

## The Vegetation of Hawaii as Seen on Captain Cook's Voyage in 1779<sup>1</sup>

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IN 1779 CAPTAIN JAMES COOK, with his two ships, the *Resolution* and the *Discovery*, spent 25 days in Kealahou Bay on the Kona or lee side of the island of Hawaii, in the group then called the Sandwich Islands. Cook himself recorded observations on geography, anthropology, etc., but almost nothing on botany. On one ship was the senior botanist, William Anderson, but he was sickly, and accomplished nothing while at Hawaii. On the other ship was the young botanist, David Nelson, who was only once permitted to make a shore excursion, a 4-day trip attempting to climb Mauna Loa. On this trip he collected 136 species of plants. He also observed 15 additional species. These collections are now in the British Museum (Natural History), London, and were reported on in a taxonomic paper by St. John (1976). A complete enumeration of them was published by St. John (1979).

From the contents of this collection it is possible to obtain a glimpse of the vegetation of that western shore and the lower slopes of Mauna Loa. The herbarium sheets (or labels) of 80 of these specimens bear only the locality data, Sandwich Islands, or merely Capt. Cook's 3rd Voyage. However, 56 of the specimens bear habitat data. These have been sorted and grouped, and it was found possible to assign them to ecological zones, as now recognized on the island of Hawaii (Ripperton 1942). The writer is able to divide the remaining 80 species and assign them to the same zones. Together, they give a picture of the vegetation of a part of western Hawaii, as it was seen in 1779.

Under each of the vegetational headings the plant species represented are arranged in

botanical order, following the Engler and Prantl system.

### MARINE STRAND

Nelson collected 9 species of marine halophytes, but he did not record any habitat data for them. These species are:

*Sesuvium Portulacastrum* (L.) L.

*Tribulus Cistoides* L.

*Euphorbia Degeneri* Sherff

*Ipomoea stolonifera* (Cyrill) J. F. Gmel.

*Jacquemontia sandwicensis* Gray

*Heliotropium curassavicum* L.

*Bacopa Monniera* (L.) Wettst.

*Scaevola Taccada* (Gaertn.) Roxb., var. *sericea* (Vahl) St. John

*Lipochaeta integrifolia* (Nutt.) Gray

This is a good sample of the marine beach plants, and about half of the common Hawaiian halophytes. It is noteworthy that not a single one of these was noted as still present on the shore of Kealahou Bay by Doty (1968:194-207), or on the shore of Honaunau Bay (5 miles to the south) by Doty (1969:192-201).

### ZONE B

This is a region with a very dry, xerophytic scrub vegetation and an annual rainfall of about 20 inches. It covers the slope from the shore to about 800 to 1000 ft altitude. Much of this area was occupied by native home sites, with grass huts, and garden patches, with dry-land taro and sweet potatoes.

Nelson collected 24 species and reported 7 that grow in this zone, but he left them all but one without habitat data. They are:

*Doryopteris decipiens* (Hook.) J. Sm., in *collibus prope littora* = on hills near the shore

*Thelypteris interrupta* (Willd.) Iwatsuki, called *ulaietea* [= *ulaekea*]

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*Pandanus tectorius* Warb., called *papa*,  
observed by Nelson  
*Digitaria setigera* R. & S.  
*Achyranthes Nelsonii* St. John  
*Portulaca villosa* Cham.  
*Capparis sandwichiana* DC., var. *Zoharyi*  
Deg. & Deg.  
*Lepidium o-waihiense* C. & S.  
*Caesalpinia major* (Medic.) Dandy & Exell,  
listed as Nicker Tree  
*Cassia Gaudichaudi* H. & A.  
*Hibiscus tiliaceus* L., listed as Syrian  
Mallow  
*Sida Ledyardii* St. John  
*Sida Nelsonii* St. John  
*Waltheria indica* L.  
*Wikstroemia Uva-ursi* Gray  
*Spermolepis hawaiiensis* Wolff  
*Ipomoea congesta* R. Br.  
*Merremia aegyptia* (L.) Urban  
*Solanum Nelsoni* Dunal  
*Scaevola coriacea* Nutt.  
*Gnaphalium sandwicensium* Gaud., var.  
*sandwicensium*, forma *canum* Sherff  
*Lipochaeta perdita* Sherff  
*Lipochaeta scabra* St. John  
*Lipochaeta trilobata* St. John

Nelson also collected *Neraudia ovata* Gaud., with the habitat, "in cultis," (= in the cultivated area). The genus grows in the xerophytic scrub at low altitudes, so this was doubtless persisting in the area, in spite of most of it being under cultivation. There is no suggestion that the endemic *Neraudia* was being cultivated by the Hawaiians.

There is also a specimen of *Gossypium tomentosum* Parl., labeled in Solander's hand as collected by "Menzie's & Dav. Nelson." The two men did not collect together, as Menzie's came later to Hawaii, on Vancouver's voyage in 1792, 1793, and 1794. He collected on most of the larger islands, but left no locality or habitat data with his specimens. *Gossypium tomentosum* has not been recorded from the island of Hawaii except for this record (Stephens 1964). The specimen, although associated with Nelson, was probably collected by Menzie's on one of the other islands.

Nearly all of the plants then growing on Hawaii were endemic or indigenous, but the

following exotic weeds were collected by Nelson:

*Thelypteris interrupta* (Willd.) Iwatsuki  
*Digitaria setigera* R. & S.  
*Waltheria indica* L.

*Merremia aegyptia* (L.) Urban

Nelson also made a written report to Clerke, the captain of his ship, and in this he mentioned some plants that he failed to collect. Of these the following were weeds:

*Indigofera suffruticosa* Mill.

*Urena lobata* L.

*Oxalis corniculata* L.

*Ludwigia octovalvis* (Jacq.) Raven

The status of these weeds was discussed in detail elsewhere (St. John 1979).

#### CROP PLANTS

Though not a part of the native flora, and not included elsewhere in our ecological zones, the crop plants cultivated by the Hawaiians are of interest. Nelson observed but did not collect specimens of them. However, in his written report to Capt. Clerke, he mentioned the following:

*Saccharum officinarum* L., as Sugar Cane  
*Schizostachyum glaucifolium* (Rupr.)

Munro, as Arundo, Bamboo Cane

*Cocos nucifera* L., as Coco-nut

*Colocasia esculenta* (L.) Schott, var. *antiquorum* (Schott) Hubb. & Rehd., as

cala, African arum, or Tarrow

*Tacca Leontopetaloides* (L.) Ktze., as

Jatropha, Cassava

*Dioscorea alata* L., as *Dioscoria*, Yams

*Musa*, as Plantain Tree, three sorts

*Amomum*, as Ginger. Doubtless either

*Curcuma domestica* Valet., or *Zingiber Zerumbet* (L.) Roscoe in Sm.

*Artocarpus altilis* (Parkins. ex Z) Fosb., as Bread-fruit Tree

*Broussonetia papyrifera* (L.) Vent., as

Morus, Chinese paper Mulberry Tree

*Aleurites moluccana* (L.) Willd., as Aliares, Candle Tree

*Eugenia malaccensis* L., as *Leptospermum*, the small red Apple of Otaheite, *papa*

*Lagenaria siceraria* (Molina) Standl., as *Cucurbita*, Gourd

## ZONE C1

This is the lower, open forest, with low trees, bushes, and herbs, and a rainfall of about 40 inches. It occupies an area from 500 to about 1200 ft altitude.

The 6 following species have habitat data:

*Cibotium glaucum* (Sm.) H. & A., in Montibus juxta loca culta = in the mountains near cultivated places

*Microlepia setosa* (Sm.) Alston, in Montibus juxta loca culta = in the mountains near cultivated places

*Asplenium unilaterale* Lam., in rupibus = on rocks

*Asplenium* no. 8 (aff. *A. caudatum* Forst. f.), montes ad latera ruposis = on rocky slopes of mountains

*Polypodium pellucidum* Kaulf., in rupibus prope (?) arborum radices = among rocks and near tree roots

*Pellaea ternifolia* (Cav.) Link, in summis jugis montium = on top of mountain ridges

The 11 following species, collected by Nelson but left without habitat data, are surely to be assigned to this zone:

*Doryopteris decora* Brack.

*Neraudia Cookii* St. John

*Charpentiera obovata* Gaud.

*Nototrichium sandwicense* (Gray in Mann) Hbd.

*Sophora chrysophylla* (Salisb.) Seem.

*Kokia drynarioides* (Seem.) Lewt.

*Wikstroemia phillyraefolia* Gray, var. *phillyraefolia*

*Wikstroemia sandwicensis* Meisn. in A. DC.

*Styphelia Tameiameiae* (Cham.) F. Muell., var. *Tameiameiae*

*Solanum incompletum* Dunal

*Lipochaeta subcordata* Gray

Together, these two lists make a total of 17 species.

## ZONE D1 AND 2

These zones the comprise the dense rain forest, which is dominated by *Metrosideros*

trees, but also has numerous tree ferns of the genus *Cibotium*. The ground cover is dense with many ferns. The forest extends from 1200 to 2500 ft in altitude. The annual rainfall is 80 inches or more.

The following 49 species were labeled with habitat data:

*Ophioglossum falcatum* (Presl) Fowler, in Jugis Montium = on mountain ridges

*Botrychium subbifoliatum* Brack., in Montibus Altis = on high mountains

*Marattia Douglasii* (Presl) Baker, in sylvis umbrosis montium = in shady mountain woods

*Cibotium Chamissoi* Kaulf., in locis apertis sylvarum = in forest openings

*Adenophorus pinnatifidus* Gaud., in sylvis arboribus putridis = on rotten trees in the woods

*Adenophorus tamariscinus* (Kaulf.) Hook. & Grev., in arboribus emortuis = on dead trees

*Asplenium acuminatum* H. & A., Montes = in the mountains

*Asplenium caudatum* Forst. f., in sylvis = in woods

*Asplenium contiguum* Kaulf., Montes = in the mountains

*Asplenium densum* Brack., in arboribus emortuis = on dead trees

*Asplenium Macraei* Hook. & Grev., in arboribus emortuis = on dead trees

*Asplenium* no. 29. sp. indet. montes ad latera ruposis = rocky mountain slopes

*Athyrium microphyllum* (Sm.) Alston, in sylvis = in the woods

*Coniogramme pilosa* (Brack.) Hieron., in Sylvis densis Jugum montium = in dense woods on a mountain ridge

*Cyclosorus truncatus* (Poir.) Farw., Sylvis umbrosis = shady woods

*Cyrtomium caryotideum* (Wall.) Presl, 1. in sylvis in truncos arborum subdeciduoses = in woods on trunks of subdeciduous trees; 2. in summis arborum = on tree summits

*Diplazium Fenzlianum* (Luerss.) C. Chr., in sylvis = in the woods

*Dryopteris Keraudreniana* (Gaud.) C. Chr., in sylvis = in the woods

*Dryopteris latifrons* (Brack.) Ktze., in

- Sylvis inter Juga Montium = in woods between mountain ridges
- Dryopteris paleacea* (Sw.) C. Chr., var. *fusci-atra* (Hbd.) C. Chr., in sylvis = in the woods
- Dryopteris unidentata* (H. & A.) C. Chr., Montes = in the mountains
- Elaphoglossum alatum* Gaud., montes sylvis = in mountain woods
- Elaphoglossum hirtum* (Sw.) C. Chr., var. *micans* (Mett.) C. Chr., in truncis arborum emortuis = on the trunks of dead trees
- Grammitis tenella* Kaulf., in arboribus deciduis = on deciduous trees
- Microsorium spectrum* (Kaulf.) Copel., parasitica arboribus virens = parasitic on living trees
- Nephrolepis exaltata* (L.) Schott, ad latera sylvarum = on wooded slopes
- Pleopeltis nuda* Hook., 1. in arboribus deciduis = on deciduous trees; 2. in truncis arborum putridis = on the trunks of rotten trees
- Pteris cretica* L., ad latera sylvarum = on wooded slopes
- Sadleria cyatheoides* Kaulf., ad latera sylvarum = on wooded slopes
- Sphenomeris chinensis* (L.) Maxon, irriguis umbrosis = by shady streams
- Thelypteris glabra* (Brack.) Ching, montes = in the mountains
- Thelypteris sandwicensis* (H. & A.) Fosb., 1. in sylvis = in the woods; 2. ad latera sylvarum = on wooded slopes
- Vittaria rigida* Kaulf., in arboribus emortuis = on dead trees
- Urera konaensis* St. John, in Sylvis Montium = in mountain woods
- Charpentiera obovata* Gaud., in Sylvis densis = in dense woods
- Cocculus Ferrandianus* Gaud., in sylvis = in woods
- Pittosporum Hosmeri* Rock, var. *Saint-Johnii* Sherff, in Sylvis Montium = in mountain woods
- Pelea chusiaeifolia* Gray, var. *cuneata* St. John & Hume, in Sylvis inter Juga Montium = in woods between mountain ridges
- Pelea volcanica* Gray, in Sylvis inter Juga Montium = in woods between mountain ridges
- Ilex anomala* H. & A., in Sylvis inter Juga Montium = in woods between mountain ridges
- Perrottetia sandwicensis* Gray, var. *tomentosa* Deg. & Greenw., in Sylvis Montium = in mountain woods
- Myrsine Lessertiana* A. DC., in Sylvis Montium = in mountain woods
- Myrsine sandwicensis* A. DC., in Sylvis Montium = in mountain woods
- Labordia Nelsonii* St. John, in Sylvis densis Jugum montium = in dense woods on a mountain ridge
- Bobea timonioides* (Hook. f.) Hbd., prope Sylvis = near the forest
- Coprosma pubens* Gray, in Sylvis Montium = in mountain woods
- Coprosma rhynchocarpa* Gray, in sylvis = in woods
- Gouldia Hillebrandii* Fosb., var. *hawaiiensis* Fosb., in Sylvis inter Juga Montium = in woods between mountain ridges
- Gouldia Hillebrandii* Fosb., var. *hawaiiensis* Fosb. × *G. terminalis* (H. & A.) Hbd., var. *antiqua* Fosb., f. *hirtellifolia* Fosb., in Sylvis Montium = in mountain woods
- To be assigned to this zone, there are 38 species which Nelson left without habitat data, and 2 which he observed. They are:
- Vandenboschia davallioides* (Gaud.) Copel.
- Asplenium gemmiferum* Schrad.
- Asplenium monanthes* L.
- Asplenium nidus* L.
- Adenophorus periens* L. E. Bishop
- Diplazium Meyenianum* Presl
- Pteris irregularis* Kaulf.
- Thelypteris stegnogrammoides* (Baker) Fosb.
- Pritchardia* sp., as *Borassus*, Palm Tree, observed by Nelson
- Astelia Menziesiana* Sm.
- Peperomia plinervata* St. John
- Rumex giganteus* Ait. f., var. *Nelsonii* Deg. & Deg.
- Broussaisia arguta* Gaud., var. *arguta*
- Rubus hawaiiensis* Gray

*Pelea grandifolia* (Hbd.) St. John  
*Euphorbia celastroides* Boiss. in DC., var. *Nelsonii* St. John  
*Wikstroemia phillyroefolia* Gray  
*Wikstroemia sandwicensis* Meisn. in A. DC.  
*Metrosideros polymorpha* Gaud., listed by Seemann (1865–73:84)  
*Cheirodendron trigynum* (Gaud.) Hellér, var. *ilicoides* Sherff  
*Vaccinium calycinum* Sm.  
*Vaccinium dentatum* Sm.  
*Phyllostegia floribunda* Benth.  
*Phyllostegia Ledyardii* St. John  
*Phyllostegia longimontis* St. John  
*Phyllostegia macrophylla* (Gaud.) Benth.  
*Stenogyne biflora* (Sherff) St. John  
*Stenogyne hirsutula* St. John  
*Stenogyne Nelsonii* Benth.  
*Stenogyne sessilis* Benth., var. *sessilis*  
*Myoporum sandwicense* Gray, subsp. *sandwicense*, var. *Fauriei* (Lévl.) Kraenzl., Hawaii Form 1  
*Hedyotis centranthoides* (H. & A.) Steud., forma *diffusa* Fosb.  
*Hedyotis Cookiana* (C. & S.) Steud.  
*Psychotria hawaiiensis* Gray, var. *Hillebrandii* (Rock) Fosb.  
*Phytolacca sandwicense* Endl.  
*Clermontia konaensis* St. John  
*Cyanea Grimesiana* Gaud., var. *cylindrocalyx* Rock  
*Cyanea Marksii* Rock, as *Euphorbia*, burning thorny plant, observed by Nelson  
 All together there is a total of 85 species that Nelson collected or observed in the rain forest (Zones D1 and D2).

#### MISSING PLANTS

After leaving the shore, it is evident that Nelson climbed rapidly through the inhabited region in Zone B, observing and noting the cultivated crops, but not collecting them. Then, on entering the native forest, evidently he was a good observer and an active collector. Obviously, he was fond of ferns, for he collected 42 species of them, and for 38 of them he recorded habitat data. He deserves

much credit for his gatherings and his observations, which give us our first glimpse of the vegetation of Hawaii, an invaluable one, as it was before the depredations by introduced grazing animals.

As one contemplates the sum of Nelson's collections, one sees that certain conspicuous native plants are missing, and one wonders why he did not find them. For instance, there are:

Zone B. *Heteropogon contortus* (L.) Beauv. ex R. & S.; *Erythrina sandwicensis* Degener; *Reynoldsia* sp.; *Plumbago zeylanica* L.

Zone C1. *Pisonia Brunoniana* Endl.; *Diospyros ferrea* (Willd.) Bakh., var. *sandwicensis* (A. DC.) Fosb.

Zone D (if not Zone C1). *Acacia Koa* Gray

The reasons for these species being overlooked are unknown.

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