

Suggestions on the botanical portion of the
Pacific Ocean Biological Survey Program

General Considerations

To achieve the goals of the Pacific Ocean Biological Survey Program (as indicated on page 2 of the program description dated November 15, 1963), it is necessary to obtain information on all the terrestrial biota of the islands visited. Studies of terrestrial vegetation could, as well as being ends in themselves, contribute significantly to the understanding of the ecosystems involved, and provide much information of specific use to ornithologists.

The broad nature of the program, the number of islands to be studied, and the time available for the project preclude the undertaking of intensive, detailed studies of individual species or of successional stages of vegetation development. Rather, it is intended that the botanical studies be of a broad, extensive nature. The expected results will be primarily descriptive, but will provide much of the information needed now, and will form a valuable background for more specialized future research.

The primary objectives of the botanical portion of the program should be:

A. Field Work

1. Collection of all terrestrial plant species on each island.
2. Collection of data on distribution of plant species and vegetative associations on each island.
3. Collection of materials to provide general ecological data (soil samples, ground water samples, etc.).

B. Work to be performed at a central locality, such as Honolulu:

1. Compilation of available bibliographic data.
 - a. Published reports.
 - b. Unpublished reports (by military, etc.).
 - c. Meteorological data.
 - d. Vertical aerial photographs (both earlier and recent photographs would be desirable).
2. Correlation of bibliographic data with field collections, leading to:
 - a. Preparation of a flora (i.e., a list of the plant species) of each island.
 - b. Preparation of descriptions of the vegetation (i.e., the groupings of plant species) of each island.
 - c. Preparation of a vegetation map of each island.

If time is available in the field, it would be desirable to make additional observations and collections. While these would not be of primary importance to this project, they would provide additional useful information and would provide a means of utilizing extra field time profitably. These additional activities should include:

1. Making collections of soil samples using aseptic techniques, from which samples the soil microorganisms could be studied.
2. Making collections of marine and fresh water algae.
3. Establishing ^{permanent} ~~permanent~~ photographic stations which could be revisited in the future to ascertain vegetational changes with time.

Method of Operation

It would seem desirable that one person direct the botanical aspects of the program, in order to ensure uniform methods of data collection and interpretation and uniform presentation of results. This person should, preferably, be located in Honolulu, for reasons of accessibility to the study area and for training purposes (see below). It would be incumbent upon this person to ensure that the primary objectives of this study are those which are most closely related to the goals of the P.O.B.S.P. He should have sufficient control over field data collection to ensure that the data determined to be most important are obtained first, and that standard methods of collection are used on all islands.

It appears feasible that the direction of the botanical portion of the program could be undertaken on a consulting basis. The consultant should be willing to direct the work of employees of the P.O.B.S.P., provide training in botanical field methods for these employees, direct the compilation of results, and prepare the appropriate reports.

The consultant directing the botanical project should prepare as soon as possible:

1. A list of the types of information required, and the methods for gathering this information.
2. A list of the plant species expected to occur in the study area, and a key to these species which can be used in the field.
3. A training program of one or two days' duration for preparing field workers for making botanical studies.

4. A model Keysort card which can be used for storage of botanical information.
5. A model Keysort card which can be used for storage of information on the physical and climatic features of islands.

Numbers 1 and 2 should probably be combined in a brief field manual for the use of program employees.

It is recognized that publication of results would take place only after clearance on the part of the Principal Investigator and the Granting Agency, and that such publication will be in a place and in a form approved by the Principal Investigator.

Preliminary Key to the Vascular Plants of the
Pacific Ocean Biological Survey Program Area

Keys and Descriptions of Vascular Plants divided into 5 categories: 1a-1f.

Herbaceous plants with parallel leaf venation, leaves basal with no leafy stem apparent.....1a.

Herbaceous and woody plants with other than parallel venation, leaves basal or more commonly borne along a stem.....1b.

Vines - commonly with leaves borne along a stem or leafless...1c.

Herbaceous plants with other than parallel venation, leaves basal or more commonly borne along a stem, very small flowers (florets) compressed into a tight head or cluster.....1d.

Plant palmlike or pinelike.....1e.

Ferns (or leafless plants with three angled stems).....1f.

1a A. Plants with basal rosette of leaves, flowers on spike-like inflorescence, petals 4.....Plantaginaceae
Plantago (1).

AA. Plants with basal clusters of leaves, florets on spike-like inflorescence, a grass like appearance.....B.

B. Plants with round, hollow stems.....Gramineae (2-16)

BB. Plants with a solid, three sided stem.....Cyperaceae (17-21) 12

1b A. Leaves alternate in arrangement along the stem.....B.

B. Plants herbaceous shrubs or low growing herbs.....C.

C. Leaves compound.....Leguminosae 4
Canavalia (22) 21

CC. Leaves simple, entire or lobed.....D.

D. Leaves succulent.....Portulacaceae 31
Portulaca oleraceae (23)
stamens 7-12 L.

DD. Leaves normal, ♂.....6

Leaves normal, not obviously succulent.....E

E. Flowers bisexual.....F.

F1. Flowers with five petals, yellow.....Tiliaceae 36
Triumfetta (24)

F2. Flowers with five petals, yellow, red, pink or white.....Solanaceae 33
Nicotiana (25-26)
Solanum (27-28)

F3. Flowers with a five lobed tubular corolla, white
x-stipulate leaves.....Nama (29) Hydrophyllaceae 18
xx-estipulate leaves.....Boraginaceae
Heliotropium

- F4. Flowers with no petals, green calyx
 estipulate.....Chenopodiaceae 8.
Atriplex (30)
- F5. Flowers with 4 petals, estipulate.....Chenopodium (31-32)
 simpleCruciferae
- EE. Flowers unisexual.....Amaranthaceae
- G. Stamens 5.....Amaranthus
- GG. Stamens 1 or 3.....Euphorbiaceae 13
 z--stamen 1.....Euphorbia (33-38)
 zz--stamen 3.....Phyllonthus
- BB. Plants woody shrubs or trees.....G.

G. Petiole or leaf stalk with basal appendages (stipules).....H.

H. Leaf entire.....I.

I. Flowers bisexual.....J.

J. Filaments of stamen joined laterally to form a tube about the
 pistil.....Malvaceae ()
Hibiscus (39)
Abutilon (40)
Sida (41-42)
Malvastrum (43)

JJ. Filaments of stamen free, leaves downy white on underside..Urticaceae 37
Pipturus (44)

JJJ. Filaments free, leaves evergreen

- K. Plants exude a milky sap
 large tree.....Moraceae 24
Arctocarpus (45)
Ficus (46)
- KK. Plants with colorless sap.....
 small tree or shrub.....Polygonaceae
Coccoloba (47) 29
- II. Flowers unisexual, leaves not velvety.....Euphorbiaceae 13.
 (48)
Acalypha (49)
Ricinus (50)
- HH. Leaf compound, leaves velvety.....Surionaceae 35 Suriona
Leguminosaea 21
Acacia (51)
Leucaena (52)
Cassia (53)
Sesbania (54)
Prosopis (55)
- GG. Petiole estipulate.....L.

- L. Flowers lacking petals.....M.
- M. Ovary inferior (below the calyx)
flowers white, unisexual
evergreen tree with entire margined leaves.....Combretaceae (9)
Terminalia (56)
- MM. Ovary superior (above the calyx)
bisexual flowers
shrub with velvety leaves.....Sterculiaceae (34)
Waltheria (57)
- LL. Plants with corolla present
- N. Shrubs, flowers zygomorphic (corolla divisible into two halves in one
plane only).....0.
- O. Petals 4, white.....Capparidaceae 5
leaves 2 x 1" Capparis (58)

O. Petals 5
 leaves 3 to 5" x
 1 to 2".....Goodeniaceae 14
Scaevola (59-60)

NN. Trees evergreen.....P.

Q. leaves smooth

PP. Flowers orange
 leaves not spirally arranged
 fruit hard, green to yellow.....Boraginaceae
Cordia (61)

PP. Flowers white
 leaves spirally arranged
 fruit a black oily nut.....Hernandiaceae
 flowers unisexual.....Hernandia (62)

- QQ. leaves very hairy, to 20 ft.....Boraginaceae (4)
Resserschmidia argentea
(L.f.) Johnston
- AA. Leaves opposite or whorled in arrangement along the stem.....B
- B. Plants herbaceous shrubs or low growing herbs.....C
- C. Leaves compound.....Zygophyllaceae (39)
Tribulus (63)
- C. Leaves simple.....D.
- D. Leaves succulent

- E. Stamens 5, flowers pink and single in the leaf
axils.....Aizoaceae 1
- EE. Stamens about 35, flowers grouped.....Sesuvium (64)
yellow.....Portulacaceae 31
Portulaca lutea (65)
- DD. Leaves thin or uncommonly succulent
- F. Stems four sided, leaves aromatic when crushed..Labiatae
Phyllostegia (66)
Stachys (67)
- FF. Stems four sided, non aromatic.....Primulaceae
Anagalis (68)
- FFF. Stems round

G. Plants branching at base spreading along the ground,
 vinelike, leaves sometimes succulent, fleshy...
 x flowers monoecious.....Euphorbiaceae
 E. prostrata

GG. Plants upright, stipules present
 T-leaves non-linear

H. Flowers congested on inflorescence, many bracts
Amaranthaceae 2
 (Achryanthes (70)
 opposite leaves
 (Amaranthus (71-73)
 alternate leaves)

HH. Inflorescence a spike.....Verbenaceae 38
Stachytarpheta (74-76)

TT- leaves linear.....Caryophyllaceae

DDD. Leaves fleshy in two rows along stem, stipulate
.....Spergularia
Urticaceae 37
Pilea (77)

BB. Plants woody shrubs or small trees.....I.

I. Plants shrubs.....J.

J. Leaves broad and thin.....K.

K. Stipulate, short petioled evergreen leaves
8" or more in length.....Rubiaceae
Morinda (78) 32

KK. Estipulate, leaves deciduous 2" long,
prickly bush.....Verbenaceae 38
Lanaa camara 79

JJ. Leaves narrow and thick.....Lythraceae 22
Pemphis (80)

II. Plants trees.....K.

K. Stipules present.....Rubiaceae
Morinda (78)

KK. Estipulate.....L.

M. Leave in pairs, opposite

L. Leaf shiny, leathery; bark rough and gray....
3 to 8" long.....Guttiferae
Calophyllum (81) 16

LL. Leaf 4 to 11" long, fruits sticky exudate
.....Nyctaginaceae
Pisonia (82)

MM. Leaves in pairs, threes or fours
Leaf to 6" long, oval, short pointed,
leatheryApocepraceae 3
Ochlosia

lc A. Plant a vine trailing along the ground or over other plants, rooted
in the ground.....B.

B. Leavd:

B. Leaves alternate, simple and entire, sap milky.....Convolvulaceae 11
Ipomoea
Jacquemontia

AA. Plant a pale green to yellow vine trailing over other plants and
not rooted in the ground.....Lauraceae 20
Cassytha

ld. Compositae - 10.

le. A. Trunks nonwoody, small tree-like herb.....Musaceae 25

B. Fruits on hanging stem; eaten raw

C. Trunks to 7' high; fruit yellow 4-5".....M. nana Lam.

CC. Trunks more than 7' high, fruit yellow or red; 6-12"
.....M. paradisiaca L.
ssp. sapientum (L) O. Ktze.

AA. Trunks woody, erect tree or shrub

D. Leaves, minute in whorls of 4-16.....Casuarinaceae 7

DD. Leaves large.....Casuarina equisetifolia L.
Casuarina glauca Sieb.

E. Leaves spiral, sessile; prop roots conspicuous; fruit
a round head of many fruits.....Pandanaceae 28
Pandanus tectorius Park.

EE. Leaves palmately divided, leaflets sharp-pointed
.....Palmae 27

F. Leaves fan-shaped, palmately veined or divided;
perfect flowers.....Pritchardia

FF. Leaves long, feather shaped, pinnately divided

If. Ferns or leafless plants with three angled stems

A. Plants bearing scalelike "leaves" or appendages but appearing
leafless from a short distance.....Psilotaceae
Psilotum nudum (L) Griseb.

AA. Plants bearing fronds.....Polypodiaceae

B. Fruiting bodies borne in clusters (sori) arranged in dots,
lines, or larger areas on the lower surface of the frond;
plant growing on the ground or some on supports; fertile
and sterile fronds similar

C. Tip of frond coiled at maturity.....Nephrolepis

CC. Tip of frond not coiled at maturity

D. Sori round or broad oblong
 Fronds jointed to rootstock.....Polypodium

DD. Sori narrow, straight or curved

E. Sori parallel to the midrib, continuous; frond
 once or twice pinnate

Plants without trunk; fronds 8-18"...Blechnum

EE. Sori more or less oblique to midrib; fronds entire;
 each sorus with one cover which opens from the
 upper side.....Asplenium

G. Trees bearing dry or pulpy fruit; shell of fruit
 with three pores.....Cocos nucifera L.

GG. Trees bearing fruits with an outer pulp.....Phoenix

Glossary

Awn - a bristlelike appendage.

Bisexual - having both sexes present and functional in the one flower.

Bract - a much reduced leaf, particularly the small or scalelike leaves in a flower cluster.

Calyx - the outer whorl of the perianth composed of the sepals.

Compound - two or more similar parts in one organ, i.e., a leaf composed of several leaflets.

Corolla - inner whorl of the perianth composed of the petals.

Deciduous - falling at the end of one season of growth or life, as the leaves of nonevergreen trees. Some trees and shrubs are deciduous throughout the year.

Dioecious - with staminate and pistillate flowers on different plants.

Entire - leaf with a continuous margin; not in any way indented; whole.

Estipulate - without stipules.

Evergreen - plants which are green throughout the year.

Filament - the stalk of the stamen which is terminated by the anther.

Floret - individual and very small flowers of the Compositae and Gramineae.

Fronn - leaves of ferns (or palms).

Glume - one of two sterile bracts at the base of most grass spikelets.

Inflorescence - a flower cluster or flowering branch.

Lemma - the lower of the two bracts immediately enclosing the flower.

Lobed - an organ part, i.e., petal, sepal or leaf parts that represent a division of the organ.

Locule - a compartment.

Mealy -

Monoecious - with staminate and pistillate flowers on the same plant.

- Ovary inferior - the ovule bearing part of the flower found below the calyx leaves.
- Ovary superior - the ovule bearing part of the flower found above the calyx leaves.
- Palea - in the grass spikelet, the upper of the two enclosing bracts, the lower one being the lemma.
- Perianth - a collective term for the calyx and corolla.
- Phyllotaxy - the arrangement of leaves on an axis, expressed by a fraction, the numerator representing the number of revolutions of a spiral made in passing from one leaf past each successive leaf to reach the leaf directly above the initial leaf, and the denominator representing the number of leaves passed in the spiral thus made.
- Rachilla - axis bearing florets (gramineae).
- Rays (ray floret) - the straplike extension of the corolla of florets (compositae).
- Spikelet - one part of a compound inflorescence the floral unit of fam. gramineae composed of flowers and subtending bracts.
- Stipulate - with stipules.
- Stipule - an appendage at the base of the petiole (leaf stalk).
- Unisexual - having one sex present and functional in the one flower.
- Sorus - the heap or cluster of fruiting bodies found on the dorsal side of fern frond.
- Zygomorphic - corollas when divisible into equal halves in one plane only.

1. Aizoaceae Sesuvium portulacastrum L. - a succulent coastal herb which resembles Portulaca oleracea L. but some leaves are narrower, up to 1.5" long and the flower is 5-parted, pink and single at leaf axils.
2. Amaranthaceae
 - A. Leaves alternate; anthers two locular, filaments separate and distinct.....Amaranthus
 - AA. Leaves opposite; anthers with one locule, filaments united at base into a cup..Achyranthes
3. Apocynaceae Orchrosia oppositifolia (Lam.) K. Sch.
Fruit oval and fleshy; flowers cream colored, fragrant, red paired.
4. Boraginaceae

Trees or shrubs

Twigs, leaves and inflorescence hairy; leaves 4-9" long; flowers white.....Messerschmidia argentea
(L.f.) Johnston

Twigs, leaves and inflorescence not hairy, flowers orange
.....Cordia subcordata Lam.

Herbs

Corolla stamens not protruding; green fruits undivided tubularHeliotropium

Branches and leaves silvery with hairs; prostrate; leaves 1" long; flowers white with yellow centers
.....Heliotropium anomalum L.
var. argenteum Gray

Branches and leaves smooth; leaves 1-2" long; flowers white.....Heliotropium curassivicum L.

5. Capparidaceae

Capparis sandwichiana DC. a spineless shrub, 2 to 3' high; oblong leaves with rounded ends; fruit a green berry.

6. Caryophyllaceae Spergularia marina (L.) Griseb. - leaves opposite, linear; petals five; seeds brown, flowers white or pink.

7. Casuarinaceae Casuarina equisetifolia L. - Leaves reduced to scales forming a collar at joints of branchlets; male flowers at tip of branchlets, female flowers at base of branchlets; fruit a cone.
8. Chenopodiaceae -Flowers perfect, calyx 5, leaves entire or lobed
Chenopodium
 leaves mealy.....C. sandwichicum Moq.
 deltoid

 leaves mealy
 lanceolate.....C. album L.

 Flowers unisexual (monoecious or dioecious)
Atriplex semibaccatus R. Br.
9. Combretaceae Terminalia catappa L. A small to large tree with branches which are horizontal and arranged in tiers bearing large rosettes of thick, shiny, blunt, short-stemmed leaves. 6-12" long; fruit 1-2" long, green to yellow; wood redish.
10. Compositae (1d)
 A. Herbs.....B.

 B. Flower heads with each floret rayed having a strap shaped extension of the corolla); leaves alternate; stem leafy, basal leaves, long stemmed, with a few deep lobes
Sonchus oleraceus L.

 BB. Flower heads with outermost florets having rays, inner flowets tubular.....C.

 C. Leaves alternate, at least upper ones...D

 D. Flower bracts overlapping, leaves white wooly or hairy, narrow triangular, flowers yellow or orange.....Verbesina

 DD. Flower bracts in one or two equal rows flowers white.....Erigeron

 CC. Leaves opposite; plants prostrate; flower heads solitary at branch tip, florets yellow; thick leaves.....Lipochaeta integrifolia
 (Nutt.) Gray

 CCC. Plants erect; ray florets yellow...Syndrella nodiflora (L)
 Gaert.

BBB. Florets with all tubular florets

E. bracts subtending the head in several rows;
flowers white or yellowish...Gnaphalium

EE. bracts in one row, flowers red or purple..
.....Emilia

AA. Shrub, flower heads with outermost florets having rays,
inner florets tubular, leaves opposite, oblong, flowers
pink or purplish.....Pluchea

Glabrous; leaves less than 5 cm long, coarsely dentate;
heads pink.....Pluchea indica (L) Less.

hairy, leaves over 10 cm long; oblong; heads whitish..
.....Pluchea odorata (L) Cass.

11. Convolvulaceae

A. Flowers funnel-shaped stigmas 2

B. Stigma lobes flat and oval.....Jacquemontia

BB. Stigma lobes not flat but thick....Convolvulus

AA. Flowers funnel-shaped, stigma 1.....Ipomoea

Jacquemontia sandwichensis Gray - perennial herb,
prostrate over ground, radiating from thick root,
flowers pale blue to white.

Convolvulus arvensis L. - perennial with long tap
root, leaves small,; flowers white to pink.

Ipomoea

Twining perennial herb; leaves nonsucculent, hairy;
corolla violet fading to pink....I. indica (Burm.) Merr.

Non-twining perennial herb; leaves succulent, smooth;
corolla purplish red.....I. pes-caprae (L.) Sweet.

12. Cyperaceae13. Euphorbiaceae

A. Shrubs and small trees...

B. Leaves 8" or more in diameter with 7 or more
lobes toothed edges...Ricinus communis L.

AA. Herbs and Shrubs....BB

BB. Leaves opposite (plant prostrate)..Euphorbia
Small herb--Euphorbia prostrata Ait.

a small herb with nearly smooth leaves
less than 0.3" long

Gramineae cont

Tribe II Festuceae

Spikelets all alike in the same inflorescence.

A. Lemmas three nerved, nerves prominent, often hairy

Inflorescence an exerted open or spike-like panicle
Lemmas not pubescent on the nerves, awnless, glumes
shorter than the lemmas. Lateral nerves of the lemmas not
marginal, internerves glabrous

Lemmas membranaceous; spikelets compressed; lemmas
acute or acuminate; spikelets 3 to many flowered

Eragrostis

AA. Lemmas 5 to many nerved, the nerves sometimes obscure

Spikelets with no empty lemmas below the fertile
florets, nerves usually prominent. Lemmas membranaceous
glumes present, lemmas longer than broad, beaked
on the back, awnless; spikelets small

Poa

Tribe VII Chloridae

Plants with perfect flowers

A. Spikelets with more than 1 perfect floret

Inflorescence exerted

Spikes more than 1 but few, rachis not prolonged

Eleusine

AA. Spikelet with only 1 perfect floret, often with additional
imperfect florets above or below.

B. Spikelets without additional modified florets,
the rachilla sometimes prolonged

Rachilla articulate above the glumes, spikes two to
many, digitate, rachilla prolonged

Cynodon

BB. Spikelets with 1 or more modified ~~bracts~~
florets above the perfect one.

Spikelets with no sterile florets below
the perfect one; second glume without a
spike.

Spikes digitate or nearly so

Fertile lemma 1 awned or awnless

Chloris

Gramineae con't

Tribe II Festuceae

Spikelets all alike in the same inflorescence.

A. Lemmas three nerved, nerves prominent, often hairy

Inflorescence an exerted open or spike-like panicle
lemmas not pubescent on the nerves, awnless, glumes shorter than the lemmas; lateral nerves of the lemmas not marginal, internerves glabrous

lemmas membranaceous; spikelets compressed; lemmas acute or acuminate; spikelets 3 to many flowered

Eragrostis

AA. Lemmas 5 to many nerved, the nerves sometimes obscure

Spikelets with no empty lemmas below the fertile florets, nerves usually prominent. Lemmas membranaceous
glumes present, lemmas longer than broad, beaked on the back, awnless; spikelets small

Poa

Tribe VII Chloridae

Plants with perfect flowers

A. Spikelets with more than 1 perfect floret

Inflorescence exerted

Spikes more than 1 but few, rachis not prolonged

Eleusine

AA. Spikelet with only 1 perfect floret, often with additional imperfect florets above or below.

B. Spikelets without additional modified florets, the rachilla sometimes prolonged

Rachilla articulate above the glumes, spikes two to many, digitate, rachilla prolonged

Cynodon

BB. Spikelets with 1 or more modified ~~bracts~~ florets above the perfect one.

Spikelets with no sterile florets below the perfect one; second glume without a spike.

Spikes digitate or nearly so

Fertile lemma 1 awned or awnless

Chloris

Tribe XII Spikelets all of one kind

A. Spikelets sunken in the cavities of the flattened
woody rachis

Stenotaphrum

AA. Spikelets not sunken in the rachis

B. Spikelets subtended or surrounded by 1 to many
distinct or more or less connate bristles

C. Bristles persistent, the spikelet deciduous

Setaria

CC. Bristles falling with the spikelet at maturity
Bristles united into a burlike involucre, the
bristles retroarsely barbed

Cenchrus

BB. Spikelets not subtended by bristles

D. glumes or sterile lemma awned, inflores-
cence panicle; spikelets silky

Rhynchelytrum

DD. glumes and sterile lemma awnless

E. Fruit flexible, usually dark colored,
lemma with white hyaline margins

Spikelets in slender racemes more or less
digitate at the summit of the culms

Digitaria

EE. Fruit rigid

Spikelets placed with the back
of the fruit turned toward the rachis
of the spike-like racemes

Fruit not long acuminate; at least
one glume present

F. First glume wanting; spikelet
plano-convex

Paspalum

FF. First glume present, spikelets
in panicles, culms herbaceous

Panicum

16. Guttiferae

Calophyllum inophyllum L.

A low branching tree to 60 ft., rough gray bark; lvs. 3-8 in. long, leathery, nearly oval; flrs. white, 1 in. across in clusters of 4-15; 4 sepals; 4-8 stamens. Fruit round and green.

17. Hernandiaceae

Hernandia ovizera L.

A tall evergreen tree becoming buttressed at the base; lvs. spirally arranged and the long petiole of each joins the blade well within the leaf margin; unisexual flrs., 2 male flrs. accompany each female flr; fruit a black, oily nut.

18. Hydrophyllaceae

A mat forming herb with a dia. of about 8 in.; lvs. alt., stemless and hairy about 0.33 in. long; flr. tubular, 5-lobed pinkish, 5 stamens.
Name sandwichensis Gray

19. Labiatae

A. Creeping plant, hairy; flrs. small, red to purple; lvs. 0.5 to 1 in. Stachys arvensis L.
AA. Plant upright at tip of stems; flrs. white with purplish tint, 1 in. long Phyllostegia varabilis Bitter

20. Lauraceae

Cassytha filiformis L.

A parasitic vine with slender green, brown, yellow stems and branches. Lvs. are a few minute scales. Flrs. 6 parted with nine stamens; fruit fleshy, round about 0.25 in in dia..

21. Leguminosae

Flowers radially symmetrical, commonly small and massed in heads or spikes; trees and shrubs
Subfam. Mimosoideae I.

Flowers bilaterally symmetrical, commonly medium to large-sized.

Flowers with petals spreading, nearly equal; trees and shrubs Subfam. Cesalpinoideae II.

Flowers resembling the sweetpea: one large upper petal, two parallel side petals, two lower petals joined, shrubs and trees but mostly herbs
Subfam. Papilionatae III.

- I. A. Lvs. twice divided; pods opening by two valves when ripe, straight or curved
 - B. Large thornless trees
 - C. Flrs. in small round heads or cylindrical spikes with short stems Acacia
 - BB. Shrubs or small trees
 - D. Flr. heads globular or cylindrical
 - E. Stamens 10 in ea. flr. Leucaena
L. glauca (L.) Benth.

Acacia farnesiana (L.) Willd.

DD. Flr. heads globular or nearly so

F. Flrs. inconspicuous; stamen 2x long as petals (white) Desmanthus virgatus (L.) Willd.

AA. Lvs. twice divided, pods not opening when ripe

B. Trees and shrubs; pods less than one ft. in length, thick...

C. Flrs. in cylindrical spikes, young branched thorny

Prosopis

P. chilensis (Mol.) Steud

Stuntz

II. Unarmed shrubs or small trees; lvs. once divided, leaflets 6 plus; flrs. conspicuous with 5 yellow, white or pink petals.... Cassia

Leaflets 8-10, 1.5-3.5 in. long ... C. occidentalis L.

Leaflets 16-32, flr. orange yellow ... C. glauca Lam.

III: Herb, lvs. compound

Pods develop above the ground

A. Pods with several joints, flat, leaflets 3 (1-5) ... Desmodium

D. uncinatum (Jacq.) DC.

D. triflorum (L.) DC.

AA Pods not breaking into joints

B. Lvs. entire, herbaceous shrubs, pods swollen ... Crotalaria

C. incana L.

C. mucronata Desv.

BB. Lvs. compound

C. Leaflets two or more, pinnate Sesbania

Pods less than 2 ft. long; shrub S. tomentosa H. & A.

CC. Leaflets 3

End leaflet stalked

Leaflets toothed; pods not opening, very small, herb

Pod straight, kidney shaped to spiral

Medicago

Medicago lupulina L.

Leaflets not toothed, pods opening

Petals unequal

Prickly shrubs; flrs. red; small tree

Erythrina indica Lamarck

Petals nearly equal

Pods broad flattened; leaflets broad; calyx

with two upper lobes joined or two parted,

the two lower lobes very small; herb

Cnavaia

Cnavaia microcarpa (DC.) Piper

23. Malvaceae

Shrubs

A. Flrs. large

B. Flrs. red opened and bell-shaped Hibiscus
H. rosa-sinensis L.

AA. Flrs. large small

C. Fruit with five to many lobes; flrs. commonly yellow or orange

D. Each fruiting lobe with three or more seeds

Abutilon
A. indicum Sweet
A. butilon molle Sweet

A. molle Sweet - capsules ten-parted, to 6 ft., black

DD. Each fruit lobe with one seed

E. Leaves ~~not~~ felt covered, stems not red
Sida

Lvs. oblong or heart shaped, carpels 7-12
S. fallax Walp.

Lvs. ovate to rhombic, carpels 8-10
S. rhombifolia L.

Lvs. heart shaped, carpels 8-9 with spines
S. cordifolia L.

EE. Leaves hairy; stems red Malvastrum

Malvastrum coromandelianum (L.) Garke

Trees

A. Erect

B. Lvs. less than 5 in. long; flrs. yellow to purple; entire, heart shaped

..... Thespesia
T. populnea (L.) Sol.

AA. Not commonly erect

BB. Lvs. rounded; flr. yellow to red .. Hibiscus
H. tiliaceus L.

24. Moraceae

A. Trees; lvs. less than 8.5 in. long, entire

B. Fruit borne at leaf axils, usually paired

C. Lvs. broad-ovate to oval, 4-8 in. long; fruit 0.5-0.75 in in dia.; young lvs. downy, aerial roots numerous; fruit red

Ficus benghalensis L.

Lvs. 4 to 8 in. by 2 to 5 in.

C. Lvs. small to medium, oval or ovate

about 8 pr.; leaf stems 0.25 - 0.5 in. long; fruit yellow to red or pink to purple

Ficus retusa L.

Lvs. 2-4 in. long

AA. Tree. Lvs. longer than 5.5 in., lobed or cut

Arctocarpus incisus (Thunb.) L.f.

Tree 30-60 ft.; lvs. 12-36 in. long, lobed or cut; monoecious, large fruit.

25. Musaceae

Treelike, nonwoody herb, flrs. somewhat irregular, stamens 5, calyx and corolla look alike.

A. Fruits on hanging stem, eaten raw

B. Trunk to 7ft. high; fruit yellow 4-5 in.

Musa nana Lour.

B. Trunk more than 7ft. high, fruit yellow or red 6-12 in.

Musa paradisiaca L.

ssp. sapientum (L.) O. Ktze.

26. Nyctaginaceae

A. Tree

B.

AA. Herb

Pisonia grandis R.Br.

BB. Smooth perennials, branching from base, spreading one to four feet or more, lvs. 0.5 to 1.5 in. long, opposite narrow, pink tubular flrs.

1. Boerhaavia diffusa L.

lvs. nearly round

2. Boerhaavia diffusa L. var. tetrandra (Forst.) Heimerl

27. Palmae

Trees, lvs. palmately divided, stiff, evergreen, leaflets sharp pointed, midrib present, fruit one-seeded.

A. Lvs. fan shaped, palmately veined or divided, perfect flower Pritchardia remota

AA. Lvs. long, feather-shaped, pinnately divided B

B. Trees bearing dry or pulpy fruit, shell of fruit with three pores Cocos nucifera L.

28. Pandanaceae Lvs. long narrow pointed, arranged spirally at the branch tips; dioecious; fruit a somewhat woody, globose head

Pandanus tectorius Park.

29. Polygonaceae A twisted tree to 20 ft.; bark thin, smooth and brown; lvs. broad, glossy and thick with a dia. to 8 in. Fruits in clusters hanging from branch tips

Coccoloba uvifera (L.)

A large herb or small shrub, woody at the base; lvs. alt., and entire

30.

Rumex giganteus Ait.

Portulacaceae

Lvs. succulent, stamens 7-12

Portulaca oleracea L.

Lvs. succulent, stamens about 35

Portulaca lutea Sol.

P. oleracea - tap root slender

P. lutea - tap root often fleshy and swollen

31. Primulaceae Anagalis arvensis L. - Creeping or erect, annual, stems quadrangular, lvs. in pairs or threes; flrs. with five broad petals, red with purple center. Has a sharp, bitter taste - poisonous to G-S ll's.

32. Rubiaceae Morinda citrifolia L. - A small evergreen tree or shrub, lvs. large, thick, shiny, 8 in. or more long

33. Solanaceae

Herbs

Corolla tubular; stamens five - - - - -

A. Flrs. in clusters; yellow or red to pink

Tube rose colored; 0.75 in long

1. Nicotiana tabacum L.

Tube yellow, 1.5 in long

2. Nicotiana glauca Grah.

AA. Flrs. white or bluish, corolla tube short
Anther with sterile tip; fruit yellow or red Lycopersicon esculentum L.

Anther without sterile tip; fruit a

S. nigrum L.

S. nelsoni Duval.

34. Sterculiaceae

Waltheria americana L. A shrub with blunt, ovate, toothed and velvety lvs., 1-3.5 in. long. Flrs. small yellow, densely clustered at axils.

35. Surianaceae

Suriana maritima L. - A shrub with clustered, narrow-spatula-shaped, velvety lvs. 0.5 to 2 in. long, small narrow flowers .

36. Tiliaceae

Triumfetta procumbens - a shrubby, hairy annual herb with toothed lvs.; flrs. small, yellow, five-parted.

37. Urticaceae

Shrubs; lvs. ovate, alternate

Lvs. about 4 in. long, broad ovate, smooth or nearly so above, downy white below

Pipturus velutinus Wedd.

Herbs with more or less succulent lvs.; lvs. in two rows; lvs. opposite, about 0.25 in long, pairs unequal in size Pilea microphylla (L.) Liebm.

Fleurya ruderalis (Forst.) Gaud.

38. Verbenaceae

Herbs; flrs. with 5 toothed calyx and five lobed corolla.

Flrs. with two fertile, two sterile stamens

..... Stachytarpheta

S. indica (L.) Vahl.

Blue flrs.; slender flr spikes, less than 0.12 in.

S. cayennensis (L. Rich.) Vahl. in dia.

Blue flrs.; broad flr. spikes, more than 0.12 in.

S. jamaicensis (L.) Vahl. in dia.

Shrubs

Lvs. compound, 3-7 leaflets

Vitex

Leaflets 3

Vitex trifolia L.

Leaflets 7

Vitex negundo Lam.

4/2 Plantaginaceae

1. Plantago

A. lvs. 1-10 in. long, 5-9 veins, smooth and broad

Plantago major L.

AA. lvs. 1-18 in. long, 3-5 veins, hairy and narrow

Plantago lanceolata L.

15 Gramineae

Subfamily I. Festucoideae

Ia. Spikelets (flowers) perfect, spikelets pedicellate and one flowered Tribe V Agrostideae

Ammophila
Sporobolus
Polypogon

Ib. Spikelets perfect, pedicellate, spikelets two to many flowered, glumes shorter than first floret... Tribe II Festuceae

Eragrostis
Poa

Ic. Spikelets one to several flowered, sessile on opposite sides of a jointed or continuous axis forming symmetrical spikes..... Tribe III Hordeae

Lepturus

Subfamily II. Panicoideae

Id. Spikelets perfect, spikelets on one side of rachis; spike usually more than one Tribe VII Chloridae

Chloris
Cynodon
Eleusine

Ie. Glumes membranaceous, the sterile lemma like the glumes in texture, fertile lemma and palea indurate or at least firmer than the glumes Tribe XII Paniceae

Cenchrus
Digitaria
Panicum
Paspalum
Rhynchelytrum
Setaria
Stenotaphrum

3. Cyperaceae

A. Flowers all uniform, spikelets uniform B.

B. Scales of the spikelet strictly 2-ranked, conduplicate and

bristles, achene without a tubercle or enlarged style base

..... Cyperus

BB. Scales of spikelet spirally arranged, achene not crowned by the persistent bulbous base of the style, no inner scales subtending the flowers, style dilated at the base, no perianth ..

..... Fimbristylis

BBB. as above but style terete, not dilated at base, perianth of 1-8 bristles or none ;;;.....

Scirpus

Lantana camara L.

39. Zygophyllaceae

Tribulus cistoides L.

Lvs. in pairs, each with about 6 leaflets,
flrs. yellow, five petals, 10 stamens; seed
in fruit with two very stiff spines.

40. ~~Planta spinescens~~

41. Cruciferae

A. Pods short and pouchlike

Cauline lvs. clasping the stem

Stamens 2

Lepidium

Cauline lvs. not clasping the stem

Lobularia

AA. Pods elongate

Flrs. yellow Brassica

Lvs. lobed

Flrs. white Coronopus

Lvs. once or twice pinnately
divided.

42. Psilophytaceae

Psilotum nudum (L.) Griseb.

43. Polypodiaceae

Blechnum brownii Juss.

Asplenium nidus L.

Polypodium scolopendrium Bernhart f.

Nephrolepis exaltata Schott.

Nephrolepis hirsutula Forst.

Preliminary Key to the Vascular Plants of the
Pacific Ocean Biological Survey Program Area

Keys and Descriptions of Vascular Plants divided into 5 categories: la-lf.

Herbaceous plants with parallel leaf venation, leaves basal with no leafy stem apparent.....la.

Herbaceous and woody plants with other than parallel venation, leaves basal or more commonly borne along a stem.....lb.

Vines - commonly with leaves borne along a stem or leafless...lc.

Herbaceous plants with other than parallel venation, leaves basal or more commonly borne along a stem, very small flowers (florets) compressed into a tight head or cluster.....ld.

Plant palmlike or pinelike.....le.

Ferns (or leafless plants with three angled stems).....lf.

la A. Plants with basal rosette of leaves, flowers on spike-like inflorescence, petals 4.....Plantaginaceae
Plantago (1).

AA. Plants with basal clusters of leaves, florets on spike-like inflorescence, a grass like appearance.....B.

B. Plants with round, hollow stems.....Gramineae (2-16)

BB. Plants with a solid, three sided stem.....Cyperaceae (17-21) 12

1b A. Leaves alternate in arrangement along the stem.....B.

B. Plants herbaceous shrubs or low growing herbs.....C.

C. Leaves compound.....Leguminosae 4
Cassipouia (22) 21

CC. Leaves simple, entire or lobed.....D.

D. Leaves succulent.....Portulacaceae 31
Portulaca oleraceae (23)
L.
stamens 7-12

DD. Leaves normal, c'.....6

Leaves normal, not obviously succulent.....E

E. Flowers bisexual.....F.

F1. Flowers with five petals, yellow.....Tiliaceae 36
Triumfetta (24)

F2. Flowers with five petals, yellow, red, pink or white.....Solanaceae 33
Nicotiana (25-26)
Solanum (27-28)

F3. Flowers with a five lobed tubular corolla, white
x-stipulate leaves.....Nema (29) Hydrophyllaceae 18
xx-estipulate leaves.....Boraginaceae
Heliotropium

F4. Flowers with no petals, green calyx
estipulate.....Chenopodiaceae 8.
Atriplex (30)

F5. Flowers with 4 petals, estipulate.....Chenopodium (31-32)
simpleCruciferae

EE. Flowers unisexual.....Amaranthaceae

G. Stamens 5.....Amaranthus

GG. Stamens 1 or 3.....Euphorbiaceae 13
2--stamen 1.....Euphorbia (33-38)
22--stamen 3.....Phyllanthus

BB. Plants woody shrubs or trees.....G.

G. Petiole or leaf stalk with basal appendages (stipules).....H.

H. Leaf entire.....I.

I. Flowers bisexual.....J.

J. Filaments of stamen joined laterally to form a tube about the
 pistil.....Malvaceae
Hibiscus (39)
Abutilon (40)
Sida (41-42)
Malvastrum (43)

JJ. Filaments of stamen free, leaves downy white on underside..Urticaceae 37
Pipturus (44)

JJJ. Filaments free, leaves evergreen

- K. Plants exude a milky sap
 large tree.....Moraceae 24
Arctocarpus (45)
Ficus (46)
- KK. Plants with colorless sap.....
 small tree or shrub.....Polygonaceae
Coccoloba (47) 29
- II. Flowers unisexual, leaves not velvety.....Euphorbiaceae 13.
 (48)
Acalypha (49)
Ricinus (50)
- III. Leaf compound, leaves velvety.....Surionaceae 35 Suriona
Leguminosaea 21
Acacia (51)
Leucaena (52)
Cassia (53)
Sesbania (54)
Prosopis (55)
- GG. Petiole estipulate.....I.

L. Flowers lacking petals.....M.

M. Ovary inferior (below the calyx)
flowers white, unisexual.
evergreen tree with entire margined leaves.....Combretaceae (9)
Terminalia (56)

MM. Ovary superior (above the calyx)
bisexual flowers
shrub with velvety leaves.....Sterculiaceae (34)
Waltheria (57)

LL. Plants with corolla present

N. Shrubs, flowers zygomorphic (corolla divisible into two halves in one
plane only).....O.

O. Petals 4, white.....Capparidaceae 5
leaves 2 x 1" Capparis(58)

O. Petals 5
 leaves 3 to 5" x
 1 to 2".....Goodeniaceae 14
Scavola (59-60)

MM. Trees evergreen.....P.

Q. Leaves smooth

PP. Flowers orange
 leaves not spirally arranged
 fruit hard, green to yellow.....Boraginaceae
Cordia (61)

PP. Flowers white
 leaves spirally arranged
 fruit a black oily nut.....Hernandiaceae
 flowers unisexual.....Hernandia (62)

GG. leaves very hairy, to 20 ft.....Boraginaceae (4)
Resserschmidia argentea
 (L.f.) Johnston

AA. Leaves opposite or whorled in arrangement along the stem.....B

B. Plants herbaceous shrubs or low growing herbs.....C

C. Leaves compound.....Zygophyllaceae (39)
Tribulus (63)

C. Leaves simple.....D.

D. Leaves succulent

E. Stamens 5, flowers pink and single in the leaf
axils.....Aizoaceae 1

EE. Stamens about 35, flowers grouped.....Sesuvium (64)
yellow.....Portulacaceae 31
Portulaca lutea (65)

DD. Leaves thin or uncommonly succulent

F. Stems four sided, leaves aromatic when crushed..Labiatae
Phyllostegia (66)
Stachys (67)

FF. Stems four sided, non aromatic.....Primulaceae
Anagalis (68)

FFF. Stems round

G. Plants branching at base spreading along the ground,
 vinelike, leaves sometimes succulent, fleshy...
 x flowers monoecious.....Euphorbiaceae
 E. prostrata

GG. Plants upright, stipules present
 T-leaves non-linear

H. Flowers congested on inflorescence, many bracts
Amaranthaceae 2
 (Achryanthes (70)
 opposite leaves
 (Amaranthus (71-73)
 alternate leaves)

HH. Inflorescence a spike.....Verbenaceae 38
Stachytarpheta (74-76)

TT- leaves linear.....Caryophyllaceae

DDD. Leaves fleshy in two rows along stem, stipulate

.....Spergularia
Urticaceae 37
Pilea (77)

EE. Plants woody shrubs or small trees.....I.

I. Plants shrubs.....J.

J. Leaves broad and thin.....K.

K. Stipulate, short petioled evergreen leaves
8" or more in length.....Eubiaceae

Morinda (78) 32

KK. Estipulate, leaves deciduous 2" long,
prickly bush.....Verbenaceae 38

Lanaa canara 79

JJ. Leaves narrow and thick.....Lythraceae 22
Pearcea (80)

II. Plants trees.....K.

K. Stipules present.....Rubiaceae
Morinda (78)

KK. Estipulate.....L.

M. Leave in pairs, opposite

L. Leaf shiny, leathery; bark rough and gray....
3 to 8" long.....Guttiferae
Calophyllum (81) 16

LL. Leaf 4 to 11" long, fruits sticky exudate
.....Nyctaginaceae
Pisonia (82)

MM. Leaves in pairs, threes or fours
Leaf to 6" long, oval, short pointed,
leatheryApocynaceae 3
Ochrosia

lc A. Plant a vine trailing along the ground or over other plants, rooted
in the ground.....B.

L. Leaves

B. Leaves alternate, simple and entire, sap milky.....Convolvulaceae 11
Ipomoea
Jacquemontia

AA. Plant a pale green to yellow vine trailing over other plants and
not rooted in the ground.....Lauraceae 20
Caesalpinchia

ld. Compositae - 10.

le. A. Trunks nonwoody, small tree-like herb.....Musaceae 25

B. Fruits on hanging stem; eaten raw

C. Trunks to 7' high; fruit yellow 4-5".....M. nana Lam.

CC. Trunks more than 7' high, fruit yellow or red; 6-12"
.....M. paradisiaca L.
ssp. sapientum (L) O. Ktze.

AA. Trunks woody, erect tree or shrub

D. Leaves, minute in whorls of 4-16.....Casuarinaceae 7

DD. Leaves large.....Casuarina equisetifolia L.
Casuarina glauca Sieb.

E. Leaves spiral, sessile; prop roots conspicuous; fruit
 a round head of many fruits.....Pandanaceae 28
Pandanus tectorius Park.

EE. Leaves palmately divided, leaflets sharp-pointed
Palmae 27

F. Leaves fan-shaped, palmately veined or divided;
 perfect flowers.....Pritchardia

FF. Leaves long, feather shaped, pinnately divided

lf. Ferns or leafless plants with three angled stems

A. Plants bearing scalelike "leaves" or appendages but appearing leafless from a short distance.....Psilotaceae
Psilotum nudum (L) Griseb.

AA. Plants bearing fronds.....Polypodiaceae

B. Fruiting bodies borne in clusters (sori) arranged in dots, lines, or larger areas on the lower surface of the frond; plant growing on the ground or some on supports; fertile and sterile fronds similar

C. Tip of frond coiled at maturity.....Nephrolepis

CC. Tip of frond not coiled at maturity

D. Sori round or broad oblong
Fronds jointed to rootstock.....Polypodium

DD. Sori narrow, straight or curved

E. Sori parallel to the midrib, continuous; frond
once or twice pinnate

Plants without trunk; fronds 8-18"...Blechnum

EE. Sori more or less oblique to midrib; fronds entire;
each sorus with one cover which opens from the
upper side.....Asplenium

G. Trees bearing dry or pulpy fruit; shell of fruit
with three pores.....Cocos nucifera L.

Alphabetized list of plant families:

Acanthaceae	Gordeniaceae	Rhizopharaceae
Aizoaceae	Guttiferae	Rubiaceae
Amaranthaceae	Hernandiaceae	Santalaceae
Amaryllidaceae	Hydrophyllaceae	Sapuidaceae
Apocynaceae	Labiatae	Simarubaceae
Baiaginaceae	Lauraceae	Solonaceae
Capparidaceae	Leguminosae	Surianaceae
Caricaceae	Liliaceae	Taccaceae
Caricaceae	Lythraceae	Tiliaceae
Caryophyllaceae	Malvaceae	Urticaceae
Casuarinaceae	Moraceae	Verbenaceae
Chenoprdiaceae	Musaceae	Zygophyllaceae
Combretaceae	Nyctagenaceae	
Commelinaceae	Olacaeae	
Compositae	Oxalidaceae	
Convovulaceae	Palmaceae	
Cruciferae	Pandonaceae	
Cucurbitaceae	Polygonaceae	
Cyperaceae	Partulacaceae	
Euphorbiaceae		

Species List:
Pacific Ocean Biological Survey Program Area

* present in key

Acanthaceae

Asystasia coromandeliana Nees graptophyllum pictum (L.) griff.
Pseuderanthemum corruthersii (Seem) gull.

*Aizoaceae

*Sesuvium portulacastrum L.
Sesuvium portulacastrum L.
var. griseum L.
Tetragonia tetragonioides

*Amaranthaceae

*Achranthes splendens
var. reflexa Hbd.

*Amaranthus brownii
Amaranthus dubius
Amaranthus hybridus L.
Amaranthus viridis L.

*Apocynaceae

Nerium oleander L.
*Ochrosia oppositifolia (Lam.) K. Sch.
Plumeria obtusa L.
Thevetia peruviana (Pers.) K. Schum.

Boraginaceae

Cordia sebestena L.
*Cordia subcordata Lam.
*Heliotropium anomalum H. and A.
*Heliotropium curassavicum L.
*Messerschmidia argentea (L.f.) Johnston

*Capparidaceae

*Capparis sandwichiana DC.

*Caryophyllaceae

Schiedea verticillata
*Spargularia marina (L.) Griseb.

~~*Casuarinaceae~~

- *Casuarina equisetifolia L.
- Casuarina glauca Sieb.

~~*Chenopodiaceae~~

- *Atriplex semibaccatus R. Br.
- Atriplex muelleri Benth.
- *Chenopodium album L.
- Chenopodium oahuense
- *Chenopodium sandwicheum Moq.

~~Combretaceae~~

- *Terminalia catappa L.
- Terminalia samoensis

~~Commelinaceae~~

- Commelina diffusa Burm. f.
- Zebrina pendula Schnize.

*Compositae

- Ageratum
- Bidens pilosa L.
- Emilia javanica (Burm.) Rob.
- *Emilia sonchifolia (L.) DC
- *Erigeron albidus (Willd.) A. Gray
- Erigeron bonariensis L.
- (Conyza bonariensis (L.) Cronq.)
- Erechtites valerianifolia DC
- Gnaphalium purpureum L.
- Gnaphalium sandwichensium Gaud.
- Gnaphalium sandwichensium Gaud.
- forma. canum Sherff
- Helianthus annuus L.
- *Lipochaeta integrifolia (Nutt.) A. Gray
- *Pluchea indica (L.) hess.
- Pluchea odorata (L.) Cass.
- Pluchea indica x odorata
- *Sonchus oleraceus L.
- *Synedrella nodiflora (L.) Gaert.
- *Verbesina encelioides A. Gray
- Vernonia cinerae (L.) hess.
- Xanthium saccharatum Walk.

Families left out by
hong

hiliaceae

Musaceae

Simarubaceae

Passifloraceae

Schrophulariaceae

~~*Convolvulaceae~~

- **Convolvulus arvensis* L.
- Calonyction
- Ipomoea campanulata* L.
- Ipomoea gibberibma*
- **Ipomoea indica* (Burm. f.) Merr.
- **Ipomoea pes-caprae* (L.) SW.
- Ipomoea pes-caprae* (L.) SW.
- subsp. *brasiliensis* (L.) V. Oost.
- **Jacquemontia sandwichensis* A. Gray

~~Cruciferae~~

- Brassica nigra* (L.) Koch
- Coronopus didymus* (L.) J.E. Smith
- Lobularia maritima* (L.) Desv.
- Lepidium o-waihiense* C. and S.
- Lepidium virginicum* L.

~~Cyperaceae~~

- **Cyperus alternifolius* L.
- Cyperus javanicus* Houtt.
- Cyperus pennatifolius*
- var. *bryanii*
- Cyperus pennatus* Lamarck
- Cyperus rotundus* L.
- Cyperus polystachyus* Rot.
- **Fimbristylis cymosa* R. Br.
- (*F. atollensis* St. John)
- Fimbristylis diphylla*
- Fimbristylis pycnocephala* Hillebr.
- **Scirpus riparius* Presl.

~~*Euphorbiaceae~~

- Acalypha wilkesiana*
- Codiaeum*
- Euphorbia atoto* Forst. f.
- Euphorbia celastroides*
- Euphorbia cyathophora* Murr.
- Euphorbia geniculata* Ort.
- Euphorbia glomifera* (Willd.) Wheeler
- Euphorbia heterophylla* L.
- Euphorbia heterophylla* L.
- var. *cyathophora* (Murr.) Griseb.
- Euphorbia hirta* L.
- Euphorbia peplus* L.

- *Euphorbia prostrata Ait
- Euphorbia pulcherrima Willd.
- Phyllanthus debilis Klein
- *Phyllanthus niruri L.
- *Ricinus communis L.

*Goodeniaceae

- Scaevola frutescens (nill.) Krause
- *Scaevola frutescens (nill.) Krause
- var. sericea (Forst. f.) Mierr.
- Scaevola taccada

*Gramineae

- *Ammophila arenaria (L.) Link
- *Cenchrus agrimonioides
- var. laysanensis R. Br.
- Cenchrus echinatus L.
- Cenchrus echinatus L.
- var. hillebrondianus (Hitch.) HB.
- Cenchrus hillebrondianus (Hitch.)
- *Chloris inflata link.
- *Cynodon dactylon (L.) pers.
- *Digitaria ciliaris (Retz.) Koel.
- Digitaria pacifica
- Digitaria sanguinalis (L.) Scop.
- Digitaria stenotaphrodes
- Digitaria timorensis
- *Eleusine indica (L.) Gaert.
- *Eragrostis amabilis (L.) W. and A.
- Eragrostis falcata
- Eragrostis pectinacea (Michx.) Nees.
- Eragrostis variabilis (Gaud.) Steud.
- Eragrostis Whitneyi
- Eragrostis Whyneyi
- var. caunii Fosc.
- *Lepturus pilgerianus
- Lepturus repens (Forst.) R. Br.
- Lepturus repens (Forst.) R. Br.
- var. repens
- Lepturus repens (Forst.) R. Br.
- var. subulatus Fosc.
- *Panicum stenotaphroides Nees.
- Panicum miliaceum Walt.
- Panicum purpurascens Raddi

- *Paspalum orbiculare Forst.
- Paspalum fimbriatum HBK.
- *Poa annua L.
- *Polypogon monspeliensis (L.) Desf.
- *Rhynchelytrum roseum (Nees) S. and H.
- *Setaria verticillata (L.) Beauv.
- *Sporobolus capensis (Willd.) Kunth
- Sporobolus virginicus (L.) Kunth
- Sporobolus poiretii (R and S.) Hitch.
- *Stenotaphrum secundatum (L.) O. Ktze.

~~*Guttiferae~~

- *Calophyllum inophyllum L.

~~*Hernandiaceae~~

- *Hernandia ovigera L.

~~*Hydrophyllaceae~~

- *Nama sandwichense A. Gray

~~*Labiatae~~

- *Phyllostegia variabilis Bitter.
- *Stachys arvensis L.

~~*Lauraceae~~

- Cassytha filiformis L.

~~*Leguminosae~~

- *Acacia farnesiana (L.) Willd.
- Albizia lebeck (L.) Benth.
- *Cassia glauca Lam.
- *Cassia occidentalis L.
- Canavalia microcarpa (DC) Pipei
- *Crotalaria incana L.
- Crotalaria mucronata Desv.
- Desmanthus virgatus (L.) Willd.
- *Desmodium uncinatum (Jacq.) DC
- *Desmodium triflorum (L.) DC
- Erythrina indica Lamarck
- Leucaena glauca (L.) Benth.
- *Leucaena leucocephala
- Medicago lupulina L.
- *Prosopis chilensis (Mol.) Stz.

~~Amaryllidaceae~~

Agave
Crinum asiaticum L.

~~*Lythraceae~~

*Pemphis acidula Forst.

~~*Malvaceae~~

*Abutilon indicum Sweet
*Abutilon molle Sweet
*Hibiscus tiliaceus L.
*Hibiscus rosa-sinensis L.
*Malvastrum coromandelianum (L.) Garcke
*Sida cordifolia L.
Sida carpinifolia
*Sida fallax Walp.
*Sida rhombifolia L.
*Thespesia populnea (L.) Sol.

~~*Moraceae~~

*Arctocarpus incisa L.
*Ficus benghalensis L.
*Ficus retusa L.
*Musa paradisiaca
ssp. sapientum

~~*Nyctaginaceae~~

*Boerhaavia diffusa L.
*Boerhaavia diffusa L.
var. tetrandra (Forst.) Heimerl.
Boerhaavia hirsuta L.
Boerhaavia tetrandra
Bougainvillea sp.
*Pisonia grandis R. Br.

~~Oxalidaceae~~

Oxalis corniculata L.

~~Palmae~~

*Cocos nucifera L.
*Phoenix sp.
*Pritchardia remota

~~*Pandana~~ceae

Pandanus tectorius Park.

Plantaginaceae

*Plantago major L.

*Plantago lonceolata L.

~~*Polygon~~aceae

*Caccoloba uvifera (L.) Jacq.

Rumex giganteus Ait.

~~*Portulac~~aceae

Portulaca caunii

*Portulaca lutea Sol. —

*Portulaca oleracea L. —

*Primulaceae

*Anagalis arvensis L.

Rhizophoraceae

Rhizophora mangle

*Rubiaceae

Borreria laevis (Lam.) Griseb.

Guettarda speciosa L.

Kadua ramanoffiensis C. and S.

*Morinda citrifolia L.

~~Santal~~aceae

Santalum cuneatum

var. laysanicum

~~*Solan~~aceae

*Lycopersicon esculentum L.

*Nicotiana glauca Grah.

*Nicotiana tabacum L.

Solanum laysanense Bitter

*Solanum nigrum L.

Solanum nigrum L.

var. nihoense

**Solanum nelsoni* Duval.
Solanum nelsoni Duval
var. *acuminatum*
var. *caumii*
var. *intermedium*

*~~Sterculiaceae~~

**Waltheria americana* L.
Waltheria indica L.

*~~Surianaceae~~

**Suriana maritima* L.

~~Taccaceae~~

Tacca pinnatifida Forst.

*~~Tiliaceae~~

**Triumfetta procumbens*

*~~Urticaceae~~

Fleurya ruderalis (Forst.) Gaud.
**Pilea microphylla* (L.) Liebm.
**Pipturus velutinus* Wedd.

*~~Vebrenaceae~~

**Lanata camara* L.
**Stachytarpheta cayennensis* (L. Rich.) Vahl
**Stachytarpheta jamaicensis* (L.) Vahl
Stachytarpheta indica (L.) Vahl
**Vitex trifolia* L.
var. *bicolor* (Willd.) Moed.
**Vitex negundo*
var. *bicolor* (Willd.) H. Lam.
Vitex trifolia L.

*~~Zygophyllaceae~~

**Tribulus cistoides* L.

~~Araucariaceae~~

Araucaria excelsa (Lamb.) R. Br.

~~Asclepiadaceae~~

Calotropis gigantea

~~Caricaceae~~

Carica papaya L.

~~Crossulaceae~~

Bryophyllum pinnatum (Lam.) Kurz.

~~Anacardiaceae~~

Mangifera indica L.

Schinus terebinthifolius Raddi

~~Onagraceae~~

Jussiaea nodiflora (L.) Gaertn.

~~*Psilophytaceae~~

*Psilotum nudum (L.) Griseb.

Psilotum triquetrum Sw.

~~Tamaricaceae~~

Tamarix aphylla Karst.

~~Myrtaceae~~

Psidium guajava L.

~~Rutaceae~~

Murraya

Murraya paniculata (L.) Jack.

~~Araceae~~

Crytosperma chamissonia (Schatt) Merr.

Scindapsus aureus (Lind and Andre) Engl.

~~Polypodiaceae~~

*Blechnum brownii Juss.

*Asplenium nidus L.

*Polypodium scolopendrium Beremann f.

*Nephrolepis exaltata Schott.

Nephrolepis hirsutula Forst.

Potamogetonaceae

Potamogeton

Bryophyta

Calymperes tenerum C.M.

Bryum nitens Hook.

Brachymenium melanothecium (C.M.) Jaeg.

July 24, 1969

Dear Jane:

The enclosed summary was compiled from Bob Long's field notes and from the botany files in your office. It was made in anticipation of your Honolulu visit. A copy will be sent to Dick Crossin.

I learned very quickly that the botany material must be used with caution because of inconsistencies galore. A good example of this is Hull Island. In his listing of vascular plants for Hull Bob listed 23 species and annotated them. Then, however, in the general descriptive narrative for Hull he mentions 8 additional species that have occurred at one time or another. This apparently was just carelessness or haste perhaps. A person using only the list of vascular plants and assuming it was complete would leave off one-quarter of the plants collected from the island. This can be corrected if one has both the list and the narrative but what do you do if you only have the list - you're up the creek, then. For Gardner Island I found three additional species mentioned in the literature - none mentioned in either the list or in the narrative. I'd be out of luck if I hadn't been on these islands.

This list shows we lack quite a bit of material particularly field notes and collection notes but also a number of the island histories (if they were in fact written). If you will notice in the column "Field Numbers Used" all those preceded by "ca." are approximations I figured out by checking his annotated lists of vascular plants and recording highest and lowest catalog numbers. We have no complete list of soil samples he took on the various islands. He also took water samples from many, if not all of the lagoons, and these were checked for salinity - we should know what these were (I have seen a few of these on a listing and Bob uses a salinity occasionally in his narratives). He ran plant quadrat studies on islands other than Howland we should have some idea regarding the results of these. It would also be of some value to know the identification of the various algae he collected - and who has these samples now.

At the present time Roger and I have an interest in any material dealing with Sydney, Gardner, Hull, Birnie, Malden and Starbuck Islands. Nevertheless, it wouldn't hurt for us to get copies of everything out there that looks interesting.

We are moving along slowly with the writing. Sydney is about 90% complete at this moment. Histories have been roughed out for Gardner and Malden and the vegetation section and an island description completed for Gardner. I'm now setting up for a description of Malden and then the plants of Malden and Starbuck before writing the history for the later. As I write the history section & plants & physical description Roger knocks out the species accounts. We then switch off and re-write and check for accuracy. Seems to work fairly well. We are constantly getting bogged down with data lapses and spend a good deal of time running down the source of inconsistencies, etc.

I have marked those places where we are missing data. I understand that Lamoureux is responsible for writing up reports on vegetation for the Leewards so wouldn't spend much time on this. If you could devote some time to the Phoenix & Line Islands, espec. those 6 mentioned above it would certainly help.

The astronauts on Apollo 11 just splashed down on the edge of the northern grid which caused a certain amount of commotion around here. We had visions of the thing coming down right in the middle of a feeding flock of Sooty Terns and landing in the water ~~KEYEK~~ in a cloud of bird feathers and then floating around with orange streamers hanging all over it. So much for today's levity.

Hope all is progressing well. Look this thing over and see if you can decipher it if not give me a buzz before heading to Hono. Regards,

Doug