), and *Fimbristylis dichotoma*. The grasses *Echinochloa colonum* and *Paspalum orbiculare* and the composite *Eclipta prostrata* are very common in the newer taro areas, and through many of the long abandoned areas there are dense emergent stems 1 to 2 metres high of *Ludwigia octovalvis*.

A distinctive community grows round the small lake Te Roto in the southern part of the volcanic area. It is a wetland grassland where *Persicaria glabra* is abundant and often dominant near the margin, and a small mat-forming sedge, *Eleocharis geniculata*, forms a fringe along the margin with the introduced grass *Paspalum scrobiculatum* and sedges *Cyperus difformis*, dense mat of *Paspalum vaginatum* on the stream bank with the sedge *Mariscus javanicus*, and the fern *Cyclosorus interruptus* in some places. In the lake itself waterlilies, *Nymphaea capensis*, are common in the shallow water at the northern end. The lake is surrounded by a riverine forest dominated by *Hibiscus tiliaceus*, with *Inocarpus fagifer* and on the water margin the large semi-aquatic fern *Acrostichum aureum*. On the northern side of the volcanic area is the Mapumai Swamp which has a somewhat different flora. Although there are some species in common the large indigenous sedges *Cladium jamaicense* and *Schoenoplectus californicus* give a distinctive appearance to this northern lake, where the introduced mat-forming floating fern *Azolla filiculoides* is spreading.