RECORD

B & W photos in this book
60-4 to 60-16

F R Fosberg.

Book #58

82 .011

Collection and Field Note Book

No. 58

(Sept. 10, 1960 - Oct. 15, 1960)

(41205 -- 41373)

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B & W photos in this book
60-4 to 60-16

F. R. Fosberg.

Book # 58

begin with 41205

ends with 41373

41500 - 41599 (p52-156)

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2

1940 California

Sept. 10 - Hayward, Alameda Co.

41205

Jasminum

cultivated in garden

3

bushy shrub 2.5 m. tall,
 long arching branches,
 leaves all alternate (some
 approaching opposite),
 both simple and
 compound; flowers fragrant,
 bright yellow.

Sept. 14 Port Moresby -

Surrounded by dry hills with vegetation varying from savanna to open forest, with gallery forest along streams and ravines. The grass is dry. The trees are mostly small Eucalyptus. Some trees appear deciduous from the air, but few have ever been seen on ground.

Small mangrove swamps at mouths of streams.

Area frequently burned fires set for amusement. This year fewer fires than usual, because of a few rains at favorable times. This is end of dry season.

Many double canoes in bay, homes of Hula people, a brown wavy haired group, fishermen, who come from two or three places where they have small footholds along the coast.

Patropia gassytipolia abundant. *Tridax*

Euphorbia cyathophora

Tribulus cistoides

Isaria forsteriana

Trichopoda ~~sp.~~ rosea

Ornamentals around Port Moresby:

Pedilanthus ~~typ.~~ tithymaloides

Polyscias scutellaria

Acalypha wilkesiana

Petunia

Delonix regia

Acalypha hispida

Cassia fistula

Mangifera indica

Plumeria rubra

Calotropis

Cordia

Peltophorum

Cocos nucifera

Ipomoea fistulosa

Carica papaya

Bougainvillea spp.

Plumeria obtusa

Musa sapientum

Ricinus communis

Helianthus annuus

Polyscias tricochleata

P. guilfoylei

Terminalia catappa

Casuarina equisetifolia

Nerium indicum

Breynia

Tamarindus

-spathaceae

Thereticia peruviana

Antigonon leptopus

Euphorbia pulcherrima

Alekananthes venicolor

Bauhinia

Canva hybrid

The trees in the savanna and open forest are almost entirely *Eucalyptus* sp. and *E. alba*.

Dahlia variabilis

Pelargonium zonale

Pedilanthus tithymaloide (green, ^{glabrous} broad lf. ^{brn.})

Caladium bicolor

Nephrolepis sp.

Air trip Port Moresby to Gorkes (DC-3) (started 12:27)

Large areas of the savanna have been recently burned and a number of fires were seen.

Followed the coast eastward, gradually getting inland.

12:32 - savanna changed to open forest, locally some very bare hills. Closed forest in ravines and becoming more prevalent. Inland some sizable clearings on more level places.

12:35 mosaic of open forest & savanna and closed forest. Then generally savanna closer to coast.

12:36 some ponds and marshy river bottom lands, meandering small rivers. Bottom lands green. Toward coast some bare saline ground and mangrove.

Manihot esculenta (variegated ornamental)

Tagetes

Ocimum basilicum

Hibiscus hybrids.

Polyscias fruticosa

Pithecellobium dulce

Coleus scutellarioides

Laccharum officinarum

Ageratum houstonianum

Pilea microphylla.

Meandering river paralleling course.

12:39 clouds.

12:41 Dense forest with meandering rivers and estuaries. Then clouds.

12:42 Large estuary - clouds.

12:43 Said to be rubber plantations just inland, but covered by clouds.

12:44 more inland from coast, but visibility none.

12:46-48 Savanna near coast, extensive marshes inland, with small wooded hills interspersed. The savanna brown, the marsh yellow-green. Some of trees on wooded hills deciduous.

12:50 clouds, with closed forest showing through holes.

1:13 Coast bends sharply to left of course.

Clouds. Should be approaching Kerema.

1:48 Large hole in clouds - undisturbed montane forests - several landslides near.

1:57 another, similar, some signs of shifting agriculture.

- 1:53 More shifting agriculture.
- 1:54 Some hills completely denuded, trails on ridge tops, village on hill top. Soil an orange brown.
- 1:55 Country predominantly denuded. Scattered wooded ravines and steep slopes. Mostly green scrub or tall grass (a fern), small proportion of actual present cultivation.
- 1:57 More dense undisturbed forest on high rugged mountain crevices.
- 1:59 Shifting agriculture again, on right, scarcely on left. On right vast cleared area.
- 2:00 Shifting agriculture on left, also from here on, predominantly induced grassland with very little wood, except in ravines.
- 2:01 Some very degraded forest on high ridge tops to left. To right the landscape is like southern Guam, but with less forest.
- 2:02 A muddy small river on right. Steep grassy hills on left, like Guam. Prob. *Miscanthus*. Fairly level country ahead and to left. Some
- 2:04 Some rather dry pure villages, crossed river, flowing ahead and left.

Broad rather uneven valley, predominantly grassy. Some villages, considerable agriculture. ca. Goroka - surrounded by grassland - little forest. Flat valley bottom partly cultivated.

5140'

Cult. plants in Goroka

- Iresine herbstii* - flowering and growing to 4 m. tall, shrubby, enlarged nodes.
- Lagerstroemia indica*
- Araucaria cunninghamii*
- Gerbera jamesonii*
- Gaillardia pulchella*
- Pilea microphylla*
- Gladiolus*
- Coleus scutellarioides*
- Canna* sp.
- Tropaeolum majus*
- Monstera deliciosa*
- Alternanthera versicolor*
- Dianthus caryophyllus*
- Plumeria acutifolia*
- Beloperone guttata*
- Kalanchoe pinnata*
- Browallia*
- Begonia* spp.
- Kalanchoe* sp.
- Hosta* sp.?
- Hippeastrum* sp.
- Tabernaemontana coronaria*

Cassia ~~didymobotrya~~
Cosmos tinctoria
Bambusa arundinacea
Musa sapientum
Cordyline terminalis
Saccharum officinarum
Cucurbita sp.
Citrus (rough skinned lemon)
Morus alba
Hibiscus (hybrids)
Euphorbia pulcherrima
Mangifera indica
Rosa sp.
Petunia
Grevillea robusta
Delonix regia
Cassia
Eucalyptus alba + *diglypta*
Lamanea saman
Casuarina ~~oligodonta~~ ^{oligodonta}
 pendulous form.
Lupinus albus
~~*Cajanus cajan*~~
Cratogeomys
Duranta repens?
Quisqualis indica
Gardenia jasminoides
Cynoglossum
 (Melast.)
Cupressus lusitanica?
Datura arborea
Araucaria klinkii
Catharanthus roseus
Ipomoea batatas

Acalypha amentacea
 v. *villosa*
Dahlia variabilis
Salvia splendens
Chrysanthemum morifolium
Musa nana
Thunbergia grandiflora
Lamanea saman
Zephyranthes rosea

Sept. 16 Grassy hills
above Goroka

(photos - end br. n. roll,
first on Kod. roll #1, with
one up valley toward Mt. Otto.
Casuarina forest, alluvial
terraces, etc.)

Grassland very
unhomogeneous. Short
grass - *Pennisetum clandestinum*
with ~~the~~ *Themeda australis*.
Patches and invasion
of *Themeda gigantea*,
some *Pennisetum* ~~brachystachyum~~,
brachystachyum, various
other grasses - *Anthracum*,
Capillipedium ^{parvifolium}, *Lophium nitidum*, *Imperata*.

Apluda
heterophylla

Soils with a dark
brown-black layer underlain
by ^{brown} red clay, total depth
to rock 1 m. on upper slopes,
several times that lower down.

Youngia japonica, *Pteridium*,
Crassosiphalum, *Osmunda*,
Blumea, *Thelypteris goegilodius*,
Fimbristylis dichotoma?
Pouzolzia, *Centella*,
Fimbristylis ferruginea?
Pueraria lobata, *Crotalaria*,
Triumfetta, *Oxalis*, *Bidens*
pilosa, *Conyza*, *Cynoglossum*

Generally a dense
rather fine grass about

1 m. tall, varying to
somewhat shorter,
more usually to ~~base~~ taller,
even twice as tall, with
patches of coarse grass
(*Themeda* ~~and~~ *gigantea*)
to 3 m. or more.

On flat terraces in
Goroka the soil is a
black fine soil like
an ando soil.

Sept. 17 - Mt. Michael
from Goroka -

Slopes densely wooded,
very steep - cliffs of bare
rock part way up.

Top ridge bare, alpine
grassland on the uppermost
slopes above an irregular
but sharp timber line.

The ridge to west of
Goroka is mainly grassy
but the higher parts
of it have a sparse
rather degraded forest. Lower
edges very ragged and
degraded. Forest lower to
with ^{almost} level valley at extreme
with end.

Sept. 17 - trip by air (proha-ming
small Otter cabin plane
(seated in rt. copilot seat).
Weather completely clear
except for localized low
cloud layers or "ground fog".

First stop - north to Mt.
Wilhelm

Patches of young *Casuarina*
abundant in grassy & cultivated
valley floor. These seem
to be planted especially in
the cultivation.

Ravines are irregularly
bushy.

(photos to be taken start of bar roll)

Perhaps 1/3 of area of
valley in present cultivation,
much of rest in fallow
but showing pattern of
cult. patches.

Mts. around head of
valley with steep upper
slopes, ridges & peaks
densely wooded, thin-
ning out into grassy
slopes with scattered
Casuarina patches as
ridges and slopes become
less abrupt. Grass follows
ridges well up into forest.
Trails on all these ridges.

River in head of valley
not at all muddy.

Ravines not conspicuously
more wooded than slopes
in transition zone. These
slopes with a mixture
of small brush and large
grass, not *Miscanthus*.
Upper slope thickly
wooded, but canopy has
a looser appearance than
is usual in other trop. mts.
Occasional bare landslide
scar.

Considerable complex of
ridges here apparently
s.e. of Mt. Wilhelm.
Almost all wooded
but some clearing,
locally on lower slopes
and in larger valley.
On very large valley
s. of Mt. Wilhelm almost
entirely cleared.

Large area of tall tawny
alpine grassland on top
of Mt. Wilhelm. Timber line
sharp but with broken
isolated patches of brush
interspersed locally
with grass. No conspicuous
thinning of scrub upward.

In upper mountain
forest on slopes are
some dead trees. Canopy
generally loose, but otherwise

typical of montane forest. Apparently this elfin wood belt is narrow here.

West of Mt. Walleh. Another very sharp jagged high peak with a small area of grass on top, mixed with patches of ~~shrub~~ scrub.

Crossed south of this into a large valley, all in shifting agriculture with patches of *Casuarina*.

Headed ~~into~~ ^{up} this valley. ~~Upper~~ ^{Lower} part a ~~for~~ broad plain grassy or cultivated, with a fairly large meandering river, rather muddy, but not excessively so.

This river curves and goes out of the broad valley through a narrow part which doubles back.

Rather little cultivation in this broad valley in proportion to grass.

Apparently Ming is at the curve in the river where the broad plain closes into the narrow valley.

Banded heron on a long-diat strip.

Left Ming by road.

Soil of plain deep and black. *Imperata* is dominant grass.

Cultivated patches of banana and sweet potato.

Upper Wabqi Valley is a lake bed, where old valley was dammed by lava flow of Mt. Hagen. River reversed its direction, then, and flows out through Chimbu Gorge.

Phragmites banks in ravine, and wet places.

(bot. coll. B) of native near Ming)

Crotalaria (*clavunifolia*) common
anagyroides *anagyroides*

Ravine with ~~barley~~ ^{barley} where steep, with tangles scrub or scrub forest. ~~where~~ ^{where} less steep, sweet potato.

Patch of *Araucaria cunninghamii* - represents original veg. of valley.

Ornamentals very abundantly planted around cult. patches, along roads, around dwellings.

Cordyline terminalis, a very narrow lfd. var. used for living fences.

Broad alluvial terraces dissected by ravines. Soil dark gray, subsoil reddish.

Sweet potato patches with ditches. Bananas.

Across from ~~Bang~~ Bang. Some large ravines with gallery forest. *Brassia actinophylla* flowering. is a branched small tree, not a strangler, here. (bud. also of natives with poison). *Homalanthus populnea* is much like *Croton heterophyllus* in same situation in Andes.

Dodonaea viscosa very common in fields and fence rows. Small tree. *Trema* and *Alphitonia* common secondary trees. *Alphitonia* bark ~~is~~ used for sapoin and aromatic properties.

Kugip.

Crossed valley.

Bamboo with dense clumps of culms. with relatively thick walls, internodes about 25 cm. long. green.

flowering at uppermost internodes of culms. long whip-like tips pendent.

Coffee plantations on flat terraces, not a scarcely shaded.

Soil sandy, top horizons black, changing to yellow-brown downward, becoming gravelly. (b.w. photo also on of Wahge R. bridge and Phragmites flat.)

Grass near Bang largely *Schaefferia* sp.

Bamboo. *Euphorbia*.

Crotalaria used for temporary coffee shade.

Dona - hills on side of valley. 2 photos across valley, showing truncated spurs of terrace on other side and grassy plains. *Grevillea papuana*.

Long-sing village of Warum tribe. temporary Village with long houses thatched with *Miscanthus*? not divided into rooms, but with many doors in both sides. Side walls of wattling of split wood uprights, horizontal bamboo members, and upright *Pandanus* leaves.

Tobacco and taro cult. bananas, sugar cane.

shaded lightly by
Casuarina, Sterculia?
and a number of other
trees - Terna, bamboos,

Bamboo flute called "mengas"
one internode with one septum
hole near septum. part
on other side with 2 points
left.

Nondugl

bamboo - dense clumps,
the foliage making a
very compact sub-spherical
mass.

Coffee plantation - shaded
with Leucaena. breeding
birds of - paradise & crowned
pigeons.

Many cultivated things,
some brought in from forest.

Nondugl to Kerowagi
hilly country, mixture
of thicket, grass, cultivation.
Toward Chimbu there
are Casuarina groves
mixed with grass and
cultivation. The gardens
are deeply ditched, the
patches 2-3 m. across,

Sit. Kerowagi
Mainly sweet potatoes
and bananas.
Pennisetum clandestinum,
introduced, forming
mats on road embankments.

Sept 18 (Chimbu) Kundiawa
2 bod. 3 b+w. of denuded hills
in different directions.

Sept. 18 - Wara Chimbu
below Kundiawa (Chimbu)
photos of steep deforested
grassy gorge wall. (b+w)
Euphorbia sp. coll.

Between Kundiawa and
Paulo Pass there is a
great abundance of
Casuarina oligodon
in sparse patches and
scattered trees in cult.
ground and grassland.
planted by natives,
allowed to reach perhaps
20 cm. diam.

Sept. 17 - vicinity of Kujip,
above Bang, Wahge Valley

41206

~~Bambusa~~ *Nastus elatus* Holttum.

2
dup to K

several clumps along
road, common and general
in thickly settled cultivated
and grassy valley

Sept. 17 near Bang, Wahge Valley
cultivated hill with
thickets

07

~~Bambusa~~ *Nastus elatus* Holttum
common

08

Gevillea papuana
common in thickets

Sept. 17 bet. Dona and Nondugl
temporary village on "sing sing" ground.

09

Arancaria
one tree seen

10

Ficus dammaropsis
occasional

Sept. 17 - Nondugl, Wahge Valley
planted around aviary
in coffee plantation

11

Bambusa
uncommon in area, planted

12

Cupressus lawsoniana
planted

3-10 m. tall,

dense clumps, culms
slightly spreading, arching
at top, green, internodes
about 25 cm. long, thick walled,
flowering in top few
internodes of culms.
(several clumps represented
in collection).

~~culm~~ culm sheaths
and top of a young shoot
(similar to 41204).
small tree 4 m. tall,
fruit immature.

small sterile tree, about
3 m. tall.
small sparsely
branched tree.

dense clump, whole
presenting a subglobose
appearance, about 6-7 m. tall
sterile shrubs 2 m. tall,
aromatic.

- 41213 *Libocedrus*
 2 planted, brought in from forest.
- 2 14 *Ficus adenosperma*
 planted, brought in from forest
- 2 15 *Ficus sterocarpa*
 planted brought in from forest
- 2 16 *Bambusa*
 planted

Sept. 17 vicinity of Kerowagi,
 Wahgi Valley

- 2 17 *Ficus adenosperma*
 common along ravine sides
- 2 18 *Smilax prenanthoides?*
 on clay road cut

Sept. 18 Wara Chimbu, just
 below Kundiaawa (Chimbu).

- 4 19 *Euphorbia*
 planted along roadsides
 throughout region

Sept 18 - Wornai, between Kundiaawa
 and Chuawale, Wahgi Valley
 in brushy ravine cut in limestone

- 1 20 *Polypodium*
 rare on rocks
- 1 21 *Navallia*
 rare on rocks
- 1 22 *Carex*
 rare on ~~stone~~ gravelly debris
- 3 23 *Carex*
 rare

etd. p. 28

small tree, about 5 m. tall,
 leaves glossy.

small tree, with seed figs,
 immature.

fig fusiform, immature.

dense clump,
 culms slightly diverging,
 arching at top, tips pendent.

small tree, 4 m. tall,
 gall ~~wasp~~ figs immature.
 foliage firm, purplish,
 esp. beneath, flowers white, well
 exerted.

shrub 3 m. tall, lactiferous;

culms erect

Sept. 17. Womai

brushy ravine in
grassy limestone area
loosely and irregularly
wooded with *Casuarina*

~~Hand~~ Nintul - scattered
oaks, *Gmelina*, *Finschia*,
Pandanus groves, grass
(*Miscanthus* + *Laccharum*
robustum), cultivated
patches (sweet potatoes,
Rungia - used for greens),
Casuarina, etc.
(photos of *Pandanus* + *Cactanopsis*)

Shave - slope
partly covered by open
Casuarina, *Phragmites*
in wet spots some cultivation.
Drymaria on wet road cut.
Ficus on rock *Timonius* on rock

Kenahi - steep canyon
wall, soft disintegrated
sandstone
Rhododendron, *Casuarina*

Daulo Pass 8175'

broken down ~~the~~ montane
forest - scattered ragged
trees - *Nothofagus* has
been logged out.

Nertera on cut banks -
closely adhering to bank,
except some cushions of
flowering branches which
are erect.

Trees to ~~25~~ 25-30 m.
tall, umbrella tops.

Dense tangled undergrowth
of climbing bamboo,
Rubus spp. and many
shrubs, *Miscanthus*,
etc.

(photos ~~brw.~~ end roll 3 &
1st. 4 on roll #4)

Soil a deep orange red
clay, cracking conspicuously
when dry.

Cultivated ornamentals
planted everywhere along
roads and trails -

~~eg~~ *Iresine herbstii*

Ficus iodoctricha Diels, shrubby
fig with insects (given me by Turner) ^{see letter}
below Daulo in Asaro Valley ^{Feb. 15, 1961}

41224 *Pyrosia*
2 common on rocks

Sept. 18 - Chuave, Wahgi Valley
slopes with secondary vegetation

3 25 *Drymaria*
on ~~clay~~ vertical clay road cut

3 26 *Ficus virgata*
on large rock

2 27 *Timonius*
on large rock

~~Kenabesi~~

Sept. 18 - Kenabesi, below
Chuave, in Wahgi Valley

1 28 *Rhododendron*
on steep wall of rotten sandstone

1 { 29 *Casuarina oligodon* Johnson (incl.)
30 abundant throughout
region, planted by natives.

Sept. 18 - Daulo Pass,
bet. Wahgi and Asaro Valleys
in degraded montane forest

2 31 *Viola*
common on vertical banks
and cuts.

1 32 *Solanum*
occasional along trail

2 33 *Amaracarpus muscous*
rare

2 34 *Sphenomeris*
occasional, terrestrial

shrub 2 m. tall (others
forming huge banyans),
figs orange, turning red.
shrub, fruit immature.

8

erect shrubs 1-2 m. tall,
flowers dull orange.
small trees, branches
pendent.

9200'

stems rather thick,
prostrate; flowers lavender.

spreading loosely
branched shrub, fruit immature.
erect, suffrutescent, sterile.

caespitose, fronds arching.

41235 (cont)

2

common

2

36

(ant.) Pipturus?

occasional

3

37

Miscanthus floridulus

common

1

38

Ophiorhiza

rare, terrestrial

3

39

Lathelypteris

local, terrestrial

2

40

Piper

common

2

41

Nertera

local, on vertical clay banks

2

42

Nertera

same

2

43

Viola papuana

common in open grassy spot

3

44

Carex

rare, one clump seen

Sept. 12 - below Pauls Pass,
on ~~road~~ road to Gorohe,

on wet talus near stream

3

45

Epilobium

common locally

3

46

Polygonum

locally abundant

shrub 1.5 m. tall, spreading.

shrub, leaves ^{greenish} white beneath

clumps, culms erect,
to 2 m. tall, flowering spikes
deep purple.

erect, leaves whitish beneath,
fruits ^{dark} purple.

shrub 3 m. tall, leaves
paler beneath, fruits
turning yellow.
prostrate, closely adhering
to ground by roots at nodes,
locally flowering stems
ascending; flowers greenish
yellow; fruit orange-red, fleshy.
same but sterile.

leaves and scapes erect;
flowers white.

Sept. 20 - trip by auto Goolra to Kainantu

Grassy hill with a pattern of "short grass", *Imperata* and *Phragmites* - local colonization by *Alphitonia*, *Vaccinium*, ^{*Wendlandia*} etc.

Koregeu - outcrop of hard almost black limestone vegetation reduced to weeds - *Bidens pilosa*, *Digitaria* sp., *Eleusine*, *Triumfetta batranchia* etc. *Brayna*? about the only native thing.

Acalypha + *Pipturus* betw. near Henganofi. Benabens toward Henganofi.

Ravin with gallery scrub

Schefflera sp.

Acalypha sp.

Pittosporum

Glaucurus

Ficus sp.

Wendlandia paniculata

Leitsea domarensis

Bischofia

Piper

Eleac?

Cudrania javanica

tangled, to 5 m. tall or less.

Hill, being colonized by *Gervillia*

(*Chloroxylon* 3 April.)

bet. Bena Bena and Henganofi

Ramu. Asans Divide degraded Nothofagus - *Castanopsis* forest with thick undergrowth. *Cinchona pubescens* var. *succinbra* occasional locally, planted. Mostly the trees here near the road are small, quite a mixture of species.

Scattered trees from original forest 25-30 m. tall - even a *Pandanus*.

Weeds abundant.

34

1960 New Guinea

Sept. 20 - Koregeu, south of
Bena Bena.

41247

Breynia

1

rare in soil pockets ~~of soil~~

in outcrop of hard limestone in grassland.

3

48

*Pipturus*one tree on slope below limestone
outcrop in grassland.

3

49

*Acalypha*several trees on slope below
limestone outcrop in grassland.

43

50

*Acalypha*several trees on slope
below limestone outcrop in grassland.Sept. 20 - South of Bena Bena
toward Kainantu
in bushy ravine in
grassland

3

51

Ficus adenosperma
occasional

2

52

Cudrania javanica

occasional, scrambling

3

53

Acalypha

common around edges

2

54

Elaeagnus

common

5

55

Breynia

common

1500

1550 M

5000'±

Eastern Highlands Distr. 35

small tree or large shrub,
3 m. tall, fruiting heads
white, fleshy.small tree or large shrub,
pistillate aments only.small tree or large shrub,
pistillate and staminate
aments.

5000'±

large shrub 3-4 m. tall
(gall fig)scandent shrub,
fruit orange.shrub 1-1.5 m. tall,
staminate aments
well down on branches.

scandent shrub,

flowers cream-white,
ripe fruit red, fleshy,
cylindric.

shrub 1.5-2 m. tall

Sept. 20 Aiyemra, near Kainantu
Agricultural Exp. Sta.
3 hrs. ~~h.w.~~ of hills above,
showing cleared slopes,
woods on top of higher
hills.

Some patches of good
forest above station.
Tall montane forest,
trees to 30 m.

Musa ingens, an
enormous banana, 10-15
m. tall, approaching
Ensete in some characters,
such as open sheath,
general habit, somewhat
persistent bracts,
infl. enlarged distally.

Kainantu Valley generally
grassy, a broad flat old
lake bed with hills
arising from and around
it, all grassy. Some
ravines wooded, at least
in their upper parts. Remnants
of forest on upper slopes.
Phragmites marshes
in ~~low~~ flat parts.

Sept. 22 - Auto trip, Kainantu -
Aiyemra, ~~Kassam~~.
photos ~~of forest~~ and
photos of Musa ingens
in degraded forest above
Aiyemra. Tall trees with
understory of Piper, Pandanus, etc.
Coll. Homalanthus, Gaertnera,
Ageratum.

Arona Valley - mostly
cleared but with
patches of forest, esp.
on slopes and in ravines and
Elmerillia papuana Dandy. ~~bulbifer~~
Some woody plants
general in ~~some~~
grassland. Vaccinium, ~~Decaspermum~~
at high gts. Dodonaea,
etc. Lemnecarpus.

Lower, flatter parts
open grass, predominantly
Imperata but with a
number of other things
and scattered ~~terrestrial~~ ant
mound.

(photos ~~h.w.~~)
Native ~~use~~ to plant taro in
wet season, this not seen now.
This valley is very sparsely
populated, little cultivation seen.
Large cattle experimental project.

Sept. 20 - Ramu - Asaro Divide,
(road from gohka to Kainantu) Kainantu
in degraded Castanopsis-
Nothofagus forest.

- 41256 *Cinchona pubescens* var. *succinula*
one large tree, probably planted,
and a number of smaller ones.
- 3 57 *Eucalyptus nitida*?
occasional
- 4 58 *Acronychia*
occasional
- 2 59 *Nothofagus macrophylla*
common
- 2 60 *Medinilla*
~~seems~~ occasional

Sept. 21 - Aiyura, near
Kainantu, Kainantu subdist.

- 1 61 *Drymaria cordata* (L.) Willd.
weed in experiment station grounds
- 2 62 *Plectranthus*
weed on road cuts
- 3 63 *Desmodium*
weed on roadside
- 3 64 *Araucaria cunninghamii*
planted in experiment station
- 2 65 *Gaertnera* GAERTNERA
in degraded forest on hill
- 1 66 *Ageratum houstonianum*?
common along roadside
(to 1044)

2000 M
6500' ±

subdist.

tree 10 m. tall, flowers
pink without, pale within,
very fragrant!

small slender tree or large
shrub, flowers white.
strictly erect shrub,

small sterile tree

scandent shrub
or liane climbing
in trees; inflorescence
scarlet; leaves with
purple veins.

prostrate

herb with long decumbent
base, flowers blue.

shrub 1 m. tall;
fruit dry.

straight tree 20 m. tall,
cones disarticulating,
seeds picked up from ground.
scandent, inflorescence
white, flowers white.

heads purplish to whitish,
herbage aromatic.

5010' ± Sept. 22 - divide bet
Arona Valley and the
Ramu. Markham Valley.

Dense tall forest
with abundant
climbers and climbing
epiphytes, a large
climbing bamboo.

Tangled thickets below
at least near road.

Ficus
agathoides
Peel.
A. hypoleuca
foliolata?

Climbing bamboo has
culms scattered, slightly
decumbent at base, 5-8
m. long, high arching,
smaller culms branching
and with distichous
broad leaves.

Rupert Haviland Memorial
Lookout. ~~Ramu~~ slopes of
Ramu - Markham Valley

Steep slope, tall forest,
30 ± m. with scattered
Araucaria heterospora,
many of trees bearded
with lichen. Trees
mostly not more than
4 dm dbh, mostly less,
canopy ~~is~~ irregular,
not completely closed,
a thin irregular second
story, a sparse to dense
shrub layer mostly of
tree seedlings, lianas common.

Pandanus, a narrow
leaved one, common in
under story and shrub
layer, ferns sparse
on ground. Has been some cutting.
Generally few epiphytes
but some trees with
many
(photos of slopes & of
Araucaria (b + w end roll 4)
& Rod.)

Some clearings on
steep slopes. Shrub
sweeping down into
valley mostly cleared.

4000' Above this a steep slope
of broken dark hard rock
(sample 1) - boulders 10-15
ft. diam. from some exposures
this seems almost in place,
merely broken off.

5000' At top of pass *Musa ingens*
is common in tall mountain
forest.

4500' Down on the ~~Arona~~ Arona side
the forest is very fine
but shifting agriculture
is eating into it.
Trees with rounded, umbrella
shaped crowns 30-35 m. tall.

no significant intermediate
story or low tree or tall
shrub layer.
Many lianas.

Arona Valley - recently
burned Imperata with
ant mounds (3 to 4)

Arona V. slopes up
to pass to Aruina.

Decaspermum neurophyllum
on steep slopes in grass.
Clump of *Miscanthus*, a
very erect form, quite tall,
to 3 m.

Thin woody growth
on still higher slopes largely
Vaccinium (possibly *blepharocalyx*).

Sept. 23 - air trip Kainantu
to Lal, down Markham V.
(DC-9)

Small coffee plantation
at Kainantu.

Grassland with wooded
ravines. Small areas of
cultivation. Round thatched
huts on ridges.

Range of hills mostly
wooded. Then Arona V.
grassy, burned areas,
deeper ravines wooded.

Grassland around Kainantu
a dense grass about 1 m. tall,
with a mixture of *Arundinella*,
Isachne, *Themeda australis*,
Capillipedium, *Fimbristylis*,
etc. with *Pteridium*,
Thelypteris *unita* scattered
through it. Woody plants
commoner at higher altitudes
and on steeper slopes
and ravines. This is
a slender stemmed
grassland, fully covering
the ground. Deeper ravines
are wooded. Around
Kainantu there has been
some planting of *Aracaria*.

Casuarina^{papua} along streams in
flatter parts.

Then over higher wooded
range to Ramu - Markham
valley.

Old lake bed with
brownish grassland (of
Lachnopus spontaneus).

In Markham stretches
of green *Imperata*, partly
newly burned, with
patches of coconut plantation
etc. - scattered trees
& patches of wood.
Steep slopes on right

44

1960 New Guinea

- 41267 *Homalanthus populnea*
common in degraded
forest and on forest edges

Sept. 22 - Kainantu
on grassy gentle slope

- 3 68 *Sorghum*
common
- 2 69 *Themeda australis*
common
- 2 70 *Capillipedium*
common
- 2 71 *Pteridium aquilinum* var.
common
- 72
- 2 72 *Arundinella*
common

Sept. 22 - divide bet. Arona Valley
and Ramu - Markham Valley
in thick tangled montane
broad-leaved evergreen
forest on steep slope.

- 2 73 (orch.)
terrestrial
- 1 74 *Ophiorhiza*
- 2 75 *Ficus subulata*
epiphytic, developing
slightly strangling habit.
- 3 76 *Ficus agapetoides* Diels
det. corner

Eastern Highlands Dist. 45

1550 m.

small tree 5 m. tall.

7.

- erect, ~~inflorescence~~ panicle
golden brown.
ascending
"kangaroo grass"
- erect, panicle purple.
- rhizome buried;
fronds up to 1 m. tall
(to 2 m. in other areas)
- erect, panicle purple.

stem decumbent, spike erect;
perianth pinkish-bronze color,
lip yellow

buds reddish, flowers white.
leaves pale beneath.

epiphytic, developing a
slightly strangling habit.
figs immature.

climbing in tall trees,
rooted in ground; stems
1-2 cm. diam. sterile.

completely denuded except
ravines, badly eroded.

Markham River
has most amazing
system of braided
shifting channels
over whole valley floor.

Large areas burned.
Patches of forest left,
scattered trees on
some of rest. Some grass
marked by old channels.
At least 20-30% recently
burned.

Large flat area solid
brown grass, no trees.

Left side, also, very
steep, denuded, much
erosion, denuded except
for bottoms of deep ravines.

Broad alluvial fan
areas mostly in grass,
but partly cultivated.
Crossed by wide braided
gravelly stream beds
joining Markham.

Lower down, foothill
zone very broad, grassy.
Alluvial fan zone also
broad, with patches
of wood and savanna,
much grass, cultivation.

Large air-strip & ~~resettlement~~
Nadzab base from war time.

Lake Wanam surrounded
by grassy hills. 200' above
river.

Then valley narrow,
river runs through
a flat, densely wooded
valley bottom, between
densely forested hills,
in a single broad
channel. out to coastal
flats at Lae, this also
forested, but irregularly,
with some clearings, etc.

41277 *Ficus hypophaeoides* Schlecht. ??
^{det. Corner.}

1 78 (bamboo) *Bambusa (Teleba) atra* Lindl. group
 common

Sept. 22 Arona Valley,
 slopes down from divide
 above Aiyura

2 79 patch of wood in ravine
Elmerillia papuana Dandy

4 80 high sparsely wooded
 steep slope in grassy hills
Dendrobium
 locally common.

2 81 *Urena lobata* L.
 in semi-shade

2 82 *Vaccinium blepharocalyx* ?
 common

4 83 Sept. 22 - hills above Aiyura
Miconia ?
 common in degraded
 bushy woods.

~~climber~~ woody climber,
 climbing in tall tree.
 culms scattered, not
 clumped, slightly
 decumbent at base.
 high arching, to 6 m. tall.

tree 10 m. ± tall, buds
 and fruits only.

stem up to 2 m. long,
 curving; flowers buff,
 purplish outside, odorless
 at 5 p.m.

— slender shrub 1-1.5 m.
 tall; flowers rose pink.
 — small tree 4-5 m. tall,
 sterile.

scrambling through
 thickets; heads white.

Sept. 22 - Rupert Haviland
Memorial Lookout, steep
slopes above Kassam,
Ramu - Markham Valley
in rather bushy tall
forest on steep slopes

41284

(bamboo) *Nastus* sp.

2

common in edges

3

85 *Cordyline*

common in loose undergrowth

4

86 *Diospyros*

in understory

2

87 *Dryopteris* (*Rumohra*)common, ~~as~~ Terrestrial

Sept. 22 - Arona - Ramu Valley
Divide, Arona side

in thick tall forest

3

88 *Amaracarpus*

occasional in undergrowth

5

89 *Psychotria*~~occasional~~ in undergrowth

3

90 *Psychotria*

common in undergrowth

2

91 *Mucuna albertesii*common climbing
in trees.

Sept. 22 - Arona Valley,
high grassy slopes common

3

92 *Decaspermum neurophyllum*

4000'

1230M

tangled, slender hollow
arching canes. sterile.
shrub up to 1 m. tall;
fruit immature,
panicly drooping.
small tree, about 8 cm.
dbh. 7 m. tall; fruit
immature.

shrub 3 m. tall.

slender shrub 3-4 m. tall,
fruit green, turning yellowish.
shrub 3-4 m. tall;
fruit soft, red.
heavy woody liana,
many m. long, flowers
in racemes from tubercles
on woody stem, scarlet.

shrub 3 m. tall, petals white.

Sept. 21 Kainantu
on grassy gentle slope

41293

Fimbristylis

2

common

2

94

Ophium?

common

Sept. 25 Lae

3

95

~~*Spermacoce*~~ *subfruticosa* Jacq.
common along roadsides

2

96

Spermacoce ocyroides Bunn. f.
common, edges of lawns
and roadside ditches

3

97

Hedyotis corymbosa
common in edges of garden

1

98

Emilia sonchifolia (L.) DC.
rare in garden

2

99

Phyllanthus
common in garden

(these next numbers were duplicated and
have been changed, through 41299)

41500

41500

Phyllanthus amarus Sch. & Th.
rare in gardens and roadsides

Sept. 26 - Kareeba, Keravat,
New Britain (near Rabaul)

41501

41501

Antocarpus

rare in primary forest, somewhat
altered, but not recently
disturbed

Changed from 41200-01 to 41500-01

small tufts

10 m.

plant erect, tending to
be purplish; corollas
pinkish white.
flowers white.

erect; corollas white,
shortly campanulate,
readily caducous.
flowers lavender

stems rachis of flowering
branchlets broad, dorsally
compressed, leaflets closing
when plant is uprooted.

10 m.

sapling 5 m. tall, sterile.

Sept. 24 - Lal

cultivated plants seen:

Codiaeum variegatum
Spathodea campanulata
Plumeria rubra
Plumeria obtusa

*Angiopteris evecta**Crocos nucifera**Allamanda cathartica*var. *hendersonii**Tectona grandis**Kalanchoe pinnata**Caladium bicolor**Barringtonia asiatica**Musa sapientum**Peltophorum ferrugineum**Hibiscus hybrids.**Mangifera indica**Jasminum pubescens**Ceiba pentandra**Saccharum officinarum**Areca catechu**Lamanea saman**Melia azederach**Clerodendrum* sp. (like spec. but am. fl.)*Euphorbia pulcherrima**Cassia grandis**Cruculifolius diglupha**Vanda Miss Joaquim**Dieffenbachia* (spotted)*Antigonon leptopus*

Sept. 24 - flight from
Lae to Rabaul (DC-3 left side)

Left 6:12

Flats n.e. of Lae are mostly wooded except for several grassy clearings and the braided river course which is variously bushy or open.

Eastward there is an area of low vegetation, then a ~~several~~ wet meadow or vegetated lagoon. Then a sloping grassy clearing with gallery wood, then another stream on a large alluvial fan, mostly wooded but with some meadows. Two large clearings or meadows with *Imperata* (?) on slopes, surrounded by forest. A clearing opposite them on the coast. Another clearing with gallery wood and another stream, then on an alluvial fan. This coast seems to be a coalescence of alluvial fans at the foot of high wooded mountains. Beyond stream some partially cleared land, then hills reach the coast. A small lagoon behind a ~~series~~ of projecting ridge is cut off by a wooded bar. After this the steep wooded

mountains come right down to the coast.

Another stream, coming down a narrow valley.

All of these streams seem to have braided beds choked with gravel.

East of this several grassy meadows of some size on flat areas near coast, possibly small lake beds.

Mountains, doubtless the Finisterre range, all densely wooded except a few peaks near coast which seem partly cleared but somewhat bushy. In distance the highest peaks seem to have mountain meadows. A fairly large river with braided bed, this mostly grassy.

Montane forest spotted here with trees ~~is~~ newly leaved out. Canopy generally solid except for a very few landslide scars. No obvious trails or roads. Clearings, shifting agriculture, suddenly common, in various stages of regrowth occupying most of area with woods principally in ravines and

6:30

6:37

highest ridges along
course, and extending
well inland.

crossed coast line

narrow coastal strip
with road, coconut plant-
ation. A small air strip
on a peninsula (Finchhafen?)

In distance ^{to left} a broad
peninsula largely in
grassland, but with
wooded ravines and
patches - grass on gently
sloping ground and
ridges sloping down to
coast. Entirely wooded
above a couple of hundred
meters.

6:57 flew over a series of reefs,
none breaking water, the
northernmost one crescent
shape, open to north, except for
a small patch.

6:58 several more, one an almost
complete small circle.
Several more, showing a
striation pattern, not well
oriented.

Sighted New Britain coast
ahead and to left.

7:02 Cape Markham in distance to left,
small islet west of it.

7:03 Many small islets mostly

apparently mangrove
covered vegetation, low
in center, higher around
periphery, surrounded by
muddy-looking reef
flats with a few scattered
mangroves. Coast of
New Britain with a
strip of mangroves, then
also with higher trees
on periphery. Solid
forest on flat to gently
sloping ground inland.
Becomes very slightly
hilly, with several incipient
small streams, water not
visible. More hilly in
middle distance to left.
No clearings at all.

7:03 Becomes more hilly, or
mountainous, but not
especially rugged. Very
densely forested.
Locally a few trees seem
to be bare.

7:10 Clouds rather bad,

7:11 continuous rainforest.

Ravines trending across course
at about 3 degrees right of it,
but very temporarily, become
quite irregular.

7:13 A rather large meandering
ravine some distance to
left roughly follows course,

getting closer then forking
one fork swinging ~~south~~
north, other south across
7:15 course. clouds curiously following ravine.

First tiny village, just
on course, with several tiny
clearings, mostly regrown.
Otherwise solid forest.

7:16 Can see north coast in distance.

Topography locally flat,
locally a close complex of
tiny relief, like a densely
wooded karst. Forest
extends to coast. Apparently
a few clearings immediately
back of coast.

7:20 Crossed a range of hills
trending northeast.

Approaching more closely
the coast, but roughly
paralleling it.

Still solid rain forest except
some shifting agriculture
near coast. Bare or newly
leafing out trees occasional.

7:22^{1/2} Crossed a river going directly
north to coast.

7:24 A large complex of lagoons
and marshes, surrounded
by swamp, mostly forest but ~~that~~ sea.

7:25 This changes back to forest.

Hills again, with some
sharp mountains near sea. (Mt. Pamb)

7:26 A hooked peninsula, bending westward

with island east of it

7:28 Approaching coast, crossed
a meandering stream.
A flat at mouth planted
with coconuts, one or two European
buildings. A small lagoon.

7:29 Hills just back of coast
forested except for some
shifting agriculture near
coast. Small irregular
peninsula.

7:31 Reached coast. Very narrow
tan sandy beach, muddy
fringing reefs.

Coast line along course.
7:33 Mouth of large stream
formed of two coming together,
one from shore from N. The
lined by grayish swamps
(burned?).

7:34 Another small black-water
estuary, bar across mouth.
Some open meadows, green,
palm swamps and
some open sand, back from
coast which again swings
northward.

7:35 Passed Mt. Wackla - a volcanic
cone, wooded to top.

7:36 Flew directly over a volcano
with green woods and great
erosion scars showing much
sulphur and bare white
ash. Just N. of it another

higher

sharp, conical, wooded to top
both sides then to way off.
Several small cones on
peninsula.

738 Crossed water again, flat land
to shifting aquaculture.

some reefs off shore, patches
Williamsey Peninsula bend in at
distance with a large island
Mt. Bulu volcano on it. ^{several small sharp conical} islands
and many tiny islets south
of it. (Gazelle Island)

Beyond Mt. Bulu the distal
part of the peninsula become
very complicated.

741 Dense clouds all over Kimbe Bay.

7:46 Kimbe Island (?) a small
wooded island, surrounded
by a broad fringing reef
with large patches in it,
almost a barrier reef
with lagoon.

6:48 Clouds.

7:51 open water - coast far in
distance to right with
several very small islands.

7:47 Coast still far to right.

7:48 Clouds, turbulence.

8:00

Coast swinging closer.

8:07

To rt. a small rocky island
and a smaller one with

a lagoon and barrier
reef. (2 photos - hd.)

8:08 A larger island with

two sharp cones, the
smaller east one smoking.
west one double peaked.
(Kolobau Island).

8:13

Mainland closer now, but
too far for observation. The
father is in clouds.

8:14

Coast swings away to right.

8:21

Crossed interrupted barrier
reef around Gazelle Pen.
(hd.) + coast. Fringing
reef very muddy.

Stream to left with sags
swamp near mouth.

Hilly country densely wooded.
To rt. a narrow sandy beach
n. of Dondo Pt.

8:23

Interior becoming very rugged,
densely wooded - emergent
trees with thin crowns, light
green (Eucalyptus diptera ???)

8:24

Rochy stream bed running west.
High mts with red landslide
scars, densely wooded to
summit. A few palms near
summit. Canopy thin near
summit but forest appears
quite tall.

Apparently completely undis-
turbed, slopes very steep,
ravines deep.

8:26

In distance over tops of mts. on
the last range, considerable
gray slopes.

- 8:27 stream angling to left
some shifting agriculture
on lower slopes.
- 8:28 Mosaic on hills from
shifting agriculture.
8:28^{1/2} curved coast. Irregular
fringing and patch reefs.
Peninsula to left largely
cultivated, rather flat.
- 8:30 Ataliklibun Bay
Shores to right cultivated
Hills wooded.
- 8:31 Island in mouth of bay
in distance, low, wooded.
To left, large clearings on
lower slopes, ~~east~~ coastal
lowlands cleared, and in
plantations.
- 8:32 Coast.
Peninsula to it wooded
but clearings on lower parts,
upper ridge wooded.
Grassy clearings along
coast. Hills with
shifting agriculture and
bananas. grass.
- 8:34 Large coconut plantations
along coast, many groves
on hills.
Much bamboo along
streams.
Most of hills cleared
and grassy or in
bananas, coconuts, or coffee.
Considerable settlement along

- shores of shallow bay to
east of Rabaul.
- 8:36 Rabaul. Sharp peak
to north, irregularly
wooded. City is on
flat land around Bay.
Large volcano to east,
partly grassy & green, esp.
near top. Patches of
thin woods.
- 8:27 landed on grass strip.

Sept. 26 - Keravat

Kareba
forest ^{that} has been logged
heavily - ~~seedling~~
8 years ago, "treated" 6-7 years
ago. Now a 95% stand
of saplings & poles 3-10 cm
dbh. of *Pometia* ~~sp.~~ *tomentosa*
15 m. or so tall. In gully,
replaced by *P. pinnata*.
Suppressed seedlings of
P. tomentosa a few inches
tall abundant.

Dark brown volcanic
ash soil.

"Treatment" removal of
canopy & undergrowth,
later removal of lianas.

A few *Canarium schlechteri*
& *C. mayhebinthum*, *Cabo-*
phyllum, etc. saplings, also
Dracontomelum mangiferum.

Spondias dulcis, *Canarium*
schlechteri scattered old
trees, now being killed. 40+ m.
tall.

Intolerant *Dracontomelum*
Pometia, *Terminalia* (rare).

Intermed. ~~*Cabo*~~ *phyllum*, *Canarium*
Tolerant *Cabo* *phyllum* &

Syzygium, *Gmelina*

About 800 acres of this regeneration.

Achatina fulica shells - said to
have been introduced by Japanese. 67

Mussorvit ~~creek~~ ^{ridge}

logging area -

Unlogged forest -

Dracontomelum

Pometia ~~sp.~~ *tomentosa*

Pometia pinnata
tomentosa

Pterocymbium beccarii

Pometia tomentosa

Sterculia

Pometia tomentosa

Dracontomelum

Elaeocarpus

Neranthus

Syzygium beccarii

fig
seed
in a
cinder

Average ht 120-150'

Canopy very open.

vines very abundant
on almost all trunks.

Very thick intermediate
story of poles up to 10 cm dbh
occasionally 20 cm, 20 m.
tall.

~~thick~~ layer to 2 m.

of *Zingiberaceae*
seedlings of trees, esp. *Pometia*
tomentosa which is the dominant
tree in top layer.

Rather open true canopy
layer 90-100'

abundant *Pometia* seedlings mainly

a few inches tall, but some almost all sizes. Mature *Pometia tomentosa* about 3-4 to a cre. Question whether ~~some~~ natural replacement takes place except in openings, but the occasional developed saplings and poles are not only in openings, but even in well shaded places. However, removal of shade stimulates them a great deal.

The logged but untreated areas have scattered trees, often close enough to be called open forest, of uncommercial species, abundantly covered by vines, with thick tangled undergrowth between, about 2000 acres of this.

These "Pometia ridges" extend about 30 miles ~~east~~ west along coast. Ravines support a different vegetation largely dominated by *Pometia pinnata*, or on new river deposits, by *Eucalyptus diglupta*.

~~41502~~ Sept. 26 - Keravat River
10 mi above mouth
41502 *Eucalyptus diglupta*
emergent in ^{rain} forest on gravel flats close to river.

Secondary forest 3 b+w
logged forest 2 b+w.

Upper Keravat River
10 mi. from mouth.
Eucalyptus diglupta
forest.
(finish b+w. roll, several
hod, ending with seedling.)

Here the river has a broad gravel bed in which the channel frequently shifts during floods, leaving bare gravel or sand flats and bars.

On these the seedlings of *Eucalyptus diglupta* establish themselves very rapidly, practically before any of the weed species. It grows very rapidly, outstripping the weeds and weed-tree seedlings. These reach a height of 200' and diameter at top of buttresses of 5 feet, bark smooth copper color and green, coming off in sheets. (G. 11.73)

trunk clear, straight,
tree 40 m. tall, bark copper color and green, stamens white, galls in inflorescence common. Specimens from top of tree.

- 41503 *Eucalyptus diglupta*
 1 common
 on bare gravel flat, full sun.
 1 04 *Eucalyptus diglupta*
 common on bare sand bar, full sun

Sept. 27 - Kavieng Air Strip
 Kavieng, New Ireland
 weeds on coral soil
 around air strip

- 1 05 *Lippia nodiflora*
 common
 1 06 *Phyllanthus*
 occasional
 2 07 *Spermacoce suffruticosa* Jacq.?
 common

Sept. 27 - Manus Air Strip,
 Los Negros I., Manus,
 Admiralty Is.
 weed around air strip
 on compacted coral.

- 1 08 *Paspalum fimbriatum*
 occasional
 2 09 *Fimbristylis cymosa* R.Br.
 abundant
 1 10 *Spermacoce suffruticosa* Jacq.?
 common
 2 11 *Torenia*
 common

(#5 chg from 41203-II to 41503-II)

seedlings, large trees
 nearby
 seedlings, large trees
 nearby

stems ascending,
 flowers white.

erect, plant purplish,
 flowers white, 4 parted.

leaves stiff.

erect, plant purplish;
 flowers white, 4 parted.
 prostrate; corolla yellow.

New Britain - information
from J. H. Havel

Tolai - dominant people
from around Rabaul.
in pumice area.

Baining - ~~some~~ shifting
villages and population
decrease. - ~~around Kera~~
begin near Kera at
southward in mountain
area. Formerly near
sea, now pushed back
into mountains, apparently
by incursions of Tolai.

Below Eucalyptus belt on
rather the lowland rain forest
is of Calophyllum, Dillenia,
Syzygium, Homalium, some
Octomeles, etc.
with Pomelia in pole stage.

On raised coral on south coast
a mixture of Homalium, Pomelia,
Calophyllum, Pterocarpus,
Vitex, Dracontomelum
no species dominant. Perhaps
oldest surface in area.

Tolai Harbor Bougainville
dominance of 2 sp. Calophyllum
on ridges, some places
dominated by Pomelia, exceptional
these two types in foothills
~~these two types~~

Pomelia tomentosa, etc.
with Dracontomelum forms
a fairly stable forest.

Eucalyptus, Octomeles,
Casuarina, Albizia sp.
are pioneers, more or less inter-
changeable on ash slopes,
Eucalyptus & Octomeles on gravel flats.
No Homalium known from
Gazelle Pen. in forestry records.

Since 1890 there have been
explosive eruptions in
each of major volcanic areas.

On south coast limestone
terraces about 12 inches of
soil, sticky clay when
wet! with limestone exposures
at surface. - reddish soils,
much clay.

Low terraces close to coast
have Calophyllum, Butsia, etc.

from to.

Stands dominated by these trees
are invaded by Pomelia pinnata
and P. tomentosa which may
form a canopy 100' high.

Eucalyptus eventually develops
a rotten center, the top is damaged
(how?) and gradually dies out.
Never establishes a seedling
except in new open habitats on
pure mineral soil. After a

this
and
most
of
V. m.
should
be
inserted
after
p. 74

begin

number of stands close to each other, even aged in a stand, different from stand to stand.

Between Rabaul and Keravat is intensively occupied land, much of it in cacao plantation, shaded by *Leucaena*, etc. some in bananas, sweet potatoes, etc. Bamboo clumps and coconut groves common enough. Away from Rabaul are some patches of grass. *Leucaena glauca* very common.

Large trees of *Canarium*, *Eugenia*, etc. that yield useful fruit are left while clearing forest, now scattered through settled area. These Tolai people have cooperatives which are encouraged by the government to compete with the Chinese. They are very aggressive and intelligent and now occupy the greater part of the volcanic ash or pumice soil area around Rabaul and toward Keravat.

These soils are deep bedded layers of ash and pumice pebbles.

insect
from
7-2-73

Sept. 27 - Air trip Rabaul -
Kavieng - Manus - Wewak
Madang - Lae. DC 3

Volcanoes around Rabaul
~~South North~~ Daughter,
Matapi

Mother, ~~South North~~ North Daughter

— Mother has greater part of slopes grassy. Has a blown out crater on side toward air strip. South Daughter slopes mainly grassy. Matapi

The lower cone that exploded in 1937 is ~~largely~~ ^{largely} bare but has some grass on outer slopes, extending in places to the top.

The grass on these volcanoes ^{at least in the morning} seems a bit too green for *Miscanthus*, more like *Imperata*. However, acc. Harel, it was recently burned, at least on the Mother, so even *Miscanthus* might be green.

Lowest slopes of Matapi have bushy patches. These extend irregularly to the top of the South Daughter and almost to top of the Mother.

North Daughter has grassy ridges, otherwise wooded. Lower slopes with some coconuts. Tavui Point abrupt, higher ridges

tend to be grassy, mostly in thickets, lower slopes with thickets and small groves of coconuts.

8:23

Coming rather close to New Ireland, but mist is so thick that no details yet visible.

8:25

Slopes are steep and wooded up to the backbone of the island. Slight coastal lowlands have some cleared land.

8:27

A wider spot on the coast has what appears to be a sago swamp.

8:30

Can see across island. Some green grassy areas in interior. Low mountains are woody. Irregularly developed fringing reef on s.w. coast.

8:34

Coconut plantation near point ~~se.~~ of Malas. Much of the coastal area here and the small island show shifting agriculture pattern. More grassy areas s.e. of Malas. Clouds.

8:37

8:38

More coconut plantations along coast.

Go over interior. Low mountains completely forested, but canopy very loose, some palms. To

8:39

Some areas of the mts. seem to be karst.

Forest very mixed. Canopy more complete inland, no evidence of disturbance here, but still the forest seems very irregular.

8:40

large patches of pure Pandanus, surrounding areas of low palm swamp.

Then large areas of marsh or wet grassland & Pandanus & savanna. Some palms.

There are irregular patches showing more and more disturbance. Then areas of cleared land, coconut plantations as coast is approached.

8:39

Coast, broad fringing reef, coastal highway, more coconut plantations, clearings, considerable bamboo. Degraded or secondary forest. Shifting aquaculture.

8:40

Kavieng air strip.

Surrounded by a low apparently secondary forest with mostly flat topped trees. ^{Tectona, Pandanus} Shathodea, ^{Coccoloba, Pandanus} noted. The aspect here is rather dry.

+ Diacron

Hibiscus

Ornamentals at terminal - Cordia, Malvaraceae. Datura multifida.

Hibiscus mutabilis, *H. hybrids*,
Plumeria obtusa. The strip
seems very new.

Dark red-brown soil mixed
with coral fragments.

Achating fulica shells
lying about.

9:25

Took off.

Small coconut plantations
+ gardens around Kavieng
small islands off shore
mostly in coconut plantation.
rain.

9:27

9:32

Tsoi Samung Island -

rather wide reef flat
on southeast side. Island
mostly densely wooded,
parts cleared and in
regrowth.

Larger parts of Kawulilsian,
Tsoi Bots and next small
island cleared.

Broad ~~sea~~ shelving reef
on lagoon side.

9:36

New Hannover. Lobate
coast lined with mangrove
or ~~swamp~~ swamps. Interior a patchy
mosaic of grass, forest
some coconut plantation

9:38

Clouds.

9:39

Hole in clouds - same mosaic but
more forest.

Then coast line, with a
belt of swamps. Interior

solid forest - visibility
very poor.

9:40

Clouds. Then swampy
coast lined by forest.
Course seems to be following
north coast.

9:42

broad swampy belt with
narrow estuaries, irregular
shore.

Small ~~etc~~ grassy clearings
opposite a small partly
cleared island.

9:44

a swamp, a marsh surrounded
by forest, then Cape Entrance (!)
coast here lined by narrow
belt of coconut plantation
around dense forest.

9:45

several small islands
surrounded by wide
reef flats, with one partly
cleared, inner one wooded.
One must be Kung I.

then open blue sea.

9:46

Tingwen Is. ahead and rather
far to left. Broad reef
flat on north side, apparently
very narrow on south. Islands
(3) appear wooded, may be
coconut plantation. Reef extends
west for almost the same
distance as the length
occupied by islets. Islets
seem very flat.

10:03

Passed Tingwen Is.

- 10:34 Rambays I. in distance to left.
Visibility very poor.
- 10:35 Horns Is. - reefs broad. no visibility
~~Pale Island~~
- 10:37 Tong I. - wooded around
at least ~~part~~ herbaceous
veg. (clearing?) in center.
2 lagoons or ponds, one on
s.e. side, one on ~~east~~ west end.
- 10:39 Pale Island.
Small lagoon with
broad barrier reef on east end.
Flat. Almost completely
covered by coconut plantation.
Scattered trees along coast.
West end has small settlement
near boat harbor, mixed
large trees (Artocarpus?? etc.)
and coconuts, on about the
west 1/5.
- 10:42 Manus ahead to left.
Long white airstrip at
Hyane Harbor.
- 10:44 Eco Negros I. partly coconut
plantation, partly woods.
Reef flat with ~~some~~
conspicuous surge channels.
A number of ponds. Large swamps.
Swamp forest, Pandanus
swamp, mangroves on south
end near airstrip.
- 10:48 landed.
Casuarina ^{australifolia} around terminal.
Hibiscus hybrid, Cordia.

11:17

Took off from Manus.

~~Eastern~~ extension of Manus.
Coconut plantations, swamp.
Along s.e. coast an irregular
barrier reef close to
coast.

Broad mangrove and
swamp belt along
coast. Extensive but
rather patchy looking
forest inland.

11:20

Some shifting agriculture.
Small bright green
grass-covered hills
scattered inland.

11:21

Irregular hilly country
partly wooded, partly
covered by tangled low
growth and some apparently
grassy patches. Shifting
agriculture clearings very
sparse.

11:22

Bunai. From here westward
broad swamp belt.
some sago swamp(?),
forested hills inland with
scattered ~~clear~~ new clearings.

11:26

(bad)

(bad)

Parusi - at w. end of large
swamp area. Drowned karst
area giving very complex reef
pattern. Westward, hills
come down to shore, densely
wooded.

Barrier reef (photos) runs

- 11:31 westward from here, changing into an extensive drowned karst with circular and crescent-shaped reefs. (Photos)
- 11:33 Coast line now far away to right, very complicated suggests subsidency
- 11:34 Reef complexes mostly left behind.
- 11:35 ~~Western~~ Southwestern peninsula of Manus in distance.
- 11:37 Passed tip of Manus. A ~~scrap~~ few of linear scraps of reef well out from it, as well as fringing reefs along shore. Peninsula appears wooded but too far away to see clearly. Scattered ~~of~~ scraps of reef that break water.
- One of them, scarcely breaking water, shows cross striated pattern.
- 11:41 Passed what appears to be a scrap of barrier reef with a hook on it and two small patches.
- 11:42 A considerable complex of linear reefs in distance appearing like an incomplete drowned atoll. ~~Possibly~~ ~~the southwest~~ Two ^{very} small islets in this. Possibly Rabben Is. Too far away to see details.

- 12:30 Hilly island, rather small, in distance to left. Koil? or Viai?
- 12:34 Coast in sight to left far in distance.
- 12:36 Vokes I. some distance to right. A somewhat eroded volcanic cone. A copes wooded, some clearings at base. Visibility poor.
- 12:40-42 Crossed long festoons of whitish foam or bloom, miles long, across course.
- 12:44 Kairim I. far ahead and to right. A rather high cone. Mushan, in front of it, is much lower, almost flat.
- 12:48 New Guinea coast, steep, forested hills with a low coastal belt that is grassy. Many grassy clearings on lower slopes around Wewak.
- Several low flat peninsulas ^{near} ~~west~~ of Wewak, w. of airstrip. Wewak is on one of them. Degraded forest w. of and back of air strip. Many palms. Grassy low land and hills immediately back of strip. On seaward side of strip a belt of *Acrostichum aureum*,

1:29

Took off - Wewak.

E. of Wewak on coastal
stony sago swamps.~~Some~~ some secondary thickets,
grass. Mountains behind
are densely wooded.Lower slopes dissected by
deep ravines. A few
scattered new clearings,

1:30

some grassy patches
a bit inland, some rather
extensive. A large fire
burning in one

1:32

Grassy hill tops and
ridges abundant inland.
Complicated low relief,
possibly karst.

1:34

Mosaic becomes predominantly
grass, ravine wooded (photos)

1:35

In distance to right large
grassy areas. Close to
course mostly forest,
some grassy areas.

1:36

Small village. Scattered
grassy clearings, most of
forest appearing undisturbed.
Relief still complex, but lower
and not so sharp.Grassy patches in middle
distance.

1:38

some. Forest along course
very dense, apparently
many species.

1:39

Forest more disturbed, some

shifting agriculture
along course, but not
far inland. No more
grass visible inland,
but distant visibility
becoming poorer.

1:40

Village on course. Shifting
agriculture, large sago
swamp. Many small new
clearings on low hills
back of swamp. Several
burning. Mosaic of
regrowth.

1:41

We are well inland.
Completely forested,
but some areas swampy,
forest rather disturbed.
Not so much relief.

1:43

1:44

Area of grass and
thickets surrounded by
forest, but no village
or shifting agriculture
seen. Clouds cut off visibility.
Dense forest, with some
irregular grass patches
directly on course. Visibility
poor.

1:46

1:47

Scattered areas of grass
and grass with scattered
trees + thickets.

1:48

Very large very muddy
river, with numerous
large black-water oxbow lakes
+ concentrically arranged

herbaceous vegetation
strips separated by
lines of trees. All this near
river. Clouds bad.

1:52 A large area of sago swamp,
with savanna inland
between ~~it~~ ^{swamp} and forest.
Small black-water streams,
meandering. Many old
grassy meanders.

1:57 Mixed savanna and
swamp extend some distance.
Forest well inland.

1:53 Savanna changes to extensive
grassland, from *Cola*, *Imperata*,
without trees. Swampy
forest ~~below~~ on north
side of this.

Continues some way, but
visibility mostly poor.
1:55 Same arrangement. Country
very flat. Extensive
savanna, grass brownish
green. Extensive forest in
distance inland.

1:57 Savanna now very extensive,
with swampy patches.
Extends into distance inland.
May be somewhat marshy,
but no water seen.

1:58 Some large patches of forest
mixed with savanna
inland.

1:59 Small village in savanna.

no cultivation in savanna
but many clearings in
nearly patches of forest.
Savanna giving way
to forest by expansion of
small patches of trees (*Pandanus*?).

2:00

2:01

Village in disturbed
forest.

2:02

Extensive flat wooded
area some clearing in
distance.

Large muddy meandering
river with striking
complex of oxbow lakes
and marshes.

2:05

Complicated systems
of clearing, regrowth,
sago swamps (?) apparently
following old stream meander
systems.

2:06

Some grassy areas, some
shifting agriculture, some
of forest disturbed, some
reasonably undisturbed.
Country flat. Visibility
poor because of cumulus.

2:09

Small meandering stream
Unbroken forest on flat land,
some clearings eastward,
more and more as country
becomes less flat.

2:10

Mosaic of regrowth and
clearings.
Meandering small river

- with many ok bows.
 2:11 Forest with much regrowth
 from shifting agriculture.
 2:12 This continues. Small meandering
 stream.
 Low hills with much
 shifting agriculture.
 2:13 small village. Mosaic
 of clearings, regrowth,
 forest.
 2:14 Small stream crossing
 course, probably flowing
~~with~~ south.
 2:15 another.
 Mosaic continues.
 Many small streams.
 2:16 Slightly larger stream.
 Then less shifting
 agriculture.
 2:17 Terrain becomes rough
 (Adelbert Range?). A landslide.
 A few steep clearings.
 A few grassy patches on
 high hills.
 2:19 Much clearing locally on
 hills.
 Then some rather high
 mountains. Undisturbed
 dense forest; very mixed.
 2:20 A few new clearings on ridge
 tops.
 2:21 A village on top of mountain
 much clearing nearby.
 Then more densely wooded

- mountain
 2:22 Two large villages strung
 along high ridges. Much
 shifting agriculture. Some
 scattered houses.
 2:23 Rugged densely wooded
 mountain.
 2:24 Then more clearing and
 disturbed forest.
 High peaks. Scattered
 clearings to tops.
 2:25 Another village on mountain
 top, with shifting agriculture.
 Wooded ~~etc~~ rugged mountain
 with a few new and regrown
 clearings.
 2:27 Clearings larger and more
 common. Then more, mts.
 still very rugged.
 2:28 More clearing and regrowth.
 Bananas abundant.
 Much undisturbed forest
 also.
 2:29 Much erosion and many
 landslide scars.
 Forest with a few clearings.
 2:30 Mixed meandering river.
 Clearing and regrowth
 more and more common. (See photo)
 2:31 Mountains lower but
 still rugged. Forest largely
 disturbed.
 Occ. Metrosylon in forest.
 2:35 Shifting cult. predominant,
 ridge lower.

Coconuts become abundant.
Patches of *Metroxylon*.

Low hills.

2:36

Coconut plantations,
with meandering streams.

2:37

Landed at Madang.

(b+w. photos of sago swamps.)

Around airport a complex
of thickets, sago swamps,
cultivated patches.

3:00

Left Madang.

Sparse low mangrove at end
strip. Madang is built
on a ~~small~~ peninsula
with a lagoon - very flat.
Some complicated flat islands
with ponds or lagoons, out
beyond it, enclosing the harbor.

Low flat coast with
edging of mangrove
swamps. Some small flat
wooded or swampy islets off
shore.

Large meandering estuary
just to west crossing
wide wooded coastal flat.
Apparently some sago swamps
west of it.

3:15

West of this, a few patches
of green grass scattered
on otherwise wooded
coastal flat.

Mountains inland very

3:16

cloudy
small stream, meandering
through a strip of herbaceous
vegetation. Then a coconut
plantation, then a large
stream with braided
course, also in non-wooded
slip. Then some light
green grassy ~~the~~ flat
land crossed by strips
of wood. Small stream.

3:17

Then a complex of hills,
partly grassy, partly
wooded, some new clearings
and regrowth.

3:19

Then thickly wooded hills
with less grass and
few clearings - a river
with broad gravel bed,
braided. Then wooded
hills with some new
clearings and regrowth.
Thick clouds.

3:20

3:24

holes in clouds. steep rugged
wooded mountains -
tremendous relief - Finisterne?
Dense forest. steep crests
that almost scrape plane.
No low vegetation even on peaks.

3:27

3:28

Much shifting agriculture.
Markham - Ramu Valley
in distance on right.
Village on hill.

- 3:29 Tremendous jumble of high peaks to left. Impressive landslides.
- 3:30 Flat grassy floor of Markham-Ramu V. to right.
- 3:31 Much shifting agriculture even on almost vertical slopes.
- 3:32 Extensive forests, clearing local, becoming more and more general.
- 3:33 ridges on right, sloping down to valley largely cleared. Village.
- 3:35 More rugged wooded mountains on right. Frequent landslides.
- 3:36 Lower ridges denuded. Gravelly river courses running into valley.
- 3:37 Vast grassy plain on right crossed a river with braided gravelly bed and striking river terraces.
- 3:39 Then more alluvial plain. Lower hills along course mostly burned, almost completely denuded of trees. Tremendous alluvial fans emerging from canyon mouths. Vast gravel flats. Bottoms of canyons flat and gravelly.
- 3:41 Wooded mountains, sloping down to valley. Not much

- disturbance. Very steep. High peaks with many landslides to left.
- 3:43 Lower slopes and ridges partly cleared. Great gravelly river course. Very little water. Many landslides on left. Much shifting agriculture on right.
- 3:45 Tremendous gravel bed in great canyon emerging to join Markham.
- 3:46 Hills on right almost completely denuded. Very little wood, even in ravines.
- 3:48 Mosaic of wood and grassy slopes and ridges. Another great gravelly affluent of Markham. Denuded hills. Some ravine still wooded. Much burning.
- 3:50 Hills on right denuded, mts. on left still wooded but much shifting agriculture on steep slopes.
- 3:51 Hills on right look much ~~deeper~~ here than back farther. Extensive very rough grassland. Many fires. Markham plain mostly grassy. Some cult. patches.

- some patches of woods, widely scattered trees.
- 3:54 wide braided gravelly stream bed,
- 3:55 then great abandoned U.S. airbase. Covers miles.
- 3:56 Markham river bed. Many large braided channels. Bars between either bare or grassy and bright green.
- 3:57 Bare grassy sharp hills around Lake Wanun.
- 3:58 Wooded terraces, grassy river flats.
- 3:59 River bed narrows, broad forested terraces on both sides. Little or no clearing. Much sago in large areas of these terraces.
- 4:02 Large clearings & plantations of cacao - ~~not shaded~~
- 4:05 Landed at Lae.

- Sept. 28 - Markham Valley
7 mi. above Lae -
cacao plantation of Mr. Henty.
Cacao shaded by *Leucaena glauca*. *Leucaena* reaches 4-5 m. Forms rather dense shade.
Mimosa invisa (the prickly one on Rota) used as cover crop for sweet potatoes. Rolled up and burned when ground is prepared.

p. 29

1960 New Guinea

Sept. 23 Oorosis Valley

Secondary thicket
along small stream.*Ficus subcordata* Bl.
tremendous banyan with
arching trunk-like aerial
roots. tree 30 m.*Ficus melanocarpa* Bl.
(incl *F. hollampra* Diels)
glabrous above, hairy
on lower branches*Leucaena* commonMany original forest
trees left, 30-40 m. tall,
tangled layer on ground
3-5 m. tall. Most of
big trees logged out several
years ago*Gnetum* - tree 10 m tall
10-12 cm dbh.In places this wood
is closed or almost so.
Rotans common, very large.
Also many other lianas.
Intermediate tree layers
very sparse.Shrub layer 1-3 m. tall
of slender shrubs and
tree saplingsHerb layer sparse and irregular
ferns, seedling, etc.

Walking easy.

Moro District

Ficus erythrosperma Mig.
small tree with reddish
brown bark

6° 40' S

Oorosis Creek

146° 45' E

Steep ridge thick
pole forest 25-30 m. tall
spaced 3-5 m.
irregular intermediate
layer. Solid ground
cover of *Selaginella*
about 4-5 m. tallAbove this, where ridge
is a little less steep, some
trees are taller and up
to 4-5 dm dbh.photos of sago swamp
Markham Valley,
above Lae.

Sept. 28 - Oornsia Creek
several miles above Lake
Wanam, Markham Valley
Drainage
in secondary thickets with
scattered old trees

41512 *Ficus melanocarpa* Bl.

6

(#5 chyd from 41212-22
41512-22

3 13 *Euphorbia heterophylla*
common in open places

2 14 *Pipturus albidus*
common along stream

3 15 *Ficus subcordata*

3 16 (arb.)
along stream

3 17 *Pohlia*
common along stream

8 18 *Gnetum*
common locally

1 19 *Trentepohlia*
on hanging root

3 20 *Forestia*
common along stream

2 21 *Ocotelea*
along stream

5 22 *Ficus erythrosperma* Miq.
under stony tree

small tree 8 m. tall; figs
turning yellow (one or two
ripe ones seen dark red);
lower foliage hispid,
that in top of tree glabrous
(*F. hololampa* Diels)
bracts pale at base.

shrub 3 m. tall; ripe heads
enlarged, fleshy, white.
giant banyan with
arching, flying-buttress-like
aerial roots, ~~figs~~ yellow.

shrub 1.5 m. tall; fruit immature.
corollas very pale lavender,
almost white; stems to

7 dm. tall.
tree 10 m. tall, 10-12 cm. dbh.
fruits orange, almost ripe.
(alcoholic material)

pale green

inflorescence whitish.

very tall tree, (~~tree~~ spikes
and leaves picked up from ground)
small tree 5 m. tall, with
reddish brown bark.

100

1960 New Guinea
 chgd from 41223-41235 to 41523 to 41535

41523

maesa

2

occasional along stream

same - in thick tall disturbed forest.

2

24

Selaginella

very common on forest floor

5

25

(gesner)

very common in undergrowth

3

26

(annon.)

occasional in undergrowth

5

27

Elatostemma

common in undergrowth

7

28

(annon.)

common in undergrowth

same - along stream in secondary forest.

2

29

Pipturus argenteus?

common

2

30

Laportea

common

2

31

Melochia umbellata

occasional

5

32

Solanum

one plant seen

6

33

Ficus armiti

rare

3

34

Forestia?

very local

Sept. 28 - Markham Valley 7 mi. above Lae

2

35

Lambucus

cultivated

7. N. G. Morobe Distr.

101

shrub 1 m. tall, stems green; fruit fleshy, white.

stem ascending to erect.

small shrub

slender erect shrub

1.5 - 2 m. tall.

sub-shrub to 1 m. or more tall,

tips pendent.

erect shrub ~~1.5 m.~~ 1 m. tall.

small tree or large shrub.

small tree ~~1.5 m.~~ 5 m. tall,

does not sting.

shrub 3 m. tall, flowers rose pink.

much-branched shrub 2 m. tall, 2 m. wide; corolla lobes deep purple, fruit scarlet, pendent.

small tree; figs ribbed, rose pink.

stems to 1 m. or more long, decumbent at base; calyx brilliant purple, aril of seed red.

shrub 2 m. tall, flowers cream, fruit black (some panicles larger).

Schlegel

Sept. 28 - Oomsis Creek, about
5 mi. above Lake ~~Wan~~ Wanam

41536

(braz.?)

1 rare in open gravel along stream

Sept. 29 - 6 mi. out of Lae on Busu River Rd.
in open cleared land, near
thickets.

2

37

Ficus variegata

Sept. 29 - 8 mi. out of Lae,
Busu River Bumaiung Mission

2

38

Ficus robusta

edge of thicket, small stream com.

2

39

Wedelia biflora (L.) DC.

climbing in roadside thickets

Sept. 29 - Between Busu and
Bufo Rivers, about 10 miles out
of Lae.

3

40

in tall *Imperata* grassland

Cycas circinalis

scattered, apparently
frequently burned, but
not killed, as trunks
are somewhat charred.

1

41

Euphorbia

occasional

✓

42

Ipomoea

common

2

43

Mussaenda

common

erect, corollas blue,
throat closed.

large spreading tree 12 m. tall
figs on tubercles on larger
branches, green, filled with
brown liquid.

large tree, 20 m. tall, 3 dm. dbh.,
leaves up to 3 dm. wide or more,
sterile.

scandent, several m. long;
heads yellow.

trunk 1 m. tall.

erect.

twining, flowers white, anthers
ovate, straight.

shrub 2 m. tall, enlarged
calyx lobe white, corolla orange-yellow.

Sept. 29 - Busu River Road.

Wide strips of *Imperata* grassland alternating with wide strips of rather altered forest.

near Kumaiyung Mission
- Tangled thickets to 5-6 m. high - *Mallotus*, etc. with scattered large trees persisting from forest.

East, between Busu and Anfu rivers, open *Imperata* and thickets. *Imperata* burned occasionally. *Imperata* here very dense and reaching 2 m. tall. *Cycas* scattered through it, about 1-1.5 m. tall. Several young male cones seen, no female ~~or~~ carpels.

Deep drains across the flats, obviously artificial. Coarse gravel soil.

No cycads seen west(?) of Busu R. Here there are trees scattered through the grassland. Forest strips apparently follow ~~the~~ river.

Sept. 29 Markham Valley, by road.

Erap River bed - broad gravelly flats with some patches and tufts of *bacharum spontaneum* and *Imperata* a few smaller grasses.

Tridax procumbens the most abundant plant, *Tricholaena rosea*, *Euphorbia hirta*

near ~~the~~ present channel *Tephrosia purpurea* quite abundant.

Gravel quite sandy. *Pantherospermum*, *Rhynchosia* common locally.

At foot of hills nearly, at old Naramonke Village, the gravel fan is cut by a ~~very~~ shallow ravine. Here is said to be an old elevated reef-limestone terrace. Searched but could find nothing but bedded gravel and sand. One boulder in ravine bed (sample 2) may be limestone. We did not find the place from which it came.

(cf. on p. 108)

Sept. 29 - Erap River Bed,
Markham Valley, Morobe Dist.
in open gravelly river
flat, very sparse vegetation

41544

Dimeria ciliata

rare

2

45

Tephrosia purpurea

locally abundant

2

46

Rhynchosia minima

local

2

47

Cantharospermum scarabaeoides (or
occasional

Sept. 29 Old Naramonke Village,
foot hills near Erap River Bridge
in sparse secondary scrubby
vegetation on ^{abandoned} village site

6

48

Ficus adenosperma
edge of ravine

det. Corner.

49

3

49

*Sida villosa*abundant in dry ~~openings~~

2

50

Melanolepis multiglandulosa
common along ravine

3

51

(Euph.)

local

4

52

Abutilon

local

4

53

Mallotus philippinensis
local along ravine

2

54

Macaranga tanarius
local along ravine

spreading tuft, ^{culms} decumbent
at base
erect, branched; flowers
bright purple.
twining in mass; flowers
yellow.

(*Atylaxia* s.) stems decumbent
to ascending, tending
to twine

spreading
scrubby tree, 5 m. tall,
figs green. (form with
spreading hairs called
F. chaetophora Warb.)
erect, sparsely branched,
1-1.3 m. tall, flowers pale
yellow, orange in center.
large shrub;
inflorescences pendent.
large shrub or small
tree
shrub - 3 m. tall;
flowers dull orange - buff.
large shrub or small tree,
leaves glaucous beneath; fruit brick red.
shrub, leaves glaucous
beneath.

#5 chad
pump
41255-7
D
41555-41557

Sept. 29 - Markham Valley
above Lae, at edge of
grassland
in roadside thicket

41555 *Euphorbia heterophylla*

very common along road.

3 56 *Ficus infecta* ~~*virens*~~ Ait.
(*F. infectoria*) det Corner
in roadside thicket

Sept. 29 - Bupu River near Lae.

1 57 *Ficus glaberrima* Bl. det. Corner
(brought in by E. J. H. Corner)

(Ctd. from p. 105)

This has been the site of
a village, recently enough
so that rusty galvanized
sheet iron is still lying
around. Loose thickets cover
the area, surrounded by
Imperata, this recently
burned, but sprouting.

The grasslands in this
part of Markham Valley
are largely *Imperata*,
growing to almost 2 m.
tall locally, stiff and
harsh. On very gravelly
areas *Themeda australis*
(banyan grass) is
dominant, with some
other grasses. Locally in
the *Imperata* are tufts and

around old air strips
if U.S. Base
Calanthe inflata
is abundant.

erect.

banyan, sterile.

banyan; figs turning
black when ripe.

patches of *Oplismenus*
and of *Paspalum*
spontaneum.

Toward Lae this grassland
passes rather abruptly
into patches of thicket,
then into old secondary forest,
with *Artocarpus altilis*
quite common. Many
large-leaved secondary
species, such as *Macaranga*
aleuritoides, *Rapanea* sp.?,
Ficus robusta, *Macaranga*
tanarius, banyans,
bananas and *Heliconia*,
Zingiberaceae, etc.

Womersley says this is
doubtless second growth on
old native garden sites.

Sept. 30 - air trip Lae to
Port Moresby. (DC-6B)

9:35

south side of Huon Gulf.
largely forested down
to sea level. Some

9:46

clearings on flat, at
base of mountains.

9:47

Clearings on lower foothills,
Pasee Pt. (island) - wooded.

9:48

Large grassy clearing
bet. Pasee Pt. and Salua.

At Salua a big lagoon
cut off by a bar from the sea.
Bar wooded.

Valley beyond Salua ~~is~~ -
floor mostly cleared.
Small wooded island.

Along this coast there
are long narrow beaches
lining the bay, and
crescent shaped shores
between points.

9:51

3 small islands, wooded,
with very narrow fringing
reefs.

9:53

A large island (Lasanga I.)
completely wooded.

Coast mostly wooded,
but small clearings on
lower slopes here and
there.

9:54

Turned inland.

Fai-awa River has
considerable flat grassland

or swamp in its lower valley.
Upper part, at foot of
mountains has bare
gravel bed.

9:59

Interior on northeastern
slopes is solidly forested -
several red landslides seen.
Larger streams have
gravelly beds.

10:00

Forest on high ridges (Bumutan
Mts.)
looks rather scrubby.

Slopes are marked by gray
steep-toned scars from cleared
forest.

10:03

Waria Valley & Ria (?) Valley
partially cleared, a
mosaic of grassy areas
and forest (Kodi).

10:06

Owen Stanley Range, largely
cloud covered. Lower slopes
densely forested.

10:07

Clouds.

10:11

Hole in clouds - Forest, but a
sizeable area of flat brownish
green grass (perhaps swamp) or alpine
grassland? Hole too small to
get much idea of topographic relation.

10:20

Then solid clouds again.
Well to right some thinning
in cloud shown forest.

We then made a sharp turn
to left. Clouds again.

10:22

Coastal lowland
Mangroves and rice

saline flats, near coast,
with a strip of brown
grassland.

Back of this low hills
and almost level ground
with green grass, some
patches of woods, intricately
meandering streams,
oxbows and abandoned channels.
Woods seem semi-deciduous
in part (or Casuarina or Eucalyptus),
some mixed green and
light yellow-green.

10:26

Hills with brown Eucalyptus
savanna, ravine bottoms
with dense green forest,
(One or two ponds), forming
an intricate mosaic.

10:32

Extensive burned area.
Many roads winding
through these hills.

10:35

All savanna, ^{little} gallery
forest. In places trees are
close enough to be called
open forest.

10:30

Landed at Port Moresby.
Chloris inflata common
around waste spots.

Also Euphorbia prostrata

Portulaca oleracea.

Alternanthera (prickly one)

Cynodon dactylon

Euphorbia pilulifera

Gomphrena sp.

Cenchrus echinatus

Port Moresby - Townsville
left P.M. at 11:38.

Some mangrove in
indentations.

On outer coast a broad
fringing reef with
some deep parts.

Outside this is a broad
barrier reef ~~extending~~
a deep lagoon (photo).

12:40

Asprey Reef in distance
to right - like a large
drowned atoll, open with

1:13

Bougainville Reef - a perfect
small drowned atoll with
rather broad reef flat, no lagoon,
shallow lagoon. Some
surf breaking. Color of
reef flat tan (photo taken).

1:34

Several small patch reefs
far in distance to right.

1:36

Many larger patches
forming 2 or 3 interrupted
rows. One large patch
has the form of a drowned
atoll. Most of them
like pieces of barrier reef.
No islets. Most patches

curved convex to south
southeast (from photo, bad)

One patch on outer edge
broken into many small pieces.

1900

Australia

brown photos

Many of convex patches.

1:49

~~1:48~~ 2 small sand bars on inner parts

1:50

An angular ~~broken~~ section of barrier seemingly broken into many small segments is the northern side of a deep pass.

Mainland can be seen in distance.

1:57

South of pass an atoll-like complex, evidently completely submerged, crossed by conspicuous striation.

at least in a n. s. direction.

1:55

An irregular patch beneath course, also atoll like and with radial striations.

1:56

A series of at least 5 high rugged dry-looking islands in middle distance to right. Apparently mostly brown grass, little woody vegetation except on largest.

Several other very small on other side of larger island.

Fully half of or 3/4 of largest island covered by forest or scrub. Some of lower slopes grassy.

2:03

Small island, long axis perpendicular to course, sloping to both sides, grassy, to right in middle distance.

Queensland

Small group of ^{principal} higher, grassy islands, in distance to right.

Mainland coast in distance has long sandy beaches, pinkish tan. Mountain back of a narrow coastal lowland strip.

2:07

Beach or sand flat very broad near Townsville, (low tide). Considerable

complex low mangrove flat, dark green low scrub with lighter gray-green trees scattered over large areas or forming closed stands. - winding channels or estuaries.

Back from coast a few low savanna covered hills and great flats with open scrub forest, varying to closed forest or savanna grass dry and brown. Landed at Townsville.

2:10

Townsville - Brisbane

3:04

left Brisbane (to fly at 16,000')

Large island opposite Townsville similar to hills on coastal flat - rocky.

Large saline area, without vegetation and areas of

Mangrove along estuaries and winding tidal channels north of Townsville.

Conspicuous beach ridge, brushy. Back of it a bare strip of sand or salty mud, no vegetation.

3:10 Complex of salt flats with winding channels lined with low mangrove seaward and landward. High rocky hills covered by drab open forest, the grass dry and brown.

3:13 Complex of salt flats and mangroves continues, greatly expanded, now open to sea, running inland along stream, changing to green cultivated fields only a small triangular strip, surrounded by dry grass and savanna.

3:15 a great dry plain with winding channels locally, savanna salt flat grasslands.

3:17 To left, a great arching sand spit, looking to north, to right, a cultivated flat plain, dry savanna inland with a great

3:18 sandy river bed crossing it toward sea but swinging

south. Between this and sea a complex of savanna and wood, with a belt of lagoons, ^{estuaries} and bars along coast. Course follows ^{just} to left of this river till it swings left

3:21 and splits into several channels, separated by extensive mangrove swamps. Cultivated ground inland replaced by a complex of winding channels, salt flats, ^(b.w.) mangrove swamps, etc. with extensive dry savanna inland.

3:23 Dry hills farther inland. A road parallels coast in this savanna plain.

3:25 Mangrove complex practically pinches out. Parallel sandy beach ^(b.w.) ridges with open scrub. More small estuaries with mangroves.

3:26 Dark brown ^{savanna} grassland with some dark green patches of scrub or forest inland, thin gallery wood along stream course. A few small dry hills with thin scrub.

3:27 Course following coast
3:28 some isolated rugged

mountain masses inland.
otherwise brown savanna.
sandy stream courses on
coastal flat.

- 3:30 savanna assumes a purplish
or reddish cast. Many
scattered mountains
sticking up from plain.
some very rocky.

Barrier reef so far out
as to be out of range of
sight.

- 3:32 crossed a sandy almost
dry river, a little cultivation
along its ~~banks~~ bottom lands.
Otherwise a monotonous
purple-brown savanna
with scattered low hills.

- 3:35 Plain becomes slightly
dissected locally. One
large hill with closed
forest, dark green, on it.
Stream courses have
scarcely any development
of gallery forest.

- 3:36 Larger mass of high hills,
somewhat wooded.

To left a large peninsula
dry, hilly, looking to
left, enclosing a bay
and some mangrove swamps.

- 3:38 Densely wooded hill rising
from savanna.
Visibility becoming poorer.

- 3:44 Very irregular coastline
to left, dry and hilly, with
many rugged irregular
islands. Some of hills
dark and brush covered.
Islands bare and tawny.

Many more islands.
To right continuous savanna
except for cultivation
along streams.

- Whitsunday passage on
left, with many high
islands. No reefs
around these islands,
a few sandy beaches in
concave parts of coasts.
3:46 Somewhat hilly country
inland, small estuary
with large complex of
mangrove and salt flats,
(b.w.) cultivation up the valley.

- 3:47 Larger complex of estuarine
(b.w.) and mangrove swamps.
More islands to right.

The salt flats a bar near
seems to form a regular belt between
mangrove and savanna (b.w.)

- 3:50 A round bowl-shaped
caldera with a conical
peak inside it (b.w.)

- Many fires in hills.
3:52 Flat cultivated valleys
separated by low dry ranges
of hills.
Crossed a fair sized river.

- 3:53 A few more islands to left, sandy coast, and a curious "drifting sand" appearance in water.
- 3:55 Large estuary - mangrove complex, cultivated valleys and low open-wooded hills inland. Scattered higher mountains farther inland.
- 3:56 Woods on low hills becomes more dense, closed. A couple of patches of reef in the far distance to left.
- 3:57 More estuaries, salt flats and labyrinths of mangrove. Cultivated valleys and wooded hills inland. Fire.
- 3:59 Flat ground with open forest. Meandering streams with gallery forest of mangrove!!
- 4:00 Wooded hills; some cultivation well inland.
- 4:01 Scattered small high islands, dry and brown, in distance to left.
- 4:02 Estuaries, mangroves along coast, large tidal sand flats (b.w.) Many scattered small dry islands off shore to left. Most of coast lined

- with mangroves and small winding estuaries, cultivated valleys behind among wooded dry hills.
- 4:06 Irregular flat wooded island near shore, scattered dry higher ones out farther, out to a considerable distance.
- 4:07 Coast lined by extensive tidal mud flats. More flat wooded islands, with surrounding sand flats.
- 4:08 Small dry islands well off shore to left.
- 4:09 Many estuaries and extensive saline flat and mangrove complexes along coast. Course is well outside coastline.
- 4:10 Large low ~~hilly~~ islands and low ~~hilly~~ peninsulas with extensive mangrove swamps, ~~some~~ looking north, separated for some distance from mainland by a tremendous shallow sandy estuary with braided channels, no vegetation on sand. Some mangrove along coast.
- 4:11 Many irregular islands far out at sea, visibility poor.
- 4:12 To right a vast plain with savanna, very narrow gallery along stream, scattered rugged

hills coming up out of the plain.

Visibility very poor.

4:24

crossed a fairly large river. Well inland. Vegetation a mosaic of patches of wood and savanna - patches tending to be angular. Small ponds or reservoirs scattered sparsely over plain. Some cultivation near river.

4:27

Rockhampton.

To northwest a complex of ponds and lakes.

Many fires in hills. Some small dry island in distance to left.

Plains, ^{savanna with} narrow gallery woods, to right; some slight relief, low mountains in distance. Meandering streams. Savanna dark brown, but banks of stream lined with bright green.

Large muddy meandering estuary with ~~intertidal~~ tidal channels and mud flats, dendritic branching side channels with mangrove scrub, otherwise extensive salt flats.

4:31

Some salt evaporating pans,

red in color.

Hilly country inland. somewhat wooded, savanna on flatter ground.

4:34

Extensive tidal flats with mangrove-lined channels to left.

4:35

Dry wooded hills to right. Some cultivation on flat ground. Dry hills grassy to ~~so~~ thinly wooded.

4:37

Complicated lagoon ^{a sound} system to left. Large offshore island a very broad bar extending south, separated from peninsula to north by passage. Sound is open to south.

4:40

4:41

Wooded hilly country quite complicated, to right.

4:42

Another lagoon system, also open to south.

4:44

More lagoons, very complex system.

This seems to be a drowned coast-line complicated by bar formation. Some hilly ground on peninsulas, generally wooded.

4:46

Inland a mosaic of hills and flat ground, hills wooded, flats grassy with gallery woods along streams. Very hazy.

4:47

Hilly country to left,
behind a straight coastline.
Wooded hills and open
valleys to right.

4:51

^{several} Mountain ridges
parallel to course ^{far} inland
Course very near coastline.

4:53

To right rolling wooded
country, small open areas.

4:55

Numerous clearings.

Course just inland from
straight coastline.

Visibility poor because of
haze. Many fires.

4:56

Crossed a fair sized river.
Cultivation along it.

Then solid forest, then
more cultivation.

Coast a bit more to left
land near coast mostly
cultivated.

Crossed large winding river.
a little cultivation to right.
Mostly flat forested land to
right of course, cultivation
to left.

4:58

A small but deep estuary
on left. Then wooded
land to coast, little

5:00

cultivation. Some green
cultivated patches to right.
Mostly woods.

5:02

Several estuaries on left
mostly wooded country.

5:03

Then coast swings away to
left to form a peninsula,
mostly cleared and
brown, with a hooked
cape pointing south.

5:05

Visibility now to right
because of haze.

5:14

No visibility to left, either.

Considerable forest.

Lagoons to left, inside
coastline.

5:15

Morais of yellow grassland
and forest to right.

5:16

Practically no visibility.

Dry grassy ^{low} hills.

5:22

Estuary with mangroves,
and a large patch of forest,
just north of Brisbane.

5:23

Over Brisbane.

Oct. 2 - Auto trip north from
Brisbane
Mamble Bay
Avicennia cut back and
coppicing from stumps, *Excoecaria*
Woody Pt.

Laterite beds at sea level
being cut into by waves.
Profile (photos) podzolized
at top, then a mottled light
gray and red nodules
and columnar concretions.
Under this a mass
of consolidated concretionary
iron oxide (sample 3)
forming an irregular
and incomplete bed,
interspersed and irregularly
interbedded with a white
kaolin. This seems
to be rather soft,
hardening when
exposed to air. Large
chunks as well as
reefs at high tide
level and intertidally.

At top of beach *Tetragonia*
Bromus, *Phalaris*, *Lonicera*,
Hypochaeris, *Baccharis*
laevifolia.

Hibiscus tiliaceus planted.
Casuarina equisetifolia
Bambusa, *Cyrtosperma*

Red Cliff - laterite section
with ironstone reefs
extending out to sea
at least half a mile.

Hibiscus tiliaceus, *Callitris*
columnaris, *Eucalyptus robusta*,
Pinus elliotii planted
along roads.

Bush vegetation with
an open to closed tall
shrub layer of *Acacia*,
scattered tall *Eucalyptus*
tereticornis, ~~and~~ dry grassy
herb layer. In some areas
the *Eucalyptus* is close
enough to form an open
forest 20-25 m. tall.

And some *Eucalyptus*
micrantha

Some areas recently burned,
some showing signs of
earlier burning.

In these open forest areas
little *Acacia*. Locally
a shrub layer of young
Eucalyptus.

Seasonally inundated
areas have a 10-15 m. open or
semi-closed forest of *Melaleuca*
leucodendron. Slightly
higher ground with open
Eucalyptus forest of several
types. Locally with
Xanthorrhoea.

Burpengary Creek has dense low gallery forest of with "rain forest" species (non Eucalypt).

Sandy flats with *Casuarina toulosa* and some Eucalyptus.

The Eucalyptus seems to stand burning very well after it has passed seedling and small sapling stages.

This area generally sandy or loamy, gently rolling. Pteridium locally common on sandy areas. Station Creek.

Eucalyptus pilularis

Banana plantation, rather wind-beaten.

Coboolture River. *Avicennia* and *Ficus macrophylla*.

Lagoon Cr. - sparse mixed gallery forest.

Open Eucalyptus with tall shrub layer of *Leptospermum flavescens*.

Generally open Eucalyptus forest trees uneven in size & height, very mixed mostly *E. intermedia*.

Six Mile Creek. - Tall Eucalyptus gallery forest, heath on small terraces.

Closed Eucalyptus forest with grass.

Beerburum - plantation of *Pinus elliotii*. Scattered very abrupt butter - trachyte plugs. On side of one called Beerburum is a patch of "rain forest" a moist broad-leaf evergreen forest.

"Glasshouse Mountains."

As called by Capt. Cook.

Closed Eucalypt forest, recently burned through by ground fire.

Photo of Mt. Tibrogargen, one of glasshouse Mt. (The old man) gentler slopes covered by a scrub of *Eucalyptus phaeotrys*, *Tristania conferta*, *Eucalyptus trachyphloia* about 10' tall.

Many interesting plants.

Each of these plugs has a different trachyte.

Two of them have *Micrera*, dwarf grass with spiral lvs.

Coenobouria. *Coenobouria*

Small swamps with a tall *Scirpus* and *Melaleuca*. Pineapple.

Citrus groves. Patches of ragged Eucalyptus forest, open to closed.

Patches of "Wallara" or heath. Semi-open Eucalyptus forest.

Mellum Creek

Rolling area of isolated hills.

with ragged forest with heath understory.

Flat sandstone or shale. Open forest of fair sized trees, has been protected from fire - has a heavy ^{clay} shrub layer 3-4 m. tall, replacing the grass or heath layer.

Dense *Eucalyptus* forest with understory of small trees, or locally without it but with ground cover of ferns.

Mooloolah River.

Much ~~land~~ recently cleared land. Ponds.

Near ^{Sippy} Lippy Cr. locally several sorts of palms in some abundance in forest.

Crossed a small basalt flow overlying sandstone, weathering to a dark red soil. Formerly covered by rain forest. Now all cleared for agriculture. Commercial ginger culture. *Baccharis halimifolia* very common weed. *Solanum mauritianum* (S. *auriculatum*, S. *cartesianum*) occasional.

Coastal plain, ~~now~~ mostly covered by forest. Dense strip along coast. *Pinus australis*.

Mooloolah

Coastal strip, was covered by small forest - winter cyclone of July 1954 killed practically every tree. Died slowly, probably from driven salt spray.

~~There~~ Broad wave-cut bench at about high tide level.

Intensive resort development.

Photos ^(had) of low bluffs and wave cut platform ^{in grey sandstone}. Bluffs ~~as~~ were covered by low forest till 1954 cyclone. Now only a few stumps & scattered *Banksia integrifolia* trees.

Carex in wetish sand ledge at top of beach and spreading down onto top of beach itself.

Estuary of Mooloolah River - lined with *Rhizophora*, sand flats ~~at~~ 1-2 m. above water, lower layers black, semi-consolidated (sample 4). on flats at low tide *Avicennia marina* scattered with abundant seedlings. Old trees twisted about 5-6 m. tall. Pelicans and black swans. (photos - had.)

Open Casuarina - *Melaleuca* forest on sand flat. ^{Melaleuca}

Cotton Tree Beach, mouth of
Maroochee ~~Beach~~ River

Row of dunes back of
beach, about 4 m. high
covered by *Casuarina*
equisetifolia, *spinifex*, ^{ici folia}
Vitex trifolia var. *simplicifolia*
Stephania, *Hibbertia* ^{sarmentosa}
Banksia integrifolia, ^{sarmentosa}
Oenothera drummondii.
Ipomoea pes-caprae (b. n. photos)

Upstream on left side
of Maroochee R. some cleared
land, some *Eucalyptus* forest,
on slopes, moist ~~at~~
draws with "wet sclero-
phyll forest" with *Anchonts-*
phoenix, *Livistona australis*,
etc.

Toward ~~Maroochee~~ ^{Palmywood} - Citrus grove,
Pineapple patches, sugar cane, etc.
Patches of *Eucalyptus* forest.
Near Palmywood abundant
pineapples.

Toward Montville
Citrus grove, pasture, *Lantana*
^{CAMARA} *camara* thickets.

Large *Eucalyptus tereticornis* ^{conus}
on flats.

Hilly sandstone slope
up to basalt plateau
mostly cleared, patches
of thin *Eucalyptus* forest.
Looking back, valley seen

to be mostly cleared.

Higher sandstone slopes
mostly well wooded.

Bananas, papayas.
Thickets of *Rubus ellipticus*,
Lantana camara, *Macaranga*
tanarius, etc. on upper
slopes, fewer trees.

On top, red soil, low
thickets of *Lantana camara*
Rubus sp. (aff. *argutus*).
^{introd.} *Platanus* much

dissected. *Baccharis halimifolia*.
^{Teosmaria capensis} *Teosmaria capensis*, ^{Buddleia} *Buddleia*,
^{rupestris} *Ligustrum lucidum* planted
as windbreaks.

^{Chaucaria} *Arctostaphylos* *bidwillii*
native here, rare now.
Hills mostly completely
clear, in *Pennisetum*
clandestinum pasture.
A few scattered *Araneas*
in pasture (photos - mod.
b. n. - firing b. n. roll.)

One small patch of rain
forest that originally covered
whole area, 2.5 mi from
Maleny toward Landsborough.
Very mixed.

On lower slopes thick
Eucalyptus forest, just
burned, still smouldering.
Mostly *Eucalyptus propinqua*.
Apparently the large trees

resist very well but seedling & small saplings as well as all other undergrowth killed.

Out of Brisbane on Petrie Road, beyond Petrie, mangifera indica, Callitris, & Pinus ^{TAXODIUM} ~~elliottii~~, & Taxodium distichum

planted along roads.

Bauhinia variegata, Albizia

Albizia lebbek also common.

Flindersia australis,

Brachychiton acerifolium.

(this in flower - bright red,

leafless). Arecastrum

romangoffianum, Steno-

carpus sinuatus.

The Eucalyptus forests in the lowlands north of Brisbane vary from quite open to closed, are mostly of rather straight trees up to 20 or 25 m. tall, mostly not very large, but ranging up to 3 dm. or even more dbh. A number of species are represented ~~over~~ in ~~the same~~ any one stand, and the composition of the stands varies greatly from place to place. Almost all of these forests show obvious signs of fire, and

many of them of very recent fire. It is clear that they are burned through by ground fires most years, killing most of the seedling reproduction and keeping any significant shrub layer from developing. Locally a layer of tall shrubby Acacia occurs. Generally there is a grass layer on the ground.

In certain places forests have been protected from fire. Here, depending on the soil, a dense heath-like myrtaceous shrub layer has come in, crowding out the grass. In some areas it may be of tree seedlings ^{and saplings}, with a ground layer of ferns, or grass.

Mangroves run far up the river ~~as~~ ^{estuaries} as a narrow fringe, widening near the mouths to swamps. Mangroves are said to occur south to Victoria.

Tropical fruits and ornamentals are commonly raised, in spite of temperatures to 28°F.

Along the coast is a belt of dunes of very fine sand. In places there are narrow, merely separating the mangrove swamps, salt meadows, and flats from the sea. Elsewhere, as at Moreton Island, these dunes are enormous - piled, it is said, to a thousand feet, mainly stabilized by vegetation. Where this is destroyed, as by resort development, the sand blows very badly. This area is very rapidly being developed for summer cottages.

#5 chgd from 41258-61
to 41558-61

Oct. 2 - Mooloolabah, 60 miles north of Brisbane

- just above beach
- 41558 *Eragrostis australasica*
common in narrow sandy beach back of top of beach
- 3 59 *Lobelia*
abundant in seepy place at foot of cliff
- 1 60 *Dianella*
rare in low bush at top of cliff
- 2 61 *Emilia sonchifolia*
common generally, these from crevices in sandstone cliff

This coast is generally of a bedded gray sandstone with coalified fossil wood inclusions. Along the shore this is planed down to a broad somewhat irregular bench up to many yards wide, the outer margin in places raised a meter or so above the general level, and broken into great blocks, some of these undercut and collapsed. This platform lies generally at about high tide level. Back of it are low cliffs, to 5-6 m. high, cut in the sandstone by waves. On top of the sandstone are sandy recent deposits.

2 m.

dense tufts, culms prostrate.

3 m.

~~the~~ prostrate with ascending floriferous branches, corollas purple, flowers dull sky blue

6 m.

5 m.

somewhat fleshy, somewhat glaucous, flowers slightly exserted, purple.

- 41562 (leg.)
3 common on ledges on sandstone cliff
3 63 Vellia
common at base of sandstone cliff

- 1 64 Solanum nigrum L.
occasional on sand flat

- 1 65 (Euph.)
rare ~~at~~ base of cliff

- 2 66 Pimelea
common on sandy slopes

- 2 67 Lobelia purpurascens
~~very local~~ on earth bank at foot of cliff

- 4 68 Carex
in grass on sand ledge, spreading onto beach

* Oct. 2 - Mooloolah River,
just south of Mooloolabah, Co
on sand terrace ~~at~~ along river.

- 2 69 (Xanth.)
very local

- 1 { 70 (Xanth.) ♀
1 { 71 rare ♂

- 4 72 Melaleuca quinguenervis
abundant in open forest

- 4 73 Eucarpus cupressiformis
occasional in open forest

- 5m matlike, much branched
shrub; flowers yellow.

- 2m. ↓ rosettes flat, scapes
procumbent, flowers bright yellow
~~spotted~~ within, lobes with
purple stripe without, 3rd lobe
spread fanwise, 2 smaller
upper ones erect.

- erect, stems blackish
below, with small processes
on angles; flowers white,
fruit immature.

- caudices with ~~old~~ charred
stems, new branches
with white flowers, pinkish
without.
very prostrate.

- rhizomatous, culms
emerging from sand.

~~2m.~~
miles north of Brisbane

- 2-3m. in dense large clumps.
edges of leaves sharp.

- 4-5 inflorescence somewhat
procumbent, ~~flowers~~

- tree 18m. tall, bark papery,
in layers.

- diffusely branched small tree,
leafless; flowers yellow-green.

140

1960 Australia

#5 obs from 41274-82 to 41574-41582

same - thicket on river bank

41574

Elaeocarpus

2

common

3

75

Dodonaea viscosa

occasional

78

same - in mangrove swamp on mud flat

3

76

Rhizophora mucronata?

locally common

4

77

Aegiceras corniculata

abundant

~~Oct. 2 - Mooloolabah~~

2

78

*Zostera*on mud in river, still
shallowly submerged at low tide,
forming dense beds.

Oct. 2 Mooloolabah

1

79

Sporobolus per-capras sp. *brasilensis* (L.) van Dact.

common at top of beach

Oct. 2 - Maroochydore, 60 miles
(Cotton Tree Beach) north of Brisbane

3

80

Oenothera drummondii

locally common

4

81

Hibbertia samentosa

common

Oct. 2 - Montville, 60 miles n. of

3

82

Rubus

on basalt plateau, common

Queensland

141

2 m.

small tree.

shrub 3 m. tall.

0 m.

shrub 2.5 m. tall,
with arching aerial roots.
Inflorescence is very
short and stout for
R. mucronata, but is twice as
shrub 1.5 m. tall; flowers
white, petals recurved.

Van Dact.

(L.) van Dact.

2

prostrate; sterile.

4-5 m.

prostrate, forming
loose mats; flowers bright yellow
prostrate, forming
a loose mat, flowers yellow, petals caducous.

Brisbane

? seed

high arching canes forming
dense tangles, flowers white.

Oct. 4 - flight Brisbane - Gladstone
in DC-3, (left side.)

8:15

Left Brisbane.

east of airstrip, some small
watercourses are thickly lined
with small mangroves and
there are mangrove swamps
about the small estuaries bordering
the bay. Most of these are also
associated with salt flats.

with low vegetation or none at all.
Some scattered mangroves in shallow
margin of Moreton Bay, south of
a residential area. North of this, inland
of a causeway there are extensive
mangrove swamps and tidal channels
off a large branched creek. Almost
uniformly, between the mangroves
and the higher, cultivated or Eucalyptus
covered land, there is a belt of bare
mud flat or salt flat of varying
width, with no vegetation (or very low?).

This is definitely tidal - partly wet at
this time. This is partly gray, but
mostly purple (halconia or tundra?),
very locally green. The country

to the right is generally covered by
closed or somewhat open Eucalyptus forest.

8:25

Here rather extensive grassland
with a few scattered trees and cultivated
patches, mangrove-lined channels,
the mangroves very narrow. Clouds.

8:28

Forest, but being cleared in places, some
young citrus groves. light gray soil. Clouds.

8:31

one of
flats
lower?

8:36

forested country with scattered
clearings, and a high sharp
pinnacle of gray igneous rock,
almost bare. Clouds.

Hilly country, largely cleared
and grassy, scattered trees,
some cultivation on top of a flat
topped ridge with red soil (basalt area?)
otherwise the soil seems pale
or grayish.

8:38

Flat tops of hills here and there,
with red soil, mostly cultivated,
but one in wooded area - from here
large wooded area, less grass.

8:39

8:41

Country largely cleared
and in grass, savanna-like,
some patches of wood, little cultivation.
continues the same but ravines
have conspicuous gallery wood. A
large patch of forest, mostly
quite closed, on course, grass in
middle and far distance to right.

8:46

8:48

Hills in this forest have low, dense or
sparse scrub on top.

Then mostly cleared and grassy.
Some sparse scrub on rocky hills.

8:50

8:51

Generally savanna-like hilly pasture.
Forest but too cloudy to see extent -
judging from holes in ^{clouds} fairly extensive.

8:53

8:54

8:55

9:01

Hills with savanna, sparse
scrub on tops, some patches of wood.

Some scattered cultivation, generally
open forest, red soil on tops of low hills.

Open forest on rolling low hills with dense gallery
along streams, savanna in distance to left.

9:10-9:33

same but little of dense gallery forest, marshes ^{a small} along old stream courses.

9:33

Cultivated area near meandering river with narrow gallery wood on banks, crossing course at an ^{acute} angle from left rear. Some patches of ~~wood~~ open forest.

9:44

Fair sized town ^{Maryborough} on larger river almost paralleling course, then bending sharply left. Then generally open forest again, with denser gallery along stream courses. Rather frequent roads.

to 9:13

When cloud cover becomes general.

9:14

A few holes show of open forest but with irregular patches of white sand with sparse scrub.

9:15

9:20

several small holes showed open forest.

9:25

Cultivated land, but only a glimpse through a hole in clouds.

9:30

Just over sea.

Mouth of large estuary, with some salt flats, mostly forest behind, some evidence of dune ridges. A spit just north of estuary, hooked at tip, enclosing a lagoon along the otherwise straight beach.

9:32

Another estuary with mangrove, shifts enclosing a long mangrove swamp along coast north of lagoon and also somewhat south. Then a few parallel beach ridges. Country generally wooded back of beach.

9:34

A large estuary, with fairly extensive mangrove swamp separated from sea by spits. A little clearing, generally woods.

The usual salt flats between mangrove and woods.

9:37

Elongate lagoon with some mangrove, separated from sea by spit except for a narrow mouth, a small estuary, very densely meandering through mangroves to ~~with~~ north end of lagoon, then back into ~~the~~ country.

9:39

Extensive bloom or floating dust on sea. Irregular large areas of savanna in distance, open wood near sea, broad sand dune belt with open to closed wood near sea.

9:41

generally open forest behind dune belt but some patches of white sand with scrub, some meadowland, some dense forest in strips of irregular width just back of dunes.

9:43

High wooded hills somewhat inland, generally open forest.

9:44

Hills with open forest. Then a large complicated estuary lined with mangrove and salt flats.

9:45

Tract of almost closed forest, about half the trees dark green, half a blue gray. Then another estuary ~~with~~ meandering in wide mangrove swamp trending north. Dunes between it and beach. Tan colored sandy beaches all along this coast.

9:47

Another estuary system extensively ramified inland, the closed gray, and dark green forest between it and dune belt.

9:49

The estuary system just noted merges with a very extensive complex of mangrove swamps and slightly higher gray and dark green woods and salt flats, then either bare or with sparse herb vegetation, this varying with open water sounds partly cut off from sea by sand islands, then wooded. (Kod. photo of the striking salt sand flats that characteristically separate the mangrove from the higher forest. Possibly this is a function of the large tidal range here, causing alternate dessication and flooding in this belt.

9:55

Extensive straw-colored streaks and elongate patches of bloom or floating dirt.

Whole coast here has wide belt of lagoon and mangrove swamps with winding channels, separated from sea by rather wide sand islands, or more locally by narrow spits and sand ridges. All rather densely wooded.

9:58

Much bloom streaking sea (photo)

9:59

Small town on point at mouth of estuary or interruption of mangrove belt by a strip of slightly higher ground that comes down to sea between two

10:00

estuarine. The north one with a very extensive system of tidal channels, salt flats and mangrove swamps.

10:01

Rather bulky, open forest country along course which is back of wide bare salt flats just south of Gladstone. Back of Gladstone low hills, mostly open to semi-open forest, some clearing. Complicated meandering system of estuarine mangrove swamps and salt flats between town and airport. Eucalyptus trees on hills light yellowish green, mostly.

Gladstone - tide range 14' av. Paulson.

Near dock a sharply dipping series of beds of a very pale light fluffy clay or highly weathered shale with some cherty beds, much shattered and weathered, the whole completely shattered by old faults, these filled with a black heavy mineral, probably manganese dioxide (sample 6). The chert layers are irregularly brown, stained with iron oxide, but with irregular black masses of manganese dioxide (?). The whole is weathered and brittle to extremely friable.

Oct 4

Oct. 4 - Boat trip - Gladstone to Heron I.

Coast to east rather low and wooded. Facing Island low hilly, with low open forest or scrub forest - some grassy slopes around Gatecombe Head.

Some low grassy and shrubby dune just beyond it. Then alternating grassy rocky low bluffs and lower sandy stretches, backed by low wooded hills, attenuating out to a long sandy point, becoming more bare distally.

About 2 1/2 hours out we were in a maze of submerged reefs, so deeply submerged that they showed only as lighter areas in the dark blue water. Crossed it in a few minutes. About 3 hours a little less out we sighted Masthead I. ahead. Masthead Island is well wooded, with some diversity of vegetation - what appear to be Casuarina patches at each end, a lower yellower forest, possibly Pisonia, over most of the rest.

An enormous reef, well exposed and apparently covered by algae, extends from it to the north.

Anchorage said to be very poor.

Erskine Island, much smaller, has a very high broad beach, perhaps 1/5 or 1/6 the total width of the island at low tide. Low scrubby

dark vegetation, somewhat irregular, in the interior.

Much Sargassum drifting in water. Several black shearwaters flying ahead of boat, from 1 to 8 gulls following - white-headed, light gray above, white beneath, a dark band across the wing just back of tip. red feet.

(Silver gull, *Larus novae-hollandiae*)

Wistari Reef, exposed at low tide, has around its western margin an abundance of boulders.

Several low sandbanks in interior. Apparently the whole is submerged at low tide. The color of these reefs, when emerged, is a medium black.

Oct. 5 Heron I.

(Photos, Kod. 102 & 624. of Pisonia forest, partly leafless, from dune ridge on s.e. side of I.)

Beach rock series in front of custodian's house

22 paces of level platform, apparently bevelled, but not clearly so, back of cuestas then, dipping strongly seaward a series of cuestas, about 42 paces, to where it pinched out near low tide mark.

Upper slopes show white grooves scarifying the whole surface, said by Stephenson

Sample 5
from
landward
edge of
inner
cuesta.

#s chg'd from 41283-96 to 41583-41596

Oct. 5 - Heron Island.

in rather open *Pisonia* forest

41583 *Lepturus repens* (Forst. f.) R.Br. var.

occasional in sandy openings

4 ✓ 84 *Ficus opposita* Miq.

common

4 ✓ 85 *Graphalium luteo-album* L.

abundant locally in sandy openings

4 ✓ 86 *Wedelia biflora* (var. *canescens* (Gaud.) Forst.?

abundant very locally in openings

3 ✓ 87 *Abutilon albesens* Miq.

abundant locally in open and semi-open places

4 ✓ 88 *Pipturus albidus* (Forst.) Wedd.

occasional

3 ✓ 89 *Celtis paniculata* (Endl.) Planch.

common

4 ✓ 90 *Stenotaphrum micranthum* (Desv.) Hubb.

local

4 ✓ 91 *Ficus opposita* Miq.

common

1 ✓ 92 *Pisonia grandis* R.Br.

abundant

same - on dune ridge
above beach

4 ✓ 93 *Tournefortia argentea* L.f.

very common

2 ✓ 94 *Wedelia biflora* (var. *canescens* (Gaud.) Forst.?

locally common

2 ✓ 95 *Scaevola sericea* Vahl

common

4 ✓ 96 *Lophosia tomentosa* L.

rare, one bush seen

subulatus Forst.

erect tufts with long
procumbent runners
low spreading tree or large
shrub; figs green.

spawling tangled herb
forming loose mats 1 m. thick; fls. yellow.

erect shrub or suffrutescent
herb, to 1.5 m. tall; flowers orange.

shrub 2 m. tall, several
m. broad, ^{opposite} branched. styles white.

shrub 2 m. tall (others small
trees to 5-6 m.); ripe fruit dark blue.

small tree 5 m. tall; figs
immature, but turning purple.

small partially bare tree,
flowers on bare part.

~~the~~ rounded shrub, 2 m.

tall; leaves gray green,
fleshy, flowers white.

heavy scrambling
herb, ~~forming~~ leaves

sub-fleshy, flowers yellow.

rounded shrub 1 m. tall,

flowers whitish; fruit white.

shrub 3-4 m. tall, sterile.

to be made by grazing fishes.
(photo b.w. not.) (several b.w.
photos of general aspect of
beachrock, also of undercut
and collapse from back of cuesta.
one b.w. also.) A coarser marking
found in ^{shallow} potholes at this
altitude and on dip slopes
just above low tide mark. (photo)

On west side is a narrow
strip, at most 9 paces wide,
dipping seaward, ^(sample #6) replaced
northward by a narrower
strip, at most 4 paces wide,
mostly much narrower,
much broken up.

Outside here a wide
sandy reef flat, not varying
in depth for ^{about 500 m.} ~~several hundred~~
~~m~~ with ^{near shore} only a few
scattered tiny patches
of dead algae-covered
coral. These patches
gradually becoming
more abundant ^{and more predominantly living until}
they cover most of the
bottom - their tops planed
off at a constant level.
Then for a hundred
yards or so the pools
or interstices become
deeper by about half
forming a sort of ^{moat} ~~moat~~
but mostly filled

with planed off but
living coral. Bladder-like
brown algae abundant.
Then a belt of about 50 m
~~yards~~ where the pools
are very shallow, and
great fragments of dead
coral, ~~are~~ are thrown
up. Then about 75 m.
of living reef almost
perfectly level. At the
outer edge this drops
off abruptly into a
~~deep~~ moat several m.
deep. This is perhaps 15 m.
wide. Then a sort of dyke
or ridge, up to almost a
quite the level of the reef,
of ~~dead~~ living coral. Then
deep water. The outer
75 foot shelf is a bit lower
than the next inner part
with the piled up fragments
and the inner ^{2/3} of it
is largely a sort of level
pavement, the living
organisms mostly in
crevices and pools. The
outer part is mostly
a mass of acropora and
other corals. Encrusting
corallines are omnipresent
but not conspicuous or massive.
(many photos, b.w. + b.w. - finished not)

The profile across the reef is as follows - a narrow beach, then sandy bottom without significant variation in depth for about 500 m. patches of coral becoming gradually more abundant and more predominantly of living coral, about half-way out the area of coral patches exceeds that of sand; then the sand bottom becomes somewhat deeper for 100 m. or so, with abundant coral patches, planed off at same level as those landward, mostly living; then about 50 m. of reef with very shallow sand-bottom, compared with that just behind, and with much coral boulder debris, here not much living coral; then about 50 m. of a pavement-like platform, slightly below the level of the boulder-strew belt, and without debris, much of the structure clearly living, but the pavement not much interrupted; then about 25 m. ^{less} of a living surface of corals, etc., a deep moat,

then a dike-like ridge of living structure. The general color of this is a khaki, from a species of brown alga that covers most of the dead and some of the living surfaces in abundance. The abundance of soft algae and the scarcity of calcareous reds is in sharp contrast to the Marshall island reefs. Here the algal felt of the Marshalls is lacking except on the belt just outside the boulder zone.

The boulders on this side are generally small, not more than 5 dm. or less in greatest diameter, generally and tendings to be flat or irregularly flattened.

156

1960 Australia

chgd from 41297-99 to 41597-41599

41597

Scaevola sericea Vahl
common

4

1 ✓ 98

Euphorbia chrysoides (Forst. f.) C. A. Gard.
rare

1 ✓ 99

Euphorbia ~~*chrysoides*~~ ^{*ramosissima* H. & A.?} (H.) Bais.
rare on outer slope of

✓ 41300

Calceia edentula (Bigel.) Hook.
common on outer slope

4

4 ✓ 01

Casuarina equisetifolia
common var. *incana* Benth.

2 ✓ 02

Pandanus
common

* ✓ 03

same - in *Pisonia* forest
Pisonia grandis R. Br.
abundant, dominant

4 ✓ 04

same - around buildings
and disturbed places
Isymbium ~~*altissimum*~~ ^{*orientale* L.}
common locally

4 ✓ 05

Lepidium virginicum L.
common locally

4 ✓ 06

Amaranthus viridis L.
common locally

2 ✓ 07

Solanum nigrum L.
rare

Queensland

157

rounded bush 2 m. tall;
flowers whitish.prostrate, half buried
by sand, flowers green.
— sprawling, decumbent
branched herbs,
petals purple.
tree 6 m. tall, branchlets
drooping (comes from ground).
— branched, rather
pyramidal tree, its
bark rather fleshy
and easily bruised and
scratched; fruit deep
orange, cluster
subglobose, 14x15, 15x16 cm,
pendent.tree 6 m. tall, trunk
very thick; sterile.

petals yellow.

petals plant large,
branched from base, petals
minute, white.
— ~~sp.~~ panicle brownish.stems green, with minute
processes; flowers white.

✓ 41708 *Tribulus cistoides* L.
occasional

4 ✓ 09 *Boerhavia repens* L.
occasional

3 ✓ 10 *Digitaria ciliaris* (Retz. Koel.)?
occasional

same - ~~flat~~ ^{sand} flats at top
of beach on north side.

4 ✓ 11 *Cassytha filiformis* L.
common on various shrubs

4 ✓ 12 *Cordia subcordata* Lam.
common

1 ✓ 13 *Sporobolus virginicus* L.
locally common

2 ✓ 14 *Scaevola sericea* Vahl
common

Ost. 6 - Heron Island -
in open *Pisonia* forest

4 ✓ 15 *Celtis paniculata*
common

8 ✓ 16 *Commiphora chinensis* (L.) Heem.
rare and local, small colony
of several plants

4 ✓ 17 *Pisonia grandis* R.Br.
very common

4 ✓ 18 *Ficus opposita* Miq.
common

1 ✓ 19 *Pisonia grandis* R.Br.
very common

~~petals~~ prostrate; petals
yellow, 1 cm. long.
- prostrate from a thick
tap root, forming a
mat; leaves white
beneath, green above;
- flowers white.
tufts spreading

vines almost dead.

small rounded tree,
4 m. tall; fruit large.

- forming loose mat &
rod.

- shrub 1.5 m. tall,
rounded; flowers purple.

tree 6-7 m. tall, fruit blue.

scrambling, divaricately
branched, slightly woody,
5 m. long; flowers white.

- rounded partly bare
tree 6 m. tall, flowers pale greenish.

- small tree, only young leaves,
figs purplish green, becoming some-
what orange, falling early at this stage.

- small tree, partly bare;
flowers pale green.

- ✓41320 ~~Oct.~~ *Abutilon albiscens* Miq.
4 abundant, forming
shrub layer

Oct. 6 - Heron Island
in open mixed scrub forest on sand
NE east end

- 1 ✓21 *Tribulus cistoides* L.
rare
- 1 ✓22 *Scaevola sericea* L.
common
- 4 ✓23 *Suaeda maritima* L.
locally abundant
- 2 ✓24 *Ficus opposita* Miq.
common
- 2 ✓25 *Pandanus tectorius* Park.
~~common~~ rare
- 2 ✓26 *Pandanus tectorius* Park. (= *P. pedunculatus*
R. Br.)
common
- 6 ✓27 *Euphorbia* ~~*amphibia*~~ ^{*clutoides* (Forst. f.) C. A. Gard.}
locally common in open sand

same - dune ridge on southeast corner

- 4 ✓28 *Scaevola sericea* Vahl (pubescent form)
~~locally common~~, one colony
- 5 ✓29 *Euphorbia* ~~*chamissoi*~~ ?
common ^{*lamprocarpa* H. & A. ?}
- 1 ✓30 *Spinifex hirsutus*
very local
- 1 ✓31 *Stenotaphrum micranthum* (Desv.) Hubb.
local
- 2 ✓32 *Thurarea involuta*
common

plant 1 m. tall;
flowers orange

- prostrate, extensive
root system, flowers
bright yellow, 28 mm. across.
shrub 1 m. tall
flowers whitish.
shrub 2 m. tall,
flowers yellow
shrub ~~2 m.~~ 2 m. tall,
leafless, figs turning purple.
tree 6 m. tall; fruits from
ground beneath, leaves also.
tree 6 m. tall; fruits from
ground beneath.
stems green, varying
to almost leafless.

- shrub 2 m. tall, flowers
purple.
prostrate; flowers green.

mat-forming; sterile.

Oct. 5 - Heron Island

Elongated east and west,
the south side bordered
by a dune ridge 4-5 m.
high, with *Tournefortia*,
Scaevola, *Pandanus*,
Casuarina, etc.

The flat interior covered
by a *Pisonia* forest, this
rather open, low, but of
trees with large trunks,
partially leafless now
due to lack of rain during
the last few months.

Anous tenuirostris
nesting abundantly in
Pisonia, but apparently
a slightly different form
than in Marshalls, with
grayish cast to neck and
tail, and perhaps a longer beak.
Nests compact, of *Pisonia*
leaves, which they were
gathering.

No raw humus on ground
and no phosphate rock.
The ground is honey-combed
with shearwater burrows
and covered by mounds
of sand from them. The
sand is very pale,
scarcely discolored.

Dry and drying leaves
are abundant on the ground.

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Oct 5 - Harbor Island
 Flattened sand and mud,
 with small ridges 4-5 m.
 long, mostly *Pisonia*,
Adiantum, *Pandanus*,
Passiflora, etc.

The flat interior covered
 by a brown forest, the
 rather low, but of
 large trees.

and the leaflets most
 of which are
 in the center of the
 forest. The forest is
 composed of *Pisonia*
 and *Adiantum*. The
 forest is very dense
 and the trees are
 very tall.

Many burrows on ground
 and no phosphate rock.
 The ground is bare, with
 a thin water layer
 and covered by mounds
 of sand from them. The
 sand is very pale,
 almost white, and
 the trees are
 very tall.

as well as stains of
 guano under the trees
 where the nests are. Sometime
 a slight caking from guano
 and sand, not washed out
 by recent rains, as there have
 been none. Apparently
 the constant stirring up
 by the burrowing has
 kept the humus well
 mixed with lime-sand, so
 no accumulation nor
 acidity develops.

Scattered among the
Pisonia are *Ficus* and
Celtis. Some grass and much *Euphorbia*
heterophylla on ground.

On the north side
Pisonia uncommon east
 of resort, but *Cordia*
 and *Casuarina*, *Bom*, with
Tournefortia, an open
 scrub-forest.

Oct. 6. ~~For~~ *Pisonia* forest
 opens up, eastward.

One small area, of
 only a few sq. m. has
 a layer of raw humus
 about 10 cm thick, and
 a slightly caked layer
 5-6 cm. thick, mixed
 humus and sand, over
 a brownish sand.

(Samples 7, 8, 9). Stained

with guano from
noddy nests overhead.

Apparently a place that,
by chance, escaped
turning over by shearwaters.

Understory in open
parts of Pisonia forest
generally a thin to
moderately dense
layer 1-2 m. tall of
Abutilon, replaced locally
by a stand 1-1.5 m. tall
of Euphorbia cyathophora.

In very few places is
the Pisonia thick enough
to produce a really open
condition beneath it.

Noddies very common, at least
a few nests in most
Pisonia trees and a few
Celtis, etc.

(Several photos b + w + skt.)

of open Pisonia forest with
abutilon shrub layer &

mounds produced by shearwaters.

Toward east end the forest
opens up, becomes dominated
by Pandanus with much
Celtis, Caccavina, some Tourne-
fortia, patches of Suriana,
Scaevola, Wedelia, grass
much Cassytha. (1 prob. Lepturus)

Pandanus variable.

Birds Ruddy turnstone 1
Wandering Tattler 4-5
Silver Gulls very common
Crested terns 2+2
Doves (Bar shouldered ^{dove} ~~passer~~) 3+2+2+2+1
^{silver} ~~white~~ eye ^{zosterops} ~~lateralis~~ 4+3
Frigate bird 1
Reef herons
White 6+3+5+1+2+1
Blue 2+6+1

geopelia
humeralis

Haliaeetus
leucogaster

Osprey? ^{white breasted} ~~sea eagle~~ *godwit* (flock)
^{prob.} ~~bar-tailed~~

Planted species

Lamanea saman
Cucurbita sp.
Tropaeolum majus
Delonix regia.
Carica papaya
Macadamia ternifolia (pot)
Jacaranda (pot)
Erythrina (pot)
Ficus sp (pot)
Cupressus sempervirens? (pot)
Cassia sp. ? (pot)
Solanum lycopersicum
Pinus sp. (yellow seedlings)
Euphorbia pulcherrima (pot)
Mirabilis jalapa
Monstera deliciosa (pot)
Codiaeum variegatum (pot)
Begonia sp. (pot)
Zehneria pendula (pot)
Sundapens aurea (pot)
Cordyline sp. (pot)
Sansevieria roxburghii (pot)

8.47

~~41333~~ Oct. 6 - Heron Island
around buildings, and disturbed places

41333 *Apium leptophyllum* (Pers.) F.v.
very local

1 ✓ 34 *Portulaca oleracea* L.
very local (formerly very common
but weeded out)

4 ✓ 35 *Euphorbia cyathophora* Murr.
abundant generally

2 ✓ 36 *Cenchrus echinatus* L.
very local.

4 ✓ 37 *Sonchus oleraceus* L.
occasional

2 ✓ 38 *Cenopus didymus* (L.) J.E. Smith
very local

4 ✓ 39 *Conyza bonariensis* (L.) Cronq.
common

4 ✓ 40 *Eleusine indica* (L.) Gaertn.
common locally

~~41~~ same - planted

1 ✓ 41 ~~Rumex~~? *Rumex vesicarius* L.

1 ✓ 42 *Limonium banderlii* (Lestib.) O. Ktze

same - open woodlands
in east central part.

2 ✓ 43 *Lepturus apens* (Forst.) R.Br. 2
~~branch stolon~~ common
but mostly dead

seeds with raised stellulae
show great variation in size

prostrate, purplish brown,
flowers yellow.

herb 1.5 m. tall, bracts
with red spot at base.

erect, glaucous; flowers yellow.

prostrate.

culms spreading.

sepal pale green, turning reddish.
rosette with several
ascending scape.

var. *undulatus* Forst.

branches stoloniferous.
~~glauca~~ (spikelets in pairs?)

Planted (old)

Euphorbia tirucalli
Kalanchoe? (pot)
Salvia splendens (pot)
Polypodium punctatum (pot)
Neandina domestica (pot)
Maranta arundinacea? (pot)
Hosta? (pot)
Nerium indicum
Cocos nucifera (seedlings)
Plumeria rubra
Petunia

On east end the reef stretches to the horizon (5 miles) and except for a sandy and gravelly strip a few yards wide at the bottom of the beach the coral patches cover most of the flat for at least 200 m. and in north east part, much more out. Some clear green sand in distance to south east.

2 low islets visible to north a northeast.

In front of n. beach a broad sand apron (b+w photos + ripple marks) + weathered beach rock. A very low dune ridge along north side. Patch of spinifers.

North side - considerable area dominated by *Cordia*, with some *Pisonia* - strip back of beach. undergrowth of *Abutilon*, *Wedelia*, *Euphorbia cyathophora*.

Then an open area of sand much dug up by turtles, with scattered small *Casuarina*, *Ficus*, *Scaevola*, *Pandanus*, *Tournefortia*, and with *Calula*, *Wedelia*, and a small patch of *Commiphora*, ~~and~~ ^{some} tufts of *Lepturus* (mostly dead) on ground (b+w photos) (photos of reef)

Eastward undergrowth gets thicker, more predominantly of *Wedelia*, *Pandanus* dominant in tree layer. (photos ext. b+w)

On east end *Scaevola* and *Tournefortia* becomes very common forming a discontinuous scrub 2-2.5 m. high among the *Pandanus* and then the extreme end *Pandanus* drops out giving way to *Casuarina*. A patch of *Luriana* in interior of east end. (photos. b+w)

n. beach lined with a row of low *Casuarina*. (photos b+w + b+w)

Reef on west side is about 25 m. wide, generally more living than on north side. Coral patches dominate all the way out. generally planed to about exactly the low tide level of today. The sandy patches are about 45 cm. below this level for about 15 m.

Then they get deeper. the reef gets more live and more dominated by *Acropora*.

The level of the *Acropora* rises slightly about 60 m. back of the reef front, ~~but~~ and the sand level also rises. Sand patches become less abundant. Then the 30 m. back of the edge slopes very gradually down toward the edge, an almost solid surface of *Acropora*, with a few pools 1 m. or so deep.

The edge is abrupt. Though several ridges are dimly visible beyond is the water.

The outer lower shelf is almost entirely of *Acropora* sp. a flat topped species with numerous conical points out of a heavy fused base.

These points get broken off and the fused bases form a pavement substantial enough to walk on. Apparently the old colonies are smoothed by abrasion. (photos)

3 gannets? with black back and white beneath on old wreck, flew away before they could be observed well.

Beach rock extends ~~and~~ along the entire south coast and a strip along perhaps half the north coast, entirely between tides.

Manning, caretaker at Heron I. Laboratory, says that on Wreck Island, to the north, a boring was put down by an oil company last year which reached bedrock at just over 1200 feet.

He also said that Lady Elliott Island had been completely denuded some years back and that phosphate had been exploited.

He says that on Masthead Island in *Pisonia* forest trees are abundant and shearwaters either absent or not numerous.

Oct. 5 - Heron Island

on fringing reef north of island

41344 *Cladophora*

2 on outer margin

2 45 (brown alga)

abundant on rocks and coral

2 46 *Cladophora*

on dead coral on reef flat

2 47 *Liagora*

on dead coral on reef flat

2 48 *Halimeda stipitata* ~~stipitata~~ *stipitata*

in sandy pools on reef flat

2 49 *Caulerpa*

on dead coral on reef flat

2 50 ~~*Caulerpa*~~

on dead coral on reef flat

2 51 *Laurencia*?

abundant on dead coral on reef flat

1 52 *Turbinaria*?

rare on dead coral on reef flat

2 53 *Halimeda*

common on reef flat

2 54 *Caulerpa*

creeping on sand of reef flat,

rhizome ~~shallowly~~

on surface of sand

Oct. 7 - Gladstone

in salt flat with
small mangroves4 55 *Rhizophora*

rare

2 56 *Avicennia*abundant along tidal channel
(Oct. 10. 1960)globose bright green
colonies.

inflated; bluish color.

bright green balls.

erect, stipe buried in sand.

reddish brown to dull brown.

brown, stiffish.

dark green

green

green, prostrate, elongate.

shrub 1.3 m. tall.

shrub 2 m. tall; leaves white
beneath (varying to broader on other
bushes); flowers orange.

Aug. 7 - Erskine Island,
from north - broad sandy
beach, but clearly only about
 $1/10$ the width of the island at
high tide. The vegetation
is low but more or less
continuous, appears to be
be mostly *Tournefortia*
except for a patch of what
possibly may be low *Pisonia*
just west of the center. The
eastern ^{half} and extreme western
parts seem to be somewhat
open. A large area of
sand is exposed at low tide.

Masthead Island -
patches of *Casuarina* at
northeast and southwest
sides. *Casuarina* scattered
along the northeast side.
Otherwise the forest which
covers the island seems to
be *Pisonia*, largely leafless
in this dry season. The *Pisonia*
and *Casuarina* forests appear quite dense.

Northeast of Masthead
island are areas of seq
covered by a thin brownish
scum and quantities
of a large *Largassum*
species. It is not clear
what the scum is, but it
seems to be associated with

the *Largassum*. This
is perhaps the "bloom"
observed from the air
between Brisbane and Gladstone.

Entering passage to Gladstone
Harbor - on left long peninsula
with low partly grass covered,
partly bare dunes with a very
small settlement. On right
a small islet, being cut away
by waves - appears to be a weakly
consolidated dune, cross-bedded,
but brown below as with ironstone,
grassy with ^{very small trees}.

On right near base of
peninsula is some low dense
forest. Then loose dunes
behind it, higher than forest.
Then the main part of the
island covered by open woods
varying to closed, low
status, on low rock partly
covered by dune sand.

Gray-green to ~~be~~ olive drab
aspect. Unseen. A few small
houses, mostly on a wooded sand peninsula.

Other side of harbor
hilly, covered by open forest.

Part the sand peninsula
the island becomes low-hilly, open
wooded. A few small mangroves
in shallow water in front of shore.

On higher hills to right of harbor

the ^{open} forest has an appearance of being planted in rows up and down the hillside as though reforestation had been carried out, or as though it were an orchard. Result of tilted bedding planes of rock?? Apparently so. Many steep gullies on wave cut cliff, suggesting same thing.

Receding shore of Facing Island, on left, low and wooded.

Inner passage, between two islands (one on right maybe peninsula) that are low hilly, one on right with open forest and Xanthorrhoea above cliffs, that on left with more closed, but still rather open forest, a thin line of ^{small} mangroves in water in front of beach.

On right very small mangrove on seaward side of peninsula, a narrow mangrove swamp all along the inner side.

The grass on all these hills between the trees is dry and brown.

Inner point of island on left is a long low sand spit, forest attenuating to grassland, then grass & sand distally, lined with narrow row of mangroves on both sides.

Another island, ~~is peninsula~~ on right, surrounded on this side by low wave cut bluffs, these ~~sparsely~~ ^{loosely} wooded. Top grassy knoll with a few scattered trees, including several small palms.

Then another low knoll-like island ~~is a~~ ^{peninsula} with open woods and a little grass, and a wide mangrove swamp on the right side.

On left, the hilly island is prolonged toward Gladstone into a sort of spit, probably of high partly eroded dunes, but possibly of rock, thinly wooded - this connected with island by a low isthmus of sand with a small hill in middle.

On right still another low hilly semi-wooded rocky island. Bluffs are partly bare. A grassy ^{partly scrubby} sand slope facing Gladstone.

End
with
city

Oct. 7 - Gladstone

Extending inland from a rather extensive mangrove swamp back of the harbor is a small tidal channel, lined with *Avicennia* about 1-3 m. tall. Around these are mud flats with a thin growth of *Suaeda*, and in parts, *Sporobolus virginicus*. A very few small *Ceris* and *Chizophora* with the *Avicennia*.

Large castings of mud common in the *Suaeda* and *Sporobolus* flats.

Toward the hill, on which most of Gladstone is built are narrow flats completely covered by a sod of *Sporobolus*. In the other direction are wide mud flats completely bare of vegetation, cracking slightly as the surface begins to dry. This mud is generally wet but finely sandy at least on top and not very sticky. Locally there is fine gravel. The whole supports a man's weight, and the mud around the mangroves.

Gladstone airport

Open *Eucalyptus* forest, trees ~~var~~ of all size classes up to 20 m. tall, 4" dbh. under story of *Xanthorrhoea* up to 4 m. tall.

Young *Acacia* and other shrubs to 2 m. tall. Grass has been very recently burned, apparently killing many of the young *Acacia* and other other small shrubs, not injuring trees or shrubs above 1 m. height nor the grass trees.

This forest has three definite layers - the tall *Eucalyptus*, the grass trees, and the herbs and ~~the~~ small shrub layer 1 m. or less tall. There seems to be a gradation in size of the *Eucalyptus*, but a preponderance at between 15-20 m. tall. The *Xanthorrhoea* layer is sparse. (photos - ect.)

Judging by the view from the air the grass-tree layer is not at all general.

180

1960 Australia

41357

Cerisops

2

rare

1

58

Sporobolus virginicus L.
abundant

1

59

Fimbristylis

common around edges of

2

60

Centaurium

common around edges of

same - ~~edges of~~ edges of sidewalks

3

61

Emilia sonchifolia (L.) DC.

common

Oct. 7 Gladstone airport

1

62

Coelospermum reticulatum

occasional in open Eucalyptus forest

Oct. 9. - near Canberra, A.C.T.

on grassland that has not
been burned or grazed in
recent years

1

63

Cheilanthes tenuifolia

common.

1

64

Asperula conferta ?

common

Queensland

181

shrub 1.5 m. tall.

forming a continuous sod;
~~scapes~~ culms and scapes erect.
small tufts.

erect, glaucous, flowers pink.

in town.

somewhat glaucous and
fleshy; flowers rose pink,
only slightly exserted.

shrub 1.5 m. tall.

erect from buried rhizome,
flowers white.

Oct. 7 - flight Gladstone - Brisbane.
in Folkestone Friendship, st. side.
left at 4:37.

Mangrove swamps are
mostly lined by an open
belt of salt flats between
mangrove and higher
ground. This can have a
sparse *Suaeda* (?) layer
locally or not. It seems
to be drying on the side
toward higher ground.

Dozens of fires in the
hills in the distance to
right, a few closer. Mts. in
distance obscured by smoke.

Much ground along course
is black and burned over.

Course is farther inland
than when I came. The hills,
generally, are covered by
open forest.

4:51

Changes to grass except
near river. Visibility poor.

Alternating areas of
grass and forest.

4:54

River systems meandering, even
away from proximity to sea.

4:58

Forest predominates,
but with some cultivation.
Flat valley, river terraces
cultivated, apparently sugar cane.

Descending toward another
river with much cultivated land.
Certainly sugar cane. Fairly large town.

Soil here seems to be very
sandy, gray to white, locally
red spots. Bundaberg.

Beyond here a varied
forest, with areas of
low scrub or scrub forest,
dark yellowish green,
outlined by open forest
or scrub showing white
sand, apparently following
water courses or differences
in level. Visibility very poor.

Then a general mosaic
of patches of forest of
different shades of grayness
due to sandy background (?)
and greenness due to tree crowns.

This is on a broad plain
in which rivers are slightly
incised.

Then the forest becomes denser
and more uniformly green.

Course following railroad,
through vast forest on flat ground.
almost closed forest but not quite
except locally.

5:40

5:55

Descending at Maryborough.

Took off.

The country southward is
largely wooded, some areas
of cultivation, dark red soil.

Fires. Smoke causes poor visibility.

Oct. 8 - air trip, Brisbane - Sydney
(Electra - int. side)

1:17 off ground (25,000' alt.)

Extensive mangrove swamps, principally *Avicennia*, around Brisbane River, salt flats not very conspicuous, largely purple from *Suaeda* or pale green from *Sporobolus*. Mangrove gallery along most tidal streams. Many patches of sparse Eucalyptus forest around Brisbane, some appear to have been burned, several are actually burning, smoke causes poor visibility.

1:19
1:20 - 1:28

Primarily savanna and grassland some areas, especially hilly ones, with open forest; very narrow gallery, or none, along streams. a little cultivation on stream terraces and flat ground generally, mostly rather hilly country. Fires common, poor visibility from smoke.

1:28

A sharp cone-shaped mountain, slopes wooded, peak rather bare. Some open country surrounding it.

1:29

Rough, densely wooded mountainous area.

1:30 - 1:35

Savanna with rather sparsely wooded hills, narrow but conspicuous gallery along streams. cultivation in flat valley bottoms.

1:36

Wooded area but smoke so thick visibility poor.

1:38 - 1:44

Rough mountains with open to mostly dense forest, some lower slopes and valley bottoms cleared. Several

fires. A river with a sandy bed and little water winding through these mountains.

1:44

Mosaic of woods and open areas, pasture and patches of open or closed forest.

1:46

Change to predominantly open country, pastures, patches of open forest or scattered trees, some cultivation, streams without gallery, landscape generally drab.

1:53

A few green patches and a general tendency to greenness in the drab pasture.

1:56

Trees become more abundant, scattered.

1:58

begins to be rocky.

1:59

A very rocky mountain mass, scattered trees, still, very locally close enough to be open forest.

2:00

Rocky hills common, open wooded, grassy valleys between them.

2:03

Clouds - no visibility.

2:09

Gap in clouds, green grassy hilly landscape, tops of hills wooded, scattering of trees on slopes.

2:12

Green, very hilly, scattered trees and patches of wood plentiful.

2:15

Series of roughly parallel ridges, rather thickly wooded with grassy valleys between them, crossing the course at an angle to left.

2:16

Open grassy country with cultivation on flat ground in valley bottoms. A few patches of open woods. Several small towns.

2:18

All grassland with small patches of scattered trees, no cultivation.

2:20

Small open cut coal mines. Generally open grassy country, scattered trees locally.

Clouds.

2:26

Complex pattern of wooded hills with side ravines perpendicular to ridge axes, flat narrow green valley bottoms. Probably karst.

2:28

The grassy valleys taper out into a maze of densely wooded low hills with only very few clearings. Locally open forest that may be the result of fire.

2:32

Crossed large meandering river, apparently dammed and backed up into these hills making a very complex reservoir (or is it an estuary?).

2:34

Another arm of this, ^{water} very green.

2:35

Appr. Sydney

Oct. 9 - Sydney - Canberra flight (in Vincent - st. side).

7:26

off ground. Mangrove swamps around some arms of Sydney Harbor - to left facing landward.

Just south of Sydney a sandstone (?) plateau with apparently a very low scrub or heath vegetation, somewhat dissected dendritically, the ravines wooded.

Southward along coast and back several miles the terrain becomes more wooded. The low ocean bluffs are apparently recently cut and not at all wooded. ~~The~~ slopes above them also not wooded but grassy.

Inland a wide cleared strip

7:38

A fair sized heathy & grassy area surrounded by a mosaic of the same and low open forest.

7:35

A reservoir with 2 long branches at right angle, surrounded by a thin open forest with some grass or heath.

Rough cleared land in middle distance.

7:37

Another reservoir.

7:39

2 more reservoirs, continuously wooded, low ~~to~~ dissected plateau

7:42

Some clearing, then mostly open country, with a small town - surrounded by cultivation, then by pasture with groves and patches of trees.

7:45

Considerable woods on dissected part of plateau. After that pasture country with occasional fairly sizeable wooded areas.

7:50

Some gully erosion in open areas.

7:51

locally predominantly wooded hills, woods closed to locally open. Flat ground grassy.

The grass generally in this whole region is bright green or thinly green, not brown as farther north.

7:52

A town to right.

General area in pasture, little cultivation, some patches of forest on hills and areas of scattered trees.

Farm headquarter very substantial, surrounded by trees and ~~hedge~~ hedges, but very widely scattered.

7:56

A small lake or large pond with what appears to be a floating bog mat in middle dist. to it.

7:57

Pasture with fair areas of forest and of scattered trees. A few areas with abundant fallen trees - these weathered. Some areas of grass with abundant shrubs.

7:59

A large wooded patch.

Then a large muddy lake or reservoir, lined with bluffs on far side.

p 5 8:02

Other side - grassy rolling plateau with scattered trees and patches of dense forest. Some parts of grassy area with abundant fallen tree trunks. In some areas these gathered in windrows. Wooded and open wooded areas increasing in proportion, many fallen trunks in open wooded and savanna areas.

8:04

Very green cultivated valley to right.

8:05

Savanna landscape, small patches of wood, mostly grass with scattered trees and fallen trunks. Density of standing trees varied.

8:07

Conifer plantation.

Canberra over low ridge to right.

Cultivated land along course.

Oct. 9 - Vicinity of Canberra
(trip with Pryn & Robbins)

The general topography here is one of rolling low hills, surrounded by higher hills. The hills are covered by open to closed Eucalyptus forest, the depressions are, and apparently were originally, grassland. This is ascribed by Pryn to frost, the low places being referred to as "frost-pockets." Eucalyptus planted in these areas do not do very well, are coppiced and slow-growing, some not surviving long. This apparently accounts for some of the pattern observed from the air on the way here.

A small surviving sample of relatively undisturbed Eucalyptus forest (logging some time ago has removed all large trees) has an almost closed but thin canopy, trees spaced 2-3 m apart, at least 4 or 5 species, about 15-20 m. tall, 10-15 cm dbh, mostly smooth bark (gums) a few rough bark (ironbark), some of the species looking remarkably alike even though

not at all closely related. No intermediate tree layers. A well marked ^{lower}ericoid shrub layer, about 1 m. tall, 1 m. apart, or more, a number of species in several families, with, on the more favorable slopes, a large tussock of *Danthonia*, very common, these lacking in otherwise similar forest on more ~~or~~ unfavorably exposed slopes. No significant amount of herbaceous plants or dwarf shrubs. Bare ground with a certain amount of loose Eucalyptus litter between the plants. Erosion not conspicuous. Slopes are gentle here. This is said to be the dominant type of forest in this area. The ericoid layer behaves rather independently from the tree layer, on rocky areas with thin soil the tree layer may be very sparse or lacking.

Oct. 10 - flight Canberra-Hydney
 5:28 left Canberra

Rolling hills some densely wooded, some with scattered trees, some grassy, some obviously recently cleared, old trunks lying about.

5:33 Lake George (?), a natural lake, rather muddy.

Gullies running into it and toward it through pastures. Area shows signs of considerable accelerated erosion. All gullies look freshly incised.

5:35 Generally rolling pasture land, with patches of scattered trees and woods.

5:37 ~~see~~ cluster of small lakes or ponds.

Ferreted area very extensive. On flat lying beds of sandstone dissected, with many bare cliffs.

5:53 Coast ^{well} south of Sydney lined with housing developments on flat areas backed by wooded hills. Flat areas crescent shaped, back of shallow embayments.

(Opposite last large reservoir noted on way to Canberra (7:35 p. 187))

6:02 More sea cliffs along this coast, cut in sandstone plateau.

interrupted by scattered narrow beaches. No beaches at foot of cliffs - vertical drops off into sea. Very complicated peninsula south of Sydney with much open sand, open forest, and mangrove swamp. From south side of Sydney Harbor

6:05

Oct. 16 Kilauea Iki - Trees below Byron ledge killed by heat from 1960 eruption - fires swept up sides of steep pit above lava lake. Some recovery, sprouting of branches from trunks.

Area of spatter around cone has trees all burned off at base and fallen towards s.w. leaving tree mounds in the semi-fused spatter. In these *Rephrodia sporolings* are

stop line

Oct. 15 - air trip Honolulu - Hilo
 Molokai - still some bare
 red areas on west end, but
 perhaps less than formerly.
 W. Maui - little or no woody
 vegetation on gulch walls
 on lee side. Dry vegetation
 very extensive.

E. Maui - on shoulder several
 patches of forest left - but
 perhaps representation. Forest left.
 On flows at least one green
 bipuka. Vegetation mostly
 very gray - check what this is.
 Lanai - wind striations on
 the n.e. side - alignment
 a bit peculiar - try to get
 air photos and study.

Kahoolawe - large areas
 of absolutely bare red
 soil. Some biawe, especially
 on slopes.

Oct. 15 - Kilauea

Area examined with Wentworth
 in 1956. In undisturbed
 lava *Nephrolepis* is
 now very prominent, mature
 plants, *Pteris cretica*, mature
 plants occasional, shooting
 of *Polypodium lineare* Thunb.

On ^{some} disturbed part *Emilia*
javanica, *Pteris cretica*, *Euphorbia*
Pluchea odorata. Fine scrub ^(not?)

from 1960 eruption deposited
 over the whole area
 filling in interstices,
 providing a "soil".

In badly disturbed
 area many other species
 have come in.

Kapoho - (photos of cinder
 cone and in f.g. Kapoho from ^{side} of "Green Cone")

Cyperus compressus
Cassia leschenaultiana
Pluchea odorata
Euphorbia hirta
E. glomerata
Emilia javanica
Digitaria chinensis
Melinis minutiflora
Setaria glauca
Paspalum orbiculatum
Tricholaena rosea
Casuarina equisetifolia
Solanum nigrum
Vernonia cinerea
Desmodium triflorum
Stachytarpheta jamaicensis
Cuphea carthagenensis
Crotalaria mucronata
Commelina diffusa
Indigofera tinctoria
Passiflora foetida

1955 flow below Kapoho
 bare flat boulder clinker
 a few scattered *Nephrolepis* a

few cm. tall, abundant under overhanging rocks. On more solid boulders algae are growing at fair depths in holes, moss (*Calymperes*?) in sheltered cavities above the algae, and lichens in only slightly or not sheltered places. General aspect is no vegetation at all. Much new pine scum.

Green cone has on north (?) side a low forest of *Aleurites*, *Artocarpus*, *Mangifera*, etc. on other side scattered bushes with ground layer of *Nephrolepis*.

In Kapoho, on top of old drum, almost 4 cm. of pine scum.

Cone at head of Kilauea flow
Ropy pahoe-hoe - covered by lichen - *Stereocaulon*
Nephrolepis abundant ~~at~~ mostly 5-15 cm. tall, some fruiting.

3 years ago the lichen was as at Kapoho, now mature, 1 cm. or so. fruiting from about a year ago.

First year quite a few seed plants, mostly *Erechtites*, appeared

flowered and disappeared. Now only a few seedlings of orchid (*Arundina*)

Ferns are generally in crevices and folds in lava.

Mosses - *Campylopus* spp. now fruiting. Lichen and ferns also reproducing, and algae also (*Cryptomonas hoffmannii*). *Pteris* + *Adiantum* very rare.

Young *Kipuka* of 1955 ash choked with *Nephrolepis* 2 m tall. *Pluchea odorata*, *Eupatorium riparium*, *Coleus scutellarioides*, *Commelina diffusa*.

Nearby are *Pityrogramma*, seedlings of *Metrosideros*, *Andropogon*, *Cyperus compressus* etc.

(b+w. photos of the *Kipuka* and of the flow lava and the cone from which it came.)

Many other plants in disturbed material in road.

Oct. 16 Kilauea Iki - trees below Byron ledge killed by heat from 1940 eruption - fires swept up sides of steep pit above lava lake. Some recovery seen in form of sprouting from trunks of *Metrosideros*.

Area of spatter around new cinder cone has trees all burned off at base and fallen toward s.w. leaving tree molds in the semi-fused spatter. In these are numerous *Nephrolepis* seedlings. A very few small seedlings

Oct. 16 - Kilauea Iki,
Kilauea Volcano
on fresh spatter beds

41345 *Oxalis martiana*
local

3 66 *Oxalis corniculata*
rare

Oct. 15 - ~~near~~ ¹⁹⁵⁵ Head of Kii Flow,
Puna District

3 67 *Nephrolepis multiflora* (Roxb.) Jarrett det. 1976
abundant in ~~very~~ tiny
~~cracks~~ pit in flow, bottom
covered by very fine scoria

2 68 *Nephrolepis multiflora* (Roxb.) Jarrett det. 1976
~~at~~ common ~~in~~ in cracks
and folds of flow, full sun.

1 69 *Metrosideros collina* var.
on bare lava, in cracks

2 70 *Metrosideros collina* var.
dominant in forests on
old lava.

1 71 *Saccilepis* ^{contracta} ~~indica~~
on cinder road on lava flow

1 72 *Peltaria geniculata*
on cinder road on lava flow.

73

Oct. 15 - Kapoho, Puna Distr.

1 73 *Casuarina equisetifolia* L.
common on fresh ash and fine lapilli

flowers pink.
many spreading stems
from center. flowers yellow,
capsules pointing upward,
green, dehiscing elastically

fronds erect, wool. on
rachise varying from
white to tawny.

fronds erect.

seedlings, presumably
of #41370

slender erect tree 8-10 m. tall,
stamens light red.

seedling, mycorrhizae on roots.

(cl. from 7.197.) in crevices and on lee sides of still standing tree trunks. Near edges of splotter *Cyperus brevifolius* coming in, especially around bases of standing tree trunks. Apparently a "shelter effect" ~~causes~~ just enough amelioration of conditions to permit establishment. *Oxalis* spp. also established.

In area covered by pumice lapillae to any depth no plants at all except a very few *Nephrolepis* in tree molds. However, here most tree molds filled by coarse scoria or pumice.

Large area of *Metrosideros* ~~are~~ completely killed but mostly still standing. Farther from ~~the~~ cone the *Metrosideros* which appeared dead are vigorously sprouting from bases and trunks.

Wentworth has photo of map by Richter showing the depths of pumice accumulation. One of park rangers, and Juliette Wentworth

have fixed points at which they have taken photos and can take more in future.

Blackberries which have

come up abundantly in area of thinner pumice have been killed by spraying by N.P.S. people.

Dubautia (yellow fld.) and *Vaccinium* spp. in areas of very thin pumice seem to have been greatly stimulated. The berries of *Vaccinium* are unusually large. The *Dubautia* is dark green with an abundance of yellow flowers.

A single *Erechtites valerianifolia* seen growing from the side of a tree mold.