Published in cooperation with the National Park Service.

JULY 1, 1958

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<tr>
<th>Date</th>
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The table above documents the conditions observed over a series of dates. Each date is associated with a documented condition.
### Collection and Field Note Book

No. 59

(Oct. 17, 1960 - March 10, 1961)

(41374 --- 41455)

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<td>Flight Kwajalein-Majuro</td>
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<td>Majuro-Jaluit</td>
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<td>Majuro</td>
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<td>Washington area</td>
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*(see above)... 152-200
(Hawaiian-Oahu)
Self-Guiding Nature Trail
KIPUKA PUAULU

George C. Ruhle

Walking Time, 1 hour

This pamphlet is a key to the numbered stakes which you will see along the trail. You may keep it if you wish, or return it to the holder at the end of the trail. It is a service to you by the Hawaii Natural History Association that you may have greater appreciation through better understanding.

Repetition is an effective tool of the learning process. As refreshers and quick reference to the descriptive paragraphs, numbers have been frequently repeated along the trail.

Published in cooperation with the National Park Service.

JULY 1, 1958
The system of 30 National Parks contains areas of highest scenic and scientific grandeur essentially in the primitive state. The National Park System, of the Department of the Interior, administers these, as well as 150 other areas of outstanding national significance. The law of the land enjoins that these be so used that they may be passed unimpaired for the enjoyment of future generations.

The story of Hawaii National Park is the story of active volcanism distinguished by eruptions of very fluent lava. The park is in two sections: that on the island of Hawaii embraces the summit of Mauna Loa and most of Kilauea Volcano; the section on the island of Maui includes the great crater of Haleakala.

In the maze of lava streams that pour out during Hawaiian eruptions, areas of older surface often escape cover by successive flows. An oasis thus formed is called a kipuka, a word that also means a loop or an open space in the forest. If a kipuka of large size is effectively isolated for a long period of time, good, deep soil forms, the plant inhabitants develop characteristics that reflect the nature of their history and environment, a distinctive flora is evolved. Such is the Kipuka Puaulu with its area of 100 acres. Some forty-odd species of native trees have been claimed as natural members of its flora. Many type specimens have been collected in it and described by botanists. Authorities have been drawn from faraway countries to observe its treasures. It is a significant place in the world of plants.

The name has been interpreted variously. Pua means flower, but is also to be translated as a collection of things bound together. Ulu is to grow; it is also the name for breadfruit, which appears inapplicable here. A popular nickname, Bird Park, has no significance and little to commend it.

Pilo
See No. 13

Momane
See No. 8

To label a plant or natural specimen is too often a prelude to its destruction or removal. Please respect the integrity of specimens and be thoughtful of those who follow you.

Cigarette butts and trash do not add to your enjoyment of the park. You can easily dispose of them so that they cannot be obnoxious to you and to those who come after you.

At the start of the trail is an exhibit with a map showing the outlines of the kipuka, surrounded by prehistoric but recent (before 1200) flows. Four common native birds, the apapane, i'iwi, amakihi, and elepaio, are illustrated in color. This is a favorite haunt, giving the nickname Bird Park. Since the birds forage in the lofty canopy of trees, and sing little during the heat of the day, patience and quiet are necessary qualities for seeing and studying these alluring subjects.

Dodonaea sp.), one of the first flowers to be seen along roads to the park. It grows to the base of theMauna Loa. Male flowers are small. The clusters of showy red stamens are closely packed in the flower clusters. It is a shrub, one of the commonest forest trees on the islands. Many species are growing in almost pure stands. It is a pioneer on most lava flows. The showy pompons of bright red stamens make it attractive while in flower.

3. As you stand on this rise, look about you. You are on the threshold of Kipuka Puaulu. Note the contrasting scenes behind and before you. Almost all of the trees on the flows back of you are ohia: the shrubs mixed through them are pu'ikaue (Styphelia tateiameiae) and aalii.

4. Ionui (Dryopteris paleacea). A rather stiff, erect fern that is common in Bird Park. Varieties or close relatives of this fern are widespread throughout the world. This and several other ferns are erroneously termed lankahi, the Hawaiian word for plantain, Plantago major.

5. Palapalai (Microlepia setosa), a lacy, attractive fern, one of the commonest along the trail. It prefers open glades and edges of the woods. It grows on all of the larger islands, and elsewhere on Pacific Islands, Malaysia, India, and Ceylon. It was used to decorate the altars of Laka, goddess of the hula.

Dodonaceae are found on all of the larger islands of Hawaii. The three chief species are D. viscosa, D. eriocarpa, and D. sandwicensis. D. viscosa is also found in other parts of the Pacific.
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1. Aalii (Dodonaea sp.), one of the commonest shrubs to be seen along roads and trails in the park. It grows to the size of a small tree along the Mauna Loa Truck Trail. Male and female flowers appear on separate plants. The clusters of yellow or bright red seed capsules with papyry wings make the shrub showy while in fruit. These were used for leis and for extracting a brilliant red dye with boiling water. Kapa and other things were colored with it. The wood of the plant is tough and durable, useful for spears and various purposes.

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2. Ohia Lehua (Metrosideros collina). The ohia, like the eucalyptus and guava, belongs to the Myrtle Family. It is found throughout Polynesia, and grows from sea-level to 9,000 feet in Hawaii. It is the commonest forest tree on the islands often growing in almost pure stands. It is a pioneer on most lava flows. The showy pommoms of bright red stamens make it attractive while in flower.

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Please help preserve the primitive scene by placing refuse in containers provided for this purpose and by refraining from picking, breaking, or removing flowers, ferns, and natural specimens.
6. Sword Fern, Nianiau or Okupukupu (Nephrolepis exaltata). Several species exist in the park. Native to tropical and subtropical climes, the sword fern is a popular house plant that exhibits many varieties. This is a pioneer plant in new lava fields and on the floor of Kilauea Crater. A very hairy variety, N. hirsutula, grows abundantly in steam cracks.

7. The common herbs forming a ground cover here are an introduced geranium (17A) and the native strawberry (17B), oholo papa (Fragaria chiloensis). The latter bears fruits that are small, white, and often of good flavor. This strawberry is distributed from southern Chile to the Aleutians.

The vigorous grove contains papala kepau, kopiko, pilo, oloupa, kolea, ma-mane, mamaki, manele and ohia lehua trees. These are discussed individually along the trail.

8. MAMANE (Sophora chrysophylla). A common shrub or small tree found from 2,000 - 10,000 feet on all islands except Molokai, this member of the bean family bears attractive yellow flowers and compound leaves. It is related to the golden shower trees. It is eagerly eaten by livestock and feral goats, that have eradicated it in many areas. The wood is very hard and durable. Note the winged pods and shiny orange or yellow seeds, if the trees are in fruit. The mamane is endemic to the Hawaiian Islands, but other species of the genus, more than two dozen in number, are found distributed throughout warmer regions of the world.

9. Kopiko (Straussia Hillebrandii) is an abundant tree in Bird Park. It belongs to the important Coffee Family, which is widespread, mostly tropical, and has 350 genera, of which a dozen are native to the Hawaiian Islands. Of these, Straussia, Gouldia, and Bobea are endemic. Kopiko in Bird Park are readily identified by their dark green, opposite leaves that have conspicuous midribs and veins. A scale aphid often infests the lower surface of the leaves.

10. Hawaiian olive, Oloupa (Osmanthus sandwicensis). The glossy, leathery leaves may be six inches long on very young trees. The hard, dense wood was used for handles of spears and adzes. Osmanthus belongs to the same family as the cultivated olive. Olea europaea.

11. SOAPBERRY, MANELE (Sapindus saponaria). It is remarkable that this tree resembles or is identical with evergreen soapberry of tropical America. Here the leaves become yellowish in autumn and are shed in winter. The smooth gray bark on larger trees peels off in big flakes. The leaves are compound with five to six pairs of leaflets; on young plants they often grow on winged anthocyanic, flattened stems. The pulpy seed coverings contain saponin, which poisons in water. The hard, round, brownish-black seeds are sought by Hawaiians for head leis.

12. Papala kepau (Pisonia inermis). The shiny, oblong leaves are dark and glossy. Like those of many other Hawaiian trees, they may be very large on young trees. The fruits, borne in a loose, open panicle 6 to 12 inches long, exude a viscid glue, used by the early Hawaiians for catching perching birds to obtain feathers for feather cloaks and ornaments. The word kepau means a viscous liquid like tar or molasses.

13. PILO (Coprosma rhyncocarpa). Of the half hundred species in this genus, fifteen have been described from the Hawaiian Islands. Several species occur as trees and shrubs in the park; of these sprawling kakeaene, so common on barren lava fields and open forest, is best known. A member of the Coffee Family, little use appears to have been made of these small trees. The pilo is readily recognized by its opposite leaves with broad triangular stipules between their stems forming a loose, funnell-shaped sheath.

14. BRACKEN, KILAU (Pteridium aquilinum). The cosmopolitan bracken, possibly the best-known fern, grows abundantly in open grassland. The native form is found from elevations of 500 to 9,500 feet. The plant has a creeping, underground stem upon which the large, coarse, triangular fronds grow. Varied use is made of the plant throughout the world such as for food, medicine, litter, and basket material. The fruiting bodies of bracken occur in a continuous band along the edges of a frond, which are partially rolled back over it.
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15. **Manena** (*Pelea cinerea*) has slender, twining branchlets with small leaves and comparatively small fruits. Like the others of its genus, the leaves are opposite; some are fragrant.

16. **Mamaki** (*Pipturus sp.*), is a member of the stinging nettle family. The inner bark of this plant was used by the Hawaiians for making kapa or bark cloth. It is one of the most abundant fiber plants found in the Islands.

17. **Manono** (*Gouldia terminalis*). The lone tree ten paces above the sign is another member of the Coffee Family. The genus is one of the three endemic to the Hawaiian Islands.

19. **Nasturtium** (*Tropaeolum majus*), a native of Peru, has escaped from gardens, finding the environment very suitable for its spread. Here it drapes a prostrate *ohia* log, ten paces below the trail.

20. **Koa** (*Acacia koa*). The trees in the glade below the trail are koa. Like the manane, the koa is a member of the legume or pea family and is native only to the Hawaiian Islands. The genus *Acacia* has 450 species in the tropics and subtropics throughout the world; those growing in Australia, are called wattles. The bark of the young koa is smooth; the bark on the older trees is coarse.

21. **Maua** (*Xylosma Hillebrandii*). This small tree is ten paces behind the sign. It is uncommon in Bird Park, but prefers drier lands on leeward slopes of all the major islands except Kauai and Oahu. It is a handsome tree with shiny, toothed, crenulate leaves whose color often gives the tree a reddish cast.

22. **Kipuka Boundary**. This ridge is the edge of the prehistoric lava flow from Mauna Loa that surrounded this *kipuka* but failed to cover it. Notice the difference between the forest growing on the relatively recent lava flow abroad and that growing on the rich soil of the *kipuka*.

23. **Papala** (*Charpentiera obovata*), an endemic tree, rare in the park. Do not touch or disturb this planted specimen. Its small red flowers hang in large loose panicles from the ends of branches. The wood is soft, fibrous, very light, and inflammable. The Hawaiians heaped it into bonfires which they pushed over cliffs and vantage points. Because of their buoyancy, rising air currents would buffet the glowing torches in brilliant display upward, downward, and sideways like so many shooting stars.

26. **False Sandalwood, Naio** (*Myoporrum sandwicense*). When the supply of true sandalwood (*Santalum sp.*), a chief item of trade in the early days, began to run low, *naio* was used as an inferior substitute. Since demand for it never became great, *naio* trees are still abundant in these islands, to which they are native. In Bird Park old trees develop deeply furrowed, knobby holes, with heartwood much decayed so that only strips of living tissue remain. (See illustration on page 12). Despite this, they cling tenaciously to life, sending out vigorous shoots from their tops. These are the most picturesque objects along the trail.

27. **Tarweed, Pukamole** (*Lythrum maritimum*). A sticky, hairy undershrub of the American tropics grows rank here. It bears small, magenta flowers. It belongs to the Crape Myrtle Family.
28. Open Forest Growth. In this locale, the trees do not compete with each other in their efforts to obtain sunlight. Compare the symmetry of the spreading ohia in the distance to the crowded koa on the left skyline. Note also the fallen ohia twenty paces to the left. Its branches have turned upward in time may become independent trees as the old tree decays. Curiously shaped ohia may be seen on the right of the trail beyond sign 39, and on the left of the trail 30 paces before reaching sign 42. Similar contorted individuals are especially conspicuous at Kipuka Nene campground.

This is an excellent spot for observing birds. The frequent crowing of pheasant cocks is a complementary sound.

29. Collapsed Lava Tube. Many layers of volcanic ash have accumulated through the centuries, some of them from eruptions of distant Mauna Kea. Such ash forms much of the topsoil in Kipuka Puaulu. This collapsed lava tube and the lava above it provide opportunity for gauging the depth of the soil. DANGER—DO NOT APPROACH THE TUBE.

30. Kookoolau (Bidens pilosa), an introduced weed from tropical America. Its annoying, black needles, less than one-half inch long, are pronged so that they readily cling to clothes and to fur of animals. The many species of Bidens have been given appropriate popular names: Spanish needles, beggar ticks, sticktight, tick seed, bur marigolds. Over sixty blander native Hawaiian species have been described. Leaves and tips of young plants, fresh or dried, are steeped for a beverage, often in preference to commercial tea. In season, a large undershrub native to Puuwaawaa glitters with thousands of golden flowers in big panicles, a glorious sight indeed. Kookoolau Crater on Chain of Craters Road was named for the species growing within it.

31. Ae (Zanthoxylum dipetalum). The Zanthoxyla, represented by three species in Bird Park, are very rare in numbers of individuals. This is an unusually large specimen. Like the Pelea, this belongs to the Rue (Citrus) Family.

32. Akala (Rubus hawaiensis), a giant among raspberries. A half dozen berries fill a bowl. The bearing season, which is in midyear, like the taste and color of the fruit, varies with plants and location. Usually the berries are purple, but the blossoms and juice are pink. Akala means pink in Hawaiian.

A short trail to the left leads to a huge koa whose base is seven feet in diameter.

33. Huehue (Cocculus ferrandianus), a native climber widely distributed from sea coast to 5,000 feet. The tough flexible stems are useful as natural twine. Hawaiians wove them into baskets with funnelform mouths that were used as fish traps.

34. Alani (Pelea Zahlbruckneri). Named by the great Hawaiian dendrologist, Joseph Rock, for his celebrated friend, Dr. A. Zahlbruckner, Director of the Viennese Botanical Museum. It has the largest leaves of any Pelea, and large, curious fruiting capsules like four-pointed stars.

35. Olapa (Cheirodendron Guadichaudii). One of the commonest, most conspicuous of forest trees. Its bright green, shiny leaves are palmately compound and constantly flutter in the breeze. When bruised, all parts of the tree emit a strong turpentine odor. The name olapa was applied to those hula dancers with lithe, supple bodies and most graceful motions, who could best imitate the dancing of the olapa leaves. The tree is twenty paces behind this sign, growing in the big patch of Microlepis.

36. Maile (Alyxia olivaeformis). This twining, native, vinelike shrub is the laurel of old Hawaii. Its fragrant stems and shiny leaves carry a faint odor of vanilla. They were a favorite and an indispensable adjunct to every festive occasion, being used for decoration and for leis.

37. Mint (Mentha spicata). This large patch of non-native mint affords an example of how native plants are often crowded out by hardy foreigners. Please do not pick the mint and drop it along the trail, as this aids in spreading it and in choking out desirable plants.

38. Large Koa (Acacia koa). In regions in which growing seasons are indefinite, the age of a tree cannot readily be determined by a count of annular rings. This tree is probably several hundred years old. The koa was used more than any other tree in making Hawaiian canoes, both the single kaukahi and the double kaulua. The hard, beautiful wood is suitable for the manufacture of furniture and other objects, such as bowls and trays.

39. Opuhec (Urera sandwicensis), like the mamaki, is a member of the stinging nettle family and is used for making kapa. It is a medium-sized tree with male and female flowers growing on separate plants. The large, oblong, dark green leaves have prominent veins; the stems exude a watery, milky fluid when broken. Fibers from the bark are tough, useful for making cord for fish nets.

40. Large Ohia Lehua (Metrosideros collina). An idea of the size to which these trees grow may be obtained from this specimen. It is approximately 80 feet high, and about five feet in diameter at the base. The flower of the ohia, the lehua, is the flower of the Island of Hawaii. Many birds, particularly the red apapane, feed on the nectar of these flowers. The wood of ohia is hard and durable; it was used for making gunwales of outrigger canoes, timbers for housing, and pol boards.
41. **Ti, Ki** (*Cordyline terminalis*), is a very useful plant to Hawaiians. The leaves are used in wrapping food, either for storage, for handling, or for cooking in the earth. They formerly served for thatch and for skirt material. A crude musical instrument is made by rolling up a leaf, *Okolehua*, a potent alcoholic beverage, is brewed from the roots of this plant.

42. **Young Koa Leaves** (*Acacia koa*). Both the fernlike, juvenile leaves and the adult, sickle-shaped phyllodea may be seen on the lower branches of these trees. A young *koa* starts growth with compound leaves only. As it grows, the petioles (leaf-stalks) expand and replace the leaflets. The resulting leaflike organ, termed a phyllode, may be a clue to the evolutionary history of the *koa*. Finely divided leaves are characteristic of plants that are not exposed to loss of life-sustaining moisture through surface evaporation. A leathery, smaller-surfaced appendage is better adapted to withstand the strain of drought. Despite heavy rainfall in the islands, supplies of moisture stop abruptly with a shift of winds: the soil and atmosphere quickly assume a desert character which, if of long duration, is critical to poorly adjusted plants. The *koa* has become neatly adjusted to its environment.

43. **Grassland.** Many grasses not native to the island grow in Kipuka Puaulu. Most of these were introduced with stock feed brought from the mainland. In some areas the grasses are growing so densely that it is impossible for native plants to get a start.

44. **Avocado** (*Persea americana*). Somebody thoughtlessly tossed aside a seed. Well above optimum range for the plant, it has grown into a robust tree that cannot bear fruit.

---

**Alaolelaiuini**

**Naio trunk**

**DESERT MUSEUM**

*AT THE DESERT MUSEUM*
*one admission charge covers all exhibits:*
Adults — 75c
Children 6 to 12 — 25c
Under Six — Free
Souvenir Aerial Map
ARIZONA-SONORA DESERT MUSEUM
A LIVING MUSEUM
P. O. BOX 5602
TUCSON, ARIZONA

We hope the use of this aerial map will add to the pleasure of your visit to the Desert Museum. The reverse side offers a directional map designed to aid those wishing to visit other places of interest in the Tucson area.

At this museum you will see interpretive displays of living animals and plants native to the states of Arizona, U.S.A., and Sonora, Mexico, with emphasis on the Sonoran Desert contained in both states.

The Desert Museum is a non-profit educational institution supported by admissions, memberships and donations. Contributions are tax deductible.

MAKE THIS YOUR MUSEUM! Membership information is available at the desk.

(Blanton & Cole aerial photo by Don Cassidy; drafting by Red Ross)
THE DESERT MUSEUM IS open every day of the year—from 10 A.M. to 5 P.M. (until sundown on Sundays and holidays).

ARIZONA-SONORA DESERT MUSEUM

Guide Map of

TUCSON MOUNTAIN PARK

KEY

1 ARIZONA-SONORA DESERT MUSEUM
2 "OLD TUCSON" MOVIE SET
3 SAN XAVIER MISSION
4 MUNICIPAL AIRPORT
5 UNIVERSITY OF ARIZONA ARIZONA STATE MUSEUM ARIZONA PIONEERS' HIST. SOC.
6 RANDOLPH PARK
7 SABINO CANYON
8 SAGUARO NAT'L MONUMENT
9 COLOSSAL CAVE

TO PAPAGO INDIAN RESERVATION
AIJO AND OPEN PIT COPPER MINE
ORGAN PIPE CACTUS NAT'L MONUMENT
PUNTO PENASCO ROCKY POINT, MEX.

TO TUBAC PRESIDIO HIST MON
TUMACACORI NAT'L MONUMENT
NOGALES AND OLD MEXICO

DIRECTION

(By George)

ARIZONA-SONORA TO PHOENIX WEST COAST

UNTO PENASCO ROCKY POINT, MEX.

ARIZONA-SONORA DESERT MUSEUM

© OLD TUCSON MOVIE SET
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DIRECTION

(By George)
Dear Ray:

Al Mead rang a short time ago to say that you would come at Easter time. He wasn't too sure whether you would arrive on April 2nd. He said he would write you and arrange to meet you at the airport, but he told him to bring you here. You can have the guest-room, if you don't mind using one in a museum. It has all been cleaned up for friends due today, and others due from Malaya at the end of April. I cannot offer much except talk, but I think that is what you have come for. We can see that you get in to see Al or Paul Martin and so make good use of your time.

You have not heard from me because I have been sick and am in the frustrated frame of mind that makes me wish to underline everything. I am wholly better this week, but have had recurrent influenza all of January and February. Never had anything like it: next February, I think we'll go away to a more equable climate and dodge this odd spring climate here. We had snow on the mts. today, after 80° temperatures two days ago: that is typical. I think I got run down before Christmas, and tried to do too much with the microscope at night.

I got a friend to make prints of the Hawaiian negatives, but they are only so-so. I enclose some. I could still send you the negatives, of course. Unfortunately my helper lost my treasured negative of Selling stick in a mucky path on Kauai: that has been bad luck.

Congress: I sent in the proposed arrangement, changing the title to:--

POLLEN CLUES TO ANCIENT PACIFIC FLORAS. That has seemed to suit everyone better. I found that nobody wished to speak on Cretaceous angiosperms. I was premature about that, but plan to stick to them myself. Dr. A.C. Smith says he has sent off the title to Honolulu, so you may know all this... Jane Gray is to do Pacific NW coast; a Jap...
congress: I sent in the proposed amendment, changing the title to:

path on canvas: that has been bad luck.

for example, why not have the measured negates of being stuck in a much

I got a friend to make prints of the Hawaiian negates, but they are

* do too much with the microscope at night

two days ago: that is a good idea; I think I got ran down before hands, and tried to

that odd apathy of some here: we had snow on the roofs today; after the temperatures

like the next week: I think we'll go away to a more equable climate and climate

weekly but have had frequent intrusions all of the next week. However had anything

frame of mind that makes me wish to understand more than I am wholly better this

You have not heard from me because I have been sick and in the hospital.

Mary and so make good use of your time.

that is what you have come for. We can see what you get in to see if or Paul

from Manila at the end of April. I cannot get enough except Falk, but I think

one in a house. I have all been cleaned up for the house; of course I don't mind

told him to bring you here; you can have the guest-room, if you don't mind

he said he would write you and arrange to meet you at the airport. I have

at Easter time. He wants too sure where you would arrive on April 7.

Dear Mrs. hay:

Sunday

TUCSON, ARIZONA
303 EAST CANTY ROAD
WATSON SMITH
something about genera that survive in Japan (it turned out he could not tackle fossil material), Muller will contribute a paper—to be read by Jane Gray—on pollen evidence to do with the history of the mangrove formation—and then Balme of W.Australia (if he can come) will give a survey of pollen and spore work for older deposits of Australia. I end up with "THE CRETACEOUS ROLE OF NOTHOFAGUS".

It will thus be a sort of progress report on pollen work in the Pacific.

To my chagrin Dr. Smith wrote last week to say that he thought I wanted a four hour session. I have been told, I understood, to arrange one of 2 hours with 3-4 speakers. He left the matter open, so I wrote back at once accepting the longer time and explaining that it would help greatly in developing the arguments. Chaney will now have more time to introduce or lead comments after papers or at the end, and I have suggested that he give his introductory comments a title* something like a "Macropalaeontologist looks at Fossil Pollen". He can be as critical or as appreciate as he likes and thus inform the audience about what is going on in general in palaeontology. He has been most co-operative so far, and all will be well, if he turns up. I have heard that he can change plans without much warning.

He wants to add in a Dr. Tokunaga from Japan. He has offered to read his paper—on Eocene pollen from Japan, so I have now accepted. He says neither Tokunaga nor Ueno (the other man, whom he recommended first and whom, unfortunately, we invited) should try to deliver papers in English.

Thus there is some chance to compare the northern and southern deposits and microfossils over a considerable period.... The mangroves will be of general interest as a lot of attention is now being paid to them in Europe, in this country, and by Croizat. The southern hemisphere is a little short just now, and I am worried as Balme has not written since term began at the beginning of March. He had had no word then about getting any financial aid. Without aid from the N.S.F. he is in a bad position in seeking aid from his University or his Govt... He went to India two years ago and is afraid the Univ. won't help now, as they are so short of funds. He suggests very aimably that I could read his paper if he failed to turn up, but it is rather beyond me. He is a to-notch, and most highly spoken of by Dr. Edna Plumstead, who is just about to come out with a striking contribution on the older fossil deposits from which the Fuchs-Hillagy Exped. collected.... You
should watch for her papers on Glossopteris too: they are used by Belville in
his theories about the devt. of the angiosperm flower (Nature, Oct. 1, 1961: long
article). (Or was it Feb. 1: I cannot remember). She agrees with me about Antarctica
but has far more evidence than I have had for somewhat revolutionary views. I have
offered her some of my new evidence, and have told her I intend to send a note
in to Nature about it as soon as possible.

With two hours extra in hand, we may be in difficulties, if Balme
does not come, so I have reinvited Dr. Isabel Cookson by cable, and have also asked
Vishnu-Mitrre (Birbal Sahni Institute) by cable. I am waiting for their replies now.
Cookson might come, as she indicated too late that she would have accepted my first
invitation if there had been any suggestion that help would be available. Vishnu-
Mitrre might be able to come, as he has been asking questions about it for some
time. Florin backs him very strongly, so I have asked him to do a short paper on
trisaccate grains: this brings in the Pacific area, Antarctica, and Kerguelen; and
then the Gondwana areas. He has plenty to say as he has been telling me his
views in recent letters/

If neither can come I am afraid I could not have more papers
read, as that would throw too much on Chaney, Jane Gray and myself.

This is a suggestion—not just an alternative: Would you be
willing to collaborate with Stella Leopold and myself in giving a piece on Rapa?
I did not invite Stella originally as I did not know of her work on the western
borings, nor that she had that Rapa sample. I think I shall telephone her and get
an opinion from her. I'd then ask her to deliver the paper, if she could come to the
Congress. She may, of course, be going to the INQUA one in Poland.....If she cannot
do it, perhaps you and I could do it, and you could deliver it. The pollen side
would be slight, comparatively, and you could handle it if I got slides ready. By
then you will have the note in Nature to refer to. (I am sure they will accept it, as
they like controversial things). PLEASE SEND ME A CABLE OR AIRMAIL LETTER AS SOON
AS POSSIBLE, AS SMITH TELLS ME ONLY UNTIL MARCH 31st to inform him about
full list of speakers, titles, times, summaries, etc. I think this would be a
chance to stake out our claims on Rapa.

(I keep finding odd monocot pollen grains and must get more comparative material as soon as possible. I need Zingiberaceae (one may be a Curcuma), Taccaceae (I have two, but need more), Commelinaceae and Musaceae.... Marliss isn't too good at sending samples at present, but Eddie Bryan would he help, he says. He might pick out a few scarps and send them along with you. All he has sent so far has been most useful. Annetta Carter (Berkeley) has also sent pollen of 13 spp. Unfortunately most of her Rapa material—whish seems to be extensive—has no pollen.

Can you get any samples of flowers of *Balanophora*? This may be important. Any *Balanophora*—the more the better. I have *B. fungosa*, but must check that as I believe Croizat lists a different species for Rapa.

The Rubiaceae may be important: I think that family should be treated monographically (for pollen types)...

The total of species for Rapa is still not high, so don't let me raise your hopes too much. This is odd, somehow, as some delicate grains are marvellously well-preserved. Bailey did not agree that my tracheids were from an Araucarian: I have lost faith in identifying this family from wood elements, anyway: most of the literature is conflicting....

The conifer pollen remains, but it is now more difficult to handle. You will see what I have done about it in the Nature article: I did not attempt to hang the whole story on it, as I had hoped to do. The title now is (if approved by Nature) "RAPA NEGLECTA: A Thimbleful of Continentality". The previous one was "A Rapa Conifer*: Contaminant, endemic, or Gift of the West Wind Drift?" We may still use that title. Tell me at once if you would prefer the second title.

My guests are overdue, so this letter has grown longer.

Best wishes,

P.S. If you send a cable you can use our Tucson Tel. number: East 6.9607. That helps get it to use quickly. Address it to me as MRS. WATSON SMITH.
Dear Mr. Wilson,

I am glad to hear from you and thank you for your kind message regarding my improvement.

I understand your concern about my health, but I assure you that I am doing my best to recover. I have been following the advice of my doctor and trying to rest as much as possible. However, I am still experiencing some discomfort.

The weather here is quite pleasant, and I enjoy taking long walks in the park. It helps me clear my mind and reduces my pain. I am also trying to stay active by doing some light exercises, which I believe are helping me.

I hope this letter finds you well. Please let me know if you need any information or assistance. I am always here for you.

Yours truly,

[Name]

---

Dear [Name],

Thank you for your concern and for the kind message you sent. It was very thoughtful of you.

I am doing my best to recover, but it is a slow process. The doctor has advised me to take it easy for a while and focus on my health. I have been following the prescribed medication and trying to rest as much as possible.

I am grateful for your support, and I hope we can continue to keep in touch. Please let me know if you need any information or assistance.

Yours sincerely,

[Name]
SESSION 2

2:00 p.m. Buses leave Ramada Inn for meeting on "Water Street U.S.A."
5:30 p.m. Buses leave for "Old Tucson"
6:00 p.m. Reception, chuck wagon dinner, and entertainment at "Old Tucson"

TUESDAY, APRIL 18
8:00 a.m. Registration
Lobby, Ramada Inn

SESSION
Ramada Room

Theme: "Multiple Use of Watersheds"
William E. Richards, President

9:00 a.m. Opportunities in Multiple Use of Watersheds
Harold G. Wilm, Commissioner, New York State Conservation Department, Albany

9:30 a.m. Discussion

9:50 a.m. Water for Agriculture, Industry and Recreation
Hon. Frank J. Welch, Assistant Secretary of Agriculture, Washington, D.C.

10:20 a.m. Discussion

10:40 a.m. Motivating Multiple Use of Watersheds Marvin Melton, President, Arkansas State Chamber of Commerce, Little Rock

11:10 a.m. Discussion

11:30 a.m. Recess

11:45 a.m. Luncheon, Plantation Room
John H. Jones, President
Luncheon, Plantation Room

Life Zones in Evidence on Spectacular Mt. Lemmon
Norman P. Weeden, Supervisor, Coronado National Forest, Tucson

1:30 p.m. Buses leave Ramada Inn for Mt. Lemmon tour

5:00 p.m. Buses return to Ramada Inn

7:00 p.m. Reception, Plantation Room

7:30 p.m. Annual Dinner, Ramada Room

Toasts

Toastmaster: C. R. Gutermuth, Chairman, Steering Committee, and Vice-President, Wildlife Management Institute, Washington, D.C.

Presentation of awards: Watershed of the Year
Watershed Man of the Year

Principal Speaker: "How Small Watershed Programs Help Communities Grow" L.L. Males, President, Security State Bank, Cheyenne, Oklahoma

"Desert Ark" live animal demonstration by Hal Grau, Tucson. Music will conclude the program

WEDNESDAY, APRIL 19
SESSION 4

Theme: "Water for a Thirsty Land"

SESSION
Ramada Room

9:00 a.m. John I. Taylor, Presiding

Arizona Water Management Programs
Andrew L. McComb, Head, Department of Watershed Management, University of Arizona, Tucson

9:30 a.m. Discussion

9:45 a.m. Water Yields from National Forests

10:15 a.m. Discussion

10:30 a.m. Watershed Management on Public Lands Karl S. Landstrom, Director, Bureau of Land Management, Washington, D.C.

11:00 a.m. Discussion

11:15 a.m. Watershed Management to Serve Reclamation Needs
LaBelle E. Coles, President, National Reclamation Association, Prineville, Oregon

11:45 a.m. Discussion

12:00 noon Recess

12:30 p.m. Luncheon, Plantation Room
Watershed Management to Serve Recreation Projects
Francis W. Sargent, Executive Director, Outdoor Recreation Resources Review Commission, Washington, D.C.

3:30 p.m. Special meeting for representatives of participating organizations, Ramada Room

THURSDAY, APRIL 20

Post-Congress tour of the Agricultural Research Service's Walnut Gulch Watershed. The 65-square-mile experimental project is located near Tombstone. This guided tour will take half the day. A luncheon stop will be made in Tombstone.

8:00 a.m. Buses leave Ramada Inn
CONGRESS STEERING COMMITTEE

C. R. Gutemuth
Chairman
Vice-President, Wildlife Management Institute
Washington, D. C.

JAMES R. CRAIG
Editor
American Forests
The American Forestry Association
Washington, D. C.

JOHN H. JONES
Secretary-Treasurer
American Watershed Council
Fairmont, West Virginia

WILLIAM E. RICHARDS
President
National Association of Soil Conservation Districts
Holdrege, Nebraska

JOHN I. TAYLOR
Assistant Legislative Director
American Farm Bureau Federation
Washington, D. C.

PARTICIPATING ORGANIZATIONS

American Farm Bureau Federation
American Fisheries Society
American Forestry Association
American Nature Association
American Planning and Civic Association
American Pulpwood Association
American Watershed Council
Chamber of Commerce of the United States
Inter-Ash'N of Game, Fish and Conservation Comm'rs
Isaac Walton League of America
National Association of County Officials
National Association of Manufacturers
National Ass'n of Soil Conservation Districts
National Audubon Society
National Farmers Union
National Grange
National Parks Association
National Reclamation Association
National Wildlife Federation
Nature Conservancy
Outdoor Writers Association of America
Society of American Foresters
Soil Conservation Society of America
Sport Fishing Institute
Wilderness Society
Wildlife Management Institute
Wildlife Society

Dr. Andrew L. McComb, Chairman, University of Arizona
Joseph Arnold, Arizona State Land Office
Robert V. Boyle, U. S. Soil Conservation Service
William Carr, Pack Forestry Foundation
Mrs. Hoyt Dockard, Arizona Federation of Women's Clubs
H. Lewis H. Douglas, Valley National Bank, Tucson
Mrs. H. Earle, Arizona Federation of Garden Clubs
C. Edgar Goyette, Pioneer Hotel, Tucson
Hal Gras, Arizona-Sonora Desert Museum
Dr. Reuben G. Gustavson, University of Arizona
Mrs. C. R. Hensley, Arizona Federation of Women's Clubs
Joseph Wood Kutch, Tucson
Marvin Morrison, Arizona Farm Bureau Federation
Dr. W. G. McGinnies, University of Arizona
C. M. Palmer, Jr., Tombstone
E. L. Rowland, Bureau of Land Management
Robert J. Smith, Arizona Game and Fish Commission
Dr. Lyle K. Sowls, University of Arizona
Jack Weadock, Arizona Daily Star, Tucson
Mrs. Mabel Weadock, Tucson
Norman Weeden, U. S. Forest Service
William H. Woodin, III, Arizona-Sonora Desert Museum

PRESS ROOM

Rodeo Room on Mezzanine Floor
Daniel A. Poole, in charge

REGISTRATION

Registration ........................................ $ 5.00
Luncheon, Monday, April 17 ........................ 2.50
Session II, Monday, April 17 ....................... 7.00
Includes all transportation and visit to
"Water Street U.S.A." at the Arizona-
Sonora Desert Museum; Reception,
Chuck Wagon Dinner, Admission, and
Entertainment at "Old Tucson"
Luncheon, Tuesday, April 18 .................... 2.50
Mt. Lemmon Bus Tour .............................. 2.00
Reception and Annual Dinner ................... 6.00
Luncheon, Wednesday, April 19 .................. 2.50
Total when purchased individually .......... $27.50
Special combined price for all tickets ....... $25.00
Post-Congress Tour of Walnut Gulch
Watershed, Thursday, April 20 ............... $ 3.00
Eighth National Watershed Congress

709 Wire Building - Washington, D.C.
| United States Department of the Interior | | |
| National Park Service | | |
| COLLECTING PERMIT | | |
| In Accordance with the Conditions and Restrictions Appearing on the Back Permission | | |

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- **Name of Collector**: Fosberg
- **Area**: Hawaii National Park
- **Plant's including one flower only from Hibiscus rosa-sinensis**
- **Locality of Collection**: Hawaii National Park
- **Special Conditions**, **Restrictions**: Not applicable
- **Date Issued**: March 27, 1961
- **Expiration Date**: April 10, 1961
- **Permit Number**: 665
- **Units**: 120 Pages
- **Book**: Standard E&P Miniature Blank Book

**Conditions and Restrictions**:

- Class A: There is no specific restriction for this permit.

**Permit Holder**: F. A. Fosberg

**Permit Number**: 665

**Telephone Number**: East 6-5900

**Location**: Washington, D.C., U.S.A.
Miniature Black Book, Do.

665 9\(\frac{1}{2}\) x 6 120 Pages Units
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J. A. Fosberg
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begins with 41374
(Nos. 41380-599 are
in Book 58, starting
p 52)

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A DOORUM & PEASE PRODUCT
1960  Johnston Island

Oct 17: Visited at night - Terminal.
The species profusely planted
in front of Terminal D 3 m. tall.
Terminalia catappa - planted
in Terminal area, 7 m.
Cocos nucifera - planted
Tounds less than 10 m.
Chloris angustiflora - abundant
Eryngium bourgattianum - abundant
Plectrachne indica - 10 seen.
Pluchea odorata - 2
Cordyline schimperiana - common
Euclea indica - occasional
Cyperus rotundus

Kawajalein

Mr. Clegg - Preventive Medicine
Unit in Pearl Harbor.
Dentistry Dispensary in P-18
turn left second turn right
after entering.

Mr. Neuzon, hospital Administrator
say there are many few black
widow spiders here now.

District Public Works Office
Fourteenth Naval District

Memo to Commanding Officer
Pacific Missile Range Facility, Kawajalei
no. 3755 dated 25 May 1960
signed W.M. Martinson.
Oct. 17 - Johnston Island
Cycadus notandrea
locally forming patches around Terminal area.

Oct. 19 - Kwajalein Atoll
on sand-filled coral reef
Psilotum nudum (L.) occasional between cobbles bordering walk around chapel.

Hedytis corymbosa (L.) abundant, forming lawn in places near Terminal

Eleocharis geniculata R. Br. abundant, very locally in marshy spots

Pluchea indica moderate
very common locally with both parents in open flats and roadides.

Oct. 21 - Kattenbrook Island
Hibiscus tiliaceus L. very local, probably planted on coral sand and small grass

fungus

on dead coconut log

abundant on slabs of strongly hackish sand.
Oct. 19 - Kwajalein Island
General appearance more luxuriant than I have seen it previously. Coconut trees bearing around old admin bldg site planted out. Cult plants (a.m. - lasonia wild)

* Hypocnemis littoralis
* Theophrastus populina
* Pseudanthium carthamoides
* U. purpureum

Cocos nucifera
* Hibiscus rosa-sinensis (a hybrid)

Nelumbo n. var. truncata
* Pandanus tectorius

Cocos nucifera
* Casuarina equisetifolia

Cnemium asiaticum
* Catharanthus roseus

(4.25)

* Ipomoea purpurea var. brasiliensis
* Zinnia elegans argenta
* Cornus alternifolia
* Ochrosia oppositifolia
* Pedilanthus tithymaloides

Vitic trifolia
* Codiaeum variegatum
* Clerodendrum inerme

Nativ plants not planted:

* Vigna marina
* Gossypolae barteri
e
* Fimbrystylis cyporum
* Zinnia linearis
* Wedelia biflora
* Carpitha filipina

Weeds (* common at food bunk)

* Desmodium canum
* Hypochaera notata
* Phyllanthus amarus
* Euphorbia prostrata
* Euphorbia thyrsoides
* Eclipsa indica
* Euphorbia hirta
* Zannia jasoniana
* Cyperus rotundus
* Desmospermum distichum
* Euphorbia longipes
* Cyperus caraminum
* Zizidia procumbens
* Cenchrus echinatus
* Euphorbia alba
* Heliotropium oiticicae
* Hedyotis cymosa
* Veronica cenisia
* Dactyloctenium aegyptium
* Chrysanthemum aciculatum
* Heliotropium ovatifolium
* Commensorum
* Pentolaca ovalacea
* Gymn diastyla
* Euphorbia espehua indica
* Phapalis angulata
* Gym diastyla coryzae
* Bidens radiata
* Phapalis adusta
* Cnemium asiaticum
* Euphorbia cyathophora
On airstrip in sun in afternoon.

(580pm) Reunion (Inhabits from their note), a number of golden flowers, and a considerable flock of turnstones. Golden flowers common generally.

Old nursery in former terminal - now being used otherwise. Only a Cuphea hirsuta, Euphorbia, asclepias, tamarisk, a clump of tamarix, acacia, and a vine of Chrysonna spinulae. Climbing on a coconut tree left of nursery stock. Physalis angulata abundant. A patch of yucca satetes cultivated in old natives area.

Generally, the weeds, that were previously found only in the old terminal area, have spread throughout the island e.g. Bidens radiata, Euphorbia compressa, Peshalum longipes, Heliotropium ocellatum, etc. Some, such as Canva canadenesis, Pluchea indica, P. odorata, Hedytrium cymosum, Chrysopogon acicularis, have remained localized, through most of these are very abundant locally. The hybrid between Pluchea indica and P. odorata has...
Reef north from Majuro. Has a ridge exposed at low tide about 1/4 block from seaward side. Small coral patches well scattered eastward in lagoon, at least on south side, more numerous eastward, esp. on north side. Large patch with sand tomb bar at low tide, about 1/4 way east on north side where north reef begins in North reef south, many inlets, and coral patches of exposed rock at low tide. Island on south side almost continuous.

Majuro–Jaluit flight. Reef flat long narrow along south coast of Majuro. No very appreciable algal ridge. Along south coast the reef flat is rather narrow. There seems to be an elongate pond occupying the place of the inlets in the intervals between inlets on the south reef.

Circled Jaluit clockwise.
Between the Japanese Weather Tower and Hydron Tower, there is a single standing coconut tree or stump, dead or alive, and only two or three dead Pandanus snags, no living one.

Rough platform remnants about midway between Jabour and Hydron Tower are not very much indicated. Sample 11 from about 1 m. above high high tide level. This layer is being undercut in various places, especially on lagoon side, where loose layer of between two indicated ones is exposed. Very little loose material on this part of land slip. Here, for some hundreds of yards, the ridge that was on the reef has vanished, at least from sight at high tide, and it is not obvious where the material has gone. The vegetation is by generally and irregularly distributed Tumefaction bushes, a few tall Pandanus, and a
few dense clumps of Pandanus sprouting along lagoon edge.  
A few seedlings—
  - Deчерола, Tournesol
  - Ipomoea pes-caprae (1)
Two wandering tattlers on lagoon reef.

Oct. 21, Jabiru—
Three roosting terns on lagoon beach.

Polypodium scolopendria
Emphibio hirta common in Wedelia mat on loose boulder deposit along lagoon near alg habits station.

Terminalia catappa trees here are growing vigorously in them than a sort of beetle invasiveness, with some dead branches not showing any effect of typhus.

A few Pandanus trees alive and dead, a few rather broken but still alive, some old snags.

Clump of Caroaria seem in very good shape.

Coconut plants generally in pits. Mostly very healthy, some as yellowish.

Jaluit
Kasselboch

Oct. 21 - Matambo?

South end of islet is of very coarse broken coral, with locally some bars of finer gravelly brown sharp light colored material piled on top.

Inlet said to have been two islets, joined by an early typhoon.

Inner end of islet surrounded by coarse beachrock, some fine small beach ridge of coral gravel.

Trees seen—
  - Pungenefia, Pandanus, Calathus
  - Deчерола
  - Cordia
  - Barbingtonia asiatica (seedling)
  - Murraya citrifolius
  - Quercus
  - Hernandia
  - Terminalia
  - Hibiscus tiliaceus

Herbs—
  - Crinum
  - Wedelia
  - Ipomoea tuba
  - Hedysarum biflor
  - Polypondium scolopendria
  - Asplenium nudum
  - Canavalia microcarp
  - Vigna marina
  - Ipomoea
  - Lepidium
  - Ficus
  - Euphoria hirta
1960 Manuello Dr.

1. Winter-thighed curl
2. Fairy tern
3. Common mollycoddle
4. Toddler
5. Reef bream, one speckled, one white, with blue stripes

On seaward side is a small embayment that has been cleared off probably by typhoon, big ridge of gravel enclosing all pond; water not quite salty as sea water, abundant green algae, now blue green.

Coral, Tipped over ferns, red and terminalia trees growing very roughly. Healthy upright sapling of terminalia.

Front reef facing passage has a broad relatively smooth fine grained planation surface; perhaps 10 m wide, sloping off rapidly seaward, with active coral growth for 5-6 m down. Then debris to flat sandy bottom of pass (see sketch). Landward a very flat eroding ramp, up to 10 m wide (in embayment) much narrower elsewhere, fairly rough, snaking off at edge of pass, a few art in layers.

15

Salvii

Remnants of back-reef.

Platform here at about high tide level

Scattered medium size boulders on reef flat and sand. up to 5-6 m. diam., irregular. Some fan-shaped areas of old surface that seems to be an old growth surface of acorpum.

Scattered boulders of vesicular lava form ballast of wrecks ship

On inner shore there an extensive low tide level flat with a rather muddy platform perhaps 3-4 m wide, protruding from flat islet, with various erosion ramp peeling off in r. Long. Underwater + collapse (art. 100 of platform), very somewhat vesicular lava.

Pieces of volcanic rock up to 2-3 cm long scattered on boulder beach in inner side, apparently carried around from the mouth or the outer reef. Abundant coconut beach.

Very few coconut trees left on this islet, a few of them lying down back wind up at 5-10
1960 Marshall

Jabiru - Mitchell on seaward side.

Hemigraphic reptiles around old mooring foundation,
barely holding on.
Hymenocallis littoralis
very common very luxuriant,
covered by seaweed at high tide.

Bananas planted abundantly
and growing luxuriantly
around old ruins.

Breadfruit - vigorous
shrubs from old imported
tree, small upright tree
in very good shape.

Cyperus willingtoni locally
abundant but dwarfed.

Oximum sanctum,
Catharanthus roseus, Mirabilis
and yellow hybrid Cannas
planted in front of houses
doing well.

A few patches of sweet
potatoes in shaded
spots doing very well.
Oct. 21 - Jabuwar

Oct. 24 - Hemigraphis upana (Tann) and
cave around old masonry ruins.

Oct. 22 - Megiris (Elizabeth) 9

85 alga (alg.)

86 (alg.)
epiphytic on Pampelis trunk
near high tide level around tidal pond.

Oct. 22 - Jaluit Island

89 (Typha?) Poedahla elegans var. ?

90 summit on little 4 m. tall
locally abundant in swamps.

91 Sonneratia alba
locally common in swamps.

92 Vittaria innsurata (v.
cave, epiphytic on tree
trunk in moist forest.)

Jaluit Island

Branched herb 0.8 m. tall,
flowers deep purple,
prostrate; chlorotic.
Marshall Is.

Several young coconut trees (nurs from Majura) the leaves, after the first few weeks, not completely opening up - pinnas adhering at margin, separating along midrib. I seen in immediate area of village, many other seedlings present.

In coconut grove the general ground cover mostly Lepisma, is complete. Much Freyniastylus patches of Neophleum himantula, scattered Stenis trigartita, clumps of Polyscistium patches of trumpet. Many young bean fruit trees planted, some volunteer about 1-3 m tall, expected to produce fruit in from 1 to 2 years.

Many small bushes of Melinda, Scanning scattered in coconut grove mostly appearing to be from old cut stubs. Possibly from clearing for coconut planting. Bananas bearing, some healthy except occasional slight chlorosis.

Jamit

Plants seen (ctd.)
1. Pseudanthemum canthiophorus
2. Digitaria spinosa, microstachys
3. Cassytha Californica
4. Wedelia bifida
5. Euphorbia hookeri
6. Cleyna subulata
7. Tulipaea oleacea
8. Guettarda speciosa
9. Lecevera mccluskeyi
10. Allophyllus tinniensis
11. Cordia subcordata
12. Terminalia samaricus
13. Hopkieria nana
14. Calophyllum inophyllum
15. Plocos pedunculata
16. Jasminum acaulis
17. Pipturus argenteus
18. Papipera lalageensis

Patches of pumpkin planted.
Also small patch of aloes in some Pandanus planted for food. Volunteer Pandanus used for hats + mats.

On end of inlet near passage:
1. Polyscistium, Cassytha, Triumpheto, nephrolepis abundant in ground cover.
2. Euphorbia, Wedelia, Digitaria, Cleyna, Franklinia, respect chene.

Wedelia generally not abundant. & Cleyna in rockpiles.

photo in open area back of lake, filled with Wedelia, also in area of young coconut and avocados, all from same plant (not tide)

Patch of Pemphis around edges of lake.

Algae not conspicuous in lake as before, but still present.

Seedlings of Pemphis and Bruguiera abundant around margins of lake, now in lake bottom, though it is almost dry at low tide (photo)

Wedelia is abundant and forms blanket in open areas toward seaward side, especially near east passage.

In semi-shallow water coconut trees will shoot 1-1.5 m tall, Polypondium, Peltiaria and Cassytha most abundant. Cassytha the most abundant. Cassytha the chest in open spots, seedling Marindo common here.

Codiaeum occasional along beach ridge, not inland, nor seedling. Guettarda not common inland from sea passage.

fertil

There are still many coconut trunks lying on ground, some rather well rooted, others still firm, but in general rather well cleared away, when they formed an obstruction.

Bank of Pemphis gone back of lake in other area generally covered by Wedelia are cotyledon-like clumps of seedling guettarda, possibly but off one but abundantly seedling, about 1.5 m tall (photo)

Bottom of lake hard, flat, like level sand, but with pits near center with water at low tide. Thickets of mud except very near edges around mangrove and Pemphis patches (sample 12). On older grained Pemphis trunks epiphytic algae, protonema, Nephrolepis exaltata, Polygonium. On older Bruguiera epiphytic Nephrolepis reniformis, large clumps.
1960 March 20.

On new corner, even in
western floor areas, ny
Medelia, Polypodium
& Nephrilepis; seedling
pandanus form principal
ground cover, gone over.

just with Trimenella,
Timistus, Lepturus,
Thuara, Polypodium,
Nephrilepis, seedling.

Tumefacint on beach
ridge (shale gravel).

Scabrosa seedling,
just above neff level.

In areas with semi-
closed cover of coconut
of various ages.

Quarterly tall gray
Coconut, Polypodium, &
Nephrilepis about m.

Range black shrub seen.

On new corner is
patch of thicket, with
tall coconut trees, cupped
like Pipturus. 1 yr.
considerable shrubby
After Phyllopus, much Ashlei,
and Parthus, Pehenoria, etc-
Growing on deposit of
Large sharp boulders.

Some shrubby Nasturtium
& figujo, Halimia. This
area is a boulder tract
just

Island

m. above general level
of island.

Just inside this is
park-like, coconut grove.
Lepturus forming dense
ground cover, seedling
Lepturus, Clumps of
Nephrilepis on fallen
coconut butt.

Surrounded by thicket
of Pipturus, Maninda,
Nymphia, Pandanus, seedling.

Small termite depression,
this filled with rotting
coconut husks, probably
left by teroplas. Pandanus
thumbs pretty well
rotted. Coconut thumb
mostly still rather
friable, but bands coming
off.

Southeast corner
rather open several
well grown young
breedfruit, a few ragged
pandanus, one or two bad
old bredfruit trees.
scattered coconuts.

General dense ground
Emerg. Vigna, this
rather Chlorotic
(bleat). One small patch
of Medelia (dark green).
170. Jumandia zone

Plants seen (26)

1. Entenia bipinnata
2. Zizana involuta
3. Crinum cormum
4. Mirabilis jalapa
5a. Hypesthesia pumicuera
5b. Calotropis procera
6a. Jatropha
6b. Physalis angulata
6c. Tephrosia rosae
6d. Asclepias curassavica
6e. Physalis huitzi (in litt.)
6f. Physalis paniculata

Coconut plantation has been fairly general regardless of whether there were trees not damaged by typhoons, except for very young ones.

Several turkey toms on bottom of pond.

Deep, clear, one white, one almost white.

Flock of white, capped nodules in lagoon.

Several white turkeys inland.

Jaluit:

Smaller islets on south reef, mostly have a tangle of shrubs, with a few coconut trees, none of them very tall. Much of tangle, at least on lagoon side, seem to be Rorovia.

Large islands mostly well covered by coconut, some leaning at odd angles, but mostly looking rather normal.

Considerable sand on lagoon side.

Brak - islet nearest Jaluit I. seems to be small islets joined together - rather few coconuts except on west end. These in east end rising through irregular thickets of small trees and shrubs.

Reef between islets very wide, inner slope rather steep, covered with rubble debris. Opposite islets more sandy, gently sloping, much live coral in shallow parts. Wide shallow area opposite Jaluit.

Plants seen
- Pandanus tectum
- Cereus meieri
- Ixora cibdela
- Carica papaya
- Lepturus nepal
- Musa sapientum
- Cucurbita
- Nicotiana jalepa
- Hymanocallis littoralis
- Cuscuta ossea
- Antocarpus altius
- Phytanthochecosta
- Gymnocalyx globosa
- Vitisina skiri
- Cleome sondaica
- Pandorea amabilis
- Digitaria seminata var. mendotana
- Cendrums echinatum
- Wedelia bifrons
- Alocasia macrorrhiza
- Lygodium reticulatum
- Ficus f. semelpetala
- Nephrolepis humilis
- Vigna marina
- Tephrosia corymbosa
- Cleandendrum inae
- Zimbristilis cyanoa
- Zinnia petala procumbens
- Locowola so forth

Zunnefloria argentea
- Bougainiera glabrata
- Ipomoea angulata
- Serpula longa
- Cleome nuda
- Acianthus nodosus
- Nephradephis acutifolia
- Vittaria elongata
- Pisonia grandis
- Allophyllum caesalpinii
- Lunaria tiera littorea "fini"
- Commareia alta "pahib"
- Moringa ceiba
- Vigna marina
- Cesthera piliiformis
- Centella asiatica
- Blechnum pyramitatum
- Cyperus javanicus
- Calodium fragans
- Calophyllum inophyllum
- Portulaca olgae
- Terminalia catappa

Several golden plumeria inland
- Swimbrel in swamp
- White tern in swamp
East of village, a few completely bare irregular and slowing signs of flowering water, drain from swamp.

West of this is an area of an acre or where all the coconut trees have been cut down—evidently healthy rather young ones—often to let in sun for the newly planted young ones. A few tall Pandanus left standing, surrounded more with salt by Xylococcus, and a few with leaves by Pandanus. The Pandanus forest is really a tidal swamp, irregular, mostly about 5 m. tall, no undergrowth at all. There some Pandanus near on adjacent flats. In them some old Pandanus, but most of this area apparently destructed by the typhoon. (Photo - 6th Aug.)

West of this a rather extensive strip of clumps of Pandanus, fast sprouting. About 7-8 m. tall, open. Then a large swamp, but all old trees removed by typhoon—nut and land system remaining. Much of this now cleared by young Burmese saplings 1-2 m. tall. (Photo - 6th Aug.)

Between this and beach a sheet of coarse gravel perhaps 10 m. wide with a few standing coconuts, many fallen ones. Open stand of young clumps of Pandanus and Pandanus about 1 m. tall or less, planted to coconuts. Many patches of Lepidium, some Triumphette, inland from beach. Few snags of Wedelia. (Photo - 6th Aug.)

This gravel sheet swept into edge of many small islands. A ridge of salt, about 2-3 m. thick lies. Trees here have fallen within east or west or generally opposite these direction.

Considerable acreage of Burmese saplings, a few old trees left in the corner of swamp.
Wedelia is abundant toward s.e. corners of islet, outside swamps. As first here generally occur, more luxuriant Agelena, large, Sphagnum convolute. Hypolytis common.

On south side of swamps Limonium is common, and a tree of Sphenostiphon. Much of this swamp is hard bottomed, now covered by small golden coral debris. In this area Limonium is locally dominant in swamps.

Not much damage here by typhoon. This area of swamps, tidal flats, locally higher ground extends westward through middle of islet. Locally Sphenostiphon abundant, with some Quaquina. Limonium, Pemphis. Locally Quaquina and Pemphis more abundant. Pemphis usually on slighter higher ground.

The area between swamps and lagoon almost treeless, grassy.

Back of lagoon ridge in places are marshes mostly dominated by Cyperus javanicus. Pandanus not at all abundant on this islet.

Long Islet.
On arcuate gravel bar along lagoon shore, intermittent sand scattered are young Larnocal, Tonnepatia, Coco seedlings. Creole rice here. Pemphis abundant along lagoon shore — bunch of sprouts.
Oct. 23. Emoplan I.
Plants seen:
a. Antrochus altalus
b. Goss weaver
c. Gomphus citripolus
d. Pandanus teakius
e. Pipturus argentens
f. Wedelia bifida
g. Vigna marina
h. Asplenium nudes
i. Chrysoc angulata
j. Epiphippis acidula
k. Allocasia macrantha
l. Cystodium perturbans
m. Kalanchee pinnata
n. Ptliurus scopos
o. Allophyllus tinnuncul
p. Pisonia grandis
q. Quettanla species
r. Hibiscus tiliaceus
s. Menisera seires
p. Calophipllum inophyllum
b. Symna obtusifolia
c. Zornopteris argente
f. Frenia rudis
p. Portulaca oleracea
b. Myrtillus
q. Echinus galapagon
r. Euphorbis guianensis
t. Digitalis plumula
u. Goya the filifolios
v. Xeris cerasus
w. Phalaenopsis
x. Ceratium echinatus
y. Eulynes indica

Palmut Atoll
Small flock of common
nesting in old tree shelter
near wooded area and generally
flying around package
end of islet.

Some of breadfruit trees
perhaps 20-30 cm dd,
broken off part way
up by typhoon - almost
all had sent out
vigorously sprouts from
upper part of trunk
and formed ball-round
well-formed trees,

now flowering.

Ground cover generally
Wedelia, locally Vigna.
Has been cleared out
some time ago.

Breadfruit trees, near
sea have not recovered,
are completely dead.

Breadfruit, bushes abundant.
Wedelia seedlings in
great abundance especially
where there is decomposing
trash, and in rotting hands.

Pipturus sprouting
vigiously from stumps
where they have been cut
during clearing. Uncut
trees commonly 5-8 m tall.

Many of spurs chlorotic.
These heavily infected with
red mite. (col) laces abundant (col)
In the pass between Rangiroa and Kabbenbock is a Y-shaped reef with very long arms. The right one perhaps 4 miles in extent and a number of very large boulders and much large wrack. A reef patch in the right hand channel about even with the inner end of the above branch of the Y-shaped reef. These all bare at low tide. These considerable number of large volcanic boulders from much in Kabbenbock here around landing probably brought by people.

Hibiscus tiliaceus, around a small bend, some not. Certain branches very chlorotic mostly manually gone. Most of the area of this reef has been almost completely cleared except clearing of Kamehi. Jornalopteris, occasional headluffe covered mostly in blanket of Wedelias.

One area has had two Wedelias chopped away, rolled up and burned recently. Here the healthy dark green soil is being colonized by millions of seedlings of Wedelias. Many bomb craters filled with water, green with microscopic algae.

Several white terns flying around, mostly near Hibiscus thickets. Common moorhens here for the most frequent bird. Many young coconut trees, from faithful typhoon along pass and lagoon side. The cleared area has been staked out for planting coconut but not very few have been planted. On sand flat including into lagoon are seedlings of Acacia, Trumphetta, banana, Nolina, Euphorbia, Vigna, Stromos, horned (chlotis)
Plant seen (etc.)
- Pseudanthera communis
- Hernandia serrata
- Fuchsia tamonan
- Eremites pre-saffra
- Terminalia catappa
- Cassytha crenata bondie
- Musa sapientum
- Junipera littorea

Young coconut trees seem mostly decumbent at base, then erect.
On lagoon shore many small stilt roots running around in broad daylight, scarcely afraid of humans.

On narrow part of islet is a long measuring stone wall about 0.7 m. high running from place where islet narrows almost to first cluster of building on seaward side gravel piled against it part way into vegetation. On lagoon side a narrow reef platform strip with a slight accumulation of sand at lagoon edge, thin vegetation of Vigna, small golden rock, small Transvaalia, bushy small Leucacanthac, coconut seedlings, a few Pandanus seedling, home Pepturnus, esp. on sandy place. Plutus also on bare rock in foliage.
A few larger coconut trees.

Some Hibiscus seedling?

Much bare rock.

Beyond end gravel no veg. on great eroded platform except small Pandanus & Until clump of buildings.
at end of sea wall
the platform rock is
eroded, a few scraps of
upper surface left. The
indicated below this
merely compacted - firm
but crumbles easily when
hammered. Black with
algae. Tumult part of
this platform must
be 3 m. above l.t.

sample #13 - indicated flat
surface

sample #14 - softer material
below:

sample #15 - hard material
from rough surface of
sea-wall erosion养成
cut in coarse platform block

Oct 17 - Johnson
Terminalia catappa
fairly well died out
c on front all over old
trunks and broken branches.
A few Pandanus with
tiny tufts of leaves in
branches that weren't
broken. No sprouting
from broken trunks.

fairly extensive mat
palm patches that
look pretty good
along main street
north of radio station.

along path:

a. Ephelidora patens

b. Stylianthus asana

c. Veronica canescens

d. Cupha brasiliensis

a. Lycaena micropus

b. Centella asiatica

c. Cynodon dactylon

d. Tectaria aromatica

a. Chrysophyllum antipodes

b. Hypolepis pyramidalis

c. Euphorbia hermaphroditica

d. Halocalyx biflorus

e. Crotalaria amabilis

c. Leucaena glauca

d. Cyperus compressus

e. Eleusine indica

f. Hedyspermum cymbosum
Oxornamentals
Pantana camara
Pseudanthemum campanulatum
and var. atropurpureum
Phlox paniculata
Plumbago rubra
Hymanocallis littoralis
Mirabilis jalapa
Pistillaria elegans
Citharanthus roseus
Gomphocarpus fruticosus
Zizinium santum
Canna hybrid.

Acenatum, very rare before, now common on distal part of inlet. Cypresses in tender bushes, observed as a small patch in village, now scattered around trails fairly generally. Cristata is still very common, but by no means as much as before - largely eradicated by Wedelia. Blechnum very abundant, especially where Wedelia has been cleared out.

Terminalia, Hernandiia, Calophyllum, Antacaphus, Ficus, have recovered very well, filling out crowns with shoots, except Antacaphus when too damaged, then it died.

In old botanic garden,
Euphorbium punicatum
Cycas circinalis
Pnus elastica
Pelonia regia
Erythrina variegata
Scindapsus aureus
Kamatea velutina
Cassia occidentalis
Fibigus tilaccus
Calophyllum inophyllum
Lamanae saman
Ribeir apathacce

Distal part of island almost completely cleared, covered by a clipped weed growth, of Blechnum, Stegopterus, Luecaena, Vigna, etc. about 2-3 dm high. Wilde, scattered trees - Cania, Terminalia, Antacaphus, Pipturus, Pandanus, Mus, Hernandez.

2 whimbrels flown up near radio station, heard a bit later heard curlews.
Oct. 23 - Enyio Islet

41393 Caesalpinia decandra (L.) Roehl.

- single plant on narrow
- part of islet in deep tangled Wedelia
- abundant in recently
- disturbed places

- 95 Hernandia sonora
- occasional

2 96 Pandanopsis arenicola

- common

Oct. 23 - Jacobow

- in white spots and
- along paths

- 97 Pentella nepens
- abundant along paths

13' 98 Hedyspis corymbosa
- abundant along paths

1 99 Euphrasia tephrobole L.

- very local in path

41400 Cyperus hygrophilus

- very local along trail

2 01 Digitaria tenuis var. minima

- very local on trail

02 Euphrasia aromatica

- very common in trail

03 Euphrasia glycyrrhiza (candy) weed

- very long and slender
- leaf

03 Helianthus annuus

- rare seedlings on bare gravel

04 seedling

Palm Tnt.

- young plant three
- vine-like branches 1-2 m long; sterile

- sprouting fallen tree
- fruiting flower is inflated,
- leaves not toothed at all,
- tall trees fruit on
- ground

- prostrate, forming a
- mat, callosa pale dull blue,
- lobe with white margin
- prostrate, forming a mat,
- callosa white,
- stems and leaves green,
- flowers white

(Crand) Fitch

- culms spreading
- whole plant purple.
Oct. 24 - Long belt of jarrah and jarrah. In the area where the ridge of boulders on the seaward reef plain has disappeared, at low tide it becomes clear that it has largely just spread out and become a stable tract.

On lagom reef flat there is a broad flat strip of gravel separated from the land strip by 30 to 500 m on the surface of the blackened rather stable mass is a ridge of smaller material, obviously more worked, when forming a sharp-topped bar ridge. This is more in line with the situation, the length of this strip between jarrah and jarrah.

Seedling of Calophyllum, deeply rooted, healthy, in bare gravel sheet.

Pemphigus forest - hard trees still standing, trunks sometimes sprouting, clumps of sprout up to 1.5 m. tall at bases (photo).

Just north of Sydneytown an area of low platform awash at high tide quite abraded. Inside this, the lagom bar in missing outside, the gravel ridge of reef flat is still mostly separated by 15 m plus of water from the land strip. This ridge is at least 1-2.5 m. high in places, quite abrupt on inner side, umbilicate slab on outer side (photo).

This outer ridge is lacking opposite Sydneytown, but a sharp ridge is piled up on the outer edge of the land strip just north of Sydneytown.

Several wandering turtles on outer reef flat.

On lagom reef flat opposite a cut through the crevices platform is an almost inner platform bar, inside the main one. (Photo "bird")
The end of the main cut for here is just opposite the cut in the terrace platform and is surrounded by narrow, intricate seaward around the end, and the opposite side of the cut is swept very clean, suggesting that the current or waves come through this channel from a dominantly north direction, exerting their force against the south side of the channel, and arranging the gravel strata in the base of the ridge in intricate pattern with less energy involved thus not carrying this loose material along into the lagoon.

Channel dredged across land strip by Japanese south of Sydney town in three layers, successively harder downstream (photos - BRW) sample 17, 19, 19 (downward).

To lagoon side of this is a circular terrace bar, surrounding & part (photo), this immediately lagoonward of shore a low, nearly flat area lagoonward of this, then a well developed bar in lagoon edge of this. The flat well strewn with large boulders. Seaward the boulder ridge is separated from the erosion ramp, and there, for a good distance of perhaps 100 m. loops out away from land and is higher than in either direction, where it is spread out and low.

South of here a very low strip about 100 m. wide, scoured off except for remnant of an old terrace platform. Lagoonward is a concentration of debris - a high curved place in the debris ridge (photos - BRW) of a number in several directions, seaward from this wash another layer of high ridge, again extending a bit south of beach inland south to here on land. On land, south Sydney town, vegetation mostly a low irregular scrub of Trinophyll and beach grass. Pumplin anywhere here, Southward same but much lower and thinner. (photo)
Enormous boulders thrown upon lagom side of lagom ridge, up to 2 x 2 x 3 m, but irregular. Many of them, this the largest, form are large milling colonies, most on very complex. A few of these are lagom remnant of former platform. This lagom ridge, here is broad and thin and lies on a planation surface that is much like an eroded ramp, sloping slightly lagomward sample 10 in from top of seaward edge of this.

Two white terns flying, Captain.

Cenphris, Lececola, Zunnefomia, Coer, Eumibravus can clearly grow someplace inundated by very high tides.

More vegetation on higher spots, also larger Zunnefomia and Lececola plants, patches of Trumpetta.

Photo of broad eroded ramp and rubble track on seaward lagom flat, also of small debris pile in landing strip beyond cement building, toward machine.

On debris ridge, scedding of Guettanda, of Camaralia, Fanningins, Coer.

Levee of Zunnefomia to Lececola 1.5 m high. Banana trees in it.
Sharp ridge near lagoon and edge of lagoon reef flat—
sandy-coloured levee made up from Pleistocene
sands, Hibiscus tiliaceus
and Pandanus seedlings.
Pandanum fruits thrown up but not seen germinating.

Wide place at watershed
with open scrub of
Feronia, Aframomum
Aptemia, a little
Allophyllus, patches
of Wedelia, bencina
Acassa, Allophyllus.

Some dense remaining
ground of ragged Pandanus,
Kisocia, Geasthitis, Trunc-
ula, and Cocos. This
area seems to be
a large gravel sheet
laid down by the typhoon.
The residual vegetation
is quite bunched. Most
of the rest representing
colonization. Surprising
thing is number of
brushes of all sizes of
Aptemia. Some of the
smaller ones seem to
be drying up, but mostly not

Heal a sheet of red
rounded flat gravel
extends from the lagoon
out onto the lagoon flat
with a lobed margin.

Much more bare
gravel between bushes,
but some large mats
of Wedelia, Vigna
Triumphata, Chenoalis
and Vigna pescaria (this)
have small patches of
Fimbristylis.

Peep herons seen — 3 white,
1 white, 1 white with red eye
(white plumage).

Peep heron chasing or playing
with a tattered.

Beyond warehouse we went
by boat. Generally the
vegetation is a strip of
irregular scrub, mostly Feronia
trees on platforms and debris,
with sparse Pandanus on demised platform
ramp.

Standing coconut very
few around warehouse
even fewer down the land
strip, then becoming
slightly more abundant till we come to a wide
place, where a considerable
number are left standing.
Here at this wide place,
a high lagoon shelf, and on beach of this
huge coral blocks, scattered.
2 whimbrels here (?)
Here on the sand ridge
most strongly washed
onto the shore, making
a typical boulder ridge
but to north it is still
a bit separated.

On the flat is an
open to closed scrub of
vaccinium, some helicia,
some guettarda, many
stunted seedlings around,
imcomplete groundcover
of Vaccinium, some
hygrocybe leaf, some
pandanus seedlings.
some Canavalia, standing water.

Part of this that was
covered by typhoon
is pretty well vegetated,
with even some residual
throning guettarda, etc.
Part arched by ground
sheet has scattered
bushes of Vaccinium,
Oct. 24 - John - Photos blooming of trees along lagoon shore of lagoon. There gray white reed hark at end of lagoon.

Oct. 24 - Evelyn - Photos bloom red up recovered headprint trees in A. M. corner of inlet.

Oct. 25 - Crossing lagoon Fabio's Sunday One hour boat trip flying over lagoon returning in evening 4 o'clock.
Asclepias curassavica
Eryngium heterocarpum
Sabalum conjugatum
NephrOPSIS hirtulata
Cypridium mediterraneum
Veratrum vanderam
Lessertia curassavica
Lecytha sericea
Tecomaria xagente
Tagetes
Hibiscus mutabilis
Cleome hirta
Cleome spinosa
Hymenocallis littoralis
Clumba asiatica
Polystichum tricholobatum (chbel)
Allomysis laevis
Calyptrium indivisum
Hymenophyllum subulatum
Asplenium cuneatum
Asplenium nidus
Asplenium viride
Glebionis speciosa
Trinimalia samsonii
Baccharis Tetrandra
Justicia byngii
Vitexa elongata
Nephotopsis acutifolia
Eriochlaena geniculata
Aloe arborescens
Hibiscus tiliaceus
Thealepis gregillana
Aphiralis humboldtii
Pinea expansa
Codiaum variegatum
Acalypha wilkesiana
Pseudorhynchus serratus var. altissimus
hand, some saplings, mainly coconut seedlings. Elechans in mud, back from edge. Coast seedlings somewhat a very echallac.

Much beach in hand.

Lago fish, about 20-25 cm. Long, mud ooze with black fungi yellow tails. mille + shape.

Several white tuna, in a two tattlers. White capped nodulas. Golden fibers.

Red foliosa, large. Are two common mille?

Big greenish, ratcha fronds. Large area of thin swards, mostly semi-open. Around this, especially southwest, is a tall, scrubby low forest of Pipturus argenteus, slender, 5-6 cm. At maximum, to 4-5 m. Tall has been cleared beneath. Various brown soil of some depth to boulder field. Ferns abundant.

In interior, a considerable open area a north scattered headfruit trees, covered by a blanket of Wedelia.

Premna obtusiflora

1. Cyperus scutellatus

2. Citrus anantaphila

3. Euphorbia characias

4. Cyperus parviflorus

5. Meea canescens

6. Physalis angulata

7. Pisonia littoralis

8. Cyperus odoratus

9. Eriophorum chamissonis

10. Elodea canadensis

11. Jussiaea cubifolia

12. Canavalia microcarpa

Other areas have grown up to the low forest type dominated by Pipturus. In places this is cleared out locally, some as the average height is 6-7 m.

The headfruit trees injured by the typhoon either died or have recovered remarkably well, branches as long as 10 cm diam. have grown since the storm, leaves dark green. Low infestation of cotton.
cushion scale. Some two
have died of a peculiar
disease. (Kendrick describes
it in report to Hi Com.)

Tass jut - generally
dominated by Thelyptera
agroeca, locally by
Echinochloa crus-galli,
locally invaded
by landplane, Vigna, etc.

Grasses common.
Very little tass culti-
vation - two rows and
scattered plants
of Cyrtosperma, scattered
small patches of
stunted Cocos.

In the pit, Thelyptera
even more generally
dominant, almost
exclusive over much
of the area. Small patches
of Eleochus, large
algae often with
blue green algae, low
invasion by Pandanus.
Occasional bushes.

No Echinochloa. Only a
very small part of the
pit occupied by Cyrtosperma,
no very little Cocos.

Of total area of two
pits, perhaps not more
than 19% occupied by
either tass. Only a few
sq. m. cultivated - Cyrtosperma.

Ardeo common.

Wedelia blankets all
place in this vicinity
and Margina of tass jut.

Pandanus conjugatum
is very locally common
along trails in semi
shade, nowhere really
abundant.

Mangrove swamp between
tass jut and village
has all large Bruguiera
trees, dead and broken.

Fruit away as
distributed to typhoon.

Many well grown
seedling Cocoyas generally.
Pandanus twigs mostly
rather well rotted, coconut
less so.

Along seaward side
a well-developed seawall
fringe 2-3 m. tall.

Epiphytes common &
abundant on older trees in
interior.

06 Fusarium insidiosum common in tar pit.

07 Echinostylis angulata (L.) Beauv. rare, locally dominant in semi-abandoned tar pit.

08 Jossia teniifolia locally planted in home yards of local grand.

09 Siphocodon pendulum rare, epiphytic in wet forest.

Oct. 26 - Kinajon I.

10 Allophyllus timorensis common in dense scrub at quayside.

11 Entada purnula D.C.

Oct. 26 - Innuj

12 Vigna marina (Burm.) Merr. [1]

Oct. 27 - Ribon I.

13 Vittoria vivipara var. rare, epiphytic in tree trunks.

Oct. 27 - Kinajon I.

Green fever grass slightly in mud.

Herb 1 m tall, branched; petals 4 yellow, caduceous, erect.

forming a close dense mat.

sterile.

Large shrub 4 m tall, seedlings abundant beneath it.

unifoliate.

prostrate, sterile, not unifoliate leaves, these seem to be characteristic of rain forest growing short in this area.
Oct. 16 - Trip abwrd Isp. Crepted tern flying over lagoon.

Oct. 16 - Imanji Islet
Plants seen

Glycophila globosa
Polygramma secolacta
Eleusine antipirealis
Canna nepalensis
Musa sapientum
Zimia elegans
Mirabilis jalapa
Cereus nuijens
Fuchsia coccinea
Passionis grandis
Citrus aurantifolia
Rubus hedyd (red raspberry)
Cordyla terminalis
Cucurbita pepo
Centella asiatica
Camarosa batatas
Cucumis sativus


Bananae very luminous around linn.
Centella is remarkably abundant on grand shell in full sun.
Young Tournesolut 2-3" tall. Sweet potato patches very common.

Phosphate bed covered by an open scrub of Tepuntia with some acacia. Much Lepturus and Digitaria filling interstices. Flexia and Polysiphon prominent in rocks here and there. Weed like species, a little Nephraspe.

Towards the pass this becomes stitched 3 m. tall, and composed of Leucaena, Tournesolut, Isletana, Morningglow (from islet) Thaeria and Lepturus in openings.

Two former Mangrove depressions at north end—one is completely bare, the other has many young seedlings and a few large, but still small plants.
Plants seen (col.)

1. Crinum asiaticum
2. Hymenocallis littoralis
3. Liparis reticulata
4. Cencrum echinatus
5. Lepidium lycoctonoides
6. Calthea sp. (twin
7. Vigna aconitifolia
8. Hedystis biflora
9. Calophyllum inophyllum
10. Leucaena leucocephala
11. Vatica amara
12. Henrya menrat
13. Thuya angustata
14. Wedelia biflora
15. Nucifera grecum
16. Clerodendrum inerme
17. Nepenthes hirsutula
18. Quettaria speciosa
19. Pachyrrhizus gomphurus
20. Euphorbia characias
21. Codiaeum variegatum
22. Allophyllum hirundinaria
23. Bauhinia gymnorrhiza
24. Rutella triandra
25. Cestrum
26. Gomphocarpus littoralis
27. Lantana camara
28. Vemania cinerea
29. Rhoeas spathacea
30. Canaga hybrida

Broad sand ridge running parallel to dunes is tall partly bare and much colonized by ferns and Tournesolia. Occasionally some Aloe, Agave, and Euphorbia, a few Allophyllums, a clump of Allophyllum, and some Tithonia. Seedlings of Tournesolia and Pandanus are common.

In central trail back from Tagaytay beach, is an open forest mostly Pinus 3-6 m tall. Some Atraphaxis, some Allophyllums, and other lianas. The undergrowth is a dense scrub 3-5 m tall. A clump of dead brush, mixed with small lianas which must have formed a dense scrub 3-5 m tall. A clump from stumps of this and other species also exist.
Oct. 25 - Kinajon.
Plants seen:

- Catharanthus roseus
- Duranta sanctum
- Phyllanthus amarus
- Euphorbia poiretii
- Alotocsis mancusia
- Cerbera jubata
- Corchorus flaccus
- Arctococcus albica
- Leptum rohdii
- Cerbera macrocarpa
- Polyscias scolopendria
- Ptelea trinervis
- Nephrolepis bisantula
- Pipturus argentus
- Vigna marina
- Xanthornus segetifolus
- Wedelia bifida
- Bignoniella
- Pandanus tectum
- Musa sapientum
- Cordia subcordata
- Mansita citrifolia
- Guettarda speciosa
- Bocconia formosana
- Cassia filiformis
- Phyllanthus angulatus
- Trumpet tree (Ficus crenata)
- Firebush (Euphorbia cyparissias)
- Pseudanthemum carinthum
- Ficus leptopetala
- Pilea microphylla

Planted area back of house to dominate by Nephrolepis, locally Vigna, Polyscias, becoming overgrown by Wedelia. Lawn still covered by firebush and/or leptum.

Further back toward Polyscias and leptum, less prominent, a little Wedelia. (Photo)

Fairy tail. Common moldy.

Many volunteer erucia.
Strip along tang, its mixed grass - Ixeris, Lycopus, Guettarda, a little Allium, Tangled in places with Cananga and Wedelia. Occasionally Cordia. This strip varies, up to 40 m. wide, 2 - 4 m. high.

Two home sites, me at landing in lagoon, shg off side on seaward side.

Gravel sheet opposite, rounded indentation on seaward side - blackened by algae, covered by seedlings of Guettarda, Scaevola, Leptum.
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1. *Truncatonia argentia*
2. *Allophytus titanensis*
3. *Camponotus microcarus*
4. *Elaeocarpus involuta*
5. *Calophasium insulare*
6. *Ochnocephalos pratophilus*
7. *Asplenium nidus*
8. *Pisonia grandis*
9. *Phytophaga tuba*
10. *Nephrolepis acutifolia?*
11. *Hibiscus tiliaceus*
12. *Leandra* sp.
13. *Barrettia asplenifolia*
14. *Terminalia nanus*
15. *Cleburna indica*

73
2. *Mimosa very abundant, vinegar half, shrubs, grass, Podophyllum.*
3. *Ragged but well-nerved Calophasium trees scattered along top of grassy beach here.*

When close bulges out, south of bay, there has been some clearing out of brush, resulting in a scattered stand of small ragged tree tangles, lead trees, coconut seedlings, cutting seedling on grassy ridge. South of curve most exposed area is a deep tangled mass of small forest of *Allophytus* *Quettarda, Calophasium, Leandra*, an *Elaeocarpus*, explaining a little tamarind, but dominantly *Allophytus* this on beach ridge of grassy *Asplenium nidus commun. here.*

Seedling of *Allophytus* abundant, *Quettarda less so.*
This scrub is apparently left as a wind breaks on the beach ridge of medium poorly sorted gravel, as it is only a few m wide inside the coconut plantation has been cleaned of brush, but is regrowing it.

Large mangroves defoliation has left trees, to 3 m tall, rather scattered, top middle layers about 1 m, gloves sparse, lower layers 0.5 m mostly dense.

When brush is cleared in interior Wedelia growing from stubs, also millions of Wedelia seedling.

Lamb belt very dense on outer beach ridge changes to Wedelia with bushes of Tecomaria cupressina, etc., 2 m high, as coast swings near toward south passage beach.

Coconut plantation recently cleaned in from here. Many young trees, but probably dating from before typhoon. This new belt of scrub continues around on beach ridge on passage beach. Near platform of debris is very well exposed (photo 61). Inside this beach ridge is a swampy that was almost completely cleared of Bureunias by the typhoon, is still the except for a few small Bureunias seedlings. Bottom is rather soft, mangrove pan with a layer of fine grade gravel in to bed it. Numerous mounds of dirt are interior. Inside this is a concrete wedge with sparse grove trees, then another, Bureunias swamp, this one not so damaged in part, part entirely. In outer swampy about half way from edge to port in center the peat is 9" deep, with about an inch of mixed sand, gravel and peat on top. Below is gravel. (samples 21, 52)
Ridge, bay, swamps cleared and staked but not yet planted & crum. Lagoon end of inner mudflat open, with only a few living small Bruguières, red trunks lying all in one direction to hinter of ridge.

Plants of this area cleared ridge.

Lagoonward end of outer swamp half filled by a thick gravel sheet that came in from far seaward quarter, of passage beach, ending abruptly, with an irregular step up on about 1.5 m. high, 15 m. wide flat. Bottom of swamp here of shale, irregular boulders. This gravel sheet lines the coast, extending well around on passage beach, proper, narrowing to a typical boulder reef. Its top is in trend inward by Wedeling, in fact by widely spaced Tournesotia bushes about 2 m. high, some eelgrass, part wetter.

and flanked by several white ferns and white - celled maddie.

Inside the second mangrove swamp is a thicket of Hibiscus tiliaceus, then a line of more extensive Bruguière swamps, the tallest tree dead, but a thicket of smaller ones, 3-4 m. tall. Much debris in margin, esp. old Bruguière poles, all lying the direction men len southwestward, not quite same as currents lying in swamps which run more south. Much rough cobbly size coastal gravel + boulders swept into swamps here from passage beach as edge of thin gravel sheet, underly Mangrove heat and sinking into it when stepped in. In swamps on a few older trees, a few Myriophyllum, Nephelium edulis, Polyphorum, and one Nephelium antipodio (?) too young to be seen, it is this sp. but probable.,)
Around edge of
swamp on a constantly
eroding gravel, seedsling
Bruguiera about 5-6 dm.
tall abundant. To
high tide mark, but
all not look especially
healthy. Around
edges, above h.t. of
patches of red tunicates.
Then, extending to
lagoon a blanket
of Wedelia at least
1 m. thick, partly
cleared inland, with
scattered trees, incl.
Palmae, Alchornea,
Allamanda, Pimentas,
Raphia, Pandanus,
and Cocconuts.

Land is taked for planting
but not planted.
Last of last swamp is
another 1 pond, only 10
m. across, with 30-50
trees, brechmore, not more
than 1-1.5 m tall. Hibiscus
Trichoceras tangle on one end.
(inset here part from
1067, but then by mistake)

Bronte small gray
ridge lying on this

656 feet platform in lagoon
side, less open of Fallen
Burying-nice (plug, b.d.)
Terminalia samoens;
occasional along lagoon
gravel ridge.

Weathered shat of
apricot, coconut in
lagoon beach.
Deeper occasional,
lagoon shore and
beach fault toward mud,
point much more sandy
than elsewhere.


Oct. 26 - Came j. 9 north southward from
landing.
Bananas, very dense and in golf shape,
few coconut.
Then sweet potato
area - boulders and
came gravel piled
up to clear sweet potato
patches.
Then open gravel
sheet not yet cleaned
off for planting.

Tall Scaevola, Pipturus,
Torrified, Wedelia
scrub.
Then high ground
planted to coconut
seedlings, otherwise
grassy toward lagoon.

This takes off toward
end of inlet into Wedelia
grass with scatters
Pipturus, Torrified,
Scaevola.
This changes to
an open scrub of same
species tangled with
Wedelia.

Plants seen (ctd.)
Pseudocentrum camellia
var. atropurpureum
Ptenis tripartita
Cardia subcordata
Cassia philippica
Ochna oppositifolia.

Fairy trees on out.
ref.
On outer edge of
 scrub is very thin
and about 1 m. high.
Some trumpetets and
some Wedelia on ground below.
Scaevola, Torrified.
and (?) Guettarda. Bushes
quite open ground. Few
Pandanus seedlings.
Some patches of Lepidium.
This character is
maintained for some
distance with blue
seaward beach, but
locally the bushes are
v.m. tall.

Hernandia, Allophyllum,
Pandanus seedling, var. in
fresh gravel ridges at
top of beach. Allophyllum,
Scaevola, Virginia.
Some Virginia appears as we go northward.

Thin, reasonably fresh, beach-rock at about mid-tide, hardens and the surface crackled, but offers quiet shelf.

Sample 23 is sound from the upper part of beach, a rather thin deposit. For examinations as to nature of material, leave beach near north end.

South from landing.

Bananas around village. Then sweet potato patch, then an open swirl of Digitaria, Pandanus, much Wedelia, some Digitaria patches, Vigna, some Tournesolus, and laevola.

This gives way abruptly to a grassland of thin, leafted, and Digitaria with scattered grass, all sizes, and tall grass of Premna, Tournesolus, Bipturus, Allophylus, Ipomoea, Terminalia, samos,

church, crops of Ateleia, dead and in a tangle.
Oct. 27 - Lijena Islet.

Species observed in 1958:
- Asplenium nidus
- Leptura vexans
- Coix muricata
- Passia grandi
- Canavalia minor
- Ipóxia biijuga
- Vario marina (2)
- Galapophyllum ziphirophyllum (2)
- Lophus acutulus

27 Terminalia saman
- Barringtonia asiatica (2)
- Cordia subcordata
- Unnepatia argentea
- Quetzales speciosa
- Guarea
- Pandanus (2)

Birds
- Fright birds 100-200
- White capped noddies many white thin
- Brown booby a number
- Brattle-thighed curlew 2
- Turtles many ocean
- Phoenix 7
- Reef heron 1 pair

Some of birds were white
beneath, only seen flying,
could not see other features.

Jaluit area.

Islet presents a solidly
vegetated appearance
2nd forest with a few
coconut and several other
taller trees as emergent.
Periphery patch still present
a weatherbeaten appearance
but is generally leafy.

Generally a mass of
Canavalia with
complete canopy at
perhaps 3 m. mass of
sprouts from fallen
trees, some standing
trees with top holes,
and masses of sprouts,
others standing out
as emergent.

Around margins
Terminalia and Pandanus
are common, forming
a zone. One clump of
Canavalia 2.5 m., tall
in this, a small tuft of
Canavalia here, also,
with the Pandanus, fruiting.
A few standing coconut
many seedlings and
young trees. One fall
Cordia with abundant
sprouts on beach.
Asplenium common on fall
trunks and ground. Many
old dead trees locally fallen.
Oct. 27 Second inlet north of Mejatto in bare sand with about 2 corremons and a few bushes.
From lagoon both ends of Mejatto appear densely vegetated, quite a few correns, thick, undergrowth, between very sparse correns, low scrub undergrowth.

Oct. 27 Mejatto north and south.
Plant, seen
1o Lema obtusifolia
1e Arctocarpus altliei
1e Lepidium Crassa
~
Cucurbita
~
Citrus papyrata
~
Pomoea batatas
1e Pandanus tectum
1e Digitaria graminea var. tubata
~
Ptcataza odorata
~
Mulinia galapaca
1e Crinum aquaticum
1e Alocasia macambya
1e Chlorodephon inam
1e Theurgo ruderalis
1e Plumeria rubra
1e Musa
1o Udvelia biflora
1e Frimbouia cymosa
1e Polyodium scolopendria
88

1. Manihot citrifolia
2. Neptunia hispida
3. Thunnus irrorata
4. Tappi hematochila
5. Teguca longipes
6. Ugni marina
7. Eclipsa indica
8. Glauca arvica
9. Paritum argenteus
10. Platysiphur speciosus
11. Ochroeca oppositifolia
12. Allophyllus temerarii
13. Intis biijus
14. Ipomoea taba
15. Triumfetta procumbens
16. Terminalia saman
17. Berringinopsis arctica
18. Pisonia grandis
19. Physalis angulata
20. Physalis argentea
21. Cordia subcordata
22. Cassytha filiformis
23. Canavalia microcarpa
24. Centella asiatica
25. Plerocitrumium
26. Calotropis procera
27. Chiriqui
28. Pemphis acidula
29. Hernandia squarrosa
30. Bertholletia tetrandra
31. Euphorbia chemorina
32. Buguina gymnophila
33. Nephrolepis antifolia

89

Near end of Mejatto
large clearing, frang
with Digitaria and
vines Reptans and
birdnesting, scattered
coconut, many head-
fruit sapling, seedlings,
up to 2.5 m tall.
This extends perhaps
halfway to the sea. Then
a dense tangle of
thicket of Paritum,
Rexovola, etc., about
3-4 m tall, with Wedders.
The with Teguca
coconut trunks. They
extend, to near the
outer beach, where
it thins and becomes
lower, becoming open
in beach ridge. Here
the beach ridge is
of cobbles, shrubs,
perhaps 2.5 m high.

A few Terminalia seedlings
on low beach ridge from
taba running out onto it.
Intensive gulfite trail
on each point.

Flock of 6 white terns
fishing just outside
outter reef. 2 white reef palms
one group. white 1.
Southward from here a lagoon shows the old clearing, becoming more mangrove with Vigna and Wedelia, in the space between the scrub belt and lagoon beach narrow.

There, where islet abruptly narrows down, mud flats are covered by a blanket of Vigna, celerying a sandy gravel flat. This extends along the lagoon coast a bit, changing inland to an open scrub of Vigna, Zornepetris, and tangled with Vigna and Wedelia.

Along lagoon beach, and deep flat they are wide, rather thin, rubble sheets with a lot of old tree trunks and rubbish.

South of the Vigna area is a flat of gravel with scattered Zornepetris beaches 1-15 m. tall, thin Sphincta, thin Vigna, thin Wedelia, presenting a rather arid aspect. Appears to be an area second to Zornepetris. Inland a coarse gravel sheet with lobate margin, flat, much of it open, scattered Zornepetris and beach about 1 m. tall, ground either has blackened gravel or thin Wedelia sand, some Zornepetris, seaweed, Zornepetris become lower. Wedelia denser and thicker, forming a closed vegetation. Become open again and irregularly grassy, with Zornepetris, open gravel, Vigna and scattered low Zornepetris and Sphincta in units 50-75 m. A low bane gravel ridge outside this. Steep gravel beach about 7 m. high. Then a rubble tract running perhaps half the length of the island. Above this rubble tract, uncovered at low tide, has several sandy strips across it, perpendicular to beach. On the gravel sheet back of the beach ridge about half way is where the open scrub starts is
A line of debris—old bushes, sticks, coconut, etc., in which a dense low strip of vegetation about 1-2 m. wide has developed—mostly treecoral up to 0.5 m. tall, numerous young coconut, little talis, Canavalia, Trumputta, and Gysytha. Curiously no Trounafetta. Though it is abundant, dominant in the swamp inland and as numerous as Dracovela (seeding) in the gravel sheet seaward to the gravel ridge. Standing coconut are very sparse in this section of the islet.

Gravel sheet rather thin here, old coconut root masses occasionally protrude through, covered with Lepturus and Zimbia nigripin.

A little further south, at perhaps the narrowed part of the islet the main portion—gravel sheet, plunge holes, scoured area, etc. has only a sparse mat of Trounafetta and Lepturus, some Vigna, Canavalia, and

Wedelia, etc., with scattered very small Trounafetta, about 2-5 dm. tall. Finistashy patches very locally. This thickens lagoonward to a scatter of scrub of Trounafetta in a blanket of Wedelia south of this an area of tall dense scrub of Lepturus, Trounafetta, Dracovela, Wedelia, etc.

Then a second open area of Thuringia, Trounafetta, Colpodium, etc., with scattered shiok. Southward, again, this thickens to an often semi and Wedelia blanket. Outside of this is a sparse scrub of Trounafetta, Lepturus, some young coconut, etc., with patches of Lepturus, Trounafetta, etc. Gravel ridge, bare, white. Southward the islet and strip narrows considerably, the low scrub, with Wedelia on a Lepturus extent the width of the islet, dominated
mostly by Tournefortia
Locally Pipturus
Scorzeda. Home open
Gravel sheet. Vigna
Forward lagoons. Southward
much open Thunnaea and
Lepturus. a Vigna
with scattered Pipturus
Bushes, 1 - 2 m tall, round,
and Tournefortia 1 - 2 m.
tall. Island a large
bare gravel sheet of
slabby boulders rather
blackened. Most of
this north old corncut
burnt by new ground
and scattered shrubs.
Seaward a narrow
strip of thicker lower
scrub tangled with
Wedelia, then the
typical sparse
Scorzeda Tournefortia
about 1 - 2 dm tall of
the seaward gravel
sheet and ridge,
some Guettarda and
scattered stunted
cornut seedlings.
This strip across is
about 1/3 the length of
the islet, north to south
and has almost no
standing cornuts, but
some stumps just
south of it taller
and denser scrub,
considerable Vigna
on seaward side. To
open low scrub near
very narrow
then a badly scorched
area across the islet,
much open gravel,
scattered bushes,
some grass. Alnus Acacia. Pipturus
some Wedelia & Triumfetta
scattered Tournefortia
Pipturus. Tender old shrub
1 - 2 m tall. This
extends some distance
scrub and open ground
in varying proportions
thinning out and
becoming more desolate in
appearance southward, with
scattered shrubs mostly
about 1 m tall, of Tournefortia
patches. Of Lepturus, Wedelia
Vigna. Thunnaea, etc., but
mostly bare gravel
with coconut roots
combed lagoonward,
old frass, fallen trunks,
etc. Many, plunging holes.
This area shows only its
beginnings. It recovers
13 bounded southward by a
Depression running across the island with practically no vegetation at all, except along north side a scattering of seedlings of hakeakole and trumpetfish, a very few around a couple of old coconut bases in the middle. Across the seaward side is a gravel ridge. An eelgrass reef flat is a pond surrounded by a circular gravel bar.

I counted terns on eelgrass beach. 2 blue herons on eelgrass beach. 1 white on seaward beach. 2 tattlers on seaward reef flat.

Several enormous deal Calophyllum in Lapion Beach, separated.

Oct. 7th - Sunny, along seaward beach from north end.
Low gray rock of kaholo trumpetfish, Peptus and mats of trumpetfish, Peptus, known, some cone gravel.
Varying greatly, both density, height, form.
4 turnstones and a gull.
Oct. 27. Kibon.
Seedling m gravel bar
Leucaena leucoasper
Calophyllum Guettarda
Beaumontia, Maclura
Cordia, Vigna, Trunenfora

Plants seen
1. Cassytha filiformis
2. Asplenium trichomanes
3. Vincia grandis
4. Polyphyllum acutipendum
5. Cordia subcordata
6. Maclura citrifolia
7. Vigna elongata
8. Canavalia hircuca
9. Trunenfora argentea
10. Nephrolepis antiquata
11. Flamna undulata
12. Caesalpinia searesii
13. Vigna mavenii
14. Guettarda species
15. Calophyllum impudicum
16. Pandanus tectorius
17. Naringiaceae asiatica
18. Coccos mutica
19. Pemphis acidula

Flock of 15-20 Black-naped Terns around end of yard on far side, one of them young. Striking tree common native, and quite a few White terns treatment grown young plants in the Accl. troubles.

Bottom of enclosed yard now about half covered by low Celmia, scrub perhaps 1.5 m. tall. Some new seedlings or sprouts from old lots. A little lefturnus near his nest. Bar surrounding it largely covered by shrub of Caesalpinia with a little Trunenfora to the north. This vine, from 1-2.5 m. tall, a little Terminalia. Vigna around edge.

Plants seen (ctd)
20. Lepartum species
21. Terminalia sarmentosa
22. Pectus argentum
and south.

The west end of plant
a solid mass of vegeta-
tion, largely Pandanus,
up to 3 m. tall, maximum,
1.5 m. Cadia,
Levora, Melinda,
occasional Tannarppia,
Gwettard, tangled
with Wedelia and occasional
Canavalia.

Intertidal, dominated
by Gwettard and farm
species, about 4 m. tall,
with an undergrowth
of Asplenium sp.
5 m. tall on large
rock masses, some
of these old rock masses
dead but covered by
countless young Asplenium
plants. Here also Immersus
and eucalyptus bushes.

A few cement trees in
north part of islet.
This part generally
is a low irregular
marshy forest swept
by eucalyptus and Gwettard,
tangled with Wedelia.

Keep a small colony of
Kerry on gravel
under a Pandanus tree.
Wedelia on base of tree.

At base of west end
a scrub of Levea and
Gwettard, distally
from this a mat of
Casuarina

Many seedlings of Pandanus
and Calophyllum, Limingita.
Distally from this a mat
of Vigna.

This islet has become
very luxuriantly overgrown
with about 5-6 m. wide
coconut and a few Pandanus
trees as emergents.
Oct. 28 - Mejatto, north wind. Fine weather and passage good. Well-developed Leucoda buyer, up to 15 m. high, along passage beach. Back of this a sheet of coarse gravel with a few scattered banks of Leucoda. Toward an old town, there scattered growth of Caspidea. Wedelia. A little Triumphattles, very sparse tufted. Leptimum, this especially, but not exclusively, a sandy mat, Caspidea, on Wedelia and Leptimum. Scattered seedling of Leucoda. Triumphattles. This was formerly a sandy area where coconut were always yellow in the lagoon. I left the Wedelia and Caspidea the closest abundant and the ground cover complex. This coincides with end of gravel sheet and greater sandines of ground. Leptimum and Triumphattles also more abundant, and there toward inward to a mixed open area with Leptimum and Wedelia passage beach lined generally by a low narrow ridge of pebble gravel.

1 white harem
1 turnstone
1 white tern.

Middle of Mejatto where I left off yesterday. South of big reef an area in being colonized by Leucoda and some Triumphattles, a few stunted yellow coconut, none of this over 2.5 m. mostly less. Toward lagoon in remnants of old is irregular sand bar. A few standing coconut trees and many stumps. Then in a stretch there
is an irregular, very low sand, quite sparse, remnants of soil filled with coconut soil.


Then another deep zone.

The entire area between these two zones, a deep sand channel has been scored off except for remnants of soil held by coconut roots. (See photo.)

The second zone also has a gravel ridge on seaward side, not as complete. No vegetation except on several areas of firm soil not entirely scored off. Here a shrub, Leptadenia, Tamarindus, Acacia 0.5 m. tall.

Southward after a broken up area of soil remnants and small

Some channels, swale very irregular, mixed scrub and grass patches, a tall

grass patch, a tall mixed scrub of Tamarindus, Leptadenia, etc. (See photo.)

This very open, with patches of grass (Euphorbia) and 60 cm. open gravel sheet. Cushion shrubs 1-2 m. tall

(Tamarindus anacrus, etc., thorn (used for cattle.)

Southward, shrubs more open, lies mats on lagoon side, Thouars and Wedelia seaward.

Small mangroves sand, sand bottom, with irregular, but pure stand of Bruguiera, 1-1.5 m. tall, near lagoon, separated from lagoon by sand ridge, encroached upon from seaward by sand ridge. No larger Bruguiera trees, but a few dead skeleton lying lagoonward, pointing toward lagoon.

Gravel sheet to seaward, very sparse scrub, mainly Cymophylla, with grass mats and Acacia (See photo).
seedlings, locally abundant. Lepidium + Thuraea were abundant southern on gravel and on sand by lagoons. Local patches of Incisaria, Chamissoa, as low as zone. Low Triumphetts.

Then tall, often seen at ripe + Triumphet, with grass, Triumphet, Wedelia + open sand patches. Created ten on lagoon side, grassy swardings at. Tall scrub becomes lower, 1-1.5 m. tall shrub, solid grass, Lepidium + Thuraea, ground layer, occasional mat of Wedelia. Beach + dune, me open, little grass, Triumphet, and Vagnia form swardy ground cover. Some Lepidium, occasional mats of Cassytha, occasional Pimplus, Mounda seedling. This sward, both zone continue for some distance but gets somewhat lower and shurvy, ground ever more inequitable, more bare.

sheet gravel. Seedling of any kind rather scarce. A few of Rupture, one Terminalia bush around old batteries but sprouting clumps of Beringiopsis are abundant. Beringiopsis seedlings, Grand seaward side. Scrub gets denser again, but ground cover less. Then a badly scored section little ground cover, but 

One, a care plant, one flowering, ridges, on sand shelf in openings, a few Quettande seedlings. Then an open area, with very sparse and irregular sand surf, mostly Triumphet, with almost complete ground cover of Thuraea, Triumphet, some Wedelia. The same almost across the area except for a strip of open algal dunes to just back of seaward beach ridge. Throughout the sward gets lower, 1-2 m. tall. Triumphet becomes domino.
in ground cover, with sand Jimbritties.
Southward small glycine more abundant, in places almost closed, with Lomatium.
Wide gravel sheet seaward, with scattered, very small Lomatium and Trumpetitis.
Almost as ground cover except scattered thin Trumpetitis mats.
Then sparse, tall, Lomatium more with Thalamic and
Lepturus ground cover. bone hair gravel sheet
Some Vigna along lagoon.
Some Trumpetitis and Wedelia inland, also.
Then mixed ground cover of Thalamic, Trumpetitis,
Engelmania, Englemannia, Jimbritties, a little Polyglandular, Cassinia
when ground is sandy gravel. Trumpetitis locally dominant.

On ocean side the
very sparse of low
seaweed continues
Density and height
inland varies. And
7-8 m. locally, in
places closed, thereafter to open.
On lagoon side a
small depression, sand
bottom, no mangroves, no very exact a couple
of small mats of Reptum
on sides.
Then southward an
area of grass with
few shrubs, backed
at and southward
high sand, tangled
with Lomatium Wedelia
Then sand with little
ground cover seaward
becoming almost dry
southward, then
somewhat open again.
Over coarse grass
down to sea.

Wing ground cover of
Lepturus, Trumpetitis,
more Cassinia, a Subset,
fairly general. Much
Thalamic in the parts
of scrub. Locally
Lemna sand and Wedelia.
Lewb thick and tall 3 m. Torendrat, Lecendro, Wedelio, toward 1 aga. Then watered many swamp, with Pontias around edge. Saw tall Briquiere, 1 m. cm. 1 cm. Briquiere, some with depression, with much debris. Southward large area of debris filled deep depression, some of it with dense stand of small Briquiere sapling. Pontias irregularly pebbled. Southward another small depression with Briquiere sapling, large hemlocks saw open and gravelly ledges bottom.

They surrounded myself by a very dense tall scrub, I mixed composition. Hemil, Allu Phyllis, Pontias, Lecendro, Wedelio, etc. There end in a gravel flat gently covered by a dense 4 open low scrub, of

Torendra, Sceptum, Lecendro, tough shrubs, and large, tough shrubs. Long Pontias and Greatland, all uperally eaten by type, but growing abundantly chalked with Wedelio in ground. Leeward a dense to open scrub of Lecendro and Torendra 1-2 m. tall. Half open white terr. Flying over this area.

The scrub types on this island mostly give the impression of being even-aged stand, regardless of density, and will, remarkably, poor seeding, in openings. Little correlation with substrataion, only broad correlation with place on island. Generally shaven and down toward seaward side.
Oct. 28 - north end of Majatto.

An open bone gravel sheet from 1957 in Late.

1st 15 Sept. regens var. wrightii, E.<br>1st 14 Sept. regens var. septentrionalis E.<br>1st 17 Sept. regens var. arctoastron E.<br>1st 18 Sephardic teland 7 ft. rare.

In old nothing coconut and

Coconut plantation on Jaluit atoll in form of a grid grid over most inlets,
and generally regardless of soils and terrain - swamps,
cliffs, gravel, etc., and
regardless of existence of
standing water. Three
foot wide and deep square
holes dug - bottom a vegetable
trash thrown in, then hole
narrowly filled with sand
and gravel. Coconuts planted
later in this hole, not
completely buried.

One rather thorough
brushing out done at time
hole was dug. Trash allowed.
general notes —
Lizard populations
scarce; larger most
islets visited except Fihon
and Lijern, where only a
very few lizards were
seen. Most seen generally
were the lined skinks. Black
skinks were seen on Nejivah
and Jalman, and slender
skinks on Fihon, Lijern,
and Megatto, one each.
However, no special effort
was made to examine
lizard populations.
Rats were seen in
abundance on Eject, all
apparently R. exulans.
Rats around the radio
station at Jalman were
a larger rat, but some
smaller ones were seen
there too, judging by
faeces of Kruskians and from
abundant droppings
seen.
Cats abundant on
 sweeps, seen alive at Jalman.
A few bugs, generally, also
chickens. Few drops on
Jalman said to be several
others on atoll.
A pet Micronesian fruit dove
on Fihon.

Wedelia leaves rather
generally somewhat eaten
by noctuid larvae (similar
to army worms), but not as
many defoliated.
Hytophini, common.
Various ants, common.
No striking abundance
of insects anywhere.
Bees occasional on all
islets, but not abundant.
Some bugs on Jalman, not many.
Very few insects came to
lights.
Little soft-wingless cicadas
common in pandanus leaves
on Megatto.
House flies and a smaller
similar fly occasional,
annoying but not at all
abundant.
Large land crabs hole
prominent on most
islets, incl. Lijern, where
the land crabs use sand
well—the humans in places
much as the sheenwaters do so.
Here I these holes are proba-
bly those of land crabs, but
may be coconut crab or
even sheenwaters (but a bit
small).
Land hermit crabs not
specially abundant.

Total trees living: 347
- Dead trees: 134
- Diseased trees: 24

Trees died last 3 months: 26
Trees diseased last 3 months: 10

Four areas of infection and development — in the latter, the tree is in last stages before leaves drop off and surrounding trees are beginning to turn yellow.

Site 1: dead yellow
- 1
- 4

Site 2: 7
- 3
- 0
- 4

Symptoms
- New leaves become progressively chlorotic; approximately 2 months after symptoms are obvious, leaves fall rapidly (except for half dozen that turn green suddenly and then, almost immediately, yellow and fall — not parasitically caused).
- Early galls appear, about 3 months after infection.
- Galls are small, somewhat xylotrophic, and often constricted.
- Galls on leaves are evident approximately two years after infection.
- Three galls appear to be "stumpy," black dot form which leaves emerge.
- Lees and, as new growth appears, leaves, etc., the tree is presumed dead.
- Leaves: top leaves — light green, yellowing starting from leaf margin, random spotting (mottling), and occasional "hairline" necrosis along the leaf margin.
- Leaf necrosis more in evidence; leaf tips slightly curled, necrotic spotting, and definite yellowing over-all.
- Increased necrosis and dead leaves yellowing.
- Similar to 3 that leaf begins to die rapidly.
- Roots: a tree in the final stages before death needs completely dug up and pulled down. Twigs and those roots 5-15 mm in diameter showed the following deformities:
- Root was twisted, wobbled, and often constricted.
- Galls were evident — approximately two years after infection.
strands radiated. The root xylem in either side of the gall usually had a streaked appearance, discolored black.

4. The galls themselves had signs of not within the tissue. In the galls, the xylem remained unaffected, but the surrounding tissues were badly discolored.

5. In stricking the roots black streaks were randomly but consistently found.

6. Where not was constricted the xylem remained relatively unaffected.

Surface roots, within 10 ft. of the trunk appeared normal. Small holes just to expose the surface root were dug around several trees to a depth of 1-1.5 ft. There was a relationship bet. the degree of yellowing and the occurrence of diseased roots. Also, a greater number of roots were found to be abnormal near the path than were found at an equal radius opposite the path.

Trunk. The tree was sawed in three places:

at base, at middle, and near top. The xylem and phloem appeared normal except for a definite black "shadow" running the penetrating the xylem tissues. This discoloration had a fairly, definite trend in the xylem but in the phloem it slowly faded without any clear limit. This condition was found only in the tree trunk branches appeared normal.

Summary
There appears to be sufficient evidence for a conclusion:
1. The majority of the diseased trees are situated along the path.
2. The disease is spreading most rapidly along the path.
3. The roots nearest the path show malformation before those farther away.
4. Once a tree yellows and dies in a recognized manner those trees nearby tend to display identical symptoms.
5. The time intervals between yellowing and
Marshall Is.

death, yellowing and subsequent infection of nearby trees at death and subsequent yellowing of nearby trees are uniform.

The trees show symptoms easily recognized and can be attributed to a common factor.

[This far from report]

The tree that I looked at that was affected was showing a bit from base, upper parts dead. But Knudsen says this is not generally the case. Surrounding smaller trees somewhat chlorotic.

When asked if some coconut trees still retaining leaves after Typhoon had died later, several Marshallers replied in affirmative. Four different periods of time, from 6 months to two years.

"Cause" for even this,

Neil Morris, agriculturist on Yap, studied the breadfruit disease further.

Jaluit - Majuro

Oct. 29 - Plane trip Jaluit to Majuro - small toilet

Drum Long Islet -

surf's channel, abundant

In Majuro - swamp only in east end.

Wm Long Islet

Jabon - White

Fan - photo

At channel of figuration and an "island" reef channel.

truly get north from Englin - Peking about 100 yards, beyond this near angle in reef many demelkis areas severely recorded.

All along the lagoon

reef flat bars are a very frequent feature mostly near the lagoon edge, but also many small areas one near other.

Many remnants of consolidated material also, out on flat in various positions.

Majuro - 1/2 square

lagoon reef flat write than anywhere on north, west and north sides.
Marshall Is. - Majuro

The seaward flat is much wider. Margin of seaward flat on the east was not included. That of lagoon west was scalloped on north side. Almost no coral patches on rim; only a pinnacle in east end of Majuro lagoon.

**SAMOYLA**

Lamp TUHUIE LAMP plant - named by Massenge. to send specimen. (sent 1st received late)

Wadellia seems to be generally the most abundant plant. Puccinia has become relatively scarce except along an atoll where it is still abundant.

Many ornamental in administrative town.

At 191 photos on bid well as aerial shots along north and west reefs of Majuro climbing from 6 to 600 ft. (lost lot of coral patches in west end)

Oct. 31 - Kwajalein Islet, Kwajalein

Dentella repens four
common on weedy lawn near school building contacts

Galvot

[illegible]

- Occasionally seen

Cyclophyllum anthophyllum

Genepinga argentea

Hyacinth anatina

**C.** anthophyllum

C%%%%%%ga

C. repens

Schordia 2 species

Dog generally planted

to coconut, some patches of breadfruit (several dead and yellow breadfruit tree, some dead tohepetia tree of beach) plains on one side. Fairly broad strip of native vegetation on one side (east?) narrow on other. A large taro pit near one and extending almost across island. This apparently has Cyclophyllum, but does not look well tending. These on several taros and heape: took about 13 kodachrome. Breadfruit grove mostly present a very dense and even level canopy.

prostrate, forming dense mats, flowers white.
Oct. 29 - Nana reef, flowly at a little distance, except very near south and only one tiny reef in entire west reef. Many on east reef, well distributed, except for a considerable expanse of reef near south end that has only 2 tiny strips of land. The largest islands are at the north and southpoint, and on a loop to the east in the east reef. A little surf is breaking along entire east reef, none in west reef.

Oct. 30 - Kwajalein
Watched cat playing with a mouse in front of hotel.

Mr. Broy, U.S. Weather Bureau, says that when he left Wake 2 years ago there were 70-100 wild cats in the woods on Wake; a few cats at that time.

He says also that the various weather stations, such as Kwaj, Eniwetok Majuro, Johnston, etc., which has recently been taken over by the Weather Bureau, now publish monthly and annual summaries, and there is a Pacific summary.
Oct. 31 - Trip in SAR
All ations plan around
Kuajalein atoll
Left field 8-48

Trees - most of trees
grow from north end,
many coconut trees
along lagoon shore of
settled part.

Center part of
Cleared, two small well
wooded, construction

Nests mostly well wooded
but the old camp has
no woody vegetation.
Thoroughly green north
Wesdela and Fleming.

Small inlet n. of
first place seen here
But no ceramics. Also nest
one well on itself

Rocky, sandy and closely
striated transversally. Here
Channels are coarsely striated.

Next small inlet also has
It natural scrub, no coconut
(Also the next Christ Pines)
also nest.

Kuajalein atoll

Next is long, some coconut
in south half, math half
shingly too.
Next inlet small next.
Next small peat with
a few coconut.
Next, tiny m. very few plant.
Next one small peat with
much Pandanus
Next small.
Next coconut.
Next small.

Reef: Name scattered
coconut, dishes in black conical
in slightly usable. Much
open ground on other old
stick grove with scattered
brush.

Next inlet next drain coconut.
Then another with coconut.
Then a pass with a low
sand bar inside it about
500 m. a.m.
Then a small densely
wooded inlet
Large inlet with coconut.
Then a pass with a good
bifurcating channel
at bifurcation mid. 3 a left
(Photos but not from good
position - end of all)
Marshall Is.

Small scrub of
a demuded reef platform
west of pass.

Small islet, densely
wooded.

Another, Phoenix Group
with fringes of coconut
along inner land.

Next, solid forest,
windward shore on east side.

Shallow pass.

Small wooded islet.

Surf on both sides
of reef, less wooded.

Reef islet, with
considerable coconut
plantations.

Cross straitions, or
much of the reef here.

Reef islet about 75
planted to coconuts, and
front in seaward side,
some of plantation extending
to sea side.

Shallow wide gap.

Then reef with small
bowlders, Black gravel
very suddenly consolidated.

Small forested islet.

Islet with irregular
forest and a few coconuts.

Then another with
abundant brush in cove.

Some coconuts, mother plant

Kwajalein

Large inlet, some
salt water scrub,
then belt of coconut,
then seacoast and half
in forest.

Many path snags.

Large reef.

Pass to windward islet
with their scrub
mangrove.

Flat, coconut to mouth
side. Then a small
islet, with much brush
and a little scrub.

Then larger inlet mostly
open, two patches of
coconuts. Small islet
outside this with
coconuts, connected by line.

Small islet with
open scrub, linear bar
outside of reef.

Then large westward
islet, irregularly
planted to coconuts.

Inlet of sand water
open at north, and west side.

Important in center.

Reef, much broken than
inlets in this western
prolongation. Islets
look down through a typhoon
had swept them across the
end of.
Marshall Is.

Much from end a number
of lumpy bars first
before lagoon begins
one at least seems to
be beachrock, others
scarcely.

On much of north
reef before west and
there seems to be a small
development of an algal
ridge in the inside
with some surf breaking
over it.

Back along south my
several groups of
reef, shallow hard
with broad transverse
striaation.

Islet partly planted to
coconuts some fruit,
some very yellow ones.
Then wide gap with
shallow area, and a
depth but narrow cross
channels. This reef,
well submerged, is quite
complex, but does not
seem to have many
channels. Few sandy
areas of different depth
than a deep channel with

Kureajalein
large V-shaped reef inlet,
each fork bifurcated
inside it right and a
number of branches
not forming a very good
pattern. Most of this
would be underwater
at lowest tides, probably,
well submerged.

Then a shallow strait
with a patch of surf.
Then a narrow beachland.
Then more well submerged
reef.

Then a regular long
islet with coral reefs
and a few patches
of coconut trees, some
regular or a e.

Then a small islet with
open coral, a few corals.
A sand bar with a few
coconuts and bushes.
A worked small islet
An long islet with coconut
and a long reef extending
lagom from along a deep
bifurcated channel

A cocooy planted islet
with a long reef extending
east along reef.
Another long coconut planted
islet. A deep pass with
An islet inside, very sandy, with coconut trees.
Then a long, narrow, planted, islet with a narrow, sandy, coastal extension with a good wind on it.
Then a long islet, irregularly, planted with coconut trees, a basically, sleeping reef, another islet in, heath in coconut, dead wood, and alternating to a short, tup, mangrove.
Then a very long, narrow islet with a short, metal, a deep, than with thin islet inside, it ranging in a bifurcating system, on one side, a sandy, coconut trees.
Then a long islet, the sand, small, is tropical, planted to coconut, very elongated, eastern, sand in tidal, coastal, paper of coconut, then almost a half, then some shifting, coastal, with coconut. This was often interrupted, sand, timber, then in sand. Then a small

A reef, wooded islet with some coconut.
4 Q • Y /
inside with large trees
and druming
Another inlet with
beach and end and
a deep pass
An inlet planted to
coconut, mangrove
eastward & point
Bar on reef, one will
vegetate there
small irregularities
get together with
at lagoon. Complicated
importance. I cross
through the inner inlet
with coconut plantations
then a deep channel
with wide gap
shallower eastward.
An inlet mostly in
corallite, from Pyramid
point southeast, mostly
sand or soft, half mud
a patch of mangrove
east end, with remaining
inside vegetated high
gravel a sand ridge
at pass. Wide deep
pass. Then a couple
of reefs with small
wall.
An inlet with....
Piromia, some corallite
connected by
bar with another with
a short, in east end.
A sand island of these two
inlets, almost the length there
with
Then a wider deep
pass and gap with
submerged reefs
Then an unvegetated
nothly blackened bar.
A couple of large
mangrove islands with
bar on them, one island
A tiny reef with coconut
a deep narrow pass.
then a elongate inlet
irregular width planted
to coconut on wider
banks.
Then a shallow pass.
Then a narrow elongate
inlet of bar with
some corallite, a little sand
A small bar bar. Then
a shallow pass.
A reef with an elongate
narrow bar, widening
eastward into an inlet
with a wide planting poking
bar at mid end in lagoon,
masses at bar on east
Shallow pass.
Elongate inlet with bar
partly low, partly sand.
Partly in deep
shallow water.
Peek here, bifurcated
Inlet with ample
shallow water.
There are elongated
shallow water,
somewhat sheltered,
eastern end curved.
Then a rather deep gap.
Then a wide shelf
with very narrow
shallow water.
Very
"..."
Cork
..."

Some of the reefs
are scattered around
the larger, mostly
shallow, scattered
coconut trees.
Then shallows gap
to Kwajalein.
And old L and reef.
Went on north barrier
Kwaj. Two large reefs
with scree.
Many coconut
on south half of village
and around old station.
Some with half.
L. N. low often, break
off. Some coconut, none

Cor intlal still demersal,
fish with blood and
but end toward near
by a gulf of around
time well in this front
around.
Northward of reef are some curious circular reefs extending from main reef into lagoon, with growth around edges of these, sand in centre.

Fluctuating to Lila. Reef is wide and west.

Sand in N. corner, N. to E. sand in middle; considerable growth there; west, only a few growths.

Treat around port and Zephyr Pitcher by Headfruit in N.B. 1/4 mile.


Diagonal to Beach;

Surge channels on W. + S. side; scarcely on west.

The front around the sand is jutting - the front looks of much like Pampal. n. Bruguieras; one patch may be Bruguiera, brighter green than rest, dull green, rather small.

Leaved; somewhat tesselated; colour...

The port is brown; muddy looking.

This island should repay study.

Back to Kuva-ka-ka, almost along south reef, opposite at Bebe, Bizajat.

Boulders are large. Bizajat has very considerable boulders from

Extensive boulder track on reef north of Bizajat. Boulders tend to be aligned transverse to reef, accounting for some of strained appearance. Most of dark patches on this reef are due to boulder or rubble track.

N.W. of Kwa-dak - a large broomed boulder - a part of a buttress between surge channels, lying nearly to be lifted on reef by a storm,

Coarsely strained, apparently due to submerged surge channels.
Rubble all along shows a remarkable tendency to traverse a alignment. But fine striation or pitted parts of reef flat is apparently not due to this, perhaps to shallow growing such as seen at Kuai by terminal.

Most of fruit seen on these islets earlier this morning is Poison.

The herbaceous vegetation on the old ramp at Rigjei seems to be Weledela about the peripheral half or so and Gymnoa in center, though hard to assess.

A very few scattered patch reefs in lagoon. Lagoon is quite rough today, quite a few white-caps.

Down south reef at low altitude finger or no alignment of rubble or these reefs. Barn very numerous, though Anemote haas on lagoon reef flats of from islets are occasional.
Oct. 16 - Honolulu
Crimini sakaei Eng.,
cultivated in garden

Oct. 25 - Honolulu
Crimini aspidium 2.
cultivated (M. O'Learying)

Nov. 4 - Trip by Boeing jet
Honolulu to San Francisco
10:30 a.m. - 6 p.m. 3 h. 30 min.

At about 1:30-2 p.m., one could
see the sea, as such, was
practically unseeable - a
scattered layer of small
clouds. Far below, one
saw the sky and clouds,
which appeared to be a
dark blue, similar to the
darkness of the night sky.

The sky did not differ in appearance
from what one would have
seen from the ground,
except that the sun was
not visible. The slight
differences observed when the
sky became darker were
not significant.

The sky was almost a
dark, dark, blue,
not black.

At this time, a man.

As the plane flew
over the mountains,
the sky appeared
darker, almost a
blackish blue.

The sun was just
a faint white light,
which created a
faint ring around the
plane.

From this view,
the sun appeared
dark and the sky
bright.

The sky was dark,
and the sun was
not visible.

The sky was
almost black,
with just a faint
ring around the
plane.
Nov. 5 - Miles Canyon
still in fairly undisturbed
condition except for railroad
and highway in bottom.
South wall mostly densely
wooded with a few stands
of live oak, Ascoclu, Albion
etc. Other wall open, grass
with scattered live oak
stream in bottom with
abundant water plants.
Road to land, more
open, but scattered live
oak's, and Quercus lobata
grass heavily grazed.

Nov. 7 - Sacramento Valley
from air. - The area
west of the lower Sacramento
River is almost entirely
under intensive rice
cultivation. The land is
in large blocks and the
entire area is cut by a
system of large sloughs
lined by very narrow
gallery woods, usually
not much more than a
single row of trees, or even
only a strip of low scrub.
Between these sloughs
are a network of ditches.
Along the river, itself, there
is a narrow to broad
belt of orchard (peaches?),
motorly on the east side,
still green but showing
some change of color toward
red. At a junction of
several sloughs is a
patch of forest or swamp.
Some small wooded islands
in larger sloughs.
The soils, when the fields
are ploughed, is almost
black.
Nov. 23 - Chantilly Airport
Large open field, thickly
grown with weeds.
Different weed communities,
apparently representing
different times of withdrawal
from cultivation - shrubs
between them abrupt and
straight. One community
dominated by Bidens sp.
A few scattered Rubus
c积累 and one Rhum in this.
Separated from a
grass community
by a line of junipers
1-2 m tall, the Bidens
spread 1-2 m beyond
two into grass. Bidens
apparently annual.
A smaller number
in into the grass.
In the Bidens abundant
small burrows into
ground - as many as 7 in
one 2q m seen.
In grass a maze of
interesting runways,
some burrows. Also
some larger burrows
with fresh dirt
around mouth.
2 1/2 junipers reedling
up to 9 m. tall in grass
- a few scattered small
After several days of weather ranging between 35° and 6°F the lake is frozen over, with a firm sheet of ice, that bears a snow blanket weighing very well. There are several long irregular cracks that had frozen together again, after opening. On the surface are patches of stubble mounds, also curious series of concentric irregular ring-like ridges, also patches of semi-condensed snow.

The upper part of this arm of the lake, the channel
Feb. 22. A heavily overcast day, damp and locally very foggy. In Washington, in the afternoon, clouds when snow was still lying were observed to be apparently smoking white vapor was drifting up from them in great quantities. In the evening, driving considerable driving around the area south of Falls Church and north of Seven Corners, it was locally so thick as to make driving almost impossible.

The distribution of the fog was very irregular. It was observed to be much heavier in areas where there was still much snow on the ground. The snow was "giving off" clouds of vapor, and when it was piled up the snow piles looked like smoking volcanoes. The temperature was generally warm.

Feb. 27. Great Falls. The water is rising that only one small patch of weeds is showing. The water is a cafe-au-lait color and smells quite filthy.
Mar. 9 - Route from U of H to Wilson tunnel to Kaneohe & Panini.

Dawson road along Wilden Ave. Foster Golden. Patched on corner.

Large banana in Palama.

Mango tree. Cycas at Kapahulu Rd.

Kam bowl in mountain to right. Casuarina forest above it and on ridge to right. Left of Kalibi st. on way to tunnel.

Center row of Jasminum multiflorum between highway.

Below Casuarina on slope spread largely of Alpinia, are Psidium and Eugenia cuminii up the valley. Scattered Acacia also abundant in the valley.

Patch of planted Eucalyptus Eugenia at lower end of Kalibi st.

Casuarina, etc. just below tunnel.

View of Kaneohe Bay.

Planted cliffs with.

Plants on end at base.

Large banana plantation. Large mango trees. Road lined w/ banana.

Plantations close to Kaneohe.

Large mango trees and casuarinas on st. before main intersection.

Kokokahi - Kalikau Rd.

Hills on right with

Scattered trees, and grove.

Pouls on right, midget low forest of Hapanea, tiliaceus, Eugenia cuminii, Damania gravis, 

Laurea, Stenocarpus, low flat-topped, apparently wind-shorn, undressed of foliage, etc.

Mar. 10 - University to Mokuleia.

Wilden Ave.

Jumah - Eucalyptus hedge.

Row of Pisonia.

Eunálio Rd. Left Ward of Victoria - fine ficus microphylla (a Benjamin) on st. in yard.

Vineyard & Queen Emma, fine group of palms.

Vineyard & Kate Smith. Palms on left & Phoenix, etc.

Vineyard & Houghtoilk. Palmae on left & Phoenix, etc. A former, etc.

Large damania & Houghtoilk, 

To st. in King, on left & several

Ma. Phoenix.
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1941 Nov. 9th. Oahu

Large firm Pandanus
m.fing. beyond Kalili.
Monalina Gardens.
Tektake Hill - kame
forest, L. excava. under slope
some Opuntia on d.s.
Red Hill - mostly L. excava.
sand, scattered low Prosopis
Area - Casuarina f. estu.
and acalyphe b. on it.
as road enters town.
Yapala Casuarina f. in town
Sugar cane fields.
L. excava. with some Prosopis
in waste places around
Hilo, but mostly cane.

Waipalu
Kilohana Rd. Jet.
Sugar cane.
Waianae Mt. ahead in s.
lower slopes grassy and
wooded in places, mostly
Thin kiawe forest, with
kiawe & clump of grass.

Barber Mt. Jet.
Sugar.

They good D. scottii forest, composed
with dunes, foundations
interesting dry land plants
D. scottii, B. heterosperma,
Clusia inflata, very abundant.
in very rocky ground.

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31st was night with
thin Prosopis, much cane.
In Monalina large
Casuarina gigantea (white
beam).

Bet. Waianae & Waipahu.
Jet. Bluffs, showing
Formation of lava
ledge, with grass, etc.
Waianae - tidal flats
with Batis.
Much dunes, kiawe forest,
cliffs with cacti.

Maile - native forest
and Rubus visible at
head of valley.
Kiawe forest in del vis.
table
Hesperaloe
caudex, pili grass in ledge.
Flat beyond - mean
forest, pastured.
Ferns - green of
Vitex in sand at top
of beach.
Cane.
Kiawe forest

Kauai \\
Kauai forest.

Kaena Pt. road. at foot
of cliff. Kiawe s."
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Straw flat, with
Mycobolus
Tower tuff algae
with Atigites seminartic
Trigites, Triarane
Fovea ocellaria, Chloris inflata
Netted fronds, (annual)
Small-leafed wood

Euphrasia
Santalum
Chromatium
Boraginaceae
Low Leucaena shrub
also Acacia pavoniana

On sand dunes
Ageratina
Desminia
Heliotropium
Euphorbia lagenari:
Boraginaceae
Atigites seminartic
Dactylotenium
Thidphloeum virginiense
Vitis rupestris, etc.
Eucapnemia
Chilo falkland
"Pistacia" lucypurus
"Leucaena"

Sea stand. Probably remains of a consolidated dune. There are remnants, occurring at various elevations, up to base of feet high

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Calm

Toward Mokolii
Leucaena scrub
Late March and
August winds break
Leucaena - often stands
with Leucaena scrub.

The slopes around
Kaanapali are mostly
covered by a Leucaena
scrub that is dead in
its upper parts, or nearly
killed by salt spray,
but with prostrate
branches at the base,
off the dead bushes
that are growing and
green. The whole vegetation
seems to be in poor
condition (because of
the dryness and salt?)

On the windward side
the point is a great
mass of lava boulders
piled out over a rough,
barren jutting above high
tides. On this are remnant
patches of what appears
to be beach-rock bedded
lime sand and gravel, quite
cased hardened. If beached
it is from a tremendous high
May 6 - Univ. to Koko Head. Lava c. stand on hills to left of road below Univ., far beyond Kaumuku - Kapahulu Valley. Lower part of the valley, filled with coral plain. Lower slope covered by newly opened Prosopis forest. Coral plain built up, golf course, residence area. Formerly cane field. Double highway with jasmineum multiflora and Canavera loliacea in middle. Hibiscus hedges, also Nerium hedges. Waihikapu Valley: semi-native forest and Kulani at head, slopes Prosopea with considerable pili grass, low Opuntia. Beyond - a nose of Delicius on left. Dogonehilla in bluff at right. Nin Valley: Hibiscus very noticeable at head of slope on side of scrub Chamaelaucium. Lower slope Prosopea, tree grass on higher slopes. Hibiscus tiliaceus on right. Kulunaeon V. form as Wailua's Nin. Ridger badly eroded. grass?
planted Casuarina torr.,
Ficus microphylla, Malvaviscus
Polygala, quill, P. Plumeria
Canna and Chamaesiphonia
Calyptrate, Calyptrate
Weeds - Chrysopogon mundu,
Cenchrus, Elusaria, eudoxis-inflata.
Jasminum indica.
Argemone plana
Richardia
Lilium, minta complex
Loranthus oleraceus
Letana ventricillosa
Cassia
Dactylorhiza
Melinae flavida (from)
upright, 5 or 6 ft. high, 2
consp. tuff beds on it.
Meniscus aestivus
Vernonia (abundant)
Plechusa (abundant)
Peucaea marmorata (top of head)
Mangrove fruit on beach,
potash is found in
Patches of potash at
base of slopes at end of
beach at night.
Cations may form a
brackish water
above -
Porphyra canina
Poturna oblonga.

Calm
Stachys annuum
Cimicifuga americana
Jainewatte
Kantara
Eragrostis variabilis
Heteropogon contortus
Low sand of Potamogeton, panum,
Pastina, Reichenbachia
Walthera
good patch of Eragrostis
in eroded place.
Gomphus jaranica (dwarf)
Fenous bricks on left
scar with Eragrostis
Ehlersia peregrina L. id.
Chrysopogon, Potumca in area
of tuff.
Eroded trail with
scum of algae, ferns,
Eugenia lehmanniana,
Aquatanium oxygynus (dwarf)
Top of ridge - bone, eroded
down to tuff layer surface.
Panacusa paucina
Clibia, Dactylorhiza
Walthera, Ototopogon, Linnaea
Heteropogon, Anophlea
Reichenbachia, Leptochloa
Cassiflora, Digitaria
Timidly, centura,
windswept Panzers on right.

Walking along banana slope toward sea end - first a very smooth eroded tuff, then a rubble tract, then a ground or qualified slope.

Heliotropium corymose

Fumitory, Parthenium, Baccharis, Echinochloa, various grasses, and in full.

First small crater, banana slope dense grass - Chloa, some Silphæra cynandra with other Reichenbachia Emilia, Chloa & grasses.

Crater floor surrounded by low wind-borne sand of Panzers. Inside the mass was well Comptonia tennellum.

In lowest part of crater solid sort of Massilia but with considerable invasion of Chloa, lettuce, Xanthium, a little Reichenbachia, Manemone, Malva, Echinochloa, various.

Calm

Phacellus calligaster, Emilia panzers, Jacqualinii, Gaertneri, Wallbergia, Echinochloa, Comptonia, Panicula portula, Aquaticum, Helianthus, Malvastrum

From crater, east, striking silhouette of wind-swept Panzers in rusty.

4-5 ft. Fanwa, up to edge of crane.

On out toward end of crater, some bare eroded tuff.

Around edges of crater some remnants of the silty soil held by a gran, and tangled mats of brane - belt soon to go. From bione intact, then 3 m. more eroding.

Schiedea glutinosa, scattering as eroded telper (typical) locally common. - neilling.
Seaward slopes also provided shelter for
Phytophorus, Heteropogon
Chloris in small colonies
Heliconia low common.
Waltheria, Vernicia
Bida, Jacqueminia, Atipala
Emilia, Pouteria, clara
Atipala

Some sloping vegetation
Disappears last struggling
Plants, viz., Chloris, Dactyloct
tella, foetida, Emilia
Torquata, or small trees
Wet with spray on
Brown days up at least
25-30 m.
Spectaculars wonderful
Nama sandwicensis
now in exucre

Euph. hirta, Lophochara

Pandanus, slope
Diuris, crumen.
Lophochara, Shibodis
fils, Pseudomicon hypnum
Pareium, Pat. fociace
Retaria, Walthera
Dactylorhizae
Euph. hirta, Dactylorhiza
Lophochara, Pseudomicon
Pareium, Jacqueminia
Pareium, torquata

On sheltered aspect
Vigna, mangifera, Emilia
and much more of everything
else. Heteropogon abundant
Phytophorus, name (5 years)
abundant and dense
Spectacular wind ever
in depression running
down opposite cliffs

Route画家
Emer on left filly
with Lophochara erect
Along edge
Asystasia, gongyla
Seligma, thebertapholina

Slope—
Heteropogon (filly)
with iron, sheared
sheaves, of broom

Turn left—beautiful
view of coral reefs in
Pandanus. Bay of Point Coconut,
A serene, crest of
Dry end of Kahanu
Mannaea Bay, bringing reef
Along one
Deamothera, vingan
Euph. hirta, prostrata
Cotalean, mannata


Road from Hanauma cut through bedded tuff, grassy areas, scree slope.
Landslides with
Juncus, Carex, Carex
Heliotropium arizmola

Where road turns in, go left.
Juncus isleae along fence
at night. Weedy flats
with field on right, to left. Cliffs above this
have Heliotropium.
Dryopteris decaen on cliff ledges.

Abundant he'e ohi'a on left just before
Makapu'u tunnel.
Mixed fili grass and hinau seed.

Helictotrichon tridens

Stop at base of cliff.
Cliffs with hanaula,
Shrubs, small flowering plants
Landslides, Helictotrichon
Panaxa ternatum

Dryopteris decaen

Shrubs, weedling
abundant in ledges and
valleys.

Cennanaria papaya
Panarea flammea
Pelecyphora integrifolia
Anemone glauca callosa (or law)
Majus weeds.

Gesneria disperma
Gesneria nipponica

Cenchrus galeata var.
with pubescent hair,
acutus small saplings, no
stems. Monosperm with
green statice and white
radiating flower from base of stem.

On down at wall house

Low shrubs of kerreola,
Pentaspermum ellipticum
(Pseudomyx, very leesened)
Gesneria indica
J. calina
Sida

Sida

Iochromes
Oxalis helicina
Panula crassum
Osteospermum
Pelecyphora integrifolia
Fimbristyliis campsis
Heliotropium arizmola

Euphorbia degener
Sisyphus chronoxi

Cenchrus lanatus

(continued)
1961 Hawaiian Jr. Oahu

- Atropa
- Ficus banyan
- Limonium frutescent
- Pachystegia
- Phlomis virgata
- Tubularia ciliata
- Broomcorn reed + black
- Smut with ends of root
- Munsia didyma
- Alyssum portulaca
- Crocusus avvensis
- Cymnea javanica
- Arachne avvensis
- Trichodes
- Acmophasis
- Menemeris aegyptia
- Asparagis

May 4, 1961 - Flaming Point, Hailus

41429 Stachys avvensis
- low cliff just above beach

May 5 - Kohala Head
- on bare eroded tuft

- 30 Limonium
- common locally

- 21 Nana sandwicensis
- very rare in Hawaii

2 m. weak herb, colorless.

60 m. prostrate

70 m. flowers purple
1961 Hawaiian Isl.

41437

1 Pultenaea planacea l. occasional

2 Digitaria lax

34 Euloba javanica common

35 in hilly & bottom of crater

36 Marantae nilotica abundant

37 Euphorbia w. common on roadside

March 5 - flat, northwest of Mokapu Head, on windward side

38 Coelocaulis common among large rocks

March 7 - Mokapu Cliff Trail

39 (Ramb) forming a dense shrub

March 8 - Ridge north of Opehau Gulch, Ko'olau Mt. open wet savanna-like

40 Rhynchospora occasional

41 Anthostemma latifolium D. W. very common

42 Baccharis contracta common on base cut banks above trail.
Mar 7 - Marion Cliff Trail.

Entrance to trail near top of today's terminus on left. Prairie clover, and purple flowered phlox. Fenced by, along trail. 

Alumwite and acacia box overhead.

Thicket of bamboo.

Forest of Pseudopaeonia occidentalis.

Occasional large pro cut trees.

Large patch of cultivated P. quinata, "Allewite".

Pantanal, along trail.

Several quadrinhaniens.

Trail lined a choired with letanum and mass of euphromimica winey on banks.

Seems to be about 1/2 or 1/4 of the yellow jones. bushui

patches frequent.

Much grass present.

Some flesheumor.
Calm

Acamanthus
Along trail—
some Eucalyptus planted
Gracig tree

Terebinth, aquiline
Pseudium castellanum

Stachytes, stachytarpheta

Martinella, Dodonaea, fea
Metrosideros

Mainly quava and bananas
Rumex punctatus

Acavula

Oncolyza aculeata, etc.

Hecht place in an old
planting of Eucalyptus and
Rubus in macrame.

Read along this through
Metrodilos scattered here

To shanty town in ad. Then
Small road up ridge &
end Trail from here on
ridge.

Eucalyptus on ridge.
Good area for forest besides

Of gulch Lush in
bottom some small lehua
get starting point in trail
Pseudium castellanum
176 1901 Hawaiian Ir

- Eucalyptus arborea
- Fibella
- Anaphora corymbosa
- Euphorbia multiflora
- Sesbania brevifolia (purple)
- Erythrina terminalis
- Rubus saxatilis
- Wisteria floribunda

Camp
- Flat ridge top at 300 ft. above camp
- Gleditsia, Erythrina, Cassia, scattered
- Leonotis, Metrosideros, etc.
- Grass, grassy spots
- Lloydia, mollis, and other
- Erythrina, Papilionaceae
- Wisteria floribunda
- Guerilla robusta

Nature
- Manchurian magnolia
- Psychotria marginata
- Clermontia kahian

Life trail
- Euphorbia corymbosa
- Agarita corymbosa
- Camp Manning

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- Calm

Route dawn
- Past cattle, small, covered by Kauai paniolo, surrounded by large acacia, box, and ohe small Metrosideros
- Alani, iris (top right)
- Waterfall, etc. (top left)
- Wooded, misty
- Hardwood, young cedars
- Acacia, Hibiscus, etc.
- Planting Eucalyptus at fest.
- Many weeds along trail
- Tungata, Lophospermum
- Evergreen slope, etc.
- Generally, general in showers, with scattered
- Astrotia, Hedyotis, Cattleya, Metrosideros
- At night, small
- Clumps of Santalum
- At night, the trail
- Eucalyptus, etc., growing in trees
- Spain, the Nepenthes, but very few
- Few. Deloera gaedei
- Cespitosa, Metrosideros
- Apple, few patches
- Erythrina terminalis
- and Euphorbia in the
- quiet bottoms.
in draws on steep sides, patches of aleurolite, grant show up pale against the general dull green of the area and leveling. Bright green splashes are patches of gleichenia locally, small, tough shrubs of Walistraewenia climbing sharply up to small camp.

Above this is an open savanna of gleichenia and grasses, with abundant scattered leucaena, some metrosideros, horse.

Upper small road is through open woodland of trees, some leucaena and leucaena - much panniculus and fagon.

Before hairpin turn - cut with weathered yellow boulders.

View of Apanola Gorge with small metrosideros wood on steep slope.

Grant green and mango trees etc. in bottom, horse on slopes, daylily in crevice off road.

From an ridge between long grassy slope.

And patches of gleichenia opposite my stream.

Hectic play - neat flat road and reservoir - flat with planted grevillea, cinchona, hecina, dillaba, etc.

Altogether reservoir is some green, many weeds. But also Grevil, Walistraewenia, Glycyphila, leucaena grand, Pterocarya, styphelia, considerable metrosideros, scattered cirrhus, grevillea, Pandanus cattleyam, some orchid slopes. Osmantus, olearia.

Two manuhu of halau and market of small plans. On bet.

Two bridges t/l Halau's徹
chan

In Apana - two patches maleai of old road.
Mauna Pauahi Trail
Pineapple fields - then fields with pandanus and scattered acacia, i.e., many planted Albizia, etc.
They glide with some scattered trees.
A large stand of planted Melaleuca.
Then dense forest with consider Eucalyptus of varied species, i.e., Allocasuarina, Melaleuca, scattered as a locally.
March story here. Cistus incisus common along road, also Helichrysum australis.
Melaleuca, common along
roadside, with
comptentiana, patches
of Pandanus transovarianus.
On steep slopes, Eucalyptus
and
Cistus incisus, Cistus, Endymion
floribundus, helix, seedling.
An example of this
continuing plant at end of trail
starts, through a
place of Acacia, then Gleichenia, linearis on
steep bank on left.
White Rubus, weasafolium, at head of trail, also Athrostemma
Grandes.
Then a small fresh
landslide zone. Excellent
examples of variation
in elevation. Cross a small
ridge on right, at crossing
a clump of Gahnia beds.
Several small Pua. Then
a Magenta. On left, among
a small Metrosideros
fern. Further on left a
small Pua. Approach
a Banksia (large
slimy stems).
Then on left, a
Gouvillea terminata, approx.
for circaeae, blue leaves.
Then excellent Banksia
and Antidesma, and on
right, ferns and Gahnia.
Close to left, Potentilla
large trev. crossing my, out
of gullet, st. brown at top.
Psorospermum (Hapnia)
cf. Mannianae (white foil)
A large tree, just beyond
on left, 

Gardenia caming
several m. off trail on Gleichenia
clump. Colony of Gouvillea
terminalis var. cirrhaceae

Once

Then a nice view of
a small clearing, just above us,
left, a small clump
of Pua. Climbing stems, and
a clump of Banksia. Just beyond on the
left, Pua. Further on left, some
large citrus trees, and a
clump of Pua. Cattlewags,
and Gouvillea.

Further on left, many
inhabitants in orchard
of Gleichenia. To
left, steep slope below
with Gleichenia with Gouldia
Gouvillea. Peleza, Peleza at
Pepetaha. Peleza station on
left. Then down a large
stream, small
Nephelechium hirundinale.

And then, along trail,
then down a clump
of Psychotria
gardener's. Psychotria
Gouvillea. Station on right.

behind it a large
Lycopus, Prickly

Ranunculus

Then down a large
gleichenia

Psorospermum

Then down below mirror of

Orthocarpus radula.
1961 Hawaiian 25.

large tree, below on right an area of overgrown bush.

Just beyond some gladiolus and some Cleome.

Now part of trail in much Cleome with Cleome
etc.

General ground under foot before another

gleichheimia slope -

Pittosporum of

left and rightplaced

in sight. Pittosporum

figurissimum.

Eupatorium campanulatum

Wal barriers on

leaves on shrub.

Under a large moss

hearing tree around

curve a false trail

with Volutaria flabellate

desert most trail

Trees have ephemytic

gleichheimia Elaph and

Well beyond this large
come another whence

Old he and excellent

view of gulch.

Ephedra abundant

Polyodium tamariscinum

several Elaph.
Hawaiian Is.

Wm. on st. He permanences and a live with Hama nui and Polyphyllum tenerum and Psilocybine.
They are a Delicate plant group over head. Grasshoppers term a term on it and fairly common. Well on my trail Palmea became common. Phytodens appears.

Acaie box remaining prominent component even in my common locally than Melicodes. Bernoumina fairly common. Fern generally at this all rather neglected. open and filled with Pleotina. Hymenopterinae on tree.

A great new landslide seen below. Beyond the the forest is in better condition but still not very good. Press been here. Melicodes abundant.


Cubu

At hairpin curve Leptoporum scoparium (1) on ridge. A little way along on it below is a Jatropha caleos. A Chamaeleon small. Calotropis angiosa. C. splendens (1) side by side on right. Coprosma longifolia camping over trail in light cave. Some large Chamaeleon mat.


Hawaiian Dr.

Metopodea, Antlerus
but Leptospermum very abundant.

Lycaena, Athecaria,

Pass over to at side of ridge then on top again. Phyllotegia

rubriflora, Rubus, Aiden.

Then to left side.

Large tree with gray hymen. Phyllum, Pityrodia turn. Elytr

rica, abundant mosses, hepatica, Hym. otus, tana, 3. Rit

straminea, Gorgonon,

Metrosia, Cheiridium
labrada, Madascarina ang.

Dubautia, Rosa, Canea
ladlessa, epacris, spherica, glauca, Ragunia mollis,

Fagus, Foug, eugenia,

Balfouria, bipinnata

Phyllitis quinquaudenta. Citrustium

Christina, Myna,

Persichisia, Antiderus
madascarica, Frenzanda,

Glechidi, linearis
all make up dense 2-3 m

scrub on high slopes.

End. simp. clean up here.

Tetraplanaea on left
A few Trachyaclides along

trail.

Oahu

This now seems fairly
good cloud forest.

More Leptospermum
Trametobolea
Antiderus next to
trail on left.

Cheirodendron wilkinson
Antiderus on trail.

Phyllitis or ventral turn
Phyllotegia caustenoides on

Right turn into a ravine
with cloud scrub

Dubautia, epacris, Frenzanda, Labaria
metrosia, Fouldia,

Cipreses, Brassocarpius
ladeis, Rubus, Eugenia,

Pelea, Myna.

Birrowave shot.

Summit trail on other
side of ravine.

Turn left, 110 m.

Pass over marsh in
flat bottom of draw.

Lamb was dehiened.

Lycaena, Athecaria
in heavy spots on left.

Adeleis hillchandii

Much Madascarica.
Deep at head of grassy draw is locally handled
and converted to grass.

Centella, Crepisites, etc.

On crest Vaccinium dentata

Meriwetheres, B. rhodina

Vinecrista, Gaultheria
Backeranum, Chrowendarum

Elecampane, Pella centrocymba,

Tetraphila, Platydesma,

Labodin.

Low dense scrub

Dyos, pruned edge, Brachia

Oenothera, Rubus, Eriogonum

Bissonii, Metodina, (ragosa), Galtia

Polleninis, Phyllleptagon

grand r, s, Tseniottela

Hyacinthina, mohlos, sempervir

Sedum, Festuca ericoides

Phillebrandi, Pipturus

Empetrum nigrum

Bryum centromesophyllum

Labocides, Gauldra, robyn

Jan thorpeum,

Panicum, Kexton, Plantago,

Lycopodium, R. hirta, lobilis

Habit: on stony edge.
March 9 - Head of Puunalmu Valley, north of head of Puamalu Trail, 800 m. Wooded west coast

1 4e  Vitis avudis

51  rare, in shelter of bushes, terrestrial

2 44  Eugenia anomala Kost. Occasional

2 45  Labordia

3 46  Cyanella

3 47  Cephalocereus longifolius

1 48  rare

1 49  Brossania crispa var. argentea

1 50  Cupreaeum crassiflorum

3 51  Reptilum allida (H. & A.) Gray

3 52  Vaccinium dentatum L.

March 9 - Puamulu Trail near 1000 ft west

1 53  Helipterodictyon occidentale

3 54  Helipterodictyon

3 55  Euphorbia parishii abundant at cut bank
March 10 - Manoa Cliff Trail
(From trailhead to Dr. 2nd)
Row of Cordyline terminalis on left of entrance.
On trail proper, a strangling fig (Ficus aurea) on an
Omania tree overhead.
Some large Acacia koa and Alpinia pseudocornus
on right. Trail grows up with
Sativa palmyroidea.
About 100 m. from entrance
Tetragonia on left, Persea
overhead. 2 introduced Eugenia
alone on left. Agaratum rhizophorum
on trail. Cellia ferruginea, bullis
gracilis, Passiflora adultis.
Bunch of heliotrope on
hoa and hulani overhead.
About 100 m. more an extensive
bambusa grove. Beyond this
a hulani forest on W. Lantana
on trail and Rubus assamica
Banana on right.
At first bend - some small
Cibotium undulatum on left.
Cinnamomea diffusa on small
flat place. Then Quaana on
below. Strawberry guava on left
Cibotium on left. Just inside on
trail. Strawberry guava
becoming abundant 100 m
beyond bend. Gleichia
on left just before second
bend.
Take left fork at this bend.
Three strawberry guava brush,
Stachys naphthas on right.
Begonia sowerbyana var.
Hawaiiensis, hawaiiensis
Massonii. Littoral guava
brush for considerable dirt
with here, Fragminta.
This is modified forest.
Coming out of strawberry
guava one encounters a
patch of Cordyline,
with several large guava
above trail and hulani on
right. Here trail lined
with Supertoma, hale
Quaana brush with Cibotium.
Then at a sharp left turn, first
small lehua, forming
a small below trail and Eryth.
multiflorum, and rhinocer.
Manzanita buds.
Often mixed species wood
of lehua + hulani just beyond
a large bora changing the
road. Indiana platyno on right.
and a thicket of Pseudosperman
of kadua. Around a small
bend, under an Alpinia
several Cyanea macrophylla
mostly below trail. Little
fountain, a blade Erythraea long.
Crozetinae vannabili
begins to appear on front to left.
5 a.m. beyond bend leveol
andichandrais about trail.
Many slender Metrosideros-
their glowing variation
narrow left forms the
just beyond this a long
rock section, then Hibiscus
anneliana below trail
several tree. Beyond this
clump, several branches
Euphorbia polio
deed, Helaginella may
common on rocky sections
Hibiscus var. damodes. Oct.

Phalangiasia
A little way on an open
area stand with frequent
Ficus umbilicata of fetaia hand.
Leaves short below trail
Several Boeselia species below trail.
This area stand continues
for some distance north scattered
Lehua, Leveol, Psychotria
Quava, strawberries, guava, etc
Figs tree below are lehua.
Sharp bend to left - large
varabellus on rock, Bidiens also
Sphenomorph, Bleechna, Podrums
Large helena with curled lea.
below trail. Mixed sect
on steep cliff-like slope.
Trin hedydonium common
in open area, guess not.
Around area's bend is

Oahu

arubug, Hymenostegia leidoh.
in night, then a well-famed
tree of Eugenia sandwicensis.
Chiche, boa forest with
quava, Helaginella, Psychotria
Brush beneath Euphorbia of
the slope, Euphorbia common.
Occasional white fetaia common.
Below.

Then on bend to left
strawberry guava scrub
with boa trees, Bidiens & Co.
Leucaena above
Beyond this lowering eleva-
ning, in opeining of fetaia
View of hauhuain forest below.
Along s curve to at left
often big foot with large tree
much Helaginella, helena,
nooagelohua, helena from
ground cover.
After a couple of hundred m.
To right, the trail bends
sharply left. Just before
this a lehua tree leans
over trail with a clump
of epiphytic birds, helena
and hauhuain.
From here mostly
bigna, then with helena.
Some guava and patch
of hauhuain below. For 100 m.
This bamboo gave above trail.
Then on speed of lehua, with
leaves and Psychotria.
Then after again, with below trail, some
Sparaxis (crispy, yellow, small).

A little away on a
and, melastoma, some
in left, Athriurn prolifera.

Then large guava trees,
Erythrina, Reuben guava.

Antidesma tree with
Darwinia caerulea, a small

branch, above trail. Soon
走近, Gloriosa superba,
below trail. Then curve to left
with patch of Melaleuca

hanging over trail, then
quartz sand.

Through this, a curve from
which up a manoa can be
viewed, and knowledge of the
is depth, marianiana formed
on right. A bit beyond this a
small Gouldia turns on course.
At edge of cliff, then
Darwinia, some in center, the
on cliff. Then cliff with
Erythrina, mixed scrub above
with Rhodanthe plantaginea.
In a small clump of wood
in Heliotrope, Panettiera, hick,
Pipturus albidus. Then some
Erythrina on cliff, Euphorbia
germinet in trail.

Next, small clumps of

Kibius a clump,
with Pteris obtusa.

Then guava thicket
with some native plants.

Gouldia, Heliotrope, acuminate
Panettiera, Heliotrope. In fine
small opening, charpentier
above trail a beaver.
Beyond next small
opening, Osma thunandi
tree on left, mixed with
Catharanthus which look
almost same size.

Then turn to left, then
mixed shrub, heliotrope, heliotrope
with much guava. Across
a curve, some Cyanea
angustifolia above trail.

A bit farther, at a small
bridge, in a guava thicket
some small Heliotrope.

Then from here, with
South, Panettiera, Gouldia,
Erythrina, Psychotria, Persoe,
Beneath
Open slope with Erythrina
Schefflera, other bushes, much
Euphorbia. At other end
a little Euphorbia adempoumu.
Then guava thicket, some
native plants, much Erythrina.

Considerable walks than
this, then several small.
Banana plants and
Toucan birds on left. Fern
covered rocks, above with
Adiantum. Delightful.

Larger trees, Umbrella
hanging on trail.

Write name with
Toucan birds. Bananas,
Calyx, Catt., Colocasia,
and Cystandra, e. cat. etc.

Prof. A. Hawaii cultivation.

Quava fruit. Thin
fleshy opening with
papery, alba and Clermontia
habitu. This at least
several more
Clermontia at a.

Much Clermontia in the
longji ridge. Much Hibiscus
Large flowers on small
ridge try to left.

From here on more lehua
than lehua.

Open slope with views of
Makua & Mills. Scehine flowers
Adiantum, Clermontia,
Planted grass in valley.
Brushy cliffs. Alaka'i
Hibiscus with both Clermontia
Patch of wood with
Hibiscus, Antidna.

Lehua, Cattleya, Citharexylum,
around small curves, down
(Elephants). Dead leaf on it
well sheathy. Nephrolepis
exalta. At next small
curve, Psychotria aberrans
Bush, to it. Range mountain
Graava, Hibiscus, pond.

Atlantina crotonifolium patch
on left.

Quava, lehua, pond
Down slope may be lehua and
lehua. Shallow, wet.
Ferns, animala, Clermontia,
Perrottetia, Jounda, Citharexylum
abundant, Antidna, P
Psychotria (travaja).

Main trail (Pt. to Anau)
down slope through lehua-grad
Take left path, then immediately,
another fork - left goes up Tantalus
straight ahead around Tantalus.
Take this. Through foot
with grass, Laminara
ath. ademophyta, some lehua
Changes very soon to almost
pure grass. With ground
cover of Camellias. diffusa
Occasional patches of grass.

And Eng. Switchback.

Clethemera rosea (rarely)
Nephrolepis of cardifolia ovata.
1 1/2 mi. bet. entrance
much fidel. in upper round top ds.
& great display of exotics.
round top dt fullwreath
by Lawsonia semprev.
black sand quava
on it, in way nap, this
called black cotton
tuff or black sand

abundent
Boulders on left near
Ficus aurea, saxigridis, Adiantum
Patch of Coccidiad (brown
& flavor).- The light's panacea
Regain piano trail.
Polygordium thomsonii, Ixera
Siebea on long top. Also trail. etc.
Adiantum in swampy area on left.
dotton change - cam to flatland.
Kalanchoe, abundant in black soil.
Kaihau fern in the area.
with lichen, Plectranthus, Pogon
Psydidium, 1ntidema, Boundy
Frequenters, etc. on one straight
stretch of trail. then more
quava fruit. Pears, etc. planted
in it. Large hibiscus &
various planted trees. Then
thickets of coffee.
stretch of quava fruit. Then
hibiscus, planted with kola
falcata or, then hibiscus, in rows.
quava, in wedge, etc. Here linden
hibiscus in quava fruit below it.
Some areas have Phoenix canad.
Ficus stromboxia, planted, scattered
here.
Eugenia jambo
Visitors and at 1stHello, Bob
@media.Honolulu Hotel
Many citrus trees planted along
last half. incl. Rever, Catharanthus, Pome
granate, etc. Hibiscus, etc. made.