

Sally Carter

LaNelle W. Peterson

October 27, 1964

Maryanna Smellow, Division of Birds

Bird stomachs, reference memo of August 27, 1964

Regarding your memo of August 27, 1964, disposition as follows should be made of the bird stomachs:

- ✓ 1. Metal tag - DAB 6 - identified as part of Pacific Project, listed of SOSC Acc. No. 27. Treat as usual.
- ✓ 2. Metal tag - 0446 - unknown, return to Division for more data
- ✓ 3. Metal tag - 445 - unknown, return to Division for more data
- ✓ 4. Metal tag - 394 - unknown, return to Division for more data
5. USNM printed tag 46 - Noddy Tern - 1-14-64, collected at Johnston Island; treat as usual.
6. USNM printed tag 0456 - Fregata minor - unknown, return to Division for more data
7. USNM printed tag 042 (?) Puffinus newelli - August 21, 1963 (destroyed at SOSC) collected at Johnston.
8. 1 lot with no data - return to Division of Birds for investigation.

UNITED STATES GOVERNMENT

# Memorandum

TO : Maryanna Smellow

DATE: August 27, 1964

FROM : LaNelle W. Peterson *LWP*

SUBJECT: Bird stomachs

The following bird stomachs were found after the SOSOC moved from Lamont Street to the Navy Yard Annex. Only one of the eight stomachs is part of the 3 missing listed under SOSOC Acc. No. 27. The other stomachs are not listed on the data sheets received to date. Are these stomachs part of the Poop project?

- |                    |   |                                  |                                      |   |
|--------------------|---|----------------------------------|--------------------------------------|---|
| <i>Bradley</i>     | 1. Medal tag                              | DAB 6                            | listed on SOSOC Acc. No. 27          | ✓ |
|                    | 2. " "                                    | 0446                             | not listed                           | ✓ |
|                    | 3. " "                                    | 445                              | " "                                  | ✓ |
|                    | 4. " "                                    | 394                              | " "                                  | ✓ |
|                    | 5. USNM printed tag 46 Noddy tern 1-14-64 | not listed                       | <i>Johnston</i>                      |   |
|                    | 6. " "                                    | " 0456 <u>Fregata minor</u>      | " "                                  |   |
| <i>Johnston</i>    | 7. " "                                    | " 042(?) <u>Puffinis newelli</u> | August 21, 1963 (destroyed at SOSOC) |   |
| <i>send back -</i> | 8. 1 lot with no data                     |                                  |                                      |   |

UNITED STATES GOVERNMENT

# Memorandum

SOSC 5  
SOSC 8

TO : Dr. Humphrey *JEW* DATE: February 10, 1964  
THROUGH: Dr. Wallen and Dr. Fehlmann *HAF*

FROM : Beatrice L. Burch *BLB*

SUBJECT: The Pacific Ornithological Oceanographic Project (POOP) at SOSC.

Bird stomach contents from the Pacific Ornithological Oceanographic Project sorted by Mr. Robert Nance reached a total of 145 lots and 2274 specimens in 46 stomachs. Out of the 46 bird stomachs, two contained no specimens. The majority of the stomachs had cephalopod beaks or beak fragments. A few entire squid were found. There was a moderate number of fish, while fish bones were present frequently. Nematodes were found in the gut cavities, not attached to the sides, consequently, it may be assumed that they were bird intestinal parasites. The copepods were fairly well digested, as were many of the squid and fish. Most of the mites and lice were in vials, so were probably from the bird skins.

We shall continue to store the specimens until otherwise advised.

UNITED STATES GOVERNMENT

# Memorandum

TO : Mr. Roger Clapp, Pacific Project, Division of Birds DATE: October 1, 1965  
Through: Dr. H. A. Fehlmann *HAF*

FROM : D. M. Damkaer, Smithsonian Oceanographic Sorting Center

SUBJECT: Shipment of Bird Stomach Contents

As requested by your secretary (phone call September 30, 1965), the Smithsonian Oceanographic Sorting Center is sending you the stomachs and the sorted contents from the eight birds listed on SOSC Invoice 471. There are 31 lots in this shipment. Please sign, date, and return the white copy of the invoice when you have checked the shipment.

Mrs. Burch, former SOSC Supervisor for Invertebrates, had apparently been instructed to discard the stomachs of these birds once the contents were removed (see her Memo to Dr. Humphrey, December 23, 1964). The technicians have since not saved the stomachs, but the previously examined stomachs had not been discarded. Do you now want us to save these stomachs, or are you still just interested in the contents?



*Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan*

UNITED STATES GOVERNMENT

# Memorandum

TO : Dr. Philip S. Humphrey, Division of Birds  
THROUGH: Dr. H. A. Fehlmann *HAF* DATE: July 12, 1965

FROM : David M. Damkaer, Smithsonian Oceanographic Sorting Center (SOSC) *DMD*

SUBJECT: Completion of Bird-Stomach Contents Sorting for Pacific Oceanographic Biological Survey Programs (POBSP) 4 and 5

Miss Fleet and Mrs. Stroman have finished sorting the stomach contents of samples for the Pacific Oceanographic Biological Survey Programs (POBSP) 4 and 5.

Enclosed are the original summary sheets, compiled from the working cards. Copies of the cards are also enclosed.

A surprise to all of us was the finding of a six-inch spiny pufferfish (Diodontidae) in the stomach of a Phaethon rubricauda (Bird 30434).

Enclosures: As stated.



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

Data for Bird Stomachs Collected by Pacific Project,  
Division of Birds, Smithsonian Institution

*all have been  
processed at SOSC  
but are on different  
listings*

(Incomplete data on following specimens on file at SOSC)

Specimen Number	Species	Date	Location	Latitude	Longitude
✓464	Diomedea nigripes	4 Feb '64	Pacific Ocean	19°28'N	162°07'W
✓481	Sula sula	12 Feb '64	Pacific Ocean	16 38'N	169 38'W
✓505	Puffinus pacificus	18 June 64	Pacific Ocean	11 53'N	157 00'W
✓506	Sterna fuscata	4 July 64	Pacific Ocean	22 52'N	157 00'W
✓507	Puffinus pacificus	4 July 64	Pacific Ocean	22 52'N	157 00'W
✓508	Fregata minor	4 July 64	Pacific Ocean	22 52'N	157 00'W
✓514	Pterodroma externa	22 July 64	Pacific Ocean	17 50'N	151 00'W
✓10204	Sterna fuscata	27 June 64	Eastern Island, Midway Atoll	28 12.3'N	177 20'W
✓10205	Sterna fuscata	27 June 64	Eastern Island, Midway	28 12.3'N	177 20'W
✓10206	Phaethon rubricauda	29 June 64	Eastern Island, Midway	28 12.3'N	177 20'W
✓10207	Puffinus pacificus	27 June 64	Eastern Island, Midway	28 12.3'N	177 20'W
✓10210	Puffinus pacificus	23 July 64	Kaohikaipu Island, Oahu, Hawaii	21 19.5'N	157 39.5'W
✓1841	Pluvialis dominica	19 Apr '64	Wake Island	19 17'N	166 37'E
✓GW 1	?	30 Apr '64	Sand Island, Midway	28 12'N	177 23'W
✓GW 2	?	30 Apr '64	Sand Island, Midway	28 12'N	177 23'W
✓GW 3	?	30 Apr '64	Sand Island, Midway	28 12'N	177 23'W
✓GW 4	Anas acuta	30 Apr '64	Sand Island, Midway	28 12'N	177 23'W

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
0715	<i>Alopex lagopus</i>	July 12 1964	St. Paul Island,	Arctic Fox
0734	<i>Leucosticte tephrocotis</i>	July 30 1964	Pribilof Is. St. George Island,	
0736	<i>Fratercula corniculata</i>	July 30 1964	Alaska St. George Island,	
0749	<i>Pluvialis dominica</i>	Aug. 6, 1964	Alaska St. George Island,	
0750	<i>Pluvialis dominica</i>	Aug. 6, 1964	Alaska St. George Island,	
0752	<i>Fulmarus glacialis</i>	Aug. 8, 1964	Alaska St. George Island,	
0753	<i>Heteroscelus incanum</i>	Aug. 9, 1964	Alaska St. George Island,	
0754	<i>Philomachus pugnax</i>	Aug. 9, 1964	Alaska St. George Island,	
0761	<i>Philomachus pugnax</i>	Aug. 12, 1964	Alaska St. George Island,	
0763	<i>Pluvialis dominica</i>	Aug. 13, 1964	Alaska St. George Island,	
0764	<i>Erolia melanotos</i>	Aug. 13, 1964	Alaska St. George Island,	
0765	<i>Erolia melanotos</i>	Aug. 13, 1964	Alaska St. George Island,	
0766	<i>Pluvialis dominica</i>	Aug. 13, 1964	Alaska St. George Island,	
0769	?	Aug. 15, 1964	Alaska St. George Island,	Fish
0771	<i>Erolia acuminata</i>	Aug. 21, 1964	Alaska St. George Island,	
0774	<i>Larus glaucescens</i>	Aug 26, 1964	Alaska St. George Island,	
0779	<i>Limnodromus scolopaceus</i>	Aug. 29, 1964	Alaska St. George Island,	
0780	<i>Ereunetes mauri</i>	Aug. 30, 1964	Alaska St. George Island,	
0781	<i>Pluvialis dominica</i>	Aug. 31, 1964	Alaska St. George Island,	
0783	<i>Philomachus pugnax</i>	Sept. 1, 1964	Alaska St. George Island,	
0784	<i>Arenaria interpres</i>	Sept. 2, 1964	Alaska St. George Island,	

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
0786	Numenius phaeopus	Sept. 2, 1964	St. George Island, Alaska	
0787	Pluvialis dominica	Sept. 5, 1964	St. George Island, Alaska	
0795	Anas carolinensis	Sept. 10, 1964	Ananiuliak Island, Alaska	
0848	Puffinus pacificus	July 18, 1964	Pacific Ocean 21 46'N 162°18'W	
0849	Puffinus pacificus	Aug. 4, 1964	Pacific Ocean 19 49'N 161 47'W	
0850	Puffinus pacificus	Aug. 4, 1964	Pacific Ocean 19 49'N 161 47'W	
0851	Puffinus pacificus	Aug. 4, 1964	Pacific Ocean 19 49'N 161 47'W	
0852	Puffinus pacificus	Aug. 4, 1964	Pacific Ocean 19 35'N 162 27.5'W	
0853	Puffinus pacificus	Aug. 4, 1964	Pacific Ocean 19 35'N 162 27.5'W	
0854	Puffinus pacificus	Aug. 4, 1964	Pacific Ocean 19 24'N 163 01'W	
0855	Sula sula	Aug. 6, 1964	Pacific Ocean 16 07'N 169 18'W	
0856	Pterodroma externa	Aug. 8, 1964	Pacific Ocean 13 48'N 170 59'W	
0857	Puffinus pacificus	Aug. 11, 1964	Pacific Ocean 16 20'N 171 45'W	
0859	Sterna fuscata	Aug. 14, 1964	Pacific Ocean 20 12'N 172 59'W	
0861	Puffinus pacificus	Aug. 14, 1964	Pacific Ocean 20 34'N 173 09'W	
0862	Sterna fuscata	Aug. 14, 1964	Pacific Ocean 21 41'N 173 13'W	
0863	Puffinus pacificus	Aug. 14, 1964	Pacific Ocean 20 43'N 173 15'W	
0864	Bulweria bulwerii	Aug. 14, 1964	Pacific Ocean 20 45'N 173 17'W	
0865	Puffinus pacificus	Aug. 14, 1964	Pacific Ocean 20 49'N 173 19'W	
0866	Puffinus pacificus	Aug. 14, 1964	Pacific Ocean 20 49'N 173 19'W	
0867	Puffinus pacificus	Aug. 14, 1965	Pacific Ocean 20 49'N 173 19'W	
0869	Puffinus pacificus	Aug. 14, 1964	Pacific Ocean 20 49'N 173 19'W	



Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
0870	<i>Puffinus pacificus</i>	Aug. 15, 1964	Pacific Ocean 23° 20' N 174° 25' W	
0871	<i>Fregata minor</i>	Aug. 15, 1964	Pacific Ocean 23 43' N 174 33' W	
0872	<i>Sterna fuscata</i>	Aug. 15, 1964	Pacific Ocean 23 43' N 174 33' W	
0873	<i>Sterna fuscata</i>	Aug. 15, 1964	Pacific Ocean 23 43' N 174 33' W	
0874	<i>Sterna fuscata</i>	Aug. 15, 1964	Pacific Ocean 23 43' N 174 33' W	
0875	<i>Phaethon rubricauda</i>	Aug. 15, 1964	Pacific Ocean 24 48' N 174 51' W	
0876	<i>Sterna fuscata</i>	Aug. 17, 1964	Southeast Island, Pearl and Hermes Reef, Hawaii	
0878	<i>Arenaria interpres</i>	Aug. 17, 1964	Southeast Island, Pearl and Hermes Reef, Hawaii	
0879	<i>Arenaria interpres</i>	Aug. 22, 1964	Lisianski Island, Hawaii	
0880	<i>Puffinus pacificus</i>	Sept. 5, 1964	Pacific Ocean 19 41' N 162 05' W	
0881	<i>Puffinus pacificus</i>	Sept. 5, 1964	Pacific Ocean 19 27' N 162 36' W	
0882	<i>Puffinus pacificus</i>	Sept. 5, 1964	Pacific Ocean 19 27' N 162 36' W	
0883	<i>Puffinus pacificus</i>	Sept. 5, 1964	Pacific Ocean 19 20' N 162 58' W	
0884	<i>Phaethon rubricauda</i>	Sept. 6, 1964	Pacific Ocean 17 52' N 166 20' W	
0885	<i>Gygis alba</i>	Sept. 7, 1964	Pacific Ocean 16 01' N 169 17' W	
0886	<i>Puffinus pacificus</i>	Sept. 7, 1964	Pacific Ocean 15 57' N 169 16' W	
0887	<i>Phaethon rubricauda</i>	Sept. 12, 1964	Pacific Ocean 16 15' N 171 47' W	
0888	<i>Arenaria interpres</i>	Sept. 12, 1964	Pacific Ocean 16 14' N 171 48' W	
0889	<i>Puffinus pacificus</i>	Sept. 12, 1964	Pacific Ocean 16 13' N 171 55' W	
0890	<i>Puffinus pacificus</i>	Sept. 12, 1964	Pacific Ocean 16 11' N 171 57' W	
0892	<i>Pterodroma</i>	Sept. 12, 1964	Pacific Ocean 15 49:5' N 172 21' W	

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Field Number	Species	Date Collected	Locality	Remarks
0893	Phaethon rubricauda	Sept. 13, 1964	Pacific Ocean 15°18'N 173°56'W	
0894	Phaethon rubricauda	Sept. 13, 1964	Pacific Ocean 15 18'N 173 56'W	
0895	Phaethon lepturus	Sept. 14, 1964	Pacific Ocean 19 44'N 171 57'W	
0896	Puffinus carneipes	Sept. 15, 1964	Pacific Ocean 23 00'N 171 52'W	
0897	Bulweria bulwerii	Sept. 15, 1964	Pacific Ocean 22 57'N 171 52'W	
0898	Sterna fuscata	Sept. 15, 1964	Pacific Ocean 22 59'N 171 52'W	
0899	Phaethon lepturus	Sept. 15, 1964	Pacific Ocean 23 17'N 171 52'W	
0900	Pluvialis dominica	Sept. 29, 1964	Pacific Ocean 20 01'N 161 06.5'W	
0901	Pluvialis dominica	Sept. 30, 1964	Pacific Ocean 18 36'N 164 31'W	
0902	Phaethon rubricauda	Oct. 1, 1964	Pacific Ocean 15 47'N 167 25'W	
0903	Stercorarius longicaudus	Oct. 2, 1964	Pacific Ocean 14 04'N 169 13'W	
0904	Sula dactylatra	Oct. 3, 1964	Pacific Ocean 14 58'N 170 10'W	
0905	Sula dactylatra	Oct. 4, 1964	Pacific Ocean 15 20'N 170 24'W	
0907	Phaethon rubricauda	Oct. 6, 1964	Pacific Ocean 16 22'N 171 37'W	
0908	Fregata minor	Oct. 6, 1964	Pacific Ocean 16 22'N 171 37'W	
0909	Pluvialis dominica	Oct. 8, 1964	Pacific Ocean 16 56'N 171 53'W	
0942	NO DATA AVAILABLE			
0943	Sula sula	Jan. 6, 1964	Pacific Ocean 18 38'N 164 10'W	
0945	Larus atricilla	Jan. 15, 1964	Pacific Ocean 16 51'N 169 40'W	
0949	Sula sula	Jan. 16, 1964	Pacific Ocean 18 19'N 165 28'W	
10565	Pterodroma hypoleuca	Sept. 19, 1964	Laysan Island, Hawaii	
10566	Pterodroma hypoleuca	Sept. 19, 1964	Laysan Island, Hawaii	
10567	Pterodroma hypoleuca	Sept. 19, 1964	Laysan Island, Hawaii	

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
10570	<i>Crocethia alba</i>	Oct. 13, 1964	Operl Island, Izembek Bay, Alaska	
10630	<i>Pluvialis dominica</i>	Dec. 26, 1964	Wake Island, Pacific Ocean	
10631	<i>Pluvialis dominica</i>	Dec. 26, 1964	Wake Island, Pacific Ocean	
20183	<i>Fulmarus glacialis</i>	Jan. 16, 1964	Green Island, Kure Atoll	
20188	<i>Fregata minor</i>	Feb. 27, 1964	Green Island, Kure Atoll	
20189	<i>Fregata minor</i>	March 1, 1964	Green Island, Kure Atoll	
20222	<i>Erolia alpina</i>	Jan. 12, 1964	Sand Island, Midway Atoll	
20223	<i>Crocethia alba</i>	Jan. 12, 1964	Sand Island, M Midway Atoll	
20224	<i>Capella stenura</i>	Jan. 13, 1964	Green Island, Kure Atoll	
20225	<i>Sula dactylatra</i>	Jan. 16, 1964	Green Island, Kure Atoll	
20226	<i>Pterodroma hypoleuca</i>	Jan. 17, 1964	Green Island, Kure Atoll	
20233	<i>Monachus schauinslandi</i>	June 1, 1964	Green Island, Kure Atoll	Seal pup
20250	<i>Sula sula</i>	Jan. 3, 1964	Green Island, Kure Atoll	
20257	<i>Puffinus nativitatus</i>	July 28, 1964	Green Island, Kure Atoll	
20260	<i>Sula dactylatra</i>	Aug. 3, 1964	Green Island, Kure Atoll	
20264	<i>Sterna fuscata</i>	Aug. 9, 1964	Green Island, Kure Atoll	
20269	<i>Sterna fuscata</i>	Aug. 14, 1964	Green Island, Kure Atoll	
20271	<i>Sterna fuscata</i>	Aug. 14, 1964	Green Island, Kure Atoll	
20278	<i>Sterna fuscata</i>	Aug. 28, 1964	Green Island, Kure Atoll	
20281	<i>Phaethon rubricauda</i>	Aug. 30, 1964	Green Island, Kure Atoll	

Data on Bird Stomachs sent to  
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Field Number	Species	Date Collected	Locality	Remarks
20286	<i>Sula sula</i>	Sept. 8, 1964	Eastern Island, Midway Atoll	
20296	<i>Anous stolidus</i>	Sept. 15, 1964	Green Island, Kure Atoll	
20303	<i>Sterna fuscata</i>	Sept. 20, 1964	Green Island, Kure Atoll	
25014	<i>Fregata minor</i>	Oct. 8, 1964	Sand Island, Johnston Atoll	
25032	<i>Sterna fuscata</i>	Aug. 25, 1964	Sand Island, Johnston Atoll	
25040	<i>Anous stolidus</i>	Aug. 20, 1964	Sand Island, Johnston Atoll	
25044	<i>Anous stolidus</i>	Sept. 4, 1964	Sand Island, Johnston Atoll	
30009	<i>Heteroscelus incanum</i>	Oct. 12, 1964	Sibylla Islet, Taongi Atoll, Marshall Islands	
30010	<i>Heteroscelus incanum</i>	Oct. 12, 1964	Sibylla Islet, Taongi Atoll, Marshall Islands	
30011	<i>Heteroscelus incanum</i>	Oct. 12, 1964	Sibylla Islet, Taongi Atoll, Marshall Islands	
30014	<i>Pluvialis dominica</i>	Oct. 12, 1964	Sibylla Islet, Taongi Atoll, Marshall Islands	
30022	<i>Sterna fuscata</i>	Oct. 12, 1964	Kamome Islet, Taongi Atoll, Marshall Islands	
30023	<i>Sterna fuscata</i>	Oct. 12, 1964	Kamome Islet, Taongi Atoll, Marshall Islands	
30029	<i>Arenaria interpres</i>	Oct. 15, 1964	Bikar Island, Bikar Atoll, Marshall Islands	
30034	<i>Gygis alba</i>	Oct. 15, 1964	Bikar Island, Bikar Atoll, Marshall Islands	
30042	<i>Sterna fuscata</i>	Oct. 18, 1964	Jaboerukku Island, Bikar Atoll, Marshall Islands	
30043	<i>Sterna fuscata</i>	Oct. 18, 1964	Jaboerukku Island, Bikar Atoll, Marshall Islands	
30051	<i>Gygis alba</i>	Oct. 20, 1964	Taka Island, Taka Atoll, Marshall Islands	
30052	<i>Gygis alba</i>	Oct. 20, 1964	Taka Island, Taka Atoll, Marshall Islands	
30054	<i>Gygis alba</i>	Oct. 20, 1964	Taka Island, Taka Atoll, Marshall Islands	

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
30063	<i>Sterna fuscata</i>	Oct. 20, 1964	Taka Island, Taka Atoll, Marshall Islands	
30066	<i>Sterna sumatrana</i>	Oct. 22, 1964	Boken Island, Taka Atoll, Marshall Islands	
30067	<i>Sterna sumatrana</i>	Oct. 22, 1964	Boken Island, Taka Atoll, Marshall Islands	
30071	<i>Anous minutus</i>	Oct. 22, 1964	Eruk Island, Taka Atoll, Marshall Islands	
30088	<i>Sterna fuscata</i>	Oct. 22, 1964	Taka Island, Taka Atoll, Marshall Islands	
30092	<i>Gygis alba</i>	Oct. 24, 1964	Jemo Island, Marshall Islands	
30094	<i>Gygis alba</i>	Oct. 24, 1964	Jemo Island, Marshall Islands	
30095	<i>Gygis alba</i>	Oct. 24, 1964	Jemo Island, Marshall Islands	
30100	<i>Gygis alba</i>	Oct. 24, 1964	Lej Island, Erikub Atoll, Marshall Islands	
30102	<i>Gygis alba</i>	Oct. 24, 1964	Lej Island, Erikub Atoll, Marshall Islands	
30129	<i>Sula leucogaster</i>	Oct. 26, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30138	<i>Sula leucogaster</i>	Oct. 27, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30139	<i>Sula leucogaster</i>	Oct. 27, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30142	<i>Sula leucogaster</i>	Oct. 27, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30143	<i>Sula leucogaster</i>	Oct. 27, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30144	<i>Sula leucogaster</i>	Oct. 27, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30145	<i>Sula leucogaster</i>	Oct. 27, 1964	Aradojairik Island, Erikub Atoll, Marshall Islands	
30146	<i>Anas acuta</i>	Nov. 2, 1964	Kwajalein Island, Kwajalein Atoll, Marshall Islands	
30148	<i>Anas acuta</i>	Nov. 2, 1964	Kwajalein Island, Kwajalein Atoll, Marshall Islands	
30157	<i>Anas acuta</i>	Nov. 3, 1964	Kwajalein Island, Kwajalein Atoll, Marshall Islands	

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
30158	Anas acuta	Nov. 3, 1964	Kwajalein Island, Kwajalein Atoll, Marshall Islands	
30159	Spatula clypeata	Nov. 3, 1964	Kwajalein Island, Kwajalein Atoll, Marshall Islands	
30160	Spatula clypeata	Nov. 3, 1964	Kwajalein Atoll, Marshall Island	
30207	Anous stolidus	Nov. 10, 1964	Enybor Island, Jaluit Atoll, Marshall Islands	
30216	Gygis alba	Nov. 11, 1964	Jaluit Island, Jaluit Atoll, Marshall Islands	
30220	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30222	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30223	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30225	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30226	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30227	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30228	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30229	Sula sula	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30231	Fregata ariel	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30236	Sterna fuscata	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
30237	<i>Sterna fuscata</i>	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30238	<i>Sterna fuscata</i>	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30239	<i>Gygis alba</i>	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30240	<i>Gygis alba</i>	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30242	<i>Thalasseus bergii</i>	Nov. 11, 1964	Lijeron Island, Jaluit Atoll, Marshall Islands	
30259	<i>Gygis alba</i>	Nov. 13, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30263	<i>Demigretta sacra</i>	Nov. 13, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30265	<i>Denugretta sacra</i>	Nov. 13, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30267	<i>Fregata ariel</i>	Nov. 13, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30270	<i>Thalasseus bergii</i>	Nov. 13, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30272	<i>Sula leucogaster</i>	Nov. 13, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30276	<i>Erolia acuminata</i>	Nov. 13, 1964	Butaritari Island, Makin Atoll, Gilbert Islands	
30278	<i>Sula leucogaster</i>	Nov. 14, 1964	Lagoon 3 miles N. of Butaritari Island, Makin Atoll, Gilbert Islands	
30285	<i>Anous stolidus</i>	Nov. 14, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
30288	<i>Anous stolidus</i>	Nov. 14, 1964	Kotabu Island, Makin Atoll, Gilbert Islands	
30291	<i>Sterna sumatrana</i>	Nov. 14, 1964	Lagoon 1 mile E. of Tukewe, Makin Atoll Gilbert Islands	
30306	<i>Erolia acuminata</i>	Nov. 14, 1964	Butaritari Island, Makin Atoll, Gilbert Islands	
30311	<i>Heteroscelus incanum</i>	Nov. 14, 1964	Butaritari Island, Makin Atoll, Gilbert Islands	
30312	<i>Heteroscelus incanum</i>	Nov. 14, 1964	Butaritari Island, Makin Atoll, Gilbert Islands	
30314	<i>Numenius tahitiensis</i>	Nov. 15, 1964	Butaritari Island, Makin Atoll, Gilbert Islands	
30321	<i>Limosa lapponica</i>	Nov. 16, 1964	Maiana Island, Maiana Atoll, Gilbert Islands	
30330	<i>Sterna sumatrana</i>	Nov. 16, 1964	Maina Island, Maina Atoll, Gilbert Islands	
30375	<i>Anous minutus</i>	Nov. 17, 1964	Kuria Island, Kuria Atoll, Gilbert Islands	
40574	<i>Puffinus nativitatus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40575	<i>Puffinus nativitatus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40576	<i>Puffinus nativitatus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40577	<i>Puffinus nativitatus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40578	<i>Puffinus pacificus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40579	<i>Puffinus pacificus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40580	<i>Puffinus pacificus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
40581	<i>Puffinus pacificus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	



Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
40582	<i>Puffinus pacificus</i>	Nov. 5, 1964	Phoenix Island, Phoenix Islands	
150378	<i>Puffinus puffinus newelli</i>	-	-	
BNT Z	<i>Sterna sumatrana</i>	Oct. 11, 1964	Sibylla Island, Taongi Atoll, Marshall Islands	
BNT X	<i>Sterna sumatrana</i>	Oct. 11, 1964	Sibylla Island, Taongi Atoll, Marshall Islands	
LNH 208	<i>Pterodroma phaeopygia</i>	May 13, 1964	Maui, Hawaii	
LNH 344	<i>Fregata minor</i>	July 3, 1964	Green Island, Kure Atoll	
LNH 361	<i>Sterna fuscata</i>	June 23, 1964	Sand Island, Johnston Atoll	
LNH 362	<i>Sterna fuscata</i>	Aug. 9, 1964	Sand Island, Johnston Atoll	
62	<i>Sterna fuscata</i>	June 18, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	July 21, 1964	Sand Island, Johnston Atoll	
99	<i>Sterna fuscata</i>	July 8, 1964	Sand Island, Johnston Atoll	
-	<i>Anous stolidus</i>	June 4, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	July 17, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	July 9, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	July 9, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	June 3, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	July 2, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	July 2, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	Aug. 9, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	May 8, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	Aug. 9, 1964	Sand Island, Johnston Atoll	
-	<i>Sterna fuscata</i>	June 18, 1964	Sand Island, Johnston Atoll	Immature
-	<i>Sterna fuscata</i>	July 27, 1964	Sand Island, Johnston Atoll	Nestling

Data on Bird Stomachs sent to  
Sorting Center 3/25/65

Field Number	Species	Date Collected	Locality	Remarks
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Nestling Plots 2 and 3
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3 local
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3
-	Sterna fuscata	June 1, 1964	Sand Island, Johnston Atoll	Plots 2 and 3
-	Anous stolidus	June 20, 1964	Sand Island, Johnston Atoll	Immature
-	Anous stolidus	June 20, 1964	Sand Island, Johnston Atoll	Immature
-	Anous stolidus	June 20, 1964	Sand Island, Johnston Atoll	
-	Anous stolidus	June 20, 1964	Sand Island, Johnston Atoll	
-	Anous stolidus	July 20, 1964	Sand Island, Johnston Atoll	

Laysan Botany List

list of Vascular Plants known to have  
occurred on LAYSAN

Includes unsuccessful  
introductions and seeds  
washed up on the  
beach - Species known  
to have grown  
on the island stand  
alone brackets for all  
others

GRAMINEAE

- Cenchrus agrimoniodes var. laysanicus F.Br. ✓
- Cenchrus echinatus L.
- Cynodon dactylon (L.) Pers.
- [Melinus minutiflora Beauv.]
- Eragrostis variabilis (Gaud.) Steud.
- Lepturus repens (Forst.) R.Br.
- Sporobolus virinicus (L.) Kunth.

CYPERACEAE

- Cyperus laevigatus
- Cyperus pennatifolius var. bryanii Kükenthal
- [Cyperus sp.]
- Fimbristylis cymosa R.Br.

PALMAE

- Cocos nucifera L.
- [Phoenix dactylifera L.]
- [Pritchardia pacifica Wendl.]
- Pritchardia sp.

LILIACEAE

- Allium sp.

CASUARINACEAE

- Casuarina equisetifolia

SANTALACEAE

- Santalum cuneatum var. laysanicum Rock

POLYGONACEAE

- [Coccoloba uvifera L.]

CHENOPODIACEAE

- [Atriplex muelleri Benth.]
- Chenopodium oahuense (Meyen) Aellen

AMARANTHACEAE

- Amaranthus viridis L.
- Achryranthes splendens var. reflexa Hillebr.

NYCTAGINACEAE

- Boerhavia repens L. = diffusa L.

AIZOACEAE

- Sesuvium portulacastrum L.

PORTULACACEAE

- Portulaca lutea Sol.
- Portulaca oleracea L.

CRUCIFERAE

- Lepidium waihiense C. & S.

CAPPARIDACEAE

- Capparis sandwichiana DC

LEGUMINOSAE

- [Leucaena glauca (L.) Benth.]

ZYGOPHYLLACEAE

- Tribulus cistoides L.

EUPHORBIACEAE

- [Aleurites moluccana (L.) Willd.]

CORYNOCARPACEAE

- ~~Cornocarpus erectus~~

MALVACEAE

- Hibiscus tiliaceus L.
- [Thespesia populnea (L.) Sol.]

CONVOLVULACEAE

- Ipomoea indica (Burm.) Merr.
- Ipomoea pes-caprae (L.) Sw.
- [Convolvulus sp.]

HYDROPHYLLACEAE

- Nama sandwicensis var. laysanicum Brand

Number  
Reported

Country of  
Origin

Scientific Name

Common Name

BORAGINACEAE

- Heliotropium curassivicum L.
- ~~Messerschmidia argentea (L.f.) Johnston~~
- Cordia subcordata Lam.

LABIATAE

- Philostegia variabilis Bitter

SOLANACEAE

- Nicotiana tabacum L.
- Nicotiana glauca
- Solanum nelsoni Dunal
- Solanum nigrum L.
- Solanum nediflorum Jacq.
- Solanum tuberosum L.

CUCURBITACEAE

- Sicyos hispidus Hillebr.
- Sicyos microcarpus Mann.
- Sicyos sp.
- Cucurbita pepo L.

GOODENIACEAE

- Scaevola taccada (Gaertn.) Roxb.

COMPOSITAE

- Conyza bonariensis (L.) Cronq
- Lipochaeta intergrifolia (Nutt.) Gray
- Pluchea incida (L.) Less.

GUTTIFERAE

- Calophyllum inophyllum (L.) Sol.

LECYTHIDACEAE

- Barringtonia asiatica (L.) Kurz

COMBRETACEAE

- Terminalia catappa L.
- Terminalia microcarpa
- Conocarpus erecta L.

LEGUMINOSAE cont.

- Canavalia ensiformis (L.) DC
- Haematoxylon campichianum
- Caesalpinia crista L.
- Entada scandens (Roxb.) Benth.
- Dioclea altissima (Velloso) Rock
- Dioclea violacea Mart
- Mucuna gigantea DC
- Mucuna urens DC
- Mucuna sp

- Caesalpinia - 1 -
- Canavalia - 1938
- Dioclea altissima
- Dioclea violacea
- Entada
- Haem

Number  
Reported

Country of  
Origin

Scientific Name

Common Name

*Sorting Center*

Sorting Center

December 21, 1964

Maryanna Smellow, Division of Birds, Pacific Project

Data for Bird Stomachs collected by Pacific Project, Division of Birds

Species Number	Species	Date	Location	Latitude	Longitude
394	<i>Sula sula</i>	4 Oct. '63	Pacific Ocean	16° 50' N	169° 15' W
445	<i>Diomedea nigripes</i>	4 Jan. '64	Pacific Ocean	20° 23' N	161° 07' W
446	<i>Diomedea nigripes</i>	6 Jan. '64	Pacific Ocean	17° 20' N	164° 12' W
456	<i>Fregata minor</i>	10 Jan. '64	Pacific Ocean	13° 31' N	172° 15' W
634	<i>Diomedea nigripes</i>	8 Apr. '64	Pacific Ocean	14° 05' N	170° 11' W

bird head found in stomach of 634 identified as *Sterna fuscata*

These specimens were sent to the Division of Birds with SOSC Invoice No. 114 requesting the above data. They will be returned now under separate cover.

LaNelle W. Peterson

October 27, 1964

Maryanna Smellow, Division of Birds

Bird stomachs, reference memo of August 27, 1964

Regarding your memo of August 27, 1964, disposition as follows should be made of the bird stomachs:

1. Metal tag - DAB 6 - identified as part of Pacific Project, listed of SOSC Acc. No. 27. Treat as usual
2. Metal tag - 0446 - unknown, return to Division for more data
3. Metal tag - 445 - unknown, return to Division for more data
4. Metal tag - 394 - unknown, return to Division for more data
5. USNM printed tag 46 - Noddy Tern - 1-14-64, collected at Johnston Island; treat as usual.
6. USNM printed tag 0456 - Fregata minor - unknown, return to Division for more data
7. USNM printed tag 042 (?) Puffinus newelli - August 21, 1963 (destroyed at SOSC) collected at Johnston.
8. 1 lot with no data - return to Division of Birds for investigation.

Out

2011  
No. 1  
2-1-64



Sorting Center

December 18, 1964

Mrs. Maryanna Smellow, Division of Birds, Pacific Project

Bird Stomachs collected by Pacific Project, Division of Birds

Eight bird stomachs as described below are being sent to the Sorting Center under separate cover.

Specimen Number	Species	Date	Location	Latitude	Longitude
788	<i>Melospiza melodia</i>	10 Sept '64	Umanak Is., Alaska	52° 56' N	168° 52' W
789	<i>Melospiza melodia</i>	10 Sept '64	Umanak Is., Alaska	52° 56' N	168° 52' W
790	<i>Melospiza melodia</i>	10 Sept '64	Umanak Is., Alaska	52° 56' N	168° 52' W
10515	<i>Anthus spinoletta</i>	14 Sept '64	Umanak Is., Alaska	52° 56' N	168° 52' W
10519	<i>Branta canadensis</i>	20 Sept '64	Izenbek Bay, Alaska	55° 14' N	162° 50' W
10524	<i>Erebia melanotos</i>	2 Oct. '64	Attu Is., Alaska	52° 50' N	173° 08' W
10525	<i>Leucosticte tephrocotis</i>	2 Oct. '64	Attu Is., Alaska	52° 49' N	173° 09' W
10527	<i>Leucosticte tephrocotis</i>	2 Oct. '64	Attu Is., Alaska	51° 49' N	176° 37' W

Long, C. R.  
1964

## Howland Island

9 October 1964

<u>Collection Number</u>	<u>Description</u>
2311	<u>Portulaca</u> sp.; on west portion, north of the Amelia Earhart daylight in disturbed site of for guano operations; in flower: 4 petals, 4 parted style, ± 14 stamens; foliage leaves and stems deeply red with anthocyanins; growing in sand which contains some humus in lower layers; associated with <u>Tribulus</u> , <u>Lepturus</u> , <u>Boerhaavia</u> and <u>Digitaria</u> ; the foliage of all species is dry and brown flower color of this collection: yellow flrs; petals 1/4 in. long two of which are cleft 1/2 the length of the petal, the one other is slightly notched; live material
2312	<u>Portulaca</u> sp.; same habit as No. 2311 but not in flower; in disturbed site but growing near the north wall of former guano dwelling enclosure; same associates as No. 2311 but a large upright <u>Portulaca</u> sp. with larger yellow flrs. with + ten thick upright stems is present; the latter is able to withstand drought much better than the smaller plants.
2313	<u>Portulaca</u> sp.; area identical to those of collections No. 2311 and No. 2312 but in the east portion of the disturbed area near the walled enclosure; flrs yellow, 5 petals, petal notched 1/3 of length, + 21 stamens, 4 parted style, plant stems prostrate.
2314	<u>Portulaca</u> sp.; large, 3 stemmed plant, semi-prostrate, much anthocyanin in stems and leaves (especially new growth - older stems are greyish-brown in color). Flrs.: yellow, 5 petals + 1/3 in. long cleft 1/3 length into two lobes, 4 parted style, ± 15 stamens; other flowers, some plant, + 10, ± 21 stamens.
2315	<u>Boerhaavia diffusa</u> L.; in sand soil of west portion of island about 200 feet north of the north wall of the guano compound; flrs white tinged purple or pink, closing at 12:50 pm., leaves small; root among stones and receives perhaps more water in this site than other plants of this species which are nearly but not in bloom and drier; in open area associated with <u>Tribulus</u> <u>Portulaca</u> and <u>Digitaria</u> .
2316	<u>Digitaria pacifica</u> ; small clumps; leaves, stems and fruits are dry and dead but these have new stems with flowers which are green and arising from the center of the clump; north of the A.E. daylight about 350 feet north of the north wall of the guano dwelling triangle, flat area <u>Digitaria</u> the

<u>Collection Number</u>	<u>Description</u>
	the conspicuous dominant with <u>Tribulus</u> , <u>Boerhaavia</u> , <u>Portulaca</u> and <u>Lepturus</u> also common.
2317	<u>Tribulus cistoides</u> L.; in gravelled area north of the guano ruins compound growing with <u>Lepturus</u> , <u>Portulaca</u> , and <u>Boerhaavia</u> , a plant with many dead stems radiating out 5 to 6 feet, only new, shorter stems in bloom and these at their termine; leaves of new stem dry and falling off; flowers seem smaller.
2318	<u>Portulaca lutea</u> Sol. - plant + 14 inches high, many greyish brown stems, a few dried leaves fallen to the base of the plant; in sand associated with <u>Boerhaavia</u> and <u>Tribulus</u> ; north of guano ruins quad, slightly east face slope, large coral boulders scattered about along rim of island above the sand beach; flower yellow, five petals and 1 smaller, 6 parted style, + 29 stamens, stems dry out from the top down; one flower has 7 petals all slightly cleft into two lobes; both pressed and live material collected.
2319	<u>Lepturus repens</u> (Forst.) R. Br.; smaller clumps (2) in beach sand and coral shell rubble on west beach midway between the A.E. daylight and the nw point; when unearthed the roots and adhering sand particles are moist; associated with <u>P. lutea</u> Sol.
2320	<u>Portulaca</u> sp.; northwest end in central depressed areas. <u>Digitaria</u> dead, <u>Tribulus</u> very dry but a few flowers present; 1. <u>P. sp.</u> with red stems (newer ones) and thick greyish-brown older stems; and, nearby are 2. <u>P. sp.</u> with thick clustered grey-brown stems and green leaves; plant 1. has reddish partially dehydrated leaves and the leaves of 2. in same area are green; 2. collected as No. 2321; area uniformly dry but condition of 1. and 2. are strikingly different; flower 5 petals, cleft about 1/3 length into 2 lobes, 5 parted style and + 17 stamens.
2321	<u>Portulaca</u> sp. nw. central depression in area with two types present - this No. 2; thick gray-brown stems, upright, but going prostrate or slumping as do the stems of No. 2320; no visible cone. of anthocyanin; leaves green but not dehydrated as in No. 2320; flower yellow; 6 petals 1/3 in. long not lobed deeply - just a dip with a small tip at the bottom, 4 parted style and + 16 stamens.
2322	Similar to No. 2320 - reddish newer stems; these two coll. have palnts with long, slender new stems; No. 2321 has

<u>Collection Number</u>	<u>Description</u>
	short, stubby new growth which is colored gray-brown as the old thicker stems; flower yellow, petals + 1/2 in. long, lobes 1/3, tips of lobes rounded, 4 parted style and ± 19 stamens; last part of depression mid n-central portion; surrounding <u>hepturus</u> clump are dead.
2323	<u>Boerhaavia diffusa</u> L.; white flowers and green stems; flat area behind beach, nw. point, gravel and sand base soil; <u>P. lutea</u> <u>Tribulus</u> and <u>Hepturus</u> (few clumps); stems to ± 4 feet long; cytological material taken.
2324	Northwest point about 6 feet beach rise above sloping beach rock 40 feet across, shallows 250 to 300 feet across, triangular area on nw point (breakers crossing, white water at all times observed) about 20 to 200 feet of shallows at mid-tide (4 pm); beach rock with sand and muck filled pockets - red coralline algae and green gelatinous types common; this coll. from rock pools and beach drift.
2325	Northwest point, crevices and damp cracks in the black rocks-exposed at low tide; thin layer of red coralline and a green linear type growing in muck and sand pockets of pools exposed at low tide; type 3 - leafy in damp, protected crevasses (but exposed to air) in sand, many 1.5 - 2.5 ft. moray eels in exposed pools.
2326	Found in sand pocket between coral rocks above beach, nw point; stems recline on flat coral slabs; flower yellow, 5 petals 1/2 inch long, cleft 1/3 length; 4 parted style and ± 22 stamens; live and pressed specimens.
2327	Plant growing in sand in side of gravel pile and just above coral rock above beach; stems upright to semi procumbent; leaves green, stem greyish-brown; flower yellow, 7 petals 3/4 inches long, natched 1/4 length, style 6 parted and ± 40 stamens; live material collected.
2328	A many stemmed plant ± 14 inches high, lvs. green, no red stems, tops of stems are dehydrated; flr. yellow, petal 1/2 in. long - broad, notched 1/5 length with peak in notch, 6 petals, 7 - parted style and ± 38 stamens; grows in rubble and sand area - many dead <u>Portulaca</u> plants, and, <u>Digitaria</u> also; saw <u>Tribulus</u> on e. face slope with green stems, and, flowers climbing on and over the clumps of dead <u>Digitaria</u> .
2329	<u>Boerhaavia</u> - white flowers; stems green and to 36 inches long, northeast mid-central area of exposed coral rubble, west face slope of ± 30 associated with <u>Tribulus</u> and <u>Digitaria</u> ;

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Collection Number      Description

cytological material taken.

2330

Cordia sp. - central, hilly area; Tribulus to 3 feet thick covering area; very dry with few flowers; leaves of small tree have dropped but some green shoots remain at the branch tips; flowers: orange about 1.25 inches long, orange, fruits dark brown-black; heavy litter covers soil.

2331

Collected on the mid-east side, west of the Cordia gulch on old reef rubble with gravel on top; only about 1.5 to 2 inches of soil, in flower.

October 10, 1964

2332

Plant semi-prostrate, some stems 7 inches high, new stems with red anthocyanin but not dehydrated (leaves fleshy), in sand, flower 5 petals 1/2 inch long cleft 1/3 length, 4 parted style, ± 31 stamens, nw end on sand hill with Tribulus and Digitaria.

2333

Algae - in drift on nw point, exposed beach rocks, some locale as No. 2324 and No. 2325.

2334

Northeast side in gravel and sand behind beach, large plant 20 to 25 upright stems (to 14 inches) greyish brown in color, flower yellow, 7 petals 1/2 inch long only slightly lobed but a peak at bottom of the lobe, style 5-parted, ± 36 stamens live collection.

2335

Large leafed young plant, sterile, found in same area at No. 2334, very large green leaves.

2336

On east side of pit east of the walled guano ruin central area of the island - one large stem with red branches, flower light yellow, 5 petals 1/2 inch long, cleft 1/3 of length, 4 styles, ± 9 stamens.

2337

Growing in flat area; exposed coral bedrock, thin soil, se of A. Earhart light, stem 3.5 inches high with many 2° stems above, anthocyanin in stems - deep red color, flower 5 petals, 1/2 inch long. cleft 1/3 the length, 4 parted style, ± 24 stamens, pressed and live material.

2338

Plant with stems to 22 inches, all secondaries originating at low main stem near soil level, flowers: yellow, petals 1/2 inch long cleft into two lobes, 5 parted style, ± 26 stamens pressed and cytological material; bracts subtending the flowers are pinkish in color.

<u>Collection Number</u>	<u>Description</u>
2339	<u>Boerhaavia</u> - white flowers, robust plant growing in square pit in coral rocks, pressed and cytological material, stems to 5 feet in length.
2340	On mid-east side of island, flat area with <u>Boerhaavia</u> , <u>Tribulus</u> and <u>Portulaca</u> ; a few flowers, clumps weathered and dry, partly brown and fallen over, gravel on top, sandy soil beneath.
2341	<u>Portulaca lutea</u> - thick grayish stem, large leaves, growing in coral sand, protected in wall of pit, mid se end of the island - live collection.
2342	Algae - beach drift left at high tide se shore - 150 feet of shallows at 1 to 2 feet (low tide), beach rock exposed along beach, sand or gravel with coral slabs above high tide line.
2343	<u>P. lutea</u> - in fine coral sand se beach above coral slabs, stems procumbent, leaves green, not dry, flower: large as compared to others - 7 petals, 1/2 inch or more, brood lobes, cleft 1/5 length, 6 parted style, $\pm$ 34 stamens, stems not red but gray-brown - preened, live and cytological material.
2344	on se shore in coral sand (damp 2 inches below the dry surface), white flowers, were watered stems to 3 feet long.
2345	West side, s of light on e slope of mound in sandy soil, in bloom at stem terminus, many stems of plant are dead.
2346	Growing in sand of mid west beach area, in flower.  Two Bristle-thighed Curlews were observed on coral rubble on the north beach along with two Wandering Tattlers and one Ruddy Turnstone. I saw two male Blue-faced Boobies fighting in the air over the east end of the island. They both landed and bright yellow beaks were observed on both at short range. Near the campsite nine Bristle-thighed Curlews were seen upon return- in field 8:45 am - 1:15 pm. In the afternoon I observed a Lesser Frigate (sex unknown) attack a female Blue-faced Booby and catch the larger of two disgorged fish (dropped from about 45 ft.) The Sooty Tern colony at the se end appears much larger. Many nestlings are found running about.

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6,

October 11, 1964

Collection Number

Description

- 2347 Tribulus cistoides - plant has  $\pm$  15 stems, 8 to 40 inches in length, with flowers - many stems are dead, associated with Digitaria and Portulaca.
- 2348 Stems semi-prostrate in sand se side, young stems very red, flower: yellow, 5 petals, 5 parted style, 1 28 stamens 1 main stem, 3 large secondary stems and many young, semi-prostrate ones (red), leaves also heavily anthocyanized-plant near the heavily stemmed clump but the aspect is quite different, petals 1/2 inch long, notched 1/3 the length but not broad.
- 2349 SW side on sand pile, stems dead, long root, a and b sheets, no flowers. Tribulus cistoides.
- 2350 B. diffusa - short blooming shoots, sw side, in sand with Tribulus and Portulaca, white flowers.
- 2351 Algae - SW beach, about 200 feet of shallows, 50 feet of sloping beach to coral rubble, about a 7.5 foot rise from beach rock shallows to top of beach, beach litter left by high tide.
- 2352 Lepturus repens - SW beach small clump in floor on beach, wet beneath dry surface, older clumps drier and not in flower.
- 2353 Portulaca - plant 5 inches high, stems to 8.5 inches, green, in sand and gravel, stony surface, s. point near Lesser Frigate colony, flower: yellow, petals 7, broad 3/4 inches by 1/2 inch. Widest point, only slightly notched with wide lobes, style six parted  $\pm$  70 stamens.
- 2354 P. lutea - SE central area, upright to 16 inches, flower: 6 petals, less 1/2 inch. Cleft only slightly, 6 parted style,  $\pm$  22 stamens; pressed, live and cytological material.
- 2355 Portulaca lutea ? - reddish young stems, semi-prostrate, on mid-west area, very dry.

Cloud cover 10 percent on the SW side Tribulus cistoides L. (see photo) with tap root 2 1/2 inches. Long and upper six inches exposed was observed. The short stem is 1/2 inch long and flattened with many dead stems radiating out from the central area - others with a few green leaves at the tips, new stems being produced. Pictures of Portulaca taken (those plants on coral rocks).

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- a. thick and dark-stemmed, style br. 6 or 7 petals 5 or 6, 1/2 in. long, broad, notched 1/6 of petal length with a peak at the bottom of the notch, + 34 stamens.
- b. much dehydrated, red-stemmed, petals 5, yellow, less than 1/2 in. long, narrow, dept 1/6 length, style 4 or 5 parted, 17-28 stamens.

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Collection Number	Description
2356	Growing in sandy soil associated with <u>Digitaria</u> between the A.E. light and the S. Wall of the guano ruins quad-white flrs., some stems dry.
2357	Growing in quad of guano ruins north of the A.E. light, inflorescence dry, scale insects infest this 4.5 ft. shrub, many leaves dry and on ground. <u>Coccoloba uvifera</u> .
2358	Thick stand N. of the A.E. daylight beacon associated with <u>Boerhaavia</u> and <u>Tribulus</u> , in sandy soil, taller stems are dry, some fresh green shoots on most plants.
2359	One live <u>Cordia</u> tree, green leaves at branch tips with buds, flrs. and fruits, orange flr. color. All other leon trees die dead, central area east of the A.E. daylight.
2360	<u>Boerhasvia diffusa</u> - white flrs., dry flat area last of the Greater Frigate colony, east of the A.E. daylight, pressed and cytological material.
2361	<u>Lepturus repens</u> - dry area E of Greater Frigate colony E of the A.E. light associated with <u>Tribulus</u> and <u>Boerhaavia</u> - central area 1/2 of clump green with a few flrs. - the other half is dry.
2362	Algae on exposed reef, south side, at low tide near beach rock sheef, growing on rocks.

In central area near Cordia grove Red-footed Booby on an egg with three fresh ends of stems (Tribulus) in the nest. In the same area 2.5 - 4 in. of litter is found on the ground (dried leaves from Tribulus stems). As on East Island, Pearl and Hermes, the disturbed sites have a very thick covering of Tribulus to the exclusion of almost all other species. Disruption seems to give this species a competitive advantage. Here on Howland the central area is devoid of other species over large areas. There is a tendency for Tribulus to assume dominance in areas of heavy bird nesting (ie both north and south portions of the island).



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On the south end the numerous Lesser Frigates are nesting on a sea - facing slope with Tribulus, Lepturus, Boerhaavia and Portulaca. Nest platforms are often built on top of plants - nests from 14 to 28 in. in diameter and from 1/2 to 7 in. deep - stems of Tribulus matted with guano. The young defend the nest territory vigorously. About 3 nests/sq. 1.5 yd. were observed on the lower slopes nests are built on top of Lepturus clumps while above Portulaca is commonly used. Some nests are placed on bare soil with or without a rudimentary stick platform. Most of the vegetation in this nesting area is in poor condition due to dryness and the heavy guano accumulations. On the west end of the colony the nests are built on clumps of Lepturus almost exclusively.

#### Banding Summary

9 October 1964 - 66 Blue-faced Booby band returns were recorded, 9 Blue-faced Boobies were banded.

11 October 1964 - 200 Sooty Terns nestlings were banded, 800 Sooty Terns adults were banded.

12 October 1964 - 192 Sooty Tern nestlings banded.

13 October 1964 - 640 adult Sooty Terns were banded, 4 band returns were recorded.

Howland Island - Photo List

10 October 1964

- I. 1. A view looking west, Blue-faced Booby adults and nestlings, dry vegetation.
2. Tribulus cistoides L. - dry stems - in flat area on the NW side.
3. Portulaca lutea Sol. - dry stems but some leaves still green.
4. Blue-faced Booby pair, immature on stone in background (point ringed), x on stone in background, marks on immature Red-tailed Tropicbird.
5. Looking NW toward the dune above the beach.
6. View toward the NW - flat area in back of beach, nesting Blue-faced Boobies.
7. P. lutea Sol. in sand at the base of a small east face slope, NW end, green, stems to 16 in. high.
8. Flat area N end looking north - note drier vegetation in area of greatest boobie concentration.
9. Taken from NW point looking south along the shore.
10. Looking NW - note depression with the beach crest in back.
11. Portulaca sp. rooted in coral rubble, sand pocket, north beach facing the surf.
12. Close-up of plant like No. 11 and growing close by: flr: petals 5, 1/2 in. long, cleft 1/3 length, style 5 parted and ± 34 stamens. Ants commonly found in these flowers.
13. Plant found at the E base of the sand pile, north end, many flowers and stems semi-prostrate.
14. Tribulus in bloom - flat area N end of island. About 50 percent of local area is composed of dry stems of this sp.
15. Immature of Blue-faced Booby on rock perch, NE end of Howland Island.
16. Looking NW, gulch on NE side - dead Digitaria, dry Lepturus and Portulaca.
17. No. 2334, NE side, in bloom - growing in gravel and sand "gulch" behind the beach.
18. Portulaca - dry flat area NE side, with Tribulus and dead looking Digitaria, stems flat, red - growing in sandy soil.
19. N. Central site looking N., bare area with Tribulus and Boerhaavia, and very dry stands of Digitaria.
20. N. Central - looking west, dry Digitaria with open areas of Boerhaavia and Tribulus. Lepturus patches dispensed about area.
21. NE in flat coral bedrock E of guano ruins in thin soil. Portulaca sp. flower yellow, 5 petals with ragged lobe ends, 4 parted style, petals 1/2 in. long and ± 22 stamens.
22. On E side of pit, east of walled guano ruin, 1 large stem, all other young, prostrate stems red.
23. Mid central area looking SW toward dead Cordia trees, dry Digitaria and Tribulus.
24. Taken from mounds mid-central area looking W toward the Greater Frigate nest area in dead Cordia grove.
25. As above but looking NE into depressed area - coral rock exposed, Lepturus and 2 sp. of Portulaca in relatively good condition.

Howland Island - Photo List continued

Two types of Portulaca:

- a. plant with upright stems grey-brown in color.
  - b. one main stem - many secondary stems prostrate to semi-erect and reddish in color.
26. Red-footed Booby in nest of Tribulus stems, central area, dead Cordia.
  27. Grove SE of light.
  28. Two Portulaca types: a. tall, b. prostrate - growing side by side on exposed bedrock flat SE of A.E. light.
  29. As in 28 but closer showing 2 forms together.
  30. Taken from bare area SE of light and in front of frigate roost - looking east -- Digetaria and Tribulus.
  31. As in 30 but looking SE toward the Sooty Tern colony, SE end.
  32. As in 30 but looking S to south end of island (Compare 30-32 with 2x2's taken on June-July ATF).

- II
- .1. SW side about 300 yds. from A.E. daylight - looking south; mounded area in foreground - Digitaria and Tribulus cover.
  2. As above but SSW looking toward beach and exposed coral rocks - Digitaria and Tribulus cover.
  3. D. Merrill, technical assistant and dead Lesser Frigates, SW side.
  4. A. Anderson, technical assistant and dead Lesser Frigates, SW side.
  5. Tribulus, SW side showing elevated bud clusters, top root exposed.
  6. As in 5. plant nearby, located on the edge of a sand mound left from digging cistern, root exposed.
  7. Uprooted Tribulus as in 5. to show root system (Coll No. 2349).
  8. D. Hackman, SW side and friend.
  9. D. Hackman, SW side and friend.
  10. D. Hackman and F. Sibley trading bands.
  11. D. Woodward, technical assistant and botanist.
  12. F. Sibley approaching Blue-faced Booby offspring, note soft shoe routine.
  13. F. Sibley bands Blue-faced Booby young; note deft fingers and sureness of touch.

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October 9, 1964 - Notes

Plants found in bloom on northwest shore area are:

Boerhaavia diffusa L.  
Tribulus cistoides L.  
Lepturus repens (Forst.) R. Br.  
Digitaria pacifica  
Portulaca lutea Sol.

The extent of bloom is much curtailed since our July visit:

- a. only plants in rocky areas or well shaded,
- b. flowers occur at tips of new growth and are not as large as those produced earlier;
- c. small clumps in beach sand where water is available (on inner areas all clumps are dry and past blooming);
- d. new stems (short) from dry plants are in bloom, but stems are about 1/3 to 1/2 as long as dry, dead mature stems.
- e. some plants are still green where protected by large clumps of grasses - blooming at apices of shaded branches or younger, smaller branches.

Eleven Bristle-thighed Curlews observed at camp about 11 A.M. and two Ruddy Turnstones along W shore at 4 P.M.

In the flat area on the NW portion Tribulus a conspicuous dominant where many pairs of Blue-faced Boobies (adults, immatures and nestlings) are found. Digitaria found on periphery of area above beach and on inner depression as well as frequent patches in the flat Tribulus stand. This grass is very dry and dead-looking. Tribulus stems are dead or green only at the tips of younger stems. Boerhaavia is found in sandy sites at edge and with white flowers. Supposed Portulaca lutea and P. oleracea hybrid is present and in poor condition, quite dry. A sand beach ecotype of P. lutea is present. Observed Sooty Terns flocking over the north central area - no nesting sites in the same area.

Nine bands were used on Blue-faced Boobies late in the evening and sixty-six band returns were recorded.

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October 24, 1964

<u>Collection Number</u>	<u>Description</u>
2535	<u>Pandanus</u> sp. - leaves to 4 feet, tree to 12 feet with 3 or 4 branches at $\pm$ 7 feet - bent limbs picture of aggregate fruit taken
2536	<u>Eupharbia heterophylla</u> - rooted in coral gravel under <u>Cocos</u> litter near abandoned huts in village.
2537	<u>Tribulus cistoides</u> - long stems to 5 ft. in dry area, gravel of village, in flower.
2538	<u>Ipomoea</u> sp. - planted (?) near abandoned huts of village, in fruit.
2539	<u>Morinda citrifolia</u> - in flower and fruit, near abandoned huts of the village and naturalized in groves throughout <u>Cocos</u> stand - to 13 ft. in flower and fruit.
2540	<u>Sida</u> sp. in flower and fruit, shrub to 4.5 ft. in coral gravel of abandoned village, most of the leaves dry and fallen, a few green sprouts flowering.
2541	<u>Boerhaavia diffusa</u> L. - white flowers with stems to 2.5 ft. in flower and fruit, in coral gravel of abandoned village, pressed and cytological material.
2542	Sedge - dry, in coral gravel of abandoned village west side of lagoon.
2543	Cyperaceae - ( <u>Fimbristylis</u> ?) in sunken area behind the north beach associated with <u>Sesuvium</u> - very dry.
2544	<u>Lepturus repens</u> - in shaded depression of coral rock near first angle of tramway and near the edge of the lagoon.
2545	<u>Eupharbia hirta</u> - in <u>Cocos</u> forest, west side in formerly cultivated area, now very dry.
2546	Compositae - common on gravel and coral rubble under <u>Cocos</u> stand near the village, very dry.
2547	<u>Portulaca lutea</u> - on rock, in crevice, above the lagoon on west side, low prostrate stems.
2548	Growing in dry pond area north end, associated with <u>hepturus</u> , <u>Sesuvium</u> and <u>Ipomoea</u>

<u>Collection Number</u>	<u>Description</u>
2549	In dry ponds, north side of island, in fruit.
2550	Algae - growing in the saline water of lagoon, west side.
2551	Algae: growing in sand on exposed beach rock, partly exposed at low tide, area 150 ft. wide on west reef.
2552	Algae: on NW reef; drift from the outer reef.
2553	Algae: on NW reef; drift from the outer reef.
2554	Algae: NW reef at the edge of reef in surge channel.
2555	Algae: NW reef, at edge of outer reef at low tide.
2556	Algae: NW reef, in drift, from the outer reef.
2557	<u>Surpus</u> sp. - in damp soil of old taro pit, near central area of the village but towards the lagoon, in flower and fruit.
2558	<u>Scaevola taccada</u> - dry coral rubble hillside in back of village towards the lagoon, small flowers.
2559	Same area as No. 2558 but larger flowers - perhaps a better watered plant.
2560	Plant in flower and fruit, near lagoon, west side of island, fruits preserved.
2561	<u>Seguvium</u> - live collection, from mat, west side of lagoon, in flower.
2562	Erect Composite - 16 - 24 in. growing in the village area SE side in sand and gravel.
2563	Erect plant 16 - 24 in. growing in village area SE side in sand and coral.
2564	Erect herb growing in coral rubble in shade of small <u>Cocos</u> on NE side.
2565	Erect herb growing in coral rubble under small <u>Cocos</u> - SE side.
2566	Lichen - growing on bark of dead coconut.
2567	Small tree growing in coral rubble on SW side in open area.

<u>Collection Number</u>	<u>Description</u>
2568	Low succulent forming a large mat by lagoon on SW side in open area.
2569	Creeping plant growing on coral rubble near <u>Cocos</u> grove S side of island.
2570	Tree 5.5 ft. tall growing in sand area on S side of island, in the open.
2571	Low erect plant growing in coral and sand under <u>Cocos</u> trees on the S side of the island.
2572	Vine growing over <u>Messerschmidia</u> in large hill of coral rubble with <u>Scaevola</u> on S side of island.
2573	Low plant growing in coral and sand in open area by lagoon on the S side of the island.
2574	Low semi-erect plant growing in an open area on south side of the island in coral and sand.
2575	Erect plant growing in coral rubble by the south shore of the lagoon.
2576	Low succulent forming large mats by the south shore of the lagoon.
2577	Tree growing in open coral rubble; flowers with 5-7 stamens.
2578	Small tree growing by <u>Cordia</u> on SE side of the island.
2579	Medium - sized tree growing in coral rubble on SE side of island associated with <u>Sida</u> and <u>Boerhaavia</u> .
2580	Low creeping herb in coral rubble on SW side of the island.
2581	Low succulent by SE side of lagoon growing in coral rubble.
2582	<u>Portulaca</u> - live collection, growing in coral rubble on SE side associated with <u>Sida</u> .
2583	Dry grass in abandoned roadway of village, west side.
2584	<u>Ipomoea</u> - in waste area behind village on lagoon side- white flowers.
2585	<u>Compositae</u> - at bottom of dry well in village, west side, blue flowers.

<u>Collection Number</u>	<u>Description</u>
2404	Plant grows near roadside by air terminal in coral gravel - in flower and leaves large.
2405	<u>Portulaca</u> sp., stems procumbent, leaves green, flower 5 or 6 petals, 5 parted style, ± 30 stamens, petals cleft 1/5 their length.
2406	<u>Lepturus repens</u> (Forst.) R. Br. - growing in coral gravel in open area near lagoon about 400 ft. south of the tennis courts.
2407	This plant grows in gravel - open area about 400 ft. south of the tennis courts. <u>P. lutea</u> Sol. present as is a hypothetical intermediate.
2408	Plant with flowers and mature fruits: in open area about 400 ft. south of the tennis courts growing in coral gravel.
2409	Plant about 3.5 ft. high; in flower and fruit; growing in coral gravel and sand in an open area near lagoon about 400 ft. south of the tennis courts.
2410	Found in open gravel area about 400 ft. south of the tennis courts associated in the open coral gravelled area with <u>Sida</u> , <u>Lepturus</u> , <u>Scaevola</u> and <u>Portulaca</u> - in bloom; this species covers the area adjacent to the lagoon with a thick cover - both live and pressed material taken.
2411	Plant with stems to 4.5 ft. high, in flower, leaves rolled, near <u>Pisonia</u> trees left side of road about 1/4 mile from terminal heading south.
2412	Plant vigorous, semi-procumbent, stems turned up near the ends - very large flowers- the largest I have been to date growing in open gravel area south of the tennis court - <u>Portulaca</u> sp. (hybrid?). Live material.
2413	<u>Portulaca</u> sp., stems upright, sterile but flowers appear to have been smaller than the large flowered coll. No. 2412. Growing in gravelled area just south of the tennis courts. Live material.
2414	<u>Portulaca lutea</u> Sol. - open gravel area south of the tennis court (± 400 ft. south) - smaller flower size than on other collections. Live material.



<u>Collection Number</u>	<u>Description</u>
2415	Chlorophyceae - in drift along lagoon edge just south of the air terminal - long green strands common along lagoon edge.
2416	Rock - algae- growing on beach- sides of pools not exposed at low tide; west reef in front of old guano dwellings.
2417	Algae - on rocks exposed to wave action by receding and surging tides; small clumps adhering to rock surfaces; west reef opposite old guano dwellings.
2418	Algae - growing in sand pockets of surge channels in beach rock/coral rock - always covered by water; on west reef opposite the old guano dwellings.
2419	Algae - forms crust on coral covered rocks in tidal zone- exposed for only a short time each day - epiphytes on this sp. numerous - sometimes found on live coral - west reef opposite the old guano dwellings.
2420	Algae - epiphytic green and red on _____? which grows attached to exposed reef rock - uncovered at low tide on west reef opposite the old guano ruins.
2421	Algae - forms crust at edge of tide pools, epiphytic red alga - on exposed beach rock covered with coral and algae crusts - west reef opposite the old guano dwellings.
2422	Algae - on west reef opposite the old guano dwellings - coralline red with conspicuous epiphytes - edges of tidal pools - not exposed at low tide.
2423	Algae - on west reef opposite old guano dwellings - on sides of coral covered beach rock - pools not exposed at low tide - many epiphytes.
2424	Algae - growing on northwest reef, in clumps rooted in sand pockets of shallow pools.
2425	Algae - growing on northwest reef - in shallow pools attached to stones imbedded in sand pockets.
2426	<u>Digitaria pacifica</u> - in sand pockets of coral rock pile above the northwest terrane - associated with <u>Portulaca</u> and <u>Boerhaavia</u> - in flower and fruit this large clump apparently has more moisture than others in the surrounding area - four sheets taken.

Collection Number

Description

- 2427 Portulaca lutea Sol. - large plant with + 30 upright (to 14.5 in.) stems, growing in sand pocket in coral rubble above terrace on the northwest side; in flower yellow, 5 petals + 1/2 in. long, lobed 1/8 distance of petal length, 7 style branches and + 33 stamens - live cytological and pressed specimens taken.
- 2428 Boerhaavia diffusa - white flowers, large plant + 10 ft. dia. with many radiating stems, on rocky coral rubble above terrace on the northwest side - most of the stems have no flowers but plenty of dried fruits. cytological and pressed material - 4 sheets.
- 2429 Sida sp. - sprouts in flower and fruit on otherwise dead looking shrub to 3.5 ft. high, bushes grouped at the edge of the lagoon on the north side surrounded by the Sesuvium mat - nesting Sula sula and Frigata ariel.
- 2430 Sesuvium - in bloom; mat along the north edge of the lagoon growing into the lower edges of the rock rubble (base of "bowl" and into the open lagoon) mat 15 to 100 ft. wide - flowers whitish tinged pink or purplish - 3 sheets + live coll. and cytological material.
- 2431 Algae - forming crust on bottom of shallow pools of standing water northwest portion of lagoon - red deposit just underneath the water varying in depth 0.5 to 5.0 in. collecting in depression of lagoon floor.
- 2432 Lepturus repens (Forst. R Br. - growing on west beach in pure sand 50 ft. south of old guano ruins; associated with Boerhaavia.
- 2433 Algae - found in surge channels as tide moves in - washed in from the outer reef; west reef opposite the old guano ruins.
- 2434 Algae - covering coral reef rocks - upper tidal zone - uncovered at low tide - forming a mat; west reef opposite the guano ruins.
- 2435 Algae - growing footed in sand in pool, surrounding area uncovered at low tide; west reef opposite the old guano ruins.
- 2436 Algae - growing in sides of rock pools or on surface washed by waves; west reef opposite the old guano ruins.
- 2437 Algae - large clumps imbedded in sand pockets of rock pools surrounding area bare at low tide; west reef opposite the old guano ruins.

<u>Collection Number</u>	<u>Description</u>
2438	<u>Portulaca lutea</u> Sol. - in sand pocket of beach rock pile, in flower, southwest beach - live collection.
2439	<u>Boerhaavia</u> sp. - white flowers and stems to 3.5 ft., plant large and vigorous, growing in sand pocket of coral rock near washed out area SW end - associated with <u>Sesuvium</u> .
2440	Algae - in saline pool, water collected in a depression, NE end of the lagoon.
2441	<u>Tribulus cistoides</u> L. - growing in gravel on bottom half of lagoon bowl rim, north end of island; nesting Blue-faced Boobies; associated with <u>Boerhaavia</u> sp.
2442	Algae - Upper 1.5 in. of lagoon crust showing algal layer - NW floor of lagoon; specimen inverted in vial; upper .25 in. salt, reddish layer next .25, - .125 in. layer blue green alga and I 1.0 in. of darker, brown colored material.

October 20, 1964 - McKean Island

<u>Collection Number</u>	<u>Description</u>
2443	<u>Boerhaavia diffusa</u> L. - growing in pocket of coral rubble, inner bowl of lagoon N side above the <u>Sesuvium</u> mat - a vigorous plant in flower and fruit; stems to 4 ft.
2444	Algae - growing in sandy pool bottom - about 1 ft. water at low tide - many epiphytis, ne reef
2445	Algae - in tide pools covered with water at low tide, ne reef.
2446	Algae: covers sides of pools, not exposed at low tide, ne reef.
2447	Algae: ne reef, on exposed rocks at low tide and in surge channels.
2448	Algae: ne reef, sides of surge channels, coralline red alga, covered at low tide.
2449	<u>Sesuvium</u> - new stem growth with flowers, collected on SE mat near the lagoon floor. Pickled collection.

<u>Collection Number</u>	<u>Description</u>
2450	<u>Portulaca lutea</u> Sol.- growing near the ruins of the walled pit SE of the compsite - associated with <u>Lepturus</u> and <u>Boerhaavia</u> . Live collection.
2451	Algae - a general collection from surge channels on the south reef - appear to be + 10 genera present covering the exposed rocks and sides of tidal pools.

21 October 1964 - McKean Island - Wind constant in both morning and afternoon hours. The cloud cover seems to pick up late in the afternoon or early evening, and, showers are much more likely at night. The south reef was observed to be the most abrupt on the island. This is especially noticeable as the tide moves in and up the surge channels. The abruptness of the reef is further indicated by the distance to which the algae grow up the reef - these being only + 20 feet (maximum) of bare rock (or poorly covered rock) at low tide. On all other sides of the island the reef is much wider, and, consequently there is a wider sterile bond below the beach.

McKean Island has a unique shape among the islands of the Phoenix group: nearly circular as though the coral growth had formed a ring around the top, almost perfectly round cone of a submerged volcanic mountain. Despite storm action and weathering this island may retain or reflect the geological structure from which it arose. (F. Sibley discounts this theory but offers no alternative). I believe there are some islands in the maldive group which have been built in this fashion.

At the southwest end of the island is the trunk of a buttressed tree (probably not Pisonia) washed about 30 feet inland from the beach. The trunk is + 32 feet long. I think that this was deposited by wave action. Also on the southwest side are several large coral boulders at the surface. These resemble several coral boulders which appear on the reef at low tide. I do not think we can underestimate the effect of the sea forces on the topography as well as the living things of the island.

At 6 P.M., October 21, 1964, the lagoon on McKean Island was observed to be about 90 percent covered with seepage water from the high tides. In the mid north central area on the largest dry "island" are + 350 Blue-faced Boobies one of the largest clubs I have seen.

19 October 1964 - McKean Island

A list of 2 x 2 colored slides taken by C. R. Long.

1. Portulaca lutea Sol. - growing in a sand pocket surrounded by slab rocks, SW beach - live collection.
2. Southwest end just above waves of high tide - P. lutea, Sesuvium and Digitaria on the outer most part of wave-built terrace.
3. "Break" in the rock rim, southwest end - Sesuvium and Boerhaavia - wave damage and possible flooding in this area.
4. F. Sibley, D. Hackman, P. Woodward, A. Anderson, and D. Merrill on SE rim of lagoon "bowl" - banding nestling Lesser Frigates.
5. Taken from S part of lagoon - looking east - note water seepage and accumulation on lagoon floor.
6. Southeast end - seepage hole in lagoon floor near the Sesuvium mat - current very apparent.
7. Seepage holes, and nestling Lesser Frigates on rock pile along the lagoon rim.
8. As above (No. 7) but vertical shot.
9. Southeast end, view along edge of Sesuvium mat. Note the frigate nests in the mat.
10. Frigata minor nestlings and Blue-faced Boobies - SE end of island near lagoon edge.
11. Taken from east side, due west, at sundown.

20 October 1964

12. Taken from west slope of lagoon bowl - looking NW - dry Sida, Digitaria and Sooty Tern colony.
13. Looking NNW toward guano ruins and along the dry NW side of the lagoon - dead Sida.
14. NW end of the lagoon slope and flats - notice green Boerhaavia and Sesuvium.
15. On west edge of lagoon - dead Sesuvium mat - only a few sprigs show any life - dead Lepturus clumps - many nesting Greater Frigates, Blue-faced Boobies and Audubon's Shearwaters just above mat.
16. At mid east end of lagoon looking southwest - seepage water which has accumulated in 14 hours as result of high tides.
17. At mid-east end of lagoon looking NW - small seep at edge of coral bedrock and lagoon - Sesuvium on bedrock, dry Sida stand in back.
18. Looking west from mid - north lagoon edge - Sesuvium on raised coral bedrock - water from seepage surrounding raised "islets".
- 19-22 - taken from NE end midway up lagoon slope.
19. Looking west - N end of lagoon
20. WSW across lagoon - showing the extent of water seepage.
21. SSW showing seepage on lagoon floor.
22. S showing the east shore of the lagoon.
23. Looking N along wave built terrace - coral rubble - Lesser Frigate nestlings in depression NE side of lagoon.

24. Northeast reef - surge channel with algae covered rocks.
25. Northeast reef - surge channel with coral and algae.
26. Northeast reef - surge channel with coral and algae.
27. Northeast reef - corals, urchins, algae encrusted rocks.
28. Halimeda sp. in pool on northeast reef.
29. Taken from east rim looking SW - Gray-backed Terns in foreground, Lesser Frigates in colony at left, view of south end of the lagoon.
30. ----
31. Gray-backed Tern eggs.
  
- 32-35 Taken from east lagoon slope just north of camp on west:
32. Northeast side of lagoon, looking north, Sesuvium mat.
33. North and northwest sides of lagoon - note extent of water cover over surface of lagoon.
34. West northwest side of lagoon.
35. West side showing dry slopes - dead looking Digitaria and Lepturus of July shots.

C.R. Long  
1964

SIC # 5

Summary of Botanical Field Work, June - July ATF, 1964

Palmyra Island

June 5, 1964

Collections were made on Cooper Island, Kaula Island and Holei Island, and along the causeway connecting Aviation Island with Kaula Island. The specific areas covered were: south side of Cooper Island along west - east runway; the north - south causeway; the extreme east portion of Kaula and the west half of Holei Island. Photographs and soil samples taken.

The following collection numbers were used: No. 1760 - 1784, C.R. Long. Assisted in banding red footed boobies.

June 6, 1964

Collections were made on Sand Island in the morning, and on Home, Paradise, Kaula and Cooper Islands in the afternoon.

The following collection numbers were used: No. 1785 - 1810, C.R. Long and D. Gill.

June 7, 1964

Collections were made on Cooper, Aviation, Quail, Whippoorwill Eastern, Holei, and Bird Islands, and the causeway connecting Aviation Island to Kaula Island, Photographs and soil samples taken.

The following collection numbers were used: No. 1811 - 1826, C.R. Long.

Washington Island

June 9, 1964

Collection No. 1827 - 1844 C.R. Long, D. Gill, C.D. Hackman, and P. Marshall. Soil samples and photographs taken.

C.R. Long

1964

June 10, 1964

Soil samples, bog cores and photographs taken. Collection No.

1845a - 1845x.

June 11, 1964

Collected in west area (bogs), across fresh water lagoon to the east end of the island. Photographs, bog core samples and soil samples taken. Collection No. 1859 - 1865.

June 12, 1964

Soil samples and photographs taken. Observations on north shore for vegetative map of the island.

Christmas Island

June 14, 1964

Cook Island Collection No. 1845 - 1858. Assisted in the banding of sooty terns.

June 15, 1964

Cook Island

Motu Upua - Collection No. 1884 - 1895.

June 16, 1964

Observations and collection made along the southeast coast of the main island, Christmas Island. Photographs were made. Collection No. 1896 - 1909.

June 17, 1964

Motu Upua - Permanent markers were placed and photographs taken. Assisted in banding Christmas Island Shearwaters.

June 18, 1964

Motu Tabu - Vegetation transects, soil collections and plant collections made. Photographs taken. Collection No. 1910 - 1919.

Motu Upua - Permanent markers adjusted and photographs taken.



C.R. Long  
1964

June 19, 1964

Cook Island Vegetative Transects made.

June 20, 1964

Assisted in banding sooty terns and noddys.

Malden Island

June 22, 1964

Collections were made in west, mideast, north and northwest areas of the island. Collection No. 1920 - 1935. Photographs and soil samples taken.

June 23, 1964

Collections were made in the southwest, south, east, and northeast parts of the island from lagoon edge to beach. Collection No. 1936 - 1938,

C.R.Long.

June 24, 1964

Photographs were taken. Permanent markers placed. Collection No. 1939 - 1942, C. R. Long.

Starbuck Island

June 25, 1964

Walked east and north during evening.

June 26, 1964

Collected along the north shore heading east then south. Vegetation transects and soil samples were taken. Collected to east end of the island. Collection No. 1936 - 1948.

June 27, 1964

Vegetation transects and soil samples were taken. Permanent markers placed.

C.R. Long  
1964

Hull Island

July 8, 1964

Collections were made on the west island and along the islets stretching to the northeast. Collection No. 1998 - 2038, C.R.Long. Soil samples and photographs were made.

July 9, 1964

Collections were made on the islets due south and across the lagoon from the ATF camp and proceeded southwest to the west island. The northeast islets were not visited. Collection No. 2039 - 2076, C.R.Long. Soil samples and photographs were made.

Phoenix Island

July 10, 1964

The island was circuited and traversed several times. Collection No. 2077 - 2083. Photographs and soil samples secured.

July 11, 1964

Collection No. 2084 - 2088. Photographs and soil samples taken.

July 12, 1964

Permanent markers were placed. Transects of vegetation carried out. Collection No. 2089, C.R.Long. Assisted with the banding of masked boobies and red-footed boobies.

July 13, 1964

Vegetation information was gathered and permanent markers were placed.

Enderbury Island

July 15, 1964

Collected the west side of the island. Collection No. 1990 - 2010

C.R. Long.

C.R. Long  
1964

July 16, 1964

Worked on U.S.S. Takelma in the morning and early afternoon. Collected and placed permanent markers during the late afternoon, and early evening on the north end of the island. Collection No. 2011 - 2020.

July 17, 1964

Collected in the west, south and east sides of the island. Collection No. 2021 - 2024.

McKean Island

July 18, 1964

Vegetation transects were made on north and south ends of the island. Collection No. 2025 - 2037. Permanent markers were placed. Photographs were taken. Assisted in banding of masked boobies.

July 19, 1964

Collection No. 2038 - 2048. Collected along the west and north from the ends of the island. Assisted in the banding of masked boobies.

Baker Island

July 21, 1964

Collections made on the south, east, north and west portions of the island. Collection No. 2049 -

Howland Island

July 22, 1964

Vegetative transects were made. Collection No. 2170 - 2179. Permanent markers were placed.

July 23, 1964

Vegetative transects and photographs were made. Permanent markers were placed.

C.R. Long  
1964

July 24, 1964

Quadrat studies of the vegetation cover were carried out.

Photographs were made.

Information from photographs, vegetation transects and observations was collected on all the islands. From this, approximate vegetation maps for all the islands or portions of islands are presently being constructed. Many thanks to F.Sibley and D. Hackman who shared information of localized species distribution, and to P. Marshall, D. Gill, and L. Huber who assisted in collecting and routine tasks.

Preliminary List of Plants Collected SIC # 5

Phoenix Islands by C.R. Long.

	HUK	COOK	STON	YORK	TERB	MAR	STARBUCK	HORRA
<i>Portulaca lutea</i> Sol	✓		✓	✓	✓	✓	✓	✓
<i>Portulaca oleracea</i> L.	✓				✓			✓
<i>Mimosa sensitiva</i>	✓							
<i>Mirabilis jalapa</i> L.	✓							
<i>Boerhaavia diffusa</i> L.	✓	✓	✓	✓	✓	✓	✓	✓
<i>Euphorbia prostrata</i> A. +	✓				✓			
<i>Pedilanthus</i> sp.	✓							
<i>Euphorbia hirta</i> L.	✓				✓			
<i>Carica papaya</i> L.	✓							
<i>Pandanus</i> sp.	✓							
<i>Morinda citrifolia</i> L.	✓							
<i>Cocos nucifera</i> L.	✓							
<i>Cynodon dactylon</i> (L.) Pers	✓							
<i>Fimbristylis</i> sp.	✓							
<i>Cenchrus echinatus</i> L.	✓					✓		
<i>Eragrostis amabilis</i> (L.) Ward	✓							
<i>Fleurya ruderalis</i> (Forst) Gaert	✓		✓					
<i>Messerschmidia argentea</i> (L.f.)	✓		✓					
Cucurbitaceae	✓							
<i>Triumfetta procumbens</i> Forst	✓		✓		✓			
<i>Sesuvium portulacastrum</i>		✓	✓	✓		✓	✓	
<i>Sida fallax</i>		✓	✓	✓	✓	✓	✓	✓
<i>Lepturus repens</i>		✓	✓	✓	✓	✓	✓	✓
<i>Digitaria pacifica</i>			✓	✓	✓	✓	✓	✓
<i>Cassipoupa filiformis</i> L.			✓	✓		✓	✓	
<i>Eragrostis whitneyi</i> Fosberg			✓	✓		✓	✓	
<i>Ipomea</i> sp.			✓	✓		✓	✓	
<i>Cordia subcordata</i> Lam.			✓			✓	✓	
<i>Tribulus cistoides</i> L.				✓		✓	✓	
<i>Cynodon dactylon</i> (L.) Pers						✓	✓	
<i>Pisonia grandis</i> R. Br.						✓	✓	
<i>Cosmos bipinnatus</i> Cav						✓	✓	
<i>Cordia</i> sp.			✓			?	✓	

Howland Island  
July 24, 1964

Quadrat Studies of the Vegetation

#	<u>Location</u>	<u>Species Present</u> SP/T/Q	#	<u>Soil</u>
1.	west of p.m. #2 on the west beach	<u>Lepturus</u> 6	s-4 m-1 <u>l-1</u>	beach rock, sand, 2° slope west
2.	30 ft. due e. from #1.	<u>Lepturus</u> 9	s-1 m-1 <u>l-7</u>	level beach with many coral rocks at surface sand underneath
3.	15 ft. e. of #2.	<u>Lepturus</u> 14	s-0 m-2 <u>l-12</u>	beach rock with sand beneath, 2° slope east
		<u>Portulaca</u> 3	s-0 m-1 <u>l-2</u>	
4.	20 ft. e. of #3.	<u>Lepturus</u> 5	s-0 m-2 l-3	beach rocks with small pockets of sand, sand beneath <u>B.</u> seedlings sprouting next to closely packed stones. Slope 8 w.
		<u>Portulaca</u> 3	s-0 m-3 l-0	
		<u>Boerhaavia</u> 29	s-26 m-3 <u>l-0</u>	
5.	15 ft. e. of #4.	<u>Lepturus</u> 9	s-1 m-2 l-6	a 6° slope west, sand and gravel with some large rocks. <u>L.</u> - one plant dead in plot.
		<u>Portulaca</u> 2	s-1 m-1 l-0	
		<u>Boerhaavia</u> 4	s-2 m-2 l-0	
6.	15 ft e. of #5	<u>Lepturus</u> 7	s-2 m-1 l-4	a 3° slope w., gravel and rock
		<u>Portulaca</u> 1	s-0 m-1 l-0	
		<u>Boerhaavia</u> 0	s-0 m-0 l-0	
7.	10 ft. e. of #6 - near the slope crest	<u>Lepturus</u> 8	s-1 m-1 l-1	a 2° slope west, gravel at surface, sand beneath with heavy stones at the surface.
		<u>Portulaca</u> 1	s-0 m-1 l-0	
		<u>Boerhaavia</u> 4	s-2 m-2 l-0	
		<u>Digitaria</u> 10	s-8 m-0 l-2	

#	<u>Location</u>	<u>Species Present</u> SP/T/Q	#	<u>Soil</u>						
8.	20 ft. n. of p.m. #2	<u>Lepturus</u> 9	s-4 m-4 l-1	level large rocks with surface gravel and sandy subsoil						
		<u>Portulaca</u> 5	s-1 m-2 l-2							
		<u>Boerhaavia</u> 5	s-2 m-3 l-0							
		<u>Digitaria</u> 8	s-3 m-0 l-5							
		<u>Tribulus</u> 11	s-0 m-11 l-0							
		9.	30 ft. e. of p.m. #2		<u>Digitaria</u> 10	s-0 m-0 l-10	sandy soil			
					<u>Tribulus</u> 1	s-0 m-0 l-1				
					<u>Boerhaavia</u> 1	s-0 m-1 l-0				
					<u>Portulaca</u> 2	s-0 m-1 l-1				
					10.	20 ft. e. of #9		<u>Lepturus</u> 8	s-0 m-0 l-8	2° slope e. sandy soil
								<u>Digitaria</u> 4	s-0 m-0 l-4	
<u>Portulaca</u> 4	s-0 m-2 l-2									
<u>Boerhaavia</u> 12	s-0 m-3 l-0									
<u>Tribulus</u> 1	s-0 m-0 l-1									

#	Location	Species Present SP/T/Q	#	Soil
11.	40 ft. due east of p.m. #8.	<u>Lepturus</u> s-0 m-0 9 l-9 <u>Tribulus</u> s-0 m-0 3 l-3 <u>Portulaca</u> s-0 m-1 3 l-2		gravel disturbed site old runway site
12.	65 ft. due east of p.m. #8	<u>Digitaria</u> s-0 m-0 3 l-3 <u>Boerhaavia</u> s-0 m-0 2 <u>Tribulus</u> l-3 s-0 1 m-0 l-1		as above
13.	85 ft. due east of p.m. #8	<u>Tribulus</u> s-0 m-0 6 l-6 <u>Portulaca</u> s-0 m-0 1 l-1 <u>Boerhaavia</u> s-0 m-0 1 l-1		as above
14.	120 ft. due east of p.m. #8.	<u>Tribulus</u> s-0 m-0 2 l-2 <u>Lepturus</u> s-0 m-0 3 l-3		east of runway gravel and sand
15.	170 ft. due east of p.m. #8	<u>Tribulus</u> s-0 m-0 2 l-2 <u>Lepturus</u> s-0 m-0 6 l-6 <u>Portulaca</u> s-0 1 m-0 l-1 <u>Boerhaavia</u> s-0 1 m-0 l-1		gravel and sand on top with sand be- neath.



#	<u>Location</u>	<u>Species Present</u> SP/T/Q	#	<u>Soil</u>
16.	215 ft. east of p.m. #8.	<u>Digitaria</u> 5	s- 0	sand and gravel level
			m- 2	
		<u>Tribulus</u> 4	l- 3	
			s- 0	
		<u>Portulaca</u> 4	m- 0	
			l- 4	
		<u>Boerhaavia</u> 2	s- 0	
			m- 0	
			l- 4	
			s- 0	
	m- 0			
	l- 2			
<hr/>				
17.	260 ft. east of p.m. # 8.	<u>Lepturus</u> 5	s- 3	sand, soil with more organic material
			m- 1	
			l- 1	
		<u>Boerhaavia</u> 1	s- 0	
			m- 0	
		<u>Portulaca</u> 8	l- 1	
			s- 0	
		<u>Tribulus</u> 1	m- 1	
			l- 7	
			s- 0	
	m- 0			
	l- 1			
<hr/>				
18.	300 ft. east of p.m. #8.	<u>Portulaca</u> 6	s- 0	sandy soil with gravel on top level
			m- 0	
		<u>Tribulus</u> 6	l- 6	
			s- 0	
		<u>Digitaria</u> 1	m- 0	
			l- 6	
	s- 1			
	m- 0			
	l- 0			
<hr/>				
19.	135 ft. from east rock beach	<u>Boerhaavia</u> 7	s- 0	bare coarse gravel
			m- 2	
			l- 5	
<hr/>				
20.	120 ft. from east rock beach	<u>Digitaria</u> 13	s- 4	sand pockets bet- ween coarse gravel
			m- 0	
		<u>Portulaca</u> 1	l- 9	
			s- 0	
		<u>Boerhaavia</u> 6	m- 0	
			l- 1	
	s- 0			
	m- 0			
	l- 6			
<hr/>				

#	<u>Location</u>	<u>Species Present</u> SP/T/Q	#	<u>Soil</u>
21.	85 ft. from (west of) east rock beach	<u>Lepturus</u> 3	s-0 m-0 l-3	gravel with sand between coral rocks
		<u>Portulaca</u> 4	s-0 m-3 l-0	
		<u>Boerhaavia</u> 5	s-0 m-5 l-0	
22.	45 ft. from rock beach due east of p.m. #8	<u>Boerhaavia</u> 5	s-0 m-0 l-5	large coral rocks with gravel and sand pockets 1° slope e.
		<u>Portulaca</u> 12	s-0 m-0 l-12	
23.	On the ne. side, along the e-w line from p.m. # 9 10 ft. due west of p.m. #8	<u>Portulaca</u> 2	s-0 m-0 l-2	sandy soil 1 slope west
		<u>Digitaria</u> 7	s-4 m-3 l-0	
		<u>Tribulus</u> 4	s-0 m-0 l-4	
24.	25 ft. due west of p.m. #8	<u>Tribulus</u> 5	s-0 m-0 l-5	sandy soil 1 slope west
		<u>Digitaria</u> 8	s-1 m-6 l-1	
		<u>Lepturus</u> 1	s-0 m-0 l-1	
25.	40 ft. due west of p.m. #8	<u>Digitaria</u> 2	s-0 m-0 l-2 (very large)	sandy soil
26.	10 ft. due s. of p.m. #8	<u>Lepturus</u> 4	s - m - l -4	

#	Location	Species Present	#	Soil
		<u>Boerhaavia</u> 3	s-0 m-0 l-3	sandy soil
		<u>Digitaria</u> 4	s-0 m-4 l-0	
		<u>Portulaca</u> 4	s-0 m-0 l-4	
27.	25 ft. due south of p.m. #8	<u>Lepturus</u> 6	s-0 m-0 l-6	sandy soil
		<u>Portulaca</u> 4	s-0 m-2 l-2	
		<u>Boerhaavia</u> 1	s-0 m-0 l-1	
		<u>Digitaria</u> 2	s-0 m-0 l-2	
28.	45 ft. due south of p.m. #8	<u>Lepturus</u> 6	s-0 m-0 l-6	sand soil
		<u>Boerhaavia</u> 2	s-0 m-0 l-2	
		<u>Portulaca</u> 3	s-0 m-0 l-3	
29.	10 ft. due east of p.m. #8	<u>Digitaria</u> 3	s-0 m-0 l-3	sand soil
		<u>Portulaca</u> 9	s-0 m-0 l-9	
		<u>Boerhaavia</u> 1	s-0 m-0 l-1	
30.	25 ft. due east of p.m. #8	<u>Digitaria</u> 6	s-0 m-1 l-5	sand soil
		<u>Portulaca</u> 1	s-0 m-1 l-0	
31.	40 ft. due east of p.m. #8	<u>Digitaria</u> 5	s- m- l-5	

Lepturus

- s.- seedling or a one crowned plant.
- m.- two crowns or many, clump two to five in. in dia. at ground level.
- l.- more than five in. in dia. at ground level.

Portulaca

- s.- seedling, plants one to six inches high.
- m.- plants six to eight inches high, stems to four in. in dia. at ground level.
- l.- plants about eight inches high, stems more than four in. in dia. at ground level.

Boerhaavia

- s.- seedling, stems one to five in. long.
- m.- stems five to twelve in. long.
- l.- stems exceeding twelve inches in length.

Digitaria

- s.- seedling or a one crowned plant.
- m.- plant two to eight crowned, from three to eight in. in dia. at ground level.
- l.- plant with eight or more crowns, more than eight in. in dia. at ground level.

Tribulus

- s.- seedling, stems less than six in. in length.
- m.- stem from six to eighteen in. in length.
- l.- stems in excess of eighteen in. in length.

Washington Island, June 9-13, 1964

June 9, 1964 - Plant collections were made by C.D. Hackman and D. Gill along the path leading around the north side of the island while C.R. Long and P. Marshall collected along the road which borders the south side of the island. The two endemic birds were seen by both parties. A Cyperus with a white head was found growing in waste areas along the road on the west and north. The trunks of Cocos support a number of lichens and mosses which are particularly thick on the wet sides of the trunk (where water drains from the fronds and the crown of the tree). The Cocos plantation is serviced by roadways which branch off of the shore road in towards the vegetated rim of the atoll and the lagoon. These are very damp and support a roadside vegetation composed of Polypodium, Nephrolepis, Asplenium, Synedrella, Cynodon and Fleurya. One bracket fungus and several capped fungi were observed and collected - all growing on Cocos. Mr. William Frew, the resident manager for the Burns, Philp Co., Ltd. was kind enough to provide bed and board for several days.

June 10, 1964 - With the assistance of P. Marshall and D. Gill peat samples were gathered from the west bog. Plant collections were made from the west bog, the canal leading northeast into the open bog and, later in the afternoon, from the waste areas immediately behind the village.

June 11, 1964 - Peat samples were taken from the bog bordering the fresh-water lagoon. Mr. Frew arranged for the writer to have the use of a small boat with outboard motor in order to cross the lake and visit Te Manounou on the east end of the island. The Cocos forest, propagating itself, comes directly to the waters edge. In a few isolated areas on the north and south shores of the lake there are Scirpus reeds growing near the shore or continuous with the shore. More often these clumps of reeds are found out from the shore in up to one foot of water - rooted in muck on top of what were at one time coral heads of the lagoon. Canals and locks on the southwest and east sides of the island are used to regulate the water level of the lake during the rainy season. At this season the bog is in some places about a foot above the water level of the lake. At other times the entire bog is under water. At the entrance to the canal on the east was growing a shrubby member of the Onagraceae. Our reference for topography and direction was a map made by Captain Brett Hilder. A copy of this map has been forwarded to us courtesy of the Burns, Philp Co., Ltd. While the succession at the north, east and south sides of the lake may be quite slow, it was noted that both Cocos and Pandanus were forming a line of elevated vegetation on the west end of the lake. This extends from the forest on the south to the canal (but thinning). The east and west portions of the bog are separated by a peninsula of forest which is well established. Collections were made on the east shore. The Pisonia trees on the beachrock at the east end are reproducing themselves. Along the east shore the Messerschmidia and Pisonia give excellent examples of wind shearing of vegetation. Along the canal on the east were noted large Cyrtosperma, breadfruit, and young Pandanus. Large areas of the forest as well as the open bog are covered with Polypodium. The red-footed boobies nest in the Pisonia and Messerschmidia on the east end. One correction to Hilder's map would be that the peat in some areas is in excess of 6 ft..

June 12, 1964 - Surf conditions dangerous. A survey of the cultivated and ornamental plants on the island was made. The following were observed and collected:\*

Artocarpus incisus (Thunb.) L.f. - used as a source of food and wood by the resident Gilbertese.

Carica papaya L. - used as a source of food.

Pandanus tectorius Park - used as a source of food and construction material.

Cocos nucifera L. - used as a source of food, construction and trade.

Calophyllum inophyllum L. - used as a source of wood.

Ficus sp. - used as a source of shade.

Hibiscus rosa-sinensis L. - used as decoration.

Morinda citrifolia L. - used as a source of food.

Psidium guajava L. - used as a source of food.

Mirabilis jalapa L. - used as decoration.

Citrus aurantiifolia (Christ.) Swingle - used as a source of food.

Tagetes erecta L. - used as decoration.

Lycopersicon esculentum Mill. - used as a source of food.

Lactuca sativa L. - used as a source of food.

Colocasia esculenta (L.) Schott. - a prime source of food.

Acalypha wilkesiana Muell.-Arg. - used as decoration.

Zephyranthes rosea (Spreng.) Lind. - used as decoration.

Acanthaceae (shrub) - used as decoration.

Allium fistulosum L. - used as a source of food.

Cucurbita pepo L. - gourds used as ornaments.

Boehmeria nivea (L.) Gaud. - used as a source of fiber.

June 13, 1964 - The surf conditions at the Boar passage where an earlier landing had been made are still unsatisfactory. The passage on the north side, Ore Abaram, proved to be excellent. We push out into the surf at 11:30 am. for the Takelma.

\* a preliminary list

Photographs: <sup>\*</sup> Washington Island, June 9-13, 1964, C.R. Long

June 9, 1964 (July, in black)

1. Cocos - Pandanus - Scirpus, in the west bog along the canal.
2. Close-up of the Scirpus reed, west bog.
3. Cocos - Pandanus - Scirpus, in the west bog along the canal.
4. Scirpus bog, west bog, core sampler.
5. Pandanus in Scirpus forming an elevated hummock, looking north from the canal, west bog.
6. Cocos forest, Scirpus, Polypodium on Cocos trunk, Colocasia cultivated in cleared area along the canal.
7. D. Gill and P. Marshall in the Scirpus bog - west end, south side, Pandanus edge in back.
8. Cyperus - to 2 ft. forming an "understory" in the Scirpus bog - on fringe or open spaces near the reeds and also under the reeds.
9. Pandanus edge and Scirpus bog.
10. Dense Cocos forest, Asplenium, Pisonia - south side of island along copra trail.
11. Cocos plantation, Asplenium nidus, Polypodium covering the Cocos trunks and the ground. Note piles of husks and shells.
12. Cocos, Pisonia, Boermeria - west end of the island.
13. Along the road on the north side of the island - Cocos, Polypodium, Boermeria.
14. North side - growing in the tracks and to the side of the road - Cyperus.
15. Boermeria shrubs - in the waste area behind the west village.
16. Copra drying racks.
17. (as above).

June 11, 1964

18. Two Gilbertese helpers - west of the fresh water lagoon in bog - Scirpus, Nephrolepis, Polypodium.
19. Pandanus, Scirpus - looking north from the canal.
20. Along the canal, west bog, looking east - Pandanus, Polypodium, Cocos and Scirpus.
21. Cocos, young Pisonia, Polypodium covering the soil surfaces, east end of the island near village.
22. (as above), Cocos litter quite heavy, soils dark, much humus.
23. Village huts of Te Manounou.
24. Fimbristylis, Boerhaavia on gravel near village, east end.
25. Wind sheared Pisonia and Messerschmidia, east end looking south.
26. (as above).
27. Pisonia trees at the east end - nesting red-footed boobies.
28. Two friends along path paralleling the canal, east end - dense Cocos and Cyrtosperma.
32. Freshwater lagoon with Scirpus clumps along the edge, Looking west.
33. Cocos forest bordering the canal, east end, Polypodium and shrub: (fam. Onagraceae).
35. North side of the lagoon - Cocos and Scirpus stands.
36. (as above).
37. The east bog - Scirpus, Pandanus, Polypodium along the canal.
38. Humps of Polypodium on bare bog - in the east bog near the canal. Area flooded regularly.

\* 2x2 Color Slides

June 12, 1964 (August, in red)

2. Cordia growing in the west village, in flower.
3. Artocarpus about 40 ft. - foliage evergreen, north side of village.
4. Zephyranthes - in flower, growing in the lawn of the plantation house.
7. William Frew, dispensary, and Hibiscus rosa-sinensis varieties.
8. Waste area east of village - Morinda, Scaevola.
9. Morinda citrifolia, flower and fruit.
10. Waste area behind the west village - Morinda, Scaevola, Pisonia, soil covered with solid stand of herbs annuals - Verbesina.
11. Waste area by the road north of the village - Boermeria, Polypodium, Pandanus, Pisonia. Along this road there was also a grove of Artocarpus grown exclusively for construction wood.
12. Cocos along the road on the nw. end, Polypodium on ground.
13. Artocarpus, Boermeria, Cocos and Polypodium along road nw. end.
14. Edge of the Cocos forest, east bog, dense Polypodium in the foreground.
15. Convolvulus covering shrubs on the nw. end.
16. Messerschmidia, Cocos along the shore on the nw. side.

June 12, 1964 (August, in black)

29. Surf at Boar passage, w. end of Washington Island.
30. Beach on the w. end, Cocos and Cordia.
31. Curcubita pepo L. - cultivated near the village.
32. Gilbertese style open school, the Nivanga anchored offshore.
33. Mirabilis jalapa L. - cultivated along the paths and beds surrounding the meeting hall.
34. View of the village on the west end - meeting house in foreground.
35. Village west end - hedges of Acalypha.
36. Dense Leucaena - waste area behind the west village.
37. Native gardens - west settlement.
38. Young fruit of Artocarpus.



Photographs: \*Midway Island, May 23-25, 1964, C.R. Long.

May 23 - 24, 1964 (May, in black)

Eastern Island - May 23, 1964

2. large Casuarina growing on the west end; Verbesina, Lobularia, and Scaevola.
3. as in 2.
4. Lobularia, Scaevola, Verbesina, Casuarina; nestling black-footed albatross.
5. Anagalis, Gnaphalium on the ne. side of the ne-sw runway.
6. Black-footed albatross nestlings in Lobularia; bare nest areas.
7. Tribulus, Lobularia; west end of the e-w runway.
8. Lobularia stand; black-footed albatross nestlings; Scaevola in back; w. end of the w-e runway.
9. Scaevola - roots exposed by high waves of storm; erosion along the sw. shore of Eastern Island.
10. Along the south shore of Eastern Island; young Messerschmidia and Casuarina.
11. Pluchea, Casuarina, Lobularia - on the n. side of the w-e runway near the intersection with the ne-sw runway.
12. Nestling black-footed albatross in Fimbristylis, Lobularia, Verbesina; at the sw. end of Eastern Island.

Sand Island, Frigate Point - May 24, 1964

13. Scaevola and Terminalia in strip parallel to and between the shore and the runway, on se. point.
14. Scaevola, Terminalia and Casuarina; in se. strip.
15. Euphorbia heterophylla under Casuarina.
16. Old bunker on se. shore; Casuarina, Cynodon.
17. Coccoloba, Setaria, young Casuarina, Boerhaavia along the se. shore.
18. Coccoloba and Casuarina trees along the se. shore.
19. Scaevola on hillocks of sand on the se. point; nestling black-footed albatross.
20. Scaevola on the se. end of the w-e runway.
21. Scaevola on the se. side of the w-e runway stabilizing and forming sand hillocks.

May 24 - 25, 1964 (May, in red)

Sand Island, Frigate Point - May 24, 1964

1. Scaevola on sand mounds; in bloom.
2. (as in 1.)
3. Litter accumulation under Scaevola.
4. Lobularia, Verbesina and Euphorbia seedlings along the Frigate Pt. road.

Eastern Island - May 25, 1964

5. Nestling black-footed albatross in Lobularia; Conyza seedlings; ne. end of the island.

6. Verbesina, Lobularia; south side of the w-e runway.
7. Black-footed albatross - adult and nestling - in Lobularia; s. side of the e-w runway.
8. Lobularia, Boerhaavia in old nest area; w. end of the w-e runway.
9. (as in 8.)
10. Sooty terns nesting in Lobularia and Fimbristylis; e. side.
11. Black-footed albatross nestling; Lobularia and young Scaevola at the e. end of the ne-sw runway.
12. Shore vegetation opposite the end of the ne-sw runway; young Scaevola.
13. Lobularia, Conyza, Pluchea; e. end of the ne-sw runway.
14. Lobularia, young Scaevola, Messerschmidia; on the beach e. end of the ne-sw runway.
15. Beach at the e. end of the ne-sw runway; looking n.; note Lobularia growing in sand.
16. Scaevola, Messerschmidia; low branches layering out into bare areas; on the e. shore; prevailing wind from the east.
17. Low Messerschmidia shrubs on beach; e. shore.
18. Solid stand of Messerschmidia, Scaevola; note the Lobularia on the formerly "bare" break.
19. Ipomoea in flower; on e. side.
20. Verbesina on se. end of island; nestling black-footed albatross.

May 25, 1964 (May, in black)

Eastern Island, May 25, 1964

1. Red-tailed tropicbird on egg; nest of Casuarina litter; just w of the boat dock.
2. Casuarina in back; open area with Verbesina; nestling black-footed albatross; w. end of island.
3. Open area in Casuarina grove, Lobularia; w. end.
4. Boerhaavia forming a thick mat under Casuarina and Scaevola.
5. Verbesina - thick patch on the ne. end.
6. Lobularia, Scaevola, Casuarina; ne. end.
7. Young Casuarina, Verbesina, Lobularia and Scaevola.
8. Portulaca oleracea L. and Verbesina seedlings.
9. Scaevola - Messerschmidia association on the e. end with Casuarina.
10. Scaevola - close-up of the flower and leaves.
11. Red-tailed tropicbird nest in Casuarina litter.
12. Pluchea stand on the nw. side, w. of the e-w runway; nestling black-footed albatross in the Lobularia.
13. Pluchea stand further west along the e-w runway.
14. Blackfooted albatross nestlings in Lobularia with Scaevola in back; nw. side of e-w runway.
15. (as in 14.) - further west along the n. side of the runway.
16. (as in 14 and 15.) - further w. along the n. side of the runway.
17. At the extreme w. end of the e-w runway; Lepidium and Boerhaavia.
18. Raised coral gravel nest of black-footed albatross in Lobularia; w. end of the e-w runway.
19. Fimbristylis, Lobularia and Conyza; w. end of e-w runway.
20. Messerschmidia, Scaevola; n. side of the e-w runway; Fimbristylis and Lobularia.
21. Northwest side of e-w runway; nestling black-footed albatross; Fimbristylis, Lobularia, Scaevola, Messerschmidia, Casuarina.

22. Pluchea, Fimbristylis; nw. side of the e-w runway; nestling black-footed albatross.
23. Fimbristylis in bare coral gravel.
24. (as in 21.)
25. Nesting sooty terns on eggs; nw. side of the e-w runway; young Scaevola; nestling black-footed albatross.
26. Nesting sooty terns; Scaevola shrub; Casuarina and Lobularia.
27. (as in 25.) - close-up of bare nesting areas of the black-footed albatross.
28. Close-up of a black-footed albatross nestling; nw. side of the e-w runway.
29. (as in 28).
30. Coronopus, Anagalis, Lobularia; ne. side of the e-w runway.
31. Coronopus, Pluchea, Fimbristylis; mid-n. side of the e-w runway.
32. Lobularia, Pluchea, Fimbristylis; nw side of the runway.
33. Dead sooty tern on nw. end in Fimbristylis and Lobularia.
34. Many sooty tern dead; nw. side of the e-w runway; young Casuarina.
35. Long view (looking n.) of the nw. side and vegetation strip - of the e-w runway.
36. Red-tailed tropicbird nest on ground, in litter, under Scaevola.
37. Scaevola - flower and leaves close-up.

Christmas Island - A Preliminary List of Plants Collected by C.R. Long  
June 14 - 18, 1964 ATF Trip.

June 14, 1964

Christmas Island, Cook Island

1. Lepturus repens (Forst.) R.Br.
2. Cassytha filiformis L.
3. Messerschmidtia argentea (L.f.) Johnston
4. Tribulus cistoides L.
5. Boerhaavia diffusa L.
6. Heliotropium anomalum H. and A.
7. Cocos nucifera L. (observed)

June 16, 1964

Christmas Island, Main Island

1. Messerschmidtia argentea (L.f.) Johnston
2. Eragrostis amabilis (L.) W. and A.
3. Scaevola taccada
4. Lepturus repens (Forst.) R.Br.
5. Sida fallax Walp.
6. Portulaca lutea Sol.
7. Cocos nucifera L. (observed)
8. Digitaria pacifica Stapf.
9. Fimbristylis atollensis St. John
10. Heliotropium anomalum H. and A.
11. Suriana maritima L.
12. Pluchea odorata (L.) Cass.
13. Sesuvium portulacastrum L.
14. Boerhaavia diffusa L.

June 15, 18, 1964

Christmas Island, Motu Upua

1. Lepturus repens (Forst.) R.Br.
2. Heliotropium anomalum H. and A.
3. Sesuvium portulacastrum L.
4. Sida fallax Walp.
5. Portulaca lutea Sol.
6. Messerschmidtia argentea (L.f.) Johnston
7. Eragrostis whitneyi Fosberg
8. Cassytha filiformis L.
9. Suriana maritima L.
10. Pisonia grandis R. Br.

June 18, 1964

Christmas Island, Motu Tabu

1. Kadua romanzoffiensis C. and S.
2. Lepturus repens (Forst.) R.Br.
3. Heliotropium anomalum H. and A.
4. Suriana maritima L.
5. Sida fallax Walp.
6. Portulaca lutea Sol.
7. Cassytha filiformis L.
8. Sesuvium portulacastrum L.
9. Tribulus cistoides L.

C.R. Long  
1964

A Preliminary List of the Plants Collected by C.R. Long  
on Malden and Starbuck Islands June 22-27, 1964 ATF.

Malden Island, June 22-24, 1964

1. Portulaca lutea Sol.
2. Boerhaavia diffusa L.
3. Sida fallax Walp.
4. Tribulus cistoides L.
5. Pisonia grandis R.Br.
6. Eragrostis whitneyi Fosb.
7. Digitaria pacifica Stapf.
8. Lepturus repens (Forst.) R.Br.
9. Sesuvium portulacastrum L.
10. Cenchrus echinatus L.

Starbuck Island, June 25-27, 1964

1. Digitaria pacifica Stapf.
2. Sida fallax Walp.
3. Tribulus cistoides L.
4. Boerhaavia diffusa L.
5. Portulaca lutea Sol.
6. Sesuvium portulacastrum L.
7. Eragrostis whitneyi Fosb.
8. Cosmos bipinnatus Cav.
9. Cassytha filiformis L.
10. Ipomoea sp.

C.R. Long  
1964

Phoenix Islands - A preliminary List of Plants Collected by C.R. Long  
June - July ATF, 1964

Hull Island July 8 and 9

- 1 Portulaca lutea Sol.
- 2 Portulaca oleracea L.
- 3 Mimosa sensitiva
- 4 Mirabilis jalapa L.
- 5 Boerhaavia diffusa L.
- 6 Euphorbia prostrata Ait.
- 7 Pedilanthus sp.
- 8 Euphorbia hirta L.
- 9 Carica papaya L.
- 10 Pandanus sp.
- 11 Morinda citrifolia L.
- 12 Cocos nucifera L.
- 13 Cynodon dactylon (L.) Pers.
- 14 Fimbristylis sp.
- 15 Centurus echinatus L.
- 16 Eragrostis amabilis (L.) W. and A.
- 17 Fleurya ruderalis (Frst.) Gaed. (Observed by C.D. Hackman)
- 18 Messerschmidia argentea (L.f.) Johnston
- 19 Cucurbitaceae
- 20 Truinfetta procumbens Forst.

Phoenix Island July 10, 11, 12, and 13

- 1 Sesuvium portulacastrum L.
- 2 Boerhaavia diffusa L.
- 3 Sida fallax Walp.
- 4 Portulaca lutea Sol.
- 5 Lepturus repens (Forst.) R. Br.

C.R. Long  
1964

Enderbury Island July 15, 1964

- 1 Sida fallax Walp.
- 2 Triumfetta procumbens
- 3 Portulaca lutea Sol.
- 4 Digitaria pacifica Stapf.
- 5 Lepturus repens (Forst.) R.Br.
- 6 Boerhaavia diffusa (Forst.) R.Br.
- 7 Cassytha filiformis L.
- 8 Eragrostis whitneyi Fosberg
- 9 Sesuvium portulacastrum L.
- 10 Ipomoea sp.
- 11 Messerschmidia argentea (L.f.) Johnston
- 12 Cordia subcordata Lam.
- 13 Fleurya ruderalis (Forst. Gaud.

McKean Island July 18, 1964

- 1 Sida fallax Walp.
- 2 Lepturus repens (Forst.) R.Br.
- 3 Portulaca lutea Sol.
- 4 Boerhaavia diffusa L.
- 5 Digitaria pacifica Stapf.
- 6 ~~Tribulus cistoides~~ Tribulus cistoides L.
- 7 Sesuvium portulacastrum L.

Baker Island July 21, 1964

- |   |                                       |    |                                    |
|---|---------------------------------------|----|------------------------------------|
| 1 | <u>Triumfetta procumbens</u>          | 5  | <u>Boerhaavia diffusa</u> L.       |
| 2 | <u>Digitaria pacifica</u>             | 6  | <u>Euphorbia hirta</u> L.          |
| 3 | <u>Sida fallax</u> Walp.              | 7  | <u>Portulaca lutea</u> Sol.        |
| 4 | <u>Lepturus repens</u> (Forst.) R.Br. | 8  | <u>Euphorbia prostrata</u> Sit.    |
|   |                                       | 9  | <u>Mimosa sensitiva</u>            |
|   |                                       | 10 | <u>Cynodon dactylon</u> (L.) Pers. |

C.R. Long  
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- 11            Setaria verticellata (L.) Beauv.  
12            Cenchrus echinatus L.

Howland Island July 22, 23, 24, 1964

- 1            Sida fallax Walp.  
2            Tribulus cistoides L.  
3            Coccoloba uvifera Jacq.  
4            Lepturus repens (Forst.) R.Br.  
5            Digitaria pacifica Stapf.  
6            Cordia subcordata Lam.  
7            Portulaca lutea Sol.  
8            Boerhaavia diffusa L.  
9            Leguminosae



PLANTS OF JARVIS ISLAND COLLECTED BY C.D. HACKMAN AND IDENTIFIED BY C.R. LONG

March 17, 1964

- P1 Abutilon indicum Sw.
- P2 Chenopodium ambrosioides L.
- P3 Eragrostis whitneyi Fosberg
- P4 Sida fallax Walp.
- P5 Lepturus repens (Forst.) R. Br.
- P6 Tribulus cistoides L.
- P7 Boerhaavia diffusa L. var. tetrandra (Forst.) Heimerl.
- P8 Boerhaavia diffusa L. var. tetrandra (Forst.) Heimerl.

PLANTS OF WASHINGTON ISLAND COLLECTED BY C.D. HACKMAN AND IDENTIFIED BY CR. LONG

March 30, 1964

- P9 Eleusine indica (L.) Gaert.
- P10 Eleusine indica (L.) Gaert.
- P11 Fimbristylis spathacea Roth.
- P12 Fimbristylis spathacea Roth.
- P13 Cenchrus echinatus L.
- P14 Polypodium scolopendrium Burm. f.
- P15 Zenophranthes rosea (Spreng.) Lind.
- P16 Lepturus repens (Forst.) R. Br.
- P17 Leucaena glauca (L.) Benth.
- P18 Acanthaceae
- P19 Bidens pilosa L.
- P20 Synedrella nodiflora Gaert.
- P21 Vernonia cinerea Less
- P22 Eragrostis amabilis (L.) Wright
- P23 Conyza microcarpa (DC.) Piper
- P24 Cyperus kyllingia Endl.

C. R. Long  
1964

SOIL SAMPLES: JUNE - JULY 1964 ATF TRIP

ATF # 5

June 6, 1964

Palmyra Island  
(5) L123-L127

- L123\* - 1 Under Messerschmidia sp. in interior of island. Much of the ground is bare - beachrock conglomerate beneath thin soil layers. Fleurya sp. common. Sand Island. (0.5-2.5 in layer).
- L124 - 2 Under Cocos sp. Ground littered with dead fronds. Also present in immediate area: Messerschmidia, Asplenium, and Pisonia. Home Island. (0.5-2.5 in. layer.)
- L125 - 3 Collected on causeway leading to radio towers, Paradise Island. Gravel layer in upper surface. (0.5- 2.5 in. layer).
- L126 - 4 Collected on Paradise Island under Cocos, dry surface (0.5-2.5 in. layer)
- L127 - 5 Collected on Kaula under Cocos - Messerschmidia grove. Soil deepest in depressions in the elevated beachrock. Cynodon sp. vigorously rooted in these soil repositories. (0.5-2.5 in. layer)

June 7, 1964

Palmyra Island  
(4) L128-L131

- L128 - 1 Under Hibiscus- Coccoloba on the northwest side of the runway. Cooper Island. One-half to three quarter inch of litter. (0.5-2.5 in. layer.)
- L129 - 2 Cooper Island. Collected along the north side of the runway - open grassy area (1.-2. in. layer.)
- L130 - 2a As No. 2, but a surface sample (0.5 in. layer.)
- L131 - 3 Eastern Island. Pisonia - Pandanua forest. (1.-4.in.layer.) Surface coral pebbles. Color: a distinct reddish brown. Appears high in organic matter.

June 9, 1964

Washington Island  
(8) L132-L139

Site IV - West Bog near Te Motu.

- L132 - 1  
L133 - 2  
L134 - 3  
L135 - 4  
L136 - 5

Site V - West Bog near Te Motu.

- L137 - 1  
L138 - 2  
L139 - 3

June 11, 1964

Washington Island  
(38) L140-L177

Site I collections I - XVII

In Scirpus bog approx. one-half the distance to the entrance to the fresh water lagoon - on the south side of the canal and approx. seventy feet from the canal edge.

Samples No. I - No. XVII (I - XVI represent 2 inch portions taken from the sampler.)

\* collection numbers : soils - C. R. Long

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Depth of hole: 63.5 in. Each 2 inch portion represents approximately (3.96) 4 in. Water filled the hole to within 22 in. of the surface.

Associated with Scirpus are Cyperus and Polypodium sp., the latter forming small hummocks above the surface, the former found rooted in the surface material.

XVII - crust sample from bare surface area near Site No. 1.

Site II collections 1 - 17

Scirpus bog approx. 100 yards from fresh water lagoon north side of the canal.

Samples No. 1-No. 17 (1-17 represent 2 inch portions taken from the sampler).

Depth of hole: 47 in. water filled the hole to within 5 in. of surface.

Site III

Depth of Scirpus peat in excess of 72 in. No samples taken.

June 14, 1964

Cook Island (Christmas Island)

(3) L236-L238

Coral sand, light brown color.

L236- 1 top 1 inch-3in. layer. Plant species: Boerhaavia, Cassytha,

L237- 2 1 in. to 2 in. deep } Heliotropium, and Lepturus.

L238- 3 1 in. to 2 in. deep } → Same description of No. 1

June 15, 1964

Motu Upua (Christmas Island)

(4) L239-L242

L239- 1 2 in. to 3 in., lighter color.

L240- 2 upper 1/4 in. of upper hard surface soil- base area,

Heliotropium

L241- 3 1/4 in. to 2 in. deep - brown color soil under hard crust.

L242- 4 open areas near salt bush.

June 17, 1964

Main Island - Christmas Island

(3) L243-L245

L243- 1 Cocos plantation 1 in. to 2 in.

L244- 2 Lepturus top 1/2 in. pebbles on top.

L245- 3 Lepturus stand 1 in. to 2 in.

June 18, 1964

Motu Upua (Christmas Island)

(4) L246-L249.

L246- 1 Heliotropium, Lepturus - 6 in. - 9 in., many roots - light brown color - burrows of Phoenix Petrels and wedgetailed shearwaters

L247- 2 Heliotropium, Lepturus, light brown soil - roots to 9 in. - top white gravel - 9 in. to 12 in. burrows of Phoenix petrel and wedgetail shearwaters.

L248- 3 Heliotropium, Lepturus - 3 in. - 6 in. root area - burrow Phoenix petrels and wedgetail shearwaters.

L249- 4 Heliotropium, Lepturus - top 0 - 3 in.

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June 18, 1964 Motu Tabu  
(5) L 178-L182  
L178 - 1 1-2 in., under Pisonia  
L179 - 2 Lepturus, Boerhaavia, Portulaca, Heavily mounded  
area, fine sand area.  
L180 - 3 open area, salt bush, 1-2 inches.  
L181 - 4 Messerschmidia, 1-2 in.  
L182 - 5 Bottom of old burrow under Lepturus, in Lepturus,  
Boerhaavia, Portulaca stand. Fine sand area,  
approximately 10 feet depression, wet 1/2 inch down.

June 22, 1964 Malden Island Lagoon  
(1) L183  
L183 salt crust

June 23, 1964 Malden Island  
(5) L184-L188  
L184 - I and L185 - II Soils forming among raised coral heads -  
Surfaces bare but Sesuvium forms a peripheral ring about the  
lagoon. Top 1/2 inch whitish with salts then dark red layer  
extends to several feet in depth. Between these two layers is a  
noticeable layer of blue-green algae?  
L184 - I bare soil in old coral rock, Sesuvium, top 1/2 in..  
L185 - II top 1-2 in., bare soil in old coral rock, Sesuvium.  
L186 - III top 1/2 in. Sida, Digitaria, Portulaca. North side  
of island. Boerhaavia, Tribulus.  
L187 - IV top 1/2 to 2 in. Sida, Digitaria, Portulaca, Boerhaavia  
north side of island.  
L188 - V bare area among Sesuvium, grasses, on flat rock, 1/2 to  
2 in., top layer white with much salt.

June 26, 1964 Starbuck Island  
(5) L189-L193  
L189 - I Portulaca, Sesuvium, Eragrostis - shells on top  
1/2 - 2 1/2 in.  
L190 - II 1/2 - 2 in. Lepturus, Sida  
L191 - III guano soil Lepturus thick, some Sida, 0-1/2 in.  
L192 - IV guano soil Lepturus thick, Sida, 1/2 - 2 1/2 in.  
L193 - V Digitaria, Sida, Tribulus 1/2-2 in. coarse gravel on top

June 27, 1964 Starbuck Island  
(4) L194-L197  
L194 - VI at Post No. 1 1/2 - 2 1/2 in.  
L195 - VII midway to post No. 2 on rim 1/2-2 1/2 in.  
L196 - VIII at post No. 2 1/2-2 1/2 in.  
L197 - IX Digitaria stand west end 1/2-2 1/2 in.

July 4, 1964 Tuituila, American Samoa  
(1) L198  
L198 Forest 800 feet 1/2-2 in.

1964

- July 11, 1964 Phoenix Island  
 (5) L199-L203  
 L199 - 1 1/2-2 in. Lepturus, Portulaca  
 L200 - 2 Sesuvium 1/2-2 in.  
 L201 - 3 Lepturus, Portulaca Nesting Sooty Terns  
 L202 - 4 1/2-2 in.  
 L203 - 5 1/2 - 2 in. Sida patch - mid north part of island
- July 12, 1964 Phoenix Island  
 (3) L204-L206  
 L204 - 1 Algal layer 1/2 in. deep lagoon. Lepturus stand at edge of lagoon (with a narrow strip of Sesuvium at edge between the grass and the bare surface of the lagoon).  
 L205 - 2 1/2-2 in. windblown soil around slab rocks.  
 L206 - 3 1/2-2 in. Lepturus South end.
- July 13, 1964 Phoenix Island  
 (3) L207-L209  
 L207 - I Sesuvium mat - dry, open area (0.5-2 in. layer), many roots present; soil dark brown.  
 L208 - II Soil accumulation under coral rock slab. Windblown mineral matter; dried organic (Lepturus, Portulaca) - crab burrows along edge of rock.  
 L209 - III Bare soil surrounded by Portulaca and Lepturus. Gravel at surface 0.5 in. (0.5-2 in. layer)
- July 15, 1964 Enderbury Island  
 (1) L210  
 L210 Eragrostis, Sesuvium 1/2-2 in.
- July 16, 1964 Enderbury Island  
 (4) L211-L214  
 L211 - 1 1/2-2 in. Portulaca, Boerhaavia, Lepturus west side of lagoon.  
 L212 - 2 Portulaca, Boerhaavia gravel top, fine beneath, northwest end.  
 L213 - 3 top 1/2 in. Cordia grove west end.  
 L214 - 4 1/2-2 in. Cordia grove west side
- July 17, 1964 Enderbury Island  
 (2) L215-L216  
 L215 - 1 South end Eragrostis sp., Sesuvium sp. soil 6 in. deep 1/2-2 in.  
 L216 - 2 Cement floored storage house - hermit crab accumulation.
- July 18, 1964 McKean Island  
 (7) L217-L223  
 L217 - 1 Under Sida, Sesuvium 1/2-2 inches  
 L218 - 2 1/2-2 in. under dead Sesuvium nest of masked booby  
 L219 - 3 1/2-2 in. bare lagoon dry on top  
 L220 - 4 Boerhaavia, Digitaria near beach, 1/2-2 in.  
 L221 - 5 1/2-1 in. rock area gravel on top south end Boerhaavia, Sesuvium  
 L222 - 6 1/2-2 inches Digitaria, Portulaca, Boerhaavia  
 L223 - 7 Sida, near old guano ruins 1/2-2 in. nesting sooty terns

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July 19, 1964 McKean Island  
(1) I224  
I224 Boerhaavia, Portulaca, Lepturus, Digitaria Northwest  
end sandy 1/2-2 in.

July 21, 1964 Baker Island  
(3) I225-I227  
I225 - 1 Lepturus, Portulaca 1/2-2 in.  
I226 - 2 east end Tribulus, Lepturus, Digitaria 1/2-2 in.  
I227 - 3 sandy area southwest end runway Digitaria, Sida,  
1/2-2 in.

July 22, 1964 Howland Island  
(3) I228-I230  
I228 - 1 south end Tribulus, Portulaca, Boerhaavia 1/2-2 in.  
I229 - 2 east side Digitaria solid stand 1/2-2 in.  
I230 - 3 central area Tribulus, Digitaria, Portulaca,  
Lepturus, 1/2-2 in.

July 23, 1964 Howland Island  
(3) I231-I233  
I231 - 1 Tribulus, Portulaca, Boerhaavia mid north area  
gravel on top 1/2-2 in.  
I232 - 2 1/2-2 in. Tribulus, Portulaca mid south area  
nesting sooty tern.  
I233 - 3 Masked booby nest 1/2-2 in.

July 24, 1964 Howland Island  
(2) I234-I235  
I234 - 1 1/2-2 in. east beach log on beach hermit crabs  
underneath  
I235 - 2 Surface- 1/2 log on beach hermit crabs east beach

C.R. Long  
1964

Algae collected by C. R. Long and collaborator, identified by R. Tsuda, Dept of Botany,  
U. of Hawaii.\*

ATF #5

2166 C.R.Long	Baker Island	July 21, 1964 in beach drift south reef	<u>Halimeda</u> sp.
2169 C.R.Long	Baker Island	July 21, 1964 south beach in drift - above south reef	<u>Halimeda opuntia</u> (L.) Lamx.
2170a C.R.Long	Baker Island	July 21, 1964 - in beach drift - south beach	<u>Centroceros opiculatum</u> Yamada, epiphytic on <u>Chondria</u> sp.
2170 C.R.Long	Baker Island	July 21, 1964 - in beach drift - south beach	<u>Chondria</u> sp.
2167 (1 dup.) C.R.Long	Baker Island	July 21, 1964 - in beach drift, south reef	<u>Turbinaria ornata</u> (Turner) J.Ag.
2168 C.R.Long	Baker Island	July 21, 1964 - in beach drift, south beach	<u>Dictyosphaeria</u> <u>cavernosa</u> (Forsk.) Boerg.
2165a C.R.Long	Baker Island	July 21, 1964	<u>Dictyosphaeria</u> <u>cavernosa</u> (Forsk.) Boerg.
2165b C.R.Long	Baker Island	July 21, 1964 - in beach drift, south reef	<u>Chondria</u> sp. epiphytic on <u>Jania adhaerens</u> Lamx.
2165c C.R.Long	Baker Island	July 21, 1964	<u>Jania adhaerens</u> Lamx.
2190a C.R.Long	Howland Island	July 23, 1964 - grow- ing sessile on exposed reef and in reef pools - west reef.	<u>Jania adhaerens</u> Lamx. (non fertile)
2190b C.R.Long	Howland Island	July 23, 1964	<u>Dictyosphaeria cavernosa</u> (Forsk.) Boerg.
2190c C.R.Long	Howland Island	July 23, 1964	<u>Chondria</u> sp. epiphytic on <u>Jania</u>
2188a C.R.Long	Howland Island	July 23, 1964 - in beach drift, west reef	<u>Jania adhaerens</u> Lamx. (non fertile)

C.R. Long  
1964

2188b. C.R.Long	Howland Island	July 23, 1964	<u>Centroceros apiculum</u> Yamada
2188c.	Howland Island	July 23, 1964	<u>Jania unguolata</u> Yendo (fertile)
2189 C.R.Long (1 dup.)	Howland Island	July 23, 1964 on exposed reef at low tide- growing in muck crevices of pools	<u>Caulerpa serrulata</u> var. <u>typica f. serrulata</u> (Weber von Bosse) Gilbert

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\* These identified collections comprise one half of the algal material gathered on the June-July 1964 ATF trip.



Sibley, F.  
1964

Plant catalog

Botany

Feb. 9

Howland Island, Pacific Ocean

Sida fallax seen for first time on this island

P-30

Small spotted  
fungus

found on dead stems of  
Digitaria pacifica

(in  
vial)

P-31

Green leafy  
algae?  
under rock on fringing  
reef

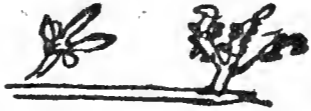


hold fast

(in  
vial)

P-32

Green viney  
algae?  
on rocks on fringing reef



(in  
vial)

C.R. Long

1964

Addenda to the Report of C. D. Hackman, February - March ATF, 1964.  
Plants.

Enderbury Island

February 27, 1964, Sida sp. - Sida fallax Walp. or close. The Sida specimens collected from the Phoenix Islands are partially indistinguishable from Sida cordifolia L. and Sida fallax Walp. A nomenclatorial change or a new taxa may be indicated.

Cordia sp. - probably Cordia subsordata Lam. but possible Cordia sebestena L.

Dodder sp. - Cassytha filiformis L.

February 28, 1964 - "grass is quite small and easily overlooked" -  
Eragrostis whitneyi Fosb. var.

Canton Island

March 2, 1964 - Scaevola taccada or Scaevola frutescens (Mill.) Krause for Scaevola sp. The former name is the oldest which may be applied to material commonly called frutescens by most authors. However, the Scaevola in the Phoenix and Line Islands varies from the Scaevola found to the north and new taxa are indicated with the proper nomenclatorial changes. - "several clumps of the species of grass we had discovered near the lagoon on Enderbury" - Eragrostis whitneyi Fosb. var. There are two varieties of this species.

Jarvis Island

March 14, 1964

Sida sp. - Sida fallax Walp. - see above February 27 note

Boerhaavia sp. - B. diffusa L. var. tetrandra Heimerl. - but the status of these color variations also noted on Hull Island indicate new taxa.

Portulaca sp. - Portulaca lutea Sol.

March 15, 1964

"The small bunchgrass-" - Eragrostis whitneyi Fosb. var.

"ragweed plant-" - Chenopodium ambrosioides L.

Illustrations: -7. Cordia subcordata Lam.; 6. Portulaca lutea Sol.;  
5. Lepturus repens (Forst.) R.Br.; 4. Digitaria pacifica Stapf.; 3. Sida fallax Walp.; 2. Tribulus cistoides L.; 10. Euphorbia prostrata L.; 11. Cenchrus echinatus L.; 12. Cynodon dactylon (L.) Pers.; 13. Setaria verticellata (L.) Beauv.; 14. Triumfetta procumbens L.; 15. Sesuvium portulacastrum L.  
16. Messerschmidia argentea (L.f.) Johnston; 17. Cassytha filiformis L.;  
18. Ipomoea indica (Burm. f.) Merr.; 19. Eragrostis whitneyi Fosb. var.;  
21. Chenopodium ambrosioides L.; 22. Eragrostis whitneyi Fosb. var.; 24. Suriana maritima L.; 25. Heliotropium anomalum H. and A.; 26. Scaevola taccada  
27. Acanthaceae (we are having difficulty keying this to genus and species level - it is not grown in Hawaii and may have been introduced from the southwest Pacific area); 28. Polypodium scolopendrium Burm. f.

C. R. Long  
Research Curator

Xerox Copies of Vegetation Sections Given to Dr. Lamoreaux -  
September 27, 1966

Lisianski	pp. 26-31
Nihoa	pp. 4-5
Necker	notes and list 3pp.
Pearl & Hermes	pp. 25-39
Christmas	Vegetation history 7pages Vascular plants recorded from Christmas Is. 10pp.
Fanning	pp.13
Palmyra	Plants Recorded from Palmyra Atoll - C.R. Long - 9pp.
Gilbert & Marshalls	4 pages - listing.

Jong

Discussion with C. Lamoreaux and R. Long

-September 27, 1966

Vegetation material for island monographs is mostly at hand-ready for final write-ups. They need guidance on final format (e.g. how much historical background, geology, climate, etc., to include).

Also, rough sketch vegetation maps have been done for most islands-~~data~~ <sup>data</sup> available for all. They need to know if Particular base maps have been selected for the monographs. If not, they will get best available from Bishop Museum.

Lamoreaux felt minimal work would be needed to get vegetation writeups in final form. Long felt a lot of work is still needed.

I gave them the xerox copies made for me during my visit to D.C. (list attached). They will check it over to see what else they know has been done. (Laysan was done as Atoll Research Paper #97- probably not been done again for us.) They did say that individual plant lists for every island have been sent to D.C. They have done nothing for Kure because they were told Wirtz was doing it. But my copy of the Kure Island account is only a rough draft and has no vegetation section.

They have a complete plant list for the Leeward Hawaiians. They promised to send me 2 copies - 1 for Kridler.

Their main problem seemed to be uncertainty about SI's plans for publication -- whether the 3 part series (island monographs, species accounts, ecology discussions) is still the plan. I assured them that it was, but that funding for it probably would be obtained elsewhere than our contract. They understood this, but asked if anything was firming up for publication. I said this was awaiting some indication of future level of our field work, but with signs pointing to a reduced level next year, it ~~was~~ probably time to start definite planning.

If SI publication is delayed very much it was suggested that their write-ups might be printed first in a new informal series of U. H. Botany Dept. papers recently started to fill the void left by the demise of the Atoll Research Bulletin. These papers are double-spaced typewritten, and bound in volumes for distribution. SI formal publication could follow.

Lamoreaux is also working on the book "Flora of Central Pacific", using Nancy Halliday's illustrations. Main remaining chore is species write-ups, which Lamoreaux hopes to do specially for this book using detailed measurements of our specimens, rather than simply copying descriptions from other works. He indicated he would probably have to do this himself, and this would not get done in the very near future. U. H. is anxious to publish this.

There was mention of the Howland report as a model for the island accounts. I detected some resentment on their part, particularly Bob,

that his section had been edited, some parts deleted, and printed without checking at all with him. There was probably duplication of writing effort that could have been avoided.

The specimens are now all mounted. Enough material is available to send one set to SI in D.C., and give one set of Leeward material to Kridler, with the remainder being adequate for the U.H. collection. Apparently Kridler can have his set whenever he has adequate insect-proof space to house it.

The discussions were very friendly all around. I enjoyed meeting them. I told them Dr. Humphrey would be in town the week of October 10, and that the four of us should meet then if at all possible.

PTERIDOPHYTA

- Psilotinae
  - Psilotaceae ----- psilotums
- Filices or Filicinae
  - Polypodiaceae
- Lichenes
  - Pyrenulaceae
  - Physciaceae

SPERMATOPHYTA

- Gymnospermae
  - Araucariaceae
- Angiospermae
  - Monocotyledonae
    - Pandanaceae ----- Pandanus, Freycineta
    - Graminae ----- Lepturus, Digitaria, Cenchrus, Eragrostis, Panicum, Corn
    - Bromeliaceae ----- Pineapples
    - Cyperaceae ----- sedges, Cyperus, Fimbristylis, Scirpus
    - Palmae ----- palms
    - Araceae ----- taro
    - Commelinaceae
    - Pontederiaceae
    - Liliaceae ----- onion (Allium)
    - Amaryllidaceae
    - Taccaceae ----- Polynesian arrowroot (Tacca)
    - Dioscoraceae ----- yam (Discorea)
    - Musaceae ----- bananas (Musa)

Dicotyledonae

- Casuarinaceae ----- ironwood
- Moraceae ----- mulberry, figs (Ficus) breadfruit (Artocarpus)
- Urticaceae ----- Fleurya
- Santalaceae ----- sandlewood
- Polygonaceae ----- sea-grape (Coccoloba)
- Chenopodiaceae ----- Chenopodium, Atriplex, beet (Beta)
- Amaranthaceae
- Nyctaginaceae ----- Boerhavia, Bougainvillea, Pisonia
- Aizoaceae ----- Sesuvium
- Portulacaceae ----- Portulaca
- Caryophyllaceae ----- pinks
- Annonaceae
- Lauraceae ----- love vine (Cassytha)
- Hernandiaceae
- Capparidaceae ----- Capparis
- Cruciferae ----- broccoli, mustard (Brassica), Lepidium, radish (Raphanus)
- Crassulaceae
- Rosaceae
- Leguminosae ----- Mimosa, beach pea (Vigna), clover (Prosopis), Phaseolus, Sesbania, alfalfa (Medicago), coral tree (Erythrina)
- Oxalidaceae

Zygophyllaceae ----- Tribulus  
Rutaceae ----- Citrus  
Simaroubaceae ----- Suriana  
Euphorbiaceae ----- castor bean (Ricinus), poinsettia, sparges (Euphorbia)  
candlenut (Aleurites), Phyllanthus.  
Anacardiaceae ----- mango (Mangifera)

Tiliaceae ----- trailing burbush (Triumfetta)  
Malvaceae ----- Sida, milo (Thespesia), Abutilon, Hibiscus, (incl. hau)  
Sterculiaceae  
Guttiferae ----- kamani (Calophyllum)  
Tamaricaceae

Passifloraceae  
Caricaceae ----- papaya (Carica)  
Lythraceae ----- Pemphis  
Lecythidaceae ----- Barringtonia  
Rhizophoraceae ----- mangrove (Rhizophora)

Araliaceae  
Umbelliferae ----- carrot (Daucus), parsley (Apium)  
Primulaceae  
Sapotaceae  
Apocynaceae ----- Plumeria, oleander (Nerium) Thevetia

Asclepiadaceae  
Convolvulaceae ----- Ipomoea  
Hydrophyllaceae ----- Nama  
Boraginaceae ----- Cordia, Tournefortia, Heliotropium  
Verbenaceae

Labiatae  
Solanaceae ----- tomato (Lycopersicon), tobacco (Nicotiana), Petunia,  
eggplant, nightshade (Solanum) pepper (Capsicum)  
Scrophulariaceae ----- Russelia  
Bignoniaceae  
Acanthaceae

Plantiginaceae  
Rubiaceae ----- Morinda, Guettarda  
Cucurbitaceae ----- Sicyos, pumpkin (Cucurbita) watermelon (Citrullus)  
cucumber, muskmelon (Cucumis)  
Goodeniaceae ----- Scaevola-  
Compositae ----- horseweed (Conyza), Pluchea, Verbesina, lettuce (Lactua)  
marigold (Tagetes)

Appendix Table

Annotated list of vascular plants from French Frigate Shoals found in the herbarium of the United States National Museum (USNM), the Bernice P. Bishop Museum (BPBM), and the University of Hawaii (UH).

Gramineae

\*Cenchrus echinatus L. Specimens only from Tern; known from East and Trig.

Lamoureux 1661 (BPBM); Long 2506 (UH).

\*Cynodon dactylon (L.) Pers. Specimens only from Tern. Lamoureux 1673 (BPBM); Long (UH).

Eleusine indica (L.) Gaertn. Specimens only from Tern. Lamoureux 1662 (BPBM); Svihla (BPBM); Long 2512 (UH).

Eragrostis whitneyi Fosb. Specimens only from Tern. Long 2504 (UH).

Lepturus repens (Frost.) R. Br. Specimens from East, Tern, Trig, and Whale-Skate; known from Little Gin and Round. Caum 88 (BPBM); Lamoureux 1668, 1684 (BPBM); Rainwater (BPBM); Svihla (BPBM); Amerson 1, 2 (USNM); Long 2465-68, 2471-80, 2490-91, 2502, 2513 (UH).

\*Setaria verticellata (L.) Beauv. Specimens from Tern and Trig. Lamoureux 1669, 1670 (BPBM); Rainwater (BPBM); Svihla (BPBM); Long 2469, 2476, 2499 (UH); and Amerson 3, 4, (USNM).

Cyperaceae

\*Fimbristylis cymosa R. Br. Specimen only from Tern. Long 2511 (UH).

Palmae

\*Cocos nucifera L. Sprouted nuts planted on East and Tern in 1923 by Tanager Expedition personnel (Wetmore, ms.); unsuccessful introduction. Reintroduced since 1942; known from East and Tern. No specimen records.

\* Presumably exotic.



Appendix Table (cont.).

Palmae

\*Livistonia australis. Seed planted on East by Tanager Expedition personnel in 1923 (Wetmore, ms.); unsuccessful introduction. No specimen records. ✓

\*Pritchardia gaudichaudii. Seed planted on East in 1923 by Tanager Expedition personnel (Wetmore, ms.); unsuccessful introduction. No specimen records.

\*Pritchardia pacifica Wendl. Seed planted on East and Tern in 1923 by Tanager Expedition personnel (Wetmore, ms.); unsuccessful introduction. No specimen records. ✓ + SP

Moraceae

\*Ficus sp. Specimen only from Tern. Lamoureux 1659 (BPBM).

Casuarinaceae

\*Casuarina equisetifolia L. Seed planted on East and Tern in 1923 by Tanager Expedition personnel (Wetmore, ms.); unsuccessful introduction. Reintroduced on Tern since 1942; specimens only from Tern. Lamoureux 1651 (BPBM). ✓

Chenopodiaceae

Atriplex muelleri Benth. Specimens only from Tern. Lamoureux 1654 (BPBM); Rainwater (BPBM).

Chenopodium sandwichicum Moq. Specimens from East, Tern, Trig, and Whale-Skate. Caum 89 (BPBM); Long 2470, 2472, 2482, 2492 (UH); Amerson 5, 6 (USNM).

\*Salicornia virginica L. Specimen known only from Tern. Herbst 1213 (USNM).

Polygonaceae

Cocoloba uvifera (L.) Jacq. Specimens only from Tern. Svihla (BPBM); Lamoureux 1660 (BPBM).

Appendix Table (cont.).

Nyctaginaceae

Boerhavia repens L. Specimens from East, Tern, Trig, and Whale-Skate; known from Little Gin, Round, and Shark. Caum 86, 87 (BPBM); Judd 9 (BPBM); Lamoureux 1671, 1675 (BPBM); Rainwater (BPBM); Svihla (BPBM); Long 2464, 2471, 2474, 2477, 2493, 2494, 2508 (UH); and Amerson 7, 8 (USNM).

Portulacaceae

Portulaca lutea Sol. Specimens from East, Tern, Trig, and Whale-Skate; known from Gin, Little Gin, and Round. Caum 90 (BPBM); Lamoureux 1667 (BPBM); Rainwater (BPBM); Svihla (BPBM); Long 2473, 2483, 2495 (UH); and Amerson 9, 10 (USNM).

Portulaca oleracea L. Specimens only from Tern. Lamoureux 1666 (BPBM); Long (UH); Rainwater (BPBM).

Cruciferae

\*Coronpus didymus (L.) J. E. Smith. Specimen only from Tern. Long (UH).

Caryophyllaceae

Spergularia marina (L.) Griseb. Specimen only from Tern. Svihla (BPBM); Lamoureux 1663 (BPBM).

Leguminosae

\*Haematoxylon campichianum. Seed planted on East in 1923 by Tanager Expedition personnel (Wetmore, ms.); unsuccessful introduction. No specimen records.

Zygophyllaceae

Tribulus cistoides L. Specimens from East, Tern, Trig, and Whale-Skate; known from Round. Caum 85 (BPBM); Lamoureux 1652 (BPBM); Rainwater (BPBM); Svihla (BPBM); Long 2461, 2496, 2501 (UH); and Amerson 11, 12 (USNM).

Euphorbiaceae

Euphorbia thymifolia L. Specimens only from Tern. Long 2498 (UH).

Euphorbia prostrata Ait. Specimens only from Tern. Long 2505 (UH).

Malvaceae

\*Hibiscus tiliaceus L. Planted in 1923 on East and Tern by Tanager Expedition personnel (Wetmore, ms.). Unsuccessful introduction. No specimen record.

Thespesia populnea (L.) Sol. Seed planted on East and Tern by Tanager Expedition personnel in 1923 (Wetmore, ms.); unsuccessful introduction. No specimen records.

Guttiferae

Calophyllum inophyllum L. Seed planted on East and Tern in 1923 by Tanager Expedition personnel (Wetmore, ms.); unsuccessful introduction. No specimen records.

Frankeniaceae

\*Frankenia grandifolia C. and S. Specimen known from Tern only. Herbst 1217 (USNM).

Lecythidaceae

Barringtonia asiatica (L.) Kurn. Specimen from Tern only. Svihla (BPBM).  
A single leaf only.

Apocynaceae

\*Plumeria obtusa L. Specimen only from Tern. Lamoureux 1650 (BPBM).

Convolvulaceae

Ipomoea pes-caprae (L.) Sw. Specimens from East and Tern. Caum 91 (BPBM);  
Lamoureux 1658 (BPBM); Rainwater (BPBM); Long 2509 (UH).

Boraginaceae

Tournefortia argentea L. f. Specimens from East, Tern, Trig, and Whale-Skate.

Lamoureux 1653 (BPBM); Rainwater (BPBM); Long 2463, 2487, 2489, 2503 (UH); and Amerson 13, 14 (USNM).

Solanaceae

\*Solanum lycopersicum L. Known only from Tern. No specimens collected.

— Tomato

Goodeniaceae

Scaevola taccada (Gaertn.) Roxb. Specimens from East, Tern, Trig, and

Wgale-Skate. Lamoureux 1656 (BPBM); Rainwater (BPBM); Long 2462, 2475 (UH).

Compositae

Conyza bonariensis (L.) Cronq. Specimens only from Tern. Lamoureux 1655,

1665 (BPBM); Long 2497 (UH).

\*Lactuca sp. Known from Tern. Blooming plant observed by Richardson (1954b:

73) on 18 December 1953. No specimen records.

\*Pluchea odorata (L.) Cass. Specimens only from Tern. Known from East in

1953. Lamoureux 1657, 1672 (BPBM); Rainwater (BPBM); Svihla (BPBM);

Long 2510 (UH).

\*Sonchus oleraceus L. Specimens from Tern and East. Lamoureux 1664 (BPBM);

Svihla (BPBM); Long 2500 (UH); and Amerson 15 (USNM).

C.R. Long  
1964

Canton

Addenda to the Report of C. D. Hackman, February - March ATF, 1964.  
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Jarvis Island

March 14, 1964

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March 15, 1964

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C. R. Long  
Research Curator

Index to Thrum's Hawaiian Annual

References Pertaining to Subjects of Interest  
To the Pacific Program

Comp. by RBC - Jan. 1969

Thrum, T. G. Comp. 1875. Hawaiian Almanac and Annual for 1875.  
[Pac. Comm. Advertiser] Honolulu. 46 pp.

No information.

Thrum, T. G. comp. 1875. Hawaiian Almanac and Annual for 1876.  
[Pac. Comm. Advertiser] Honolulu 64 pp.

p.10 "Hawaiian Registered Vessels"

p.12-23 "Chronological Table of Important Events"

p. 19 [Origin of Akamai]

p. 21 Palmyra - taking possession of for Hawaiian Gov't.

p.28 "Casualties of Shipping connected with the port of Honolulu.  
for 1875" Enderbury - [Marianne Nottebohm returned for repairs]

pp. 40-44 - H. L. Sheldon "Historical Sketch of the Press of Honolulu"  
[gives information on periods of publication of Honolulu  
papers that might have articles dealing with our area. p. 41  
The Polynesian - Ran intermittently from 6 June 1840 through  
Feb. 1964. p. 42 Pacific Commercial Advertiser - from 1 July  
1855 through this annual and continuing - p. 42-43 Hawaiian  
Gazette - Weekly from 21 Jan 1865 through 1875 and continuing.

Thrum, T. G. Comp. 1876 Hawaiian Almanac and Annual for 1877.  
Thrum and Oat, Honolulu. 62 pp.

p. 10 "Hawaiian Registered Vessels" no other info of interest

Thrum, T. G. comp. 1877? Hawaiian Almanac and Annual for 1878. Centennial  
Issue.

Thrum and Oat, Honolulu. 56 pp.

p. 25 "Hawaiian Registered Vessels"

p. 55-56 "Casualties of Shipping Connected with the Port of Honolulu  
for 1876 and 1877.

Jarvis [Fleet ford]

Thrum, T. G. comp. [1877] [?] Hawaiian Almanac and Annual for 1879.  
T. G. Thrum, Honolulu. 70 pp.

p. 39 "Hawaiian Registered Vessels"

pp. 41-58\* Dole, S.B. "List of Birds of the Hawaiian Islands"

p. 68-69 "Casualties of Shipping Connected with the Port of  
Honolulu, 1878"

[no ships from our area]

Hawaiian Annual Index - cont.

- Thrum, T. G. comp. 1879. Hawaiian Almanac and Annual for 1880.  
T. G. Thrum, Honolulu 76 pp.  
p. 39 "Hawaiian Registered Vessels"  
p. 74 "Casualties of Shipping Connected with the Port of Honolulu,  
1879  
Fanning - "Vivid"
- Thrum, T. G. comp. 1880. Hawaiian Almanac and Annual for 1881.  
T. G. Thrum, Honolulu 72 pp.  
p. 55 "Hawaiian Registered Vessels"  
p. 60 "Casualties of Shipping Connected with the Port of Honolulu, 1880.  
Vostok "Tokatea"
- Thrum, T. G. comp. 1881. Hawaiian Almanac and Annual for 1882.  
T. G. Thrum, Honolulu 84 pp.  
p. 31-36 "Marine Casualties for the Hawaiian Islands"  
no info.  
p. 55 "Hawaiian Registered Vessels"  
p. 70 "Casualties of Shipping Connected with the Ports of the Hawaiian  
Islands, 1881.  
- no info.
- Thrum, T. G. comp. 1882. Hawaiian Almanac and Annual for 1883.  
T. G. Thrum, Honolulu 80 pp.  
p. 25 "Hawaiian Registered Vessels"  
p. 40-42 "Marine Casualties for the Hawaiian Islands [Cont. from the  
Annual for 1882].  
p. 41 Wake "Moi Wahine"  
French Frigate Shoals "Daniel Wood"  
p. 63-65 "Casualties of Shipping connected with Ports of the Hawaiian  
Islands, 1882  
- no info.
- Thrum, T. G. comp. 1883. Hawaiian Almanac and Annual for 1884.  
T. G. Thrum, Honolulu 82 pp.  
pp. 34-38 "Marine Casualties for the Hawaiian Islands" [cont. from  
1883 Annual]  
p. 35 Howland "Arno" - 1864  
p. 36 Howland "Monsoon" - 1865  
p. 36 Howland "Kathay" - 1866  
p. 36 Enderbury "Golden Sunset" - 1866  
p. 36 Baker "Mattre Banks" - 1869  
p. 36 Baker "Lorenzo" - 1869  
p. 36 Baker "Robin Hood" - 1869  
p. 36 Howland "Morning Star" - 1869  
p. 37 Ocean "Saginaw" - 1870  
p. 37 Baker "Liebig" - 1870  
p. 37 Jarvis "Kamaile" - 1871  
p. 37 Baker "Napier" - 1871  
p. 37 Baker "Royal Saxon" - 1871  
p. 37 Starbuck "Sea Breeze" - 1871  
p. 37 Enderbury "Coringa" - 1873  
p. 38 Enderbury "Marriane Nottebohm" - 1875

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- p. 45 "Hawaiian Registered Vessels"
  - p. 48-49 "Casualties of Shipping Connected with Ports of the Hawaiian Islands, 1883"
    - no info.
- Thrum, T. G. comp. 1884. Hawaiian Almanac and Annual for 1885.  
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- pp. 68-69 "Marine Casualties for the Hawaiian Islands for 1884"
    - no info.
  - p. 81 "Hawaiian Registered Vessels"
- Thrum, T. G. comp. 1885. Hawaiian Almanac and Annual for 1886.  
T. G. Thrum, Honolulu 90 pp.
- p. 23 "Hawaiian Registered Vessels"
  - p. 65 - Nihoa [under - "Retrospect of the Year 1885"]
  - p. 67-68- "Marine Casualties, Hawaiian Islands, 1885"
    - no info.
- Thrum, T. G. comp. 1886. Hawaiian Almanac and Annual for 1887.  
T. G. Thrum, Honolulu 100 pp.
- p. 25 "Hawaiian Registered Vessels"
  - p. 65 "Annexation of Ocean Island"
  - p. 87-89 "Marine Casualties, 1885-86."
  - p. 88 Ocean "Dunnotta Castle"
- Thrum, T. G. comp. 1887. Hawaiian Almanac and Annual for 1888.  
T. G. Thrum, Honolulu 100 pp.
- p. 25 "Hawaiian Registered Vessels"
  - p. 62 Nihoa [under "Table of Important Hawaiian Events"]
  - p. 65-67 "Marine Casualties, Hawaiian Islands, 1887".
    - Midway "General Siegel".
- Thrum, T. G. comp. [1888] ? Hawaiian Almanac and Annual for 1889.  
T. G. Thrum, Honolulu 110 pp.
- p. 26 "Hawaiian Registered Vessels"
  - pp. 70-81 "Brief History of the Steam Coasting Service of the Hawaiian Islands"
  - pp. 81-84 "Casualties of Shipping Connected with the Ports of the Hawaiian Islands, 1887-8."
  - p. 82 Fanning "Jennie Walker"
  - p. 84 Malden "Hermann, Virgo"
- Thrum, T. G. comp. 1889. Hawaiian Almanac and Annual for 1890.  
T. G. Thrum, Honolulu 126 pp.
- p. 23 "Hawaiian Registered Vessels".
  - pp. 66-79 "Hawaiian Maritime History".
  - p. 73 Lisianski "Holder Borden" - [Island then known as "Drake's Island"]
  - p. 78 Baker, Jarvis "Liholiho" (History of Manuokawa: on same page)
  - p. 103 [Another Akamai]
- Thrum, T. G. Comp. 1890. Hawaiian Almanac and Annual for 1891.  
T. G. Thrum, Honolulu 170 pp.



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- / p. 35 "Hawaiian Registered Vessels"
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  - / p. 126-130 "Nettie Merrill"
  - / p. 130-131 "Kalama"
  - ✓ p. 131 "Odd Fellow"
  - ✓ p. 131-132 "Marilda"
- Thrum, T. G. comp. 1891. Hawaiian Almanac and Annual for 1892.  
T. G. Thrum, Honolulu 154 pp.
- ✓ p. 40 "Hawaiian Registered Vessels"  
No other information
- Thrum, T. G. comp. 1892. Hawaiian Almanac and Annual for 1893.  
T. G. Thrum, Honolulu 150 pp. and 1-8 pp. addenda
- ✓ p. 36 "Hawaiian Registered Vessels"
- Thrum, T. G. comp. 1893. Hawaiian Almanac and Annual for 1894.  
T. G. Thrum, Honolulu 162 pp.
- / p. 7 Nihoa
  - / p. 31 "Hawaiian Registered Vessels"
  - ✓ p. 135 "Casualties in Retrospect for 1893 pp. 130-137.  
Palmyra "Lady Lampson"
- Thrum, T. G. comp. 1894. Hawaiian Almanac and Annual for 1895.  
T. G. Thrum, Honolulu 166 pp.
- p. 31 "Hawaiian Registered Vessels"
  - p. 136 "Necker Island and Pacific Cable" in Retrospect for 1894,  
pp. 130-139.
- Thrum, T. G. comp. 1895. Hawaiian Almanac and Annual for 1896.  
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- p. 31 "Hawaiian Registered Vessels"
- Thrum, T. G. comp. 1896. Hawaiian Almanac and Annual for 1897.  
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- ✓ p. 47 "Hawaiian Registered Vessels"
- Thrum, T. G. comp. 1897. Hawaiian Almanac and Annual for 1898.  
T. G. Thrum, Honolulu 199 pp.
- ✓ p. 165-166 "Islands comprising the Hawaiian Republic"  
[most Leewards, Palmyra]
- Thrum, T. G. comp. 1898. Hawaiian Almanac and Annual for 1899.  
T. G. Thrum, Honolulu 203 pp.
- ✓ pp. 55-69 "Chronological Table of Important Hawaiian events"
  - ✓ p. 63 Palmyra [shipwreck]
  - ✓ p. 65 Necker [possession taken]
  - ✓ p. 66 French Frigate Shoal [possession taken]
  - p. 175-176 "Hawaiian Registered Vessels"
- Thrum, T. G. comp. 1899. Hawaiian Almanac and Annual for 1900.  
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- ✓ p. 48 "Hawaiian Registered Vessels"

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Henshaw, H. W. pp. 132-142 "Introduction of foreign birds into the  
Hawaiian Islands with notes on some of the introduced species"  
p. 176 "Shipping Casualties" in "Retrospect for 1900"  
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- Thrum, T. G. comp. 1901. Hawaiian Almanac and Annual for 1902.  
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p. 37 "Hawaiian Registered Vessels"  
pp. 43-54 "History of the House of H. Hackfeld and Co."  
Laysan - p. 5
- Thrum, T. G. comp. 1902. Hawaiian Almanac and Annual for 1903.  
T. G. Thrum, Honolulu 202 pp.  
pp. 154-155 "Marine Casualties" in "Retrospect for 1902"  
Laysan - "Ceylon"
- Thrum, T. G. comp. 1903. Hawaiian Almanac and Annual for 1904.  
T. G. Thrum, Honolulu 247 pp.  
p. 29 "Vessels documented in the District of Hawaii, June 30, 1903."  
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ok? pp. 203-204 "Marine Casualties" in "Retrospect for 1903"  
French Frigate Shoals "Conetable de Richmond"  
Midway "Julie E. Whalen"
- Thrum, T. G. comp. 1904. Hawaiian Almanac and Annual for 1905.  
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p. 28 "Vessels permanently documented in the District of Hawaii, June  
30, 1904"
- Thrum, T. G. comp. 1905. Hawaiian Almanac and Annual for 1906.  
T. G. Thrum, Honolulu 225 pp.  
71-72 pp. p. 66-74 "Extracts from an ancient log"  
p. 70 Wake  
p. 189-190 "Shipping Casualties" in "Retrospect for 1905"  
Palmyra "Lavinia"  
Laysan "C. Kennedy"  
cf. for "C.L. Woodbury"  
Malden "Victor"  
"Sabonis"
- Thrum, T. G. comp. 1906. Hawaiian Almanac and Annual for 1907.  
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pp. 111-115 "Marine Casualties for 1906"  
Midway "Mongolia"
- Thrum, T. G. comp. 1907. Hawaiian Almanac and Annual for 1908.  
T. G. Thrum, Honolulu 219 pp.  
p. 36-37 "Record trips between Hawaiian and distant ports"  
[Jarvis]  
pp. 181-182 "Shipping Casualties" in "Retrospect for 1907"  
Midway "Carollton"
- also xerox p. (9) [Pacific Guano & Fertilizer Co. all]

Hawaiian Annual Index - cont.

- Thrum, T. G. comp. 1908. Hawaiian Almanac and Annual for 1909.  
 T. G. Thrum, Honolulu 214 pp.  
 pp. 177-178 "Marine Casualties" in "Retrospect for 1908"
- Thrum, T. G. comp. 1909. Hawaiian Almanac and Annual for 1910.  
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 pp. 176-178 "Shipping Casualties" in "Retrospect for 1909"  
Pearl and Hermes [Rescue of stranded Japanese]
- Thrum, T. G. comp. 1910. Hawaiian Almanac and Annual for 1911.  
 T. G. Thrum, Honolulu 204 pp.  
 p. 175- "Bird Poachers" [Laysan]  
 pp. 176-177 "Shipping Casualties" [Both in "Retrospect for 1910"]
- Thrum, T. G. comp. 1911. Hawaiian Almanac and Annual for 1912.  
 T. G. Thrum, Honolulu 204 pp.  
 pp. 151-152 "Shipping Casualties" in "Retrospect for 1911"  
Fanning
- Thrum, T. G. comp. 1912. Hawaiian Almanac and Annual for 1913.  
 T. G. Thrum, Honolulu 209 pp.  
 pp. 47-62 "Honolulu's share in the Pacific whaling industry of  
 by-gone days. [see p. 48 for Wilmington and Liverpool Packet  
 in 1845]  
 pp. 63-68 "List of Honolulu Whalers, with their annual catches"  
 p. 176-177 "Shipping Casualties" in "Retrospect for 1912"  
Fanning
- Thrum, T. G. comp. 1913. Hawaiian Almanac and Annual for 1914.  
 T. G. Thrum, Honolulu 252 pp.  
 pp. 216-217 "Shipping Casualties" in "Retrospect of 1913"
- Thrum, T. G. comp. 1914. Hawaiian Almanac and Annual for 1915.  
 T. G. Thrum, Honolulu 203 pp.  
 Lydgate, Rev. J. M. pp. 133-144 "Wrecks to the North-West"
- |                              |               |                         |
|------------------------------|---------------|-------------------------|
| <u>French Frigate Shoals</u> | 13 Mar. 1859  | "South Seaman"          |
|                              | 14 Apr. 1867  | "Daniel Wood"           |
|                              | ?             | "Rebecca"               |
|                              | ?             | [Several years ago"     |
|                              | 10 Oct. 1903  | "Conetable de Richmond" |
| <u>Laysan</u>                | 3 Mar. 1905   | "C. C. Kennedy"         |
| <u>Lisianski</u>             |               | "Neva"                  |
|                              |               | "Holder Borden"         |
|                              |               | "Konohasset"            |
|                              |               | "Wanderer"              |
| <u>Pearl and Hermes</u>      | 26 Apr. 1822  | "Pearl and Hermes"      |
| <u>Midway</u>                | 16 Nov. 1886  | "General Siegel"        |
|                              |               | "Wandering Minstrel"    |
|                              | 22 Oct. 1903  | "Julia E. Whalen"       |
|                              | 28 Dec. 1906  | "Carrollton"            |
|                              | 16 Sept. 1906 | "Mongolia"              |
| <u>Kure</u>                  | 9 June 1937   | "Gledstones"            |
|                              | 24 Sept. 1842 | "Parker"                |
|                              | 29 Oct. 1870  | "Saginaw"               |
|                              | 15 July 1886  | "Dunnotter Castle"      |

Hawaiian Annual Index - cont.

Laysan

- see for Ceylon

✓ pp. 175-176 "Marine Casualties" in "Retrospect for 1914"

Thrum, T. G. comp. 1915. Hawaiian Almanac and Annual for 1916.  
T. G. Thrum, Honolulu 202 pp.

✓ pp. 165-166 "Marine Casualties" in "Retrospect for 1915"  
Laysan ["O.M. Kellog survivors there"]

Thrum, T. G. comp. 1916. Hawaiian Almanac and Annual for 1917.  
T. G. Thrum, Honolulu 205 pp.

✓ pp. 177-178 "Marine Casualties" in "Retrospect for 1916"

Thrum, T. G. comp. 1917. Hawaiian Almanac and Annual for 1918.  
T. G. Thrum, Honolulu 201 pp.

p. 167-168 "Marine Casualties" in "Retrospect for 1917"

Jarvis

French Frigate Shoals

"Churchill"

Thrum, T. G. comp. 1918. Hawaiian Almanac and Annual for 1919.  
T. G. Thrum, Honolulu 179 pp.

✓ p. 146-147 "Shipping Mishaps" in "Retrospect for 1918"

Malden

"Annie Larsen"

"Baxter"

"John Murray"

"Ysabel May"

Christmas

[Fanning]

File - Long's Vegetation:  
Enderbury

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ATOLL RESEARCH BULLETIN

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No. 65

Some Marine Algae from Canton Atoll

by

E. Yale Dawson

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Some Marine Algae from Canton Atoll<sup>1/</sup>

by

E. Yale Dawson

The following annotated list has resulted from an examination of a collection of algae made during the first part of February, 1958, by Dr. and Mrs. Otto Degener on Canton Atoll in the Phoenix group. Only the green, brown, and red algae are treated here, inasmuch as a rather large series of Cyanophyta has been identified by Dr. Francis Drouet and is accounted in Bulletin No. 64.

With the exception of about a dozen species mentioned by Degener & Gillaspy (1955) on the basis of determinations by M. S. Doty, this is the first floristic list of which I am aware of the marine vegetation of Canton Atoll, or of any island in the Phoenix group. Accordingly, these records supplement and extend our knowledge of central Pacific atoll floras derived from such reports as have appeared in recent years for the Marshall, Gilbert, and Line Islands (cf. Taylor 1950, Dawson, Aleem & Halstead 1955, Dawson 1956, 1957, Moul 1957).

The specimens are cited according to Degener collection numbers. The first set of specimens, all of which are liquid preserved, has been deposited in the Herbarium of the University of California, Berkeley.

CHLOROPHYTA

Enteromorpha clathrata (Roth) J. Ag. 24841.

Enteromorpha sp. 24863. This appears to agree with what Chapman has called E. clathrata var. pumila (Aresch.) Chapm. from New Zealand.

Enteromorpha kylinii Bliding 24763; 24764; 24739; 24849?

Ulvella lens Crouan 24843a, growing on Caulerpa serrulata.

Cladophora fascicularis (Mert) Kütz. 24717. This material, about 1½ cm. tall, is in good agreement with Borgesen's illustrations of specimens both from Mauritius and the West Indies. The specimens are much smaller in height than many West Indian ones, but agree in cell size and form.

Cladophora flexuosa (Griffiths) Harv. 24852. The specimens show such close accord in size, habit, branching and cell form with this tropical Atlantic species as to be referable here with reasonable certainty. The similarity to Vicker's illustration of the species from Barbados is especially striking. The plant is reported from Australia, but apparently not from the central Pacific.

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1. Contribution from the Beaudette Foundation for Biological Research, Solvang, California.

Dictyosphaeria cavernosa (Forrsk.) Börg. 24724; 24735; 24832;  
24859; 24865.

Boodlea composita (Harv.) Brand 24716b; 24719. The latter specimen represents a lax form and bears much sterile Ceramium gracillimum v. byssoidum.

Cladophoropsis gracillimum Dawson 24758. These are in good agreement in structure, but are slightly coarser than either the Mexican type or material from Arno Atoll, Marshall Islands, and much coarser than Eniwetok material. The colony is quite compact and the filaments densely arranged in a rather erect fashion. The exceedingly long cells and thick, stratified walls are distinctive. Number 24781 is still coarser, up to 140  $\mu$  in diameter in some places, although mostly about 125  $\mu$ . Some of the walls are up to 20  $\mu$  thick. This would seem to be a particularly robust form of this generally slender species.

Cladophoropsis sundanensis Reinbold 24715. This is very much like material from Palmyra Island, forming rounded, compact colonies as reported from there. The filaments are about the same size or tending to be slightly larger. 24826a, growing in a turf with Jania tenella, has filaments 70-100  $\mu$  in diameter. 24747 is a very young colony compacted with Lyngbya filaments. 24766 shows the characteristic sub-spherical clumps, but the cells are very long. 24820 has filaments 100-130  $\mu$  in diameter. 24846 is a darker colored form with somewhat shorter cells than other material from this area. It may be a distinct entity, but points of distinction are not clear.

Derbesia attenuata Dawson 24572a. Well developed, typical material, on Turbinaria.

Caulerpa racemosa var. peltata (Lamx.) Eubank 24713; 24716;  
24756a; 24787; 24831; 24845; 24861; 24864.

Caulerpa racemosa var. turbinata (J. Ag.) Eubank 24784.

Caulerpa serrulata (Forrsk.) J. Ag. emend. Börg. 24751; 24756;  
24782; 24843.

Caulerpa urvilleana Mont. var. 24840; 24842.

Bryopsis pennata Lamx. 24731; 24743 (On Turbinaria); 24822a;  
24837; 24850. Unilateral branching is especially prominent and consistent in this last collection.

The following identifications and notes on Codium are provided by Dr. Paul C. Silva, University of Illinois.

Codium ovale Zanard. 24746; 24740. This latter collection is a mixture of two species growing in intimate association: Codium ovale and a member of the C. arabicum complex. The known range of C. ovale has now been extended beyond the type locality



(New Guinea) to include Kwajalein, Majuro and Canton islands. The adherent Codium is somewhat more cerebriform than is usual for C. arabicum, but anatomically it clearly reveals its relationship to the C. arabicum complex.

Codium geppii O. C. Schmidt 24714; 24570; 24788; 24821; 24851; 24825. These are very similar to the type collection. In the Indo-Pacific region a member of the C. arabicum complex and one of the C. geppii complex are always found as an integral part of the biocoenosis of coral reefs. In the Atlantic a similar, but less constant, relationship holds: an adherent form, referable to the C. intertextum complex, is invariably present on coral reefs, while a repent form, referable to the C. repens complex, is found only on certain islands.

Halimeda fragilis Taylor 24774.

Halimeda micronesica Yamada 24768. A good specimen 6-7 cm. tall.

Halimeda opuntia (L.) Lamx. 24771.

#### PHAEOPHYTA

Ectocarpus indicus Sonder 24836. Good material on Turbinaria with very long plurilocular sporangia often to 200  $\mu$  or more.

Sphacelaria furcigera Kütz. 24754 (on old Turbinaria); 24752b.

Sphacelaria sp. 24723a. This may be a tropical form of S. subfusca Setch. & Gard. The specimens have propagulae like S. furcigera, but many of them are trifurcate rather than bifurcate. Plurilocular sporangia, however, are dominant on this material.

Dictyota friabilis Setchell 24845a; 24828; 24859; 24862; 24868. This latter collection is almost without doubt like the type from Tahiti.

Dictyopteris repens (Okam) Börg. 24752 (small amount).

Pocockiella papenfussii Taylor 24824.

Pocockiella variegata (Lamx.) Papenf. 24765.

Turbinaria ornata (Turn.) J. Ag. 24783.

Turbinaria trialata (J. Ag.) Kütz. 24721.

#### RHODOPHYTA

Gelidium pusillum (Stackh.) Le Jolis 24736. Typical, small, cystocarpic material 3-4 mm. tall.

Pterocladia sp. 24742; 24755. These tetrasporic and cystocarpic materials are well developed, over 2 cm. tall, and pinnately branched much as in Pterocladia nana Okam. from southern Japan and Formosa. They may be referred provisionally to that species, but additional Pterocladia collections from the central Pacific, such as at Palmyra Island where one is reported from intestinal contents of fishes (Dawson, Aleem and Halstead, 1955) are needed to enable us to interpret more satisfactorily the occurrence of this genus.

Gelidiella rigidiuscula (Grunow) J. Feldmann 24737. This richly fertile material has the stichidia and branching much as in G. acerosa, but is smaller in size: 300  $\mu$  down to 120  $\mu$  in the ultimate branchlets. This is in agreement with the discussion and key in Feldmann (1931) of G. rigidiusculum from Ceylon, for which reproduction is not reported. The size and habit are much like G. hancockii from the Gulf of California, but that species has cylindrical tetrasporangial stichidia on short lateral branchlets rather than acute, bulbous, terminal ones as in the present material. This disposition seems justified awaiting the report of fertile material from Ceylon for comparison. 24838 (with some Herposiphonia secunda); 24759 (tetrasporangial); 24832a (some growing with Dictyosphaeria); 24789. The tetrasporangial stichidia in this collection are so abundant as to terminate almost every branch.

Gelidiopsis intricata (C. Ag.) Vickers 24728; 24857a.

Jania capillacea Harv. 24857.

Jania micrarthrodia Lamx. 24761a (cystocarpic); 24737a (with Gelidiella rigidiuscula); 24860.

Jania tenella Kütz. 24826 (in mixture); 24822 (a questionable form with very abundant conceptacles).

Hypnea esperi Bory? 24730; 24854. These specimens have the tetrasporangial sori in part at first unilateral on the branches, causing some distortion. Later they may fill in all around. They are similar in this character to specimens reported and illustrated by Setchell as H. nidifica J. Ag. from Tahiti.

Gracilaria sp. 24866. This may be the plant described as Corallopsis reptans Weber van Bosse, from the Kei Islands.

Lomentaria sp. 24864b.

Ceramium clarionensis Setch. & Gard. 24730b.

Ceramium equisetoides Dawson 24864a. These are in good agreement with Pacific Mexican specimens.

Ceramium gracillimum var. byssoideum (Harv.) G. Mazoyer 24716a; 24784a (with Caulerpa racemosa v. turbinata); 24730a (a very lax form); 24804; 24843b.

Ceramium vagabunde Dawson 24843c. This material is somewhat more slender than Ehiwetok specimens and has nodal bands more like those of the material reported from Isla San Benedicto, Mexico, yet the agreement is generally satisfactory. Growing with Caulerpa serrulata.

Ceramium sp. 24840a. Fertile, tetrasporangial material apparently near C. personatum Setch. & Gard. The agreement is good except that the descending appendages within the axial cells were not observed. The tetrasporangia are at first abaxial, then whorled and involucrate. Growing with Caulerpa urvilleana.

Griffithsia sp. 24864c, sterile.

Herposiphonia secunda (Ag.) Ambronn 24733 (richly developed); 24805; 24829 (richly developed); 24834.

Heterosiphonia wurdemannii var. laxa Borg. 24748 (mixed with Herposiphonia); 24741 (in mixture); 24854a (on old Turbinaria); 24853.

The following determinations and notes on Polysiphonia are provided by Dr. George J. Hollenberg of the University of Redlands, California

Polysiphonia ferulacea Suhr 24866a. This determination is probably correct if Tseng, Cribb and others have been correct in their identifications of Pacific specimens. It should be considered tentative, however, until male plants are found.

Polysiphonia flaccidissima Hollenberg 24867. This determination is probably reliable although the segments are shorter (1.0-1.5 diameters) and the trichoblasts are not well developed and with tapering tips.

Polysiphonia mollis Hook. & Harv. ?? 24823. This identification is doubtful because of (1) small size; (2) obvious sympodial branching; (3) very long, continuous tetrasporangial branches.

Laurencia nana Howe 24761. The cortical cells are of the non-palisade type, although an error occurs in expressing this in Dawson 1957, p. 124.

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Peter Marshall

Binion Amerson

Determinations of grasses of Peter Marshall and Binion Amerson  
determined by J. R. Swaller.

Enderbury Island

6. Digitaria pacifica Stapf

7. Unknown

Howland Island

7. Digitaria pacifica Stapf

8. possibly Lepturus

Baker Island

1. Digitaria pacifica Stapf

10. possibly Lepturus

11. Lepturus repens (Forst.) R. Br.

French Frigate Shoals, East Island, June 8, 1963

Setaria verticillata (L.) Beauv.

French Frigate Shoals, East Islands, June 9, 1963

Lepturus repens (Forst.) R. Br.

Setaria verticillata (L.) Beauv.

French Frigate Shoals, Whale-Skate Isl. June 13, 1963

Lepturus repens (Forst.) R. Br.

Pearl and Hermes Reef, Southeast I., June 21, 1963

Eragrostis variabilis (gaud) Stend.

Setaria verticilliata (L.) Beauv.

*Cynodon dactylon* (L.) Pers.

Pearl and Hermes Reef, South north Island, June 25, 1963

*Lepturus repens*. (Forst) R. Br.

Enderbury Island

1. *Messerschmidia argentea* (L.f) Johnst.
2. *Sesuvium portulacastrum* L.
4. *Cassytha filiformis* L.
5. possibly *Portulaca lutea* Sol.
8. *Triumfetta procumbens* Forst. f.
9. Closest to *Sida fallax* Walp.
10. *Cordia subcordata* Lam.
11. possibly Mayaceae
12. *Ipomoea lutea* (Schlecht.) Don

Baker Island

2. *Portulaca oleracea* L.
5. *Phyllanthus amarus* Schum. and Th. (*P. niruri* L.)
6. probably *Euphorbia hirta* L.
7. closest to *Sida fallax* Walp.
8. *Triumfetta procumbens* Forst. f.
12. *Boerhavia diffusa* L.

Pearl and Hermes Reef, Southeast Island, June 21, 1963

*Sesuvium portulacastrum* L.

possibly *Scaevola*

*Scaevola sericea* Vohl. [(*S. frutescens* (Mitt.) Krauses--the name is controversial)].

possibly *Luffa operculata* (L.) cogn.

*Solanum nelsonii* Duval

*Boerhavia diffusa* L.

*Tribulus cistoides* L.

Pearl and Hermes Reef, North Island, June 25, 1963

Amaranthaceae

*Achryonthes splendens* Mart. var

Pearl and Hermes Reef, Seal Island, June 26, 1963

*Capparis spinosa* L. var. *Mariona* (Jacq.) k. Sch.

French Frigate Shoals, East Island, June 8, 1963

*Sonchus asper* (L.) Hill (but doubtfully distinct from *S. olerceus* L.)

Closes to *Chenopodium sandwicheum* Moq in DC.

*T*<sub>r</sub>*ibulus cistoides* L.

*Boerhavia diffusa* L.

*Messerschmidia argentea* (L.f.) Johnst.

possibly *Portulaca* (or ? *Amaranthaceae*).

French Frigate Shoals, Whale-Skate Island, June 13, 1963

Closest to *Chenopodium sandwicheum* Moq. in DC.

*Tribulus cistoides* L.

*Boerhavia diffusa* L.

*Messerschmidia argentea* (L.f.) Johnst.

possibly *Portulaca*

Howland

2. *Boerhavia diffusa* L.

4. *Cordia subcordata* Lam

5. *Tribulus astoides*

6. *Coccoloba uvifera* (L.) L.

Cytological Material,\* Leeward Hawaiian Islands,

September 14-28, 1964, by C. R. Long

September 14, 1964, Kure Island

1. No. 2252, Boerhaavia, vial No. 4
2. No. 2230, vial No. 5
3. No. 2251, vial No. 8
4. No. 2232, vial No. 3
5. No. 2228, vial No. 23.
6. No. 2248, vial No. 17.

September 16, 1964, Pearl and Hermes, Southeast Island

1. Cytological collection No. 1, vial No. 16.

September 17, 1964, Pearl and Hermes, North Island

1. Cytological collection No. A., vial No. 15.
2. Cytological collection No. B., vial No. 14.

September 18, 1964, Lisianski

1. Sicyos - cytological collection A. - vial No. 7
2. Sicyos - cytological collection C. - vial No. 18.
3. Cytological collection E. - vial No. 22.
4. Scaevola, collection C. - vial No. 21.
5. Scaevola, collection B. - vial No. 6.
6. Scaevola, collection A. - vial No. 1.
7. East Beach, cytological collection C, vial No. 9
8. Scaevola, cytological collection L., vial No. 10.
9. Scaevola, cytological collection D., vial No. 11

September 19, 1964, Laysan

1. Sicyos, cytological collection B., vial No. 2.
2. Sicyos, cytological collection C., vial No. 3.
3. Sicyos, cytological collection A., vial No. 12.
4. Boerhaavia, purple flowered, cytological collection No. 2, vial 19.
5. Scaevola, cytological collection No. 1, vial No. 20.
6. Boerhaavia, white flowered, hint of purple, cytological collection A., vial No. 24.

September 23, 1964, Nihoa

1. Fritchardia remota

\* Flower buds preserved in a solution composed of four parts absolute alcohol and one part propionic acid.



OUTLINE PROPOSAL: FLORA

POBSP

Long

INTRODUCTION

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ADDENDA

Bob Long -

Plant Catalog

Philip C. Shelton.

401 Tribulus cistoides L. 16 June 1966

Zygophylloaceae  
Lionski s. Leeward Group.  
Sandy opening in Scaevola, 300 yds  
from North Shore, growing with  
Boerhovia, Scaevola and Eragrostis.

402 Boerhovia diffusa L.

Nyctaginaceae 16 June 1966

Lionski s., Leeward Group.

300 yards from No. shore, see 401.

Prostrate. - Sandy near top of seaward  
slope.

403 Sicyos hispidus Hbd.

Cucurbitaceae

16 June 1966

Lionski s. Leeward Group.

Same locus as 401 + 402

Climbing on dead Scaevola.

404 Ipomoea pes-caprae T.!!

Convolvulaceae

16 June 1966

Lionski s. Leeward Group.

Sandy north shore, near top of  
storm beach, few yards from  
edge of Scaevola

one seedling only.

Plant Catalogue.

Philip C. Shelton.

405. Nama sauwicensis var laysonicum <sup>Brand.</sup>  
Hydrophyllaceae 16 June 1966  
Lisianski Island, Leeward Group,  
North shore, open, sandy beach,  
between Scaevola and tide line.

406. Portulaca lutea Sol.  
Portulacaceae 16 June 1966  
Lisianski I. Leeward Group,  
North shore, top of Storm beach,  
open sand near Scaevola.

407 Solenum nigrum L.  
Solonaceae 17 June 1966  
Lisianski I., Leeward Grp.  
150 yards from E shore, level sandy  
area, nearly lowest part of interior of  
Island. - between Scaevola &  
Ipomoea indica

408 Ipomoea indica (Burm. f.) Merr.  
Convolvulaceae  
Lisianski I. Leeward Group.  
150 yards from E shore (see 407)  
Climbing on Scaevola  
flowers white.

Plant Catalog

Philip C. Shelton

409

Casuarina equisetifolia L.

Casuarinaceae

18 June 1966

Lisianski Island, Leeward Group,  
from the tree growing near E  
shore, near two palms - at edge  
of Scaevola zone <sup>with</sup> Eragrostis.

410

Portulaca lutea Sol.

Portulacaceae

19 June 1966

Lisianski I., Leeward Group.

Top of storm beach - edge of Scaevola  
NE shore. flowers lemon yellow,  
fruits black-mature.

411

Casuarina equisetifolia L.

Casuarinaceae

19 June 1966

Lisianski I. Leeward Group.

Sandy, top of storm beach - West Shore.  
Edge of Scaevola zone.

412

Scaevola taccada (Gaertn.) Roxb.

Goodeniaceae

19 June 1966

Lisianski I. Leeward Gp.

West shore, just behind top of  
storm beach. Sandy seaward slope.

# Plant Catalog

Philip C. Shelton

413. Scaevola taccada (Gaertn.) Roxb.  
Goodeniaceae  
Lisianski I. Leeward Group.  
100' from top of West Beach,  
Sandy, level terrace behind  
Storm beach.

414 Eragrostis variabilis (Gaud.) Steud.  
Gramineae  
Lisianski Island, Leeward Grp.  
Near west shore, sandy seaward  
slope above beach.

Plant Catalog

Philip C. Shelton

415 Conyza bonariensis (L.) Krong.  
Compositae 21 June 1966  
Lagoon I. Leeward Group.  
Top of West Seaward slope, just  
inside edge of Scaevola zone - in  
open Eragrostis.

416 Sicyos hispidus Hillebr.  
Cucurbitaceae 21 June 1966  
Lagoon I. Leeward Group.  
Climbing on Scaevola near  
inner edge of Scaevola zone.

417 Solanum nigrum  
Solanaceae 21 June 1966  
Lagoon I. Leeward Group.  
In Scaevola near top of Seaward  
slope. one plant only.

418 Sicyos microcarpus Mann.  
Cucurbitaceae 21 June 1966  
Lagoon I. Leeward Group.  
East side of Lagoon, 100' from  
water, 50-100' from Scaevola ~~Pludica~~  
zone, in Heliotropium - Sesuvium  
level, wet sandy-guano soil.  
with non-flowering Eragrostis.

Plant Catalog

Philip C. Shelton

419 Aleurites moluccana (Rukui)  
Euphorbiaceae 11 June 1966  
Laysan I., Leeward Group.  
1 nut, picked upon shore of lagoon

420 Macuna sp.  
Leguminosae 11 June 1966  
Laysan I., Leeward Group.  
~~nut~~, seeds found on beach.

421 Macuna sp.  
Leguminosae 17 June 1966  
Laysan I., Leeward Group.  
Seeds found on beach.

422 Vigna marina  
Leguminosae 3 May 1967  
Johnston Island, Johnston Atoll, Pacific Ocean.  
Growing on fresh coral on top of Security  
Police head quarters.

SI-USNM-196  
11-24-58

United States National Museum  
Washington 25, D.C., U.S.A.

REPORT OF IDENTIFICATIONS

A letter ~~has~~, has not,  
been written.

Registrar File No. ---

To Dr. F. C. Sibley - Div. of Birds  
608 Natural History Building  
Smithsonian Institution

Date 7 Feb 1964

Initiated by C. V. Morton Department of Botany Division of Ferns

<u>Collector</u>	<u>Specimen</u>	<u>Locality</u>	<u>Identifier</u>
------------------	-----------------	-----------------	-------------------

All collections are F. C. Sibley.

Howland Island

	<i>Cordia subcordata</i> Lam.		C. V. Morton
	<i>Coccoloba uvifera</i> L.		"
	<i>Tribulus cistoides</i> L.		"
	<i>Boerhaavia diffusa</i> L. var. <i>tetrandra</i> (Forst.) Heim		"
	<i>Portulaca lutea</i> Solander		"
	<i>Lepturus repens</i> (Forst.) R. Br.		J. R. Swallen

Baker Island

	<i>Boerhaavia diffusa</i> L. var. <i>tetrandra</i> (Forst.) Heim		C. V. Morton
	<i>Triumfetta procumbens</i> Forst.		"
	<i>Portulaca lutea</i> Solander		"
	<i>Lepturus repens</i> (Forst.) R. Br.		J. R. Swallen
	<i>Abutilon indicum</i> Sweet ?		C. V. Morton
	<i>Sida fallax</i> Walp.		"
	<i>Digitaria pacifica</i> Stapf		J. R. Swallen

Lisianski Island

	<i>Ipomoea indica</i> (Burm.) Merrill		C. V. Morton
	<i>Tribulus cistoides</i> L.		"
	<i>Boerhaavia diffusa</i> L. var. <i>tetrandra</i> (Forst.) Heim		"
	<i>Casuarina equisetifolia</i> Forst.		"

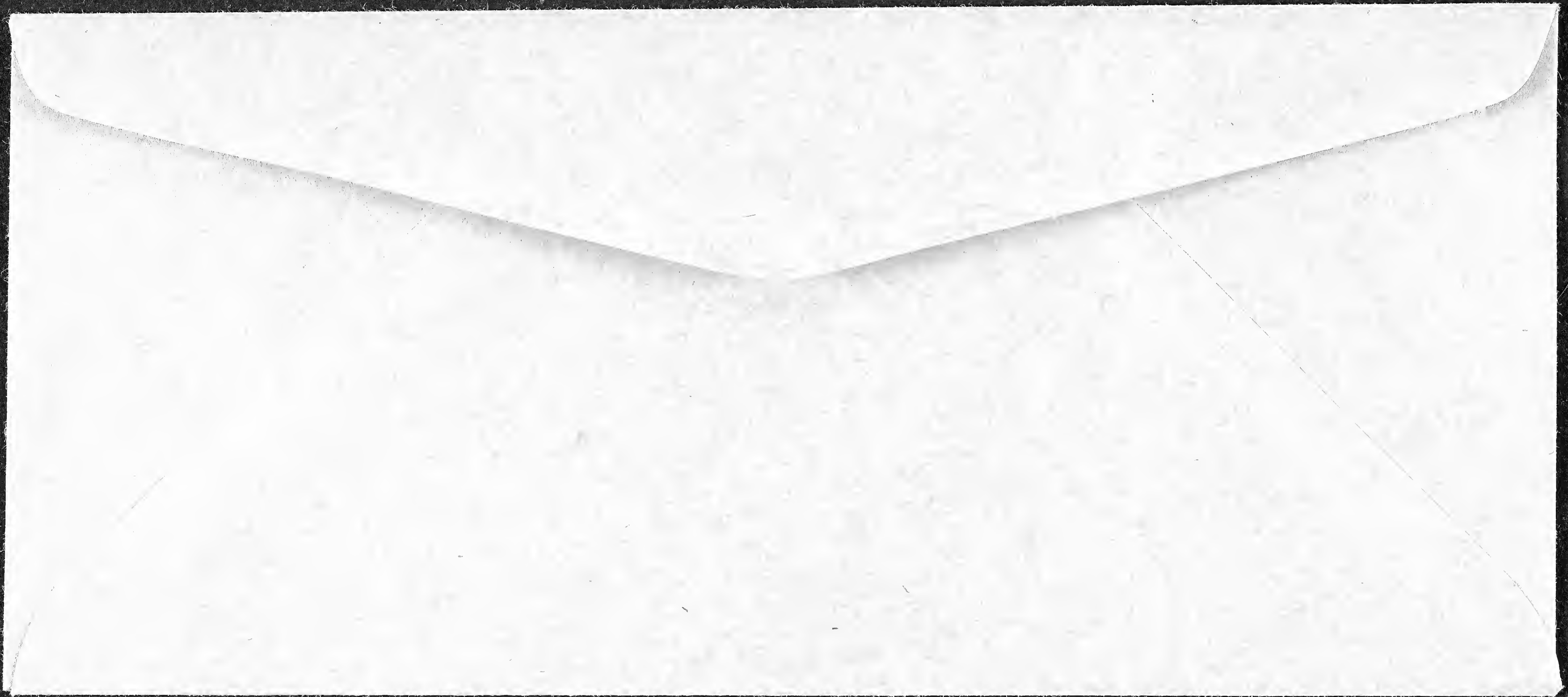
Pearl and Hermes Reef

1	<i>Tribulus cistoides</i> L.		C. V. Morton
2	<i>Brassica campestris</i> L.		"
3	<i>Boerhaavia diffusa</i> var. <i>tetrandra</i> (Forst.) Heim		"



4	<i>Solanum auriculatum</i> Ait.	C. V. Morton
5	<i>Eragrostis variabilis</i> (Gaud.) Steud.	J. R. Swallen
6	<i>Cucumis sativus</i> L.	C. V. Morton
7	<i>Sesuvium portulacastrum</i> L.	"
8	<i>Coronopus didymus</i> (L.) Smith	"
9	<i>Portulaca oleracea</i> L.	"
10	<i>Cynodon dactylon</i> (L.) Pers.	J. R. Swallen
11	<i>Solanum nigrum</i> L.	C. V. Morton
12	<i>Setaria adhaerans</i> (Forsk.) Chiov.	J. R. Swallen
14	<i>Lepidium owaihiense</i> C. & S.	C. V. Morton

F. C. Sibley  
Rev. of Birds



## II. Vascular plants of Tern Island, French Frigate Shoal

Through the courtesy of the United States Coast Guard and Dr. Harold F. Coolidge, the author was able to visit Tern Island on September 2, 1961. Since only half an hour ashore was available, during which time a circuit of the island was made, the observations reported here should be considered as "preliminary". I wish to express my appreciation to H. Ivan Rainwater who supplied me with a list of his collections from French Frigate Shoal, and to Dr. V. J. Krajina and Miss Marie Neal who assisted in the identification of the material designated here as Atriplex muel-leri.

French Frigate Shoal, about 480 miles northwest of Honolulu, is a crescent-shaped atoll on which are a number of sand islets. A few miles to the southwest are two rock islets, remnants of the original volcanic island. Tern Island, one of the sand islets (23° 54' N. Lat., 166° 19' W. Long.), is now the site of an airstrip and a United States Coast Guard loran station.

The botanical history of Tern Island is brief. The Tanager Expedition in 1923 (Christophersen and Caum, 1931) found five species of vascular plants growing there: Lepturus repens, Chenopodium sandwichicum, (now C. oahuense), Boerhavia diffusa, Portulaca lutea and Tribulus cistoides. During World War II the airstrip was constructed and some time later the loran station was built. H. Ivan Rainwater made plant collections on Tern and other islands in October, 1953. The second published observations were by Svihla (1957), who visited the island in 1956, and reported that the flora consisted of "various grasses", Ipomoea pes-caprae, Scaevola (probably S. sericea although no species was cited), and cultivated plants of Cocos nucifera and Casuarina sp.

Most of the surface of Tern Island is now occupied by the crushed coral airstrip which is 3100 feet long and drops off sharply into the water at the east and west ends. Along the south edge of the airstrip is an unpaved area 10 to 50 meters wide on which the living quarters are located. There is an extensive sandy beach along the south shore. On the north edge of the airstrip the unpaved area is up to 20 meters wide and there are only a few small sandy beach areas. The island is about two meters high. It is likely that little, if any, of the surface of the island was left untouched when the airstrip was constructed (see note p. 10).

The unpaved area south of the airstrip is rather densely covered with shrubs of Messerschmidia argentea and Pluchea odorata, and an herbaceous cover in which the predominant species are Ipomoea pes-caprae, Boerhavia diffusa, Cenchrus echinatus, Setaria verticillata, Sonchus oleraceus, and Conyza bonariensis. Of less frequent occurrence here are Eleusine indica, Lepturus repens, Portulaca lutea and P. oleracea. One large clump of Scaevola sericea is present southwest of the living quarters. Spergularia marina is abundant on the margins of the airstrip. The unpaved area on the north side of the island is less densely vegetated than that on the south. Pluchea odorata is present, but the shrubs are widely scattered. Very few plants of Messerschmidia argentea are present.

The herbaceous species are the same as those on the south except that Tribulus cistoides and Cynodon dactylon are also present on the north. Atriplex muelleri was found only in a single locality at the west end of the airstrip.

Cultivated plants around the Coast Guard quarters include Cocos nucifera, Casuarina equisetifolia, Ficus sp., Coccoloba uvifera, and Plumeria obtusa.

Of the five species noted by Christophersen and Caum (1931) for Tern Island all but Chenopodium oahuense were collected in 1961. The four species named by Svihla (1957) were still present. Fourteen additional species of weeds and cultivated plants are reported here for the first time. The flora now contains 22 species of vascular plants.

While it is impossible to determine the modes of introduction of the weedy species, it seems likely that the seeds of some of these came to the island in the soil which was reportedly brought there from Honolulu (Svihla, 1957). Honolulu was probably the place from which the cultivated plants were obtained. Other weedy species may have reached Tern Island accidentally via construction equipment, aircraft, or personnel. One cannot completely discount the possibility of "natural" dispersal by wind, birds, or ocean currents. However, most of the weedy species were present in the main Hawaiian Islands for many years before 1923, but the species were not found on French Frigate Shoal then. Thus, the weeds appeared there only after man began to make frequent visits.

The specimens cited below are deposited in the herbarium of the Bernice P. Bishop Museum, Honolulu 17, Hawaii. The initials "CHL" identify the author's collections made on September 2, 1961. The initials "HIR" indicate that the species was collected by H. Ivan Rainwater in October, 1953; "AS" indicates the species was collected by Arthur Svihla in February, 1956. The collections of Rainwater and Svihla were not numbered. New records are indicated by \*.

#### GRAMINEAE

- \*Cenchrus echinatus L. CHL 1661.
- \*Cynodon dactylon (L.) Pers. CHL 1673.
- \*Eleusine indica (L.) Gaertn. CHL 1662, AS.
- Lepturus repens (Forst.) R. Br. var repens. CHL 1668, 1674, HIR, AS.
- \*Setaria verticillata (L.) Beauv. CHL 1669, 1670, HIR, AS.

#### PALMAE

Cocos nucifera L. (Specimens not collected).

CASUARINACEAE

Casuarina equisetifolia L. CHL 1651.

MORACEAE

\*Ficus sp. CHL 1659.

POLYGONACEAE

\*Coccoloba uvifera (L.) Jacq. CHL 1660.

CHENOPODIACEAE

\*Atriplex muelleri Benth. CHL 1654, HIR.

NYCTAGINACEAE

Boerhavia diffusa L. CHL 1671, 1675, HIR, AS.

PORTULACACEAE

Portulaca lutea Sol. CHL 1667, HIR.

\*Portulaca oleracea L. CHL 1666.

CARYOPHYLLACEAE

\*Spergularia marina (L.) Griseb. CHL 1663.

ZYGOPHYLLACEAE

Tribulus cistoides L. CHL 1652, HIR, AS.

CONVOLVULACEAE

Ipomoea pes-caprae (L.) Sw. CHL 1658, HIR.

APOCYNACEAE

\*Plumeria obtusa L. CHL 1650.

BORAGINACEAE

\*Messerschmidia argentea (L.f.) Johnston. CHL 1653, HIR.

GOODENIACEAE

Scaevola sericea Vahl. CHL 1656, HIR.

COMPOSITAE

\*Conyza bonariensis (L.) Cronq. CHL 1655, 1665.

\*Pluchea odorata (L.) Cass. CHL 1657, 1672, HIR, AS.

\*Sonchus oleraceus L. CHL 1664, AS.

SI-Lib-855  
Rev. 1-8-60

BOOK

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Vascular plants of the Leeward Islands, Hawaii.  
Bishop Museum Bulletin 81: 1-41, 1931.

Clay, Horace F.

Narrative report of botanical field work on Kure Island.  
Atoll Research Bulletin 78: 1-3, 1961.

Svihla, A.

Observations on French Frigate Shoals, February, 1956.  
Atoll Research Bulletin 51: 1-2, 1957.

Note -- The statement on p. 7, "It is likely that little, if any, of the surface of the island was left untouched when the airstrip was constructed," has recently been confirmed by Dr. Vernon E. Smith of Kaneohe, Hawaii. Dr. Smith tells me that he spent several days on Tern Island in 1948, at which time he did not observe any higher plants growing on the island.

28  
1212  
-1810

sonian Library,  
al History Building,  
Desk, Room 28,  
ngston, D. C.

RN TO:

Pacific Vegetation Survey Files

1. Discussion of Voyda and Rappaport: "Aspect of Man's Influence upon Island Ecosystems.
2. Ellis, Albert F., 1936, Sydney Adventuring in Coral Seas. (copy of article)

Hull Island

Land plants: Abundance of wild portulaca (pigweed)

Vegetation: About 20,000 coconuts landed there in 1887, to be planted.

3. Baker Island

Vegetation: " - in our time there was not a single tree on it. The largest bushes were only about three feet high, and even these were not plentiful." p. 19.

Howland Island:

Howland Island:

Land plants: Wild portulaca.

Vegetation: "In the center there is a clump of scrubby trees about fifteen feet in height and covering an area of several acres;" p. 20

Author's party planted several thousand coconuts. Reported to have since died in drought period.

Canton Island:

Vegetation: no trees except "a single fair-sized coconut palm at the eastern end,--" p. 53. Sole survivor of many planted by Arundil Co.



Sydney Island:

Vegetation: Coconuts planted by the phosphate Co. have done well.

Gardner Island:

Vegetation: Planted in coconuts by the Arundel Co. Hull, Sydney,  
and Gardner: Well wooded.

Enderbury, Phoenix, McLean, Birnie:

Vegetation: Coconuts planted on Enderbury but did not do well;

"several clumps of stunted bushes" on it; the three others treeless.

3. Groves 1951 (abstr. F. R. Fosberg)
  4. The Phoenix Islands from Luke, Sir Harry. From a South Seas Diary,  
1938-1942. London: Nicholson and Watson, 1945. 255 pp.  
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  8. Von Zwaluvenburg, R. H., Notes on the Temporary Establishment of  
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XLVI 2:1942
- H. O. NO. W-270 Weather Summary for Naval Air Pilot Central Pacific  
Hawaiian islands Area
- U. S. N. Dept. Hydrographic Office (Climate of Midway, Line Island,  
Howland) Upper winds of Canton, Howland, Jarvis, Midway.

## 15 d. Baker

1. Exerpts on Baker from "Life on a Guano Island", Nautical Magazine, 39: 113-118, 1870. London: Suspkim Marshall, and Co., 1870.
2. Ellis, Albert F., 1936 Adventuring in Coral Seas  
See: Canton, Sydney, Gardner, Phoenix
3. Baker Island in American Polynesia by Bryan, Edwin H. Jr., Honolulu, Tongg Publishing Company, 1942. examples on Baker.

## 15 d Birnie

1. Birnie Island-quatation from Dona, James D. "Structure of Coral Islands", Geology, U. S. Exploring Expedition, Vol. 10, p. 69, 1849 (slight member .....
2. Dona, James D. "Coral Islands", Am. Journal of Science 1851 a, Vol. 12: 25-51. (second series).  
"Distinguished no vegetation except the low purslone and some trailing plants."
3. Excerpt from Birnie Island in American Polynesia by Bryan, E. H., Jr., Honolulu, Tongg Publishing Company, 1942. mentions vegetation.
4. Groves 1951 (Abstract F. R. Fosberg)'
  - p. 4 Enderbury Island - "Low, flat terrain is dotted here and there with clumps of trees thickets" uninhabited
  - p. 5 Sydney Island "50 coconut palms"
  - p. 9 Birnie Island uninhabited; little vegetation
  - p. 10 Jarvis Island "Treeless, with heavy sea bird population; - "
  - p. 10 Christmas Island - 1200 acres in coconuts.
  - p. 13 Palmyra Island - "As a result of the abundant rainfall the vegetation id luxuriant."

p. 15 Kingmen Reef - "there is on islet about twenty-five feet square with a few seedling coconut palms planted by the ship's crew on a previous trip."

15 d. Canton

1. Regene, O. and I. Degener, 1955, Canton Island, South Pacific, Atoll Research Bulletin No. 41
2. photos, letter, manuscript: Hatheway, W. H. and Garrison Costar, The Natural Vegetation of Canton Island, Phoenix Group, Pacific Ocean. also Local Climatological Summary Canton Island, South Pacific U. S. Dept. of Commerce, Compiled under the direction of James H. Fellgren San Francisco: 1951.
3. Photos by L. P. Schvets Phoenix and Samoa Island April - July 1939. Canton - Sida, Portulaca, Cordia, Lepturus.
4. Murphy, R. C., Niedrach, R. J., and A. M. Barley, Museum Pictorial No. 16. Denver Museum of Nat. History, Denver, Colorado, 1954.
3. Buddle, G. A. Rec. Auckl. Mus. 2: 125-132, 1938  
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4. Henry, T. R., 1957, Washington Evening Star Wed. July 17  
Victor in Science.
5. V. S. D. Commerce Weather Bureau Local Climatological Data with Comparative Data 1957 Canton Island, South Pacific.
6. Canton Island soil samples collected by Degener, Degener and Alexander, Feb. 12, 1958. Samples Nos. 1-9. list of analyzed soils.
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12. Hatheway, W. H., Degener, O., and Carrison Loster, the Natural  
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- N.B.13. List of plants Canton Island Collection, 1949, F. R. Fosberg and  
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vegetation
14. Bryan, E. H., Jr., 1942, Canton Island in America Polynesia, Honolulu,  
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15. Ellis, A. F., 1936, Adventuring in Coral Seas, Sydney, Australia  
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16. Degener, O. and W. Hatheway (Honolulu, Hawaii) Die Flora Des  
Canton Atolls IM STILLEN OZEAN, Revista Sudan. Bot. 10 (2): 33-37, 1952.
17. Von Zwaluwenburg, R. H., notes on the Temporary Establishment of  
Insect and Plant Species on Canton Island, Hawaiian Pl. Rec. XLVI  
2: 1942. pp. 49-52.
18. Von Zwaluwenburg, R. H., Canton Island, Hawaiian Pl. Rec. XLVI: 1941.  
pp. 15-23.
19. Copy of letter J. P. Swallen Apr. 16, 1951 to D. Degener - list of  
plant identifications  
(see below)  
In list is Degener 21291 *Lepturus repens* (Forst.) R. Br.  
Degener 21311 " " " "
- Swallen comments: " The two specimens of *Lepturus repens* do look very  
different. If this species were known only from a few specimens,

I would be inclined to think that these two represented distinct species. Considering the large amount of material we have, however, and the great variation which is evident, I feel that it is impossible to segregate any species. Almost every collection seems to differ from the rest. Also mentions Digitaria variation and meager collection.

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Canton Island Photos by Hatheway

Canton Island 1950 to 1951 by Hatheway (just prints) Messerschmidia, Cordia, Scaevola frutescens, Suriana maritima, Portulaca lutea - (dates and area in general - not exact compass) Sida fallax, Lepturus repens, Boerhavia tetrandra, Truinmfetta. Pictures of birds in vegetation

get Hatheway's address

15 d Christmas

1. Abstract Benson, 1838.

pp. 66. "The land is extremely low, and composed entirely of sand with only a few bushes and small trees.....on the western parts there are some scattering groups of coconut trees...." about 2000 in all.

pp. 67 Benson planted nuts on the south side and found 7 sprouted before leaving the island.

2. Abstract from Tresilion, F. H. Remarks on Christmas Island Hawaiian Spect. 1: 1838. mention of coconuts on island.

3. Fosberg Field notes 1934 Christmas Island mention: Pandanus, Puka, Guettarda, Cocnut, Bunchgrass, Scaevola, Tournefortia, Sida,  
(yard bird notes too!)

pp. 4 mentioning colors of ponds

"One here is bright blue-green, while 50 meters away is one with the color of bright brick red. The red color is due to a gelatinous water plant growing in a thick layer all over the bottom."

-did not visit the south coast and south eastern peninsula of the island, -check with Chock. note--neither did Chick and Hamilton.

4. Fosberg Field notes August 1936 Christmas Island

Motu Topu - Eisonia, Messerschmidia, Sariana, Heliotropium, Sida fallax, Lepturus repens, Portulaca lutea, Boerhavia, Fragroctis, Hedyotis romangoffiensis, Scaevola frutescens mention of dried vegetation - fluctuations in growth due to climatic factor.

Four Brothers.

Heliotropium	abutilons	description of vegetational associations.
Portulaca	Lepturus	
Messerschmidia	Surrain	
Sida		
Boerhavia		

"Two types of Boerhavia, or perhaps three were seen. One has hairy leaves with wavy margins, and dense heads of flowers. (Check tetrandra in shade? (sp. repens) or sp. viscosa (in galopagor)

F. R. Fosberg. The other has glabrous leaves, with entire margins, and looser heads. Another, perhaps the same as the last forms much coarser growth and larger mats, and has white flowers."

- same plant 1. flr. and fruit in flower and
- 2. nodes with lenes

differe - ascending paniculate, diffre in floves cercos.

Greigs grove (extreme part)

Chlorrtic coconuts, Lepturus, Scaevola, Portulaca,  
Northwest Point - Lepturus, Sida, Heliotropium, Portulaca, Boerhavia,  
Messerschmidia.

Paris, Aug. 28, 1936

Palms quite yellow

Heliotropium      Messerschmidia

Lepturus      Hedyotes romanzoffiensis not seen

Surriana      Portulaca oleraceae      observed no hylinds

Scaevola      P. lutea

Eyphorbia hirta (weed); Hibiscer tiliaceus, Phaesobus  
lathyroides

Motu Upon

many dead coconuts.

Heliotropium      Boerhaavia      Cassytha filiformis

Anamahen var. mediotis

Messerschmidia Suriana  
argentea

Scaevola      Erogrsotis

furtescens

Sida      Cocos

Lepturus repens      Portulaca lutea

5. Groves 1951 - (Abstract. F. R. Fosberg)

p. 10 Christmas Island - 1200 acres in coconuts.

6. Bryan, Edwin H. Jr., Christmas Island in American Polynesia, (excerpts)

p. 137, 138, 140.

7. Abstract Bennett, F. D. 1840 Vol. 1

p. 383 referes to Cook Islet "no vegetation except a few littoral herbs and 2 - 3 groups of stunted trees." p. 384, 385, 386, 387, 388.

15d Enderbyr

1. Dona, James D. "Coral Islands, Structure of," Geology, U. S. Exploring Expedition, Vol. 10, p. 64, 1849.

pp. 64.

2. Dona, James D., "Coral Islands", Am. Journal of Science 1851 a, Vol. 12: 25-51. (second series) pp. 43 "little vegetation on any part, and but a few trees."

3. Excerpts: Bryan, E. H., Jr., American Polynesia, Honolulu, Tongg Publishing Company, 1942

p. 50 Sesuvium bontree

Sida tree heliotrope

morning glory vines

"several small clumps of trees"

Coconut palms

4. Groves 1951 (Abstract. F. R. Fosberg)

Enderbury Island - "low, flat terrain is dotted here and there with clumps of trees and thickets"

5. Photos by L. P. Schultz Phoenix and Somoa Islands

April - July, 1939 - 8 prints only, no negatives, showing birds and vegetation



## Fanning

1. Quatations Fanning, Captain Edmund. Voyages and Discoveries in the South Seas, 1792-1832. Mass.: Marine Research Society, 1924. 335 p.
2. Quatations Herms, William B. "Doocalandra Taitensis (Guerin) and other Coconut Pests of Fanning and Washington Islands," The Philippine Journal of Science, Vol. 30, May to August, 1926 - Manila : Bureau of Printing, 1926. Pp. 243-271.

## General vegetation climate

3. Bryan, E. H., Jr., American Polynesia, Honolulu, Tongg Publishing Company, 1942.

Excerpts p 142

"The land is thickly covered with coconut palms and the remains of native bush. These reach a height of 60 to 90 feet, making the island visible from the deck of the vessel at about 10 miles.

"The beach is backed by ...."mentions Scaevola, tree heliotrope, Pisonia, Pondanus, bunchgrass, purslane, morning glory vines and low herbs and shrubs. The soil is fertile and breadfruit, bananas, figs, pineapples, taro and arrowroot grow readily.

## 15. d Gardner

1. Laxton, P. B., Nikamarono, Vol. 60, Nos 2 and 3, 1951, the Journal of Polynesian Society, Wellington, N. 2.
- pp. 143 - Pisonia, Tournefortia, Scaevola, Cordia, merinda
- pp. 147 - Sida
- pp. 150 buta trees
- pp. 151 Cordia

2. Bryan, E. H. Jr, 1942 American Polynesia Tongg Publishing Company, Honolulu.

p. 70 Pisonia, Cordia, Tournefortia "and other species characteristics of central Pacific Islands."

3. Ellis, Albert F., 1936, Adventuring in Coral Seas, Sydney Vegetation: Coconuts planted on Enderbury but did not do well; "several clumps of stunted bushes" on it;

15 d Howland

1. Excerpts Bryan, E. H. Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu.

p. 39 "only six species of plants were found on Howland, prior to its recent occupation. Lepturus bunchgrass, Boerhavia herb, and two kinds of purslane or pigweed (Portulaca lutea and oleraceae) dominate the surface. There are scattered patches of Tribulus, and a few small clumps of scrubby kon trees (Cordia), apparently more dead than alive, due to the dryness and nesting birds."

15 d Hull

1. Excerpt Bryan, E. H., Jr., American Polynesia, Tongg Publishing Company, Honolulu.

p. 64 Coconuts, Pisonia (50 feet)  
(75-80 feet)

2. Photo prints by L. P. Shultz Phoenix and Samoa Islands  
April - July 1939 (No. 55-85).

Pictures of beach rock vegetation, Sooty Terns, No. 66-good tree shots,  
nesting birds

No. 71

76. Red-footed Booby on nest

84-85 Red-tailed Tropicbird

on stones under tree

1. Dona, James D. "Coral Islands", Am. Journal of Science 1851 a,  
Vol. 12: 25-51 (second series).

pp. 41 - "without trees, and partly covered with small shrubs."

2. Dona, James D. "Coral Islands, Structure of", Geology, U. S.  
Exploring Expedition, Vol. 10, p. 68, 1849.

p. 68 - 11 - without trees, and partly covered with small shrubs."

3. Abstract Bennet, F. D., 1840.

Vol. 1 . . . . . 388 . . . . . - and destitute of vegetation."

Excerpts

4. Bryan, E. H., Jr., American Polynesia, Honolulu, Tongg Publishing  
Co., 1942.

134-135 "In 1938, etc. - Sesuvium, Portulaca mentioned.

Lepturus, Tribulus, Tragrostis, Abutilon, Boerhaavia and Sida.

15 d Kingman Reef

1. Groves 1951 (Abstract, F. R. Fosberg)

p 15 "there is an islet about 25 feet square with a few seedlings coconut  
palms planted by the ships crew on a previous trip."

2. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co.  
Honolulu

p. 153 "there is no land flora. Some coconut palms, planted in 1924, were  
still alive in 1926, but it is not know if they have survived."

15 d Malden Island

1. Bryan, E. H., Jr., 1952, American Polynesia, Tongg Publishing Company,  
Honolulu.

p. 133 "Coconuts, planted by the guano diggers, grew for a few years and  
then died."

15 d. McKean Island

1. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co., Honolulu

"There are not trees on McKean, the vegetation consisting of such low buk is Portulaca, Sesuvium and Lepturus bunchgrass.

15 d Monihiki (Tangareva)

1. Linton, A Murrey. "Notes on the Vegetation on Penrhyn and Monihiki Islands," The Journal of the Polynesian Society 42: 300-307. 1933.

pp. 300-307 "of about 28 different species of native plants and a considerable number of imported varieties." Mentions: Cultivated trees, birds "take possession" of islands guano bills coconuts, these replaced by puka, fono and taumanu native names of trees used - uses enumerated.

p. 306 mentions: 1. Fleurya interrupta Gand.  
2. Triumfetta procumbens Forst.  
3. Lepturus repens [(Forst)] R. Br.

p. 307 2 types of fern "maue", "rakotahu"; Holimeda incrossata Lem.  
Caulerpa cupressoides, Turbinana ornatu.

2. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co. Honolulu

p. 102 Cordia, Guertarda, Calaphyllum, Tournefortia mentioned as being much depleted. Pisonia is holding its own.

15 d Palmerston file

Palmyra (list)

1. Lichens of Palmyra Atoll collected by E. Yale Dawson Identified by Mason E. Hale.

Bacidia sp.

Coll. Nos 19812-19817, 19858 Anthracothecium

ochraceoflora (Nyl.) Mill. Aig.

Anthracothecium

libricolum (Fee) Mill. Aig.

2. Plants of Palmyra Atoll collected by E. Yale Dawson, determined by F. R. Fosberg Oct. 15-21, 1958 Col. Nos. 19800-19804, (Menge I., plants of: Straun I., Aviation I., Cooper I. Kaula I., Holei I., Papali I.)

3. Excerpts Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co., Honolulu.

(scant mention of luxuriant vegetation)

4. Groves 1951 (Abstract F. R. Fosberg) p. 13 "as a result of the abundant rainfall the vegetation is luxuriant."

15 d Phoenix Island

1. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co., Honolulu.

p. 54	<u>Lepturus</u> bunchgrass	<u>Sesuvium</u>
	<u>Boerhaavia</u>	<u>Sida</u>
	<u>Portulaca</u>	<u>Triumfetta</u>

15 d. Pukapuka 4 items

15d Rakaharga 3 items

15 d Starbuck

1. Arundel, John R. "The Phoenix Group and other Islands of the Pacific," a paper read at the Geographical Society of the Pacific, San Francisco, 3 March, 1885. Reprinted in the the New Zealand Herald. Pp. (1-2).

(birds and behavior)

"The vegetation of Starbuck is very scanty; about six varieties of plants, the largest a shrub of only about 4 feet in height at the most, and nothing of this can be seen from the sea."

2. Excerpt Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu.

quotes Arundel

15 d. Suwaror 1 item 25 small islets

15 d. Sydney

1. Arundel, John R., 1885

(6) - "Clumps of trees" -

2. Dona, James D. "Coral Islands", Am Journal of Science 1851 a, Vol. 12: 25-51. (second series)

"Well wooded nearly all round; but on leeward side the first in patches) - "

3. Excerpt Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company p. 60 Coconuts Geuttarda

Tournefortia Scaevola

Morinda

Dordia " - with the usual low herbs, shrubs, and vines, found on the treeless island." "The bird life is similar to that on the other islands, but less abundant."

4. Ellis, A. F., 1936, Adventuring in Coral Seas, Sydney. Vegetation: Coconuts planted by the phosphate company have done well.

5. Groves 1951, (Abstract. F. R. Fosberg)

Morinda citrifolia

15 d Tongareva Penrhyn Island

1. Bryer, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co.

Honolulu

p. 102 - "Coconut palms, pandanic and usual low trees."

2. Frisbie, Robert Dean, 1930, "South Seas Fairylands", The Atlantic

Monthly 146: 190-202 July-December 1930.

(popular account, scanty mention of vegetation)

15 d Vostok 2 items.

15d Washington

1. Dona, James D. "Structure of Coral Islands," U. S. Exploring Expedition,

Vol. 10, p. 70, 1849.

70 "It is a dense coconut grove, with luxuriant shrubbery."

2. Dona, James D. "Coral Islands", Am. Journal of Science 1851 a,

Vol. 12; 25-51 (second series)

(same as 1 above)

3. Fanning, Captain Edmund. Voyages and Discoveries in the South Seas,

1792-1832. Mass.: Marine Research Society, 1924. 335 p.

161 - general description on discovery

162 - " " " " "

4. Groves 1951 (Abstract F. R. Fosberg)

p. 12 - population enumeration no vegetation mentioned.

15 e Leeward Hawaii Island Atolls 4 items

Box 15 e photo's

a. Kure (Green Island) Septe. 1961 - *Solanum nelsoni*, in patch of

18 total

*Scaevola taccada*.

b. *Scaevola taccada*, *Boerhaavia diffusa*, *Eragrostis variabilis*.

(Prints only)

21 c. Laysan - September 1961  
total

2 d. Pearl and Hermes Reef  
total

15 e Kure

1. Prints - - by Clay 1959  
(good)

- a. Lepidum congesta R. Br. [I. Indica]
- b. " vivaihiense Cham. E. Schlecht.
- c. Tribulus cistoides L.
- d. Solanum nelsoni Duval
- e. Solanum nigrien L.
- f. Sicyos hispidos HBK.
- g. Scaevola sericea Vahl.
- h. Lipochaeta integrifolia (Mutt.) Gray
- i. Bulldozed Runway Oct. 8 1959.
- j. Lepturus repens (Forst.) R. Br.
- k. Eragrostis Whitneyi Fosb. var caunii Fosb.
- l. Eragrostis variabilis (Gaud.) [E. falcata]
- m. Cynodon dactylon (L.) Pers. Steud.
- n. Messerschmidia argentea (L.) Johnston
- o. Pluchea odorata (L.) Cass.
- p. Verbesina encelioides Gray
- q. Casuarina equisetifolia L.
- r. Boerhavia diffusa L.
- s. Ipomoea congesta R. Br. [I. Indica]



2. handwritten - field note - mention 70 monk seals, water table 9' 8" etc.

3. Notes taken on talk by Philip A. DuMont, Jan. 12, 1955, "Green Islet is covered generally by a brushy vegetation, probably *Scaevola frutescens*; some lighter colored spots probably grass; some spots where brush seems dead.

4. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co. Honolulu.

p. 204 *Scaevola* "-Kure's flora of thirteen kinds of grassy area vascular plants."

5. Clay, H. F., (mimeographed report) narrative Report of Botanical Field work on Kure Island, 30 October 1955 to 9 October 1959.

Tanager Expedition April 1923 - 15 species

Clay 1955 - 11 species of original 15 mentioned in the Tanager Report.

Cenchrus agrimonioides var. Loysanensis and Achryonthis splendidus var. reflexa - disappeared.

Reports 6 new species:

2 Fungi (Unidentified)

Cynodon dactylon (L.) Pers.

Casuarina equisetifolia L.

Messerschmidia argentea (L.) Johnston (photo only)

Solanum ingrien L.

(Specimens at H. B. M. and U. S. N. H.)

6. e aerial photos (two vertical, 1 oblique)

information as follows:

a. oblique; Green Island, Kure Atoll - view from Northwest, 1961

Photo 4 official Coast Guard Photograph

Number 14CGD - pr1961-35

Released by United States Coast Guard 14th Coast Guard District Public  
Information Office POB 4010, Honolulu, T. H.

b. vertical

VU - 1/32p55 (L) - 10-59 Date: 10-3059

Made for: Commander Naval Construction Forces Pacific

Subject: AER

Green Island (Kure Atoll)

Altitude: 12,000 ft.

Before Construction

Date: 10-3-59 Time: 1925

Camera: k-17 12" F. D.

View: Vertical

(Photo after construction is in map case, Hawaiian Atolls).

Photo 2

c. Duplicate of b.

15 e Laysan

1. Dill, Homer R. and W. Alanson Bryan. "Report of an Expedition to  
Lays Island in 1911 Under the Joint Auspices of the United States Department  
of Agriculture and the University of Iowa," in U. S. Department of  
Agriculture Biological Survey Bulletin No. 42, 1912 Pp. 1-30.

10. mentions guinea pigs "in the thick juncus."

2. Dill, Homer R. "The Albatross of Laysan" in the Wilson Bulletin;  
No. 97, A quarterly Journal of Ornithology, Vol. XVIII, December, 1916,  
No. 4. Pp. 162.

172 "the higher ground bordering the beach is covered with a rich growth  
of low bushes and sand grasses, among which are the trailing vines."

3. Notes on talk by Philip A. DuMont, Jan. 12, 1955  
Herbaceous vegetation covers about 1/3 total area, bare sand flats  
1/3, and lagoon 1/3.

4. Bryan, E. H., 1942, American Polynesia, Tongg Publishing Company,  
Honolulu.

p. 185 "But so much sand has drifted into this basin, while the  
island was denuded of vegetation, that now it is probably much shallower."

p. 186 They [the rabbits] ate off much of the green vegetation.

p. 187 [guinea pigs] introduced: "Literally every green leaf on the island  
was devoured, except the tobacco patch."

15 e. French Frigate Shoals no items

15 e Johnston Island

1. Manuscript (of Doty and Newhouse?) Johnston Island by F. R. Fosberg

- pg 3 "Thus it is believed that there are now about sixty-one species  
of flowering plants growing untended at Johnston Island."  
also algae mentioned.

2. letter (Fosberg to Newhouse April 27, 1954)

list of collections: Johnston Island Jan 18, 1950 Aug 14, 1952  
Apr. 25, 1950 Oct 20, 1953  
Oct. 22, 1951

3 and 4 Fosberg - field notes Oct 22, 1951; Aug. 14, 1952.

5. Christophersen, E., 1931, Vascular Plants of Johnston and Wake  
Islands, OCC. Pap. Bishop Mus. 9(13): 1-20, 1931.

- Lepturus repens                      Aleurites moluccana (mit)
- Tribulus cistoides                Mucuna (seed)
- Boerhaavia diffusa

6. Excerpts Bryan, E. H., Jr., 1942. American Polynesia, Tongg Publishing Company, Honolulu.  
p. 35 Lepturus, Tribulus, Boerhaavia
7. Fosberg, F. R., 1949, Flora of Johnston Island, central Pacific, Pacific Science, Vol. 3, No. 4, Oct. 1949.  
(full list presented)
8. Newhouse, Jan, 1955, Additional Records to the Flora of Johnston Island, Pacific Science. Vol. IX, No. 1, 1955. adds to (7)  
15 e Lisianski
1. Excerpts Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu p. 194 "--and the vegetation again spreading over its low sand surface - "  
15 e Midway Atoll
1. Neff, Johnson A. and Philip A. DuMont, 1955, A Partial List of the Plants of the Midway Island, Atoll Research Bulletin No. 45, August 15.  
(also in manuscript found).
2. List of principal references on the flora of the Midway Islands.
3. Midway Island (Sand Islet) vegetation and flora - notes copied from field notebook for Feb. 13, 1954 - F. R. Fosberg. (list of observation and collections with numbers.)
4. Fosberg field notes 1951-2.  
July 16 - Midway Island - sight records  
trees (Casuarina and Terminalia)
5. Excerpts: Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu.  
p. 202 Ammophila arenaria  
Casuarina equisetifolia

6. Bryan, W. A., 1905, Report of a Visit to Midway Island, Bishop Mus  
Occ. Pap. 2: No. 4; 291-299.

A few hardy shrubs and grass"

Mentions: Correhrus calyculatus Cav.

Boerhaavia tetrandra Forst.

"a variety near Lepiduien oahuensis Cha. I. Schl."

Capparis sandwichiana D. C.

Ipomeae insularis Steud.

Scaevola keenigii Vahl.

Tribulus cistoides Linn. "In addition to the above are

Eragrostis cynosuroides (Retz.) three widely distributed

beach plants, two of which are grasses that are as yet undetermined."

7. Hadden, F. C. 1941, Midway Islands, Reprint from The Hawaiian  
Planters' Record, Vol. XLV, No. 3, 1941.

15 e Pearl and Hermes Reef.

1. Notes taken on talk by Philip A. DuMont, Jan, 12, 1955 Southeast  
Islet has green herbaceous vegetation; - North Islet, green  
herbaceous vegetation.

Excerpts

2. Bryan, E. H., Jr. 1942, American Polynesia, Tongg Publishing Company,  
Honolulu.

p. 193 Casuarina planted in 1928

3 norther islands - "supporting only bunchgrass and low herb."

North Island - "although larger, had on it only the same kinds of  
plants, eleven species in all."

"The sand bards were bare of vegetation, and appeared to be constantly  
shifting their position under the action of wind and wave."

Botanical work on the various ATF trips has consisted mainly of collecting plants and comments on their distribution, abundance and flowering in the journals. Some of this information has been summarized in the various reports of the trips, but most of the information on distribution, etc. is scattered through the notes and needs interpretation by the original writer. As a result the information collected below is by no means ~~extensive~~ a complete summary of facts collected by the Pacific Project. Lack of time and incompleteness of the information does not seem to warrant further efforts to extract data from the journals.

First ATF Trip (Feb.-March, 1963): Plant specimens collected on Laysan, Lisiansky, Pearl & Hermes, Howland and Baker Islands. Due to poor preservation ~~only specimens from Pearl and Hermes~~ none of these specimens were ever identified. However familiarity of project personnel with the plants and photographs taken ~~at~~ on this trip enabled us to ~~identify~~ the transfer information about distribution, etc. to identified plants collected on the June-July trip.

Second ATF Trip (June-July, 1963): Plant specimens collected on French Frigate Shoals, Pearl and Hermes Reef, Howland, Baker and Enderbury Islands. All except the succulents were later identified although there is some question on the accuracy of identification below genus. See attached field catalog and summary from preliminary trip report.

Third ATF Trip (Oct-Nov, 1963): Plants collected on Baker, Gardner, and Sydney, Islands. List maintained on plants observed on all islands with comments on distribution, and stage of reproduction. On the wetter islands (Gardner, Hull and Sydney) and Canton no attempt was made to list all the introduced and cultivated plants and list from these islands are very incomplete. See attached plant catalog and list of plants on McKean, Phoenix and Birnie plus additions or corrections to the list given for Baker Island in the June-July report.

- Howland, Baker, Enderbury <sup>Xerox</sup>
- Enclosure ✓ # 1 Field Catalog (P. Marshall)
- ✓ # 2 List of identifications - Xerox Table I, H
- # 3 Summary from June-July Report Table II, IV, VI
- ✓ # 4 Plant catalog (Oct-Nov.) attached
- # 5 Plant List plus corrections) type

Plants observed on various Phoenix Islands during the Oct-Nov. ATF trip

*These lists represent all species present.*

McKean Tribulus  
Lepturus  
Digitaria  
Boerhaavia  
Portulaca  
Sida  
Sesuvium

Phoenix Lepturus  
Boerhaavia  
Portulaca  
Sida  
Sesuvium

Birnie Boerhaavia  
Portulaca  
Sesuvium

Baker Island: Add following species: Ipomea; Sandbur grass; Setaria; to June-July trip report. Euphorbia hirta should be listed as widespread and common instead of rare.

Sibley, F.

1963

Plant Catalog

Oct. 17 Baker Island, Pacific Ocean

P-1 - Ipomea sp. - one plant only  
at <sup>w</sup> end of old airstrip at high  
tide line

P-2 - Bermuda grass - only one with  
old fruiting stalk - general around  
buildings of Messeturm.

P-3 - Sand bar type grass - only 3-5  
clumps between cannon & lighthouse  
on W shore.

P-4 - Fox tail Grass - 50+ clumps south  
of cannon under old dead trees

P-5 - Euphorbia ?? - widespread

P-6 - Succulent - only one in bloom  
yellow flowers with 5 notched  
petals. Previously another succulent  
was in bloom without notched  
petals.

Oct. 28

Gardner Island, Phoenix Group

P-7 Sida sp? - orange flowers  
widespread

P-10 Off 6 foot shrub - to 90 feet

P-11 Poinsettia - to 3 feet

P-12 - Grass -  
↓

Nov. 2

Sydney Island, Phoenix Islands

Seen but not collected: Coconut, Pandanus,  
Papaya, Boerhaavia, Hibiscus, Messerschmidia,  
Scaevola, Portulaca oleracea & lutea, Sida,  
Pisonia, Cordia, Ipomea



Sibley, F.  
1963

Plant Catalog

Nov. 2

Sydney Island, Phoenix Islands

- P-13 tall sedge  
P-14 low sedge  
P-15 sand bur type grass  
P-16 composite - to 3 feet - blue flowers  
P-17 Lepturus? grass  
P-18 tree - to 20 feet - small lemon  
sized fruit

Determinations of grasses of P. Marshal & B. Amerson

Determined by J. R. Swallen

Enderbury Island

6. *Digitaria pacifica* Stapf

7. Unknown

Howland Is.

7. *Digitaria pacifica* Stapf

8. possibly *Lepturus*

Baker Island

1. *Digitaria pacifica* Stapf

10. possibly *Lepturus*

11. *Lepturus repens* (Forst.) R. Br.

French Frigate Shoals, East Island, June 8, 1963

*Setaria verticillata* (L.) Beauv.

French Frigate Shoals, East Island, June 9, 1963

*Lepturus repens* (Forst.) R. Br.

*Setaria verticillata* (L.) Beauv.

French Frigate Shoals, Whale-Skate Is. June 13, 1963

*Lepturus repens* (Forst.) R. Br.

Pearl & Hermes Reef, Southeast I., June 21, 1963

*Eragrostis variabilis* (Gaud) Steud.

*Setaria verticillata* (L.) Beauv.

*Cynodon dactylon* (L.) Pers.

Pearl & Hermes Reef, South North Island, June 25, 1963

*Lepturus repens* (Forst) R. Br.

6 Aug. 1963

Determinations of plants of P. Marshall & B. Amerson. by W. R. Ernst

Enderbury Island

1. *Messerschmidia argentea* (L. f.) Johnston.
2. *Sesuvium portulacastrum* L.
- Parasitic → 4. *Cassytha filiformis* L.
5. possibly *Portulaca lutea* Sol.
8. *Triumfetta procumbens* Forst. f.
9. closest to *Sida fallax* Walp.
10. *Cordia subcordata* Lam.
11. possibly Malvaceae
12. *Ipomoea tuba* (Schlecht.) Don

Baker Island

2. *Portulaca oleracea* L.
5. *Phyllanthus amarus* Schum. & Th. (*P. niruri* L.)
6. probably *Euphorbia hirta* L.
7. closest to *Sida fallax* Walp.
8. *Triumfetta procumbens* Forst. f.
12. *Boerhavia diffusa* L.

Peally & Hermes Reef, Southeast I., June 21, 1963.

*Sesuvium portulacastrum* L.

possibly *Scaevola*

*Scaevola sericea* Vahl. ((*S. frutescens* (Miller) Krause -- the name is controversial.))

- possibly *Luffa operculata* (L.) Cogn. (*Sicyos*??)

+ *Solanum nelsonii* Duval

*Boerhavia diffusa* L.

*Tribulus cistoides* L.

Pearl & Hermes Reef, North Island, June 25, 1963

*Achryanthes splendens* Mart. var.

Pearl & Hermes Reef, Seal Island, June 26, 1963

*Capparis spinosa* L. var. *mariana* (Jacq.) K. Sch.

French Frigate Shoals, East Island, June 8, 1963

*Sonchus asper* (L.) Hill (but doubtfully distinct from *S. oleraceus* L.)

closest to *Chenopodium sandwichicum* Moq. in DC.

*Tribulus cistoides* L.

*Boerhavia diffusa* L.

*Messerschmidia argentea* (L. f.) Johnston.

possibly *Portulaca* (or ?*Amaranthaceae*)

French Frigate Shoals, Whale-Skate Island, June 13, 1963

closest to *Chenopodium sandwichicum* Moq. in DC.

*Tribulus cistoides* L.

*Boerhavia diffusa* L.

*Messerschmidia argentea* (L. f.) Johnston.

possibly *Portulaca*

Howland

2. *Boerhavia diffusa* L.
4. *Cordia subcordata* Lam.
5. *Tribulus cistoides*
6. *Coccoloba uvifera* (L.) L.

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<u>Collection Number</u>	<u>Description</u>
2404	Plant grows near roadside by air terminal in coral gravel - in flower and leaves large.
2405	<u>Portulaca</u> sp., stems procumbent, leaves green, flower 5 or 6 petals, 5 parted style, $\pm$ 30 stamens, petals cleft 1/3 their length.
2406	<u>Lepturus repens</u> (Forst.) R. Br. - growing in coral gravel in open area near lagoon about 400 ft. south of the tennis courts.
2407	This plant grows in gravel - open area about 400 ft. south of the tennis courts. <u>P. lutea</u> Sol. present as is a hypothetical intermediate.
2408	Plant with flowers and mature fruits: in open area about 400 ft. south of the tennis courts growing in coral gravel.
2409	Plant about 3.5 ft. high; in flower and fruit; growing in coral gravel and sand in an open area near lagoon about 400 ft. south of the tennis courts.
2410	Found in open gravel area about 400 ft. south of the tennis courts associated in the open coral gravelled area with <u>Sida</u> , <u>Lepturus</u> , <u>Scaevola</u> and <u>Portulaca</u> - in bloom; this species covers the area adjacent to the lagoon with a thick cover - both live and pressed material taken.
2411	Plant with stems to 4.5 ft. high, in flower, leaves rolled, near <u>Pisonia</u> trees left side of road about 1/4 mile from terminal heading south.
2412	Plant vigorous, semi-procumbent, stems turned up near the ends - very large flowers - the largest I have seen to date growing in open gravel area south of the tennis court - <u>Portulaca</u> sp. (hybrid?). Live material.
2413	<u>Portulaca</u> sp., stems upright, sterile but flowers appear to have been smaller than the large flowered coll. No. 2412. Growing in gravelled area just south of the tennis courts. Live material.
2414	<u>Portulaca lutea</u> Sol. - open gravel area south of the tennis court ( $\pm$ 400 ft. south) - smaller flower size than on other collections. Live material.

<u>Collection Number</u>	<u>Description</u>
2415	Chlorophyceae - in drift along lagoon edge just south of the air terminal - long green strands common along lagoon edge.
2416	Rock - algae- growing on beach- sides of pools not exposed at low tide; west reef in front of old guano dwellings.
2417	Algae - on rocks exposed to wave action by receding and surging tides; small clumps adhering to rock surfaces; west reef opposite old guano dwellings.
2418	Algae - growing in sand pockets of surge channels in beach rock/coral rock - always covered by water; on west reef opposite the old guano dwellings.
2419	Algae - forms crust on coral covered rocks in tidal zone- exposed for only a short time each day - epiphytes on this sp. numerous - sometimes found on live coral - west reef opposite the old guano dwellings.
2420	Algae - epiphytic green and red on _____? which grows attached to exposed reef rock - uncovered at low tide on west reef opposite the old guano ruins.
2421	Algae - forms crust at edge of tide pools, epiphytic red alga - on exposed beach rock covered with coral and algae crusts - west reef opposite the old guano dwellings.
2422	Algae - on west reef opposite the old guano dwellings - coralline red with conspicuous epiphytes - edges of tidal pools - not exposed at low tide.
2423	Algae - on west reef opposite old guano dwellings - on sides of coral covered beach rock - pools not exposed at low tide - many epiphytes.
2424	Algae - growing on northwest reef, in clumps rooted in sand pockets of shallow pools.
2425	Algae - growing on northwest reef - in shallow pools attached to stones imbedded in sand pockets.
2426	<u>Digitaria pacifica</u> - in sand pockets of coral rock pile above the northwest terrane - associated with <u>Portulaca</u> and <u>Boerhaavia</u> - in flower and fruit this large clump apparently has more moisture than others in the surrounding area - four sheets taken.

<u>Collection Number</u>	<u>Description</u>
2427	<u>Portulaca lutea</u> Sol. - large plant with + 30 upright (to 14.5 in.) stems, growing in sand pocket in coral rubble above terrace on the northwest side; in flower yellow, 5 petals + 1/2 in. long, lobed 1/8 distance of petal length, 7 style branches and + 33 stamens - live cytological and pressed specimens taken.
2428	<u>Boerhaavia diffusa</u> - white flowers, large plant + 10 ft. dia. with many radiating stems, on rocky coral rubble above terrace on the northwest side - most of the stems have no flowers but plenty of dried fruits, cytological and pressed material - 4 sheets.
2429	<u>Sida</u> sp. - sprouts in flower and fruit on otherwise dead looking shrub to 3.5 ft. high, bushes grouped at the edge of the lagoon on the north side surrounded by the <u>Sesuvium</u> mat - nesting <u>Sula sula</u> and <u>Frigata ariel</u> .
2430	<u>Sesuvium</u> - in bloom; mat along the north edge of the lagoon growing into the lower edges of the rock rubble (base of "bowl" and into the open lagoon) mat 15 to 100 ft. wide - flowers whitish tinged pink or purplish - 3 sheets + live coll. and cytological material.
2431	Algae - forming crust on bottom of shallow pools of standing water northwest portion of lagoon - red deposit just underneath the water varying in depth 0.5 to 5.0 in. collecting in depression of lagoon floor.
2432	<u>Lepturus repens</u> (Forst. R Br. - growing on west beach in pure sand 50 ft. south of old guano ruins; associated with <u>Boerhaavia</u> .
2433	Algae - found in surge channels as tide moves in - washed in from the outer reef; west reef opposite the old guano ruins.
2434	Algae - covering coral reef rocks - upper tidal zone - uncovered at low tide - forming a mat; west reef opposite the guano ruins.
2435	Algae - growing footed in sand in pool, surrounding area uncovered at low tide; west reef opposite the old guano ruins.
2436	Algae - growing in sides of rock pools or on surface washed by waves; west reef opposite the old guano ruins.
2437	Algae - large clumps imbedded in sand pockets of rock pools surrounding area bare at low tide; west reef opposite the old guano ruins.

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<u>Collection Number</u>	<u>Description</u>
2438	<u>Portulaca lutea</u> Sol.- in sand pocket of beach rock pile, in flower, southwest beach - live collection.
2439	<u>Boerhaavia</u> sp. - white flowers and stems to 3.5 ft., plant large and vigorous, growing in sand pocket of coral rock near washed out area SW end - associated with <u>Sesuvium</u> .
2440	Algae - in saline pool, water collected in a depression, NE end of the lagoon.
2441	<u>Tribulus cistoides</u> L. - growing in gravel on bottom half of lagoon bowl rim, north end of island; nesting Blue-faced Boobies; associated with <u>Boerhaavia</u> sp.
2442	Algae - Upper 1.5 in. of lagoon crust showing algal layer- NW floor of lagoon; specimen inverted in vial; upper .25 in. salt, reddish layer next .25, - .125 in. layer blue green alga and I 1.0 in. of darker, brown colored material.

October 20, 1964 - McKean Island

<u>Collection Number</u>	<u>Description</u>
2443	<u>Boerhaavia diffusa</u> L. - growing in pocket of coral rubble, inner bowl of lagoon N side above the <u>Sesuvium</u> mat - a vigorous plant in flower and fruit; stems to 4 ft.
2444	Algae - growing in sandy pool bottom - about 1 ft. water at low tide - many epiphytis, ne reef
2445	Algae - in tide pools covered with water at low tide, ne reef.
2446	Algae: covers sides of pools, not exposed at low tide, ne reef.
2447	Algae: ne reef, on exposed rocks at low tide and in surge channels.
2448	Algae: ne reef, sides of surge channels, coralline red alga, covered at low tide.
2449	<u>Sesuvium</u> - new stem growth with flowers, collected on SE mat near the lagoon floor. Pickled collection.



<u>Line Is</u>	Date	Known Field Numbers	Field Notes Available	List of Vascular Plants	History/Description	Remarks
Palmyra	5-7 June 1964 Nov 1964	1760-1826 About 2831-2867	X	Yes	X	List of soil collection L123-131 on 6-7 June 1964
Washington	9-10 June 1964	1827-44 1859-65	General note for 9-13 June 1964 + for 14-17 June 64	1 = collected by CDH on 3/30/64	X	List of soil sample L132-177 on 9-11 June 1964 Soil sample, bog core 1845a-1845x 10 June 64 CDH collected - 24
Fanning		About 3496-3598	X	Yes	Gen description	
Christmas	14-18 June 64 Nov 64 June 1965	1845-58 1854-1919 About 2740-2798 About 3398-3491	X	Yes + Prelim list by island	Gen description + history	List of soil samples L 236-249, L178-182 14-18 June 1964
Jarvis	Nov 1964	2690-2738	X	1 = collected by CDH - 3/17/64 #2 Yes	General description + part. history	CDH small collection (8 plants)
Malden	22-24 June 1964	1920-42	General note for 22-24 June 1964	Yes Also prelim. list from June 64 trip	General description + speciation	Soil samples list - L183-188 on 22-23 June 1964
Starbuck	25-26 June 1964	1936-48	General note for 25-26 June 64	Prelim list from June 64 trip. Yes		List of soil samples L 189-197 26-27 June 1964
Caroline	X	X	X	X	X	X
Kostoh	1965	3191-3208	X	Annotated list.	General description	X
Tongareva	X	X	X	X	X	X
Swains	Part of data for this island written up by Long + part was assembled by CA Sly in response to a request from D.C.			Avail. Compiled from field work of others		Long rot on this island.

ISLAND SUMMARY

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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S1-USNM-914  
8-6-63

Misc	Date	Field Numbers	Field Notes Available	List of Vascular Plants	History / Description	Remarks
Gilbert Is.	1964 Trip	2870 - 2989				Compilation of collection by Ken Ammann
Marshall Is.						
Wake Is.						
Alaska						
Tobelman <del>Atafu</del> Is.				Compilation of work of others	History + Short description	Long not on this island.
<del>Atafu</del>						
Samoa						Soil sample 1198 on 4 July 64



Hawaiian Islands	Date	Field Numbers	Field Notes Available	List of Vascular Plants	History/ Description	Remarks
Kure		2223 - 2250 Approx	Gen notes 14 Sept 64	Yes by Lamoureux + Long	X	
Midway		?	Gen notes 15 Sept 64	List for 22-26 May 64 Partial list by Neff + DuMont	General Description Short history by Neff + DuMont	Soil samples L212-216 25-27 May 64
Pearl + Hermes		About 2265-2313	General for June 63 by Sibley + Anderson Gen notes for 16 Sept 64	Yes Prelim list	General description + some history	Collections by Sibley, Allen Young, Long + Lamoureux
Laysan		2316-2356 approx	Gen. note 18 Sept 64	Yes + prelim list	General description + note on geology	Collections by Long, Sibley + Allen Young
Kauai		?	Gen notes Sept 64	Yes + Prelim notes	X	
Gardner Pinnacles		?	X	X	X	
French Frigate Shoals		?	X	List for 27-28 Sept 1964 X	X	
Necker		About 2445-2458	Gen notes 25 Sept 64	Yes + prelim list	Very short description	
Nihoa		About 2405-2444	Gen notes <del>23+24</del> Sept 64 23+24	Yes + prelim list	General description	
Main Hawaiians		?	X	X	X	
Sand-Islands		?	X	X	X	



C.R. Long  
1964

PLANTS OF JARVIS ISLAND

COLLECTED BY C.D.HACKMAN AND  
IDENTIFIED BY C.R.LONG

March 17, 1964

- P1 Abutilon indicum Sw.  
P2 Chenopodium ambrosioides L.  
P3 Eragrostis whitneyi Fosberg  
P4 Sida Fallax Walp.  
P5 Lepturus repens (Forst.) R.Br.  
P6 Tribulus cistoides L.  
P7 Boerhaavia diffusa L. var. tetrandra (Forst.) Heimerl.  
P8 Boerhaavia diffusa L. var. tetrandra (Forst.) Heimerl.

PLANTS OF WASHINGTON ISLAND COLLECTED BY C.D.HACKMAN AND  
IDENTIFIED BY C.R.LONG

March 30, 1964

- P9 Eleusine indica (L.) Gaert.  
P10 Eleusine indica (L.) Gaert.  
P11 Fimbristylis spathacea Roth.  
P12 Fimbristylis spathacea Roth.  
P13 Cenchrus echinatus L.  
P14 Polypodium scolopendrium Burm. f.  
P15 Zephranthes rosea (Spreng.) Ling.  
P16 Lepturus repens (Forst.) R.Br.  
P17 Leucaena glauca (L.) Benth.  
P18 Acanthaceae  
P19 Bidens pilosa L.  
P20 Synedrella nodiflora Gaert.  
P21 Vernonia cinerea Less.

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P22 Eragrostis amabilis (L.) Wright

P23 Cenavalia microcarpa (DC.) Piper

P24 Cyperus kyllingia Endl.



Notes on Botany and Condition of the Vegetation from POBSP Field Reports on Lisianski

Feb.14	1963	
Mar.12-13,	1963	-----
Mar.11-12	1964	-----
Aug.21-23	1964	Plants collected by Alan Young, botanist, University of Hawaii.
Sept. 18	1964	-----
Mar.12-14	1965	-----
July 14-17	1965	-----
June 16-19	1966	The island's vegetation was less lush than in July last year, when Crossin was last on the island. <u>Scaevola taccada</u> was greatly reduced in height and dead and decadent plants were fairly common. Abundant growth of black organism, probably a blue-green alga, and numerous scale insects were found on the Scaevola, but these were not likely the cause of decadence. Salt water and drought were more likely to blame. Other species found dead or decadent included <u>Sicyos hispidus</u> and <u>Tribulus cistoides</u> . All species of plants were in some stage of bloom and most had both

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Kure		ca. 2223-50	Sept 64	Yes. by Long & Lamoureux	None.	
Midway		?	June 63 (Sibley) Sept 64	Prelim list for May 64 Prelim. list by Neff & DuMont in Long's file.	Brief gen. descrip. Also a short hist. by Neff & DuMont in Long's file.	Soil samples L212-216 from May 64.
Pearl & Hermes		ca. 2265-2313	June 63 (Sibley) Sept 64	Yes. Also a prelim. list-unk date	Gen. descrip. & a bit of history	Collections have been made by Sibley, Allan Young, Long & Lamoureux.
Lisianski		ca. 2316-2356	Sept 64	Yes. Also a prelim. list from unk date	Gen descrip. & a note on geology	Collections have been made by Sibley, Long & Allan Young.
Laysan		?	Sept 64	Yes. Also a prelim. list from unk date	None	
Gardner Pinnacles		?	None.	None.	None.	
French Frigate Shoals		?	None	Prelim. list from Sept 1964	None	
Necker		ca. 2445-2458	Sept 64	Yes. also a prelim list from unk date	Very brief descrip.	
Gilbert & Marshall	1964	2870-2989	None	<del>None</del> Prelim. list from 64 trip by atoll.	None	Compiled from the plant collections made by Ken Amerman on 1964 trip.

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Howland	July 64 Oct 64	2170-79 2311-62	July & Oct 64 and on 2311-62	Yes. also prelim list for July 64	Detailed descrip. & comments	Quadrat studies -July 64 Soil samples L228-235 for July 64 List of algae ID'd
Baker	July 64 Oct 64	2049 ca. 2150-72 ca. 2364-2402	None.	Prelim. list-July 64 only.	Brief hist & descrip.	Soil samples L225-227 from July 64 List of algae ID'd Peter Marshall also made a collection here July 63
McKean	July 64 Oct 64	2025-48 2443-51	Oct 64 only. Notes on coll. 2443-51	Yes. also prelim. list for July 64	Gen. veg. descrip. & very short hist.	Soil samples L217-224 from July 64
Gardner		ca. 2452- 2525	None.	Yes.	General descript & history	
Hull	July 64	1998-2076	July 64	Yes. also prelim. list from July 64	General description	Annotated list omits many introduced species that are mentioned in the general account.
Sydney	Oct 64	2535-2591	Collection notes on 2535-2585 only.	Yes.	None.	
Birnie		ca. 2635-47	None.	Yes.	Brief gen. descrip. & some hist.	
Phoenix	July 64	2077-89 2614-34		Yes. also prelim list of July 64	None.	Soil samples L199-209 from July 64

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Enderbury	July 63 July 64 Nov 64	1990-2024 ca. 2090-2121 2613 ca. 2649-86	July 64 only	Yes. also prelim list of July 64	brief gen. descrip.	Soil samples L210-216 from July 64. Paul Woodward made an addit. collection here -Feb 1965.
CantOn	?	?2404-2442?	coll. notes for 2404-42.	None.	None.	
Palmyra	June 64 Nov 64	1760-1826 ca. 2831-67	None	Yes.	None.	Soil samples L123-131 from June 1964.
Washington	June 64	1827-44 1859-65	June 64	<i>Only a preliminary list of identifications of the 24 collection made by C.D. Hackman</i>		Soil samples L132-177 for June 64. Also bog samples 1845a-1845x in June 64. C. D. Hackman made a small (24) collection here Mar 64.
Fanning		ca. 3496-3598	None	Yes.	Gen. descript.	
Christm.	June 64 Nov 64 June 65	1845-58 1884-1919 ca. 2740-98 ca. 3398-3491	None	Yes. also a prelim listing by island	Gen descript. w/ some history	Soil samples L236-249, & L178-182
Jarvis	Nov 64	2690-2738	None.	Yes. also a prelim list from coll of c. D. Hackman	Gen. descript. & a partial history.	Small collection (8 plants) by C. D. Hackman (spring 64)

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Malden	June 64	1920-42	June 64	Yes. also a prelim. list from June 64	Gen. descript. & some comment & speculation	Soil samples L183-188 from June 64.
*			*		*	*
Starbuck	June 64	1936-48	June 64	Yes. also a prelim. list from June 64		Soil samples L189-197 from June 64
*			*		*	*
Carolina	June 1965					
*			*		*	*
Vostok	June 1965	3191-3208	None	Yes.	Brief. gen descript.	
*			*		*	*
Tongareva	June 1965	3173 UH				
*			*		*	*
Swains				Yes but compiled from work of other field botanists.		Long did not visit this one.
*			*		*	*
Samoa						Soil sample 198 from July 64
*			*		*	*
Tokelaus				Yes but compiled from work of other field botanists.	History and short description	Long did not visit this one. Plants collected by Paul W. Woodward on POBSP visit.
*			*		*	*
		Vostok				
		<del>3191</del> 3197	<del>3207</del>			
		<del>3192</del> 3198	<del>3208</del>			
		3193 3199	3205			
		3194 3200	3206			
		3195 3201	3207			
		3196 <del>3202</del>	<del>3208</del>			

No material in D.C. for the following:

Wake Island

Sand-Johnston

Alaska

Main Hawaiian Islands (including offshore)

Samoa

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Kure		ca. 2223-50	Sept 64	Yes. by Long & Lamoureux	None.	
*			*		*	*
Midway		?	June 63 (Sibley) Sept 64	Prelim list for May 64 Prelim. list by Neff & DuMont in Long's file.	Brief gen. descrip. Also a short hist. by Neff & DuMont in Long's file.	Soil samples L212-216 from May 64.
*			*		*	*
Pearl & Hermes		ca: 2265-2313	June 63 (Sibley) Sept 64	Yes. Also a prelim. list-unk date	Gen. descrip. & a bit of history	Collections have been made by Sibley, Allan Young, Long & Lamoureux.
*			*		*	*
Lisianski		ca. 2316-2356	Sept 64	Yes. Also a prelim. list from unk date	Gen descrip. & a note on geology	Collections have been made by Sibley, Long & Allan Young.
*			*		*	*
Laysan		?	Sept 64	Yes. Also a prelim. list from unk date	None	
*			*		*	*
Gardner Pinnacles		?	None.	None.	None.	
*			*		*	*
French Frigate Shoals		?	None	Prelim. list from Sept 1964	None	
*			*		*	*
Necker		ca. 2445-2458	Sept 64	Yes. also a prelim list from unk date	Very brief descrip.	
*			*		*	*
Gilbert & Marshall	1964	2870-2989	None	<del>None</del> Prelim. list from 64 trip by atoll.	None	Compiled from the plant collections made by Ken Amerman on 1964 trip.

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Howland	July 64 Oct 64	2170-79 2311-62	July & Oct 64 and on 2311-62	Yes. also prelim list for July 64	Detailed descrip. & comments	Quadrat studies -July 64 Soil samples L228-235 for July 64 List of algae ID'd
Baker	July 64 Oct 64	2049 ca. 2150-72 ca. 2364-2402	None.	Prelim. list-July64 only.	Brief hist & descrip.	Soil samples L225-227 from July 64 List of algae ID'd Peter Marshall also made a collection here July 63
McKean	July 64 Oct 64	2025-48 2443-51	Oct 64 only. Notes on coll. 2443-51	Yes. also prelim. list for July 64	Gen. veg. descrip. & very short hist.	Soil samples L217-224 from July 64
Gardner		ca. 2452- 2525	None.	Yes.	General descript & history	
Hull	July 64	1998-2076	July 64	Yes. also prelim. list from July 64	General description	Annotated list omits many introduced species that are mentioned in the general account.
Sydney	Oct 64	2535-2591	Collection notes on 2535-2585 only.	Yes.	None.	
Birnie		ca. 2635-47	None.	Yes.	Brief gen. descrip. & some hist.	
Phoenix	July 64	2077-89 2614-34		Yes. also prelim list of July 64	None.	Soil samples L199-209 from July 64



Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Enderbury	July 64 Nov 64	1990-2024 ca. 2090-2121 2613 ca. 2649-86	July 64 only	Yes. also prelim list of July 64	brief gen. descrip.	Soil samples L210-216 from July 64. Paul Woodward made an addit. collection here -Feb 1965.
CantOn	?	?2404-2442?	coll. notes for 2404-42.	None.	None.	
Palmyra	June 64 Nov 64	1760-1826 ca. 2831-67	None	Yes.	None.	Soil samples L123-131 from June 1964.
Washington	June 64	1827-44 1859-65	June 64	<i>Only preliminary list of identifications of the 24 collections made by C.D. Hackman</i>	<i>None.</i>	Soil samples L132-177 for June 64. Also bog samples 1845a-1845x in June 64. C. D. Hackman made a small (24) collection here Mar 64.
Fanning		ca. 3496-3598	None	Yes.	Gen. descript.	
Christm.	June 64 Nov 64 June 65	1845-58 1884-1919 ca. 2740-98 ca. 3398-3491	None	Yes. also a prelim listing by island	Gen descript. w/ some history	Soil samples L236-249, & L178-182
Jarvis	Nov 64	2690-2738	None.	Yes. also a prelim list from coll of C. D. Hackman	Gen. descript. & a partial history.	Small collection (8 plants) by C. D. Hackman (spring 64)

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Malden	June 64	1920-42	June 64	Yes. also a prelim. list from June 64	Gen. descript. & some comment & speculation	Soil samples L183-188 from June 64.
*			*		*	*
Starbuck	June 64	1936-48	June 64	Yes. also a prelim. list from June 64		Soil samples L189-197 from June 64
*			*		*	*
Caroline						
*			*		*	*
Vostok	1965	3191-3208	None	Yes.	Brief. gen descript.	
*			*		*	*
Tongareva						
*			*		*	*
Swains				Yes but compiled from work of other field botanists.		Long did not visit this one.
*			*		*	*
Samoa						Soil sample 198 from July 64
*			*		*	*
Tokelaus				Yes but compiled from work of other field botanists.	History and short description	Long did not visit this one. Plants collected by Paul W. Woodward on POBSP visit.
*			*		*	*

No material in D.C. for the following:

Wake Island

Sand-Johnston

Alaska

Main Hawaiian Islands (including offshore)

Samoa



Street - Aug. 1873

H. F. Bergman August 1924

C. D. Hackman March 1964

C. R. Long June and November 1964

Vascular plants recorded from Washington Island

by C. R. Long

Psilopsida

check → Psilotum sp. triquetrum Swartz  
✓ Bergman 102 (BISH).

Filices

Polypodiaceae

Asplenium nidus L.  
Bergman 85, (BISH).

Nephrolepis <sup>hrisutula</sup> exaltata Schott. 1840  
Bergman 97 (BISH), Long 1828/ (UH).

Polypodium scolopendria Burm. f. <sup>Street - S.W. (U.S.N.M.)</sup>  
Bergman 84 (BISH), Hackman 14 (USNM), Long 1830, 1845j (UH).

Spermatophyta

<sup>no can</sup> Pandanaceae  
Pandanaceae  
Potamogetonaceae  
Potamogeton sp.? Bergman 103 (BISH).  
Bergman 119 (BISH)

Gramineae

Cenchrus echinatus L. <sup>no can</sup>  
✓ Hackman 13 (USNM), Long 1845k (UH).

Digitaria pacifica Stapf.  
Long 1838 (UH).

Eleusine indica (L.) Gaertn. <sup>as E. amabilis (L.) Ward A</sup>  
Bergman 73 (BISH), Hackman 9, 10 (USNM), Long 1835, 1845l (UH).

Eragrostis tenella (Link) Beauv.  
Bergman 74 (BISH) as E. amabilis (L.) W. and A., Hackman 22 (USNM),  
Long 1832, 1834, 1845m (UH).

Lepturus repens (Forst.) R. Br.  
Bergman 81 (BISH), Hackman 16 (USNM), Long 1819, 1844, 1845n, 1848,  
1859, 1863, 2809, 2810 (UH).

1864,

Cyperaceae

Coereba kyllingia Endl.  
Hackman 24 (USNM), Long 1845p (UH). <sup>not previously recorded</sup>

Cyperus pennatus Lam. = *javanica* Handl.?  
Bergman 82 (BISH).

Cyperus polystachus Rottb.  
Bergman 92a (BISH), Long 1818, 1821, 1845p, 1860, 1870 (UH).

Cyperus polystachus var. texensis (Torr.) Fernald  
Bergman 93 (BISH).

Fimbristylis cymosa R. Br.  
Bergman 77 (BISH) as F. spathacea Roth., Hackman 11, 12 (USNM),  
Long 1845q, 1865, (UH). Introduced?

no cond  
Bergman 98 Long 1838, 1861 (UH).  
(Bisl); *Palmae*  
Cocos nucifera L.

Araceae

no cond  
Cyrtosperma chamissonis (Schott.) Merr.  
Bergman 118 (BISH). *observed in 1964. Two types seen - ?*  
*bilicaceae*

Allium fistulosum L.

Amaryllidaceae

Cinnam asiaticum L. *observed in the village in 1964.*

no cond  
Zephranthes rosea (Spreng.) Lind.  
Hackman 15 (USNM). *new seen along path near Mr. Frew's home.*

*moraceae*

Artocarpus actinobolus (Pant.) Fosl.

Urticaceae

Fleurya ruderalis (Forst.) Gaud. ex Wedd.  
Bergman 86 (BISH); Long 1845r, 2822 (UH).

Pipturus velutinus Wedd.  
Bergman 79 (Bisl); Long 1827, 1845s, 1875, 2820, 2823 (UH).

no cond

Amaranthaceae

Amaranthus viridis L.  
Bergman 101 (BISH). *not seen in 1964.*

Nyctaginaceae

*reperit.*  
Boerhavia sp.  
Bergman 78 (BISH) as B. tetrandra Forst.; Long 1845t, 1845u, 2824, 2826  
(UH).

? *mirabilis jalapa* L.

Pisonia grandis R. Br.  
Bergman 99 (BISH); Long 1827b (UH).

Portulacaceae

Portulaca lutea Sol.  
Long 1855 (UH).

Annonaceae

Annona squamosa L.  
Bergman 96 (BISH).

- not in Christophersen!

No. 100

Lauraceae

Cassytha filiformis L.  
Bergman 117 (BISH); Long 1845w, 1849 (UH).

Cruciferae

Lepidium bidentatum Mont.  
Bergman 71a,b,c (BISH) as L. bidentoides F. Brown; Long 1837, 1845, 2822, 2825 (UH).

Leguminosae

Canavalia cathartica Thon.  
Bergman 91 (BISH) as C. microcarpa (DC.) Piper; Hackman 23 (USNM); Long 1829, 1845w, 2812 (UH). Reported by Strutz but no specimen extant.

Leucaena glauca (L.) Benth. 1842  
Hackman 17 (USNM); Long 1831, (UH).

Phaseolus lathyroides L. sp.

Simarubaceae

Suriana maritima L.  
Long 1847 (UH). Reported by Strutz

Euphorbiaceae

Acalypha wilkesiana var. macafeana W. Miller. Not previously recorded  
Long 1871 (UH).

Euphorbia glomerifera (Millsp.) Wheeler not previously recorded  
Long 1845x (UH).

Euphorbia hirta L.  
Bergman 83 (BISH). Observed in 1964.

Euphorbia prostrata Ait. ~~not~~  
Bergman 75 (BISH). Observed in 1964

Phyllanthus amarus Schum. and Thom.  
Bergman 76 (BISH) as P. niruri L.

not in Christophersen's account!

Tiliaceae

Triumfetta procumbens Forst. f.  
Long 1832 (UH). Not previously recorded.

Malvaceae

*rosa-sinensis* L. - observed in the vilage in 1744.

Hibiscus tiliaceus L.

Long 1796 (UH). not previously recorded

Sida rhombifolia L.

Bergman 87 (BISH).

Psidium guajava L.

~~no cards~~ Bergman 92 (BISH).

Myrtaceae

Onagraceae

? → Jussiaea erecta L. or *suffruticosa* L.

Long 1820, 1834, 1862 (UH).

Cucurbitaceae

Cucurbita pepo L.

Convolvulaceae

Ipomoea pes-caprae (L.) Sw.

Bergman 80 (BISH).

Ipomoea tuba (Schlecht.) Don.

Bergman (BISH) as I. campanulata L.

Boraginaceae

Cordia subcordata Lam.

Bergman 89 (BISH). observed in 1864 growing in vilage. Tree to 3m.

Tournefortia argentea L. f.

Bergman 72 (BISH), Long 1833, 1841, 1845y (UH).

Verbenaceae

Clerodendrum inornatum (L.) Gaertn.  
Hackman 18 (UH), Long 1866 (UH).

no cards

Rubiaceae

Borreria laevis (Lam.) Griseb.

Long 1833 (UH).

Goodeniaceae

Morinda citrifolia L.

Long 1841 (UH).

Scaevola taccada (Gaertn.) Roxb.

Bergman 90 (BISH), Long 1831, 1840, 1845z, 2811, 2819 (UH).

ad S. frutescens (Willd.) Krause

Solanaceae

Lycopersicon esculentum L.

Compositae

Bidens pilosa L.

Hackman 19 (UH), Long 1845 (UH).

Synedrella nodiflora (L.) Gaertn.

Hackman 20 (USNM); Long 1845 (UH).

Lonyza bonariensis (L.) Cronq.  
Long 1829 (UH).

Vernonia cinerea (L.) Less.

Hackman 21 (USNM); Long 1832, 1839, 2822 (UH).



Vascular plants recorded from Starbuck Island  
by C. R. Long

Gramineae

- Digitaria pacifica* Stapf.  
C. R. Long 1936, 1937, 3305, (UH).  
*Eragrostis whitneyi* Fosberg  
C. R. Long 1942, 1948, 3299, 3301, 3311 (UH).  
*Lepturus repens* (Forst.) R. Br.  
C. R. Long 1935, 1936a,b, 1937, 1947, 3309, 3320 (UH).

Nyctaginaceae

- Boerhavia* sp.  
C. R. Long 1943, 1946, 3300, 3302, 3307, 3319, 3351 (UH).

Aizoaceae

- Sesuvium portulacastrum* var. *griseum* Deg. and Fosb.  
C. R. Long 1939, 3310, 3314, 3316 (UH).

Portulacaceae

- Portulaca lutea* Sol.  
C. R. Long 3306, 3321, 3350 (UH).  
*Portulaca oleracea* L.  
C. R. Long 3315 (UH).

Lauraceae

- Cassytha filiformis* L.  
C. R. Long 1944 (UH). also 1948

Leguminosae

- C. R. Long 3313 (UH).

Zygophyllaceae

- Tribulus oistoides* L.  
C. R. Long 1938, 3297 (UH).

Malvaceae

- Sida fallax* Walp.  
C. R. Long 3303, 3318 (UH).

## Convolvulaceae

*Ipomoea* sp.

C. R. Long 1941, 3308 (UH).

(L.)

*Ipomoea pes-caprae* ssp. *brasiliensis* Van Ooststr.

C. R. Long 3312 (UH).

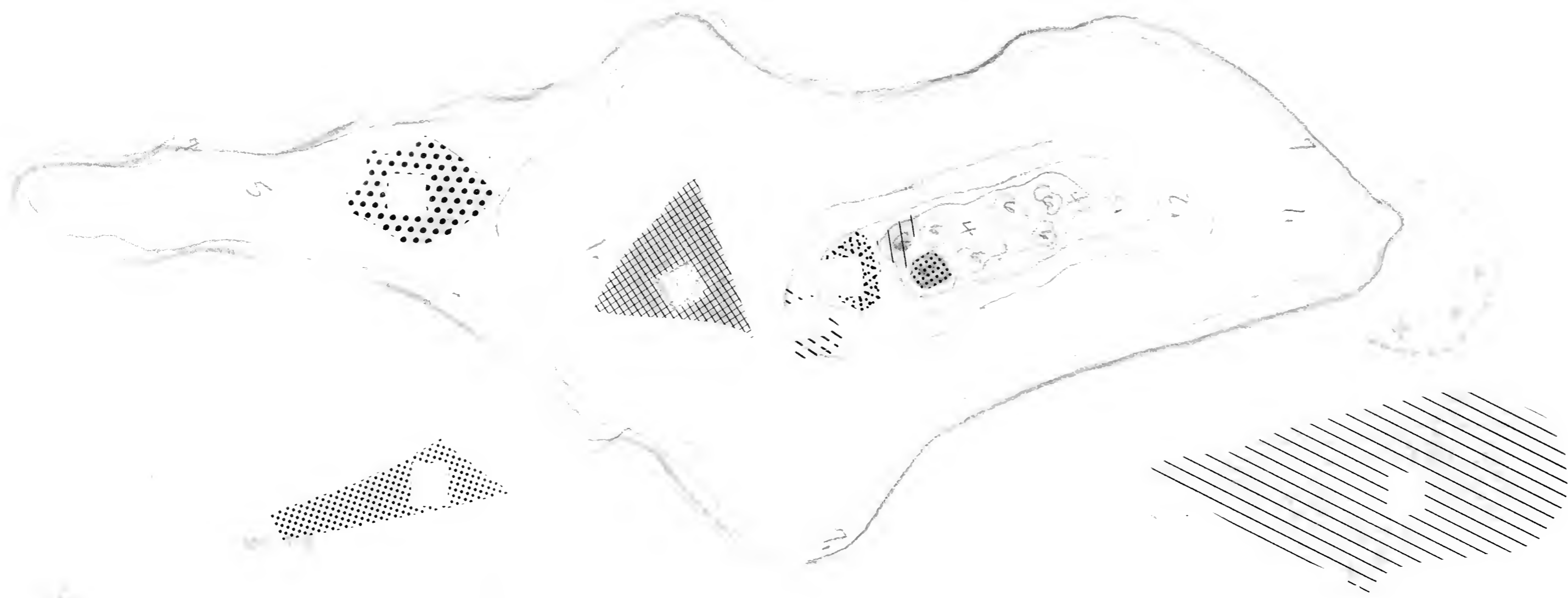
## Compositae

*Bidens pilosa* L.

C. R. Long 1940, 1948, 3298, 3304, 3317 (UH)

- | BOERHAVIA - SIDA association
- < LEPTURUS - PORTULACA association
- < PORTULACA - ERAGROSTIS association
- < SESUVIUM association
- < LEPTURUS - DIGITARIA association
- < WATER
- < BARREN AREAS

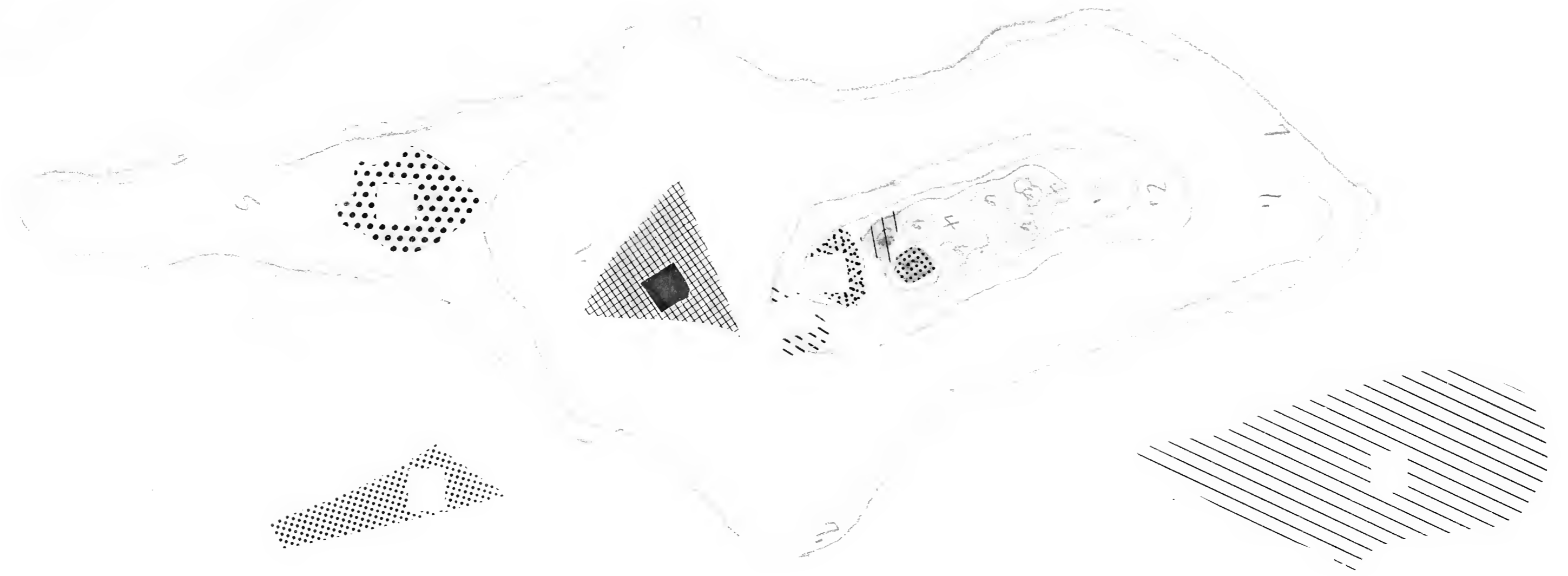
STARBUCK



00000

155° 30'

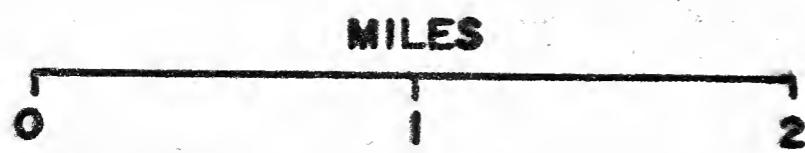
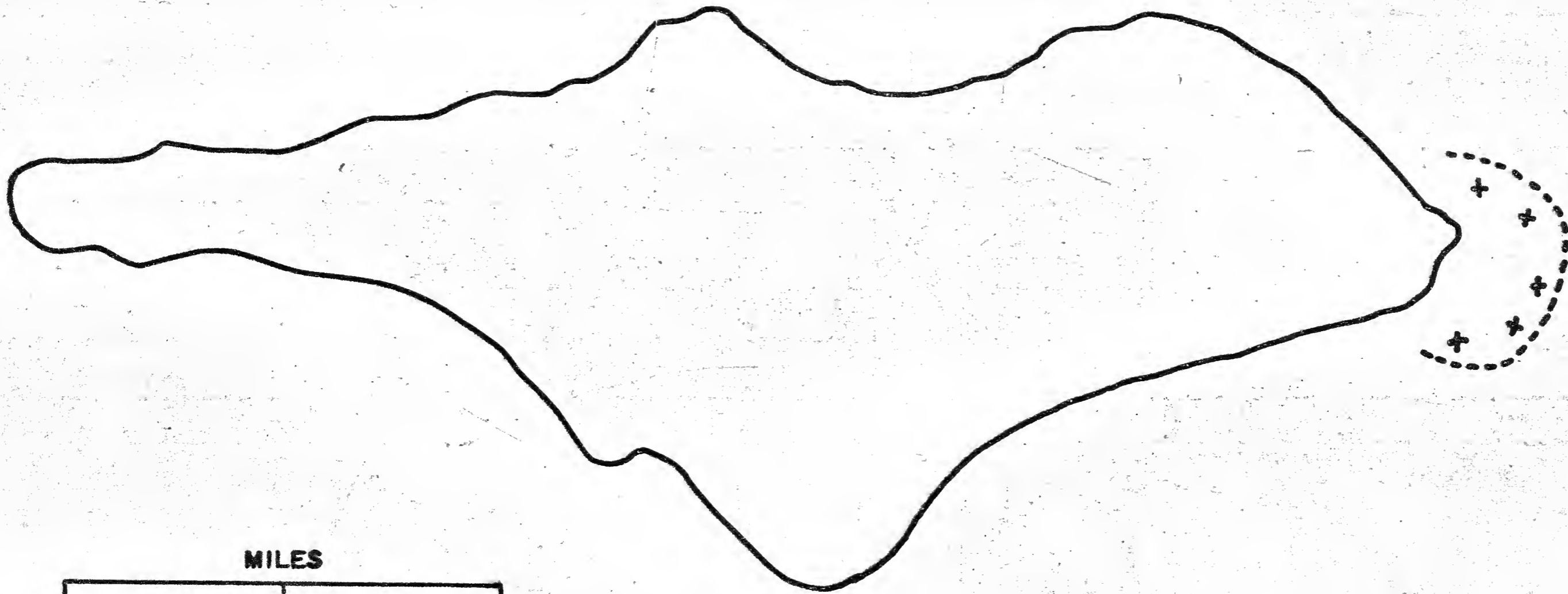
- 1 BOERHAVIA - SIDA association
- 2 LEPTURUS - PORTULACA association
- 3 PORTULACA - ERAGROSTIS association
- 4 SESUVIUM association
- 5 LEPTURUS - DIGITARIA association
- 6 WATER
- 7 BARREN AREAS



# STARBUCK

5° 35'

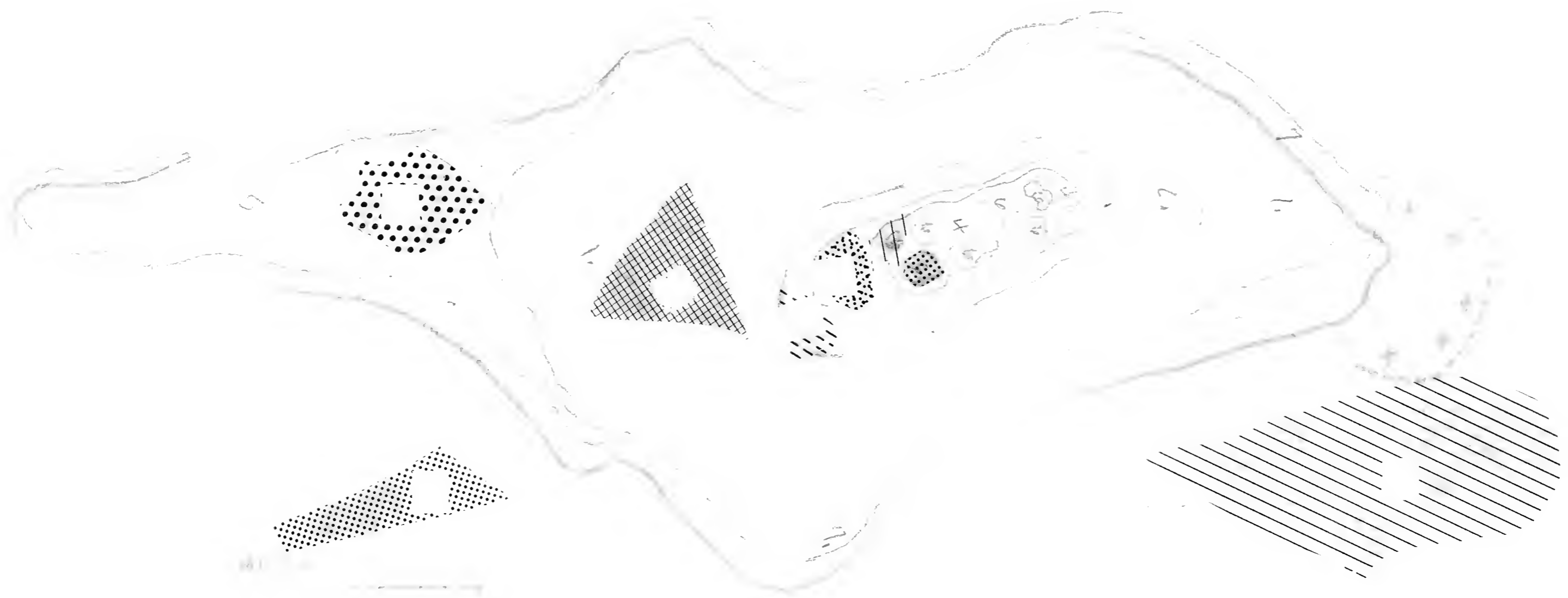
5° 38'



155° 55'

155° 50'

STARBUCK



55° 30'

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→ arrow means I am Musci  
not sure of order  
in relation to others  
in subgroup  
(- shows area of confusion in order)

Bryum nitens Hook.

Brachymerium melanothecium (C.M.) Jacq.

Calymperes tenerum C.M.

(Division) (Pteropsida =) PTERIDOPHYTA (are vascular plants)  
(Class) (Pteridophyta + Spermalophyta) Psilotinae - psilotums (or?) Psilopsida  
PSILOTACEAE - psilotums  
Psilotum nudum (L.) Beauv.

(Class) Filices (or?) Filicinae - true ferns  
POLYPODIACEAE - ferns

- ① Asplenium nidus Linne - Birdsnest Fern<sup>8</sup> (G)
- Dryopteris nymphalis (Forst.) Copel.
- Blechnum brownii Juss
- Davallia solida (Forst.) Swartz
- ② Nephrolepis hirsutula Forst.
- Nephrolepis biserrata (Swartz) Schott. - Fishtail Fern<sup>8</sup> (G)
- ③ Polypodium scolopendria Burm. f. - Kino (M)<sup>8</sup>

<sup>8</sup> = common names from Fosberg and Sachet, 1962

(M = marshallese  
H = hawaiian  
G = english)

Lichenes

PYRENUACEAE

Anthracothecium palmarum (Krmphbr.) Mull.

PHYSICIACEAE

Physcia crispa (Pers.) Nyl.

Pyxine copelandii Vainio

(Division)  
(Subdivision)

SPERMATOPHYTA

Gymnospermae

ARAUCARIACEAE - Araucaria Family

(large trees to 140 feet high or more)

Araucaria excelsa (Lamb) R. Brown - Norfolk Island pine <sup>2.8</sup> (e)

(Class)

Angiospermae

Monocotyledoneae

PANDANACEAE - Screw-pine Family

(trees or shrubs, erect or sometimes vines)

Freycinetia

\* Pandanus tectorius Sol. - screw-pine <sup>2</sup> (e) or hala<sup>1</sup>

~~GRAMINEAE - Grass Family~~

~~Brachymenium melanothecium (C. Mull.) Jacq.~~

~~Cenchrus agrimonoides Trin. var. laysanensis F.B.H. Brown~~

~~Cenchrus echinatus L. - bur-grass<sup>2</sup> or sand bur~~

~~Chloris inflata Link.~~

~~Fingergrass<sup>2</sup>~~

~~Chloris virgata Swartz~~

1. common names from Degeen & Degeen, 1959 2. common name from Bailey 1956

GRAMINAE - Grass Family  
(herbs, or rarely woody plants)

- 1) Cenchrus agrimonoides Trinius var. laysanensis F. Brown
- Cenchrus echinatus R. Brown - sandbur<sup>(E)</sup>, burr grass
- Chloris inflata Link - swollen fingergrass<sup>2</sup>
- Chloris virgata Swartz - fingergrass
- 3) Cynodon dactylon (Hinne) Persoon - Bermuda grass<sup>(E)</sup>
- Eleusine indica (Hinne) Gaertner - goose grass<sup>2,8(E)</sup>
- Digitaria henryi Rendle
- Digitaria pacifica Stapf - bunch grass<sup>1</sup>
- 2) Digitaria sanguinalis (Hinne) Scop. - crabgrass<sup>1</sup>
- Digitaria timorensis (Kunth) Bal
- Digitaria ciliaris\* (Retzius) Koeler - crabgrass<sup>8(E)</sup>
- 4) Eragrostis tenella (Link) Beauvois (= E. amabilis?)
- Eragrostis amabilis (Hinne) Wright and Arnott lovegrass<sup>8(E)</sup> feather lovegrass<sup>1</sup>
- Eragrostis whitneyi Fosberg
- Eragrostis whitneyi var. caumii Fosberg
- Eragrostis falcata Gaudichaud
- Eragrostis variabilis (Gaudichaud) Staudel
- 5) Lepturus pilgerianus Hansen and Potzta
- Lepturus repens (Forster f.) R. Brown

\* Fosberg and Sachet, 1962 - say that most records of D. sanguinalis in the tropics are D. ciliaris

- Panicum terribile Gaudichaud
- Panicum distachyum Linne
- Panicum miliaceum Linne
- Panicum purpurascens Pohl - Para grass<sup>2</sup>
- Pennisetum setosum (Swartz) L. Rich.
- Setaria verticillata (Hinne) Beauvois - bristly tail grass<sup>1</sup>

- same #
- Rhynchelytrum roseus (Nees) Stapf
  - Tricholaena rosea Nees
  - Stenotaphrum secundatum Walters (or (Walt.) O. Ktze.) - Natal grass<sup>1</sup>
  - buffalograss<sup>(E)</sup>
  - St. Augustine grass<sup>8(E)</sup>
  - "San Francisco grass"<sup>4</sup>
  - Ammophila arenaria (Hinne) Link
  - Sporobolus virginicus (Hinne) Kunth - seashore rush grass<sup>2</sup>

out comment

GRAMINAE (cont)

→ / (

Brachymenium melanothecium (C. Mull.) Jaeg

Polypogon monspeliensis (Linne) Desf.

Paspalum fimbriatum HBK

Paspalum vaginatum Sw.

Paspalum conjugatum Bergius

- Hilo grass<sup>8</sup> (G)

BROMELIACEAE - Pineapple family  
(mostly short stemmed herbaceous epiphytes)

6

Ananas sp.

CYPERACEAE - Sedge family

(grasslike or rushlike herbs, often of damp, boggy, marshy, or riparian habitats)

→ Cyperus alternifolius Linne

umbrella plant<sup>2,8</sup> (E)

Cyperus kyllingia Endl.

Cyperus javanicus Houtt.

- marsh cyperus<sup>2</sup>

(evidently = Cyperus pennatus)

Cyperus pennatiformis var. bryanii Kükenthal

Cyperus polystachyos Rott.

Cyperus rotundus Linne

- nutgrass<sup>1,8</sup> (E)

Eleocharis geniculata (Linne) R. and S.

- spike-rush<sup>8</sup> (E)

→ Fimbristylis cymosa R. Brown

- button sedge<sup>2</sup> (evidently = Fatkenis. St. John)

Fimbristylis dichotoma (Linne) Vahl

(= F. diphylla)

Fimbristylis pinocephala Hbd.

Scirpus riparius Presl.

PALMAE - Palm family

(woody shrubs, vines, or trees)

→ Cocos nucifera Linne

- coconut palm (E)

Phoenix dactylifera Linne

- date palm<sup>1,8</sup> (E)

Pritchardia remota Becc.

- Nihoa fan palm<sup>3</sup>

Pritchardia pacifica Seem.

and Wendl.

ARACEAE - Arum family

(mostly herbaceous terrestrial plants (rarely aquatic) with milky, watery or purulent sap. Sometimes epiphyte)

→ Cyrtosperma chamissonia (Schott) Merr.

- giant taro<sup>8</sup> (E)

Scindapsus aureus (Hindl. and Andre) Engl.

- taro vine<sup>8</sup> (E)

Anthurium sp.

Philodendron sp.

- Alocasia macrorrhiza (Linne) Schott

- Elephant ear<sup>8</sup> (E)

Colocasia esculenta (Linne) Schott

- taro<sup>8</sup> (E)

Alocasia indica

- rough taro

3 - name covered by me

DIOSCORACEAE

Dioscorea alata Linne

yam<sup>8</sup> (E)

COMMELINACEAE - Spiderwort Family

(succulent perennial or annual herbs)

Rhoeo discolor

Rhoeo spathacca (Sw.) Stern - white flowered tradescantia or oyster pl. <sup>tradescantia<sup>8</sup> (E)</sup>

Setcreasea purpurea B.K. Boom

Commelina diffusa Burmann f. - Day flower<sup>2</sup>

Zebrina pendula Schnize

LILIACEAE - Lily Family

(mostly perennial herbs, infrequently or only occasionally woody)

Allium fistulosum Linne - onion

Sansevieria cylindrica Bojer (cull)

Sansevieria guineensis (Jacquin) Willd - Bowstring hemp<sup>8</sup> (E)

AMARYLLIDACEAE - Amaryllis Family

(perennial mostly scapose plants)

Crinum asiaticum L. - grand crinum<sup>4</sup>, crinum lily<sup>8</sup> (E)

Furcraea foetida (L.) Haworth (hemp?)

Gloriosa rothschildiana O'Brien

Zephyranthes rosea (Spreng.) Lindl - pink star of Bethlehem<sup>8</sup> (E)

TACCACEAE -

Tacca pinnatifida

Tacca leontopetaloides (Linne) O.Ktze. - island arrowroot<sup>8</sup> (E)  
Polynesian arrowroot

MUSACEAE - Banana Family

(mostly large herbs, often tree-like in appearance)

Musa paradisiaca

Musa nana Lour. - Chinese banana<sup>8</sup> (E)

Musa sapientum L. - banana<sup>8</sup> (E)

Dicotyledonae

CASUARINACEAE - Casuarina Family

(evergreen woody trees or shrubs)

Casuarina equisetifolia L. (ironwood, she-oak, beefwood<sup>2</sup>, ironwood<sup>8</sup> (E)  
<sup>horizontal beefwood?</sup>

Casuarina glauca Siab. coarse ironwood<sup>4</sup>

\* Fosberg and Sachet, 1962, treat Agave as distinct from liliaceae and following it. These two species would be in Agavaceae if used.

\* Some identifications of R. discolor in the literature may have been

PIPERACEAE - Pepper Family

MORACEAE - Mulberry Family

(deciduous or evergreen trees or shrubs with milky latex)

- { Morus alba Linne - mulberry<sup>2</sup>
- Artocarpus altilis (Pank) Fosberg - breakfast<sup>2</sup> (E), mai<sup>2</sup> (M)
- Ficus pumila Linne - (- fig)
- Ficus tinctoria Forst. - (- fig)
- Ficus vetusa Linne - Chinese banyan<sup>2</sup> (E)
- Ficus carica Linne - Fig<sup>2</sup> (E)

URTICACEAE - Nettle Family

(fibrous herbs, or infrequently subshrubs or small trees)

- { Fleurya ruderalis (Forst. f.) Gaud. ex Wedd. - nenkuti kut<sup>2</sup> (M), nenkotkot<sup>2</sup> (M)
- Pipturus velutinus Wedd. (May = P. argentatus (Forst. f.) Wedd.) arenie<sup>2</sup> (M)
- Prochris pedunculata \*\* Wedd.
- Pilea microphylla (L.) Hierbn. \*\* - artillery plant<sup>2</sup> (E)
- Boehmeria nivea (Linne)\* - ramie<sup>2</sup> (E)

SANTALACEAE - Sandalwood Family

(trees, shrubs, or herbs)

haysan sandalwood

- Santalum cuneatum var. laysanicum Rock (= S. freycinetianum Gaud)

POLYGONACEAE - Buckwheat Family

(herbs, shrubs, or rarely trees)

- { Coccoloba uvifera (Linne) Jacquin - scagrape<sup>2,3</sup> (E)
- Rumex giganteus Ait.
- Antigonon leptopus H. and A. - Mexican creeper<sup>2</sup> (E)

\* also given as B. n. (L.) Gaud. by Fosberg and Sachet (1962)  
 \*\* given without the (L.) by Fosberg and Sachet (1962)  
 \*\*\* given as P. l. (Forst. f.) Wedd. by Fosberg and Sachet (1962)

Those without language designations are almost always English or are Hawaiian or Polynesian - used widely by English speaking persons

(9)

### CHENOPODIACEAE - Goosefoot Family

(Predominantly halophytic annual or perennial herbs, shrubs, or rarely small trees)

- Chenopodium oahuense (Meyen) Aellen - aweoweo (= C. sandwichianum Moq.)
- Chenopodium ambrosioides Linne.
- Atriplex muelleri Benth
- Atriplex semibaccatus R. Br.
- Beta vulgaris garden beet<sup>4</sup>)

### AMARANTHACEAE - Amaranth Family

(Annual or perennial herbs (rarely shrubs), trees, or vines)

- Amaranthus viridis Linne - slender amaranth<sup>2</sup>
- Amaranthus dubius Mart.
- Amaranthus spinosus Linne
- Amaranthus brownii C. and C.
- Amaranthus gracilis (?)
- Achyranthes splendens var. reflexa Hillebrand
- Achyranthes velutina H. and A.
  
- Gomphrena globosa Linne - pearl everlasting<sup>8</sup> (c)

### NYCTAGINACEAE - Four-o'clock Family

(Herbs or (in the tropics) shrubs or trees)

- Boerhaavia tetrandra Forst. - dapijdoka<sup>8</sup> (M)
- Boerhaavia diffusa Linne
- Boerhaavia diffusa Linne var. tetrandra (Forst.) Heimert.  
(= B. tetrandra)
- Boerhaavia repens Linne
  
- Bougainvillea spectabilis Willd. - Bougainvillea<sup>8</sup> (c)
- Mirabilis jalapa Linne - four-o'clock<sup>8</sup> (c), emai aur<sup>8</sup> (M)
  
- Pisonia grandis R. Brown - kangl<sup>8</sup> (M)



AIZOACEAE - Mesembryanthemum Family  
(annual or perennial low herbs or shrubs)

- Sesuvium portulacastrum L. - akulikuli, seaside purslane<sup>2</sup>
- Sesuvium portulacastrum L. var griseus L.

Tetragonia tetragonioides (Pallas) O. Kuntze

PORTULACACEAE - Purslane Family

(annual or perennial herbs or suffrutescent shrubs)

Portulaca canini F. Br.

Portulaca lutea Solander

Portulaca oleracea Linne

- pigweed<sup>2</sup>, marmilgan<sup>2</sup> (M)



- Portulaca grandifolia (?)
- Portulaca fosbergii von Poelln
- Portulaca cyanosperma Egler
- Portulaca samoensis von Poelln

- rose moss

CARYOPHYLLACEAE - Pink Family

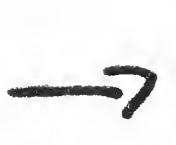
(annual or perennial herbs, infrequently suffrutescent shrubs)



- Spergularia marina (Linne) Griseb
- Schiedea verticillata F. Br.

ANNONACEAE - Custard-apple Family

(trees, shrubs, or vines with aromatic wood & foliage)



- Annona squamosa L. - sugar apple, sweetop<sup>8</sup> (S)
- Ananas sp.

LAURACEAE - Laurel Family

(mostly evergreen trees or shrubs)

- Cassytha filiformis Linne - love vine<sup>1</sup>

in Bromeliads?

HERNANDIACEAE - Hernandia Family  
(trees and shrubs, rarely lianous)

Hernandia ouigera Hiene

CAPPARIDACEAE - Caper Family  
(herbs, shrubs, or trees, sometimes lianous)

Capparis sandwichensis DeCandolle

Capparis spinosa var. marina (Jacq.) K.S. (= C. sandwichensis)

CRUCIFERAE - Mustard Family  
(herbs, rarely subshrubs)

hepidium bidentatum Mont.

hepidium owaihiensis Chamisso and Schlechtendahl

hepidium virginicum Hiene - peppercress

Hobularia maritima (Hiene) Desvaux - sweet allysum?

Coronopus didymus (Hiene) J.E. Smith

Brassica campestris (Hiene)

Brassica rapa

Brassica oleracea

Brassica nigra (Hiene) Koch (mustard)

CRASSULACEAE - Orpine Family

(herbs, shrubs, or rarely scandent, succulents)

same? (Bryophyllum pinnatum (Ham.) Kurz. - air-plant)

Kalanchoe pinnata (Ham.) Pers.

ROSACEAE - Rose family  
(trees, shrubs, or herbs, sometimes dwarf)

(12)

Rosa sp.

LEGUMINOSAE - Pea family  
(Herbs, shrubs, and trees)

- M Albizzia lebbek (Linne) Benth. - silk tree<sup>2</sup>, woman's tongue<sup>2</sup> (albizia)
- M Acacia farnesiana (Linne) Willdenow (wattle)
- M Leucaena leucocephala (Ham.) de Wit
- M Leucaena glauca (Linne) Benth. - haole koa, false koa
- M Mimosa pubica var. unijuga (Duchass. and Walp.) Griseb.
- Erythrina variegata var. orientalis (Linne) Merr.
- Phaseolus lathyroides Linne (bean)
- Bauhinia monandra Kurz.
- C Cassia occidentalis Linne (senna)
- L Crotalaria retusa Linne
- L Crotalaria incana Linne - rattlepod<sup>2</sup>
- L Crotalaria mucronata Desv.
- L Desmodium uncinatum (Jacquin) DeCandolle - Spanish clover<sup>2</sup>
- L Desmodium triflorum (Linne) DeCandolle
- Medicago lupulina Linne - black medick, nonesuch<sup>2</sup> (alfalfa)
- Sesbania tomentosa H. and A.
- Canavalia cathartica Thon.
- Desmanthus virgatus (Linne) Willd. - slender acuan<sup>7</sup>
- M Prosopis chilensis (Molina) Sturtz - algaroba<sup>1</sup>
- M Prosopis juliflora (Swartz) DC. (clover)
- r Trifolium sp.
- Pithecellobium dulce (Roxb.) Benth.

OXALIDACEAE - Oxalis family

(Herbs, sometimes suffrutescent, or shrubs, rarely arborescent)

Oxalis corniculata Linne - lady's sorrel<sup>2</sup>, yellow wood sorrel<sup>2</sup>

ZYGOPHYLLACEAE - Caltrop Family  
(mostly herbs and shrubs, rarely trees)

Tribulus cistoides Hinne

RUTACEAE - Rue Family  
(herbs, shrubs, and trees)

Citrus aurantiifolia (Christ.) Swingle

Murraya paniculata (Hinne) Jack - mock orange, orange jessamine

SIMARUBACEAE - Quassia Family  
(shrubs or trees)

Suriana maritima Hinne

EUPHORBIACEAE - Spurge Family  
(herbs, shrubs, or trees)

- ( Acalypha wilkesiana Muell. - Arg.
- Ricinus communis Hinne - castor bean<sup>2</sup>
- Codiaeum variegatum var. pictum (Hodd.) Muell. - Arg.

- ( Euphorbia cyathophora Murr. \*
- Euphorbia glomifera (Millsp.) Wheeler
- Euphorbia geniculata Ortega - wild spurge<sup>2</sup>
- Euphorbia heterophylla Hinne - five plant<sup>2</sup>

- ( Euphorbia hirta Hinne - hairy spurge<sup>2</sup>
- Euphorbia peplus Hinne
- Euphorbia prostrata Aiton - prostrate spurge<sup>2</sup>
- Euphorbia pulcherrima Willdenow - garden poinsettia
- ( Euphorbia hypericifolia Hinne
- Euphorbia thymifolia Hinne

Pedilanthus tithymaloides (Hinne) Poit.

- ( Phyllanthus debilis Klein ex Willd.
- Phyllanthus amarus Schum. and Thon. (= P. niruri)
- Aleurites moluccana (Candolle)

\* Euphorbia heterophylla L. var. cyathophora (Murr.) Griseb

ANACARDIACEAE - Cashew Family

(trees or shrubs) usually with resinous bark

- Mangifera indica Linne - mango<sup>4</sup>
- Schinus terebinthifolius Raddi - Christmas berry<sup>2</sup>

TILIACEAE - Linden Family

(trees or shrubs), rarely herbaceous

- Triumfetta procumbens Forst. f. - trailing bush<sup>1</sup>

MALVACEAE - Hibiscus Family

- Malvastrum coromandelianum (Linne) Garcke - false mallow<sup>2</sup>

Abutilon indicum Don

- Thespesia populnea (Linne) Solander - nilo<sup>4</sup>

- Sida fallax Walpers - ilima<sup>4</sup>

Sida rhombifolia Linne

- Gossypium brasiliense Macf. - kidney cotton<sup>2</sup>

- Hibiscus rosa-sinensis Linne - hibiscus<sup>2</sup>, common China hibiscus

- Hibiscus tiliaceus Linne - hau<sup>1</sup>

Hibiscus schizopetalus

STERCULIACEAE - Sterculia Family

(trees, shrubs, sometimes lianas, or herbs)

- Walteria indica Linne

GUTTIFERAE - Garcinia Family

(trees or shrubs with resinous sap)

- Calophyllum inophyllum (Linne) Solander - kamani

TAMARICACEAE - Tamarisk Family

(small, leafless, trees or shrubs)

- Tamarix aphylla Karst - European tamarisk<sup>1</sup>

PASSIFLORACEAE - Passion-flower Family  
(shrubs or herbs, often lianous)

Passiflora foetida Linne - foetid passionflower

CARICACEAE - Carica Family  
(soft-wooded trees with milky sap)

Carica papaya Linne - papaya

LYTHRACEAE - loosestrife Family (herbs, shrubs, trees)

Pemphis acidula Forster

COMBRETACEAE - Combretum Family  
(trees or shrubs, often lianous)

Conocarpus erecta Linne

Terminalia catappa Linne

- Indian almond

Terminalia samoensis ( )

MYRTACEAE - Myrtle Family  
(shrubs or trees)

Psidium guajava Linne

- guava

ONAGRACEAE - Evening-primrose Family  
(mostly herbs, rarely shrubs or trees)

Jussiaea suffruticosa Linne

Jussiaea erecta Linne

LECYTHIDACEAE

Barringtonia asiatica (Linne.) Kurz



ARALIACEAE - Ginseng Family  
(herbs, shrubs or trees, sometimes lianas)

- Polyscias guilfoyei (Cogn. and March.) Bailey
- Polyscias balfouriana (Sander) Bailey
- Nothopanax scutellarum (Burm. f.) Merr.

or P of (Bull) H. H. Bailey

UMBELLIFERAE - Carrot Family  
(mostly herbs, occasionally suffrutescent, rarely shrubs)

- Daucus carota (?) carrot

ERICACEAE - Heath Family

(many shrubs, occasionally suffrutescent, herbs, trees, or rarely vines)

PRIMULACEAE - Primula Family

(herbs rarely suffrutescent)

- Anagallis arvensis Linne

APOCYNACEAE - Dogbane Family

(trees, shrubs, or herbs)

- Nerium oleander Linne - oleander<sup>2</sup>
- Ochrosia oppositifolia (Lam.) K. Sch.
- Plumeria rubra Linne - frangipani<sup>1</sup>
- Carissa grandiflora A. DeCandolle - Natal plum<sup>2</sup>
- Thevetia peruviana (Persoon) K. Schumaker - be-still tree<sup>2</sup>, yellow oleander<sup>2</sup>
- Catharanthus roseus (Linne) G. Don - Madagascar periwinkle<sup>2</sup>
- Plumeria obtusa Linne.
- Thevetia thevetiodes (HBK)

ASCLEPIADACEAE - Milkweed Family  
(herbs, shrubs, or rarely small trees)

Calotropis gigantea (Linne) Aitn - white crown flower<sup>1</sup>

CONVOLVULACEAE - Morning glory Family  
(erect or twining herbs or shrubs or small trees)

Cuscuta sp.

Ipomea indica (Burmann f.) Merrill

Ipomea pes-caprae (Linne) Sweet - beach morning glory<sup>2</sup>

Ipomea tuba (Schlecht.) Don - moonflower<sup>1</sup>

Ipomea batatas (Linne) Lam. \* - sweet potato<sup>1</sup>

Ipomea pes-caprae subsp. brasiliensis (L.) v. Ooststr.

HYDROPHYLLACEAE - Waterleaf Family  
(mostly herbs)

Nana sandwichensis var. laysanicum A. Brand

BORAGINACEAE - Borage Family  
(herbs, shrubs, or trees or rarely lianous)

Cordia sebestena Linne

- geigertree<sup>1</sup>

Cordia subcordata Lam.

- kou' or kou tree

Heliotropium anomalum H. and A.

Heliotropium anomalum var. mediate Johnston

Heliotropium curassavicum Linne

- seaside heliotrope<sup>2</sup>

Jounefortia argentea Linne f.

- tree heliotrope<sup>2</sup>

VERBENACEAE - Verbena Family  
(herbs, shrubs, a tree)

Stachytarpheta jamaicensis Vahl

- oi, false verane<sup>2</sup>

Stachytarpheta indica (Linne) Vahl

Vitex trifolia Linne

Vitex negundo var. bicolor (Willd.) H. non

Vitex trifolia var. bicolor (Willdenow) Mold

Lantana camara Linne

Clerodendrum inerme (Linne) Gaertn.

\* on (Linne) Poir.



LABIATAE - Mint Family

(mostly herbs, sometimes shrubs, and rarely trees)

Phyllostegia variabilis Bitter

- false dragonhead

Oscimum basilicum Linne.

SOLANACEAE - Nightshade Family

(herbs, shrubs, trees, often lianous, or creeping)

Lycopersicon esculentum Mill.

Lycopersicon esculentum var. communis Bailey - common tomato<sup>1</sup>

Nicotiana tabacum Linne

- tobacco<sup>2</sup>

Nicotiana glauca R. Grab.

- tree tobacco<sup>1</sup>

Petunia hybrida Willd.

- common garden petunia<sup>1</sup>

Physalis angulata Linne

- husk tomato<sup>1</sup>

Solanum melongena var. esculentum Nees

- eggplant<sup>1</sup>

Solanum nelsoni Duval

(= S. lasianse)

Solanum nelsoni var. intermedium F. Brown

Solanum nodiflorum Jacquin

- black nightshade<sup>6</sup>

Solanum nigrum Linne<sup>1</sup>

- black nightshade<sup>2</sup>

Solanum nigrum Linne var. nipoense

Solanum tuberosum

Solanum nelsoni Duval var. acuminatum

Solanum nelsoni Duval var. caunii

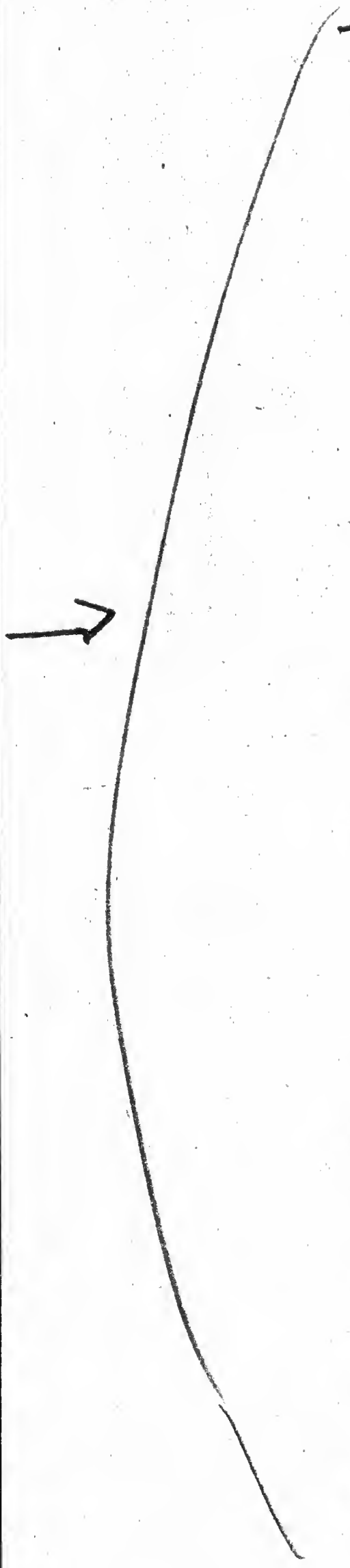
Capsicum frutescens Linne

- common red pepper

SCROPHULARIACEAE - Figwort Family

(mostly herbs or small shrubs, sometimes lianous)

Russelia equisetiformis Schlecht and Cham coral plant



BIGNONIACEAE - Bignonia Family

(trees or shrubs, often climbing or twining, rarely herbs)

Spathodea campanulata Beauvois

ACANTHACEAE - Acanthus Family

(herbs or shrubs, rarely trees)

→ (

Graptophyllum pictum (Hinnel) Griff

Pseuderanthemum carruthersii (Seem.) Guill

PLANTAGINACEAE - Plantago Family

(herbs or rarely branched subshrubs)

Plantago lanceolata Hinnel

- buckthorn plantain<sup>2</sup>

Plantago major Hinnel

- common plantain

RUBIACEAE - Madder Family

(trees or shrubs, sometimes lianas, infrequently herbs)

Casasia elusifolia (Jacq.) Urban

Urban

- Bahama gardenia

Morinda citrifolia Hinnel

- noni

Gardenia taitensis D.C.

→

Borreria laevis (Ham.) Griseb.

Griseb.

Hedyotis romanzoffiensis (C.

and S.

) Mill

Guettarda speciosa Hinnel

CUCURBITACEAE - Gourd Family  
(climbing or prostrate herbs, rarely suffruticose)

Sicyos hispidus Hillebrand  
Sicyos microcarpa Mann

(may = S. pachycarpus)

Cucurbita pepo

Citrullus vulgaris Schrad.

- watermelon

Cucumis dipsaceus Ehrenb.

- teacegourd

Cucumis melo Linne

- muskmelon

GOODENIACEAE - Goodenia Family  
(herbs or small shrubs)

Scaevola taccada\* (Gaertn

) Roxb.

- nau-paka  
(= S. frutescens)

Put vostoak  
+ caroline  
lupinus

COMPOSITAE - Composite family  
(herbs, shrubs, or less commonly trees or climbers)

Congza bonariensis (hinne) Cronquist

- horseweed<sup>2</sup>  
(= Erigeron?)

Vernonia cinerea (hinne) Hess

Sonchus oleraceus hinne

- sow thistle<sup>2</sup>

Xanthium saccharatum Walther

- cocklebur<sup>2</sup>

Gnaphalium purpureum hinne

- purple cudweed<sup>2</sup>

Gnaphalium sandwichiensis Gaudichaud forma canum Sherff

Gnaphalium sandwichianum Gaudichaud

Pluchea indica (hinne) Hess.

- Indian pluchea<sup>1</sup>

Pluchea odorata (hinne) Cassini

- sour bush

Pluchea odorata x indica

Bidens pilosa hinne

- Spanish needle

Hypochaeris integrifolia (Nuttall) Gray

Verbesina encelioides (Cavanilles) Benth and Hooker - golden crown head<sup>2</sup>

Emilia sonchifolia (hinne) DeCandolle

Emilia javanica (Burm.) Rab.

Synedrella nodiflora (hinne) Gaertn

Lactuca sativa hinne

Helianthus annuus hinne

Tugetes sp.

- marigold<sup>1</sup>

Gaillardia picta Sweet

Paul -

Species <sup>(or families)</sup> marked with an + are additional to those you already have on the list.

Ray

GRAMINAE - Grass family  
(herbs, or rarely woody plants)

- Cenchrus agrimonoides Trinius var. laysanensis F. Brown
- Cenchrus echinatus R. Brown - sandbur<sup>(E)</sup>, burr grass<sup>1,8</sup>  
sand bur or burgrass<sup>9</sup>
- Cenchrus brownii R. + S.
- Chloris inflata Link - swollen fingergrass<sup>2</sup>
- Chloris virgata Swartz - fingergrass
- Cynodon dactylon (Linne) Persoon - Bermuda grass<sup>1(E)</sup>
- Eleusine indica (Linne) Gaertner - goose grass<sup>2,8,9(E)</sup>
- Digitaria henryi Rendle
- Digitaria pacifica Stapf - bunch grass<sup>1</sup>
- Digitaria insularis (Linne) Henr. - sour grass<sup>9</sup>
- Digitaria gaudichaudii (Kunth) Henr.
- Digitaria sanguinalis (Linne) Scop. - crabgrass<sup>1</sup>
- Digitaria timorensis (Kunth) Bal
- Digitaria ciliaris\* (Retzius) Koeler - tropical crabgrass<sup>9(E)</sup>  
- crabgrass<sup>8(E)</sup>
- Dactyloctenium aegyptium (Linne) Reich - crowfoot grass<sup>9</sup>  
(= E. aegyptium?)
- Eragrostis tenella (Link) Beauvois (= E. amabilis?)
- Eragrostis amabilis (Linne) Wright and Arnott - lovegrass<sup>8(E)</sup><sup>9</sup>  
feather lovegrass<sup>1</sup>
- Eragrostis whitneyi Fosberg
- Eragrostis whitneyi var. caunii Fosberg
- Eragrostis falcata Gaudichaud
- Eragrostis variabilis (Gaudichaud) Stuedel
- Lepturus pilgerianus Hansen and Potzta
- Lepturus repens\* (Forster f.) R. Brown
- Eragrostis poaeoides Beauvois ex R. + S.
- \* Fosberg and Sachet, 1962 - say that most records of D. sanguinalis in the tropics are D. ciliaris
- Panicum terribile Gaudichaud \* see next page
- Panicum distachyum Linne
- Panicum mitraceum Linne
- Panicum purpurascens Pohl - Para grass<sup>2</sup>
- Pennisetum setosum (Swartz) H. Rich.
- Lepturus aspariicensis Fosberg
- Setaria verticillata (Linne) Beauvois - bristly bartal grass<sup>1,9</sup>
- Rhynchelytrum roseus (Nees) Stapf
- Tricholaena rosea Nees
- Stenotaphrum secundatum Walters (or (Walt) O. Ktze.) - Natal grass<sup>1</sup>  
- buffalograss<sup>1(E)</sup>  
St. Augustine grass<sup>8(E)</sup>  
"San Francisco grass"
- Amnophila arenaria (Linne) Link - seashore rush grass<sup>2</sup>
- Sporobolus virginicus (Linne) Kunth - Hitchcock
- Sporobolus poiretii (R. and S.)

+

+

+

+

+

same as

in comment  
p. 105

GRAMINEAE (cont)

→ Brachymenium melanotheicum (C. Mull.) Jørg

Polypogon monspeliensis (Linne) Desf. (ontames)

Paspalum fimbriatum HBK

Paspalum vaginatum Sw. (Swallen?)

Paspalum conjugatum Bergius

- salt grass<sup>9</sup> (E)

- Hilo grass<sup>2</sup> (E)

+ Lepturus repens var. septentrionalis Osberg - bunchgrass<sup>?</sup>

+ Sorghum dochna var. technicum (Koern.) Snow - broomcorn<sup>9</sup>

+ Zea mays Linne - maize or Indian corn<sup>9</sup>

BROMELIACEAE - Pineapple family  
(mostly short stemmed nonbarren epiphytes)

6

Ananas sp.

Ananas comosus (Linne) Merrill

Pineapple 9

CYPERACEAE - Sedge family

(grasslike or rushlike herbs, often of damp, boggy, marshy, or riparian habitats)

Cyperus alternifolius Linne

umbrella plant 2, 8 (E)

Cyperus kyllingia Ench. iohar

Cyperus javanicus Houtt.

- marsh cyperus 2

(evidently = Cyperus pennatus)

Cyperus pennatifolius var. bryanii Kükenthal

Cyperus laevigatus Hitchc. equals some more recent name?

Cyperus polystachyos (Rott.)

Cyperus rotundus Linne

- nutgrass 1, 8 (E)

Eleocharis geniculata (Linne) R. and S.

- spike-rush 8 (E)

Fimbristylis cymosa R. Brown

- button sedge 2

(evidently = Fimbristylis St. John)

Fimbristylis dichotoma (Linne) Vahl

(= F. diphylla)

Fimbristylis pycnocephala Hbd. (Hildebrand)

Scirpus riparius Presl.

PALMACEAE - Palm family

(woody shrubs, vines, or trees)

Cocos nucifera Linne

- coconut palm (E)

Phoenix dactylifera Linne

- date palm 1, 8 (E)

Pritchardia remota Becc.

- Nihoa fan palm 3

Pritchardia pacifica Seem. and Wendl.

ARACEAE - Arum family

(mostly herbaceous terrestrial plants (rarely aquatic) with milky, watery or purged sap. Some are epiphytes)

Caladium sp.

Cyrtosperma chamissonia (Schott) Merrill

- giant taro 8 (E)

Scindapsus aureus (Hindl. and Andre) Engler

- taro vine 8 (E)

Anthurium sp.

Philodendron sp.

Alocasia macrorrhiza (Linne) Schott

- Elephant ear 8 (E)

Colocasia esculenta (Linne) Schott

- taro 8 (E)

Alocasia indica

- rough taro

Dieffenbachia sp.

- dumb-cane 9



DIOSCORACEAE

Discorea alata Linne

— yam<sup>8</sup> (E)

COMMELINACEAE - Spiderwort family  
(succulent perennial or annual herbs)

Rhoeo discolor

Rhoeo spathacca (Sw.) Stern - white flowers tradescantia<sup>8</sup> (E) or ardisia<sup>9</sup>

Setcreasea purpurea B.K. Boom

Commelina diffusa Burmann f. - Day flower<sup>2</sup>

Zebrina pendula Schumize

PONTEDERIACEAE - Pickerel weed family

Eichhornia crassipes (Mart. and Zucc.) Salms-Laub. - water hyacinth<sup>9</sup>

LILIACEAE - lily family

(mostly perennial herbs, infrequently or only occasionally woody)

Cordyline terminalis (Linne) Kunth - ti<sup>9</sup>

Allium fistulosum Linne - onion

Sansevieria cylindrica<sup>\*\*</sup> Bojer - call<sup>9</sup>

Sansevieria guineensis<sup>\*\*</sup> (Jacquin) Willdenow - Bowstring hemp<sup>8</sup> (E)

Sansevieria roxburghiana<sup>\*\*</sup> Schultes - Bowstring hemp<sup>9</sup>

AMARYLLIDACEAE - Amaryllis family

Hymenocallis littoralis (Jacquin) Salisbury (mostly scapose plants) - spider lily<sup>9</sup>

Crinum asiaticum Linne - grand crinum, crinum lily<sup>8</sup> (E)

Furcraea foetida (Linne) Haworth (hemp?)

Gloriosa rothschildiana O'Brien

Zephyranthes rosea (Spreng.) Lind - pink star of Bethlehem<sup>8</sup> (E)

TACCACEAE -

Tacca pinnatifida

Tacca leontopetaloides (Linne) O. Ktze. - island arrowroot<sup>8</sup> (E) Polynesian arrowroot

MUSACEAE - Banana family

(mostly large herbs, often tree-like in appearance)

Musa paradisica

Musa nana Lour. - Chinese banana<sup>8</sup> (E)

Musa sapientum Linne - banana<sup>8</sup> (E)

Dicotyledoneae

CASUARINACEAE - Casuarina family

evergreen woody trees or shrubs

Casuarina equisetifolia Linne, ironwood, she-oak, basketwood, <sup>10</sup> normal<sup>8</sup> (E)

Casuarina glauca (Siab.) coarse ironwood<sup>9</sup>

\* Fesberg and Sargent, 1962, treat Agavaceae as distinct from Liliaceae and following it. These two species would be in Agavaceae if used.

\* Some ident. features of R. discolor in the literature may have been

PIPERACEAE - Pepper Family

MORACEAE - Mulberry family

(deciduous or evergreen trees or shrubs with milky latex)

- { Morus alba Linne - mulberry<sup>2</sup>
- Artocarpus altilis (Parks) Fosberg - breadfruit<sup>2</sup> (E), mai<sup>2</sup> (M)
- Ficus pumila Linne - fig
- Ficus tinctoria Forster - fig
- Ficus vetusa Linne - Chinese banyan<sup>2</sup> (E)
- Ficus carica Linne - Fig<sup>2</sup> (E)
- Ficus ribiginosa Desf. ontaines

URTICACEAE - Nettle family

(fibrous herbs, or infrequently subshrubs or small trees)

- { Fleurya ruderalis (Forst. f.) Gaud.<sup>ichaud</sup> ex Wedd.<sup>||</sup> - nenkuti kut<sup>2</sup> (M), nenkotkot<sup>2</sup> (M)
- Pipturus velutinus Wedd.<sup>||</sup> (May = P. argutatus (Forst. f.) Wedd.) arenie<sup>2</sup>
- Prochris pedunculata Wedd.<sup>||</sup> \*\*\*
- Pilea microphylla (Linne) Hiebm.<sup>\*\*</sup> - artillery plant<sup>2</sup> (E)
- Boehmeria nivea (Linne)\* - ramie<sup>3</sup> (E)

SANTALACEAE - Sandalwood family

(trees, shrubs, or herbs)

kayuan sandalwood

- Santalum cuneatum var. laysanicum Rock (= S. freycinetianum Gaud.)

POLYGONACEAE - Buckwheat family

(herbs, shrubs, or rarely trees)

- { Coccoloba uvifera (Linne) Jacquin - seagrape<sup>2,3</sup> (E)
- Rumex gigantus (Ait.)
- Antigonon leptopus (H. and A.) - Mexican cepepe<sup>2</sup> (E)

\* also given as B. n. (L.) Gaud. by Fosberg and Sachet (1962)  
 \*\* given without the (L.) by Fosberg and Sachet (1962)  
 \*\*\* given as P. l. (Forst. f.) Wedd. by Fosberg and Sachet (1962)

Those without language designations are almost always English or are Hawaiian or Polynesian used widely by English speaking persons

CHENOPODIACEAE - Goosefoot Family

(Predominantly halophytic annual or perennial herbs, shrubs, or trees)

- Chenopodium oahuense (Meyen) Allen - aweoweo (= C. sandwicense Hoff)
- Chenopodium ambrosioides Linne
- Atriplex muelleri Benth
- Atriplex semibaccata R. Brown
- Beta vulgaris (garden beet)

AMARANTHACEAE - Amaranth Family

(Annual or perennial herbs (rarely shrubs), trees, or vines)

+

- Amaranthus tricolor (amaranth pigweed)
- Amaranthus graecizans Linne (amaranth pigweed)
- Amaranthus viridis Linne - slender amaranth, Chinese spinach
- Amaranthus dubius Mart. - amaranth pigweed
- Amaranthus spinosus Linne
- Amaranthus brownii C. and C.
- Amaranthus gracilis
- Achyranthes splendens var. reflexa Hillebrand
- Achyranthes velutina (H. and A.)
- Gomphrena globosa Linne - pearly everlasting (c)

NYCTAGINACEAE - Four-o'clock Family

(Herbs or (in the tropics) shrubs or trees)

- Boerhavia tetrandra Foster - dapiidoka (M)
- Boerhavia diffusa Linne
- Boerhavia diffusa Linne var. tetrandra (Foster) Heimert (= B. tetrandra)
- Boerhavia repens Linne
- Bougainvillea spectabilis Willd. - Bougainvillea (c)
- Mirabilis jalapa Linne - four-o'clock (c), emu'au (M)
- Pisonia grandis R. Brown - kangl (M) buka

HERNANDIACEAE - Hernandia Family  
(trees and shrubs, rarely lianas)

Hernandia ovigera Linne

CAPPARIDACEAE - Caper Family  
(herbs, shrubs, or trees, sometimes lianas)

Capparis sandwichensis DeCandolle

Capparis spinosa var. marina (Jacquin) K.S. (= C. sandwichensis)

CRUCIFERAE - Mustard Family - (herbs rarely subshrubs)

Brassica oleracea var. italica Plenck. broccoli?

Leptidium bidentatum (Mont.)

Leptidium <sup>or o-wahianensis?</sup> owahianensis Chamisso and Schlechtendahl - scurvygrass?

Leptidium virginicum Linne - peppercress?

Raphanus sativus Linne! - radish?

Hobolobos maritima (Linne) Desvoux - sweet allysum?

Coronopus didymus (Linne) J.E. Smith

Brassica campestris (Linne)

Brassica rapa

Brassica oleracea

Brassica nigra (Linne) Koch (mush.?)

CRASSULACEAE - Orpine Family

(herbs, shrubs, or rarely scandent, succulent)

scare? Bryophyllum pinnatum (Hamrock) Kurz. - air-plant<sup>1, 8, 7</sup> (e)

Kalanchoe pinnata (Hamrock) Pers.

Sempervivum tectorum Linne - hen and chickens?

ROSACEAE - Rose Family  
(trees, shrubs, or herbs, sometimes climbing)

Rosa sp.

LEGUMINOSAE - Pea Family - herbs, shrubs, & trees

- Phaseolus vulgaris Linne - bean<sup>9</sup>
- M Albizzia lebbek (Linne) Benth - silk tree<sup>2</sup>, woman's tongue tree<sup>2</sup> (E)
- M Acacia farnesiana (Linne) Willdenow (wattle)
- M Leucaena leucocephala (Lamarck) de Wit
- M Leucaena glauca (Linne) Benth - hacle koa, false koa
- M Mimosa pudica var. unijuga (Duchass. and Walp.) Griseb.
- Erythrina variegata var. orientalis (Linne) Merr. - coral tree<sup>2</sup> (C)
- Phaseolus lathyroides Linne (bean)
- Bauhinia monandra Kurz.
- C Cassia occidentalis Linne - coffee senna<sup>(E)</sup> (E)
- L Crotalaria retusa Linne
- L Crotalaria incana Linne - rattlepod<sup>2,8</sup> (E)
- L Crotalaria mucronata Desvoux - rattlepod<sup>8</sup> (E)
- L Desmodium uncinatum (Jacquin) DeCandolle - Spanish clover<sup>2</sup>
- L Desmodium triflorum (Linne) DeCandolle
- Medicago lupulina Linne - black medick, nonesuch<sup>2</sup> (alfalfa)
- Sesbania tomentosa H. and A.
- Canavalia cathartica Thon.
- Desmanthus virgatus (Linne) Willdenow - slender acuan<sup>1</sup>
- M Prosopis chilensis (Molina) Sturtz - algaroba<sup>1</sup>
- M Prosopis juliflora (Swartz) DC. (= DeCandolle) (clover)
- L Trifolium sp.
- Vigna marina (Burmann) Merrill - beach pea<sup>8</sup> (E)
- Cesalpinia crista
- Pithecellobium dulce (Roxb.) Benth
- Entada scandens

OXALIDACEAE - Oxalis Family

(Herbs, sometimes succulent, or shrubs, rarely arborescent)

Oxalis corniculata Linne - lady's smock<sup>2</sup>, yellow coral corn<sup>2</sup>

\* spelled lebbek - by Fosberg and Sachet, 1962

ZYGOPHYLLACEAE - Callitrop Family  
(mostly herbs and shrubs, rarely trees)

Tribulus cistoides Linne

RUTACEAE - Rue Family  
(herbs, shrubs, and trees)

Citrus aurantiifolia (Christ.) Swingle

Murraya paniculata (Linne) Jack - mockorange, orange jessamine

SIMARUBACEAE - Quassia Family  
(shrubs or trees)

Suriana maritima Linne

EUPHORBIAACEAE - Spurge Family  
(herbs, shrubs, or trees)

- Acalypha wilkesiana (Muell.-Arg.) - Joseph's coat, beeblack plant<sup>8</sup> (G.)
- Ricinus communis Linne - castor<sup>oil</sup> bean<sup>8</sup> (E)
- Codiaeum variegatum var. pictum (Hodd.) Muell.-Arg. - croton<sup>9</sup>

- Euphorbia cyathophora Murr. - dwarf poinsettia<sup>8,9</sup> (E)
- Euphorbia glomerata (Millsp.) Wheeler - spurge<sup>9</sup>
- Euphorbia geniculata Ortega - wild spurge<sup>8</sup> (E)
- Euphorbia heterophylla Linne - fire plant<sup>2</sup> (E)

- Euphorbia hirta Linne - hairy spurge<sup>2,8,9</sup> (E)
- Euphorbia peplus Linne
- Euphorbia prostrata Aiton - prostrate spurge<sup>8,9</sup> (E)
- Euphorbia pulcherrima Willdenow - garden poinsettia<sup>1</sup> (E)
- Euphorbia hypericifolia Linne - poinsettia<sup>8</sup>
- Euphorbia thymifolia Linne

Pedilanthus tithymaloides (Linne) Port.

- Phyllanthus debilis Klein ex Willdenow
- Phyllanthus amarus Schum. and Thon. (= P. niruri)
- Aleurites malaccana (Candolle)

\* May also regard E. heterophylla L. var. cyathophora (H.) G. Don as a distinct sp. use Surianaceae

ANACARDIACEAE - Cashew Family

(trees or shrubs, usually with resinous bark)

- Mangifera indica Linné - mango<sup>2</sup> (E)
- Schinus terebinthifolius Raddi - Christmas-berry<sup>2</sup> (E)

TILIACEAE - Linden Family

(trees or shrubs, rarely herbaceous)

- Triumfetta procumbens Forst. f. - trailing bush<sup>1</sup>

MALVACEAE - Hibiscus Family

- Malvastrum coromandelianum (Linné) Gardke - false mallow<sup>2</sup>

- Abutilon indicum Dow. - not an abbece<sup>2</sup>

- Abutilon albescens Miq.

- Thespesia populnea (Linné) Solander<sup>++</sup> - m. lo<sup>4,9</sup> portia tree<sup>2</sup>

- Sida fallax Walpers - ilima<sup>4,9</sup>, Kio<sup>8</sup> (M)

- Sida rhombifolia Linné

- Gossypium brasiliense Macf. - or cotton<sup>2</sup> (E), Kiamy cotton<sup>2</sup>

(= G. peruvianum Cav.)

- Hibiscus rosa-sinensis Linné - hibiscus<sup>2,8</sup> (E), common Chinese hibiscus<sup>4</sup>

- Hibiscus tiliaceus Linné - hau<sup>1</sup>, lau<sup>8</sup> (M)

- Hibiscus schizopetalus

- Gossypium religiosum Linné - wild cotton<sup>2</sup>

STERCUNIACEAE - Sterculia Family

(trees, shrubs, sometimes lianas, or herbs)

- Wattiera indica Linné

GUTTIFERAE - Garcinia Family

(trees or shrubs with resinous sap)

- Calophyllum inophyllum (Linné) Solander - kamani, buluk<sup>5</sup> (M)

TAMARICACEAE - Tamarisk Family

(small, leafless, trees or shrubs)

- Tamarix aphylla Karst - European tamarix<sup>1</sup>

PASSIFLORACEAE - Passion-flower Family  
(shrubs or herbs, often lianous)

Passiflora foetida Linne - foetid passionflower

CARICACEAE - Carica Family  
(soft-wooded trees with milky sap)

Carica papaya Linne - papaya

HYTHACEAE - Hoopstree Family (herbs, shrubs, trees)

Pemphis acidula Forster - Kengi (m)

COMBRETACEAE - Combretum Family  
(trees or shrubs, often lianous)

Conocarpus erecta Linne

Terminalia catappa Linne - Indian almond (E)?

Terminalia samoensis Rech.

MYRTACEAE - Myrtle Family  
(shrubs or trees)

Psidium guajava Linne - guava

Eucalyptus citriodora Hooker - lemon scented Eucalyptus?

ONAGRACEAE - Evening-primrose Family

(mostly herbs, rarely shrubs or trees)

Jussiaea suffruticosa Linne

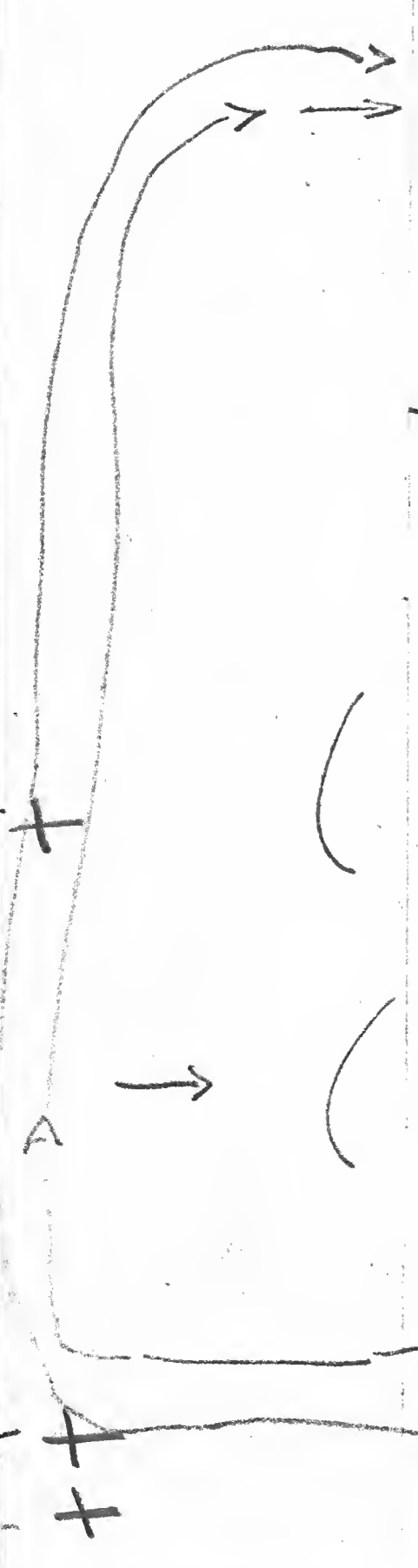
Jussiaea erecta Linne

LECYTHIDACEAE

Barringtonia asiatica (Linne) Kurz

RHIZOPHORACEAE - Mangrove Family

Rhizophora mucronata Lamarck - mangrove (E)





ARALIACEAE - Ginseng Family

(Herbs, shrubs or trees, sometimes woody) - hedge parrot (E)

Polyscias guilfoyei (Cogn. and March.) Bailey

Polyscias balfouriana (Sander) Bailey

Nothopanax scutellarum (Burmam f.) Merrill

P. sp. (Bull) H.H. Baker

UMBELLIFERAE - Carrot Family

(mostly herbs, occasionally subshrubs, rarely shrubs)

Daucus carota

carrot

Anethum graveolens Linne

dill?

Apium petroselinum Linne

parsley?

ERICACEAE - Heath Family - mainly shrubs, occasionally suffruticose, herbs, trees or rarely vines

PRIMULACEAE - Primula Family - herbs rarely suffruticose

Anagallis arvensis Linne

SAPOTACEAE - Sapote Family - trees or shrubs

Chrysophyllum cainito Linne? - star apple?

APOCYNACEAE - Dogbane Family

(trees, shrubs, or herbs)

Nerium oleander Linne

- oleander 4, 5 (E)

Ochrosia oppositifolia (Lamarck) K. Schumaker

Plumeria rubra Linne

- frangipani 1, 8 (E)

Carissa grandiflora A. DeCandolle

- Natal plum 2

Thevetia peruviana (Persoon) K. Schumaker

- be-still tree, poison dandruff 2

Catharanthus roseus (Linne) G. Don

- Madagascar periwinkle 2

Plumeria obtusa Linne

- plumeria 8 (E)

Thevetia thevetiodes (HBK)

LABIATAE - Mint Family  
(mostly herbs, sometimes shrubs, and rarely trees)

Phyllostegia variabilis Bitter - false dragonhead

Oscimum basilicum Linne - basil? (E)  
Coleus scutellarioides Linne - coleus?

SOLANACEAE - Nightshade family  
(herbs, shrubs, trees, often lianous, or creeping)

Lycopersicon esculentum Mill.

Lycopersicon esculentum\* var. communis Bailey - common tomato!

Nicotiana tabacum Linne - tobacco 29

Nicotiana glauca - R. Grab. - tree tobacco!

Petunia hybrida Willd. - common garden petunia

Physalis angulata Linne - husk tomato!

Solanum melongena var. esculentum Nees - eggplant!

Solanum nelsoni Duval (= S. laeyense)

Solanum nelsoni var. intermedium F. Brown

Solanum nodiflorum Jacquin - black nightshade?  
nightshade 2/8?

Solanum nigrum Linne - black nightshade?

Solanum nigrum Linne var. nipoense

Solanum tuberosum

Solanum nelsoni Duval var. acuminatum

Solanum nelsoni Duval var. caunii

Capsicum frutescens Linne - chili pepper?  
common hot pepper

Capsicum annuum Linne? - pepper?

SCROPHULARIACEAE - Figwort family  
(mostly herbs or small shrubs, sometimes lianous)

Ruellia equisetiformis Schlecht. and Cham. coral plant

\* given as Solanum lycopersicum Linne by Fosberg, 1959

CUCURBITACEAE<sup>++</sup> - Gourd Family  
(climbing or prostrate herbs, rarely suffruticose)

- Sicyos hispidus Hillebrand
- Sicyos microcarpa Mann (may = S. pachycarpa)
- Cucurbita pepo Linne - pumpkin<sup>9</sup>
- Citrullus vulgaris (Schrad.) - watermelon<sup>1,8</sup> (E)
- Cucumis dipsaceus Ehrenb. - teacup<sup>1</sup> (E)
- Cucumis melo Linne - muskmelon<sup>1</sup> (E)  
cantaloupe<sup>2</sup>
- Cucumis sativus Linne - cucumber<sup>2</sup> (E)

GOODENIACEAE - Goodenia Family  
(herbs or small shrubs)

- + Scaevola taccada<sup>\*</sup> (Gaertner) Roxb. - uapaka<sup>1</sup>  
(= S. frutescens)  
- kumat, kenat<sup>2</sup> (M)
- Scaevola sericea Vahl (may = S. taccada) - scaevola, beach magnolia<sup>9</sup>

\*\* listed after Passifloraceae by Fosberg and Sackett, 1962

Put vostoik  
+ caroline  
topple

COMPOSITAE - Composite family  
(herbs, shrubs, or less commonly trees or climbers)

Coryza bonariensis (Linne) Cronquist

- horseweed<sup>2,9</sup>  
(= Erigeron?)

Vernonia cinerea (Linne) Less.

Sonchus oleraceus Linne

- sow thistle<sup>2,9</sup>

Xanthium saccharatum Walther

- cocklebur<sup>2</sup>

Gnaphalium purpureum Linne

- purple cudweed<sup>2</sup>

Gnaphalium sandwicense Gaudichad forma canum Sherff

Gnaphalium sandwicense Gaudichad

Pluchea indica (Linne) Less.

- Indian pluchea<sup>2</sup>

Pluchea odorata (Linne) Cassini

- sour bush

Pluchea odorata x indica

Bidens pilosa Linne

- Spanish needle

Hypochaeris integrifolia (Nuttall) Gray

Verbesina encelioides (Cavanilles) Benth and Hooker - golden crown head<sup>2</sup>

Emilia sonchifolia (Linne) DeCandolle

Emilia javanica (Burmam) Rab.

Synedrella nodiflora (Linne) Gaertn.

Lactuca sativa Linne

lettuce<sup>9</sup>

Helianthus annuus Linne

Tagetes erecta Linne

- marigold<sup>1,5</sup> (E)

Gaillardia picta Sweet

Gaillardia pulchella Fouq.

Others to add

- ~~Pithectobium dulce (Roxb.) Benth.~~  
~~Prosopis juliflora (Sw.) DC~~  
? ~~Thevetia thevetiodes (HBK)~~  
? ~~Gomphrena globosa~~  
? ~~Antigonon leptopus~~  
? ~~Ficus carica~~  
? ~~Baccharis monandra~~  
? ~~Evolvulus retusus~~  
? ~~Rhoeo discolor~~  
? ~~Kalanchoe pinnata~~  
? ~~Gaillardia pulchella~~  
~~Entolasia indica = coarse taro~~  
? ~~Pedilanthus tithymaloides~~  
? ~~Euphorbia alternifolia~~  
? ~~Paritium tiliaceum~~  
Pritchardia pacifica  
Mucuna gigantea  
Mucuna urens  
? ~~Atocasia macrocarpa~~  
? ~~Colocasia esculentum~~  
? ~~Tagetes erecta Linn.~~  
~~Allium fistulosum Linn~~  
~~Boehmeria nivea (Linn)~~  
~~Hibiscus schizopetalus~~  
~~Brassica rapa~~  
~~Daucus carota~~  
~~Brassica oleracea~~  
~~Beta vulgaris~~  
~~Solanum tuberosum~~  
Hematoxylon campechianum  
~~Aleurites moluccana~~ - the candlestick (Linn 1903)  
Entada scandens  
Dioclea altissima  
Caesalpinia erista  
(Gossypium tomentosum - see Linn 1963)

Pacific Vegetation Survey Files

1. Discussion of Voyda and Rappaport: "Aspect of Man's Influence upon Island Ecosystems.
2. Ellis, Albert F., 1936, Sydney Adventuring in Coral Seas. (copy of article)

"Hull Island

Land plants: Abundance of wild portulaca (pigweed)

Vegetation: About 20,000 coconuts landed there in 1887, to be planted.

3. Baker Island

Vegetation: " - in our time there was not a single tree on it. The largest bushes were only about three feet high, and even these were not plentiful." p. 19.

Howland Island:

Land plants: Wild portulaca.

Vegetation: "In the center there is a clump of scrubby trees about fifteen feet in height and covering an area of several acres;" p. 20

Author's party planted several thousand coconuts. Reported to have since died in drought period.

Canton Island:

Vegetation: no trees except "a single fair-sized coconut palm at the eastern end,--" p. 53. Sole survivor of many planted by Arundil Co.

Sydney Island:

Vegetation: Coconuts planted by the phosphate Co. have done well.

## Gardner Island:

Vegetation: Planted in coconuts by the Arundel Co. Hull, Sydney, and Gardner: Well wooded.

Enderbury, Phoenix, McLean, Birnie:

Vegetation: Coconuts planted on Enderbury but did not do well;

"several clumps of stunted bushes" on it; the three others treeless.

3. Groves 1951 (abstr. F. R. Fosberg)
  4. The Phoenix Islands from Luke, Sir Harry. From a South Seas Diary, 1938-1942. London: Nicholson and Watson, 1945. 255 pp.  
(general information)
  5. Abstract Univ. of Iowa Studies in Natural History Vol. B 1929-31 (Geology)
  6. Laxton 1951 pp. 134-160 (mainly account of visit to Gardner Jan. 1, 1949). (General Information)
  7. Hutchinson, Evelyn G.: The Geo Biochemistry of Phosphorus, from The Biology of Phosphorus, Mich. State College Press, 1959. pp. 21-29. (Geology)
  8. Von Zwaluvenburg, R. H., Notes on the Temporary Establishment of Insect and Plant Species on Canton Island. Hawaiian Pl. Reç. XLVI 2:1942
- H. O. NO. W-270 Weather Summary for Naval Air Pilot Central Pacific Hawaiian islands Area
- U. S. N. Dept. Hydrographic Office (Climate of Midway, Line Island, Howland) Upper winds of Canton, Howland, Jarvis, Midway.

## 15 d. Baker

1. Exerpts on Baker from "Life on a Guano Island", Nautical Magazine, 39: 113-118, 1870. London: Suspink Marshall, and Co., 1870.
2. Ellis, Albert F., 1936 Adventuring in Coral Seas  
See: Canton, Sydney, Gardner, Phoenix
3. Baker Island in American Polynesia by Bryan, Edwin H. Jr., Honolulu, Tongg Publishing Company, 1942. examples on Baker.

## 15 d Birnie

1. Birnie Island-quatation from Dona, James D. "Structure of Coral Islands", Geology, U. S. Exploring Expedition, Vol. 10, p. 69, 1849 (slight member .....
2. Dona, James D. "Coral Islands", Am. Journal of Science 1851 a, Vol. 12: 25-51. (second series).

"Distinguished no vegetation except the low purslone and some trailing plants."

3. Excerpt from Birnie Island in American Polynesia by Bryan, E. H., Jr., Honolulu, Tongg Publishing Company, 1942. mentions vegetation.
4. Groves 1951 (Abstract F. R. Fosberg)'
  - p. 4 Enderbury Island - "Low, flat terrain is dotted here and there with clumps of trees thickets" uninhabited
  - p. 5 Sydney Island "50 coconut palms"
  - p. 9 Birnie Island uninhabited; little vegetation
  - p. 10 Jarvis Island "Treeless, with heavy sea bird population; - "
  - p. 10 Christmas Island - 1200 acres in coconuts.
  - p. 13 Palmyra Island - "As a result of the abundant rainfall the vegetation is luxuriant."



p. 15 Kingmen Reef - "there is on islet about twenty-five feet square with a few seedling coconut palms planted by the ship's crew on a previous trip."

15 d. Canton

1. Regene, O. and I. Degener, 1955, Canton Island, South Pacific, Atoll Research Bulletin No. 41
2. photos, letter, manuscript: Hatheway, W. H. and Garrison Costar, The Natural Vegetation of Canton Island, Phoenix Group, Pacific Ocean. also Local Climatological Summary Canton Island, South Pacific U. S. Dept. of Commerce, Compiled under the direction of James H. Fellgren San Francisco: 1951.
3. Photos by L. P. Schvetz Phoenix and Samoa Island April - July 1939. Canton - Sida, Portulaca, Cordia, Lepturus.
4. Murphy, R. C., Niedrach, R. J., and A. M. Barley, Museum Pictorial No. 16. Denver Museum of Nat. History, Denver, Colorado, 1954.
3. Buddle, G. A. Rec. Auckl. Mus. 2: 125-132, 1938 Notes of Birds on Canton Island (a few vegetation notes),
4. Henry, T. R., 1957, Washington Evening Star Wed. July 17 Victor in Science.
5. V. S. D. Commerce Weather Bureau Local Climatological Data with Comparative Data 1957 Canton Island, South Pacific.
6. Canton Island soil samples collected by Degener, Degener and Alexander, Feb. 12, 1958. Samples Nos. 1-9. list of analyzed soils.
7. Report on Referred Fossils, P. and S. Branch U. S. Geological Survey 338 U. S. National Museum Washington 25, D. C.  
recent fossil Foraminifera from Canton.
- 8,9,10. U. S. Dept

- 8,9,10. U. S. Dept of Commerce Weather Bureau Local Climatological  
Data with Comparative Data 1956, 1955, 1954.
11. List of Marine Shells Collected by Otto Degener on Canton Island  
Just vegetation references from here on in file
12. Hatheway, W. H., Degener, O., and Carrison Loster, the Natural  
vegetation of Canton Island, Phoenix Group, Pacific Ocean Manuscript  
N.B.13. List of plants Canton Island Collection, 1949, F. R. Fosberg and  
Collection members.  
vegetation
14. Bryan, E. H., Jr., 1942, Canton Island in America Polynesia, Honolulu,  
Tongg Publishing Company
15. Ellis, A. F., 1936, Adventuring in Coral Seas, Sydney, Australia  
excerpts.
16. Degener, O. and W. Hatheway (Honolulu, Hawaii) Die Flora Des  
Canton Atolls IM STILLEN OZEAN, Revista Sudam. Bot. 10 (2): 33-37, 1952.
17. Von Zwaluwenburg, R. H., notes on the Temporary Establishment of  
Insect and Plant Species on Canton Island, Hawaiian Pl. Rec. XLVI  
2: 1942. pp. 49-52.
18. Von Zwaluwenburg, R. H., Canton Island, Hawaiian Pl. Rec. XLVI: 1941.  
pp. 15-23.
19. Copy of letter J. P. Swallen Apr. 16, 1951 to O. Degener - list of  
plant identifications  
(see below)

In list is Degener 21291 *Lepturus repens* (Forst.) R. Br.

Degener 21311       "       "       "       "

Swallen comments: " The two specimens of *Lepturus repens* do look very  
different. If this species were known only from a few specimens,

I would be inclined to think that these two represented distinct species. Considering the large amount of material we have, however, and the great variation which is evident, I feel that it is impossible to segregate any species. Almost every collection seems to differ from the rest. Also mentions Digitaria variation and meager collection.

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Canton Island      Photos by Hatheway

Canton Island 1950 to 1951 by Hatheway (just prints) Messerschmidia, Cordia, Scaevola frutescens, Suriana maritima, Portulaca lutea - (dates and area in general - not exact compass) Sida fallax, Lepturus repens, Boerhavia tetrandra, Truinmfetta. Pictures of birds in vegetation

d

get Hatheway's address

15 d Christmas

1. Abstract Benson, 1838.

pp. 66. "The land is extremely low, and composed entirely of sand with only a few bushes and small trees.....on the western parts there are some scattering groups of coconut trees...." about 2000 in all.  
pp. 67 Benson planted nuts on the south side and found 7 sprouted before leaving the island.

2. Abstract from Tresilion, F. H. Remarks on Christmas Island Hawaiian Spect. 1: 1838. mention of coconuts on island.

3. Fosberg Field notes 1934 Christmas Island mention: Pandanus, Puka, Guettarda, Cocnut, Bunchgrass, Scaevola, Tournefortia, Sida,

(yard bird notes too!)

pp. 4 mentioning colors of ponds

"One here is bright blue-green, while 50 meters away is one with the color of bright brick red. The red color is due to a gelatinous water plant growing in a thick layer all over the bottom."

-did not visit the south coast and south eastern peninsula of the island,  
-check with Chock. note--neither did Chick and Hamilton.

4. Fosberg Field notes August 1936 Christmas Island

Motu Topu - Pisonia, Messerschmidia, Sariana, Heliotropium, Sida fallax, Lepturus repens, Portulaca lutea, Boerhavia, Eragrostis, Hedyotis romangoffiensis, Scaevola frutescens mention of dried vegetation - fluctuations in growth due to climatic factor.

Four Brothers.

Heliotropium	abutilons	description of vegetational
Portulaca	Lepturus	associations.
Messerschmidia	Sarrain	
Sida		
Boerhavia		

"Two types of Boerhavia, or perhaps three were seen. One has hairy leaves with wavy margins, and dense heads of flowers. (Check tetrandra in shade? (sp. repens) or sp. viscosa (in galapagos))

F. R. Fosberg. The other has glabrous leaves, with entire margins, and looser heads. Another, perhaps the same as the last forms much coarser growth and larger mats, and has white flowers."

same plant      1. flr. and fruit in flower and  
                  2. nodes with lenes

differa - ascending pariculate, diffre in floves cerces.

Greigs grove (extreme part)

Chlorrtic coconuts, Lepturus, Scaevola, Portulaca,

Northwest Point - Lepturus, Sida, Heliotropium, Portulaca, Boerhavia,  
Messerschmidia.

Paris, Aug. 28, 1936

Palms quite yellow

Heliotropium      Messerschmidia

Lepturus      Hedyotes romonzoffiensis not seen

Surrina      Portulaca oleraceae      observed no hylinds

Scaevola      P. lutea

Eyphorbia hirta (weed); Hibiscer tiliaceus, Phaesobus

lathyroides

Motu Upon

many dead coconuts.

Heliotropium    Boerhaavia    Cassytha filiformis

Anamahen var. mediotis

Messerschmidia Suriana

argentea

Scaevola      Erogrsotis

furtescens

Sida      Cocos

Lepturus repens    Portulaca lutea

5. Groves 1951 - (Abstract. F. R. Fosberg)

p. 10 Christmas Island - 1200 acres in coconuts.

6. Bryan, Edwin H. Jr., Christmas Island in American Polynesia, (excerpts)

p. 137, 138, 140.

7. Abstract Bennett, F. D. 1840 Vol. 1

ps. 383 referes to Cook Islet "no vegetation except a few littoral herbssand 2 - 3 groups of stunted trees." p. 384, 385, 386, 387, 388.

15d Enderubyr

1. Dona, James. D. "Coral Islands, Structur of, " Geology, U. S. Exploring Expedition, Vol. 10, p. 64, 1849.

pp. 64.

2. Dona, James D., "Coral Islands", Am. Journal of Science 1851 a, Vol. 12: 25-51. (second series) pp. 43 "little vegetation on any part, and but a few trees."

3. Excerpts: Bryan, E. H., Jr., American Polynesia, Honolulu, Tongg Publsihing Company, 1942

p. 50 Sesuvium bontree

Sida tree heliotrope

morning glory vines

"several small clumps of trees"

Coconut palms

4. Groves 1951 (Abstract. F. R. Fosberg)

Enderbury Island - "low, flat terrain is dotted her and there with clumps of trees and thickets"

5. Photos by L. P. Schultz Phoenix and Somoa Islands

April - July, 1939 - 8 prints only, no negatives, showing birds and vegetation

## Fanning

1. Quatations Fanning, Captain Edmund. Voyages and Discoveries in the South Seas, 1792-1832. Mass.: Marine Research Society, 1924. 335 p.
2. Quatations Herms, William B. "Doocalandra Taitensis (Guerin) and other Coconut Pests of Fanning and Washington Islands," The Philippine Journal of Science, Vol. 30, May to August, 1926 - Manila : Bureau of Printing, 1926. Pp. 243-271.

## General vegetation climate

3. Bryan, E. H., Jr., American Polynesia, Honolulu, Tongg Pubilshing Company, 1942.

## Excerpts p 142

"The land is thickly covered with coconut palms and the remainss of native bush. These reach a height of 60 to 90 feet, making the island visible from the deck of the vessel at about 10miles.

"The beach is backed by ...."mentions Scaevola, tree heliotrope, Pisonia, Pondanus, bunchgrass, purslone, morning glory vines and low herbs and shrubs. The soil is fertile and breadfruit, bananas, figs, pineaples, taro and arrowroot grow readily.

## 15 d Gardner

1. Laxton, P. B., Nikamarono, Vol. 60, Nos 2 and 3, 1951, the Journal of Polynesian Society, Wellington, N. 2.
- pp. 143 - Pisonia, Tournefortia, Scaevola, Cordia, merinda
- pp. 147 - Sida
- pp. 150 buta trees
- pp. 151 Cordia

2. Bryon, E. H. Jr, 1942 American Polynesia Tongg Publishing Company, Honolulu.

p, 70 Pisonia, Cordia, Tournefortia "and other species characteristics of central Pacific Islands."

3. Ellis, Albert F., 1936, Adventuring in Coral Seas, Sydney Vegetation: Coconuts planted on Enderbury but did not do well; "several clumps of stunted bushes" on it;

15 d Howland

1. Excerpts Bryan, E. H. Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu.

p. 39 "only six species of plants were found on Howland, prior to its recent occupation. Lepturus bunchgrass, Boerhavia herb, and two kinds of purslone or pigweed (Portulaca lutea and oleraceae) dominate the surface. There are scattered patches of Tribulus, and a few small clumps of scrubby kon trees (Cordia), apparently more dead than alive, due to the dryness and nesting birds."

15 d Hull

1. Excerpt Bryan, E. H., Jr., American Polynesia, Tongg Publishing Company, Honolulu.

p. 64 Coconuts, Pisonia (50 feet)  
(75-80 feet)

2. Photo prints by L. P. Shultz Phoenix and Samoa Islands

April - July 1939 (No. 55-85).

Pictures of beach rock vegetation, Sooty Terns, No. 66-good tree shots,  
nesting birds

No. 71

76. Red-footed Booby on nest

84-85 Red-tailed Tropicbird

on stones under tree



1. Dona, James D. "Coral Islands", Am. Journal of Science 1851 a,  
Vol. 12: 25-51 (second series).

pp. 41 - "without trees, and partly covered with small shrubs."

2. Dona, James D. "Coral Islands, Structure of", Geology, U. S.  
Exploring Expedition, Vol. 10, p. 68, 1849.

p. 68 - 11 - without trees, and partly covered with small shrubs."

3. Abstract Bennet, F. D., 1840.

Vol. 1 388 - and destitute of vegetation."

Excerpts

4. Bryan, E. H., Jr., American Polynesia, Honolulu, Tongg Publishing  
Co., 1942.

134-135 "In 1938, etc. - Sesuvium, Portulaca mentioned.

Lepturus, Tribulus, Eragrostis, Abutilon, Boerhaavia and Sida.

15 d Kingman Reef

1. Groves 1951 (Abstract. F. R. Fosberg)

p 15 "there is an islet about 25 feet square with a few seedlings coconut  
palms planted by the ships crew on a previous trip."

2. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co.  
Honolulu

p. 153 "there is no land flora. Some coconut palms, planted in 1924, were  
still alive in 1926, but it is not know if they have survived."

15 d Malden Island

1. Bryan, E. H., Jr., 1952, American Polynesia, Tongg Publishing Company,  
Honolulu.

p. 133 "Coconuts, planted by the guano diggers, grew for a few years and  
then died."

## 15 d. McKean Island

1. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publshing Co., Honolulu

"There are not trees on McKean, the vegetation consisting of such low buk is Portulaca, Sesuvium and Lepturus bunchgrass.

## 15 d Monihiki (Tangareva)

1. Linton, A Murroy. "Notes on the Vegetation on Penrhyn and Monihiki Islands," The Journal of the Polynesian Society 42: 300-307. 1933.  
pp. 300-307 "of about 28 different species of native plants and a considerable number of imported varieties." Mentions: Cultivated trees, birds "take possession" of islands guano bills coconuts, these replaced by puka, fono and taumanu native names of trees used - uses enumerated.

- p. 306 mentions:
1. Fleurya interrupta Gand.
  2. Triumfetta procumbens Forst.
  3. Lepturus repens [(Forst)] R. Br.

p. 307 2 types of fern "maue", "rakotahu"; Holimeda incrossata Lem.  
Caulerpa cupressoides, Turbinana ornatu.

2. Bryan, E. H., jr., 1942, American Polynesia, Tongg Publishing Co. Honolulu

p. 102 Cordia, Guetarda, Calaphyllum, Tournefortia mentioned as being much depleted. Pisonia is holding its own.

## 15 d Palmerston file

## Palmyra (list)

1. Lichens of Palmyra Atoll collected by E. Yale Dawson Identified by Mason E. Hale. Bacidia sp

Coll. Nos 19812-19817, 19858 Anthracothecium  
 ochraceoflora (Nyl.) Mill. Aig.  
 Antracothecuim  
 libricolum (Fee) Mill. Aig.

2. Plants of Palmyra Atoll collected by E. Yale Dawson, determined by  
 F. R. Fosberg Oct. 15-21, 1958 Col. Nos. 19800-19864, (Menge I.,  
 plants of: Straun I., Aviation I., Cooper I. Kaula I., Holei I., Papali I.)

3. Excerpts Bryan, E. H, Jr., 1942, American Polynesia, Tongg  
 Publishing Co., Honolulu.

(scant mention of luxuriant vegetation)

4. Groves 1951 (Abstract F. R. Fosberg) p. 13 "as a result of the abundant  
 rainfall the vegetation is luxuriant."

15 d Phoenix Island

1. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Co.,  
 Honolulu.

p. 54	<u>Lepturus</u> bunchgrass	<u>Sesuvium</u>
	<u>Boerhaavia</u>	<u>Sida</u>
	<u>Portulaca</u>	<u>Triumfetta</u>

15 d. Pukapuka 4 items

15d Rakaharga 3 items

15 d Starbuck

1. Arundel, John R. "The Phoenix Group and other Islands of the  
 Pacific," a paper read at the Geographical Society of the Pacific,  
 San Francisco, 3 March, 1885. Reprintia in the the New Zealand Herald.  
 Pp. (1-2).

(birds and behavior)

"The vegetation of Starbuck is very scanty; about six varieties of plants, the largest a shrub of only about 40 feet in height at the most, and nothing of this can be seen from the sea."

2. Excerpt Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu.

quotes Arundel

15 d. Suvaror 1 item 25 small islets

15 d Sydney

1. Arundel, John R., 1885

(6) - "Clumps of trees" -

2. Dona, James D. "Coral Islands", Am Journal of Science 1851 a, Vol. 12: 25-51. (second series)

"Well wooded nearly all round; but on leeward side the first in patches) - "

3. Excerpt Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company p. 60 Coconuts Geuttarda

Tournefortia Scaeyola

Morinda

<sup>C</sup>  
Dordia " - with the usual low herbs, shrubs, and vines, found on the treeless island." "The bird life is similar to that on the other islands, but less abundant."

4. Ellis, A. F., 1936, Adventuring in Coral Seas, Sydney. Vegetation: Coconuts planted by the phosphate company have done well.

5. Groves 1951, (Abstract. F. R. Fosberg)

Marinda citrifolia

15 d Tongareva Penrhyn Island

1. Bryer, E. H., Jr., 1942, American d Polynesia, Tongg Publishing Co.

Honolulu

p. 102 - "Coconut palms, pandamic and usual low trees."

2. Frisbie, Robert Dean, 1930, "South Seas Fairylands", The Atlantic Monthly 146: 190-202 July-December 1930.

(popular account, scanty mention of vegetation)

15 d Vostok 2 items.

15d Washington

1. Dona, James D. "Structure of Coral Islands," U. S. Exploring Expedition, Vol. 10, p. 70, 1849.

70 "It is a dense coconut grove, with luxuriant shrubbery."

2. Dona, James D. "Coral Islands", Am. Journal of Science 1851 a, Vol. 12; 25-51 (second series)

(same as 1 above)

3. Fanning, Captain Edmund. Voyages and Discoveries in the South Seas, 1792-1832. Mass.: Marine Research Society, 1924. 335 p.

161 - general description on discovery

162 - " " " "

4. Groves 1951 (Abstract F. R. Fosberg)

p. 12 - population enumeration no vegetation mentioned.

15 e Leeward Hawaii Island Atolls 4 items

Box 15 e photo's

a. Kure (Green Island) Septe. 1961 - *Solanum nelsoni*, in patch of 18 total

*Scaevola taccada*.

b. *Scaevola taccada*, *Boerhaavia diffusa*, *Eragrostis variabilis*.

(Prints only)

21 c. Laysan - September 1961  
total

2 d. Pearl and Hermes Reef  
total

15 e Kure

1. Prints - - by Clay 1959  
(good)

- a. Lepiduum congesta R. Br. [I. Indica]
- b. " vivaihiense Cham. E. Schlecht.
- c. Tribulus cistoides L.
- d. Solanum nelsoni Duval
- e. Solonum nigrien L.
- f. Sicyos hispidos HBD.
- g. Scaevola sericea Vahl.
- h. Lipochaeta integrifolia (Nutt.) gray
- i. Bulldozed Runway Oct. 8 1959.
- j. Lepturus repens (Forst.) R. Br.
- k. Eragrostis Whitneyi Fosb. var caumii Fosb.
- l. Eragrostis variabilis (Gaud.) [E. falcata]
- m. Cynodon dactylon (L.) Pers. Stend.
- n. Messerschmidia argentea (L.) Johnston
- o. Pluchea odorata (L.) Cass.
- p. Verbesina encelioides Gray
- q. Casuarina equisetifolia L.
- r. Boerhavia diffusa L.
- s. Ipomoea congesta R. Br. [I. Indica]

2. handwritten - field note - mention 70 monk seals, water table 9' 8" etc.

3. Notes taken on talk by Philip A. DuMont, Jan. 12, 1955. "Green Islet is covered generally by a brushy vegetation, probably *Scaevola frutescens*; some lighter colored spots probably grass; some spots where brush seems dead.

4. Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publshing Co. Honolulu.

p. 204 *Scaevola* "-Kure's flora pf thirteen kinds of grassy area vascular plants."

5. Clay, H. F., (mimeographed report) narrative Report of Botanical Field work on Kure Island, 30 October 1955 to 9 October 1959.

Tanager Expedition April 1923 - 13 species

Clay 1955 - 11 species of original 13 mentioned in the Tanager Report.

*Cenchrus agrimonioides* var. *Loysanensis* and *Achryonthis splendidus* var *reflexa* - disappeared.

Reports 6 new species:

2 Fungi (Unidentified)

*Cynodon dactylon* (L.) Pers.

*Casuarina equisetifolia* L.

*Messerschmidia argentea* (L.) Johnston (photo only)

*Solanum ingrien* L.

(Specimens at H. B. M. and U. S. N. H.)

6. e aerial photos (two vertical, 1 oblique)

information as follows:

a. oblique; Green Island, Kure Atoll - view from Northwest, 1961

Photo 4 official Coast Guard Photograph

Number 14CGD - pr1961-35

Released by United States Coast Guard 14th Coast Guard District Public Information Office POB 4010, Honolulu, T. H.

b. vertical

VU - 1/32p55 (L) - 10-59 Date: 10-3059

Made for: Commander Naval Construction Forces Pacific

Subject: AER

Green Island (Kure Atoll)

Altitude: 12,000 ft.

Before Construction

Date: 10-3-59 Time: 1925

Camera: k-17 12" F. L.

View: Vertical

(Photo after construction is in map case, Hawaiian Atolls).

Photo 2

c. Duplicate of b.

15 e Laysan

1. Dill, Homer R. and W. Alanson Bryan. "Report of an Expedition to Lays Island in 1911 Under the Joint Auspices of the United States Department of Agriculture and the University of Iowa," in U. S. Department of Agriculture Biological Survey Bulletin No. 42, 1912 Pp. 1-30.

10. mentions guinea pigs "in the thick juncus."

2. Dill, Homer R. "The Albatross of Laysan" in the Wilson Bulletin; No. 97, Quarterly Journal of Ornithology, Vol. XVIII, December, 1916, No. 4. Pp. 162.

172 "the higher ground bordering the beach is covered with a rich growth of low bushes and sand grasses, among which are the trailing vines."



3. Notes on talk by Philip A. DuMont, Jan. 12, 1955

Herbaceous vegetation covers about 1/3 total area, bare sand flats 1/3, and lagoon 1/3.

4. Bryan, E. H., 1942, American Polynesia, Tongg Publishing Company, Honolulu.

p. 185 "But so much sand has drifted into this basin, while the island was denuded of vegetation, that now it is probably much shallower."

p. 186 They [the rabbits] ate off much of the green vegetation.

p. 187 [guinea pigs] introduced: "Literally every green leaf on the island was devoured, except the tobacco patch."

15 e. French Frigate Shoals no items

15 e Johnston Island

1. Manuscript (of Doty and Newhouse?) Johnston Island by F. R. Fosberg

pg 3 "Thus it is believed that there are now about sixty-one species of flowering plants growing untended at Johnston Island."

also algae mentioned.

2. letter (Fosberg to Newhouse April 27, 1954)

list of collections: Johnston Island Jan 18, 1950 Aug 14, 1952

Apr. 25, 1950 Oct 20, 1953

Oct. 22, 1951

3 and 4 Fosberg - field notes Oct 22, 1951; Aug. 14, 1952.

5. Christophersen, E., 1931, Vascular Plants of Johnston and Wake Islands, OCC. Pap. Bishop Mus. 9(13): 1-20, 1931.

Lepturus repens

Aleurites moluccana (mit)

Tribulus cistoides

Mucuna (seed)

Boerhaavia diffusa

6. Excerpts Bryan, E. H., Jr., 1942. American Polynesia, Tongg Publishing Company, Honolulu.  
p. 35 Lepturus, Tribulus, Boerhaavia
7. Fosberg, F. R., 1949, Flora of Johnston Island, central Pacific, Pacific Science, Vol. 3, No. 4, Oct. 1949.  
(full list presented)
8. Newhouse, Jan, 1955, Additional Records to the Flora of Johnston Island, Pacific Science. Vol. IX, No. 1, 1955. adds to (7)  
15 e Lisianski
1. Excerpts Bryan, E. H., Jr., 1942, American Polynesia, Tongg Publishing Company, Honolulu p. 194 "--and the vegetation again spreading over its low sand surface - "  
15 e Midway Atoll
1. Neff, Johnson A. and Philip A. DuMont, 1955, A Partial List of the Plants of the Midway Island, Atoll Research Bulletin No. 45, August 15.  
(also in manuscript found).
2. List of principal references on the flora of the Midway Islands.
3. Midway Island (Sand Islet) vegetation and flora - notes copied from field notebook for Feb. 13, 1954 - F. R. Fosberg. (list of observation and collections with numbers.).
4. Fosberg field notes 1951-2.  
July 16 - Midway Island - sight records  
trees (Casuarina and Terminalia)
5. Excerpts: Bryan, E. H., Jr. , 1942, American Polynesia, Tongg Publishing Company, Honolulu.  
p. 202 Ammophila arenaria  
Casuarina equisetifolia

6. Bryan, W. A., 1905, Report of a Visit to Midway Island, Bishop Mus  
Occ. Pap. 2: No. 4; 291-299.

A few hardy shrubs and grass"

Mentions: Cerrchrus calyculatus cav.

Boerhaavia tetrandra Forst.

"a variety near Lepiduien oahuensis Cha. I. Schl."

Capparis sandwichiona D. C.

Ipomeae insularis Stend.

Scaevola keenigii Vahl.

Tribulus cistoides Lim. "In additon to the above are

Eragrostis cynosuroides (Retz.) three widely distributed

beach plants, two of which are grasses that are as yet undetermined."

- 75 e Hadden, F. C. H. 1941; Midway Islands, Reprint from The Hawaiian  
Planters' Record, Vol. XLV, No. 3, 1941.

15 e Pearl and Hermes Reef.

1. Notes taken on talk by Philip A. DuMont, Jan, 12, 1955 Southeast  
Islet has green herbaceous vegetation; - North Islet, green  
herbaceous vegetation.

Excerpts

2. Bryan, E. H., Jr. 1942, American Polynesia, Tongg Publishing Company,  
Honolulu.

p. 198 Casuarina planted in 1928

3 norther islands - "supporting only bunchgrass and low herb."

North Island - "although larger, had on it only the same kinds of  
plants, eleven species in all."

"The sand bards were bare of vegetation, and appeared to be constantly  
shifting their position under the action of wind and wave."

Vascular plants recorded from Fanning Island

by C. R. Long

Sixty-eight species of vascular plants are recorded for Fanning Island. One moss and three lichens are included. Collections of vascular plants, lichens and mosses have been made by the following: S.C. Ball, July, August 1922; E. Christopherson, July 1922, 1924; G. P. Wilder, December 1924; F. R. Fosberg, April 1934; H. St. John and F. R. Fosberg, April 1934; H. St. John, April 1934; F. C. Sibley and L. N. Huber, July 1965; and C. R. Long, July 1965. A plus mark indicates that the species is introduced.

Lichenes

Anthracothecium palmarum (Krmplhbr.) Mull.\*

Long 3593 (UH). An orange thallus lichen found on a branch of Tournefortia argentea. This species is common on the trunks of Cocos.

Physcia crispa (Pers.) Nyl.

Long 3595 (UH). Found on the branch of Tournefortia.

Pyxine Copelandii Vainio

Long 3593 (UH). Collected with Anthracothecium on Tournefortia.

Musci

Calymperes tenerum C.M.\*\*

Long 3598 (UH). Common on branches of Tournefortia and on Cocos trunks.

Filices

Polypodiaceae

Polypodium scolopendria Burm. f.

Ball 6 (BISH), Christophersen 19 (BISH), Long 3523, 3549 (UH). This species forms a groundcover with Lepturus under the older Tournefortia stands, and is common at the base of Cocos trees within the plantations.

Araucariaceae

Araucaria excelsa (Lamb) R. Br.+

Noted by Christophersen (1927) and observed in 1965 - a tree about 5 m. high. Several smaller trees were observed near the cable station quarters.

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\* Lichens were identified by Prof. C. W. Dodge, Department of Botany, The University of Vermont.

\*\* Identified by Mr. Wm. Hoe, Department of Botany, The University of Hawaii.

## Pandanaceae

### Pandanus sp.+

Long 3524 (UH). This large fruited tree was apparently cultivated at the village on the northeast tip of Teuru Mangaro, to 3.2 m. high, branched, keys with orange-red color at base. The fruit weighed about 45 lbs. This specimen has been given to Prof. Harold St. John for identification. Christophersen (1927) refers to a large fruited specimen which was not collected. He suggested that this might be P. rockii. It is possible that a number of species are present some of which may have been imported from the Gilbert Islands. This tree was the only specimen observed on Fanning Island which was bearing fruits. Several informants confirmed the use of this tree as a source of food. Pandanus hermsianus Mart was established on the basis of a single phalange from the beach on Fanning Island (see Martelli, 1926).

## Gramineae

### Cenchrus echinatus L.+

St. John and Fosberg 14117 (BISH). This weed was observed in numerous disturbed sites in 1965.

### Cynodon dactylon (L.) Pers.+

Mentioned by Merrill (1925) as having been collected by Herms and Kirby. This species was used for lawns around the homes of the cable compound. It did not appear to be spreading into other areas in 1965.

### Eleusine indica (L.) Gaertn.+

Fosberg 11002 (BISH), Long 3537 (UH). Common in disturbed sites.

### Eragrostis whitneyi Fosberg

Sibley and Huber (Long 3507). Collected in the vicinity of Val Topu in a sandy depression on the lagoon side of the islet. This small grass occurs on Christmas Island, in the Phoenix Group and one collection has been made from the Gilbert Islands.

### Lepturus repens (Forst.) R. Br.

Ball 7 (BISH), Wilder 1 (BISH), Christophersen 18 (BISH), Long 3506, 3510, 3538, 3553, 3571 (UH). Common in sandy soils over the atoll. This species forms thick swales under open Tournefortia and Cocos groves.

### Stenotaphrum secundatum (Walt.) Ktze.+

Long 3581 (UH). This species was used as a lawn grass in the cable station compound and appears to be spreading moderately into adjacent open sites.

## Cyperaceae

### Fimbristylis cymosa R. Br.

Wilder 3 (BISH), Christophersen 17 (BISH) as F. spathacea, Ball 8 (BISH) as F. spathacea, Long 3512, 3514, 3552 (UH). This sedge was found on both the northwest and south island probably spreading into open sites from the settlement at English Harbour and at the cable station.

## Palmae

### Cocos nucifera L.

Long 3552, 3569 (UH). Christophersen (1927) mentioned the figure of 350,000 trees. According to Mr. Philip Palmer the resident manager for the

Burns, Philp Co. Ltd. the number of trees is about the same. Fallen fruits sprout readily and old or fallen trees are replaced easily. Some natural areas with Tournefortia and Pisonia have been left comparatively untouched although these sites would support Cocos plantations.

#### Araceae

Cyrtosperma chamissonis (Schott.) Merr. +

Long 3502 (UH). This species is cultivated in tin drums as a source of food. Two other distinct cultivated aroids probably Alcocasia and Colocasia were also observed in the village at English Harbour. An informant indicated that the Cyrtosperma is preferred and easily cultivated.

#### Liliaceae

Gloriosa rothchildiana O'Brien +

Long 3513 (UH). Cultivated in the abandoned cable compound gardens.

#### Amaryllidaceae

Crinum asiaticum L. +

Observed in the garden of the cable station compound and as an ornamental around the village at English Harbour.

#### Taccaceae

Tacca leontopetaloides (L.) O. Ktze. +

Long 3496 (UH). Cultivated in the small settlement near the abandoned cable station and in the village at English Harbour. Used as a food by the Gilbertese but not preferred according to two informants.

#### Musaceae

Musa sapientum L. +

Mentioned by Christophersen (1927). Not observed in 1965.

#### Casuarinaceae

Casuarina equisetifolia L. +

Long 2515 (UH). Mentioned in Christophersen (1927). Two trees to 4 m. observed near the cable station in 1965.

#### Moraceae

Artocarpus altilis (Park.) Fosb. +

Long 3568 (UH). Noted by Christophersen (1927). Trees were observed in the inhabited villages and temporary copra sites on the island. The largest tree was at English Harbour - about 6 m. high. The fruit is highly prized by the Gilbertese for food.

Ficus pumila L. +

Long 3547 (UH). Formerly cultivated in the gardens of the cable station compound. Ficus tinctoria which was expected was not seen in 1965.

Fleurya ruderalis (Forst. f.) Gaud. ex Wedd.  
Ball 10 (BISH), Christophersen 20 (BISH), Long 3521, 3550 (UH).  
Common in the Cocos and Tournefortia groves.

Polygonaceae

Antigonon leptopus H. and A.+  
Long 3498 (UH). Cultivated as an ornamental at English Harbour.

Amaranthaceae

Gomphrena globosa L.+  
Long 3501 (UH). Cultivated as an ornamental at English Harbour.

Nyctaginaceae

Boerhavia sp.  
Ball 5, 16 (BISH) as B. tetrandra, Bergman 11, 78 (BISH), Wilder 2 (BISH), Emory and Gessler s.n. (BISH), Long 3532, 3539, 3548, 3592 (UH).  
Common in sandy soil over the island. This taxon may be referable to B. repens L. The flowers are pinkish-purple.

Bougainvillea spectabilis Willd.+  
Long 3565 (UH). Cultivated as an ornamental in the gardens of the abandoned cable station and at English Harbour.

Pisonia grandis R. Br.  
Wilder s.n. (BISH), St. John and Fosberg 14111 (BISH), Long 3555, 3557 (UH). One large native stand of this species is found on the northwest island. It appears reasonable that the Pisonia forest was at one time of greater extent than at present.

Aizoaceae

Sesuvium portulacastrum var. griseum Deg. and Fosb.  
Long 3533, 3578, 3591 (UH). Mentioned by Merrill (1925) as collected by Herms and Kirby. This species is not abundant.

Portulacaceae

Portulaca lutea Sol.  
Christophersen 22 (BISH), Long 3508, 3535 (UH). This species does not appear to be abundant on either the northwest or south islands.

Lauraceae

Cassytha filiformis L.  
Long 3534, 3575 (UH). Christophersen (1927) mentions this species "in great abundance over Tournefortia trees". Also mentioned by Merrill (1925). This vine was found on Scaevola.

## Cruciferae

### Lepidium bidentatum Mont.

Christophersen 16 (BISH) as L. owaihiense, St. John and Fosberg 14108 (BISH), Long 3554 (UH). Found in open areas adjacent to Cocos groves on the lagoon side of the south island near the east channel. This species is also found on Christmas Island and Caroline Island further south.

## Crassulaceae

### Kalanchoe pinnata (Lam.) Pers. +

Long 3526 (UH). Formerly cultivated as an ornamental in the garden of the cable station compound.

## Leguminosae

### Bauhinia monandra Kurz. +

Long 3513 (UH). A small tree 1.7 m. high growing in the garden of the resident manager's house at English Harbour.

### Cassia occidentalis L. +

Long (UH). Mentioned by Merrill (1925) as having been collected by Herms and Kirby. Four trees to 18 m. in the cable station compound.

### Crotalaria retusa L. +

Long 3516 (UH). A weed found in abandoned site of the cable station compound.

### Desmodium triflorum (L.) DC. +

Mentioned by Merrill (1925) as having been collected by Herms and Kirby. Not seen in 1965.

### Leucaena leucocephala (Lam.) deWit +

Observed in the cable station compound and at English Harbour in 1965.

## Simaroubaceae

### Suriana maritima L.

Mentioned by Streets (1877) but not collected since. Merrill (1925) showed that the account by Streets was very inaccurate and we may presume that Suriana has never been collected from Fanning Island. It does occur on Christmas Island.

## Euphorbiaceae

### Acalypha wilkesiana Muell.-Arg. +

Long 3566 (UH). Noted by Christophersen (1927) and observed in 1965 at the cable station and in English Harbour.

### Euphorbia cyathophora (Murr.) Griseb. +

Long 3518 (UH). Collected from the abandoned garden of the cable compound. It appeared to be naturalizing in adjacent areas.



Codiaeum variegatum var. pictum (Lodd.) Muell.-Arg.<sup>+</sup>

Long 3493 (UH). Formerly cultivated as an ornamental at the cable station.

Euphorbia hirta L. +

Ball 17 (BISH), Long 3542 (UH). Common in disturbed areas.

Euphorbia prostrata Ait. +

Mentioned by Merrill (1925) as having been collected by Herms and Kirby. Not seen in 1965.

Phyllanthus amarus Schum. and Thonn.

Ball 2 (BISH), as P. niruri, Christophersen s.n. (BISH), Long 3544 (UH). Infrequent in Cocos groves or in disturbed sites around the village. A probable introduction.

#### Anacardiaceae

Mangifera indica L.<sup>+</sup>

Mentioned by Christophersen (1927). Several trees were observed in the abandoned cable station compound and at English Harbour.

#### Tiliaceae

Triumfetta procumbens Forst. f.

Ball 13 (BISH). Not found in 1965.

#### Malvaceae

Hibiscus rosa-sinensis L.<sup>+</sup>

Long 3544, 3584 (UH). Mentioned by Christophersen (1927). Grown as an ornamental near the villages.

Malvastrum coromandelianum (L.) Garcke +

Mentioned by Merrill (1925) as having been collected by Herms and Kirby. Not seen in 1965.

Sida fallax Walp.

Ball 15 (BISH), Long 3536, 3556, 3579 (UH). Found at edges of Cocos stands and most often under old Tournefortia fringe vegetation. Present on both the northwest island and south island.

#### Guttiferae

Calophyllum inophyllum L.<sup>+</sup>

Long 3583 (UH). Mentioned by Christophersen (1927). One tree at English Harbour is about 12 m. high. Young trees sprout readily from fallen seeds.

#### Passifloraceae

Passiflora foetida L.<sup>+</sup>

Long 3497 (UH). Formerly cultivated in the garden of the abandoned cable compound.

Labiatae

Oscimum basilicum L.+

St. John 14113 (BISH). Not seen in 1965.

Scrophulariaceae

Russelia equisetiformis Schlecht. and Cham.+

Long 3586 (UH). Cultivated as an ornamental at the cable station.

Bignoniaceae

Spathodea campanulata Beauv.+

Long (UH). Tree to 10 m. in the village at English Harbour.

Rubiaceae

Borreria laevis (Lam.) Griseb.+

St. John and Fosberg 14115 (BISH), Long 3505, 3543 (UH).  
Mentioned by Christophersen (1927). Common in disturbed areas of  
the village and along the roads.

Morinda citrifolia L.+

Long 3545, 3580 (UH). Mentioned by Christophersen (1927).  
Found around the villages. Many of the children were seen eating  
the fruits of this plant.

Goodeniaceae

Scaevola taccada (Gaertn.) Roxb.

Ball 3 (BISH), St. John and Fosberg 14116, 14119 (BISH), Long  
3572, 3590 (UH). Common on the seaward side of the islands forming  
a fringe type vegetation.

Compositae

Gaillardia pulchella Foug.+

Long 3503 (UH). Sparingly naturalized on the south island in  
open areas.

Erigeron albidus (Willd.) A. Gray+

Mentioned by Merrill (1925) as having been collected by Herms and  
Kirby. Not seen in 1965.

Sonchus oleraceus L.+

A questionable record by Ball (see Christophersen, 1927). Not  
seen in 1965.

Synedrella nodiflora (L.) Gaertn.+

Long 3522 (UH). Common in open areas and in Cocos stands.

Vernonia cinerea (L.) Less.+

Long 3573 (UH). Common weed in disturbed sites.

Caricaceae

Carica papaya L.+

Long 3504 (UH). Mentioned in Christophersen (1927). A few plants were seen in 1965. An informant stated that they were of difficult cultivation.

Myrtaceae

Psidium guajava L.+

Mentioned by Christophersen in 1927 and observed near the cable station in 1965.

Araliaceae

Nothopanax guilfoylei (Cogn. and Marsh) Merr.+

Long 3499, 3517 (UH). An ornamental used for hedging.

Polyscias fruticosa (L.) Harmst+

St. John and Fosberg 14114 (BISH). Not collected or seen in 1965.

Convolvulaceae

Ipomoea glaberrima Baj.+

St. John and Fosberg 14120 (BISH). Mentioned by Merrill (1925) as having been collected by Herms and Kirby. Observed growing in tin drums in the village at English Harbour in 1965. Used as a food source.

Ipomoea tuba (Schlecht.) Don.

Long 3540 (UH). Collected on the northwest island in an open area under Tournefortia. Not common.

Boraginaceae

Cordia subcordata Lam.+

Ball 12 (BISH). Several trees were seen near the cable station in 1965.

Heliotropium anomalum H. and A.

Ball 14 (USNM), Christophersen 21 (BISH), Long 3551, 3559, 3576 (UH). Common on mud flats on the lagoon side of the south island.

Tournefortia argentea L. f.

Ball 1 (BISH), Long 3520 (UH). Old open stands were found on the northwest island. In other areas this type of vegetation is confined to the fringe of the island. Often occurs with Pandanus.

Verbenaceae

Clerodendrum inerme (L.) Gaertn.+

Long 3546, 3569, 3570 (UH). Planted near villages and temporary copra camps. Tends to form thickets. Undoubtedly introduced from the Gilbert Islands.

## The Vegetation

The greater portion of the land area of Fanning Island is covered with Cocos plantations. This type of vegetation dominates all of the dry land portions of the south island, the northeast island and about eighty percent of the northwest island. On the latter one finds a Pisonia forest and open clearings with Tournefortia and Pandanus. A rim of Tournefortia and occasional Scaevola is found around the lagoon rim. Scaevola is the usual shrub on the seaward side of the islets with Tournefortia occurring in depressions in back of the beach. Fanning Island is unique in that large areas are covered with silty flats and mounds periodically covered with water at exceptionally high tides. Many of these flats near the periphery of the lagoon or in bays of the lagoon remain dry for long periods and are covered with an association of Heliotropium and Lepturus. Many of these areas are mounded with water channels between. These mounds are often vegetated with Lepturus and Heliotropium especially near the dry shore. Interestingly, the anticipated Sesuvium rarely formed extensive mats in these areas but was common near the shore of the lagoon in those areas where the lagoon waters increased in depth rapidly from the shore. In these situations Sesuvium was found in sandy soil over a coralline hardpan. The roots of the plants are found penetrating into the hardpan. At the edge of the Cocos plantations and under the Cocos, Pisonia and Tournefortia forests the ubiquitous Polypodium scolopendria is common. This species is found on most of the wet islands of the Pacific and usually, but not in this case, with Asplenium nidus. This fern is also found on Palmyra and Washington Islands in the Line Group.

Several weedy grasses were found on the island particularly around the settlement and spreading to the roads and disturbed areas of the Cocos plantations. The most commonly encountered species in this group is Eragrostis tenella. Also common on the south and northwest island are Cenchrus echinatus and Stenotaphrum secundatum. The latter is especially common near the settlement on the northwest island and was probably introduced as a lawn grass. Two native grasses occur on the island: Eragrostis whitneyi and Lepturus repens. The Lepturus is a common groundcover under the Cocos groves, along paths and near the lagoon in openings with sandy soil. Many clumps in the latter situation were observed with stolons and many areas appeared to have derived their covering of this species from one initial clump. Eragrostis whitneyi was found growing in sand in a lagoon side depression on the northeast island. It was plentiful locally but was not discovered on the other two large islets after a careful search. This distribution is curious in light of the fact that so much of the peripheral areas of the larger islets of the atoll are suitable to this species. Another striking instance of the local distribution of this species was found on Sydney Island in the Phoenix Group confined to saline encrusted sandspits of the central lagoon not more than 2.8 dm. above the water level of the lagoon and in association with Sesuvium portulacastrum. It appeared that these small spits had been inundated by waves carrying a saline froth. Salt encrusted both species of plants and the Eragrostis was found in many instances encrusted with a layer of dried salt and algal debris. To date this unique species has been found in the Phoenix, Line and Hawaiian Leeward Islands. One collection is also extant from Onotoa in the Gilbert Islands.

Fimbristylis cymosa is common on the south and northwest islands particularly under the Cocos groves and in disturbed sites. It is difficult to say whether this species is native or introduced. The first collection was made in 1924. The succulent herb Fleurya ruderalis is commonly found in sand in open areas or within the Cocos and Pisonia groves. In the more mesic environments this species tends to grow taller and less compact than those plants in open situations. Another common herb with trailing stems and pink flowers, Boerhavia species, is found over the island usually in open, sandy sites. The specimens which were collected earlier in this century have been referred to B. tetrandra and B. diffusa var. tetrandra. Recently another epithet has been used for the Boerhavia found on Christmas Island - Boerhavia repens (see Chock, and Hamilton, 1962) One of the most important species of the native vegetation is Pisonia grandis. A large stand of this species is found in the middle portion of the northwest island. Trees in this grove are approximately 11 m. high forming the usual thick canopy with dense shade beneath. Away from the road inside the stand no other species were found. A thick litter layer and numerous sprouts from fallen trunks were observed. Along the road which cuts through the forest Boerhavia and Fleurya were common. In wide, open spaces and near the north end of the stand where Tournefortia is encountered Pandanus is found. Beneath the Pisonia stand the characteristic phosphatization was found. In the upper layers the sandy soils had been cemented together. This type of semi-hard rock gave way to a light colored hard rock about 3 dm. below the humus layer (which is very thin, perhaps no more than 2-3 cm. deep in a Pisonia forest).

Sesuvium portulacastrum var. griseum was found sparingly distributed along the lagoon side of the northwest island in sand over a moist coralline hardpan. This species was not as numerous or as common as had been expected probably because the large peripheral areas along the edge of the lagoon are subject to inundation and wave washing. The sites which are suitable for this species occur extensively on smaller islands with enclosed lagoons. On larger atolls with many islets and channels this species is never found forming large mats except in curved areas along the lagoon which have been silted in and which are not subject to displacement. One species most commonly anticipated on low, coral islets, Portulaca lutea, is not common on Fanning Island. There appear to be many suitable sites for this species. It may be that the rat population utilizes this plant as a source of food. The few plants which have been collected were found in open Cocos groves. The common Pacific dodder Cassytha filiformis was occasionally found parasitizing Scaevola or Sida. It was not found on the extensive areas of Heliotropium as on Christmas Island. Lepidium bidentatum was found on the south island among the Cocos groves. It was not abundant. It has been collected from the northwest island and occurs on Washington and Christmas Islands in the Line Group and was also collected on Tongareva and Caroline Atolls further south.

A collection of Triumfetta was made in 1922 by S. C. Ball from "near cable station". This species was not found on any of the islets in 1965. This species is highly sporadic in distribution in the central Pacific and is frequently lacking on islands which appear to provide extensive areas of suitable habitat. Sida fallax was found on the south and northwest island in open Cocos groves, under Tournefortia forest and in disturbed sites along roadways and in clearings. It is not abundant in any area. The leaf shape and large size (to 1.2m.) of those specimens encountered varies markedly

from the specimens from the drier islands. Ipomoea tuba was collected in 1934 from Vai Tepu on the lagoon side of the northeast island "climbing high over trees". A second collection was made on the northwest island in 1965 near the roadside. In this case the vine was also climbing over Tournefortia trees. This vine is not common and has always appeared sparsely distributed on any given island. A specimen of Cordia subcordata was collected in 1922 presumably from the area of the Cable Station. It is doubtful if this species is native to the island since the only trees found are near a disturbed site where much planting has been carried out. No evidence of this tree was seen in natural areas in 1965. Several trees are found on Washington Island but these are known to have been planted at the settlement. Native stands of Cordia have been found on Howland and Sydney Islands in the Phoenix Group. One of the commonest herbs on Fanning Island is Heliotropium anomalum var. mediale which is found on open sandy areas and dry mounds of silted mud flats.

Tournefortia argentea open scrub forests remain on the north portion of the northwest island and in small stands along the lagoon on the south island. This species tends to reach tree size - up to about 6.2 m. high. It is probable that much of the original land area not covered by Cocos and Pisonia was occupied by this open scrub forest. A similar area is found on the east end of Palmyra Atoll. This forest type may be transitional to a Pisonia "climax" type of vegetation. It seems probable that Pisonia is a climax forest on the wet central Pacific atolls and that the extensive stands of other forest and scrub associations is due to either aridity or storm damage. Once a Pisonia forest is established the tendency is for a solid stand to cover an islet from beach to lagoon. Scaevola taccada is found along the beach over coral rubble and along the lagoon shore. It forms extensive thickets along the wide wave built coral terraces along the southeast side of the south island. It is usually more common on the seaward side of the islets. In some windy areas the Scaevola is sheared and often found growing very low and in the lee of coral boulders or piles of coral rubble. This species is important in ecological considerations of coral atolls for several reasons. Among these is the habit of the plant to invade coral rubble waverows laid by high wave action; the accumulation of vegetable humus in the soil which forms from sand and coral gravel under such stands; and, the break formed around extensive areas by the solid stands of this shrub which blocks salt spray. In addition there is the factor of anchoring the substrates during high wave action. In such cases the soils are often washed away and roots exposed but the Scaevola quickly recovers on such devastated areas. Such an effect can be very important when considering the small areas of atoll islets and the importance of anchoring substrates during storm action if the land area is to be retained. This can be very important in the case of Cocos plantations which are extremely vulnerable to storm damage.

A number of species have been introduced to Fanning Island as ornamentals or food plants: Nothopanax guilfoylei, Gomphrena globosa, Passiflora foetida, Gloriosa rothchildiana, Spathodea campanulata, Antigonon leptopus, Ficus carica, Bauhinia monandra, Crotolaria retusa, Cyrtosperma chamissonis, Rhoeo discolor, Tacca leontopetaloides, Casuarina equisetifolia, Artocarpus altilis, Kalanchoe pinnata, Acalypha wilkesiana, Codiaeum variegatum, Euphorbia cyathophora, Hibiscus rosa-sinensis, Calophyllum inophyllum, Carica papaya, Cordia subcordata, Clerodendrum inerme, Oscimum basilicum, Russelia

equisetiformis, Morinda citrifolia, and Gaillardia pulchella. Accidental weed introductions include: Euphorbia hirta, Phyllanthus amarus, Borreria laevis, Synedrella nodiflora and Vernonia cinerea.

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On the flora of Fanning and Washington islands. Note: All references to this manuscript are fide Christophersen. No trace of Merrill's manuscript can be found in the Bishop Museum in 1965. The card file prepared by Prof. Merrill for a proposed flora of Polynesia is extant at the Pacific Science Information Center at the B. P. Bishop Museum. This file contains the information (Merrill gathered and later quoted) in Christophersen's paper concerning the collections by Streets, and , Herms and Kirby.



## Vegetation

Although numerous parties have stopped at Necker, visits were brief and few botanical collections were made. La Perouse, who was the first to mention the vegetation of the island, stated that in 1786 "It [did] not exhibit a single tree, but there [was] a great deal of grass near the summit" (La Perouse, 1799). Both Captain John Paty (1857:40) and the annexation party who visited Necker in 1857 and 1894 respectively also noted patches of grass.<sup>1</sup> Fisher (1903a:777) of the Albatross Expedition gave a slightly more detailed description of the vegetation:

The wider shelves of the island are sparsely covered with a flesh-stemmed, yellow-flowered portulaca (Portulaca lutea), and the summit is rather plentifully grown over with Chenopodium sandwicheum bushes, on which large colonies of Sula piscator [Red-footed Booby] and Fregata aquila [Great Frigatebird] were nesting at the time of our visit.

Elschner (1915:16) briefly mentions the vegetation as being "slight... and this...[is found] in higher, more flat parts of the island while the lower parts of the vertical walls and the shore rocks are bare." While he alludes to plant collections made--"my time being limited I was unable to gather many plants on this island"--the disposition of the

1. Article in the Hawaiian Star (a Honolulu newspaper), issue of 31 May 1894.

specimens is unknown.

The first comprehensive botanical collections were made by the Tanager expedition in 1923 and 1924. The resulting publication on the vascular flora (Christophersen and Caum, 1931) concurs with all earlier observations in that the vegetation of Necker is described as sparse and inconspicuous. During the 1923 Tanager survey, C. S. Judd, a forester, sowed seed of seven species of plants in the saddle between Flagpole and Summit Hills (Christophersen and Caum, 1931:7; cf. annotated list below). None of these plants were found growing there subsequently.

In comparing past accounts of the vegetation, it appears that the composition has remained fairly constant over the years. Probably, differences can be attributed to the amount of rainfall previous to the visit. The vegetation cover was sparse on recent visits. Plants were restricted primarily to the top of the island, with some intermittently distributed on the natural terraces lower on the side.

Vascular plants have been collected on Necker by the following: J. O. Snyder, May 1902; E. L. Caum, June 1923; E. Christophersen, July 1924; E. Kridler, July 1964; and C. R. Long and J. W. Beardsley, September 1964. The following list notes all species of vascular plants collected from, introduced to, or observed on Necker Island. Three of the five species now growing there, Panicum torridum, Chenopodium oahuense, and Sesbania tomentosa, are native to Hawaii, while the other two are widespread throughout the Pacific islands. Lists of lichens from this island may be found in Magnussen (1942); Tsuda (1966) lists marine algae.

Specimens of the following are deposited in the B. P. Bishop Museum Herbarium (BPBM), the Herbarium of the University of Hawaii (UH), or the U. S. National Museum (USNM).

Gramineae

Panicum torridum Gaud.

Caum 56 (BPBM), Christophersen 10 (BPBM), Kridler 3 (UH), Long 2445, 2450, 2455 (BPBM).

As would be expected, the amount and distribution of this annual grass have varied more than those of the other four phanerogams. Christophersen and Caum (1931:7) report that it was fairly common on the north side of the main island in 1923, but one year later only two clumps were seen. In June 1962 (Kramer and Beardsley, ms.) small tufts were found everywhere on the island's crest, while in August 1968 the grass was found in moderate numbers only, and these primarily on Bowl Hill. This grass was also thought to be most abundant in the vicinity of Bowl Hill in September 1964 and 1966 (BSFW). The short growing period, the rapid wearing of dead tufts by the seabirds and the ease by which the wind can disperse the densely vested spikelets can explain the varied distribution patterns.

Palmae

Livistonia australis

Pritchardia pacifica Wendl.

Pritchardia sp.

Seed sowed in 1923; not found subsequently.

Casuarinaceae

Casuarina equisetifolia L.

Seed sowed in 1923; not found subsequently

Chenopodiaceae

Chenopodium oahuense (Meyen) Aellen

C. sandwicheum Moq. f. microsperma Aellen

Snyder (Albatross Expedition, see Fisher ), Caum 58 (BPBM),  
Christophersen 14 (BPBM), Kridler 2, 5 (UH), Long 2447, 2452, 2454,  
2458 (UH).

Since 1923, at least, it has been the most common plant on Necker. Christophersen and Caum list it as being "abundant on the sloping sides, but rare on the flat top." In August 1968 and on other recent visits Chenopodium formed an almost pure stand in the saddle between Flagpole and Summit Hills (Figure 11); it was abundant on the portion east of this region (Figure 12) but somewhat less common on the tops of the hills than on the sloping sides and the saddle between them. It occurred in small amounts on the top of Flagpole Hill and was rare on both Annexation Hill and Northwest Cape.

Aizoaceae

Sesuvium portulacastrum O.

Caum 93 (BPBM), Christophersen 12 (BPBM), Long 2456 (UH).

The Tanager Expedition members found this species growing within reach of the spray on the southern slopes of Annexation Hill. In September 1966 Sesuvium was most prevalent along the lower elevations

where it would receive spray from the ocean (BSFW). In 1968 Herbst noticed one or two isolated plants on the northeast side of Annexation Hill. The rest of the sparse population was limited primarily to the southern slope near the top of the saddle between Annexation and Flagpole Hills. A similar pattern of distribution was noted by Long in September 1964 (POBSP).

#### Portulacaceae

##### Portulaca lutea Sol.

Gilbert (Albatross Expedition, USNH 594972) (USNM), Caum 59 (BPBM), Christophersen 13 (BPBM), Kridler 4 (UH), Long 2457 (UH).

As in previous reports, Portulaca was common on the flat tops and ledges of the cliffs. In August 1968, except for a rare Chenopodium shrub, it was the only plant growing on Northwest Cape--in cracks and in shallow pockets of soil. Some plants on the summit of Flagpole Hill appeared intermediate between P. lutea and P. oleracea.

#### Leguminosae

##### Haematoxylen campechianum L.

Seeds sowed in 1923; not found subsequently.

##### Sesbania tomentosa H. & A.

Gilbert (USNH 594974) (USNM), Caum 57 (BPBM), Christophersen 11 (BPBM), Kridler 1 (UH), Long 2449, 2451, 2453, 2460 (UH).

Christophersen and Caum observed a few plants along the top of the main part of the island. Kramer (in Kramer and Beardsley, ms.) concurs and adds that it seemed "to be holding its own quite well" in June 1962.

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Kridler (BSFW), Long (POBSP) and Herbst (UH) found this shrub on the tops of all of the hills of the main island and Kridler found a few plants on Northwest Cape in March 1967. Sesbania is evidently more common than Christophersen and Caum indicated.

Euphorbiaceae

Aleurites moluccana L.

Seeds found on the shores of Shark Bay in 1923 (Christophersen and Caum, 1931:7).

Malvaceae

Thespesia populnea (L.) Sd.

Seeds sowed in 1923; not subsequently found.

Solanaceae

Solanum lycopersicum L.

Seeds sowed in 1923; not subsequently found.

Figure Saddle between Summit and Flagpole Hills, looking towards  
Flagpole Hill, August 1968. Note dense growth of Chenopodium.

Photograph by D. Herbst.



Figure                      Saddle between Bowl and Summit Hills, looking  
towards Summit Hill, August 1968. Note Chenopodium and Blue-  
faced Boobies.

Photograph by D. Herbst.

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ILLUSTRATIONS

- Fig. 1. View of Nihoa Island from the south. Miller Valley appears as a white line to the left of the saddle. Miller Peak above it is the highest point on the island; the landing and camping sites are at its base.
- Fig. 2. Miller Peak--the sharp point--as it appears from the saddle. The slight cleft to its right marks the position of Devil Slide. Note the shrub-covered terrain and the precipitous cliffs of the north side of the island.
- Fig. 3. Remains of ancient house terrace in East Palm Valley; vegetation is chiefly Chenopodium shrubs with some Sida.
- Fig. 4. Middle Valley; vegetative cover--typical of the sides of the valleys--consists primarily of 2 to 3 foot tall Sida and Chenopodium shrubs.
- Fig. 5. Low, scrambling Euphorbia shrubs around rock outcroppings along northern cliffs. In the foreground are Chenopodium (left) and Solanum shrubs.
- Fig. 6. Small grove of Pritchardia remota at base of cliff in upper East Palm Valley.
- Fig. 7. Portulaca villosa plant growing from crack in face of stone ledge.
- Fig. 8. Euphorbia celastroides. A variety with the same habit growing in a somewhat similar environment at Kaena Point, Oahu, also were in flower at this time ~~XXXXXX~~, but were leafless.
- Fig. 9. The Solanum nelsoni flowers from Nihoa have a white corolla and purple anthers; those of Moomi Beach, Molokai--~~in my knowledge, the only stand left on the inhabited islands~~--have light-blue petals.

	Nihoa	Necker	French Frigate Shoals	Gardner Pinnacles	Laysan	Lisianski	Pearl and Hermes Reef	Midway	Kure
<i>Polypogon monspeliensis</i> (L.) Desf.								o	
<i>Rhynchelytrum roseum</i> (Nees) Stapf & Hubb								o	
<i>Setaria verticillata</i> (L.) Beauv.			o				o	o	o
<i>Sporobolus virginicus</i> (L.) Kunth					o			o	
<i>Stenotaphrum secundatum</i> (L.) O.Ktze.								o	
CYPERACEAE									
<i>Cyperus alternifolia</i> L.								o	
<i>Cyperus javanicus</i> Houtt.								o	
<i>Cyperus laevigatus</i>					o				
<i>Cyperus pennatifolius</i> var. <i>bryanii</i> Kük.					o				
<i>Cyperus rotundus</i> L.								o	o
<i>Fimbristylis cymosa</i> R.Br.					o			o	
PALMAE									
<i>Cocos nucifera</i> L.			o		o	o	o	o	o
<i>Phoenix</i> sp.								o	
<i>Pritchardia remota</i> Becc.			o						
<i>Pritchardia</i> sp.					o				
COMMELINACEAE									
<i>Commelina diffusa</i> Burm. f.								o	
LILLIACEAE									
<i>Allium fistulosum</i> L.									
AMARYLLIDACEAE									
<i>Agave</i> sp.								o	
<i>Crinum</i> sp.								o	
MUSACEAE									
<i>Musa</i> sp.								o	
CASUARINACEAE									
<i>Casuarina equisetifolia</i> L.			o		o	o	o	o	o

Appendix Table

Annotated list of vascular plants from Pearl and Hermes Reef found in the herbarium of the United States National Museum (USNM), the Bishop Museum (BISH), and the University of Hawaii.

Gramineae

\* Cynodon dactylon (L.) Pers. Specimens only from Southeast Island.

Lamoureux s.n. (UH); Sibley 10 (USNM); Young 115 (UH).

Eragrostis variabilis (Gaud.) Steud. Specimens from Southeast, Grass, and North Islands; known also from Seal Island. Caum 38, 45 (BISH); Lamoureux s.n. (UH); Sibley 5 (USNM); Young 105, 122 (UH); Long 2272, 2285, 2313 (UH).

Lepturus repens (Frost.) R. Br. Specimens from Grass, Little North, North, and Southeast Islands; known from Seal Island. Caum 39, 46 (BISH) as L. repens var. subulatus Fosb.; Lamoureux s.n. (UH); Young 110, 128 (UH); Long 2270 (appears to be var. subulatus Fosb.), 2273, 2274, 2277, 2279, 2292, 2293, 2302, 2311, 2312 (UH).

\* Setaria verticellata (L.) Beauv. Specimens only from Southeast Island; known also from Grass Island. Lamoureux s.n. (BISH); Sibley 12 (USNM); Young 109 (UH); Long 2269 (UH).

Liliaceae

\* Allium sp. Found growing on Southeast Island refuse heap, eradicated March 1963. No specimens collected.

Palmae

\* Cocos sp. Planted in 1928-29 on Southeast Island, all dead or dying in 1930 (Galtsoff, 1933:14). No specimen record.

\* Pritchardia pacifica Wendl. Planted in 1923 on Southeast Island by Tanager Expedition personnel (Gregory, 1924:21). No specimen record.

\* presumably exotic.

Casuarinaceae

\* Casuarina equisetifolia L. Specimen only from Southeast Island; planted in 1963 by U.S. Navy. Young 120 (UH).

Amaranthaceae

Achyranthes splendens var. reflexa Hbd. Specimens from Grass and North Islands; known from Seal Island. Caum 50 (BISH); Wilder 3 (BISH); Lamoureux s.n. (UH); Long 2298 (UH).

Nyctaginaceae

<sup>reher</sup>  
Boerhavia diffusa L. Specimens from Southeast, Grass, Little North, and North Islands; known from Seal Island. Caum 40, 41, 47, 48 (BISH); Galtsoff s.n. (USNM); Lamoureux s.n. (UH); Sibley 3 (USNM); Young 98, 130 (UH); Long 2271, 2291, 2295, 2306, 2307, 2310 (UH).

Aizoaceae

Sesuvium portulacastrum L. Specimens from Southeast and Seal Islands. Caum 43, 55 (BISH); Galtsoff s.n. (USNM); Sibley 7 (USNM); Lamoureux s.n. (UH); Young 100, 103 (UH); Long 2276 (UH).

Portulacaceae

Portulaca lutea Sol. Specimens from Southeast and North Islands. Sibley 9 (USNM); Young 104, 108, 123 (UH); Long 2283 (UH).

<sup>sandwichiana DC.</sup> Capparidaceae

Capparis spinosa var. marina (Jacq.) K. Sch. Specimens only from Seal Island. Wilder 2 (BISH); as C. sandwichiana DC.; Caum 54 (BISH) as C. sandwichiana DC.; Lamoureux s.n. (UH) as C. sandwichiana DC.

Cruciferae

\* Brassica campestris L. Specimens from only Southeast Island; known also at North Island. Sibley 2 (USNM); Young 106, 107, 111, 116 (UH).

\* Coronopus didymus (L.) J. E. Smith. Specimen only from Southeast Island.  
Sibley 8 (USNM).

Lepidium bidentatum var. o-waihense (C. and S.) Fosb. Specimens from Southeast, Grass, and North Islands; known from Seal Island. Caum 51 (BISH); Lamoureux s.n. (UH); Sibley 14 (USNM); Young 99, 124 (UH); Long 2286, 2289, 2299 (UH).

#### Zygophyllaceae

Tribulus cistoides L. Specimens from Grass, Seal, Southeast, Little North, and North Islands. Caum 44 (BISH); Wilder 1 (BISH); Lamoureux s.n. (UH); Sibley 1 (USNM); Young 102, 126 (UH); Long 2268, 2282, 2296, 2305 (UH).

#### Malvaceae

\* Malvastrum coromandelianum (L.) Garcke. Specimen only from Southeast Island. Young 114 (UH).

\* Hibiscus tiliaceus L. Planted in 1923 on Southeast Island by Tanager Expedition personnel (Gregory, 1924:21). No specimen record.

#### Boraginaceae

Tournefortia argentea L. f. Specimens from Grass, Little North, and North Islands. Young 118, 129 (UH); Long 2297, 2300 (UH).

#### Solanaceae

Solanum nelsoni Dunal. Specimens from Grass, Southeast, and North Islands; known also from Seal Island. Caum 49 (BISH); Wilder 5 (BISH); Lamoureux s.n. (UH); Sibley 4 (USNM); Young 101, 125 (UH); Long 2275, 2301 (UH).

Solanum nigrum L. Specimens only from Southeast Island; known also from Grass Island. Sibley 11 (USNM); Young 112 (UH).

Cucurbitaceae

Sicyos hispidus Hbd. Specimens from Southeast, Seal, and North Islands.

Caum 42, 53 (BISH); Wilder 4 (BISH); Lamoureux s.n. (UH); Sibley 6 (USNM) as Cucumis sativus L.; Young 117, 119, 121 (UH), probably S. hispidus; Long 2280, 2303 (UH) probably S. hispidus.

Goodeniaceae

Scaevola taccada (Gaertn.) Roxb. Specimens from Southeast, North, and Grass Islands; known from Seal Island. Caum 52 (BISH); Galtsóff s.n. (USNM); Lamoureux s.n. (UH); Young 97, 127 (UH); Long 2265, 2281, 2287, 2304 (UH).

Compositae

\* Sonchus oleraceus L. Specimens only from Southeast Island. Young 113 (UH); Long 2290 (UH).



St. John, H. 1970. The genus Sicyos (Cucurbitaceae) on the Hawaiian Leeward Islands Hawaiian Plant Studies 35. Pacific Science 24 (4): 439-456

Describes:

- Sicyos laysanensis - from specimens: May 1911, W.A. Bryan; and from almost all recent collections - Laysan & Oahu  
Sicyos nihoaensis - Nihoa (Beardsley, Kramer, & Yen Spec.)  
Sicyos atollensis - Ocean (= Kure), & Laysan  
Sicyos caunii - Pearl & Hermes Reef, Seal, Southeast  
Sicyos lamoureauxii - Kure, Lisiansky  
Sicyos semitorus - Laysan Island

Caspers, H. 1968. Biology of a hypersaline lagoon in a tropical atoll island (Laysan). Recent Adv. Trop. Ecol. 1: 326-333.

Fosberg, F.R. 1962. Miscellaneous notes on Hawaiian plants --- 3. Occ. Pap. Bishop Mus. 23: 29-44.

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Kohls, G.M. and Clifford, C.M. 1967. The male and larva of Ixodes laysanensis Wilson with notes on rearing (Acarina, Ixodidae). Jour. Med. Ent. 4: 83-86.

Ross, E.S. 1951. A new species of Embioptera from Oceania. Proc. Haw. Ent. Soc. 14: 307-318

W.A. Bryan

638-1269

Long, Charles R.

1964

Field Notes

September 15, 1964 - Midway Island, Eastern Island

A brief morning collecting trip was made with J. Beardsley, entomologist, University of Hawaii. A mass collection of Scaevola taccada was made. A series of photographs were taken to give some idea as to the seasonal change in the vegetation of this island. The Lobularia was very dry and in seed at this season. The Scaevola along the north side of the east-west runway showed bare stems and an accumulation of dry leaves at the base of the plant. A large area of Lepidium oahuense was noted on the north side of the east-west runway (see vegetation map). The Solanum-nigrum and Lepidium oahuense are in flower and fruit. On the northwest beach the Bragrostis variabilis clumps are much larger and more conspicuous than when examined in May 1964, but the clumps are much smaller and less vigorous than those seen on Kure, Laysan or Lisianski Islands. Many of the other plants on Eastern Island - Carexopus, Cenchrus and Verbesina reflect the dry season with their dried leaves and stems. Verbesina encelioides as seen on Eastern Island is, as noted in the field on Kure Island, a vigorous and undesirable colonizer, which if allowed to spread, will occupy areas now used by ground nesting birds. This herb is tall and has strong stems. It produces a great quantity of seeds, is heat resistant and its vertical stems are not attractive to perching birds. I estimate about 40 % of the land area of Eastern Island is vegetated.

September 16, 1964 Pearl and Hermes Reef

We land on Southeast Island at 5:50 p.m. Plant collecting was limited to the light remaining for this day. The plants collected were:

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1. Tribulus - abundant on the dry east end but also common on raised Flat areas and on the raised coral beach on the north side of the island.

2. Sesuvium - in depression near center of island partially covered with water, stems very red, a reddish pink flower - also found along the shore in the area of the small bay which dividing the island into halves.

in lines.

3. Setaria - brown, dry and in generally poor condition - a few green plants found around the periphery of the central, water-filled depression.

4. Lepturus - brown and in poor condition in dry areas. Those plants around central island depression and in well-watered gravel on the outer portion of the island are in bloom. Flattened clumps were very noticeable on the south beach.

5. Boerhaavia - found growing in beach sand and on the exterior with Tribulus and Setaria.

6. Eragrostis variabilis - on the interior in flat areas which are well watered.

7. Eragrostis whitneyi - along bare coral gravel and sand strand along the south shore.

8. Scaevola taccada - isolated, small plants on the south shore, used as perches by the noddies, in flower and fruit but planted.

9. Sicyos sp. - on the west part of the island in central area.

10. Erigeron - a few plants on east part of the island along the north shore.

11. Portulaca - on north shore, east part of island in gravel along the beach.

12. Lepidium - conspicuous as dominant on the west half of the island, the large stand in fruit.

13. Cruciferae - dried remains of large members of this plant were collected on the west part of the island. E. Kridler (personal communication) stated this species was a conspicuous dominant on the spring visit of the Fish and Game party. Only intact seed pods were found these suggesting a Brassica sp.

14. Casuarina - seedlings planted by the U.S. Coast Guard on the west end of the east portion of Southeast Island were uprooted by E. Kridler. Many of the original plantings had died.

NAVY

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The burrows of Bonin Island Petrels and the light phase wedgetailed shearwater are common. Also sighted were greater frigatebirds, sooty terns, brown boobies, masked boobies, ruddy turnstones, bristle-thighed curlews and wandering tattlers.

The following plant associations were observed:

1. Setaria - Boerhaavia - Tribulus
2. Eragrostis - Sesuvium - Setaria
3. Scaevola
4. Lepidium - Sicyas

September 17, 1964 - Southeast Island

The soil of the pool depression located on the east half of the island is dark with humus, wet and the parent material is coral sand and gravel. The Hawaiian monk seal is present with patches of epiphytic green algae. Turtles are also found on the north shore of the island. Collections of drift algae and algae in situ on rocks were made. Soil samples, cytological material of Boerhaavia and Scaevola preserved materials were secured. On Southeast Island Boerhaavia appears to be a pioneer on coral gravel bars. Tribulus is associated with Boerhaavia in these bare areas. Eragrostis is found in bare gravel on the outer parts of the island as well as on the interior. Seedlings of Sesuvium were seen in bare soil of the central depression which appear to be former booby or albatross rest sites.

15. Messerschmidia - one small plant on the north shore of the east portion of the island on the west portion of the Southeast Island dead stems of a crucifer were found (to 40 inches in length). No live plants or seedlings were present. One Casuarina seedling was uprooted.

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September 17, 1964 - North Island

The following species were observed:

1. Lepidium - still in bloom along east shore, growing in bare gravel. Plants of this species on the interior are in fruit with only a very few flowers remaining.
2. Tribulus - present in the entire central part of the North Island and a conspicuous dominant on the northwest side.
3. Scaevola - small, stunted shrubs on the south shore - perching frigatebirds, boobies and noddies.
4. Boerhaavia - found from the beach to the central portions, pinkish lavender to white flowered (faded?).
5. Lepturus - flattened clumps with stolons found on the periphery of the island; upright many-crowned plants found on the interior. The stromed plants are obviously younger and, perhaps, due to the wave and wind action, a perpetual colonizer of these shifting island parts.
6. Eragrostis variabilis - clumps found in central area alone.
7. Achryanthes - several bushes were found in the central somewhat depressed portion of the island.
8. Dolanus - in flower and fruit. A low spreading shrub found in the central area.

A transect was made beginning at a point midway along the south shore and walking a compass line due north.

<u>Lepturus</u>	<u>Tribulus</u>	<u>Tribulus</u>	<u>Solanum</u>	<u>Tribulus</u>
<u>Boerhaavia</u>	<u>Boerhaavia</u>	<u>Lepidium</u>	<u>Tribulus</u>	<u>Boerhaavia</u>
(shore)	<u>Lepidium</u>		<u>Lepidium</u>	<u>Eragrostis</u>
			<u>Eragrostis</u>	(shearwater
			<u>Boerhaavia</u>	burrows)

<u>Tribulus</u>	<u>Tribulus</u>	<u>Lepidium</u>	<u>Lepturus</u>	<u>Solanum</u>
<u>Eragrostis</u>	<u>Eragrostis</u>	<u>Tribulus</u>	<u>Solanum</u>	<u>Lepidium</u> (seedlings)
<u>Boerhaavia</u>	<u>Lepidium</u>	<u>Solanum</u>	<u>Tribulus</u>	<u>Lepturus</u>
<u>Solanum</u>	<u>Solanum</u>	<u>Eragrostis</u>	<u>Boerhaavia</u>	<u>Tribulus</u>
<u>Sicyos</u>				

Boerhaavia  
Tribulus  
(shore)

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9. Messerschmidia - small, stunted shrub used by perching noddies - found on the south shore.

10. Sicyos sp. - on central part of island, no flowers or fruit. Red-tailed Tropicbird nestling observed in a nest under a clump of Eragrostis. On the east spit of the island Lepturus is found growing in beach sand with Lepidium in the narrow central portion. Stunted Messerschmidia plants were observed along the south shore. Noddies perching in large numbers in the stunted, flat-topped Messerschmidia and Scaevola shrubs. Adult and yearling seals observed on the beach.

September 17, 1964 - South North Island

The following species were observed:

1. Tribulus - patches on west end, young plants found on most of the area.
2. Boerhaavia - light lavender colored flowers, many young plants.
3. Lepturus - semi-prostrate, clumps flattened from the center.
4. Messerschmidia - in flower and fruit, small stunted shrubs but leaves are healthy green in color.

Two fruits of Cocos were observed, one on the north beach and one on the south beach. On trip back to Southeast Island raised sand bars in the lagoon were observed covered with algae.

South North Island has been cited as "intermittent." The plants present growing in coral gravel and sand are probably all bird introduced. Since the noddies use the Scaevola and Messerschmidia as perches there is a suggestion that this species may be responsible for the transportation of the species found on this island.

The numerous perching noddies are reminiscent of the Cook Island, Christmas Island. No evidence of shearwater burrows on South North was found although the substrate would allow burrowing. This information suggests that there is a periodic inundation during storms and that the species found on South North are being reintroduced constantly by birds which alight on the sand to rest. The burrows on North Island

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are under heavy vegetation notably Solanum and Eragrostis. The burrows are often only hollowed out pits at the base of a plant and covered with a thick canopy of vegetation. No nana or Portulaca as yet encountered on these two sand islets.

September 18, 1964 - Lisianski Island

Transect I - beginning at the Casuarina tree on the west beach and walking a straight line to the Cocos on the East side.

<u>Eragrostis</u>	<u>Eragrostis</u>	<u>Eragrostis</u>	<u>Scaevola</u>
<u>Scaevola</u>	<u>Boerhaavia</u>	<u>Boerhaavia</u>	<u>Tribulus</u>
<u>Ipsocoa</u>	<u>Ipsocoa</u>		<u>Eragrostis</u>
<u>Boerhaavia</u> (lavender flowers)	<u>Scaevola</u> (few scattered clumps)		<u>Boerhaavia</u>

Seedlings seen on beach sand: Eragrostis, Portulaca, Boerhaavia.

The following plants were in bloom: Scaevola, Portulaca, Sicyos,

Eragrostis, Solanum, Ipsocoa and Nana.

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Plants Collected on Kure Island, September 14, 1964

- |   |   |
|---|---|
| 1. <u>Boerhaavia diffusa</u> L.                               | 14. <u>Coccoloba unifera</u> Jacq.                    |
| 2. <u>Scaevola taccada</u>                                    | 15. <u>Casuarina equisetifolia</u>                    |
| 3. <u>Eragrostis whitneyi</u> Fomb.                           | 16. <u>Cenchrus echinatus</u> L.                      |
| 4. <u>Eragrostis variabilis</u> (Gaud.) Steud.                | 17. <u>Coronopus didymus</u> (L.)<br>J. E. Smith      |
| 5. <u>Verbesina encelioides</u> A. Gray                       | 18. <u>Sicyos</u> sp.                                 |
| 6. <u>Tribulus cistoides</u> L.                               | 19. <u>Lipochaeta integrifolia</u><br>(Mutt.) A. Gray |
| 7. <u>Solanum nelsoni</u> Drval                               | 20. <u>Cruciferae</u>                                 |
| 8. <u>Solanum nigrum</u> L.                                   |   |
| 9. <u>Gnaphalium sandwicense</u> Gaud.                        |   |
| 10. <u>Erigeron bonariensis</u> L.                            |   |
| 11. <u>Eleusine indica</u> (L.) Gaert.                        |   |
| 12. <u>Cynodon dactylon</u> (L.) Pers.                        |   |
| 13. <u>Achrysanthes splendens</u><br>var. <u>reflexa</u> Hbd. |   |

Vegetation of Kure - Scaevola taccada forms a nearly continuous ring or band of shrub vegetation around the island and on the outer side. On the north side of the island are sand hills and a steep sand bank rising from the beach. In there across one finds Eragrostis and Boerhaavia as well as two introduced grasses! Cynodon and Eleusine. The interior of the island is filled with Solanum (two species), Verbesina (apparently extending its area to the detriment of ground nesting species), Erigeron, Gnaphalium, Achrysanthes, Ipomoea indica and Cenchrus agrinoides var. layaensis R.Br. In open areas between masses of Scaevola one finds Solanum nelsoni Drval., Boerhaavia and Eragrostis. W. Wirtz told us that both Sesuvium and Portulaca are found on the other island. The Boerhaavia has lavender flowers. Some plants of these seem to have flowers which fade to white. About 97 % of the land area of Kure Island, excluding the runway, is heavily vegetated. The soils are uniformly low in organic material with a sand base. Plant species are found in bare sand or the light soils with their varying organic content.



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Plants Collected on Kure coast.

Coronopus, Eleusine and Eragrostis colonize the bare areas at the edges of the runway. The roots of Eleusine penetrate the tarred surfaces to the moist soil beneath. Tribulus noted with extra petals and petaloid structures derived from the stamens of the flower. The flowers are very large. Scaevola on interior near road leading to antennae had curled leaves; in this case, rolled leaves. Other plants examined in the immediate area did not have the leaves rolled into cylinders.

Sicyos is abundant in the cleared area of the antennae field. With the exception of Solanum nelsoni and Sicyos all other plant species are in flower. Erigeron and Gnaphalium are just finishing the last flowers.

The following plant associations were noted:

1. Eragrostis whitneyi - Boerhaavia
2. Scaevola - Boerhaavia
3. Eragrostis variabilis - Boerhaavia
4. Scaevola - Solanum - Boerhaavia - Eragrostis variabilis
5. a. Weedy Associates - Tribulus-Eragrostis-Boerhaavia-Verbesina  
b. " " (along runway) - Gnaphalium-Boerhaavia-Eragrostis  
(2 sp.) - Erigeron

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Plants Collected on Pearl and Hermes Reef, Hawaiian Leeward Islands, September 16-17, 1964 by C. R. Long

September 16, 1964 - Southeast Island

1. Tribulus cistoides L.
2. Sesuvium portulacastrum L.
3. Setaria verticillata (L.) Beauv.
4. Lepturus repens (Forst.)
5. Boerhaavia diffusa L.
6. Eragrostis variabilis (Gaud.) Steud.
7. Eragrostis whitneyi Fosb.
8. Sesuvia taccada
9. Sicyos sp.
10. Erigeron bonariensis L.
11. Portulaca sp.
12. Lepidium oahuense C. and S.
13. Cruciferae
14. Casuarina equisetifolia L.\*
15. Messerschmidia argentea (L.f.) Johnston

September 17, 1964 - North Island

1. Lepidium oahuense C. and S.
2. Tribulus cistoides L.
3. Sesuvia taccada
4. Boerhaavia diffusa L.
5. Lepturus repens (Forst.) R.Br.
6. Eragrostis variabilis (Gaud.) Steud.
7. Achryanthes splendens var. reflexa Hbd.
8. Solanum nelsoni Duval.
9. Messerschmidia argentea (L.F.) Johnston
10. Sesuvia taccada

September 17, 1964 - South North Island

1. Tribulus cistoides L.
2. Boerhaavia diffusa L.
3. Messerschmidia argentea (L.f.) Johnston
4. Lepturus repens (Forst) R. Br.

\* observed

Plants Collected on Lisianski Island, September 18,  
1964, by C. R. Long

1. Tribulus cistoides L.
2. Eragrostis variabilis (Gaud.) Steud.
3. Scaevola taccada
4. Musa sandwichense A. Gray
5. Portulaca oleracea L.
6. Solanum nelsoni Duval.
7. Elyon sp.
8. Boerhaavia diffusa L.
9. Cocos nucifera L.
10. Casuarina equisetifolia L.
11. Iponoea sp.
12. Solanum nigrum L.

1. The Tribulus is found in sandy soil of open areas near the outer rim of the island with Eragrostis, Boerhaavia and Iponoea.

2. Eragrostis variabilis is found occupying the entire inner portion of the island and associated with Boerhaavia, Convolvulus and Scaevola.

Many seedlings of Eragrostis are found in bare sand along the beach (above and on the sand). Young plants are common on hillocks in the interior of the island. These mounds are a result of shearwater burrowing. Fleet estimates 50,000 pairs of shearwaters and their accumulative effect on the vegetation i.e. providing bare sand areas for the Eragrostis dominant - cannot be ignored. At this time Eragrostis was the only grass to be found on Lisianski Island.

3. Scaevola taccada is present on the island rim along the entire periphery but not forming a solid ring of low shrubbery. On the south end of the island wave action is eroding the sandy elevated soil and the Scaevola is being killed.. There are many new seedlings and some

root sprouts evident in areas which have been washed out. Scaevola seedlings were observed sprouting in the beach sand. On the interior of the island the plants of this genus tend to a flattened growth due in part to the large number of perching noddies, and nesting boobies and frigates. The Scaevola on the interior often is associated with Eragrostis and Boerhaavia.

4. Hana grows in sand on the south, east and northeast sides of the island. The best stands are found on gently sloping sand areas or/and on coral strands on the southeast and northeast shores. Many of the larger plants are in flower while those intermediate in size and seedlings are non-flowering. Flowers are white. Hana is found associated with Boerhaavia, forming a strand association.

5. Portulaca oleracea is found growing in sand near the outer periphery of the islands. This Portulaca has large yellow flowers - unusually large for oleracea but the habit of the stems and leaves are oleracea and tend to be quite large. This plant may possibly represent a hybrid between P. oleracea and P. lutea. Many seedlings observed on the beach some below the high tide line.

6. This species is found as a low growing shrub on the interior part of of the island and associated with Eragrostis, Boerhaavia and Imopoa.

7. Sicyos sp. is prominent as a vine clambering over the Scaevola shrubs

8. Boerhaavia is present in almost every square yard on this island. Often sending upright stems above the Scaevola or Eragrostis. Seedlings of this species are to be found on the beach as well as in the interior of the island. Plants are found with flowers white or pale lavender or lavender.

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9. Two Cocos trees are alive. I saw seven Cocos fruits on the beach.

10. Four Casuarina trees are alive. The one tree on the southwest side is now dead. All the trees are used as perches by noddies, Fairy Terns, Boobies, and frigates.

11. Iponoea is a conspicuous though perhaps seasonal dominant on the interior portion of the island often covering Scaevola bushes and large areas of Eragrostis. The flowers are blue fading to white.

12. Solanum nigrum L. - Several plants were found growing in gravel jackets of upraised coral rock, north side of island just above the high water mark. In flower and fruit, plant small. Dr. Beardsley remarked at how some of the commonest insects of the other Leeward islands are not present on Lisianski Island. This is also true of the plant life. The soils are all sand base with varying amounts of humus under the Scaevola and Eragrostis cover. The plant associations are not as clearly defined as those on Laysan and remind one of the smaller, vegetated sand islets of French Frigate Shoals or Pearl and Hermes Reef. The inner portion of Lisianski is heavily burrowed and quite reminiscent of the burrowed areas of the sand islets although Eragrostis is not found on these. I estimate 95 - 97% cover on Lisianski Island. By far the greater part of the island is covered by Scaevola and Eragrostis. The other species are "squeezed" into any available niche. Tribulus and Portulaca are not abundant. No Hama is present on the west side where the wide sand shelf is missing.

The following associations were observed:

1. Bourhaevia - Tribulus - Eragrostis

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2. Eragrostia - Senecioia - Boerhaavia
3. Eragrostia - Boerhaavia - Ipomoea (see 1)
4. Eragrostia - Ipomoea
5. Ipomoea - Boerhaavia
6. Portulaca - Boerhaavia (see 3.)
7. Senecioia - Sicyos - Boerhaavia

Loug, C. R.  
1954

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Plants Collected on Laysan Island, September 19, 1954  
by C. R. Loug

1. Nana grandiflora A. Gray var. laysanicum
2. Cocos nucifera
3. Cordia alliodora L.
4. Cyperus laevigatus
5. Panicum polystachyon R.Br.
6. Sesuvium portulacastrum L.
7. Sicyos microcarpa
8. Sicyos macrocarpa
9. Iponoea pes-caprae
10. Eragrostis variabilis (Cand.) Steud.
11. Tribulus cistoides L.
12. Boerhaavia diffusa L.
13. Scaevola taccada
14. Heliotropium curassavicum L.
15. Sicyos sp.
16. Cyperus sp.
17. Portulaca oleracea L.
18. Nicotiana glauca L.
19. Capparis sandwichiana DC.
20. Erigeron bonariensis L.
21. Solanum nigrum L.
22. Messerschmidia argentea (L.f.) Johnston \*\*
23. Iponoea indica (Horn. f.) Merr.
24. Flueggea indica (L.) Leas.

We land on Laysan Island at 9:05 a.m. on the west side of the lagoon. We find dead Iponoea, Nana and Sesuvium plants and bird skeletons and eggs (albatross). These indicate the annual flooding of the low areas adjacent to the lagoon. Seedlings of Nana, Sesuvium and resprouted rhizomes of Cyperus are abundant in a strip varying from about 8 feet to 45 feet in width. A similar area is located on the north east side of the lagoon. Laysan finches, red-tailed tropicbirds, bristle-thighed curlews, ruddy turnstones, wandering tattlers, greater frigatebirds, masked boobies, brown boobies, sooty terns, fairy terns and wedge-tailed shearwaters were seen.

\* observed

\*\* dead stem observed

A possible error occurs in Lamoureux's map on the east side: i.e. the Scaevola association seems to be more extensive on the east. There also seems to be some error in the handling of the southwest end of the island. I observed dried plants of Solanum nigrum on the west side growing with Tribulus and Erigeron. The Erigeron is also dry and most of the plants have passed blooming. On the southwest end the Scaevola seedlings are numerous in the Moss association. A large area at the southwest end looks as if swept over by high seas. I collected Solanum nigrum in flower and growing vigorously in the Iponoea stand on the midwest side of the lagoon. I observed nine Cocos fruits on the beach. On the northeast side of the lagoon is a large area of dead Pluchea and Cyperus. I collected Capparis on the west side. Two large bushes with large white flowers--growing in the thick Scaevola. These are located just to the south of the hill camping area on the west side. I collected two Portulaca plants as live specimens. The cleomeae sp. varies morphologically depending on the niche in which it grows. Plants in sand have very red stems and more widely spaced leaves along the stem.

- Itinerary:
- a. from camp to north end of lagoon;
  - b. west side of lagoon to bare area on southwest side then to the south end of the lagoon and across beach;
  - c. up the southeast beach crossing to east side of lagoon;
  - d. north to beach and west along sand hills to camp;
  - e. in evening I collected by Flashlight on the west side of lagoon, southwest beach and west beach area.



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The Hawaiian Monk Seal sleeps in the Scaevola association. This is particularly noticeable on the south and west sides of the island even in areas where the grade from the beach is fairly high. Areas in the Scaevola are kept open due to these behavioral traits of the seals. In these areas Tribulus, Boerhaavia and Portulaca are found as seedlings and mature plants.

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PLANTS COLLECTED ON NIHOA ISLAND, SEPTEMBER 23-24, 1964  
By C. R. Long

1. Pritchardia remota
2. Portulaca caudata
3. Portulaca lutea Sol.
4. Euphorbia sp.
5. Sida sp.
6. Solanum nelsoni Dunal
7. Heliotropium curassavicum L.
8. Sesbania tomentosa Hook. and Arn.
9. Tribulus cistoides L.
10. Eragrostis variabilis (Gaud.) Steud.
11. Panicum terribile
12. Rumex sp.
13. Portulaca oleracea
14. Ipomoea sp.
15. Chenopodium sandwichicum Moq.

Plants Collected on Necker Island, September 25-26, 1964  
by C. R. Long

1. Chenopodium sandwichicum Moq.
2. Sesuvium portulacastrum L.
3. Portulaca lutea Sol.
4. Panicum terribile
5. Sesbania tomentosa Hook. and Arn.

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September 23, 1964 - Nihoa Island

We land at approximately 9 a.m. The surf is high and we land with some difficulty on the rocky ledge at the outlet of east palm canyon. We set up camp about 100 feet above the ledge in the dry stream bed. Some of the pot holes along this dry stream contain damp mud or an inch or two of water which supports a luxuriant bloom of algae. I walk up east palm gulch to Tanager Peak and about 200 yards east along the cliffs crossing west along the upper ridge of Tanager Peak. I then crossed the eastpalm gulch at its head and continued west along the crest of the north cliffs Sida sp. and Chenopodium are the most common species present on the upper and middle slopes with Portulaca caunii frequent on bare rock areas with soil pockets and Solanum nelsoni commonly found with Sida and Chenopodium. Pritchardia remota is found in the dry stream beds of east palm canyon and west palm canyon, and, at the base of sheltered cliffs - on the east palm canyon, and on the upper west side of west palm canyon. Portulaca lutes grows at lower elevations on the island but is infrequently found on the high rock ledges with P. caunii. I collected lichens (2 sp.) and Rumex on the north face cliffs near the summit of Tanager Peak. These cliffs fall nearly sheer 300 feet into the sea except for pockets and chimneys in the cliffs which afford a soil pocket for plants and a handhold for the botanist. The Rumex was sterile at this time. Panicum terribidum is common on the upper slopes, and, like Eragrostis is in flower and fruit. Both Sesbonia and Tribulus were found - both much flattened and dry - on the south side of the cliff faces.

The following associations were observed:

1. on rocky upper slopes; thin, rocky soils
  - a. Euphorbia - Chenopodium - Sida - Solanum
  - b. Panicum - Portulaca
  - c. Portulaca
  - d. Euphorbia
  - e. Eragrostis - Chenopodium - Sida
2. on lower slopes with more soil than in 1.
  - a. Chenopodium - Sida - Eragrostis
3. Wet north face cliffs, thin soil in pockets or bare rock walls
  - a. lichens
  - b. Rumex - Panicum
4. wet west and south face cliffs, thin soils in pockets or bare rocks
  - a. Chenopodium - Portulaca
  - b. lichens
5. dry stream beds and base of cliffs
  - a. Pritchardia remota
  - b. Chenopodium - Sida - Solanum

I cross the mid upper ridges between east palm gulch and west palm gulch and, after climbing to Neale Rock retrace my route east via the lower slopes back to the camp area.

The rare endemic palm Pritchardia remota was collected from east palm gulch. Cytological material was also obtained. A count was taken of all existing plants of this rare species.

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West Palm Gulch

East Palm Gulch

a. 107

a. 52

b. 148

b. 69

a. Seedlings

c. 127

c. 46

non-flowering trees  
flowering and  
fruiting trees

September 24, 1964 Nihoa Island

Itinerary: I walked west to Millers Gulch along the low ridges to the west of camp ascending Millers Peak by way of the gulch. We covered the peak area and helicopter landing pad and then I proceeded south to the 341 foot peak on the southwest portion of the island descending to the beach at the foot of east palm canyon and proceeded east along the beach and low ridges to camp. Portulaca oleracea was found near the helicopter pad but there was no evidence of Cenchrus echinatus or Sicyos sp. both of which have been conspicuous on past visits of the Hawaii Fish and Game authorities. In this area all three species of Portulaca are found growing together but there seems to be little evidence of hybrids. An ecotype of P. lutea with large leaves and long stems (flattened) is found in the sand beach at the base of west palm canyon. Heliotropium curassavicum grows in this area alone on the island. I counted only about 27 plants in this limited niche. Euphorbia grows on dry rocky exposed ridges, along the cliff creasts both upper (north) and lower (south). It is in flower and fruit. On the west side of the island, on east face slopes, the Sida sp. and Chenopodium sp. are much more healthy

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in appearance than plants of the same species on west facing slopes.

Neither Amaranthus brownii nor Schiedea verticellata were collected.

September 25, 1964 Necker Island

Plant associations observed:

1. Sesbonia - Chenopodium
2. Portulaca - Chenopodium
3. Sesbonia
4. Sesuvium
5. Sesuvium - Portulaca
6. Panicum - Portulaca - Chenopodium

The vegetation of Necker Island is quite unique in that many species not found could be expected ie. Sida, Solanum, Ipomoea. These are species found on Nihoa the nearest volcanic island. Despite the building of a helicopter landing pad on the ridge extending east from the 262 foot peak no introduced weed species could be found. The five species reported by the Tanager Expedition were recollected but no additional species could be found. A white flowered P. lutea was discovered.

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September 14, 1964 - Kure Island

<u>Collection No.</u>	<u>Note</u>
2217	<u>Scaevola taccada</u> - growing in sand on the barracks side of the runway. In flower and fruit.
2218	Low spreading herb growing at the edge of the <u>Scaevola</u> shrub in pure sand and spreading onto the tarred runway margin.
Species observed parallel to runway: <u>Scaevola taccada</u> , <u>Boerhaavia diffusa</u> , <u>Gnaphalium</u> sp. <u>Verbesina encelioides</u> and <u>Eragrostis variabilis</u> .	
2223	on "lagoon" side of runway, sandy hillocks, in flower and fruit.
2227	
2228	due east of Buildings, "lagoon" side of island
2229	
2230	
2234	<u>Boerhaavia diffusa</u> - "lagoon" side of runway and old root with new stems
2235	<u>Eragrostis variabilis</u> - at edge of runway in sand
2236	<u>Eleusine indica</u> - at edge of runway in sand.
2249	<u>Boerhaavia diffusa</u> - lavender - pink flowers. Greenish white stems to 5 feet in length, profuse bloomer, growing in beach sand on ocean side of runway opposite the barracks.
2250	<u>Scaevola taccada</u> - in flower and fruit, in sand forming dense thicket. Same area as 2216. Flowers for cytological material taken from plant collection No. 2216.

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Plants Collected on French Frigate Shoals,  
September 27-28, 1964 by C. R. Long

September 27, 1964 - Trig Island

1. Boerhaavia diffusa L.
2. Tribulus cistoides L.
3. Portulaca lutea Sol.
4. Scaevola taccada
5. Messerschmidia argentea (L.f.) Johnston
6. Chenopodium sandwichicum Moq.
7. Lepturus repens (Forst.) R. Br.
8. Setaria verticillata (L.) Beauv.

September 27, 1964 - Whale Island

1. Scaevola taccada
2. Portulaca lutea Sol.
3. Boerhaavia diffusa L.
4. Tribulus cistoides L.
5. Chenopodium sandwichicum Moq.
6. Messerschmidia argentea (L.f.) Johnston
7. Lepturus repens (Forst.) R.Br.

September 27, 1964 - East Island

1. Boerhaavia diffusa L.
2. Tribulus cistoides L.
3. Chenopodium sandwichicum Moq.
4. Portulaca lutea Sol.
5. Cocos nucifera L.\*
6. Messerschmidia argentea (L.f.) Johnston
7. Lepturus repens (Forst.) R.Br.
8. Scaevola taccada

September 28, 1964 - Tern Island

1. Coccoloba unifera Jacq.\*
2. Casuarina equisetifolia L.\*
3. Cenchrus echinatus L.
4. Iponoea pes-caprae L.
5. Messerschmidia argentea (L.f.) Johnston
6. Cynodon dactylon (L.) Pers.
7. Coronopus didymus (L.) J. E. Smith
8. Sonchus oleraceus L.
9. Pluchea odorata (L.) Cass.

\* observed



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September 28, 1964 - Tern Island cont.

10. Eleusine indica (L.) Gaert.
11. Lycopersicon esculentum L.\*
12. Portulaca oleracea L.
13. Portulaca lutea Sol.
14. Erigeron whitneyi Post.
15. Euphorbia prostrata Ait.
16. Cocos nucifera L.\*
17. Euphorbia hirta L.
18. Erigeron benariensis L.
19. Tribulus cistoides L.
20. Lepurus repens (Forst.) R. Br.

\* observed

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22

September 14, 1964 - Kure Island

Collection No.

Note

2217

Scaevola taccada - growing in sand on the barracks side of the runway. In flower and fruit.

2218

Low spreading herb growing at the edge of the Scaevola shrub in pure sand and spreading onto the tarred runway margin.

Species observed parallel to runway: Scaevola taccada, Boerhaavia diffusa, Gnaphalium sp. Verbesina encelioides and Eragrostis variabilis.

2223

on "lagoon" side of runway, sandy hillocks, in flower and fruit.

2227

2228

due east of Buildings, "lagoon" side of island

2229

2230

2234

Boerhaavia diffusa - "lagoon" side of runway and old root with new stems

2235

Eragrostis variabilis - at edge of runway in sand

2236

Eleusine indica - at edge of runway in sand.

2249

Boerhaavia diffusa - lavender - pink flowers. Greenish white stems to 5 feet in length, profuse bloomer, growing in beach sand on ocean side of runway opposite the barracks.

2250

Scaevola taccada - in flower and fruit, in sand forming dense thicket. Same area as 2216. Flowers for cytological material taken from plant collection No. 2216.

Herbarium of the University of Hawaii  
PLANTS OF THE HAWAIIAN ISLANDS

LAYSAN

Cyperus laevigatus L.

Growing in dense tangled masses to 1 m.  
high around the shore of the central lake.  
This specimen collected from N. shore  
of lake.

Coll. C. H. Lamoureux

No. 1685

Date Sept. 5, 1961

Herbarium of the University of Hawaii  
PLANTS OF THE HAWAIIAN ISLANDS

LAYSAN

Eragrostis variabilis (Gaud.) Steud.

Erect bunch grass to 1 m. tall covering  
much of crest and inner slopes of  
island. This specimen collected on  
inner slopes of NE part of island.

Coll. C. H. Lamoureux

No. 1686

Date Sept. 5, 1961

Herbarium of the University of Hawaii  
PLANTS OF THE HAWAIIAN ISLANDS

LAYSAN

Boerhavia

Prostrate herb on inner NE slopes of  
island.

Coll. C. H. Lamoureux

No. 1690

Date Sept. 5, 1961

Herbarium of the University of Hawaii  
PLANTS OF THE HAWAIIAN ISLANDS

LAYSAN

Boerhavia

Prostrate herb on inner NE slopes of  
island.

Coll. C. H. Lamoureux

No. 1691

Date Sept. 5, 1961

Herbarium of the University of Hawaii  
PLANTS OF THE HAWAIIAN ISLANDS

LAYSAN

Nama sandwicense A. Gray var. laysanicum Brand

Prostrate herb with white flowers, found  
commonly along beaches above high tide line.  
This plant collected however from inner  
slope of island on east side.

Coll. C. H. Lamoureux

No. 1693

Date Sept. 5, 1961

Herbarium of the University of Hawaii  
PLANTS OF THE HAWAIIAN ISLANDS

LAYSAN

Cynodon dactylon (L.) Pers.

Forming a turf in area on N. shore of  
lake near grove of Cocos.

Coll. C. H. Lamoureux

No. 1695

Date Sept. 5, 1961

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Kure		x ca. 2223-50	Sept 64	Yes. by Long & Lamoureux	None.	
* Midway		x ? <i>See list</i>	June 63 (Sibley) Sept 64	Prelim list for May 64 Prelim. list by Neff & DuMont in Long's file.	Brief gen. descrip. Also a short hist. by Neff & DuMont in Long's file.	Soil samples L212-216 from May 64.
* Pearl & Hermes		x ca. 2265-2313	June 63 (Sibley) Sept 64	Yes. Also a prelim. list-unk date	Gen. descrip. & a bit of history	Collections have been made by Sibley, Allan Young, Long & Lamoureux.
* Lisianski		x ca. 2316-2356	Sept 64	Yes. Also a prelim. list from unk date	Gen descrip. & a note on geology	Collections have been made by Sibley, Long & Allan Young.
* Laysan		x ?	Sept 64	Yes. Also a prelim. list from unk date	None	
* Gardner Pinnacles		x ?	None.	None.	None.	
* French Frigate Shoals		x ?	None	Prelim. list from Sept 1964	None	
* Necker		x ca. 2445-2458	Sept 64	Yes. also a prelim list from unk date	Very brief descrip.	
* Gilbert & Marshall	1964	2870-2989	None <i>maybe in Amerman's file</i>	<del>None</del> Prelim. list from 64 trip by atoll.	None	Compiled from the plant collections made by Ken Amerman on 1964 trip.

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Howland	July 64 Oct 64	2170-79 2311-62	July & Oct 64 and on 2311-62	Yes, also prelim list for July 64	Detailed descrip. & comments	Quadrat studies - July 64 Soil samples L228-235 for July 64 List of algae ID'd
Baker	July 64 Oct 64	2049 ca. 2150-72 ca. 2364-2402	None.	Prelim. list-July 64 only.	Brief hist & descrip.	Soil samples L225-227 from July 64 List of algae ID'd Peter Marshall also made a collection here July 63
McKean	July 64 Oct 64	2025-48 2443-51	Oct 64 only. Notes on coll. 2443-51	Yes, also prelim. list for July 64	Gen. veg. descrip. & very short hist.	Soil samples L217-224 from July 64
Gardner		ca. 2452- 2525	None. <i>None in files</i>	Yes.	General descript & history	
Hull	July 64	1998-2076	None in files July 64	Yes, also prelim. list from July 64	General description	Annotated list omits many introduced species that are mentioned in the general account.
Sydney	Oct 64	2535-2591	Collection notes on 2535-2585 only.	Yes.	None.	
Birnie		ca. 2635-47	None. <i>None in files</i>	Yes.	Brief gen. descrip. & some hist.	
Phoenix	July 64	2077-89 2614-34	<i>brought back</i>	Yes, also prelim list of July 64	<i>brought back</i> None.	Soil samples L199-209 from July 64

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Enderbury	July 64 Nov 64	1990-2024 ca. 2090-2121 2613 ca. 2649-86	<del>that's all</del> July 64 only Some returned (Nov 1964)	Yes. also prelim list of July 64	brief gen. descrip.	Soil samples L210-216 from July 64. Paul Woodward made an addit. collection here -Feb 1965.
CantOn	?	?2404-2442?	coll. notes for 2404-42.	None.	None.	
Palmyra	June 64 Nov 64	1760-1826 ca. 2831-67	None in files	Yes.	None in files	Soil samples L123-131 from June 1964.
Washington	June 64	1827-44 1859-65	June 64	Only a preliminary list of identifications of the 24 collections made by C. D. Hackman		Soil samples L132-177 for June 64. Also bog samples 1845a-1845x in June 64. C. D. Hackman made a small (24) collection here Mar 64.
Fanning		ca. 3496-3598	None in file	Yes.	Gen. descript.	
Christm.	June 64 Nov 64 June 65	1845-58 1884-1919 ca. 2740-98 ca. 3398-3491	None	Yes. also a prelim listing by island	Gen descript. w/ some history	Soil samples L236-249, & L178-182
Jarvis	Nov 64	2690-2738	None in file	Yes. also a prelim list from coll of C. D. Hackman	Gen. descript. & a partial history.	Small collection (8 plants) by C. D. Hackman (spring 64)

Island	Dates	Field Numbers Used	Field Notes Available in D.C.	Presence of Annot. & Prelim lists/D.C.	History/Descript. avail in D.C.	Remarks
Malden	June 64	1920-42	June 64	Yes. also a prelim. list from June 64	Gen. descript. & some comment & speculation	Soil samples L183-188 from June 64.
*			*		*	*
Starbuck	June 64	1936-48	June 64	Yes. also a prelim. list from June 64	None	Soil samples L189-197 from June 64
*			*		*	*
Caroline						
Vostok	1965	3191-3208	None * Nothing in file	Yes.	Brief. gen descript.	*
*			*		*	*
Tongareva						
*			*		*	*
Swains		* No cards for long.	* None in files.	Yes but compiled from work of other field botanists.	*	Long did not visit this one.
*			*		*	*
Samoa						Soil sample 198 from July 64
*			*		*	*
Tokelaus				Yes but compiled from work of other field botanists.	History and short description	Long did not visit this one. Plants collected by Paul W. Woodward on POBSP visit.
*			*		*	*

No material in D.C. for the following:

Wake Island

Sand-Johnston

Alaska

Main Hawaiian Islands (including offshore)

Samoa



Botanical Information contained in the notes and reports of the Hawaiian Department of Fish and Game.

<u>Period of observation</u>	<u>Observations</u>
May 27-June 4, 1958.	Laysan Island is no longer the wind-swept, devegetated desert that it was in the days immediately preceeding the catastrophic Schlemmer period. Those species of plants which were not completely lost are now replenishing themselves, and an equilibrium is slowly being reached. There are still large areas devoid of any plant species and where the wind has carried away the sand to reveal casts of pre-existing root systems, indicating some sort of vegetative cover during earlier times.

Walking from the lagoon shore to the ocean's edge, one first encounters mats of succulent *Portulaca*, stained purple from the small blossoms which are in profusion at that season of the year, and in some places a strip of Sedge. Next one traverses a broad band of Beach Morning Glory growing in a lush tangle 12 to 16 inches deep. This thins out as the sand slopes up from the water table, eventually being replaced by clumps of Bunch Grass interspersed with *Boerhaavia*. At the outer edge of the vegetated zone is a broken ring of *Scaevola* which seems less reluctant to face the salt-spray of the encircling ocean. There are local variations in this pattern, but the dominant theme, and the pattern upon which the ecologies of the various bird species are overlaid, is the above.

(From an unpublished report by Warner, 1958)

Mar. 7-8, 1961	There appeared to have been a severe storm during the past winter season from the condition of the lagoon and the vegetation around the lagoon. Large waves had washed completely over the low portions of the southeast end of the island, carrying numerous glass fishing floats into the lagoon and central part of the island. The storm appeared to have been mostly from the southwest as the vegetation at the north end of the lagoon was in some places covered with sand and large shrubs were knocked down or beaten back as far as twenty yards from the northeast edge of the lagoon.
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The coconut trees which were planted by Richard Warner in 1958 have become established at two places. There is one grove of trees (seven) near the southeast end of the lagoon and another grove of some 13 trees in the northwest part of the island, which have reached a height of about 13 feet. The growth of these trees should not hamper any of the nesting birds and may provide additional nesting sites for the Fairy Terns. (from unpub. rept. by Woodside and Kramer)

Sept. 1961	(Lamoureux would have data)
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June 1962	Vegetation is up to four feet in height with the dominant species being an <u>Eragrostis</u> and a <u>Scaevola</u> . Vegetation is much more lush and higher than normal on Laysan this year according to biologist Kramer. No doubt this is due to above normal precipitation. The nearest weather station at Tern Island recorded more rain the past six months than is normal for the entire year. Several newly introduced plants appear to be making headway on the island, including potatoes and onions which were apparently thrown out as garbage in the form of peelings by military personnel or other campers. The potatoes and onions were pulled where found. Tobacco, introduced many years ago, is extending itself as well as an introduced shrub which is about three feet high. (From unpublished Report by Marshall, 1962)
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Vegetation

As with Nihoa, it would appear that rains have been continuous throughout the winter and spring months. Based on vegetative growth and species distribution it would appear that the past year has been a good one for Laysan. In September of 1961, Woodside reported finding Nama in fair abundance on the windblown slopes on the north and

east sides. At the time of the present trip Nama was found island wide, growing everywhere from the lagoon edge to the sea's edge. Much young growth was noted on the north and east shores but whether these small plants will survive without continuing rainfall for the next several months is unknown. The one Messerschmidia tree on the island appeared to be in excellent shape and is making good growth. The one Ironwood tree on the island was thriving well with many new needles; the 20 coconut palms on the island are growing at an excellent rate with the ones on the northwest side of the island now reaching a height of up to 15 feet. The tobacco plants reach a height of four to five feet. They are flowering and spreading along the entire northwest portion of the island. That the rainfall has been great in the past months is also borne out by the fact that the lagoon had risen considerably over past year's observations to the point of killing out great masses of Sesuvium, Cyperus, and Ipomea at the lagoon edges. Since many thousands of Laysan Albatross eggs .....

The Eragrostis is very dense and shows excellent growth. Because of this, most of the photo station stakes could not be located; those that were found are often invisible in the pictures due to the height of this grass. The Scaevola has made great growth on the inner portions of the island and has filled in many of the vacant spots throughout the upper rim of the island. Cyperus pennatifolius was located in two 6 to 7 foot tall clumps at the extreme southeast tip of the lagoon near the 7 palm trees. This is an increase in growth of 3 to 4 feet from the September 1961 trip. In general, such vegetation as Cyperus laevigatus, Cynodon dactylon, Boerhaavia, Sesuvium, Tribulus, Ipomea, and Pluchea were also growing lushly. Heliotropium curassavicum, while noted on prior expeditions as being common, was extremely abundant and growing well this year. Recorded for the first time on Laysan was Solanum nigrum. Six to eight small fruiting plants were found growing among the Ipomea on the southwest side of the island between the lagoon edge and old tram tracks. Two different species of Sicyos were found on the island, Sicyos hispidus was common in the tobacco patches on the northwest side of the island, and Sicyos microcarpus was very common over the entire southern half of the island, often spreading over Eragrostis clumps and patches of Scaevola. One sprouted seed of the soybean plant, Mucuna sp, was found on the north beach, but it is extremely doubtful that this plant will survive here. Seeds of this species were also found in 1923 but apparently never survived.

Another member of the Cyperaceae, Fimbristylus cymosa was extremely common along the inner rim of the island, and was bearing mature seed heads. This species was not recorded anywhere in the Leeward chain in 1923, but has been existing on Laysan for some years where it is now becoming a prominent member of the vegetative structure.

An experimental planting of seeds from Nihoa was made in a line across the bare sand from a point just west of the photo stake #c2(3) up to the edge of the Scaevola patch noted in the same photograph (March 1961) The three species planted were Chenopodium, Solanum, and Sicyos microcarpa; this last species has now been identified as being already resident on Laysan.

(From unpublished report by Kramer and Beardsley, 1962)

February 11-13, 1963

Vegetation: Even though there have been very heavy rains through the month of December and January, as evidenced by the large number of inundated nests with eggs along the lagoon edge, the vegetative appearance of the island was that of a drought condition. Ass species excepting Sesuvium and Fimbristylus appeared to be greatly reduced in number as well as condition when compared to the extreme lushness of the island when visited in June of 1962. A close examination of each species revealed a multitude of causes. The island appears to have been subjected to intense and severe storm winds and seas from the west and south. An accompanying photograph shows the Scaevola

almost completely denuded for distances up to 20 feet into these ordinarily lush patches. Nama is found only lightly scattered throughout the island, with drifting sand having once again covered most of the stand noted growing so well on the north end last June. The heavy salt spray carried by the winds has killed or hastened the "browning up" of all exposed Eragrostis seed heads; those heads protected from this wind are still green and ripening.

Various stages of competition are becoming quite evident. Ipomea suffered heavy damage, both along the lagoon edge from inundation and along the beach edge from spray and wave action. Eragrostis is beginning to be a noticeable competitive factor in some of these areas, while in the Eragrostis zone, Frimbristylus is becoming one of the key plants. Cynodon holds its own with every species except Ipomea; in these areas it appears to be crowded out.

The large tobacco plants have seeded and are dead but many new plants are beginning to sprout. Heliotropium seems to be practically non-existent in growing form and Boerhaavia is scarcer than ever noted before. Sicyos is sprouting primarily in the zone comprised of mixtures of Ipomea and Eragrostis and is seldom seen elsewhere.

The June report mentioned that the one Messerschmidia shrub on the island was ← thriving. Except for one branch with a few leaves, this plant appears to have been burnt by salt spray.

The experimental seed planting (Chemopodium, Solanum, and Sicyos) made in June, ← 1962 shows no sign of growth whatsoever.

(From unpublished report by Kramer, 1963.)

Laysan Botany Notes from Miscellaneous Sources

Salisbury (ms. -- RG-22-43) Many bushes had been girdled and vegetation appeared to be suffering from their ravages..... We planted 100 cocoa-nut sprouts, protecting them with woven wire guards.... Tobacco, originally planted in small quantity by employees of a Guano company, has spread to various parts of the island and continues to spread. The finches eat and distribute the seed. This plant, eaten to some extent by rabbits, grows to a height of five or six feet, and is strong enough to support the nests of the Hawaiian Tern which use it as the other bushes disappear. Albatross frequent the tobacco patches for nesting and to escape the sun and wind.

Letter from G.P. Wilder to E.W. Nelson, dated April 19th, 1926 in RG 22

When I visited Laysan in 1924 there was not a vestige of the seeds or plants that I had placed there on a previous visit. The birds had cropped very closely any plant life that appeared for I noticed that the nesting material consisted of weeds and herbage which they were able to find.

Letter from G.P. Wilder to Paul G. Reddington, dated 20 March 1928 in RG 22

Dr. Pietschman reported to me that the vegetation was coming back on Laysan, including grasses peculiar to that region, false tobacco, weeds of various species, and some shrubs of the seeds I planted when I visited the island with the late John Rodgers.

Letter from G.P. Wilder to E.A. Goldman, 20 July 1928, in RG 22

The fishing schooner "Lanikai" returns yesterday having been away some 50 days . . . Captain Andersen . . . Andersen made a short stop at Laysan and he says the grasses, which I carried from Midway and planted sometime ago and some of the plants are showing up very well. Especially was the shrub, *Nicotiana glauca* which I carried from Honolulu doing very well.

Wilder ms. dated August 25th, 1930 ----RG 22

Many of the plants left there by me in 1924 have got a very good start. ....(list of plants planted this visit) -..... cf. original for other plant notes.

Diggs ms. Record Group 45 --- (Sept. 1918)

The island is abundant in vegetation, beginning above the surf line and running down the slope on the inner side to a lagoon . . . . (lagoon's banks flat) (and) are covered with thick, reddish hued marsh grass and pasley. . . . Two shabby leafed coconut trees still remain in front of the barracks . . . . (Rabbits found in number) . . . in and around their burrows among the stones, shrubberies and green juncus growing near the lagoon. . . . Only in one spot, and that near the southeast end of the lagoon, was there any noticeable amount of dead shrubbery and no rabbits at all were to be found, at any time during our stay feeding upon this plant. . . . Shrubberies of the same kind existed elsewhere but seemed still green and untouched. The green juncus growing lower on the ground was quite fresh and seemed to cover immense area around the lagoon. Here and upon this the rabbits were seen feeding at times.

R - Hawaii

RBC copy

return to Roger

RG-22-51

Copy on file

G. B. Keon

UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF BIOLOGICAL SURVEY

IN REPLY REFER TO

Honolulu August 25th, 1930

Notes cabinet 2  
RBC  
A. H.

File  
H. H.

Dr. Paul G. Reddington  
Chief Bureau Biological Survey  
Washington, D.C.

Dear Dr. Reddington

Herewith is my detailed report of the trip to the island of Laysan, on the Coast and Geodetic Survey boat "Pioneer"

Left Honolulu July 28th, and arrived at Laysan Saturday morning August 2nd.

Remained enamped on the island 16 days.

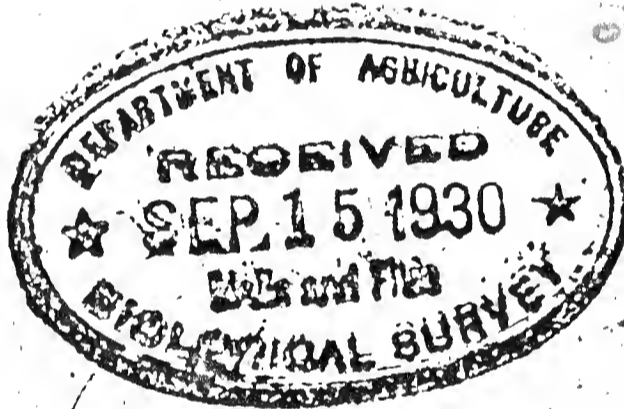
Vegetation Many of the plants left there by me in 1924 have got a very good start. I planted on this trip 60 trees of several species.

As follows

- Terminalia catappa
- Terminalia miriocarpa
- Barringtonia asiatica
- Calophyllum inophyllum
- Thespesia populnea
- Cordia sub-cordata
- Scavola fruticosa
- Casaurina equisitifolia
- Phoenix dactylifera
- Nicotiana glauca
- Cornocarpus erectus
- Cyperus species
- Canavalia ensiformis
- Convululus species, vine.

as Hawaiian  
Gregory lists Coccotheca  
& Cocos as well  
& R. hederacea  
others checked

Cocos



Besides seeds of grass, vines, and some beans.

Along the edge of the lagoon has re-appeared the small rush which gives protection to the small birds during the very hot days.

Tobacco has sprung up everywhere, and the twigs of the dead plants are used by the Frigate bird and the Ganet for nesting material.

Sesuvium, portulacastrum covers large areas just above the high water mark of the lagoon, this was one of the two plants left after the rabbits nearly completed the destruction of the vegetation.

Cynodon dactylon, a strong recumbent grass, is found in large patches and under its roots the burrowing species find ample protection

Ipomea pes-caprae, a very luxuriant growing vine has extended to the sandy dry portions of the higher elevations, and even is seen growing on the side of South east end almost to the waters edge. This furnishes good nesting locations for the swallow, Sterna fuliginosa or the sooty tern, and it was for these birds that I took the two bales of straw, to furnish this species with good nesting material. This straw was distributed over many locations on the island and the birds had already begun to avail themselves of this building material before we had completed our 16 days visit.

Molasses grass, Melinis minutiflora, was planted by me as an experiment and also several pounds of Arizona salt bush, in hopes some of this would take root and become a binder of the shifting sands, so detrimental to the life of the young birds of the burrowing species, such as Bulwers Petrel, Bulweria Bulweri and Pterodroma cuneatus, or the Shearwater.

From Honolulu, a plant supposed to have come from the Phillipine islands, and appearing in all filled in lands or salt marsh places, was planted by me and if this is established it will be a good addition to Laysan flora.

The following are the species of plants collected by me, on Laysan.

Portulacca lutea, Capparis sandwichina, Cyperus papyrus, Mucuna gigantea, Scaevola frutescens, Tribulus cistoides, Cynodon dactylon, Nicotiana tabacum, Heliotropum curassavicum, Sicyos sp. ?, Solanum nodiflorum, Sedge Sp. ?  
Boerhaavia Sp. Undetermined Grass, Sp. ?

Birds Sterna fuliginosa, or Sooty Terns were the most plentiful, and the young were about  $\frac{3}{4}$  grown and just about to fly. The next species of importance were the, wedge tailed shearwater, Pterodroma cuneatus, and these were mating and burrowing holes, mostly in the open sandy stretches.

Both Diomedea Nigriceps and Diomedea immutabilis the latter the Laysan Albatross had migrated, but of the last named species, a few of the young not being old enough to fly had been left behind, most of them will starve. It is evident from this condition that the instinct to migrate is greater than that of the care of its offspring.

P.G.R.

Birds. Fregata aquila, Man 'o war bird, was feeding their young and these were of all stages, this bird confining itself to the places where there was brush and the tobacco plant, and scaevola fruticosa.

Sula piscator, red footed booby, is rather scarce, and but two colonies were seen, in all about 30 pairs. The lone remaining tree, Casuarina sp. near the old buildings, accommodates about ten pairs, these had young nearly full grown.

Sula cyanops, blue faced booby, saw but a half dozen of this species.

Anous stolidus, plentiful, scattered over the whole island, generally in the creeping vines along the sea shore, and even in the coral rocks, where they had both eggs and young. Of this species great havoc is being done by the migratory Curlew, Numenius tahitiensis during my visit of the 16 days I saw no less than 20 nests destroyed, by the curlew, eggs eaten, and even when the eggs contained embryo immature these birds devoured them with apparent relish.

Arenaria interpres were on the island in great numbers, and these birds were observed eating the eggs of the Tern, and Anous stolidus.

Charadrius dominicus pacifica were arriving when we left there, a few male birds were seen. Wandering tattler, was seen, a few along the sea shore

Microanous Hawaiiensis a few pairs were observed in the Casuarina tree this species is rare.

Gygis alba Kittlitzii,, This bird is becoming scarce, a few pairs were nesting in the old sheds and buildings, and three pairs were seen out on the rocks, some with eggs some with young.

Phaethon rubricauda This bird is few in numbers, seen only about the old buildings, and is the one species which the Frigate bird attacks seeking the fish which it is carrying to its young. The old sheets of corrugated <sup>iron</sup> which had been blown from the buildings, and lodged out in the sand flats served as shelter and nesting places for both the shearwater, and the Tropic bird, which had burrowed beneath. When the vegetation increases, it is possible that the Phaethon will increase.

Telespiza cantans, in 1924 I recorded but a few specimens of this bird, but

since the return of shelter due to the vines and other vegetation this inquisitive prolific little songster has increased to many hundreds, but this species too, has learned to eat the eggs of the Tern, and depends a lot on this food for subsistence.

The species Himatione sanguinea, Laysan honey eater is now extinct, for no specimens were seen. There are no Rail on Laysan, but in 1904 I took to the island of Midway several pairs, and as they are now very plentiful there, I am hoping some day to be able to get these birds back again to Laysan where they belong, as they are useful fly catchers.

Acrocephalus familiaris, no specimens were seen, and it is to be presumed this species has gone forever.

Anas Laysanensis It is regrettable that this species has now dwindled to but one female specimen, she either appeared lame or was fainting for she would not fly, fluttering about, and when I searched through the grass found a nest of white eggs, all had been punctured by the Curlew.

Captain Anderson of the schooner "Lanakai" told me he thought these ducks migrated for sometimes on his visits to Laysan he did not see any of them

However in 1928 he saw a flock of 15 birds, so its possible this species is not entirely gone.

In suming up the situation as regards the plants, and the possibility of the normal condition returning to Laysan, I think we are to be congratulated with the results of former visits, and when we have occasion to return again I am sure we will find many additions to the original flora.

The assistance given me by the Captain and the officers of the "Pioneer" have had much to do with the successful planting of the trees and shrubs, and I desire to express my appreciation for their many helpful suggestions.

Enclosed find some pictures taken of the island which will show just what has occurred, since the rabbits were removed.

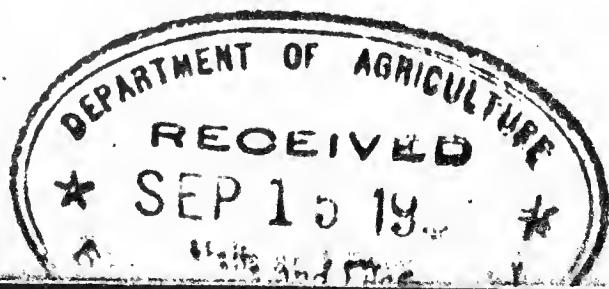
Trusting this report will meet with your approval

Yours Respectrully

*Gerrit P. Wilder*

Gerrit P. Wilder

U.S. Deputy Reservation Protector





BSFW - notes - Botany Haysan

Sept. 1966 -

Individual Coryza plants scattered 200-300 yards both north and south of camp-site + occasional plants found about half-way down the west side. <sup>noted</sup>

Pluchea along east shore of lagoon, which we thought had been killed by flooding in the past winter, apparently has ~~bee~~ recovered & appears to be quite thriving.

Chenopodium seed scattered around camp site [seed from French Frigate Shoals]

Palms - north trees - 9 live, 2 producing coconuts  
south trees - 2 live, no nuts but some flowering heads.

Mar. 64 - (Walker) Scaevola - burned back on NW + W sides between 2 and 12 feet. Young plants seen around lagoon.

Messerschmidia - No live leaves, dead ones hanging down. Tree looks dead.

Cocos - 10 of 13 at NW looked poor 5 of 7 at SE <sup>was</sup> in bad shape

Sicyos - around lagoon - smothering Scaevola and Eragrostis, flowering and fruiting.

Pluchea - in flower, young plants about 6 inches.

Extensive dead areas around NE end of lagoon.

About 40-60 acres covered with it.

Cyperus - Young plants sprouting all around lagoon. Some seed heads found on larger specimens.

Sept. 19-20 -- The Messerschmidia plant near the northwest landing appears to be ←  
1964 dead - it has no green leaves. The tobacco introduced by the guano diggers many decades ago is sparsely scattered over much of the island. The on the east end of the lagoon is much reduced in acreage as compared to that found a year ago at this time. This appears due to the high water experienced this past winter which apparently flooded out a considerable amount of this plant. Sicyos ←  
was flowering and on the south side of the lagoon. Of the ←  
coconut trees planted by personnel of the Hawaii Division of Fish ←  
and Game some years back, seven on the north side appear very healthy and two are bearing good-sized nuts. The southern growth has been reduced to only three healthy plants. The armour scale so prevalent on the Scaevola on Lisianski was all but absent here on Laysan and the Scaevola appeared to be very healthy and

Mar. 26-31 --- Pictures were taken of the vegetative photo stations. We checked  
1966 around the camp site (north and east of the Ironwood tree) for  
→ the presence of Conyza bonariensis, the weed which was apparently ←  
introduced by the Air Force which had established a camp on the island in 1963 during the HIRAN operations. Four plants were found which were pulled up. A soft-leaved composite with a reddish or ←  
→ yellowish head which we were unable to identify was collected by Ron Walker. Kramers Chenopodium plantings at photo station C-2 were checked but no evidence of germination was found. The Chenopodium ←  
seeds collected on East Island of French Frigate Shoals were planted in a row of about 50 feet at Photo station C-1 and near the shores of the lagoon at a plot marked by two half-inch conduits about 50 feet apart. The location of this plot was in the northwest shore of the lagoon. Tribulus appeared to be thriving and much of it was in bloom as was the Nama and Boerhavia. Sicyos down near the shores of the lagoon was just beginning to bloom.

Dec. 13, Some Ipomea was blooming, but no blooming Tribulus or Boerhavia was  
1967 noted. Albatross had trampled trails through the thinner growth of Scaevola along the beaches. The two Messerschmidia plants south of the northwest landing were thriving and in bloom. The lone bush north of the landing was not as robust. The lone Chenopodium plant noted at the campsite last September was not found. Conyza was for the most part in the rosette stage. The plots made experimentally contained a number of smaller plants. However, this growth might have been the result of seeds germinating after the plot was sprayed. Results thus are inconclusive. The remaining palms on the north and south appeared to be green and thriving.

Additional Data on Haysan  
Botany from BSW Reports

Mar. 67 - No botany data

Sept 67 - Photostation pictures taken

A patch of 100 x 100 ft. Conyza b. was sprayed with a 5% solution of 2,4-D. The plot was located SE of camp-site. The plant was in the seed stage, however, and results may not be too good. A large plot just north of the camp was also sprayed.

Noted a lone Chenopodium plant on SE corner of old food cache. This is the first one noted on Haysan for decades. We watered it well.

Mar. 69 - The Chenopodium plant established just south of the campsite seems to be thriving and producing seed. This plant is the sole result of a number of efforts during the last eight years to reestablish the species on the island.

A single large plant of Cenchrus echinatus was found along the path from the landing site to the campsite. It was pulled and thrown in the ocean.

Photostation pictures were taken in Kodacolor

June 69 No botany data

Sept 69 Two Cenchrus echinatus in flower found near the benchmark on the west side of the island. They were removed & thrown into ocean.

The two Chenopodium plants near campsite thriving - putting out much lateral growth. The second plant is on the northwest corner of the innwood.

Siegos - much fruiting

Coconuts - north end - flowering - 2 on south end much healthier & robust than in March.

Conyza was all dry but plant heads still retained much seed.

## Data on Botany and Condition of the Vegetation from POBSP Field Reports

Date of Survey	Comments
Feb. 11-13 1963	-----
Mar. 10-11 1964	-----
Sept. 16-20 1964	Observations and a partial collection of plants were taken by Alan Young, botanist, University of Hawaii.
Mar. 6-11 1965	-----
July 17-21 1965	-----
Aug. 5-12 1965	-----
June 10-16 20-21 1966	The vegetation on the island was considerably less lush than last August. Much of the Ipomea about the lagoon was drying up and the fringing Scaevola belt along the outer beach was roughly 1/4 to 1/2 as high as during the previous August survey. Four species of plants were collected.
Oct. 20-23 1966	-----
Mar. 18-19 1967	-----
June 7-12 1967	Weather during the survey was hot and sunny with no rain during the period. From observations of the vegetation it could be surmised that this island had received less rainfall than wither Pearl and Hermes Reef or Lisianski Islands. The easiest method to determine relative rainfall is by observing the plant <u>Ipomea pes-caprae</u> . Large areas of dried up <u>Ipomea</u> was present on Laysan but not on the other two islands. Condition of other plants on the three islands supported this general observation.
Sept. 5-11 1967	The lagoon level was 6 to 12 inches lower than when the writer last visited the atoll in March of 1965. This would be due to the maximal high tidal level of the ocean, lower now than during the March visit, resulting in a fluctuation of the lagoon from seepage between the ocean and lagoon. Lagoon water only covered 2/3 or 3/4 as much area during the month of June compared to the month of March. This lower level resulted in a large open dry area on the west side of the lagoon. The Captain of the support vessels said he walked across the middle of the lagoon, indicating a depth of less than four feet.
Sept. 5-11 1967	-----

seeds or seedlings planted by  
Tanager Expedition

*Calophyllum inophyllum* Kanani

*Barringtonia asiatica* Botong

*Casuarina equisetifolia* Ironwood

*Tlespesia populnea* Milo

*Pritchardia pacifica* Fiji fan palm

*Leucaena glauca* Haole, Koa  
hoqwood

*Haematoxylum campechianum*

*Ipomea pes-caprae* Poluelue

*Scaevola frutescens* Naupaka

*Hibiscus tiliaceus* Itau

native palms, Roqwood, milo, ironwood,  
lobelia + various vines

Vegetation on hisianaki in 1923  
was confined to a narrow ridge  
along the north west beach

Long, C. R.  
1964

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Plants Collected on French Frigate Shoals,  
September 27-28, 1964 by C. R. Long

September 27, 1964 - Trig Island

1. Boerhaavia diffusa L.
2. Tribulus cistoides L.
3. Portulaca lutea Sol.
4. Scaevola taccada
5. Messerschmidia argentea (L.f.) Johnston
6. Chenopodium sandwichicum Moq.
7. Lepturus repens (Forst.) R. Br.
8. Setaria verticillata (L.) Beauv.

September 27, 1964 - Whale Island

1. Scaevola taccada
2. Portulaca lutea Sol.
3. Boerhaavia diffusa L.
4. Tribulus cistoides L.
5. Chenopodium sandwichicum Moq.
6. Messerschmidia argentea (L.f.) Johnston
7. Lepturus repens (Forst.) R.Br.

September 27, 1964 - East Island

1. Boerhaavia diffusa L.
2. Tribulus cistoides L.
3. Chenopodium sandwichicum Moq.
4. Portulaca lutea Sol.
5. Cocos nucifera L.\*
6. Messerschmidia argentea (L.f.) Johnston
7. Lepturus repens (Forst.) R.Br.
8. Scaevola taccada

September 28, 1964 - Tern Island

1. Coccoloba unifera Jacq.\*
2. Casuarina equisetifolia L.\*
3. Cenchrus echinatus L.
4. Ipomoea pes-caprae L.
5. Messerschmidia argentea (L.f.) Johnston
6. Cynodon dactylon (L.) Pers.
7. Coronopus didymus (L.) J. E. Smith
8. Sonchus oleraceus L.
9. Pluchea odorata (L.) Cass.

\* observed

Long, C. R.  
1964

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September 28, 1964 - Tern Island cont.

10. Eleusine indica (L.) Gaert.
11. Lycopersicon esculentum L.\*
12. Portulaca oleracea L.
13. Portulaca lutea Sol.
14. Eragrostis whitneyi Fosb.
15. Euphorbia prostrata Ait.
16. Cocos nucifera L.\*
17. Euphorbia hirta L.
18. Erigeron bonariensis L.
19. Tribulus cistoides L.
20. Lepturus repens (Forst.) R. Br.

\* observed

1964

- June 18, 1964 Motu Tabu  
 (5) L 178-L182  
 L178 - 1 1-2 in., under Pisonia  
 L179 - 2 Lepturus, Boerhaavia, Portulaca, Heavily mounded area, fine sand area.  
 L180 - 3 open area, salt bush, 1-2 inches.  
 L181 - 4 Messerschmidia, 1-2 in.  
 L182 - 5 Bottom of old burrow under Lepturus, in Lepturus, Boerhaavia, Portulaca stand. Fine sand area, approximately 10 feet depression, wet 1/2 inch down.
- June 22, 1964 Malden Island Lagoon  
 (1) L183  
 L183 salt crust
- June 23, 1964 Malden Island  
 (5) L184-L188  
 L184 - I and L185 - II Soils forming among raised coral heads - Surfaces bare but Sesuvium forms a peripheral ring about the lagoon. Top 1/2 inch whitish with salts then dark red layer extends to several feet in depth. Between these two layers is a noticeable layer of blue-green algae?  
 L184 - I bare soil in old coral rock, Sesuvium, top 1/2 in..  
 L185 - II top 1-2 in., bare soil in old coral rock, Sesuvium.  
 L186 - III top 1/2 in. Sida, Digitaria, Portulaca. North side of island. Boerhaavia, Tribulus.  
 L187 - IV top 1/2 to 2 in. Sida, Digitaria, Portulaca, Boerhaavia north side of island.  
 L188 - V bare area among Sesuvium, grasses, on flat rock, 1/2 to 2 in., top layer white with much salt.
- June 26, 1964 Starbuck Island  
 (5) L189-L193  
 L189 - I Portulaca, Sesuvium, Eragrostis - shells on top 1/2 - 2 1/2 in.  
 L190 - II 1/2 - 2 in. Lepturus, Sida  
 L191 - III guano soil Lepturus thick, some Sida, 0-1/2 in.  
 L192 - IV guano soil Lepturus thick, Sida, 1/2 - 2 1/2 in.  
 L193 - V Digitaria, Sida, Tribulus 1/2-2 in. coarse gravel on top
- June 27, 1964 Starbuck Island  
 (4) L194-L197  
 L194 - VI at Post No. 1 1/2 - 2 1/2 in.  
 L195 - VII midway to post No. 2 on rim 1/2-2 1/2 in.  
 L196 - VIII at post No. 2 1/2-2 1/2 in.  
 L197 - IX Digitaria stand west end 1/2-2 1/2 in.
- July 4, 1964 Tuituila, American Samoa  
 (1) L198  
 L198 Forest 800 feet 1/2-2 in.



1964

Midway Island, Eastern Island - May 25, 1964

- I212 - 1. collected in albatross nest area, bare soil and coral sand and gravel as base parent material, in the Lobularia stand at the end of the west-east runway (0.5-2.5 in layer).
- I213 - 2. in bare corraline parent material, thin soil, east side of the island (Area IV of collecting map), (0.5-2.5 in layer).
- I214 - 3. under Casuarina grove midwest side of the island. Litter layer is 0.25-.75 in deep.

Midway Island, Sand Island - May 27, 1964

- I215 - 1. sand base soil under Casuarina on Frigate Point.
- I216 - 2. under Scaevola, tip of Frigate Point.

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\* collection numbers: soils - C.R.Long

\* all soil collections from 0.5-2 in. layer except where noted.

C.R. Long  
1964

Midway

PLANTS COLLECTED BY C.R.LONG, MAY 22-26, 1964

Midway Island, Eastern Island

Eragrostis amabilis (L.) W. and A.

Polypogon monspeliensis (L.) Desf.

Messerschmidia argentia (L.f) Johnston

Fimbristylis cymosa R.Br.

Solanum nigrum L.

Lepidium owaihiensis C. and S.

Pluchea odorata (L.) Cass.

Cynodon dactylon (L.) Pers.

Lobularia maritima Desv.

Lepturus repen (Forst.) R.Br.

Boerhaavia diffusa L.

Portulaca oleracea L.

Euphorbia heterophylla L. var. cyathophora (Murr.) Griseb.

Coronopus didymus (L.) Sm.

Spergularia marina (L.) Griseb.

Verbesina encelioides A. Gray

Euphorbia hirta L.

Eleusine indica (L.) Gaert.

Eragrostis whitneyi var. caumii Forb.

Sonchus oleraceus L.

Gnaphalium sandwichensium Gaud.

Cenchrus echinatus L.

Anagolis arvensis L.

Terminalia catappa L.

Tribulus cistoides L.

C.R. Long  
1964

Midway Island, Frigate Point, Sand Island

Sida cordifolia L.

Stachys arvensis L.

Setaria verticillata (L.) Beauv.

Casuarina equisetifolia L.

Cordia subcordata Lam.

Conyza bonariensis (L.) Cronq.

Scaevola sericea Vahl.

Lobularia maritima Desv.

Messerschmidtia argentea (L.f.) Johnston

Eragrostis variabilis (Gaud.) Steud.

Digitaria sanguinalis (L.) Scop.

Euphorbia hirta L.

Fimbristylis cymosa R.Br.

Boerhaavia diffusa L.

Scaevola sericea Vahl.

Lepturus repens (Forst.) R.Br.

Coccoloba uvifera (L.) Jacq.

Euphorbia heterophylla L. var. cyathophora (Murr.) Griseb.

Midway Island, North Beach

Scaevola sericea Vahl.

Messerschmidtia argentea (L.f.) Johnston

Euphorbia heterophylla L. Var. cyathophora (Murr.) Griseb.

C.R. Long  
1964

The Vegetation of Midway Island, Eastern Island

The predominant vegetation of Eastern Island is composed of the following species and species associations:

- 1.) Casuarina equisetifolia L.
- 2.) Scaevola sericea (Vahl.) - Messerschmidia argentea  
(L.f.) Johnston
- 3.) Pluchea odorata (L.) Cass.
- 4.) Lobularia maritima (L.) Desv.
- 5.) Fimbristylis cymosa R.Br.

Less prominent but occupying areas so fully as to constitute a temporal dominance are:

- 6.) Verbesina encelioides A. Gray
- 7.) Gnaphalium sandwichensium Gaud.

Area I\*- (bounded by the nw end of the nw-se runway and by the ne end of the ne-sw runway including north point of island.) Small clumps of Scaevola along nw and ne shore. The remainder of the area is sparsely vegetated with Lobularia, Gnaphalium, and Cynodon (near edge of runway). Large colony of nesting sooty terns (with eggs).

Area II - (bounded by ne end of ne-sw runway mid part of nw-se runway and end of ew runway.) Along the shore is found Messerschmidia-Scaevola extending several score of yards into the interior of the island. The association is not continuous but broken by several open areas extending from the shore into an area covered by low herbs. Along the edge of the nw-se runway a large patch of Fimbristylis (south portion) and several small patches of same in nw portion where observed. Present also were Eleusine, Gnaphalium, and Lobularia. The sooty terns colony occupied an area synonymous with that of the larger Fimbristylis stand and was "overflowing" into other bare areas to the north. Several dozen nesting albatrosses were also seen in the area. At the east end of the ew runway is a solid Messerschmidia stand.

Area III- (bounded by north end of ew runway, on the west by nw-se runway.) Messerschmidia along shore and on se end Scaevola. Isolated clumps of Casuarina along runway. In open area between Messerschmidia and the runway are solid stands of Verbesina. Also present are Ipomoea, Gnaphalium, and Lobularia.

\* Refer to vegetation map of midway Island, Eastern Island constructed by C.R. Long from observations and field notes taken between May 22-26, 1964.

Area IV- (bounded on east by se-nw runway, on north by ew runway, on west by sw-ne runway.) Solitary clumps of Scaevola and Messerschmidia along shore above elevated reef rock beach. In the middle area and to the east, Lobularia and Verbesina in open areas. On the west and nw along the ew runway Pluchea forms a solid stand. Scaevola also found in mid west portion of this area. Stands of Casuarina parallel the ew runway. In the ne corner of Area IV are isolated clumps of Lepidium, Gnaphalium and Solanum. Large sooty tern colony is found in the ne end of the area.

Area V- (Triangle bounded by all three runways.) In west angle: Casuarina and Verbesina (only at edge of runways). Pluchea found along ew runway with a Casuarina grove in the mid portion. On the east end of the area Pluchea, in se angle and a few Messerschmidia. On north side are found Lobularia, Spergularia, Coronopus, Sonchus, Anagalis, Cynodon and Eleusine. A much disturbed area with many weed species.

Area VI- (bounded by the end of the nw-se runway, the long portion of the ne-sw runway and the long end of the ew runway.)  
a. area to the ne of the boat docks. Low herbs such as Lobularia and Gnaphalium, patches of Cynodon, Portulaca, Eleusine, and Verbesina were observed and collected. Small clumps of Scaevola were found on the shore side and one small clump of Pluchea. Anagalis and Coronopus were observed near runway along with three distinct areas dominated by Fimbristylis.  
b. area sw of boat dock. Casuarina is conspicuous in this area—a planting roughly paralleling the shore and extending toward the sw tip of the island. This area is broken by and contain open places in which are found the Messerschmidia-Scaevola association (west end), and, low growing herbs such as Eragrostis, Verbesina, and Gnaphalium. On the bay side many Messerschmidia seedlings were observed along the beach particularly toward the sw point on the south side adjacent to the runway is an area of low herbs and shrubs. At the ne end is a stand of Pluchea. Intermittent patches of Lobularia stretch toward the sw in this area with Coronopus and Cynodon. At the west end of this low strip is a small number of Lepidium plants. At the west end of the ew runway is an area of low vegetation, Eleusine, Lobularia, and Gnaphalium. Lobularia was the conspicuous dominant in late May. This area was favored for nesting by the albatross. Near the shore is a weedy area with Verbesina, Solanum, Lepidium, Sonchus, and Portulaca.

Area VII- (bordered on nw by runway and on the se by sw-ne runway.) Scaevola observed along the shore with open area dominated by Lobularia. A clump of Casuarina is present. In open areas are Boerhaavia, Tribulus, and Portulaca. In the south portion the Scaevola and Messerschmidia are stunted by the prevailing wind. At the south end of the ew runway is a small clump of Lepidium owhyhiensis among the Lobularia. A large colony of sooty terns is found midway along the ew runway in this area.

C.R. Long  
1964

Vegetation - Avifauna Association \*

The distribution of the major number of bird species found on Eastern Island in late May 1964 correlates significantly with the low herbaceous type of vegetation found adjacent to the runways. The terns and albatross nesting groups are found in the Lobularia or Fimbristylis association. The red tailed tropic birds nest under Scaevola on the sw and mid south portion of the island.

One group of sooty terns observed along the ew runway in Area VI b. had settled near the clump of Casuarina adjacent to the ew runway. There within a radius of 10 feet, the nesting birds had laid their eggs. The other nesting birds in the club were without eggs.

The albatross nest areas tend to become bare and somewhat elevated - a soil rim being formed. The Lobularia seedlings were numerous in these bare areas.

Heavy nesting on the unused runways was not observed by any species. The albatross do utilize the bare runways for their takeoffs.

Disruptive Effect of Man

It may be assumed that a drastic reduction in the bird population of Eastern Island has taken place in modern times. The leveling and paving of large areas, the erection of large antennae and the various other activities of man have been most harmful to the bird populations. At the same time the flat areas containing low herbaceous type of vegetation are limited further by the planting of Casuarina. The significant area covered by these self-reproducing trees represents an additional reduction in potential nesting area.

\* Refer to vegetation map of Midway Island, Eastern Island, constructed by C. R. Long from observation and field note taken during period May 22-26, 1964.

# Journal

Philip C. Shelton

Hisianaki Island  
16-20 June 1966

- arrived from Laysan I. about 1730 hrs. with same crew as on Laysan - Dick Cronin (in charge) Ken Balcomb, Frank Smith, Dave Hoff, Dave Pearson and R. Chordella.

Made a brief excursion to the north east side of island, picking up a few plants, including what looks like a seedling of Sponsoea pas-copraea on the north shore. (Identified later by Robt Long - probably first record for Hisianaki)

- Scaevola is more widely spread on this island than on Laysan - extending inland 2-4 times as far from shore all around the island. Here as on Laysan, Dick Cronin immediately noticed the striking difference in height of Scaevola from what it was last July. In contrast with Laysan, however, there is a conspicuous amount of dead & decedent Scaevola here.

- A black rust-like organism (Blue-Green Algae?) grows on the stems & leaves. + large number of <sup>scale insects</sup> eggs are attached to leaves & stems.

Journal

Philip C. Shelton

Kisianski p2  
16-19 June 1966

The island generally appeared dry. light showers in the early evening of 16 June + heavy showers in the early morning on the 19th were the only breaks in the clear-partially-cloudy skies.

Itinerary - Work Schedule.

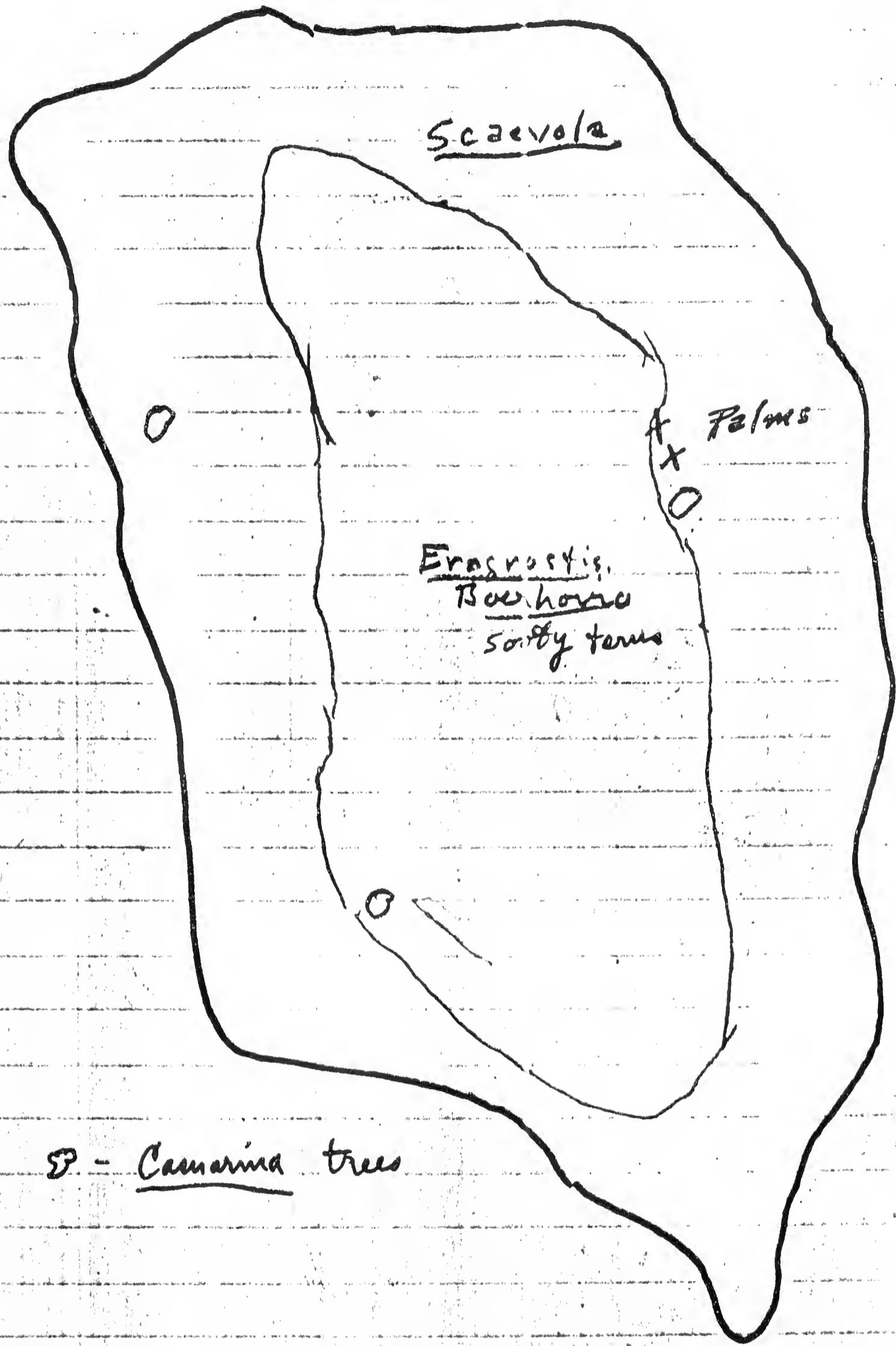
16 June Banded Sooty terns, in Ev. <sup>B</sup>  
Blk wedgetails toward Morning.

17 June. Erected FFW S signs,  
Banded Sooty terns, Blk  
Boobies + Frigates.

18 June Shore bird + nest count,  
Banded Sooty terns,  
Blk Sooty terns, finished  
Boobies + Frigate.

19 June - took pictures, finished  
plant collection.  
Finished Sooty Tern Banding.  
Collected ectoparasites.  
Left the Island





SP - Casuarina trees

Lisianski

Location Lisianski I  
 Observer Philip C. Shelton Date 16-19 June 66 time to  
 Weather

SPECIES	Abundance				Breeding			Remarks
	1-10	10-100	100-1000	1000 +	Nests	Eggs	Young	
Laysan Albatross								2785 - 199 Ad. - 4-5000 yrs
Black-footed Albatross								99: ch - 10 Ad 1000 yrs
Wedge-tailed Shearwater								50,000
Christmas I. Shearwater								2 courting pairs, 2 w/egg
Audubon's Shearwater								
Bonin I. Petrel								2 Ad - 1 ymg
Phoenix I. Petrel								
Bulwer's Petrel								
Sooty Petrel								
Red-tailed Tropicbird								6 eggs, 5 ymg. - 300 m
White-tailed Tropicbird								
Masked Booby								58 nests w/ ymg 3 w/ egg - 300 nests
Brown Booby								8 w/ ymg, 1 w 2 eggs - 100
Red-footed Booby								33 w/ ymg 2 w/ egg - 1000 -
Great Frigatebird								218 ymg, 68 egg - 2000 T.T.
Golden Plover								55
Ruddy Turnstone								117
Wandering Tattler								15
Sanderling								
Bristle-thighed Curlew								28
Sooty Tern								1,000,000 T
Gray-backed Tern								
Brown-winged Tern								
Common Noddy								4-5000 nests - 1-2% hatched
Hawaiian Noddy								500-1000
Blue-gray Noddy								
Fairy Tern								7 nesting 50-100 birds
Black Bellied Plover								1 coll.

LA  
 BFA  
 WTS  
 CTS  
 BIP  
 RTTB  
 BFB  
 BB  
 RFB  
 GF  
 GR  
 RT  
 WT  
 BTC  
 ST  
 CNT  
 HNT  
 FT  
 BBP

Species Accounts - Laysan

Philip C. Shelton

16-20 June 1966

LA

- Laysan Albatross - Chicks appear at about the same stage in development as those on Laysan - a very few have lost all head and neck down; most are still downy except on their sides, breast, and belly. Adults are still feeding young. There are no large concentrations of young birds. Most birds are on the beaches, but good numbers occur in areas of nearly pure Sporobolus indicus or Boerhaavia in the interior - several of these openings have 50-100 young Laysan Albatrosses. Otherwise the birds are scattered throughout the island except in densest stands of Scaevola.

2785 chicks and 198 adults were counted by 4 people covering all but the central Eragrostis area 18 June. Estimated total population about 4000-5000 young.

Species account - Laysan I

Philip C. Shelton

16-~~20~~<sup>19</sup> June 1966

Black-footed Albatross

BFA

This species is confined to the shore line where 993 <sup>+10 AAs</sup> chicks were counted by Crossin & Pearson 18 June.

Many chicks are fully feathered and are capable of short hopping take-off attempts. About half-~~73~~ still have downy heads and necks.

Est population - 1000 young.

Species Accounts - *kuonshiki*

Philip C. Shelton

16-19 June 1966

Wedge tailed Shearwater

WTS

Widespread but less abundant than on Laysan. Absent only in lowest part of SE center interior region

Much courting going on.

Several eggs were found, both in burrows and in open nests under Scaevola

Total population Estimate:

~ 100/acre or about 50,000 birds.

Species Account: - *hisonskii*  
Philip C. Shelton 16-19 June 1966

Christmas I. Shearwater

CIS

Found two nests, <sup>each with one egg</sup> in open - no burrow -  
and saw two courting pairs, all  
in Scaevola zone on Northwest  
portion of Island.

Species accounts - Lisianski

Philip C. Shelton

16-19 June 1966

Bonin I. Petrel

B18

Most birds probably have left the island. I saw one immature 18 June during the day with down still present on the head. Saw two birds, age undetermined, on the night of 18 June.

Species Accounts - L'Ansonski I.

Philip C. Shelton

16-19 June 1966

○ Red-tailed Tropicbird

RTTB

Nesting is well underway - 6 nests with eggs; 5 with young were counted during nest count 18 June. All were under Scaevola.

This count was very superficial for this species. An estimate 2-300 nests could be found - total pop. 500 birds.



Species accounts - hisionaki

Philip C. Shelton

16-19 June 1966

BFB

Masked Booby, (Blue-faced)

Nesting birds are restricted to the edge of Scaevola at the top of the storm beach. Nests occur all around the island in this ~~strip~~ strip. Inland areas are apparently too well vegetated for this species. No concentrations of nests occur.

Crossin counted 58 nests with young, 3 with egg on 18 June. Size of young were as follows:

Roosting birds occur on two or three wide sandy points on the SW side. About 300 birds were counted there at dusk 19 June.

Total pop - 120 nesting.  
300 roosting  
~ 500 total.

Crossin estimates 2-300 more roosting on north beach - I didn't see these.  
Total 800

Species Account - Kiszonski I.

Philip C. Shelton

16-19 June 1966

Brown Booby

BB

The few nests seen (8 with young, 1 with two eggs) were near the inner edge of the Scaevola assoc. near the NW side of the island. A few more roosting birds were scattered over the island.

Total Pop. est - 100 birds.

Species accounts - Laysanski

Philip C. Shelton

16-19 June 1966

RFB

Red-footed Booby

Nesting birds are mostly at the north end of the island, but a few hundred roost in scattered groups all around the island in the highest Scaevola and in the Casuarina trees

Hatching is well behind that of the other two boobies. 33 nests were found with young and 23 with an egg (18 fine nest count)

Several immature birds, including an orange-streamered one, were seen. Also an adult with red (possibly orange) point.

Total population Est ~ 1000 birds.

Species Account - *H. sianuski*

Philip C. Shelton

16-19 June 1966

GF

Great Frigatebird

16 June - An immature with a brownish white head tried to bite the top of my head as I walked along the NE beach.

General Young occur in all stages from freshly hatched to large ones with black feathers coming in on Scapular and Secondary tracts.

218 young and 68 eggs counted

18 June - total pop est. 2000

These birds occur wherever there is Scaevola. Most nests are on the northern portion of the island & most birds seen on southern half were roosting only. Scattered patches of Scaevola in the interior have nests and roosting birds.

Immatures are common and appear to be healthy. Mortality of these is much lower than on Southern Islands - Phoenix & McKean. Frank Smith saw one with a blowfish & I saw one making repeated passes at a freshly hatched chick from which I had just flushed the adult, but the immature did not take the chick.

Species Accounts - Lisionstai  
Philip C. Shelton, 16-19 June 1966

~~Wandering Tattler~~

Shorebirds

○ Results of Count. June,  
Golden Plover - 56  
Ruddy Turnstone - 119  
Wandering Tattler. 15  
BT Curlew 28  
Black-bellied Plover 1 (collected by Pearson & Cronin)

GP  
RT  
WT  
BTC  
BBP

Philip C. Shelton

16-19 June 1966.

ST

Sooty Tern

○ Nesting birds in various stages occupy  $\frac{1}{2}$  to  $\frac{2}{3}$  of the Eragrostis association in the interior of the island. Many are crowded under edges of Scaevola clumps where these occur scattered over the island.

The large concentration of birds near the NW corner of the interior have many small chicks - about 25% hatch.

○ Those near the Palm trees and Casuarina on the east side have fewer chicks & the concentration at the south end of the island have only eggs.

There may be scattered small groups of birds still coming down to breed. One group of a few hundred was found, 18 June near the north edge of Eragrostis, some now were on eggs & all flew up when I approached.

○ Total population for the island at least 1 million birds.

Species accounts - Laysan

Philip C. Shelton.

16-19 June 1966

GBT

Gray backed Tern

Breeding in scattered flocks in Scaevola - all parts of the island, periphery and interior.

Many immatures - saw none too young to fly, but Dick Crossin reported eggs & small young.

Total pop. est. 5000

Species Account - Laysan Noddy

Philip C. Shelton,

16-19 June 1966

CNT

Common Noddy

Nesting under Scaevola all around the island. More abundant than on Laysan. Three small chicks were seen 18 June - no more than 1% hatch.

Total nesting population est. 5000, perhaps as many more non-nesting.

Species Account - Laysan Noddy

Philip C. Shelton,

16-19 June 1966

CNT

Hawaiian Noddy

One or two dozen nests occur in each Casuarina tree (4).

Most young are fully fledged but apparently are not yet flying.

Many more roosting birds occur mostly in Scaevola along west shore.

Population est - 2000 total.



Species Accounts - Hisiowski

Philip C. Shelton,

16-19 June 1966

FT

Fairy Tern

Dide Crossin found a 4-5-day-old chick. I found a maggot-ridden egg (cracked) being incubated on a Scaevola branch along the beach south of camp.

A few pairs roost in each Casuarina tree. Those roosting in the two trees by camp were not seen after the first night - perhaps they were disturbed by us.

Total pop est 200

Philip C. Shelton

16-19 June 1966

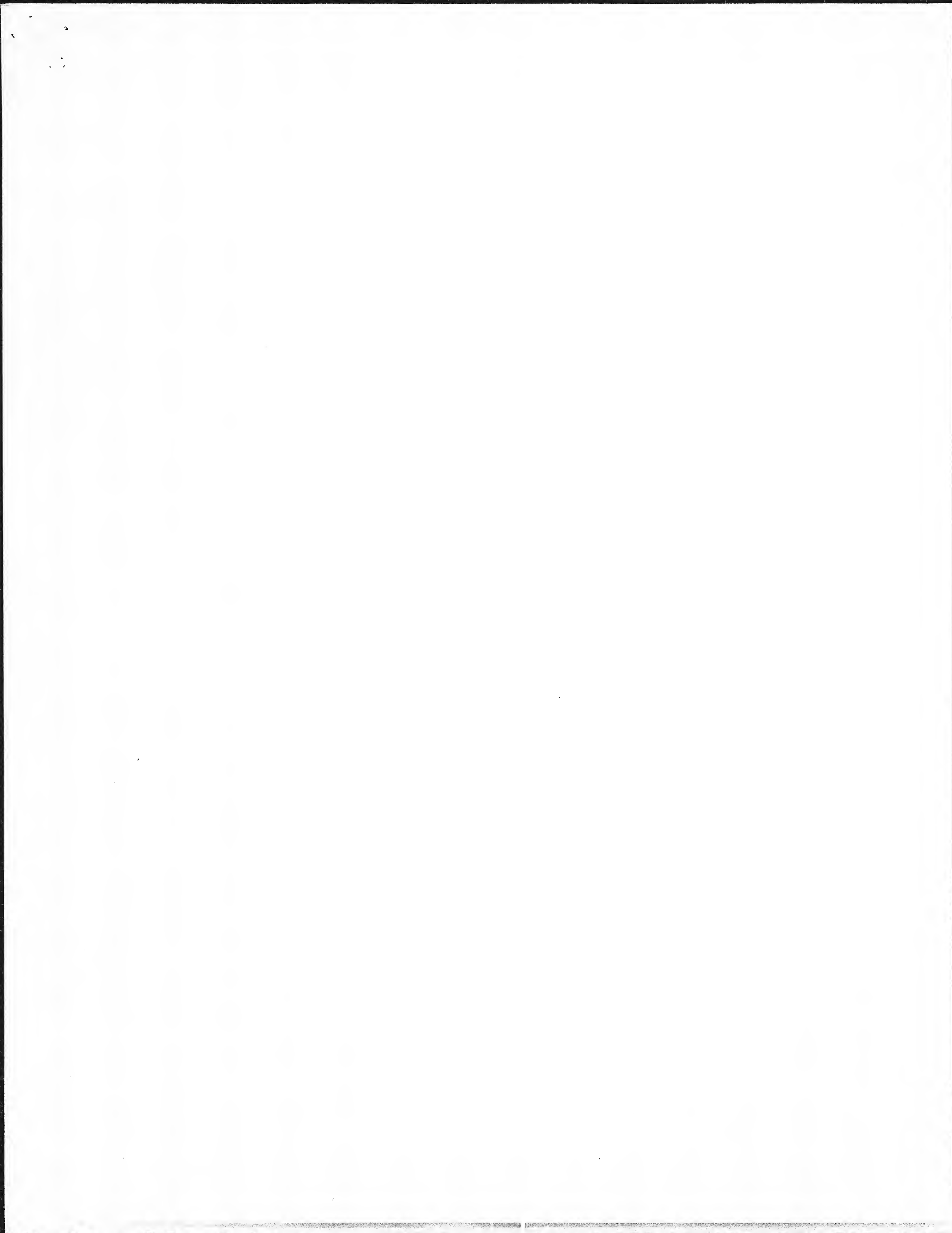
Kisianski - Vegetation -

- only two of the five plant associations described by Lamoureaux for Koyoon have counterparts on Kisianski. They are the Scaevola and brunchgrass (Eragrostis) Associations.

Name occurs on the beach margins, but there are not wide enough to allow extensive development of a Name type such as occurs on the broader Koyoon beaches.

- Portulaca lutea occurs only at the top of the storm beach ~~at the top of the storm beach~~ where it was well scattered. It was in bloom & mature fruits were developed.

Scaevola is relatively more abundant and widespread than on Koyoon, forming thickets to the top of the seaward slope all around the island.



Species accounts - Plants

Philip C. Shelton,

Kuonshiki I

16-~~19~~ June 1966

○ Eragrostis variabilis (PC 414)

occurs on all parts of the island.  
Densest in interior where it occurs  
as almost pure stands, with  
Boerhavia growing on sand mounds  
between grass clumps.

Scattered clumps and larger  
~~patches~~ stands occur in Scaevola areas,  
all the way out to the beach.

○ Cocos nucifera (not collected)

Two trees, NE side ~ 12" dbh +  
25' high (estimated)

One (NW) has several large nuts  
none recently fallen. Several  
large, old nuts on ground  
SW tree has only a few nuts.

Species Account - Plants - Laysan Is.  
Philip C. Shelton.

16-19 June 1966

Casuarina equisetifolia (PCS 409, 411)

Four live trees - 2 at top of West  
beach, 1 NE, near palms, 1 SW.  
2 dead, SW.

Collections made from NE & W  
trees.

Extensively used as perches by  
Red-footed Boobies, Great Frigates,  
Fairy terns and Common Noddies, &  
for nesting by Hawaiian Noddies.

Boerhavia diffusa (PCS 402)

As widespread as Eragrostis but  
less conspicuous. Much of it is in  
full bloom. Forms pure stands in  
a few small openings in the north  
central interior. Associated with  
Eragrostis over the entire island.

Plant accounts - Hisianski  
Philip C. Shelton.

16-19 June 1966.

Portulaca lutea (P.C.S. 406, 410)

Found only at top of storm  
beach, noticed only on W, N, + E  
sides - didn't look closely on S.

Plants scattered along margin of  
Scaevola

In bloom + has black fruits.

Tribulus cistoides (P.C.S. 401,

Generally most common on outer  
half of Scaevola area, where it is  
common all around the island,  
except possibly the SE corner.

Also, scattered patches, some nearly pure,  
occur at inner edge of Scaevola  
area + a very few on the interior,  
especially on the E. side.

In flower with green fruits,  
occasional blackened dead patches  
were found with dead Scaevola.

Flora Account - Lisianski

Philip C. Shelton.

16-19 June 1966.

○ Sporobolus indicus (PES 408)

Abundant on N. 1/3 of I in Scaevola,  
sometimes climbing + choking same.  
Widespread in Eragrostis area, often  
forming pure stands on level,  
sandy areas in interior and ~~ocean~~  
occasionally on inward + seaward  
slopes.

In full flower - flowers white.

○ Sporobolus pes-caprae #11 (PES 409)

one seedling thought to be of  
this species was collected on the  
north beach, near the top of the  
storm beach. (PES 409)

Robert Long identified this specimen  
and stated that it probably is the  
first record of the species from  
Lisianski Island.

Plant Accounts - Wisconsin

Philip C. Shelton

16-19 June 1966

Nema sandwicensis var laysonium  
(PCS 405)

~~Sporae~~

Scarce - scattered along northward facing shores, seedling common. Beaches not wide enough for good development. Occurs below fringe of Scaevola + Portulaca lutea in this rim, occurrence on other shores not well investigated.)  
In flower.

Solanum nigrum (PCS 407)

Three plants found - two at inner edge of Scaevola with Sponoia near the east side, and one near center of the island in open Sponoia, Eragrostis etc.

Fruits mostly green, a few black - no flowers.



Plant Account - *H. wronski*

Philip C. Shelton

16-19 June 1966.

*Sicya lupinus* (PCS 403)

Occasional scattered patches in NW 1/3 of island. Climbing on *Scaevola* - some dead patches + large healthy patches occur on north seaward slope.

In bloom + with well developed fruits.

*Scaevola taccada* (PCS 412, 413)

Forms rim around entire island to top of seaward slope and in scattered patches throughout interior. Interdigitated with *Eragrostis* ocean. *Eragrostis* replaces *Scaevola* on level terrace between top of storm beach and rise to highest ridge on NW slope - this stand not continuous

Thickest *Scaevola* occurs on SE end of I.

Robert Long felt that the decaying of this and other species which I described to him + showed him pictures of, may have been caused by salt water spray, rather than any organism.

## Vegetation

Brooks (1860:6) first recorded vegetation at Pearl and Hermes Reef in 1859; he found the largest islands covered with coarse grass and trees. Bitter (1900:7) identified two species--Eragrostis hawaiiensis [= variabilis], and Solanum laysanense [= nelsoni]--from photographs taken by Walker in 1899.

The vegetation of Pearl and Hermes was first detailed in a report by Christophersen and Caum (1931:15-16, 20-41), who discussed the eleven species of vascular plants found growing on the islands by the Tanager Expedition in April 1923, and the two species represented by seeds found in beach litter. More specimens were collected by Galtsoff in 1930.

Photographs by Frear, Wetmore, and Galtsoff make it possible to reconstruct the vegetative history of the atoll in the present century.

POBSP personnel have collected vascular plant specimens, and taken notes and photographs, on most visits to the atoll. The islands and their major <sup>vegetation</sup> ~~floral~~ associations were mapped in March 1965. Specimens have been collected by Charles H. Lamoureux and C. Robert Long of the University of Hawaii, POBSP cooperators in botany, who prepared the annotated list of species presented in Appendix . Plant specimens from Pearl and Hermes collected by the POBSP and its cooperators may be found in the herbarium of the United States National Museum (USNM), the Bishop Museum (BISH), and the University of Hawaii (UH).

## Vascular Plants

Twenty-five species of vascular plants, representing 17 families, have been recorded from ~~the~~ 5 islands at Pearl and Hermes Reef (Table and Appendix ). The following discussion of the flora, by island, is based on all previous botanical accounts, as well as the data of the POBSP. Wherever plant associations are discussed the species are listed in the order of decreasing abundance.

### Southeast Island

Twenty-two vascular plants are known from Southeast Island (Table <sup>vegetation</sup>). The ~~flora~~ is presently dominated by ten species, two of which were introduced (Figure ). Eighteen species have been found by the POBSP. One of these, an onion (Allium sp.) growing on the refuse heap, was eradicated by the POBSP in March 1963.

The central portion of the western section has a sparse <sup>vegetation</sup> flora of Solanum nelsoni, Coronopus didymus, Boerhavia <sup>sp.</sup> ~~diffusa~~, Tribulus cistoides, and Lepidium bidentatum. Several clumps of Eragrostis variabilis grow to a height of about three feet near the center of this area.

The ledge of reef rock extending southeastward from the western section has a large patch of Sesuvium portulacastrum in its interior. A patch of Sesuvium also grows on the reef rock extension at the southeastern corner of the eastern section.

The area in and adjacent to the tidal pools in the eastern half of the eastern section is dominated by a lush growth of Sesuvium. West of these pools is a large area dominated by Coronopus. A large patch of Eragrostis and a smaller one of Cynodon dactylon, presumably introduced, grow adjacent to each other in the center of the Coronopus area. A few plants of Sonchus oleraceus and Solanum nigrum grow among the Cynodon and Coronopus.

Surrounding the Coronopus area on the north and west is a steadily expanding area dominated by an introduced mustard, Brassica campestris. The area also has some Cynodon and some Sicyos hispidus. From this central, heavily-vegetated area out to the beaches is a relatively open coral sand and rubble region with patches of Solanum nelsoni, Tribulus, Boerhavia, and Sicyos. The extent of these patches varies with location and season. Solanum nelsoni is especially dominant on the southern side and Tribulus on the north. Tribulus and Sicyos are mixed with Solanum nelsoni on the southern two-thirds, and Tribulus and Boerhavia are mixed with S. nelsoni on the northwestern side. A northern area dominated by Tribulus has one patch of pure Sicyos and a larger patch of Eragrostis. A second clump of this grass grows further east in the S. nelsoni-Tribulus-Sicyos association. Several very stunted Scaevola taccada bushes grow along the margin between the vegetated area and the beach on the southwestern and southern sides of the eastern section.

Other plant species recorded in small numbers for Southeast are Setaria verticillata, evidently introduced in 1961 (HDFG, 1961); Lepturus repens; Portulaca lutea; Malvastrum coromandelionum; and Casuarina equisetifolia, introduced in 1963, mostly dead in 1965, and absent in 1969.

The photographs of Frear (Figure ), taken in December 1912, indicate that the flora of the island was chiefly tall bunchgrass, presumably Eragrostis. Eleven years later, in April 1923, the photographs of Wetmore show the island to have a moderate, open cover of Eragrostis (Figure ). Sesuvium grew abundantly on the large reef rock ledge (Figure ). The Tanager Expedition collected six species on Southeast Island (Christophersen and Caum, 1931:15-16). Eragrostis and Lepturus were distributed indiscriminately on the island. Sesuvium grew on the reef rock

areas and in the mud flats around the ponds at the eastern end of the island. Boerhavia was present, but not abundant, and Tribulus was present. Sicyos was represented by a few plants. One seed each of Mucuna gigantea and M. urens was found on the beaches.

In May 1923 the Tanager Expedition planted hau, <sup>H. lucida</sup> ~~Paritium~~ tiliaceum, and palm, Pritchardia [~~Hibiscus~~] pacifica, trees on Southeast Island (Gregory, 1924:21 and Wetmore, ms.), and scattered seeds. Though no record remains of what seeds were scattered, Wetmore has a list of the species given the expedition by the Territory of Hawaii and the Department of Agriculture for planting on the Reservation to replace vegetation destroyed by rabbits. With the exception of Scaevola none of the species on this list are presently growing on Southeast Island.

Photographs taken by Galtsoff in 1930 show that the eastern section was nearly solid Eragrostis, with some areas of Lepturus and Boerhavia (Figure ). A photograph of the buildings (Figure ) of the pearl fisheries venture shows a Casuarina about five feet tall, many plants of Sonchus, and an unidentifiable composite which is apparently no longer present. One view of the western section (Figure ) shows a flora of scattered Boerhavia and very sparse Lepturus. Galtsoff (1933:16) identified two species of algae from the lagoon, Halimeda and Codium. The latter is frequently used as food by sea turtles. He also mentions the planting of Casuarina and Cocos sp. in 1928, but further states that they were all dead or dying by 1930.

Jones (ms.) reported that the predominant noncalcareous algae noted at Pearl and Hermes in the summer of 1956 were Sargassum sp., which grew in clumps in eight to fifteen feet of water within the lagoon. The genus was not found on the reefs or rocks intertidally. A related genus, Turbinaria sp., was found on the reef flats. [He noted that "the occurrence of these two members of the Sargassaceae at Pearl and Hermes is somewhat surprising inasmuch as this family is generally considered to be absent on atolls." ] Occasional specimens of Halimeda were seen, and large patches of blue-green algae on the sands area within the lagoon were identified as probably Lyngbya sp.

ms.  
Woodside and Kramer (HDFG,) reported finding the introduction of Setaria verticillata on Southeast Island in March 1961. Ironwood (Casuarina) trees were planted on Southeast Island by the U.S. Navy sometime in 1963. As this planting was in violation of refuge regulations all trees which were not already dead were destroyed in 1964. Setaria was reintroduced with the ironwoods in 1963.

A significant change has occurred in the flora of Southeast Island since it was first described in 1923 and 1930. Eragrostis has been reduced from the status of a major plant cover to one of insignificance. Only a few isolated clumps remain on the eastern section, which in 1930 was nearly solid grass. It is possible that the major vegetation change occurred in late 1930 when George Kaufman reported no live vegetation, only tall clumps of dead bunchgrass, after a severe storm (Munro, 1945). As information on plant succession in the Northwestern Hawaiian Islands is very limited, it is not known whether the floral change observed, from grasses to herbs and vines, is a result of natural succession or caused by some edaphic catastrophe.

## North Island

Twelve species of vascular plants have been recorded from North Island (Table ). The center of North Island is presently dominated by a lush growth of Sicyos hispidus (Figure ). Some Boerhavia ~~diffusa~~ and Tribulus cistoides also grows in this area. At the northern perimeter of the island is a nearly solid growth of Solanum nelsoni. East of this growth is an area of mixed Tribulus, Boerhavia, and S. nelsoni. At the northeast corner of the island is a nearly pure stand of Eragrostis variabilis about 100 by 200 feet. The remainder of the vegetated area is a sparse mixture of Lepidium bidentatum, S. nelsoni, Sicyos, Tribulus, and Boerhavia, except for a nearly pure stand of Lepidium along the western side. Plant density decreases from the interior to the beaches, and Lepidium is the last species to be found in the coral rubble closest to the beaches and extending part way south on the southern tip. Several stunted and nearly dead Tournefortia argentea bushes were found along the southwestern edge of the island in March 1965. Several areas of Brassica campestris were found in August 1967. Other plants recorded in small numbers for North Island are Lepturus repens, Portulaca lutea, and Scaevola taccada.

In March 1913 Willett (Bailey, 1956:32) stated that "tussocks of bunch grass...covers the northern end of the island." Christophersen and Caum (1933:15-16) report that the Tanager Expedition collected Achyranthes splendens and Tribulus on North Island in 1923.

As the island has only a few patches of grass at present, with several species of ~~vines~~ <sup>creepers</sup> dominating the flora, it appears that this island has undergone the same type of successional changes as recorded for Southeast and Grass Islands.

### Little North Island

Only four vascular plant species are known from Little North Island (Table ). The raised central portion of the island, about 400 feet long north to south, presently supports a meager growth of one grass and two <sup>prostrate</sup> herbaceous vines (Figure ). Lepturus repens is represented by several clumps, small seedlings of Boerhavia <sup>repens</sup> ~~diffusa~~ were found, as were a few sprigs of Tribulus cistoides. Small Tournefortia argentea plants were noted on the island in June 1963, but were not found in March 1965.

### Grass Island

Eleven species of vascular plants have been recorded from Grass Island (Table ). Only a portion of the western end of Grass Island is vegetated (Figure ). The interior of this vegetated portion is a dense patch of Solanum nelsoni about 400 feet long east to west, and 100 feet wide. It grows to the height of a foot. Between the Solanum and the sandy beach is a sparsely vegetated area of Lepturus repens, Tribulus cistoides, Boerhavia diffusa, and S. nelsoni. About a dozen clumps of Eragrostis variabilis grow among the Solanum.

In April 1923 a photograph by Wetmore shows that the island was virtually solid Eragrostis (Figure ). Wetmore (ms.) noted that "the crest of the island was covered with bunch grass and a few of the shrubs recorded on Southeast Island." Eight species were recorded from the island by Christophersen and Caum (1931:15-16). The <sup>vegetation</sup> flora was dominated by Eragrostis, which was restricted to the central parts of the island. Lepturus grew in a fringe around the Eragrostis. Two plants of Achyranthes splendens were found. Boerhavia and Tribulus were present, but not abundant, and Lepidium o-waihiense [= bidentatum] was rare. A few small



Scaevola taccada and Tournefortia argentea bushes were present. Solanum laysanense [= nelsoni] was present though not abundant.

By the time Grass Island was visited in 1963, the interior had become a dense mat of Solanum nelsoni. Lepturus formed a thick cover on the west end of the vegetated area, Lepidium was found along the southern side of the island, and Solanum nigrum was common. Twenty to thirty clumps of Eragrostis were found, and Boerhavia and Tribulus were widespread. Scattered clumps of Setaria verticellata were noted. There were no longer any plants of Scaevola or Achyranthes. In 1965 the Setaria was not found and the number of Eragrostis clumps had been reduced to 14.

The change in vegetation from grasses to herbaceous <sup>creepers</sup> vines is, thus, well-documented for Grass Island also. The vegetation change has brought about a change in the bird nesting colony composition as well. For example, in April 1923 the Great Frigatebird (Fregata minor) was not breeding on Grass Island (Wetmore, ms.); in recent years 300 to 350 Great Frigatebirds roost in the Solanum, and 75 to 100 nest there.

#### Seal Island

Eleven species of vascular plants have been recorded from Seal Island (Table ). The central portion of the western half of Seal Island, about 600 feet east to west and 150 feet wide, contains most of the vegetation of the island (Figure ). The interior of this vegetated area is primarily Sicyos hispidus, Solanum nelsoni, and Eragrostis variabilis. Between the densely vegetated area and the beach is a transition zone of Tribulus cistoides, Boerhavia diffusa, Lepturus repens, and Eragrostis. Growth of all but the Eragrostis extends out among the beach rubble. One clump of Achyranthes splendens grows at the eastern border of this vegetated area. Small Sesuvium portulacastrum plants are scattered on the rocky ledges of the eastern half.

In April 1923 Wetmore (ms.) noted that "the crest was covered with the bunch grass and much of the grayish leaved shrub" (Figure ). Christophersen and Caum (1933:15-16) found eleven species on the island in 1923. Eragrostis and Lepturus were distributed indiscriminately, and Achyranthes was common. Boerhavia and Tribulus were present. Large flourishing plants of Sicyos grew on the eastern half of the western section. Solanum nelsoni was present, though not abundant. Lepidium o-waihiense [= bidentatum] was rare. Sesuvium grew on the raised reef and low wet flats of the eastern portion (Figure ). Capparis sandwichiana [~~spinosa~~] was scattered over much of the island except for beach and reef. A few small Scaevola taccada bushes were also present.

The same eleven species were present when the island was surveyed in 1963. Only one clump of Capparis and one Scaevola bush were found. Tribulus and Boerhavia were widespread, and Lepidium was common in the transition zone from bunchgrass to beach. There were 40 to 50 clumps of Eragrostis, and Lepturus was common. Solanum nelsoni was also common, and Sicyos was present. Sesuvium still occurred on the rocky and wet areas of the eastern portion. About five plants of Achyranthes were noted.

#### Other Islands

POBSP and BSWF personnel have not found any plants on Bird, Kittery, Planetree, or Sand Islands on visits to Pearl and Hermes between 1963 and 1969. No vegetation was listed for these islands in earlier reports on the atoll (Wetmore, ms.; Galtsoff, 1933:13-14; and Christophersen and Caum, 1931:15-16, 20-41).

Table Vascular plant distribution at Pearl and Hermes Reef.

Species	Southeast	North	Grass	Seal	Little North
<u>Cynodon dactylon</u>	x				
<u>Eragrostis variabilis</u>	x	x	x	x	
<u>Lepturus repens</u>	x	x	x	x	x
<u>Setaria verticellata</u>	x		x		
<u>Allium</u> sp.	x				
<u>Cocos</u> sp.	x				
<u>Pritchardia pacifica</u>	x				
<u>Casuarina equisetifolia</u>	x				
<u>Achyranthes splendens</u>		x	x	x	
<u>Boerhavia <del>diffusa</del> <sup>regalis</sup></u>	x	x	x	x	x
<u>Sesuvium portulacastrum</u>	x			x	
<u>Portulaca lutea</u>	x	x			
<u>Capparis <sup>sandwichiana</sup> spinosa</u>				x	
<u>Brassica campestris</u>	x	x			
<u>Coronopus didymus</u>	x				
<u>Lepidium bidentatum</u>	x	x	x	x	
<u>Tribulus cistoides</u>	x	x	x	x	x
<u>Malvastrum coromandelianum</u>	x				
<u>Hibiscus <sup>2</sup> tiliaceus</u>	x				
<u>Tournefortia argentea</u>		x	x		x
<u>Solanum nelsoni</u>	x	x	x	x	
<u>Solanum nigrum</u>	x		x		
<u>Sicyos hispidus</u>	x	x		x	
<u>Scaevola taccada</u>	x	x	x	x	
<u>Sanchus oleraceus</u>	x				
Total	22	12	11	11	4

Appendix Table

Annotated list of vascular plants from Pearl and Hermes Reef found in the herbarium of the United States National Museum (USNM), the Bishop Museum (BISH), and the University of Hawaii.

Gramineae

\* Cynodon dactylon (L.) Pers. Specimens only from Southeast Island.

Lamoureux s.n. (UH); Sibley 10 (USNM); Young 115 (UH).

Eragrostis variabilis (Gaud.) Steud. Specimens from Southeast, Grass, and North Islands; known also from Seal Island. Caum 38, 45 (BISH); Lamoureux s.n. (UH); Sibley 5 (USNM); Young 105, 122 (UH); Long 2272, 2285, 2313 (UH).

Lepturus repens (Frost.) R. Br. Specimens from Grass, Little North, North, and Southeast Islands; known from Seal Island. Caum 39, 46 (BISH) as L. repens var. subulatus Fosb.; Lamoureux s.n. (UH); Young 110, 128 (UH); Long 2270 (appears to be var. subulatus Fosb.), 2273, 2274, 2277, 2279, 2292, 2293, 2302, 2311, 2312 (UH).

\* Setaria verticellata (L.) Beauv. Specimens only from Southeast Island; known also from Grass Island. Lamoureux s.n. (BISH); Sibley 12 (USNM); Young 109 (UH); Long 2269 (UH).

Liliaceae

\* Allium sp. Found growing on Southeast Island refuse heap, eradicated March 1963. No specimens collected.

Palmae

\* Cocos sp. Planted in 1928-29 on Southeast Island, all dead or dying in 1930 (Galtsoff, 1933:14). No specimen record.

\* Pritchardia pacifica Wendl. Planted in 1923 on Southeast Island by Tanager Expedition personnel (Gregory, 1924:21). No specimen record.

\* Presumably exotic

Casuarinaceae

\* Casuarina equisetifolia L. Specimen only from Southeast Island; planted in 1963 by U.S. Navy. Young 120 (UH).

Amaranthaceae

Achyranthes splendens var. reflexa Hbd. Specimens from Grass and North Islands; known from Seal Island. Caum 50 (BISH); Wilder 3 (BISH); Lamoureux s.n. (UH); Long 2298 (UH).

Nyctaginaceae

Boerhavia <sup>repens</sup> diffusa L. Specimens from Southeast, Grass, Little North, and North Islands; known from Seal Island. Caum 40, 41, 47, 48 (BISH); Galtsoff s.n. (USNM); Lamoureux s.n. (UH); Sibley 3 (USNM); Young 98, 130 (UH); Long 2271, 2291, 2295, 2306, 2307, 2310 (UH).

Aizoaceae

Sesuvium portulacastrum L. Specimens from Southeast and Seal Islands. Caum 43, 55 (BISH); Galtsoff s.n. (USNM); Sibley 7 (USNM); Lamoureux s.n. (UH); Young 100, 103 (UH); Long 2276 (UH).

Portulacaceae

Portulaca lutea Sol. Specimens from Southeast and North Islands. Sibley 9 (USNM); Young 104, 108, 123 (UH); Long 2283 (UH).

Capparidaceae

Capparis <sup>sandwichiana DC.</sup> spinosa var. marina (Jacq.) K. Sch. Specimens only from Seal Island. Wilder 2 (BISH); as C. sandwichiana DC.; Caum 54 (BISH) as C. sandwichiana DC.; Lamoureux s.n. (UH) as C. sandwichiana DC.

Cruciferae

\* Brassica campestris L. Specimens from only Southeast Island; known also at North Island. Sibley 2 (USNM); Young 106, 107, 111, 116 (UH).

\* Coronopus didymus (L.) J. E. Smith. Specimen only from Southeast Island.

Sibley 8 (USNM).

Lepidium bidentatum var. o-waihense (C. and S.) Fosb. Specimens from Southeast, Grass, and North Islands; known from Seal Island. Caum 51 (BISH); Lamoureux s.n. (UH); Sibley 14 (USNM); Young 99, 124 (UH); Long 2286, 2289, 2299 (UH).

#### Zygophyllaceae

Tribulus cistoides L. Specimens from Grass, Seal, Southeast, Little North, and North Islands. Caum 44 (BISH); Wilder 1 (BISH); Lamoureux s.n. (UH); Sibley 1 (USNM); Young 102, 126 (UH); Long 2268, 2282, 2296, 2305 (UH).

#### Malvaceae

\* Malvastrum coromandelianum (L.) Garcke. Specimen only from Southeast Island. Young 114 (UH).

\* Hibiscus titiaceous L. Planted in 1923 on Southeast Island by Tanager Expedition personnel (Gregory, 1924:21). No specimen record.

#### Boraginaceae

Tournefortia argentea L. f. Specimens from Grass, Little North, and North Islands. Young 118, 129 (UH); Long 2297, 2300 (UH).

#### Solanaceae

Solanum nelsoni Dunal. Specimens from Grass, Southeast, and North Islands; known also from Seal Island. Caum 49 (BISH); Wilder 5 (BISH); Lamoureux s.n. (UH); Sibley 4 (USNM); Young 101, 125 (UH); Long 2275, 2301 (UH).

Solanum nigrum L. Specimens only from Southeast Island; known also from Grass Island. Sibley 11 (USNM); Young 112 (UH).

Cucurbitaceae

Sicyos hispidus Hbd. Specimens from Southeast, Seal, and North Islands.

Caum 42, 53 (BISH); Wilder 4 (BISH); Lamoureux s.n. (UH); Sibley 6 (USNM) as Cucumis sativus L.; Young 117, 119, 121 (UH), probably S. hispidus; Long 2280, 2303 (UH) probably S. hispidus.

Goodeniaceae

Scaevola taccada (Gaertn.) Roxb. Specimens from Southeast, North, and Grass Islands; known from Seal Island. Caum 52 (BISH); Galtsoff s.n. (USNM); Lamoureux s.n. (UH); Young 97, 127 (UH); Long 2265, 2281, 2287, 2304 (UH).

Compositae

\* Sonchus oleraceus L. Specimens only from Southeast Island. Young 113 (UH); Long 2290 (UH).

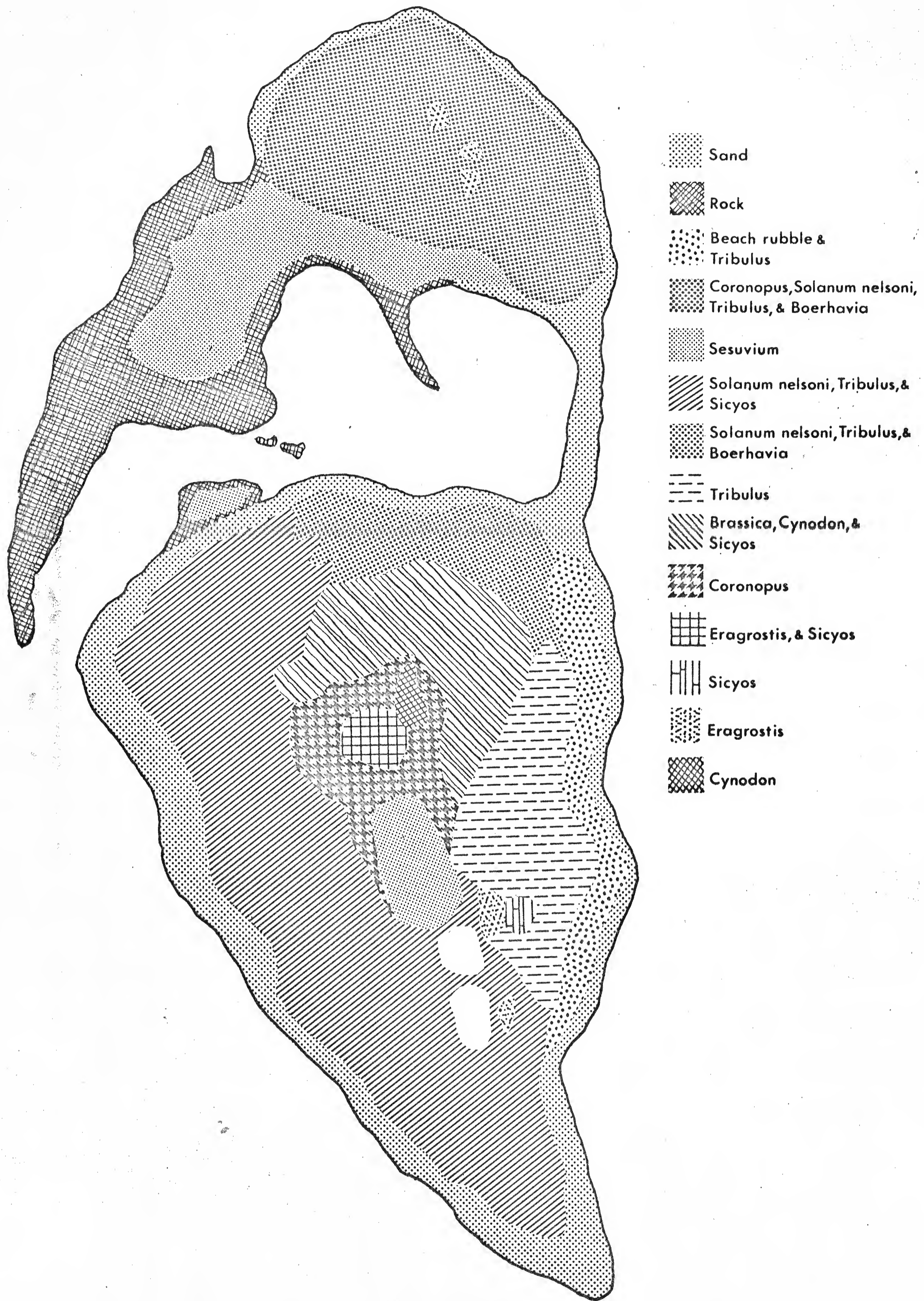
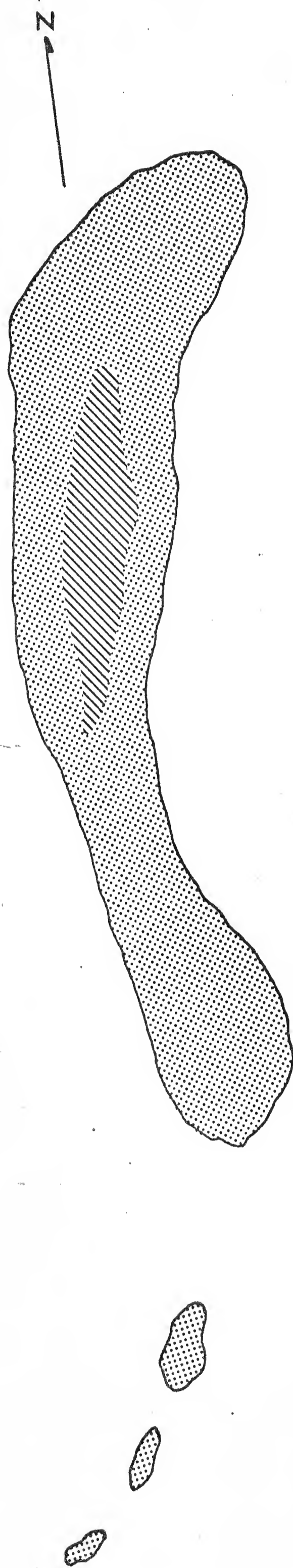


Figure . Southeast Island vegetation.





Stippled pattern: Sand  
Diagonal hatching: Lepturus, Boerhavia & Tribulus

Figure . Little North Island vegetation.

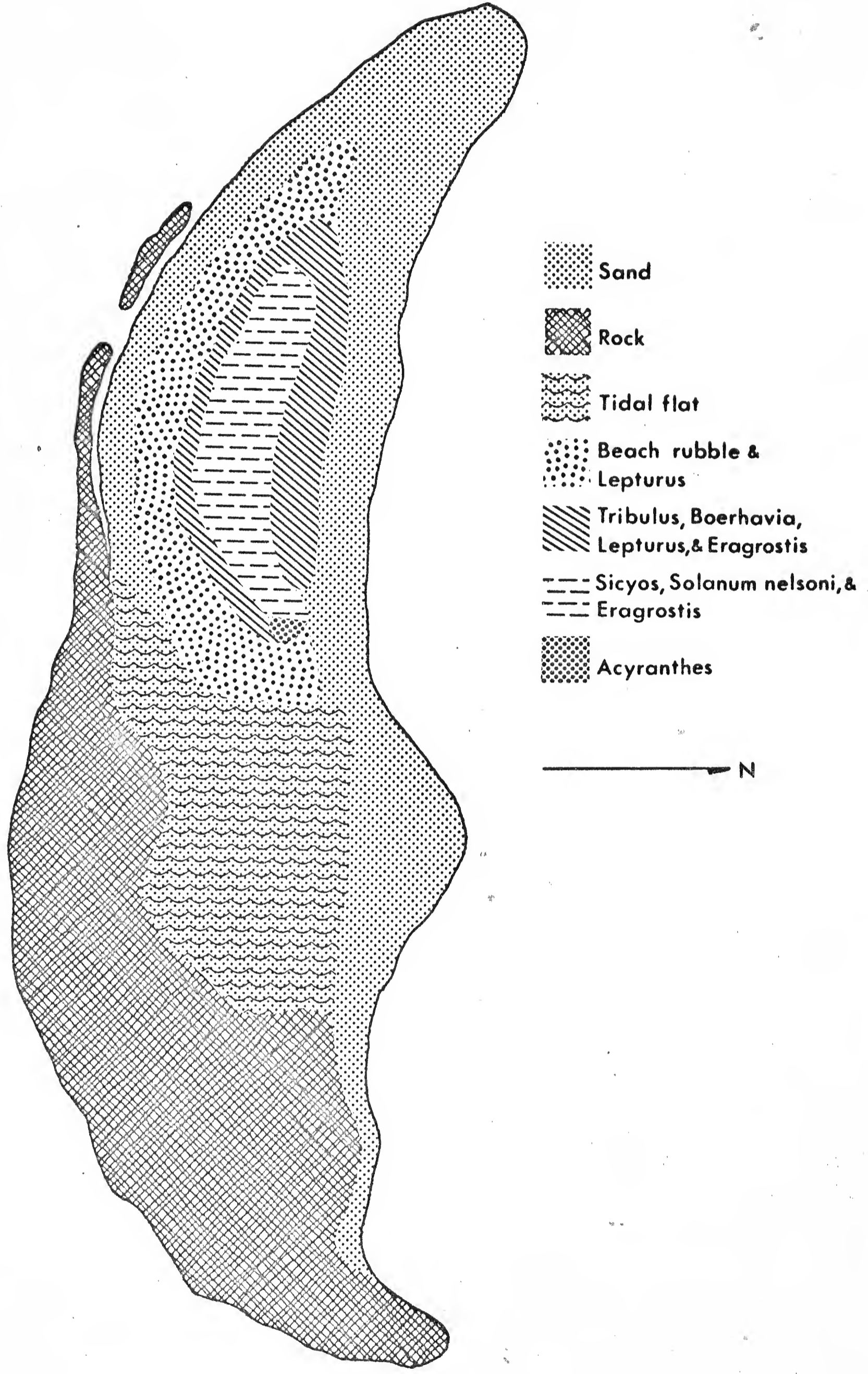


Figure . Grass Island vegetation.

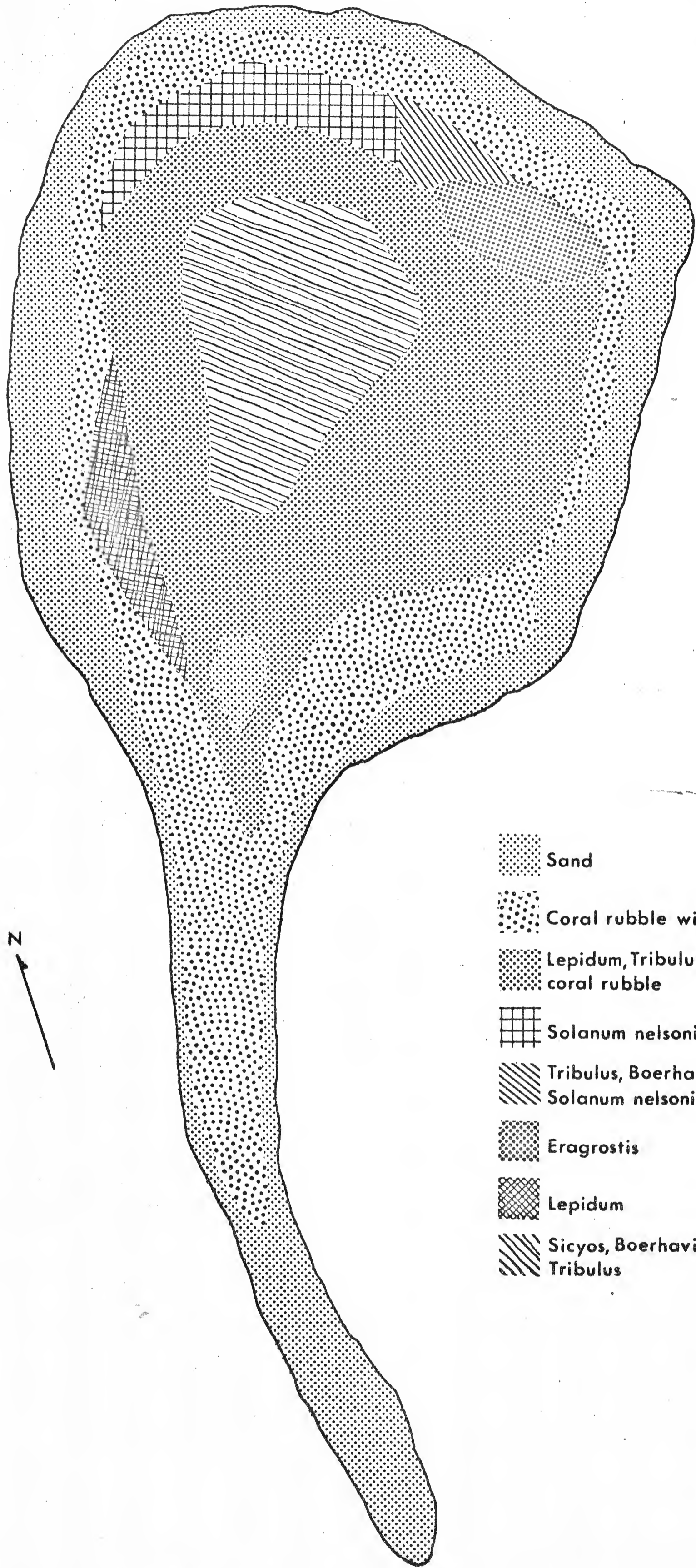


Figure . North Island vegetation.

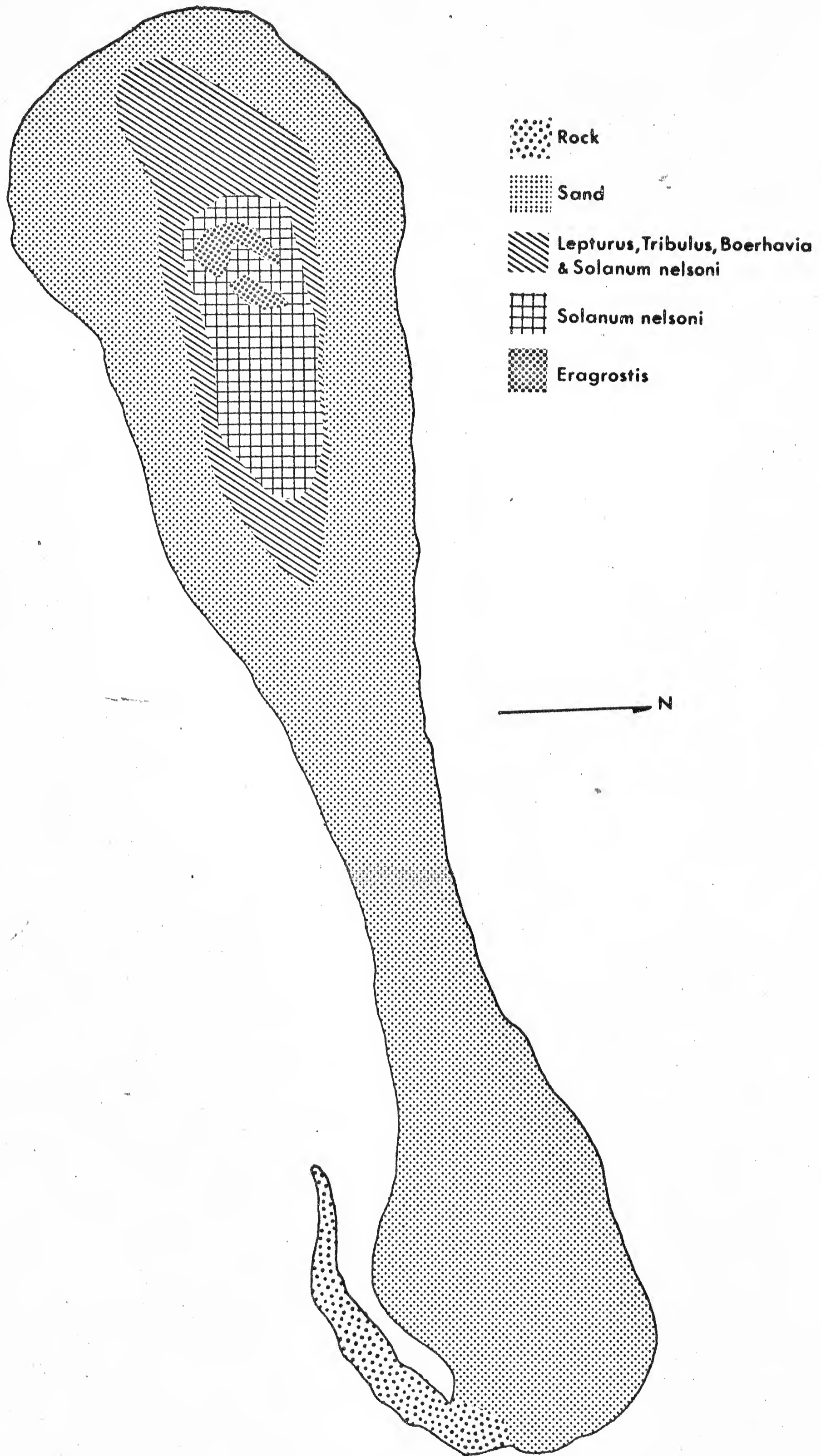


Figure . Grass Island vegetation.

Preliminary List of the Plants of the Northwestern Hawaiian Islands

	Nihoa	Necker	French Frigate Shoals	Gardner Pinnacles	Laysan	Lisianski	Pearl and Hermes Reef	Midway	Kure
ARAUCARIACEAE									
<u>Araucaria excelsa</u> R.Br.								o	
PANDANACEAE									
<u>Pandanus tectorius</u> Sol.								o	
<u>Pandanus</u> sp.									o
GRAMINEAE									
<u>Brachymenium</u> sp.									o
<u>Cenchrus agrimoniodes</u> Trin. var. <u>laysanensis</u> F.Br.					o			o	o
<u>Cenchrus echinatus</u> L.			o					o	o
<u>Chloris inflata</u> Link								o	o
<u>Chloris virgata</u> Swartz									o
<u>Cynodon dactylon</u> (L.) Pers.			o		o		o	o	o
<u>Digitaria ciliaris</u> (Retz.) Koel.								o	
<u>Digitaria henryi</u> Rendle									o
<u>Digitaria sanguinalis</u> (L.) Scop.									o
<u>Eleusine indica</u> (L.) Gaertn.			o					o	o
<u>Eragrostis amabilis</u> (L.) W.&A.								o	o
<u>Eragrostis variabilis</u> (Gaud.) Steud.	o				o	o	o	o	o
<u>Eragrostis whitneyi</u> var. <u>caumii</u> Fosb.								o	o
<u>Lepturus repens</u> (Forst.) R.Br.					o		o	o	
<u>Lepturus repens</u> var. <u>repens</u>			o						
<u>Lepturus repens</u> var. <u>subulatus</u>									o
<u>Panicum purpurascens</u> Raddi								o	
<u>Panicum torridum</u> Gaud.	o	o							

ARAUCARIACEAE - Araucaria family

Araucaria excelsa R.Br. Norfolk Island pine

Midway : A few found growing on Sand Island in 1954 by Dumont and Neff (195 )

PANDANACEAE - Screw-pine family

Pandanus tectorius Park Screw-pine or hala

Midway : A few specimens found in the administrative and residential area of Sand Island and one found in Scaevola schrub in 1954 by Dumont and Neff ( ).

Pandanus sp.

Kure : Introduced plant found near living quarters in 1961 by Lamoureaux (1961).

GRAMINEAE - Grass family

Brachymenium sp.

Kure :

Cenchrus agrimoniodes Trin. var laysanensis F.Br.

Laysan :

Midway :

Kure :

Seen and collected in 1961 (Lamoureaux, 1961)

Cenchrus echinatus L. Sand bur

F.F. Shoals :

Midway :

Kure : Two plants found in 1961 (SC) by Lamoureaux (1961)

Chloris inflata Link

Midway :

Kure : Found in disturbed areas near quarters and on roadsides in 1961 (SC) (Lamoureaux, 1961)

Chloris virgata Swartz

Kure : Found in 1961 (SC) in disturbed areas near quarters (Lamoureaux, 1961)

Cynodon dactylon (L.) Pers. Bermuda grass

F.F. Shoals :

Laysan :

P.&H. Reef :

Midway :

Kure :

Digitaria ciliaris (Retz.) Koel.

crab grass

Midway : Found by Fosberg to be rare in open sandy areas on Sand Island in 1954 (SC)  
(Dumont and Neff, 195 )

Digitaria henryi Rendle

Kure :

Digitaria sanguinalis (L.) Scop.

Kure : Found in disturbed areas near quarters in 1961 (SC) (Lamoueaux, 1961)

Eleusine indica (L.) Gaertn.

goose grass

F.F. Shoals :

Midway : Found by Fosberg and Dumont and Neff (SC) to be locally common in open spaces in 1954 on Sand and Eastern Islands (Dumont and Neff, 195 )

Kure : Found in 1961 (SC) in disturbed areas near quarters by Lamoureau (1961)

Eragrostis amabilis (L.) W.&A.

love grass

Midway : Found by Fosberg and Dumont and Neff (SC) to be locally common in open spaces on Sand Island in 1954.

Kure : Found in 1961 (SC) in disturbed areas near quarters by Lamoureaux (1961)

Eragrostis variabilis (Gaud.) Steud.

~~Nihoa~~

Laysan :

Lisianski :

P.&H. Reef :

Midway :

Kure :

Eragrostis whitneyi var. caumii Fosb.

Midway :

Kure :

Lepturus repens (Forst.) R.Br.

Laysan :

P.&H. Reef :

Midway :

Lepturus repens var. repens

F.F. Shoals :

Lepturus repens var. subulatus Fosb.

Kure :

Panicum purpurascens Raddi

Para grass

Midway : Found in only two areas on Sand Island ~~in 1954 (SC)~~ under the ironwood trees near the Cable Company compound in 1954 (SC) by Dumont and Neff ( ).

Panicum torridum Gaud.

Nihoa :

Necker :

Polypogon monspeliensis (L.) Desf.

Midway :

Rhynchelytrum roseum (Nees) Stapf and Hubb

Natal Redtop

Midway : Rare in two or three small areas on the older undisturbed part of Sand Island in 1954 (SC) (Dumont and Neff, 195 ).

Setaria verticillata (L.) Beauv.

F.F. Shoals :

P.&H. Reef :

Midway : Locally abundant in open spaces on Sand and Eastern Islands in 1954 (SC) (Dumont and Neff, 195 ).

Kure : One plant found near the west end of the landing strip in 1961 (SC) (Lamoureaux, 1961).

Sporobolus virginicus (L.) Kunth

Laysan :

Midway :

Stenotaphrum secundatum (L.) O.Ktze.

Buffalo grass

Midway : Found by Fosberg and Dumont and Neff (SC) in 1954 in open spots in the older vegetated portion of Sand Island.



CYPERACEAE - Sedge family

Cyperus alternifolia L.

Umbrella plant

Midway : Two or three clumps seen under old ironwoods near the Cable company compound and a few small plantings seen near residences on Sand Island in 1954 by Fosberg, and Dumont and Neff (SC)(195 ).

Cyperus javanicus Houtt.

marsh cyperus

Midway :

Cyperus laevigatus

Laysan :

Cyperus pennatifolius var. bryanii Kük.

Laysan :

Cyperus rotundus L.

nut grass

Midway :

Kure : A few plants found in disturbed areas near quarters in 1961 (SC) Lamoureaux (1961).

Fimbristylis cymosa R.Br.

Laysan :

Midway : Locally common along margins of runways, alongs edges of paved roads, and near foundations of larger buildings in 1954 (SC) (Dumont and Neff, 195 ).

PALMAE - Palm family

Cocos nucifera L.

coconut palm

F.F. Shoals :

Laysan :

Lisianski :

Midway :

Kure :

Phoenix sp.

Midway :

Pritchardia remota Becc.

Nihoa :

Pritchardia sp.

Laysan :

COMMELINACEAE - Spiderwort family

Commelina diffusa Burm. f.

day flower

Midway :

LILIACEAE - Lily family

Allium fistulosum L.

onion

AMARYLLIDACEAE - Amaryllis family

Agave sp.

Midway :

Crinum sp.

Midway :

MUSACEAE - Banana family

Musa sp.

Midway :

CASUARINACEAE - Casuarina family

Casuarina equisetifolia L.

ironwood

F.F. Shoals :

Laysan :

Lisianski :

P.&H. Reef :

Midway :

Kure :

MORACEAE - Mulberry family

Ficus retusa L.

Chinese banyan

Midway :

Morus alba L.

mulberry

Midway :

SANTALACEAE - Sandlewood family

Santalum cuneatum var laysanicum Rock

Laysan :

POLYGONACEAE - Buckwheat family

Coccoloba uvifera (L.) Jacq.

sea grape

F.F. Shoals :

Laysan :

Midway :

CHENOPODIACEAE - Goosefoot family

Atriplex muelleri Benth

F.F. Shoals :

Chenopodium oahuense (Mey.) Aellen.

Nihoa :

Necker :

F.F. Shoals :

Laysan :

AMARANTHACEAE - Amaranth family

Achyranthes splendens var. reflexa HB.

Laysan :

P.&H. Reef :

Midway :

Kure :

Amaranthus brownii C. and C.

Nihoa :

Amaranthus viridus L.

Laysan :

Amaranthus spinosus L.

Kure :

NYCTAGINACEAE - Four-O-Clock family

Boerhavia diffusa L.

Nihoa :

F.F. Shoals :

Laysan :

Lisianski :

P.&H. Reef :

Midway :

Kure :

Bougainvillea sp.

Midway :

AIZOACEAE - Mesembryanthemum family

Sesuvium portulacastrum L.

seaside purslane

Necker: :

Laysan :

Lisianski :

P.&H.Reef :

Tetragonia tetragoniodes (Pallas) O. Kuntze

Nihoa :

PORTULACACEAE - Purslane family

Portulaca caunii F.Br.

Nihoa :

Portulaca lutea Sol.

Nihoa :

Necker :

F.F.Shoals :

Laysan :

Lisianski :

P.&H.Reef :

Midway :

Portulaca oleracea L.

F.F.Shoals :

Laysan :

Midway :

CARYOPHYLLACEAE - Pink family

Schiedea verticillata F.Br..

Nihoa :

Spergularia marina (L.) Griseb.

F.F Shoals :

Kure :

CAPPARIDACEAE -Caper family

Capparis sandwichensis DC

Laysan :

Midway :

Capparis spinosa var. marina (Jacq.) K. Sch.

P.&H. Reef :

CRUCIFERAE - Mustard family

Brassica sampestris L.

P.&H. Reef :

Coronopus didymus (L.) J.E. Smith

Midway :

Lepidium o-waihiense C.& S.

Laysan :

P.&H. Reef :

Midway :

Kure :

Lepidium virginicum L.

pepper grass

Midway :

Kure :

Lobularia maritima (L.) Desv.

Sweet alyssum

Midway :

## LEGUMINOSAE - Pea family

<u>Acaeia farnesiana</u> (L.) Willd.	klu
Midway :	
<u>Albizzia lebbeck</u> (L.) Benth.	woman's tongue
Midway :	
<u>Crotalaria incana</u> L.	rattlepod
Midway :	
<u>Crotalaria mucronata</u> Desv.	rattle-pod
Midway :	
<u>Desmodium uncinatum</u> (Jacq.) DC.	
Midway :	
<u>Leucaena glauca</u> (L.) Benth.	koa haole
Midway :	
<u>Medicago lupulina</u> L.	nonesuch
Midway :	
<u>Sesbania tomentosa</u> H. & A.	
Nihoa :	
Necker :	
<u>Trifolium</u> sp.	
Midway :	
<u>Entada scandens</u>	
Laysan :	
<u>Ceasalpina crispa</u>	
Laysan :	

## OXALIDACEAE -Oxalis family

<u>Oxalis corniculata</u> L.	sorrel
Midway :	

ZYGOPHYLLACEAE - Caltrop family

Tribulus cistoides L.

Nihoa :

F.F. Shoals :

G. Pinnacles :

Laysan :

Lisianski E.

P.&H. Reef :

Midway :

Kure :

RUTACEAE - Rue family

Murraya paniculata (L.) Jack

mock orange

Miway :

EUPHORBIACEAE - Spurge family

Codiaeum sp

Kure :

Euphorbia celastroides Boiss.

Nihoa :

Euphorbia geniculata Ort.

spurge

Midway :

Euphorbia glomifera (Millsp.) Wheeler

Kure :

Euphorbia heterophylla L.

wild poinsettia

Midway :

Euphorbia hirta L.

Midway :

Kure :



Euphorbia peplus L.

Midway :

Euphorbia prostrata Ait.

Midway :

Euphorbia pulcherrima Willd.

poinsettia

Midway :

Ricinis communis L.

castor bean

Midway :

Aleurites moluccana

candlenut

Laysan :

Kure :

ANACARDIACEAE -Cashew family

Schinus terebinthifolius Raddi

Christmas berry

Midway :

MALVACEAE - Hibiscus family

Hibiscus tiliaceus L.

hau

Laysan :

Midway :

Hibiscus sp.

Kure :

Malvastrum coromandelianum (L.) Garcke

P.&H. Reef :

Midway :

Sida fallax Walp.

ilima

Nihoa :

Midway :

Thespesia populnea (L.) Sol.

milo

Laysan :

Midway :

Kure :

## STERCULIACEAE - Sterculia family

Waltheria indica L.

Midway :

## GUTTIFERAE - Garcinia family

Calophyllum inophyllum (L.) Sol.

Laysan :

## COMBRETACEAE - Combretum family

Terminalia catappa L.

tropical almond or false kamani

Midway :

Kure :

## PRIMULACEAE - Primula family

Anagallis arvensis L.

Midway :

## APOCYNACEAE - Dogbane family

Carissa grandiflora A. DC.

natal plum

Midway :

Catharantus roseus (L.) G. Don

periwinkle

Midway :

Thevetia peruviana (Pers.) K. Schum

Bestill tree

Midway :

Nerium oleander L.

oleander

Midway :

Kure :

Plumeria obtusa L.

F.F Shoals :

## CONVOLVULACEAE \_ Morning glory family

Ipomoea indica (Burff. f.) Merr.

Nihoa :

Laysan :

Lisianski E:

Midway :

Kure :

Ipomoea pes-caprae (L.) Sweet

beach monring glory

F.F. Shoals :

Laysan :

Midway :

## HYDROPHYLLACEAE - Waterleaf family

Nama sandwichensis var. laysanicum Brand

Laysan :

Lisianski :

## BORAGINACEAE - Borage family

Heliotropium curassivicum L.

seaside heliotrope

Nihoa :

Laysan :

Tournefortia argentea L.f.

tree heliotrope

F.F. Shoals :

Laysan :

P.&amp;H. Reef :

Midway :

Kure :

VERBENACEAE - Verbena family

Lantana camara L.

lantana

Midway: :

Stachytarpheta jamaicensis (L.) Vahl

false vervain

Midway :

Vitex trifolia var. bicolor (Willd.) Mold.

Midway :

LABIATAE - Mint family

Phyllostegia variabilis Bitter

Laysan :

Midway :

Kure :

SOLANACEAE - Nightshade family

Nicotiana tabacum L.

tobacco

Laysan :

Lisianski :

Solanum nelsoni Dunal

Nihoa :

P.&H.Reef :

Midway :

Kure :

Solanum nigrum L.

Laysan :

Lisianski :

P.&H. Reef :

Midway :

Kure :

Solanum nodiflorum Jacq.

Laysan :

PLANTAGINACEAE-Plantago family

Plantago lanceolata L.

buckthorn plantain

Midway :

Plantago major L.

common plantain

Midway :

CUCURBITACEAE - Gourd family

Sicyos hispidus Hbd.

Laysan :

Lisianski :

P.&H.Reef :

Kure :

Sicyos microcarpus

Nihoa :

Sicyos sp.

Laysan :

GOODENIACEAE - Goodenia family

Scaevola taccada Vahl

naupaka

Laysan :

Lisianski :

P.&H. Reef ::

Midway :

Kure :



## COMPOSITAE - Composite family

Bidens pilosa L. Spanish needle

Midway :

Conyza bonariensis (L.) Cronq. horseweed

F.F. Shoals :

Midway :

Kure :

Emilia javanica (Burm.) Rob.

Kure :

Gnaphalium purpureum L. purple cudweed

Midway :

Gnaphalium sandwicense Gaud.

Midway :

Kure :

Helianthus annuus L.

Kure :

Pluchea indica (L.) Less

Laysan :

Pluchea odorata (L.) Cass

F.F. Shoals :

Laysan :

Midway :

Kure :

## COMPOSITAE - Composite family

Bidens pilosa L.

Spanish needle

Midway :

Conyza bonariensis (L.) Cronq.

horseweed

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Midway :

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Midway :

Kure :

Helianthus annuus L.

Kure :

Pluchea indica (L.) Less

Laysan :

Pluchea odorata (L.) Cass

F.F. Shoals :

Laysan :

Midway :

Kure :



Sonchus oleraceus L.

sow thistle

F.F. Shoals :

P.&H. Reef :

Midway :

Kure :

Lipochaeta integrifolia (Nutt.) Gray

Laysan :

Kure :

Xanthium saccharatum Wallr.

cocklebur

Midway :

Verbesina encelioides (Cav.) B.&H.

Midway :

Kure :

~~Brown's report of April 1915 visit --- RG-26-16~~

Munter ms. (19 February 1916 visit -- RG-26-22)

The rabbits are ~~disappearing very fast~~ multiplying very fast and the vegetation is disappearing rapidly. . . . thousands of Hawaiian terns were nesting in the tall plants growing on the island. . . . (the noddy) (were very common) and) were nesting principally on the northeast part of the island and wherever the bunch grass grows. The nests were located on the ground.

From B.L. Bassham to Commandant, March 14 1936 RG 26-30 (March 1936 visit)

Two coconut trees and one ironwood tree stand near the buildings (ruins on NW corner ) and a large part of the island is covered with a coarse grass, and near the lagoon, with a coarse vine.

Journal

Philip C. Shelton

Rayon Island

10-15 June 1966 - 7.

Arrived on the island at about 0900, via the U.S. N.S. Shearwater from Honolulu - 4 day trip - sea sick all the way. Crew consisted of Richard Crossin (in charge) Ken Balcomb, Frank Smith, Dave Hoff, Dave ~~Walt~~ Pearson, Richard Chandler & myself.

There appears to have been little rain recently as has been true of the main Hawaii Islands this spring. Dick Crossin commented on the difference in vegetation between now & last August. Then the *Scaevola* was noticeably lighter. The difference must be due to loss of stiffness by the stems when water is in short supply, for there is ~~some~~ <sup>little</sup> dieback evident. Blooms are present. *Promoea* <sup>pos-caprae</sup> has died back in large areas, especially in the inner part of the island where it is best developed. Also on beaches.

*Nema* may be more sparse than described by Lamoureaux, but without specific data, it is difficult to determine & how ~~not~~ ~~not~~ yet

Cases  
W x 25 3/4 tall  
15 wide  
4" 4 in tall  
Case 2  
25" long 15' wide  
Case 1  
26" long 17 1/2 wide

Journal

Philip C. Shelton

Lagoon Island  
10-15 June 1966

had a chance to look closely for seedlings of Nene or seedling of other plants growing within Nene clumps. Nene is in bloom.

Ipomoea <sup>pes-caprae</sup> growing out onto bare sand is sometimes dead.

21 June north beach - Dead Nene plants are common, but seedlings are common also.

Boerhavia is mostly green + blooming, but dead patches are occasionally found

Scaevola is bright green.

Found <sup>& collected</sup> Sida hispidus growing south of camp at inner edge of Scaevola when I went to collect the Solanum nigrum.

~~Found~~ ~~Sida~~ collected Sida microcarpa on E side of lagoon in Scaevola - Heliotropium association.

Species accounts

Philip C. Shelton.

Laysan Island.

10-15, 20-21 June 1966

Albatrosses.

Distribution is almost exactly the same as shown by Pitt (1911). Laysans are scattered over the entire island, but highest concentrations occur around the lagoon and in the bare area SW of the lagoon where guano was mined. This is the densest concentration on the island. Black-foots are confined to the beaches, especially along the edge of the large north beach. Smaller concentrations occur on the east beach & south end.

Most chicks have feathered bodies with a few fluffs of down and partly grown remiges. Most have down on their heads & necks, but about 20-25% are losing this. Most black-foots have most of their head & neck feathers.

On 10 & 11 June there was little wind & fanning practice was rarely seen. Later, there were stronger winds, & more flying practice was observed.

Species Account

Philip C. Shelton

Laysan I.

10-15, 20-21 June 1966

Albatrosses

On the 14th ~~at~~ at the south end of the lagoon just before a rain squall, 50-75% of the Laysan chicks had their wings spread in the 15 to 20 mph wind

21 June - first noted Laysan albatross chicks picking up small sticks.

~~Observations~~ Species Accounts

Philip C. Shelton

Laysan Island  
15 June 66

Laysan Albatross

Watched from 5 feet while an adult Laysan Albatross came in & fed its chick. The adult landed on the beach & walked past me to the chick, which had been resting in the shade of Scaevola. The chick came to meet ad., who greeted it with almost no display. Chick eagerly began ~~pecking~~ pecking at ad's bill. Ad. made 4 trips 10 feet across a small opening to peck a chick resting in shade of Scaevola. Ad. made head throws & gave out low high <sup>pitched</sup> cry, which approaching this chick ~~provoked~~ Between attacks on the strange chick it returned briefly to its own chick, who continued to try to feed. Finally the ad. began to feed its chick, by lowering its head & opening the bill so the chick could slide its bill in at a 90° angle. The adult's tongue pressed against the chick's lower mandible & a brown soup flowed rapidly into the chick's bill near the base. This operation was repeated about 8 times at 30 ~~sec.~~ sec. to 1 min. intervals. Between times the chick continued to nibble

Philip C. Shelton

Laysan Albatross (p 2)

vigorously at the adult's bill.

after the final feeding, the adult returned to the alien chick (who had not moved) & gave it a thorough going over, pulling it from its resting place & repeatedly grabbing its neck. No apparent harm was done.

then the adult walked ~~back~~ back out to the beach, but I didn't see

if it flew or not. The chick <sup>that had been fed</sup> sat still, making a contented two note cry, then a few minutes later sat down ~~partly~~ partly under some Scaevola & rested.

Stopping once to make a head throw & cry.

The entire operation took less than 10 minutes.

When ad. approached initially it held its head high with its chin tucked in.



## Species Accounts

Philip C. Shelton

Laysan I.  
10-15, 20-21 June 1966.

### Wedge tailed Shearwaters.

These were evenly distributed throughout the Eragrostis zone, much digging & courting going on, probably a few eggs. Dick Crossin found a few eggs eaten by Laysan Finch, estimated 50,000 maximum pop.

### Christmas I. Shearwaters.

Est. pop. 1000 birds.

---

almost all were in the Eragrostis association

### Bonin I. Petrel

Fairly large numbers of immatures, many with a little down on belly, still present. Adults, distinguished by having light edges of back feathers worn away, giving darker appearance than Imm, were also found. Dick Crossin banded 100 ad. 10 June. Many burrows here of this species rather than wedgetails. We have no doubt covered in a few thousand, many of which may have contained birds. They are not as capable of digging out as Wedgetails.

Species accounts

Philip C. Shelton

Laysan I.

10-15, 20-21 June 1966

~~THESE~~ Bulwer's Petrel.

These were nesting in Scaevola & under Casuarina trees on West side in comparatively small numbers, & a large concentration occurred on the stretch of rocky beach & shore beginning 300 yards south of camp. An estimated thousand, possibly more, were gathered here & were courting intensively. A few were already on eggs, as were a few of those under Scaevola & Casuarina near camp.

A few banded birds were picked up near camp. Band prefixes were not in banding record book.

Species Account

Philip C. Shelton

Laysan Island  
10-15, 20-21 June 1966

Red-tailed Tropicbird.

Nesting under Scaevola all around the island. Estimated total population 500 to 1000.

Blue-faced Booby.

Most abundant on the East side of the lagoon, especially near the South end, where several dozen roosted.

Nesting birds, mostly with  $\frac{1}{2}$  grown young occurred all along the E. side of the lagoon, in the open Cyperus laevigatus, Heliotropium, Lesium association. A few

~~large percentages~~ nesting birds occurred in open areas in the Eragrostis association on the West side of the lagoon.

Total estimated population 300-500.

# Species Accounts

Philip C. Shelton

Laysan Island  
10-15, 20-21 June 1966

## Brown Booby

Nesting near inner edge of Scaevola,  
south of camp. Some had young,  
some still on eggs (?)  
Total estimated to be 200 for entire  
island.

## Red footed Booby.

Several birds on eggs, mostly  
in Pluchea around the north &  
E. sides of lagoon. Roosting birds  
widely scattered, a few in palms.  
Total estimated at 1000.

Species Account

Philip C. Shelton,

Laysan Island,  
10-15, 20-21 June 1966.

Great Frigatebird

Nesting in Scaevola all around the island. Young range from freshly hatched to  $\frac{1}{2}$  grown with black feathers showing on back.

also adults on eggs.

Estimated population about 3000.

Species Accounts

Philip C. Shelton

Laysan I.

10-15, 20-21 June 1966

Laysan Teal

at Dusk on the 11th the crew circled the lagoon & counted about 250 teal, including ~~many~~ broods of

Pairs were encountered almost anywhere on the island, & frequently walked along the beach. They were most conspicuous at dusk along the lagoon.

Most birds were reluctant to fly, & flew but short distances when flushed. Most preferred to walk away from an intruder.

However, ~~one~~ one circled the ship at anchor 1/4 mile from the island at ~1800 20 June.

On the evening of the 21st, Ken Belcomb & I circled the lagoon & found 3 broods of <sup>large</sup> downy ducklings, & one small duckling by itself (no female), all were close to the shore of the lagoon.

These ducks rarely were observed out on the lagoon.

Species Account

Philip C. Shelton,

Layson I.

~~10-15~~, 20-21 June 1966

○ Golden Plover est pop. 250.

Ruddy Turnstone est. pop. 500

○ Wandering Tattler est Pop 25

Bristle-thighed Curlew est pop 75.

Species Account  
Philip C. Shelton. Laysan Island,  
10-15, 20-21 Jan 1966

Sooty Tern

The most advanced colony was located between camp & the north end of the lagoon; next most advanced was SW of large bare blowout area  $\frac{1}{4}$  mile<sup>2</sup> south of camp. The former colony probably has most of the eggs laid & incubation is under way. The latter is still in process of laying & is expanding in all directions possible, by more eggs ~~and~~ more birds on the ground every day.

Just north of this colony with a short diastema <sup>between</sup> a large number of unbanded birds were on the ground on the 15th that were not present, or very few, on the 10th & 11th. There were very few eggs on the 15th.

Didn't check this area closely on 20th or 21st.

Spot checks in the area of heaviest banding, near blowout, showed areas of up to 75% banded, ~~but~~ on the 15th (nearly 70,000 banded, but on the 20th & 21st, this had changed over sufficiently & mixed with others to greatly lower the



# Species Accounts

Philip C. Shelton

Laysan I  
20-25, 20-21 June 1966

Sooty Tern p 2

figures. I banded on the 20th on the E side of the lagoon in an area of roosting birds ~~then~~ on bare sand beside nesting birds in Eragrostis, ~~see~~  
Got only 2 recently banded birds out of 500 total. about 5-10 returns from previous years.

A huge swirl of birds occurred over the SE corner of the island on the 21st. To my knowledge, no-one banded in that area at all.

Dick Crossin & I concurred that the population might easily be 2000000 birds using the island.

## Species Accounts

Philip C. Shelton

Laysan I.  
10-15, 20-21 June 1966

### Gray-backed Tern

Abundant in the edge of Scaevola at the top of the storm beach along the west shore, especially south of Camp. A few eggs, ~~and~~ removed & young ranged from newly hatched to volant immatures.  
est. pop. ~ 5-10,000.

### Common Noddy

Nesting scattered in edge of Scaevola at top of storm beach along west shore - More scattered than Gray-backed Terns & than Noddies on Lisianski. A few small chicks were found, & occasionally a larger one, but most nests still had an egg. Roosting, non-breeding adults were common.  
est pop. 5000 - Dick Crossin says 25000, but I saw no evidence for that many.

Species Account

Philip C. Shelton

Laysan I.

20-15; 20-21 June 1966

Hawaiian Noddy

Nesting in Casuarina tree  
behind camp & in a few widely  
scattered locations on Scaevola  
on E side of lagoon. Most

of young were large, nearly  
fully fledged nestlings. - perhaps  
a dozen in half dozen locations?

Several flocks of non-breeders  
roosted on highest Scaevola  
on West side, near camp.

Total Est. 2-3000.

Fairy Tern

Scattered along edge of Scaevola  
on the west side, and on Rocks at  
North & South, especially South,  
ends of the island.

Ken Belcomb saw several chicks  
& eggs on the Southend.

est. population - 1000

~~Journal~~ Species Accounts.

Philip C. Shelton

Laysan I.

10-15 ~~10-14~~ June 1966

Laysan Finches

On 10 June I saw a finch pecking open a graybacked tern egg on the rocky beach south of camp.

On the 11th the entire crew saw two or three breaking open sooty tern eggs between camp & the lagoon.

As we walked along the terns flushed ahead & if a finch were nearby it invariably hopped up to the egg & pecked it open, flicking away pieces of shell & possibly eating a little of the shell. After a big hole was opened, it ate some of the contents. Hundreds or

thousands of eggs are broken in this manner thru out this nesting area, probably because we have walked thru several times during the day.

The larger sooty colony to the south has fewer broken eggs, partly because there are fewer eggs & partly because we have been there little during the day.

On 14 June I walked thru this larger sooty tern colony & tried to photograph the finches breaking eggs

Journal of Species Accounts.

Philip C. Shelton

Laysan Island

10-15 June 1966

21 June

Laysan Finch (cont)

Saw two or three at work <sup>(pictures)</sup> & got a few shots, mostly thru grass. Near the south end of the island on 14 June I saw several finches feeding on buds & blossoms & possibly on leaves, of both Boerhavia diffusa and Portulaca oleracea.

on 13 June Dick Crossin found 3 nests, each with 2 eggs, all in clumps of Eragrostis variabilis.

on 12 June Dick caught a finch at camp & found ~~several~~ several eggs of some parasite attached to the feathers of the head-top & sides.

21 June

Found an immature chasing its parents trying to be fed, occasionally it appeared the adults did feed it. Adult birds, including the parents of the imm. were found eating from Tribulus and Nanoa. Also pecking flowers of Nycticonia - probably eating stamens, & feeding from Cocos flowers.

FEBRUARY		1966				
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					
*	*	*	*	*	*	*

SUNDAY

27

FEBRUARY

58

307

*Plant Species*  
*Accounts for Layson*

*Maps for Kucinski*

	M A 7
	B
	M A 9
	M A 01
	M A 11
	M A 21
	M A 31
	M A 41
	M A 51
	M A 61
	M A 71
	M A 81
	M A 91
	M A 01
	M A 11



Check List of Field Notes Available for Lisianski Island

- ES #1 Feb. 14, 1963 : Wirtz, ✓  
Amerson no notes available  
Blagden no notes available  
McFarlane no notes available  
Sibley ✓
- ES# 3 Mar. 11-12, '64: Amerson  
Wislocki
- LS# 4 Aug. 21-23, '64: Amerman ✓  
Woodward ✓  
Merrill ✓  
Marshall ✓  
Anderson - apparently none available
- LS# 5 Sept. 18, 1964 : Fleet
- LS# 7 Mar. 12-14 '65 : Wirtz ✓  
: Amerman - none taken  
Clapp ✓  
Hoeman ✓  
Stadel ✓
- LS# 9 July 14-17, '65: Crossin  
Harrington - none available  
Husted - none available  
Tordoff - none available
- LS# 13 June 16-19, '66: Shelton ✓  
Crossin ✓  
Balcomb ✓  
Chandler - none taken  
Hoff - apparently none taken  
Pearson ✓  
Smith none available
- LS# 17 Oct. 18-20, '66: Balcomb - none available  
Gould - none available  
Harrington  
Lewis
- LS# 18 Mar. '67: Hackman



May 26, 1965

Live Data from Field Notebooks  
in Honolulu

All of the  
Enclosed data  
checked out  
in June 65

JR

Data

TESTIS 7x5mm RIGHT TESTIS 7.5 x 4.5mm

9x5mm RIGHT 7.5 x 4mm TESTIS ENLARGED

1mm

TESTIS 2x1mm RIGHT TESTIS 1x1mm

10x5mm 1.4 LARGEST OVUM OVIDUCT ENLARGED

TESTIS 5mm x 2 1/2 mm RIGHT TESTIS 3mm x 2mm - LEFT TESTES SMALL & UNDEVELOPED

20285 ✓ + ♀ LEFT 14x5mm LARGEST OVUM 2mm

20288 ♀ OV. 5x5mm LARGEST OVUM OVIDUCT ENLARGED

20293 ✓ ♀ OVARY 6.4mm LARGEST OVUM - LESS THAN 1mm

20308 ♂ ADULT LEFT TESTIS 3mm x 4mm RIGHT TESTIS 2mm x 4mm - MODERATE FAT

20312 ♂? GONADS? QUESTIONABLE TESTIS FOUND

20313 ✓ ♂ LEFT TESTIS 4x5mm

20319 ✓ ♀ OVARY 3 1/2<sup>mm</sup> x 12mm SMALL

20320 ♂ ADULT MODERATE FAT LEFT TESTIS 6 1/2 mm x 3mm RIGHT T. 5 1/2 mm x 2 1/2 mm NOT MODERATE FAT PARTICULARLY ENLARGED

20321 ✓ ♂ LEFT TESTIS 1mm x 4mm RIGHT TESTIS 6.7mm x .5mm

20324 ✓ ♀ LG. OVUM OVARY 5x8 1mm DIAM.

20325 ✓ ♀ LEFT OVINE 1mm OVARY 7x4mm

20326 ✓ ♀ LEFT OV. 10mm x 8mm RIGHT OV. 7mm x 3mm LEFT OVIDUCT ENLARGED - LGST OVUM 1.5

20327 ✓ ♂ LEFT TESTIS 5 1/2 mm x 2 1/2 mm RIGHT TESTIS 6mm x 1 1/2 mm

20328 ✓ ♂ LEFT TESTIS 4x6mm RIGHT TESTIS 3x5mm

20329 ✓ ♀ ABUNDANT FAT - STOMACH PRESERVED - OVARY 3mm x 3mm LG. OVUM 1.5mm

20330 ✓ ♂ LEFT TESTIS 5x5mm DIAM. RIGHT TESTIS 5x5 DIAM

ALL OF THE  
ENCLOSED DATA  
CHECKED OUT  
IN JUNE 65'

JR

May 26, 1965

# Reproductive Data from Field Notebooks in Honolulu

Field  
Number

DATA

- 10564 ✓ ♂ LEFT TESTIS 7x5MM RIGHT TESTIS 7.5 x 4.5MM
- 0565 ✓ ♀ LEFT 9x5MM RIGHT 7.5 x 4MM TESTIS ENLARGED
- 0567 ✓ ♀ OVARY 8MM
- 10212 ✓ ♂ LEFT TESTIS 2x1MM RIGHT TESTIS 1x1MM
- 20265 ✓ ♀ OVARY 10 x 5MM 1.4 LARGEST OVUM OVIDUCT ENLARGED
- 20270 ♂ ADULT LEFT TESTIS 5MM x 2 1/2 MM RIGHT TESTIS 3MM x 2MM - LEFT TESTES SMALL & UNDEVELOPED
- 20285 ✓ ♀ ? LEFT 14x5MM LARGEST OVUM 2MM
- 20288 ♀ OV. 5x5MM LARGEST OVUM OVIDUCT ENLARGED
- 20293 ✓ ♀ OVARY 6.14MM LARGEST OVUM - LESS THAN 1MM
- 20308 ♂ ADULT LEFT TESTIS 3MM x 4MM RIGHT TESTIS 2MM x 4MM - MODERATE FAT
- 20312 ♂ ? OVADS: QUESTIONABLE TESTIS FOUND
- 20313 ✓ ♂ LEFT TESTIS 4x5MM
- 20319 ✓ ♀ ? OVARY 3 1/2 x 12MM SMALL
- 20320 ♂ ADULT MODERATE FAT LEFT TESTIS 6 1/2 MM x 3MM RIGHT T. 5 1/2 MM x 2 1/2 MM - MODERATE FAT PARTICULARLY ENLARGED
- 20321 ✓ ♂ LEFT TESTIS 1MM x 4MM RIGHT TESTIS 1.7MM x .5MM
- 20324 ✓ ♀ LG. OVUM OVARY 5x8 1MM DIAM.
- 20325 ✓ ♀ LEFT. OVINE 1MM OVARY 7x4MM
- 20326 ✓ ♀ LEFT OV. 10MM x 8MM RIGHT OV. 7MM x 3MM LEFT OVIDUCT ENLARGED - LGST. OVUM 1.5
- 20327 ✓ ♂ LEFT TESTIS 5 1/2 MM x 2 1/2 MM RIGHT TESTIS 6MM x 1 1/2 MM
- 20328 ✓ ♂ LEFT TESTIS 4x6MM RIGHT TESTIS 3x5MM
- 20329 ✓ ♀ ABUNDANT FAT - STOMACH PRESERVED - OVARY 3MM x 3MM LG. OVUM 1.5MM
- 20330 ✓ ♂ LEFT TESTIS 5x5MM DIAM. RIGHT TESTIS 5x5 DIAM.

♂  
♀

Field  
Number

Data

- 20333 ✓ ♂ LEFT TESTIS 5X1.5MM RIGHT TESTIS 5X1MM
- 20334 ✓ ♀<sup>P</sup> LEFT AND RIGHT TESTIS WHITE 7X2MM 17MM X 5MM OVARY EXAMINATE
- 20335 ✓ ♂ LEFT TESTIS 2X5MM
- 20337 ✓ ♂ Moderate fat left testis 4X7mm. right testis 3X5mm
- 20338 ♀ OVARY 6X11MM LARGEST OVUM 1.5 MODERATE FAT OVIDUCT ENLARGED
- 20339 ✓ ♀<sup>ADULT</sup> OVARY 13MM X 7MM LARGEST OVUM 2
- 20341 ✓ ♂ LEFT TESTIS 2X5MM WHITE RIGHT TESTIS 2X4MM BLACK
- 20345 ✓ ♀ OVARY 6X5MM OVUM .5MM
- 20347 ✓ ♂ LEFT TESTIS 4X7MM RIGHT TESTIS 4X8MM
- 20375 ✓ ♂ TESTIS 3X1MM
- 25019 ♀<sup>?</sup> LEFT TESTIS 15X5MM LARGEST OVUM 2.5MM WHITE
- 25020 ♂ RIGHT TESTIS 3MM X 1.5MM LEFT TESTIS 4MM X 1.5MM

1355 ~~30290~~ 30295 ♂ Ad. TESTES 7.5 X 4.5 MM light body molt  
 1357 30290 ♀ OVARY 8 X 4 MM FINE GRANULAR wt. 120 grams  
 30293 Juv. ♀ OVARY 8.5 X 2.5 MM MODERATE FAT  
 30036 ♀ OVARY 7 X 4.5 MM AND CONTAINING OVA MODERATE FAT  
 30313 ♂ IMMATURE TESTES 1.5 X 1 MM MODERATE FAT  
 30079 ♂ IMMATURE TESTES 2.5 X 1.5 MM VERY FAT  
 30111 ♂ TESTES ROUND 3.5 AND 4 MM MODERATE FAT  
 30084 ♂ Adult TESTES L. 7 X 3.5 MM R. 4.5 X 2 MM BLOOD PATCH WELL DEVELOPED MUCH FAT  
 30103 SEX NOT DETERMINED GONADS DISINTEGRATED VERY FAT  
 30099 ♀ IMMATURE VERY FAT  
~~30292 ♂ Adult 7.5 X 4.5 MM TESTES light body molt~~

25020 ♂ R. TESTES 3 X 1.5 MM L. TESTES 4 X 1.5 MM  
 25019 ♀  
 25021 ♂ TESTES 8 X 4 MM LITTLE FAT  
 25034 ♂ IMMATURE TESTES 4 X 1 MM VERY FAT  
 25036 ♀ Adult OVARY 10 X 7 MM LARGEST OOVUM 2 MM, LITTLE FAT  
 25039 ♂ L. TESTES 7 X 2.5 MM R. TESTES 5 X 2.5 MM LITTLE FAT BLOOD PATCH WELL DEVELOPED  
 25029 ♂ L. TESTES 6.5 X 2.5 MM R. TESTES 3 X 2 MM NO FAT  
 20349 ♂ LARGEST TESTES 2.5 X 1 MM

Jeffrey P. Tordoff

JUNE 65

1. *Sterna sumatrana* - 30293 - juv. ♀ - ovary 8.5mm x 2.5mm  
moderate fat 6-15-65
2. *Procelsterna cerulea* - 30036 - ♀ - ovary 7mm x 4.5mm and  
containing ova - moderate fat 6-17-65
3. *Heteroscelus incanum* - ~~30079~~ 30313 - ♂ immature - testes 1.5mm x 1mm  
moderate fat 6-17-65
4. *Heteroscelus incanum* - 30079 - ♂ immature - testes 2.5mm x 1.5mm  
very fat 6-17-65
- ✓ 5. *Sterna fuscata* - field # 20274 - ♂ - testes 1.5 x ~~1.5~~ <sup>0.5</sup> mm  
little fat 6-19-65
6. *Sterna sumatrana* - field # 30111 - ♂ - testes round, 3.5mm  
and 4mm, moderate fat 6-19-65
7. ~~#~~ *Anous stolidus* - field # 25021 - ♂ testes 8mm x 4mm  
little fat 6-21-65
- ✓ 8. *Anous stolidus* - field # 25034 - ♂ immature, testes 4mm  
x 1mm, very fat 6-22-65
- ✓ 9. *Sterna fuscata* - field # 25036 - ♀ ad., ovary 10 x 7mm,  
largest ovum 2mm, little fat 6-23-65
- ✓ 10. *Sterna fuscata* - field # 30084, ♂ ad., testes: left 7mm x  
3.5mm and right 4.5mm x 2mm, brood patch well  
developed - much fat 6-23-65
11. *Sterna fuscata* - field # ~~25039~~ <sup>25039</sup> - ♂, left testis 7 x 2.5mm,  
right testis 5 x 2.5mm, little fat 6-24-65

12. *Sterna fuscata* - field ~~# 25028~~ # 25029

♂, left testis 6.5 x 2.5 mm, right testis 3 x 2 mm

brood patch well developed, no fat 6-24-65

✓ 13. *Arenaria interpres* - field # 30103

sex not determined - gonads disintegrated - <sup>very</sup> fat  
6-24

✓ 14. *Arenaria interpres* - field # 30099

♀ imm. - very fat

✓ 1354 20262 STERNA FUSCATA ♂ Ad. T. 11X4MM <sup>NO</sup> MOIT

✓ 1355 30292 STERNA SUMATRANA ♂ Ad. T 7.5X4.5MM light body molt

Lagoon 1 MI. E of TAKERUE, MAKIN Atoll, Gilbert Is. P.O.  
14 November 1964

✓ 1356 20280 STERNA FUSCATA ♀ Ad. Ovary 8X5MM, Largest ovum 1MM  
Koyabu I. MAKIN Atoll, Gilbert Islands, P.O. 14 November 1964  
coll. Lehner

✓ 1357 30290 HETEROSCELUS INCANUS ♀ Ovary 8X4MM FINE GRANULAR  
120GM.

✓ 1358 20279 STERNA FUSCATA ♂ Ad. TESTES 8X3MM, MOD. FAT

30103



From my field-~~catalogue~~ catalogue notebook (Testis measurements - left testis)

Skinned: 8 Nov. 1964 on Kure

- ✓ 20287 F (Imm) Ovary 11 X 3 mm.
- ✓ 20371 F Ovary 3 X 3 mm.
- ✓ 20282 F Ovary 5 X 3 mm.
- ✓ 20366 F ovary 3 X 2 mm.
- ✓ 20367 M Testes  $2\frac{1}{2}$  X 1 mm.
- ✓ 20309 M testes  $2\frac{1}{2}$  X 1 mm.

Skinned later in above week: not dated:

- ✓ 20311? M testes 2 X 1 mm.
- ✓ 20284? M testes 3 X  $1\frac{1}{2}$  mm.
- ✓ 20369? F ovary (?) 6 X 3 mm. Viscera badly shot damaged.
- ✓ 20331 M Testes 5 X  $2\frac{1}{2}$  mm.
- ✓ 20363 F Ovary 9 X 2 mm.
- ✓ 20323? F ovary 10 X 3 mm.
- ✓ 20375 M testes 3 X 1 mm.
- ✓ 20373 F Ovary 17 X 5 mm.
- ✓ 20380 F ovary 10 X 3 mm.
- ✓ 20379 F ovary 17 X 5 mm. (boomerang shape)

Skinned by others here at the house:

- ✓ 20342 F Ovary 4 X 7 largest ovum 2 mm.
- ✓ 20322 F Ovary 10 X 5 mm. largest ovum 1.5 mm. oviduct enlarged.
- ✓ 20340 M L testis 3 X 3 mm; R. testis 1 X 2 mm. black
- ✓ 20336 F Ovary 10 X 5 mm. largest ovum 2 mm.
- ✓ 20267 F ovary 12 X 4 mm. largest ovum 1 mm.
- ✓ 20343 M L. testis 5 mm.; R. 3 mm.
- 20349 M largest testis  $2\frac{1}{2}$  X 1 mm.
- ✓ 20375: Mc Bee card states: Ruddy Turnstone, 11:6 collected by Fleet. Conflicts with specimen here: Fairy Tern (no card) dated 10:27 by DuMont. (have fun Bob).

CATALOGUED  
AS *ATENARIA*  
INTERPRETES

0558

✓ = recorded on label and Mc Bee card

Feb. 6 1965

- 20391 SKELTON ONLY — SKELTON IN D.V. OF MAMMALS ✓
- 20377 SKELTON + SKIN — SKIN + SKELTON IN D.V. MAMMALS #316 ✓
- 20376 Alcoholic — IN 604
- 20297 SK. + SKIN — SKELTON IN D.V. MAMMALS <sup>WHERE IS SKIN</sup> ♂ AT TANNERS
- 20245 - SKELTON — SKELTON IN D.V. MAMMALS ✓
- 20239 - SKELTON — SKELTON IN D.V. MAMMALS ✓
- 20238 - SKELTON — SKELTON IN D.V. MAMMALS ✓
- 20237 - SKELTON — SKELTON IN D.V. MAMMALS ✓
- 20213 - ? — SKIN + SKELTON IN D.V. MAMMALS NO SKULL ✓
- 20201 - SKELTON — SKELTON IN D.V. MAMMALS ✓
- 20192 - SKELTON — SKELTON IN D.V. MAMMALS ✓
- 20156 - SKIN + SKELTON — SKIN SENT TO TAXIDERMIST 3/25/69 ♀ AT TANNERS

- 20462 — SKELTON IN D.V. MAMMALS — NO FIELD # <sup>BEING SENT TO TANNERS</sup> SKIN IN TAXIDERMIST
- 20468 — SKELTON IN D.V. MAMMALS —
- 20470 — SKELTON IN D.V. MAMMALS
- 20471 — SKIN IN TAXIDERMIST #374 BEING SENT TO TANNERS

3 Adults

# 316 AT TANNER

2 without

Shipment Inventory - from Kure Island, April 1, 1965, to Washington, D. C.

Ectoparasites:

small vials	200	bird samples
large vials	36	berlese samples

McBee cards:

all completed cards from live measurement birds.

Cards for specimens sent 28 Feb. 1965

<del>20393</del>	<del>20411</del>	<del>20424</del>	<del>20435</del>
<del>20394</del>	<del>20414</del>	<del>20426</del>	<del>20437</del>
<del>20396</del>	<del>20415</del>	<del>20427</del>	<del>20438</del>
<del>20403</del>	<del>20418</del>	<del>20428</del>	
<del>20405</del>	<del>20420</del>	<del>20430</del>	
<del>20406</del>	<del>20421</del>	<del>20431</del>	
<del>20407</del>	<del>20422</del>	<del>20432</del>	
<del>20410</del>	<del>20423</del>	<del>20434</del>	

*catalog*

Specimens, bird, stuffed plus McBee cards.

<del>20443</del>	Diomedea immutabilis	chick
<del>20444</del>	Larus hyperboreus	
<del>20445</del>	Oceanodroma markhami	
<del>20446</del>	Accipiter gentilis	
<del>20447</del>	Larus sp.	
<del>20448</del>	Larus occidentalis	
<del>20449</del>	Larus hyperboreus	
<del>20450</del>	Larus occidentalis	
<del>20453</del>	Anas acuta	
<del>20454</del>	Anas acuta	

Eggs

Two boxes of blown Albatross eggs.

Equipment shipped from Kure to D.C. via military transport 15 May 1965

- 1 balance, triple beam, Ohaus
- notebooks, used, for record
- reprints, misc.
- 1 seal skeleton
- data sheets
- 1 tranquilizer gun and accessories
- 1 turtle tags, Carr - Florida
- 1 pliers, turtle tagging - Carr - Florida
- 5 slide box, empty
- maps
- 1 shotgun, 16 ga., single barrel
- 1 revolver, .22 cal.
- 1 tempscribe, broken
- 1 sling psychrometer, broken
  
- 1 half drum preserved specimens
- 1 ammo box skeletons
- 1 box flat rat skins (in trunk)
- 1 box gull and swallow skins (in trunk)

SEAL

- 20213 - SKIN - SKELTON NO skull
- 20377 - SKIN + SKELTON
- 20391 - SKELTON
- 20462 - SKELTON NO FIELD #
- 20470 - SKELTON
- 20213 - SKELTON NO skull SKIN
- 20245 - SKELTON
- 20238 - SKELTON
- 20239 - SKELTON
- 20192 - SKELTON
- 20201 - SKELTON
- 20237 - SKELTON
- 20468 - SKELTON
- 20297 - SKELTON should be SKIN
- 20471 - SKIN TAXIDERMING
- 20156 - SKIN SENT TO TAXIDERMING 3/25/64

Aug. 16, 1965

Field Numbers of skeletons sent from Kure to Washington:

HAVE THOSE CHECKED

- 20360 ✓
- 20361 ✓
- 20362 ✓
- 20377 ✓
- 20391 ✓
- 20397 ✓
- 20398 ✓
- 20400 ✓
- 20401 ✓
- 20402 ✓
- 20409 ✓
- 20418 SEAL white
- 20429 ✓
- 20430 SEAL white
- 20470 ✓
- 20472 ✓
- 20473 ✓
- 20474 ✓
- 20475 ✓

GET IN MAMMALS  
20462 ? — no field tag, but in skeleton pen. Ask Wirtz. — seal skel.

Could not find skeletons on these field numbers:

- 20203 GET CAT.
- 20204 GET CAT.
- 20297 ? SEAL
- 20372 ? bird
- 20413 ? bird

- 1 CHANGED <sup>FIELD</sup> TAG PUT ON SEAL
- 2 UNCHANGED HAD FIELD TAG
- 3 } CHANGED FIELD TAG TO BE PUT ON SKELTON WHEN IT COMES BACK
- 4 } FROM JOE WISS
- 5 } CHANGED TO ALCOHOLICS FIELD TAG 20200 LOST?
- 6 }
- 7 }
- 8 }
- 9 UNCHANGED
- 10 UNCHANGED NO FIELD TAG
- 11 UNCHANGED HAD FIELD TAG
- 12 CHANGED HAD FIELD TAG

16 UNCHANGED

20203 *Fulmarus glacialis* skel.

Witz 3-29-64 Green Is. Kure

20204 *Fulmarus glacialis* skel.

Witz 3-30-64 Green Is. Kure

20205 *Sula dactylatra* N also.

Witz 3-31-64 < 1 day old  
Green Kure

20206 *Sula dactylatra* N also.

Witz 4-01-64 1 week old 2nd cluck  
Green Kure

20207 *Sula dactylatra* N also.

Witz 4-02-64 4 days old 2nd cluck  
Green Kure

20208 *Sula dactylatra* N also.

Witz 4-03-64 < 1 day old 2nd cluck  
Green Kure

20210 *Sula dactylatra* N also.

Witz 4-13-64 3 days old 2nd cluck  
Green Kure

20216 *Phaethon rubricauda* N also.

Frost 4-15-64  
Green Kure



Nsucose -

ANNOTATED LIST

June 17-20, 29, 1923 June 17-20, 1923: Common nesting as at Nihoa. The barking calls  
 (Wetmore) of these birds muffled and amplified by the rock caves surrounding  
 our camp had a supernatural sound at night inducing the statement by a visitor ashore  
 for the night that he heard the spirit dogs of ~~the~~ ancient Hawaiians.  
June 29: Abundant.

July 26, 1964  
 (Kridler) One nest of a Bulwer Petrel contained a downy chick.

Sept. 25, <sup>26</sup>1964  
 (Fleet, POBSP) Total population estimate ----- 100  
 (Kridler) An estimated 75-100 Bulwer Petrels were using the island; a few old  
 petrified downy young were found. No eggs were noted.

March 15, 1965  
 (Banko, POBSP) None mentioned in report.  
 (Kridler) None mentioned in field notes.

Sept. 10-11, 1966  
 (Kridler) One downy young was found under a Marhiai stone on Annexation Hill.  
 Another almost fully-grown young was found near Bow Hill. Several pairs of adults  
 were found in crevices on cliff-sides. There was a slight increase at night. We  
 estimated that probably 200 were to be found on the island at the time, but this again  
 is only a guess.

March 10, 1967  
 (Hackman, POBSP) (Rept) Not mentioned (Notes) None were observed but we werent on  
 the island during the night. Probably on the island but deep in burrows during  
 this visit.

Sept. 15, 1967  
 (Kridler) Observed only one adult and one chick with a little down still  
 present on its head on the main part of the island near the western  
 end.

Christmas Shearwater ----- Annotated List ----- Necker

June 17-20, 1923  
(Wetmore, 1923) -- None mentioned in species account

-----  
July 26, 1964  
(Kridler) None mentioned in field notes

-----  
Sept. 25, <sup>26</sup>1964  
(Fleet, POBSP None mentioned in field notes  
(Kridler) None mentioned in field notes

-----  
March 15, 1965  
(Banko, POBSP) None mentioned in field notes  
~~(Kridler)~~ None mentioned in field notes

-----  
Sept. 10-11, 1966  
(Kridler) None mentioned in field notes

-----  
March 10, 1967  
(Hackman, POBSP) (Rept) Population estimate: 1+ adult. (Notes) Gene Kridler saw one  
bird near the landing area.

-----  
Sept. 15, 1967  
(Kridler) None mentioned in field notes.  
-----

June 17-20, 29, 1923

June 17-19: One or two seen daily.

20 seen.

June 20 E A small one taken had small sexual organs. About

June 21(?): Three seen.

-----  
July 26, 1964

(Kridler)

Several Ruddy Turnstones were seen on the top of the most eastern peak...

-----  
Sept. 25, 1964

(Fleet, POBSP)

Actual count ----- 23

(Kridler)

23 recorded

-----  
March 15, 1965

(Banko, POBSP)

Estimated total island population ----- 50

(Kridler)

30 turnstone were seen at the landing site about a quarter hour before we left the island.

-----  
Sept. 10-11, 1966

(Kridler)

11 were observed and notagged birds were seen

-----  
March 10, 1967

(Hackman, POBSP)

(Rept) Population estimate: 22 + (Notes) Several small flocks were observed, 5 + 12 and 5 solitary birds were observed along the ridge.

The flocks were in flight over Shark Bay.

-----  
Sept. 15, 1967

(Kridler)

We observed 30 near the shelf at the landing and another flock of 7 on Northwest Cape. No dyed or banded birds were seen.

WANDERING TATTLER ----- Annoated List ----- NECKER

June 17-20, 29, 1923  
(Wetmore)

June 19: One taken was molting the outer primaries. One or two  
seen daily from 17 to 19.  
June 20: Seen.

-----  
July 26, 1964  
(Kridler)

None mentioned in field notes.

-----  
Sept. 25, <sup>26</sup> 1964  
(Fleet, POBSP)  
(Kridler)

None mentioned in field notes.  
One seen.

-----  
March 15, 1965  
(Banko, POBSP)  
(Kridler)

None mentioned in field notes.  
None mentioned in field notes.

-----  
Sept. 10-11, 1966  
(Kridler)

3 recorded

-----  
March 10, 1967  
(Hackman, POBSP)

(Rept) Population estimate: 1 + (Notes) One bird was observed  
near the landing area.

-----  
Sept. 15, 1967  
(Kridler)

None mentioned in field notes.  
-----

June 17-20, 1923  
(Wetmore, 1923)                      June 19, 1923 : One reported by Grant

-----  
July 26, 1964  
(Kridler)                      None mentioned in field notes  
-----

Sept. 25, <sup>24</sup>1964  
(Fleet, POBSP)                      None mentioned in field notes  
(Kridler)                              None mentioned in field notes  
-----

March 15, 1965  
(Banko, POBSP)                      None mentioned in field notes  
(Kridler)                              None mentioned in field notes  
-----

Sept. 10-11, 1966  
(Kridler)                              None mentioned in field notes  
-----

March 10, 1967  
(Hackman, POBSP)                      None seen.  
-----

Sept. 15, 1967  
(Kridler)                              None mentioned in field notes.  
-----

June 17-20, 29, 1923  
(Wetmore)

June 20 : One taken.

-----  
July 26, 1964  
(Kridler)

None mentioned in field notes.

-----  
Sept. 25<sup>26</sup>, 1964  
(Fleet, POBSP)

Actual count ----- 3

(Kridler) 3 seen.

-----  
March 15, 1965  
(Banko, POBSP)  
(Kridler)

None mentioned in field notes.

None were noted.

-----  
Sept. 10-11, 1966  
(Kridler)

4 recorded

-----  
March 10, 1967  
(Hackman, POBSP)

(Rept) Population estimate: 2 + (Notes) 2 observed.

-----  
Sept. 15, 1967  
(Kridler)

6 noticed scattered over the island.

June 17-20, 29, 1923  
(Wetmore)

None mentioned in species account or journal

July 26, 1964  
(Kridler)

None mentioned in field notes.

Sept. 25, <sup>26</sup>1964  
(Fleet, POBSP)

None mentioned in field notes.

(Kridler)

None mentioned in field notes.

March 15, 1965  
(Banko, POBSP)

None mentioned in field notes.

(Kridler)

None mentioned in field notes.

Sept. 10-11, 1966  
(Kridler)

None mentioned in field notes.

March 10, 1967  
(Hakcman, POBSP)

None observed.

Sept. 15, 1967  
(Kridler)

None mentioned in field notes.



June 17-20, 1923  
(Wetmore, 1923)

Population estimate --- about 500 pairs here

Species account: Common over the higher slopes of the island where they have young from half to nearly grown. When undisturbed the females and young frequently utter their loud quacking calls in a contented tone.

June 29: A big female seen anxiously guarding a runt egg the size of a Bulwer's Petrel...

July 26, 1964  
(Kridler, 1964)

Blue-faced Boobies were perch'd on the upright stones on the top of the hill.. Several Blue-faced Booby nests were found, containing two eggs ... I estimated ...about 20 immature Blue-faced Boobies and another 30 immatures [~~\*~~ adults ?][Near Bow Hill]

Sept. 25, <sup>26</sup>1964  
(Fleet, POBSP)

Actual counts	Adults -----	58
	Immatures -----	57
	Locals -----	6
Total population estimate	-----	190

(Kridler) An estimated population of 250 birds. Recorded were 58 adults, 57 immatures, and 60 locals not yet capable of flight.

March 15, 1965  
(Banko, POBSP)

Estimated total island population ----- 230  
(Breeding - 110 nesting adults, 11 wakers, 1 chick)

(Kridler) Estimated population of 230 birds. Most were found on the summits of all the hills. 110 nests were located all of which contained eggs, except for one in which was found one egg and a very newly hatched chick. One downy young out of its nest had the wings and tail partially feathered. Fifty nesting adults were banded with band no. 767-00351 through 400. These birds tend to remain at the nests when approached and were easier to capture by hand than the other two species.

Sept. 10-11, 1966

(Kridler) There were at least 200 on the island, but no thorough census was conducted because of the lack of time. All the chicks were almost completely grown. Some, however, were still attendant and being fed by adults.

March 10, 1967  
(Hackman, POBSP)

(Rept) Population estimate: 200 adults, 103 nests, 3 young ..

Small naked (newly hatched) chicks were found on Necker Island (3)

(Notes) Breeding birds were scattered along the ridge in the bare areas. Nests usually occurred in little clusters - sometimes 5-6 feet apart. Counted 108 nests:

43 with 2 eggs (also 2 nests with 2 eggs on Northwest Cape)

23 with 1 egg (2 of these pipped)

1 with 1 egg and 1 naked chick

2 with small naked chicks

37 with - unknown contents.

All birds were reluctant to leave their nests, possibly because they are seldom disturbed or possibly because many were on eggs that were about to hatch. Found one bird with a light blue egg - about the color of the lines on standard notebook paper.

March 10, 1967

(Hackman, POBSP)  
(cont.)

Measured a number of eggs: 8 sets of 2 and 2 nests with one egg. Didn't have time to measure any more because a downpour gummed up my calipers. Measurements given in notes[ ..Nests were along ridge in bare areas. In one area nests were only 4 feet apart but in most areas the birds were 15 to 20 feet apart.

---

Sept. 15, 1967

(Kridler)

Also good estimates. Main island - adults - 6, immatures flying - 30. Northwest Cape - immatures flying - 2, downy chicks - Main Island - 3, Northwest Cape - 3.

---

June 17-20, 29, 1923  
(Wetmore, 1923)

June 17-19: A few seen on the lower rock cliffs. One or two half grown young recorded .  
June 20 : About 50 pairs inhabit the ledges on the rock cliffs.

July 26, 1964  
(Kridler)

I also found a Brown Booby nest with two eggs

September 25, <sup>26</sup>1964  
(Fllet, POBSP)

Actual count --- Adults ----- 8  
Immatures ----- 3  
Total population estimate -----20

(Kridler) estimated population of 15 birds; this might be somewhat low. Recroed were 8 adults and 3 immatures capable of flight. No eggs or nests were recorded.

March 15, 1965  
(Banko, POBSP)

Estimated total island population ----- 22  
Breeding (16 nesting adults, 2 chicks, 6 walkers)

(Kridler) Estimated 25 birds. We found 10 nests on the Northwest Cape mainly near the top and west side. One almost fully grown chick was recorded. This bird had but a trace of down on the sides of the neck. Also found was one small downy chick attended by one adult.

Sept. 10-11, 1966  
(Kridler)

No count was made. No chicks or nests with eggs were found.

March 10, 1967  
(Hackman, POBSP)

(Rept): Population estimate : 10 + adults..(Notes) Saw 8-10 birds flying around the island. No nests were found. One bird was observed flying with a stick in its mouth to one of the inaccessible ridges above the landing spot. Nests: 4 (2 on NW cape) - 2 eggs each.

Sept. 15, 1967  
(Kridler)

Main island- adults - 6, immatures flying - 3, and one large downy chick, nests with eggs. These are also very good figures. On Northwest Cape, adults-6, immatures -7, large chicks - 2, nest with one egg - 1, nests with two eggs - 1.

June 17-20, 23, 1923

(Wetmore) June 17-19, : Common. Nests in some cases are just built., a few contain eggs and the majority young one third to half grown. I saw a young bird almost adult with only a trace of down on the head. There is something definitely serpentine in the appearance of the adult as they protrude and retract their necks when disturbed.

June 20: About 1000 pairs here.

June 29: No change

July 26, 1964

(Kridler) Red-footed Boobies were perched on the upright stones...  
 [Heavy growth of Chenopodium about a foot to a foot and a half in height ..on the slope of Flagpole Hill ] is used as nesting sites by Red-footed Boobies. Red-footed Booby nests contained eggs to down young. ... On the north side of this hill [the eastern most peak] grows some Chenopodium in which there were about 50 Red-footed Booby nests...

September 25, <sup>24</sup>1964  
 (Fleet - POBSP)

Actual count	Adults on nest -----	74
	on eggs -----	27
	on chicks -----	22
	unknown-----	25
	Adults unoccupied -----	84
( <del>xx</del> = capable of flight)	Immature -----	64
(+ large dept.young)	Local-----	23
Total population estimate	-----	650

(Kridler) This Chenopodium [grows mostly at the higher parts all over the slopes] is used extensively ...by Red-footed Boobies for nesting sites. .... [Count of?] 84 adults on the nests, 27 of the nests contained eggs and 22 contained a chick; we were unable to check the nests of 25 others. In addition to the above birds on the nest we found 23 nests which contained chicks which were quite large. Also observed were 64 immatures capable of flight.

March 15, 1965  
 (Banko, POBSP)

Estimated total island population ----- 1,000  
 Breeding -- most on nests with eggs.

(Kridler) Estimated 500 nests. Actually counted 412. All the adults were on eggs. Nests on the Chenopodium and principally on the north slopes of the island. Only one adult was banded with No. 767-00302.

Sept. 10-11, 1966

(Kridler) No count was made. Most of the birds appeared to be immatures and an estimated 95 % had reached flight stage. Less than tendowny young were noted .

March 10, 1967  
 (Hackman, POBSP)

(Rpt) Population estimate: 350 adults, 3 eggs. (Notes) Population about 175 pair. Many birds on nests courting or carrying vegetation. All nests had fresh vegetation. Of 100 nests checked only 3 had eggs - only measured one of these. Birds preferred to nest on Chenopodium and used this species for the nest. There were a few nests scattered round on the old Polynesian ruins but most were found along one slope in bush g rowths of Chenopodium. ....Only 3 eggs observed by total field party. I only found one of those.

Sept. 15, 1967  
(Kridler)

Count done on main part of the island. Adults- 420 recorded, immatures flying - 93, chicks - 59, nests with one egg - 17, new nests without egg - 17; on Northwest Cape - 5 immatures were noted roosting. No nests were found on Northwest Cape. Nests without the eggs were new or almost complete. These figures are very very good.

---

June 17-20, 29, 1923  
(Wetmore)

Many young practically grown are found in the higher slopes with the Laysan Albatross. A few have down clinging to the head and neck but many are seemingly adult except for a slight lack in wing development. During our stay here I have seen no adults with these birds and believe that they have been deserted. They seem healthy enough and walk about without difficulty.  
 (June 20) -- about 100 pairs seen. No adults seen whatever.  
 (June 29) -- young somewhat more developed.

-----  
 July 26, 1964  
(Kridler)

None mentioned in field notes

-----  
 Sept. 25, <sup>26</sup> 1964  
 (Fllet, POBSP)

None mentioned in field notes

(Kridler)

None mentioned in field notes

-----  
 March 15, 1965  
(Banko, POBSP)

Estimated total island population ----- 375  
 Breeding (200 nesting adults, 100 chicks, 75 walkers)

(Kridler)

We counted 94 nests and estimated that there were probably 100. A total adult population of 400 was calculated. Most nests were found on the upper slopes of Annexation and Flagpole Hills. None were found on Northwest Cape.

-----  
 Sept. 10-11, 1966  
(Kridler)

[None] recorded on the island

-----  
 March 10, 1967  
(Hackman, POBSP)

(Rept) Population estimate: 75 + adults; 25-30 young. (Notes)  
 Approximately 75 birds with 25-30 nestlings all about 1/4 to 1/2 grown. These are scattered here and there among the nesting Laysan Albatroas.

-----  
 Sept. 15, 1967  
(Kridler)

None mentioned in field notes.  
 -----

June 17-20, 23, 1923 : Common . Eggs and young.  
 (Wetmore) : June 20 : About 400 pairs.  
 June 29, : No change.

July 26, 1954  
 (Kridler) Fairy Terns were very common, estimate at least 5 to 600....  
 Working my way along the top towards Bow Hill the ridge becomes more knife-like and  
 the number of Fairy Tern nests were located here which contained eggs to almost  
 ready to fly. There were at least 50 nests in this general area....

Sept. 25, 1964  
 (Fleet, POBSP) Total population estimate ----- 450  
 eggs to immatures

Observed adult Fairy Tern feed flying young. Called young to itself by repeated squeaks  
 -- transferred single minnow like fish from bill to bill.

(Kridler) An estimate of 400-500 utilizing the island, 30 of which were banded.

March 15, 1965  
 (Banko, POBSP) Total island population estimate ----- 200  
 Breeding -- some with eggs.

(Kridler) Estimated population of perhaps 200. Most of these on Northwest  
 Cape, especially on the west end. Eggs were found but no chicks. Later trips to Necker  
 revealed that many of these birds nest in the holes in the steep cliffs which  
 constitute the north and south sides of the island so it is very conceivable that  
 many were missed and the population estimate of 200 is quite low.

Sept. 10-11, 1966  
 (Kridler) Estimated population of 500-600, this is a rough one. Nests , if  
 we could call them nests, were recorded which contained eggs to flying young.  
 However, most of these appeared to contain young. I would estimate that approximately  
 75-80%. They were distributed along the cliff face over the entire island, with  
 Northwest Cape especially favored. We found several Fairy Tern chicks almost  
 completely feathered out but they were extremely emaciated. Apparently the parents  
 had deserted them before they learned to fly and fend for themselves.

March 10, 1967  
 (Hackman, POBSP) (Rept) Population estimate : 600 +, eggs to young. (Notes)  
 A few birds with eggs were observed along the higher ridges and  
 cliffs. Most birds were located along the steeper cliff areas where the nests couldnt  
 be easily checked. Population appears to be around 500-1000 birds. Gene found one  
 small downy young on Northwest Cape.

Sept. 15, 1967  
 (Kridler) Main part of island: 212, Northwest cape: 151. These figures are  
 a minimum. A few were still on eggs and a number of very small  
 downy young were present as were some very large young.

June 17-20, 29, 1923      June 17-19: Common. Nests contain eggs or young to 1/3 grown.  
 (Wetmore)                      June 20:      About 300 pairs on the island  
    June 27:      No change.

July 26, 1964  
 (Kridler)                      [Heavy growth of Chenopodium about a foot to a foot and a half in height ..on the slope of Flaggpole Hill] is used as nesting sites by frigatebirds. ...Frigatebird nests contain eggs to half-grown young. In addition there was a considerable number of immature birds flying about....I estimated that about 250 frigatebird nests were found on the island but this is a very rough estimate.. Majority of the young frigatebirds were feathered on the back, wings, top of the head, and the breast, with considerable down on the neck...

Sept. 25, <sup>26</sup>1964                      Actual count ----- Immatures ----- 375  
 (Fleet, POBSP)                      Locals ----- 84  
    Nestlings ----- 8  
    Total population estimate ----- 1800

Estimate includes 50 % nest failure.

(Kridler) This Chenopodium [grows mostly at the higher parts all over the slopes] is used extensively ...by frigatebirds ..for nesting sites. .... Population estimate-- 1500-1800. We recorded 375 immature birds, 85 locals still in the nest, and 8 very small downy nestlings.

March 15, 1965  
 (Banko, POBSP)                      Estimated total island population ----- 1,700  
    Breeding -- 850 nests and platforms

(Kridler)                      Estimated population of 2,000 birds. We tallied 832 nests and estimated that there probably were about 850. These were found in all areas except Northwest Cape. Most of them, about 540, are on the north slopes of Summit Hill. There seemed to be a greater percentage of immature birds flying above us than we noted at Nihoa

Sept. 10-11, 1966  
 (Kridler)                      A few downy young. Probably 200 immatures were still on the nests. Notes one immature with a red streamer on the left leg but we were unable to capture it. Several thousand adults and immatures were flying over the island throughout the day.

March 10, 1967  
 (Hackman, POBSP)                      (Rept) Population estimate: 500 adults, 200 nests. (Notes) About 200 nests scattered around island. Birds were found in little clusters on Chenopodium around the edges of the ridges. A number of nests were found on the same slopes as the bulk of the Red-footed Boobies in the Chenopodium. This plant species was used for the nest. The majority of nests were new construction but empty. Only 37 of 100 had eggs. ...Measurements given in notes for 20 eggs. By candling 7 of 20 were fresh; 11 of 20 were opaque, and 2 were ?. Nest description: nests on Chenopodium base and constructed almost exclusively of Chenopodium twigs. Heights of nests above the ground in inches: 8, 10, 19, 14, 18, 12, 11, 9, 13, 14, ,. Diameters of nests in inches: 15, 14, 13, 17, 18, 16, 15, 16, 16, 12, ,.



Sept. 15, 1967

(Kridler)

Many half to almost full grown young in the nest Through a misunderstanding the nests were not counted. However there was a population of approximately 1200 birds.

---

June 17-20, 29, 1923 June 17-19: Common. Nesting on open slopes. Eggs.  
 (Wetmore) June 20 : About 3000 pairs.  
June 29 : No change

July 26, 1964

(Kridler) Common Noddies were very abundant [? along the east side of Northwest Cape?]. . . . In this general area [that of the western hill] there were at least 10,000 Common Noddy nests, primarily in the egg stage. However, there were chicks in all growth stages. . . . Common Noddies were . . . abundant on the top [of Flagpole Hill]

Sept. 25, <sup>26</sup>1964 Actual count ----- immatures ----- 1,000  
 (Fleet, POBSP) Locals ----- 2,000  
 few eggs Total population estimate ----- 3,500 (young)  
 Banded ----- 97

(Kridler) Population estimate of 8,000-10,000. These birds were distributed over most of the island with the greatest number on Northwest Cape. Nests contained eggs to flying young. A rough estimate of 3,000 chicks was made.

March 15, 1965

(Banko, POBSP) Estimated total island population ----- 25  
 Breeding --(no notes -- indicating no breeding ?)

(Kridler) Estimated 25 birds although only 3 were actually seen. This is in considerable contrast to last September when we thought that perhaps 10,000 were present.

Sept. 10-11, 1966

(Kridler) No counts were made but they were extremely abundant. Estimated at least 8,000-10,000 adults with another 4,000+ chicks. Few nests still contained eggs but we estimated that approximately 99% had already hatched. Young were in all stages but mainly from 1/2 to 1/3 grown. A very few were capable of flight. They were distributed all over the island with the Northwest Cape most favored. Another favorite area was Annexation Hill. We did notice that the noddies when they were brooding chicks would brood them either under the left or right wing and not under the body itself.

March 10, 1967

(Hackman, POBSP) (Rept): Population estimate: None (Notes) None were observed.

Sept. 15, 1967

(Kridler, POBSP) Main part of island: 8,200, Northwest Cape: 850, downy chicks on the main ~~part-of-the~~ island : 61; on the Northwest Cape: 25, nests with one egg on the main part of the island: 1,580, on the Northwest Cape: 600. These birds were scattered all over the island and the nest and egg counts are a minimum. There were many more we were unable to count because of the lack of time.

June 17-20, 29, 1923

(Wetmore) June 17-19: Abundant, eggs and grown young seen nesting on ledges of cliffs and in open slopes of island.

June 20 : About 4000 pairs nest here. The young wander about the rocky slopes of ten tumbling head first over the ledges with no apparent harm. A good many are now in full first plumage but are loath to fly.

June 29 : Many young are now well grown.

July 26, 1964

(Kridler) On the western hill I estimated about a thousand Gray-backed Tern nests containing chicks almost ready to fly. ... [Gray-backed Terns] were ... abundant on the top [of Flagpole Hill].

Sept. 25, 1964

(Fleet, POBSP)

Actual count -----	Adults -----	3
	Immatures -----	2
Total population estimate -----		15

(Kridler) Observed were 3 adults and 2 flying immature birds.

March 15, 1965

(Banko, POBSP) Estimated total island population ----- 7,500  
Breeding -- some with eggs

(Kridler) Estimated total population of 7,500 and 3,700 nests. This is speculated because the nests are very much scattered. Northwest Cape had the largest numbers, approximately 1,000. Quite a few of the nests are in inaccessible cliff areas.

Sept. 10-11, 1966

(Kridler) Over 25 flightless but almost full-grown young were found on Annexation Hill. Several others were ~~xx~~ about 2/3rds grown. Less than ten adults were observed on the island.

March 10, 1967

(Hackman, POBSP) (Rept \ Population estimate : 500+ adults, some eggs .. present in large numbers only on Nihoa and Necker where the birds appeared to be on fresh to lightly incubated eggs. (Notes) Difficult to assess population because the birds were nesting down + cliff walls around the island. No chicks were found. Only about 10 eggs were found. Two of these were checked and were only slightly incubated. Population: at least 2,000 birds. [Eggs measurements given for 10 eggs]

Sept. 15, 1967

(Kridler) On the main part of the island: adults: 13, on Northwest Cape: adults: 4, on the main part of the island: locals: 2, on Northwest Cape: locals: 1. These locals were very large and just about ready to fly.

June 17-20, 29, 1923

(Wetmore)

June 17-19: Abundant. Eggs to grown young noted. They have the same trick of rushing down the slopes in early morning in a screaming mass noted on Nihoa.

June 20 : About 15,000 pairs. Many are laying and others have young.

June 29 : Many young awing.

-----  
July 26, 1964(Kridler)

Many of the Sooty Tern nests contain young chicks.... I estimated about 2 to 3000 Sooty terns in this general area [that approaching the top of Bow Hill??]

-----  
Sept. 25, 1964(Fleet, POBSP)

Saw 4 adults in evening

(Kridler)

Four adults were recorded flying overhead. No young were noted

-----  
March 15, 1965(Banko, POBSP)

Estimated total island population ----- 50,000  
Breeding -- 80 % with eggs, 20% with chicks

(Kridler)

Estimated population of at least 50,000 birds if not more and approximately 25,000 nests. These were scattered all over the island. They were located on bare rock on Northwest Cape and on the main island; under Chenopodium vegetation above the cliffs ;to the tops of the hills. About 50 % contained egg chicks on Northwest Cape and 15-20% elsewhere on the island. At least ~~two~~ three almost fully fledged young were recorded.

-----  
Sept. 10-11, 1966(Kridler)

Approximately 300 were on the ground, and more of them at night. A few flightless chicks were observed-most of these were on the west slope of Flagpole and Summit Hills. However, some were also found on the north slope of Annexation Hill.

-----  
March 10, 1967(Hackman, POBSP)

(Rept) Population estimate: 15,000 (; or ) eggs and young. ..

The Necker Island birds had all stages from eggs to fledged young. (Notes) Approximately 37,000 scattered over several slopes and ridges. Birds were in all stages of breeding from barely incubated eggs to flying young/ In one area a few fresh chicks were seen. Birds nested in bare areas on the slopes, on little ledges along the cliffsides, and under dense growth of Chemopodium. About 25 % with chicks. [Measurements given in notes for 20 eggs.]

-----  
Sept. 15, 1967(Kridler)

Approximately 100 adults noted flying about with a few immatures among them.

June 17-20, 29, 1923

(Wetmore) June 17-19: Common but less abundant than at Nihoa. The birds have eggs scattered about over the slopes most of them showing slight traces of incubation. I saw one instance where two eggs had rolled together and one bird was incubating both.

June 20: About 3000 pairs here. The calls of these birds echo along the rock cliffs at nightfall with a weird cadence that is ghostly in the extreme ----  
 June 29: No change

July 26, 1964

(Kridler) Wedge-tailed Shearwaters were very common but the birds had the same problem here which they have on Nihoa Island; they are unable to burrow because of the rocky nature and as a result they use any holes or depressions they can find in the rocks, the rim rocks, and along the cliff sides as well as nesting on the surface of the ground under the thick growth of Chenopodium on the west slope of Flagpole hill. Many of the nests contained eggs.

Sept. 25, 1964

(Fllet, POBSP) Total population estimate ----- 1500 young  
 downy chicks some of body tracts in  
 Banded ----- 19

(Kridler) Underneath these growths of Chenopodium [which mostly grows at the higher parts over all the slopes] are a number of Wedge-tail burrows; however we found Wedge-tail Shearwaters not only utilizing the holes in the rubble of the rock but also nesting in whatever nook and cranny they could find. Some were found nesting in slight caves above the surface of the rock exposed to the wind and the climate. .... a population of 4 to 5 thousand -- this is an estimation at best. About 1500 downy young were recorded. A few of the young had their just breaking out of their sheaths.

March 15, 1965

(Banko, POBSP) Estimated Island total population ----- 2,000  
 Breeding (88 pairs seen, no eggs)

(Kridler) A very speculative estimate of 2,000 was made. No eggs or chicks were found,

Sept. 10-11, 1966

(Kridler) No estimate was made but these birds were considered to be abundant with populations increasing considerably at night. All young were found in the big downy stage. There was considerable caterwauling and calling during the night by this species.

March 10, 1966

(Hackman, POBSP) (Rept) Population estimate. 10+ adults roosting... These birds were sitting around or were in crevices between rocks. (Notes) Saw about 10 birds in holes along top of ridges. No eggs were seen.

Sept. 15, 1967

(Kridler) No attempt was made to conduct a thorough census of these birds, however, we observed the following during our investigation: adults- 60, locals - 112, all downy; eggs 8; on the Northwest Cape we found 6 downy chicks. There undoubtedly were many more but since they tended to be found along holes in the steeper slopy sides of the island as well as being scattered underneath the Chenopodium on the hillsides and we didn't have time to check all the areas.

June 17-20, 29, 1923  
(Wetmore)

-----  
July 26, 1964  
(Kridler)                      None mentioned in field notes.

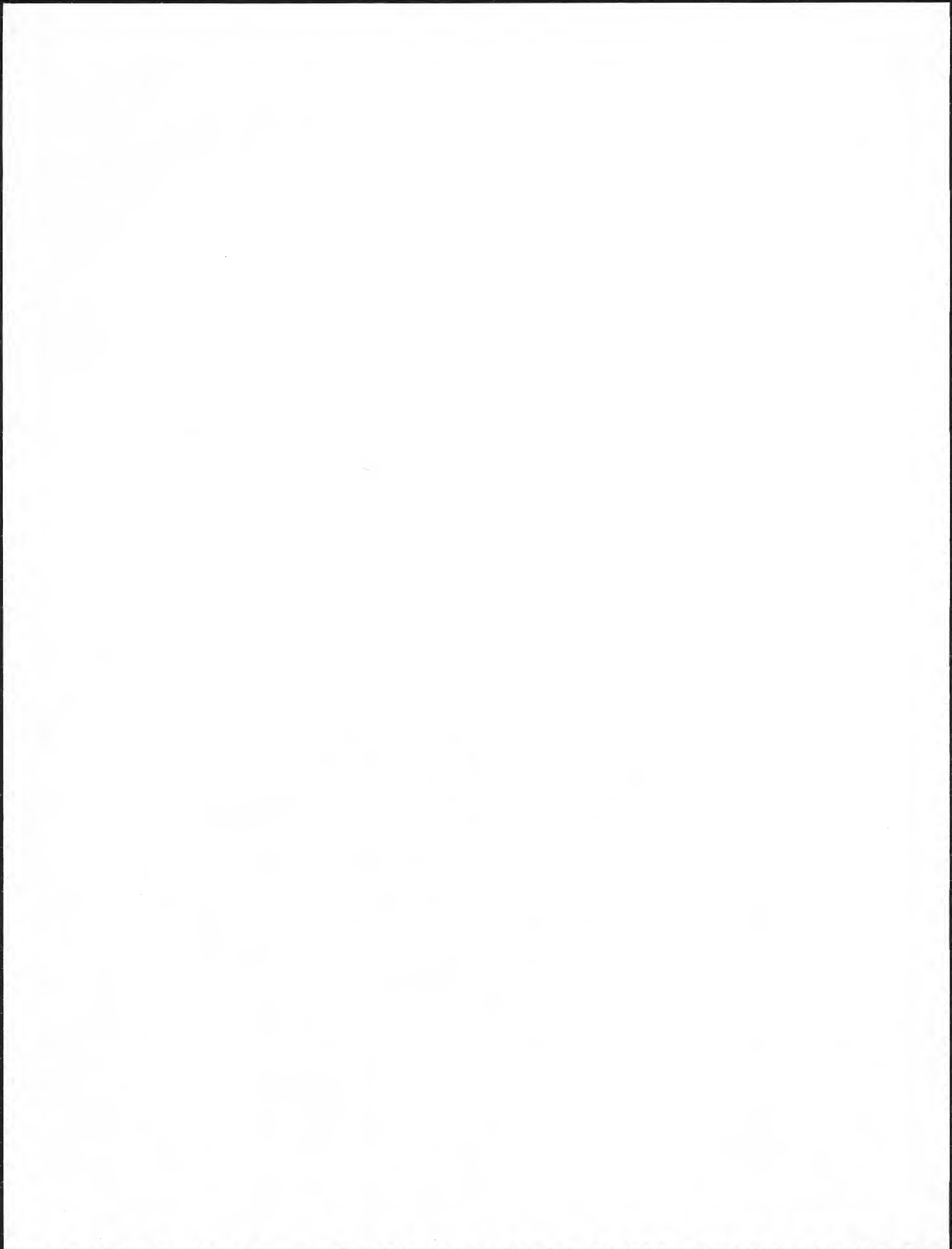
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Sept. 25<sup>26</sup>, 1964  
ØFleet, POBSP)                      None mentioned in field notes.  
(Kridler)                      None mentioned in field notes.

-----  
March 15, 1965  
(Banko, POBSP)                      None mentioned in field notes.  
(Kridler)                      None observed

-----  
Sept. 10-11, 1966  
(Kridler)                      None mentioned in field notes.

-----  
March 10, 1967  
(Hackman, POBSP)                      None mentioned in report or field notes.

-----  
Sept. 15, 1967  
(Kridler)                      None mentioned in field notes.  
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June 17-20, 29, 1923  
(Wetmore)

June 17-19: About 100 pairs nesting in clefts in the rocks.

July 26, 1964  
(Kridler)

In addition, there were another 300 Hawaiian Noddy Tern nests found all containing eggs.

Sept. 25, 1964  
(Fllet, POBSP)

one on egg.

Actual count -----	none made
Total population estimate -----	250

(Kridler) Population estimate of 300-400. 7 nests were found at Northwest Cape and these contained eggs to flying young.

March 15, 1965  
(Banko, POBSP)

Estimated total island population ----- 250  
Breeding -- 7 nests for 20 seen.

(Kridler)

Estimated population of 300. Of ten nests found on Northwest Cape which we checked, 6 contained eggs, and one a small downy chick.

Sept. 10-11, 1966

(Kridler)

We only observed about 20 on the north slope near Ball Cave. There possibly could have been more in the holes in the cliffs on both sides of the island. No eggs or chicks were noted.

March 10, 1967

(Hackman, POBSP)

(Rept) Population estimate: 1000 +, eggs to young . . . (Notes)

This species was confined to the steep slopes where it was impossible to check their breeding status. No eggs or young were observed along the higher ridges and slopes. Population probably exceeds 1,000 birds. On Northwest Cape some birds on eggs and 1 half-grown chick.

Sept. 15, 1967

(Kridler)

Observed approximately 150 in a flock on the extreme end of Northwest Cape. We were not able to find any eggs or nests.



June 17-20, 29, 1923 (Wetmore) June 17-19: Common. Nesting season here father advanced as all young seem to be awing. This species frequents little caves and overhanging ledges and does not come out in the high open slopes. Many seem now to spend the day at sea and return to roost at night. At night fall they are common about camp but few are seen during the day.

June 20 : About 400 pairs.

June 29 : No change

July 26, 1964 (Kridler) I estimated about 200 Blue-gray Noddies in this general area [that of the western hill] some of which were on eggs.

Sept. 25, 1964 (Fleet, POBSP) Total population estimate ----- 450  
eggs to immatures

(Kridler) An estimated population of 500. Breeding phenology eggs to almost full grown young. No nests were counted in the time we had.

March 15, 1965 (Banko, POBSP) Estimated total island estimate ----- 100  
Breeding -- some with eggs

(Kridler) Estimated 100 on the island. In the light of further trips these population estimates are considered to be very low because as many Fairy Terns many of these birds nest in holes in the cliff side. Only one egg was found and two of the birds were banded with band numbers 662-05707 (an adult female which had just laid an egg and was still wet) -- ( the cloaca was red and distended, the brood patch was present). No. 708 had a normal cloaca. However, it too had a brood patch.

Sept. 10-11, 1966 (Kridler) No eggs or young were found. They were sparsely distributed over the cliffs of the island and here again Northwest Cape was the favored place by this species. There was a decided increase of the population during the night.

March 10, 1967 (Hackman, POBSP) (Rept) Population estimate : several thousand - eggs to young.  
(Notes) Only a few eggs and several small chicks were found because this species nested along the cliff walls in inaccessible areas. Couldn't even begin to survey them in six hours. Population probably exceeds 2-3,000 birds. Most chicks downy. 1 chick about 1 week from fledging.

Sept. 15, 1967 (Kridler) Adults: Main island: 135, Northwest Cape: 119. One was found incubating an egg. These figures are considered to be a minimum because some of these birds nest on both the north and south cliffs of the main island which are relatively inaccessible. Hence we were not able to work these areas and obviously there are a number of [these] terns nesting here.

June 17-20, 1923

(Wetmore) June 17-19 : Common on the points of the hills. Young are now almost grown and in many cases have lost a great deal of down on the head and neck. Others have the body covered with full plumage but the head and neck downy. Their wings are still undeveloped. Though the birds sit about as when younger they walk readily now and often stand with wings extended to catch the breeze. Adults are dancing still but not as steadily or regularly as last month. In one male that I skinned I noticed a few new feathers growing on the abdomen. Adults are as attentive to them (the young) as ever and are feeding them regularly. The plumage on the back is beginning to appear worn.

Adults often preen the head of the young, a caress that seems to be greatly enjoyed. The affection of these beautiful birds for their young is remarkable.

The young at times regurgitate large pellets of squid beaks.

June 20, 1923: 600 pairs estimated on the island. There is considerable mortality among the grown young with no particular causes evident. I have seen about 75 nearly grown birds, dead during my stay here.

June 29, 1923: Some of the young birds now have wings almost grown. They stand and wave them in the strong wind occasionally rising a few inches and supporting themselves in the air. I found two or three dead or nearly drowned down near the sea where they had fallen in attempting to fly.

July 26, 1964

(Kridler) [On the top of the western hill] I found one adult Laysan Albatross and five immatures which had not reached flight stage. .... [On the top of Flagpole Hill] I found an additional 11 Laysan Albatrosses. .... Scattered about this hill [Bow Hill] were another 35 immature Laysan Albatross, still not able to fly... On the east side ridge I found another 10 young Laysan Albatross ...

Sept. 25, 1964

(Fleet, POBSP) None mentioned in field notes  
(Kridler) None mentioned in field notes

March 15, 1965

(Banko, POBSP) Estimated Island Total Population ----- 1,650  
Breeding ( 1,100 nestlings, 550 adults, 550 chicks)  
(Kridler) Estimated population of 2,200 on the island with approximately 550 nests. All contained large chicks, 100 of which were banded. No. 767-00201 through 300.

Sept. 10-11, 1966

(Kridler) [None] recorded on the island but we did find one dead Laysan adult.

March 10, 1967

(Hackman, POBSP) (Rept) 600 adults, 200 young. ... (Notes) About 600 birds with 150-200 nestlings to 1/2 grown. These birds were nesting mostly along the ridge but a few were also found on some of the rock shelves down the sides of the cliffs and slopes. No eggs were found.

Sept.15, 1967  
(Kridler)

None mentioned in field notes.

June 18, 1923 : (Ad Larus): Body of one picked up by Grant on small beach.  
(Wetmore, 1923)

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Sept.15,1967 We all saw the mockingbird which flew up behind us on the south slope  
(Kridler) near the ~~base~~ east base of Flagpole Hill (?), before it flew out  
of sight around the rocks. Although we kept watch for it the rest of  
the day, we never saw it again. It was observed at a distance of about 40 yards.  
The autolight ( ) feathers on the long tail, the white wing patches,  
gray coloration, undulating ~~ix~~ flight were all plainly seen and ~~ix~~ distinctive. Several  
years ago Smithsonian personnel and Binion Amerson collected one on Tern Island,  
French Frigate Shoals.

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June 17-20, 29, 1923

(Wetmore)

June 17-19: Abundant, eggs and recently hatched young seen.

June 20 : About 500 pairs. Some have fresh eggs now. The

birds seek small cavities for nesting or several may (Nest?) long beneath a long over hanging ledge 8-20 feet apart. Occasionally both parents are found at the nest. Awkward and clumsy on the ground.

June 29 : Many now are shedding and renewing their rectrices.

July 26, 1964

(Kridler) : There were 10 Red-tailed Tropicbird nests found which contained eggs to almost full grown young.

Sept. 25<sup>26</sup>, 1964

(Fleet, POBSP)

Actual count ----- immatures ----- 25

Adults ----- 15

Aerial count at 1400 hours .

Total population estimate -----125

Banded ----- 21

Red-tailed Tropicbird threw up deep water (mullet?) fish 8 " long with head digested. 2" deep and 1 " wide.

(Kridler) --getting good estimates of these birds is rather difficult because they can be found nesting in the holes on the aides of the inaccessible cliffs, but we did record 25 immatures in their nests as well as 15 adults flying. A couple of nests contained eggs.

March 15, 1965

(Banko, POBSP)

None mentioned in report.

(Kridler)

None observed at any time. Last September we found birds nesting

on this island.

Sept. 10-11, 1966

(Kridler)

Estimated at 100+ were using the island. 60 large young were found.

One adult was found incubating an egg. There were 12 young also found about half-way up the north cliff in the valley between Bow and Summit Hills. Undoubtedly there were many more young on the island.

March 10, 1967

(Hackman, POBSP)

(Rept) Population estimate: 15+ adults courting. (Notes) Saw only

10 -15 birds in the air during the 6 hour visit. No nests or

birds on the ground were observed by the party. These may have been well down the steep slopes where none of us ventured.

Sept. 15, 1967

(Kridler)

Not mentioned in field notes.

June 17-20, 29, 1923  
(Wetmore) Not mentioned in field notes.

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July 26, 1964  
(Kridler) Not mentioned in field notes.

---

September 25, 1964  
(Fleet, POBSP) Not mentioned in report.  
(Kridler) Not mentioned in field notes.

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March 15, 1965  
(Banko, POBSP) Estimated total island population ----- 10  
1 found dead; none seen alive  
(Kridler) One adult was found which was estimated to have been dead  
about a week.

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Sept. 10-11, 1966  
(Kridler) None mentioned in field notes.

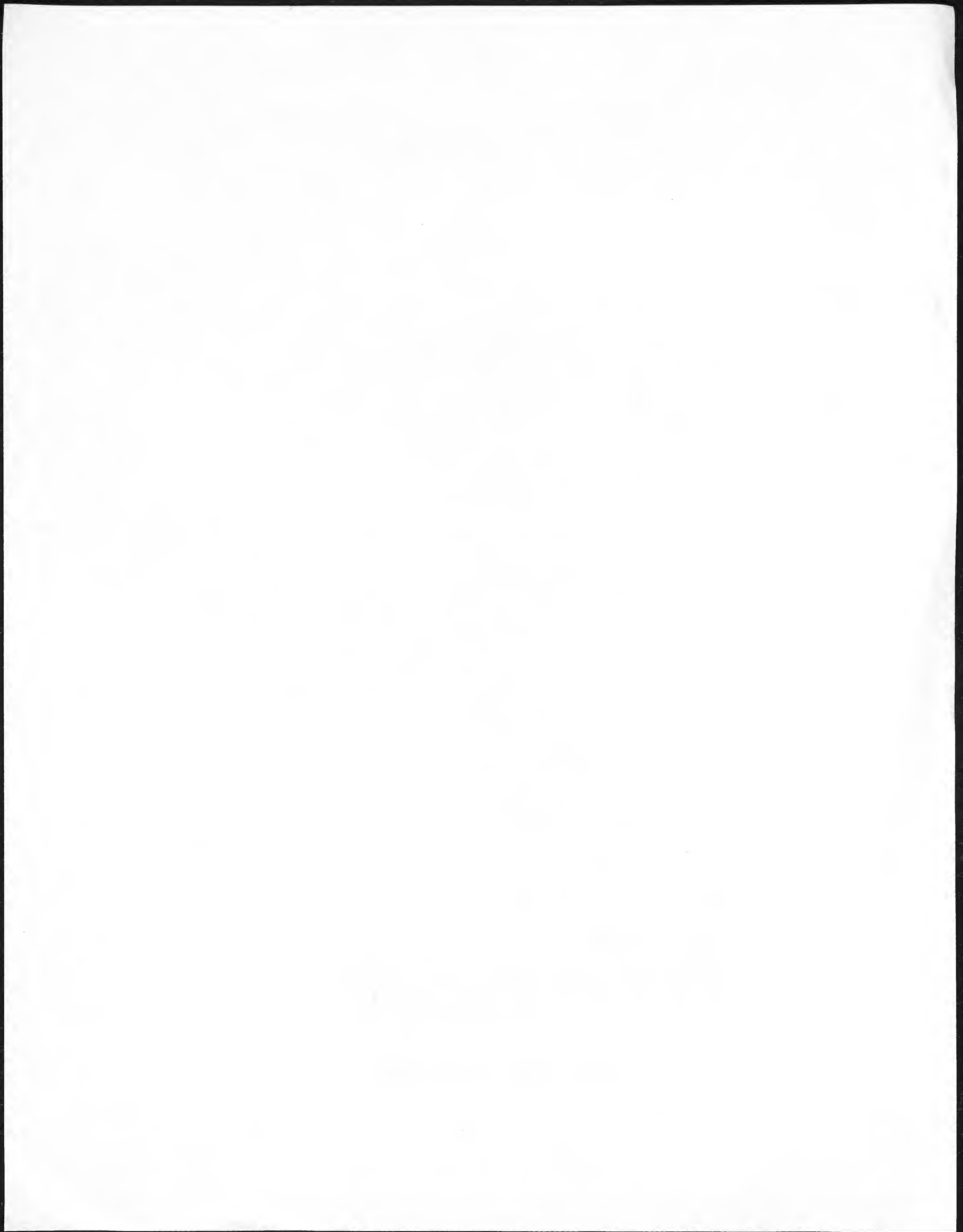
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March 10, 1967  
(Hackman, POBSP) (Rept) None mentioned (Notes) None mentioned

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Sept. 15, 1967  
(Kridler) None mentioned in field notes.

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Two species of terrestrial reptiles occur on Enderbury and no other species have ever been recorded as occurring on the island.

Sea turtles from about 20 pounds to adult size have frequently been seen feeding in shallow water over the reef, particularly on the east side. Turtles were found on the beach on several occasions and three dead turtles were found in the interior of the island. The tracks, left by the turtles before they died, seemed to indicate that they had become lost and had been unable to return to the sea. One of them had wandered at least a mile through the interior of the island, for much of the way over sharp coral rubble.

Snake-eyed Skink (Cryptoblepharus poecidopleurus)

Current Status: Abundant

Population: This species was common on most parts of the island but was never found in the areas of coral rubble at the north end. When Bryan visited the island in March 1924 he found "numerous" lizards, presumably this species. A large number of specimens have been collected by POBSP personnel and deposited at the Smithsonian Institution.

This species is strictly diurnal while the gekko, <sup>although</sup> mainly nocturnal, is found hunting for food during the day inside the buildings.

Mourning Gekko (Lepidodactylus lugubris)

Current Status: Common

Population: Although found most frequently around the buildings gekkos are probably equally common in other areas but are less easily observed. Over 30 specimens have been deposited with the Smithsonian Institution by POBSP personnel.

POBSP has recorded 22 species from the island of which five species (~~Christmas Island Shearwater~~, Ruddy Turnstone, Wandering Tattler, Sanderling and Crested Tern) are new records for the island. One additional species (Phoenix Island Petrel) is recorded in the literature. Fourteen of the species have ~~been~~ been recorded as breeding but ~~three~~ <sup>two</sup> of these (Audubon's Shearwater, Phoenix Island Petrel<sup>e</sup>, and Fairy Tern) don't breed at present.

The island is inhabited by large numbers of birds but only one of the five common species is medium or small sized. Several thousand Blue-faced Boobies, Red-footed Boobies, and Great Frigatebirds inhabit the island year around <sup>periodically</sup> and <sup>^</sup>Lesser Frigatebirds and Sooty Terns visit\* the island in great numbers to breed.

The various expeditions which have visited the island are listed below and a ~~brief~~ brief summary of their contributions to our knowledge of the avifauna is given.

← Wilkes (1840) U.S. Exploring Expedition.

← Beck (1924):

← Schultz (1939):

← Munroe (1938-1941):

1963 POBSP <sup>Trip<sup>s</sup></sup> ~~1, 2, 3, 4, 5, 6, 7,~~ : July and November

1964 " " February, July and October

Enderbury Island

D R A F T 3/4/65

Specimens

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Wedge-tailed Shearwater

Puffinus pacificus

D

USNM 358142

L. P. Schultz

May 20, 1939

## FLORA AND VEGETATION OF NECKER ISLAND

by Derral Herbst

Department of Botany, University of Hawaii

Necker Island, a small island of about 17 hectares, is located at 23° 34' N. lat., 164° 42' W. long. (1). It is a narrow, volcanic ridge with steep sides and a gently rounded top. The crest is divided into five moderately sloped hills, the highest at 92 meters. The western end is separated from the main part of the island by a deeply cut divide less than a meter above the sea. The soil is coarse and gravelly and confined to benches or terraces formed by the differential erosion of less resistant lava. The rainfall was estimated by Palmer (14) at between 20 and 25 inches annually. Complete descriptions of the island and its history are found in Palmer (14), Bryan (1), and King (9).

Although numerous parties have stopped at the island, their visits were brief and few botanical collections were made. Archaeological sites and artifacts indicate that in some remote period Polynesians had frequented the island, perhaps using it as a religious sanctuary. However, at the time of its discovery by La Perouse in 1786, Necker was unknown to the Hawaiians, and there was no reference to it in their tradition (4). Although unable to land because of heavy seas, the discoverer made this observation: "It does not exhibit a single tree, but there is a great deal of grass near the summit" (11). Both Captain John Paty (15) and the annexation party (8) also noted the presence of the "...patches of coarse grass." Fisher (5) of the Albatross Expedition gives a slightly more detailed description of the vegetation:

"The wider shelves of the island are sparsely covered with a flesh-stemmed, yellow-flowered portulaca (Portulaca lutea), and the summit is rather plentifully grown over with Chenopodium sandwicheum bushes, on which large colonies of Sula piscator and Fregata aquila were nesting at the time of our visit." Elschner (3) briefly mentions the vegetation as being "slight...and this...is found in higher, more flat parts of the island while the lower parts of the vertical walls and the shore rocks are bare." While he alludes to plant collections made--"my time being limited I was unable to gather many plants on this island"--the disposition of the specimens is unknown. The first comprehensive botanical collections were made by Caum in 1923 and Christophersen in 1924 during the "C" and "E" trips, respectively, of the Tanager Expedition (6,7). Their publication (2) concurs with all earlier observations in that the vegetation of Necker is described as sparse and inconspicuous.

C. S. Judd, a forester, sowed seed of the following species of plants in the saddle between Flagpole and Summit Hills during the 1923 expedition: Haematoxylum campechianum L., Thespesia populnea Sol., Casuarina equisetifolia L., Pritchardia pacifica Seem. & Wendl., Pritchardia sp., Livistonia australis Mort., and Lycopersicum esculentum Miller (2). Fortunately, none grew.

Later collections were by Eugene Kridler in July, and Charles Long and J. W. Beardsley in September, 1964.

Through the courtesy of Eugene Kridler, manager of the refuge, and the Coast Guard, I was able to visit Necker Island on August 28-29, 1968.

In comparing past accounts of the vegetation, it appears that the composition has remained fairly constant over the years. Probably, differences can be attributed to the amount of rainfall previous to the visit. The vegetation cover was sparse in August, 1968; at no place were there dense stands of any species. Plants were restricted primarily to the top of the island, with some intermittently distributed on the natural terraces lower on the side. There were five species of vascular plants:

Panicum torridum. As would be expected, the amount and distribution of this annual grass have varied more than those of the other four phanerogams. Christophersen and Caum (2) report that it was fairly common on the north side of the main island in 1923, but one year later only two clumps were seen. In 1962 (10) small tufts were found everywhere on the island's crest, while in 1968 the grass was found in moderate numbers only, and these primarily on Bowl Hill. The short growing period, the rapid wearing of dead tufts by the sea birds and the ease by which the wind can disperse the densely vested spikelets can explain the varied distribution patterns.

Chenopodium oahuense. Since 1923, at least, it has been the most common plant on Necker. Christophersen and Caum list it as being "abundant on the sloping sides, but rare on the flat top." In 1968 Chenopodium formed an almost pure stand in the saddle between Flagpole and Summit Hills; it was abundant on the portion east of this region, but somewhat less common on the tops of the hills than on the sloping sides and the saddle between them. It occurred in small amounts on the top of Flagpole Hill and was rare on both Annexation Hill and Northwest Cape.

Sesuvium portulacastrum. The Tanager Expedition members found this species growing within reach of the spray on the southern slopes of Annexation Hill. Although I noticed one or two isolated plants on the northeast side of Annexation Hill, near the top, the population--a sparse one--was limited primarily to the southern slope of the saddle between this and Flagpole Hill.

Portulaca lutea. As on previous reports, Portulaca was common on the flat tops and ledges of the cliffs. Except for a rare Chenopodium shrub, it was the only plant growing on Northwest Cape--in cracks and in shallow pockets of soil. Some plants on the summit of Flagpole Hill appeared intermediate between P. lutea and P. oleracea. Long (12) cites a white form found by J. W. Beardsley; although I searched the same area, I was unable to find another; the disposition of the original collection is unknown.

Sesbania tomentosa. Christophersen and Caum observed a few plants along the top of the main part of the island. Kramer (10) concurs and adds that it "seems to be holding its own quite well." I found this shrub on the tops of all of the hills, except the Northwest Cape, and consider it more common than previous authors indicate.

The following list comprises all known specimens of vascular plants collected from Necker Island. Three species--Panicum torridum, Chenopodium oahuense and Sesbania tomentosa--are endemic to Hawaii, while the other two are widespread throughout the Pacific Islands. Lists of lichens from this island may be found in Magnussen (13); Tsuda (16) lists marine algae.

Specimens of the following are deposited in the B. P. Bishop Museum Herbarium (BISH), the Herbarium of the University of Hawaii (HAW) or the U.S. National Herbarium (USNH).

Gramineae

Panicum torridum Gaud.

Caum 56 (BISH), Christophersen 10 (BISH), Kridler 3 (HAW), Long 2445, 2450, 2455 (HAW).

Chenopodiaceae

Chenopodium oahuense (Meyen) Aellen

C. sandwicheum Moq. f. microsperma Aellen  
Snyder (Albatross Expedition, see Fisher (5), Caum 58 (BISH), Christophersen 14 (BISH), Kridler 2, 5 (HAW), Long 2447, 2452, 2454, 2458 (HAW).

Aizoaceae

Sesuvium portulacastrum L.

Caum 93 (BISH), Christophersen 12 (BISH), Long 2456 (HAW).

Portulacaceae

Portulaca lutea Sol.

Gilbert (Albatross Expedition, USNH 594972) (USNH), Caum 59 (BISH), Christophersen 13 (BISH), Kridler 4 (HAW), Long 2457 (HAW).

Leguminosae

Sesbania tomentosa H. & A.

Gilbert (USNH 594974) (USNH), Caum 57 (BISH), Christophersen 11 (BISH), Kridler 1 (HAW), Long 2449, 2451, 2453, 2460 (HAW).



## ACKNOWLEDGEMENT

I wish to express my appreciation to Dr. C. H. Lamoureux of the Botany Department, University of Hawaii, for his review of the manuscript.

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LAYOUT of Map for Necker Island Expand Map in Palmer ~~1927~~ (1927) so that it fills most of a 8x10 or whatever sized sheet is.

~~Reduce size below~~ Same size as attached on it don't include anything but contour intervals, numbers for contour intervals, and scale + north south line. To this will be added legends some what like below

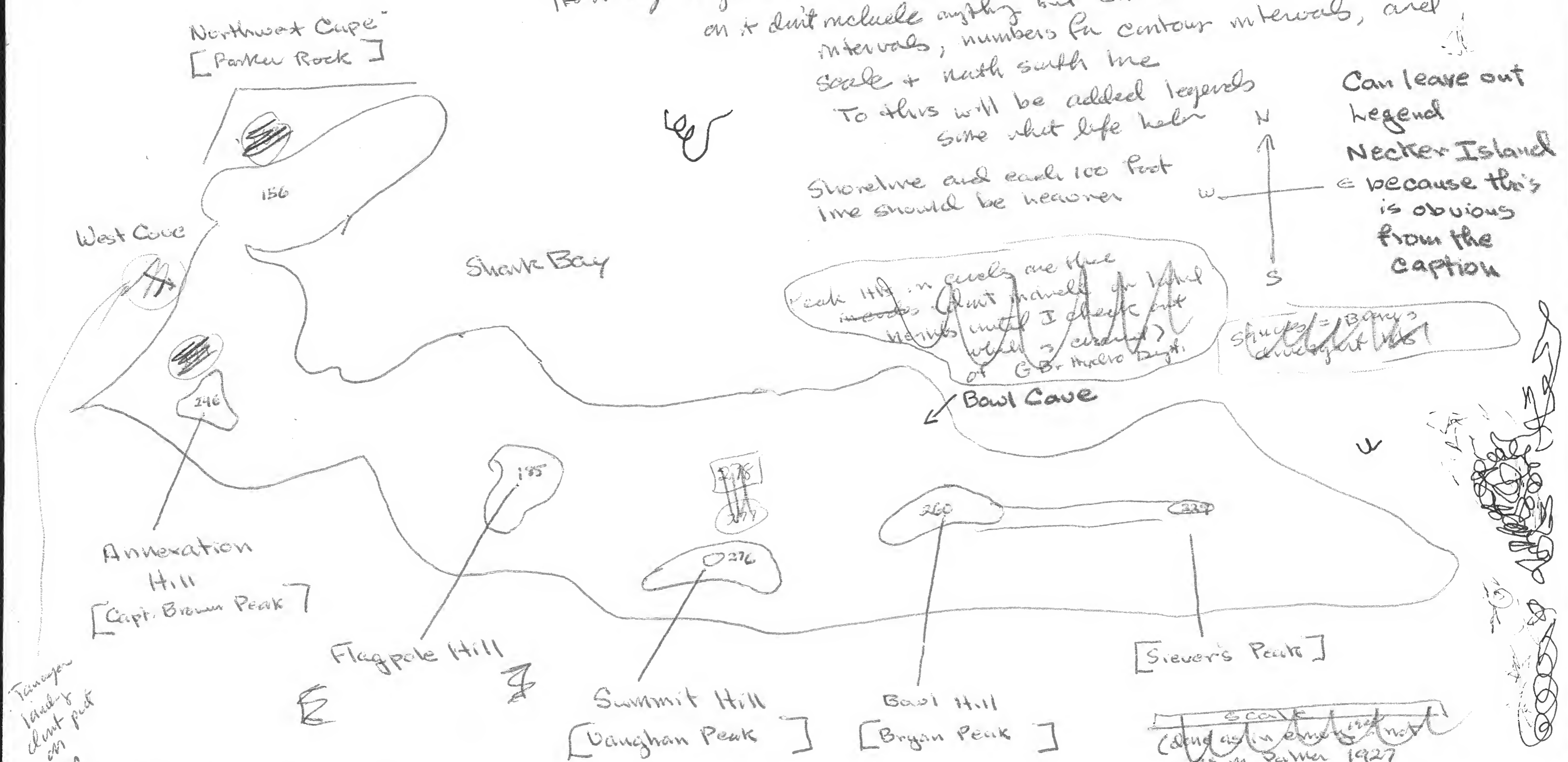
Shoreline and each 100 foot line should be heavier

Can leave out legend Necker Island because this is obvious from the caption



Peak 148 in circles are the islands. (Don't include in label numbers until I check out what is correct) of G.B. MacLeod Dept.

Shades = Bryan's development



Tanager Island don't put on map

Necker- Island

(After Judah in ~~1927~~ Palmer, 1927) and Elschner (1915). Names in parentheses are those used by Elschner; others are those used by Tanager Expedition and subsequent U.S. tars.

Smaller they - however it was done on Bryans

names spaced however will look best

Scale (done as in Palmer 1927)

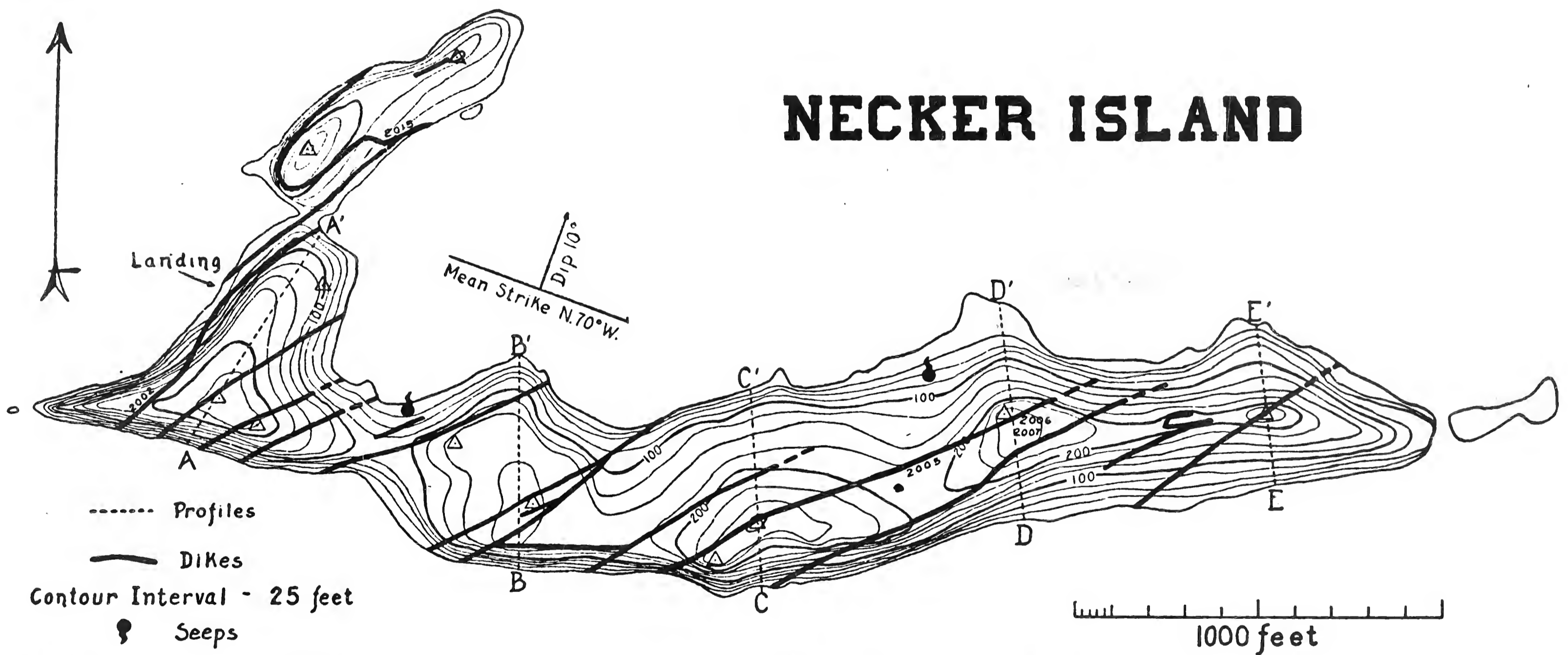
Contour interval: 25 feet

put Elevations in small figures at tops of peaks & on NW cape

Omit geological lines Utilize 50 foot contour level but only label hundreds



# NECKER ISLAND



The three species of reptiles found on Enderbury by the Pacific Program are all forms which occur on most of the Central Pacific islands, and their occurrence on this island is not surprising. None of the three species have been formally reported and identified in the zoological literature.

~~Green Turtle (Chelonia mydas)~~

Current Status: Periodically common, breeding in small numbers.

Prior Records: Stewart (1945) stated: "The large sea turtle is found on the beaches..." and probably referred to the above-listed

species.

Comments:

Turtles, presumably the above species, were seen on Enderbury a number of times by Pacific Program personnel. They ~~seem~~ to occur most abundantly on the windward (east) side of Enderbury, about 10 having been seen ~~of~~ feeding offshore on July 15, 1964 and a group of four having been seen on February 13, 1965 feeding in the same area.

On both occasions the turtles were feeding on floating bits of vegetation, a grass like plant, which is found on the reef off the east shore. The group of ten turtles varied considerably in size. The ~~to~~ smallest had a shell about one foot in diameter while the largest was about four feet across.

We have seen turtles or found their remains on several other occasions. A turtle, weighing perhaps 300 lbs, was seen walking along the beach on November 16, 1963 and tracks of three others were found. On February 12, 1965, three were seen swimming in the surf off the west side of the island near the house, and two more were seen at the beach later that day.

In addition, ~~a number of skeletons were found.~~ Pacific Program personnel found a number of turtle remains.

One skull, collected July 14, 1963, was <sup>later</sup> identified as Chelonia mydas by Dr. Don's Cochran. On November 10, 1964 3 turtle skeletons and the body of a ~~new~~ recently hatched turtle were found depressions covered with Sesuvium in the heaps of coral rubble at the north end of the island.

Two fresh nest excavations were found on the beach February 13~~th~~, 1965, and ~~old turtle eggs were found beneath~~ <sup>and</sup> many were observed ~~at the~~ in sandy areas along the west shore in July 1964. In May 1965 ~~some~~ 10 to 20 nest excavations were present along the east shore of the island.

(Continued on lower sheet)

POBSP Specimens: <sup>USNM</sup> Nov. 20, 1963; 158668 - 158687 (20 specimens); Nov. 12, 1964  
USNM 157694 - 157705 (12 specimens.)

Snake-eyed Skink (Cryptoblepharus boutan.)

Current status: Common

Prior records: In July, 1938 when W.R. Donagho visited Enderbury he noted that he had seen "lizards and skink" probably indicating that Cryptoblepharus was present on the island. (Donagho, 1952)

Comments: This species has been present on each visit to Enderbury and has been common at each visit.

POBSP Specimens: Nov. 20, 1963; USNM 158688 - 158699 (12 specimens); Nov. 12, 1964  
USNM 157706 - 157727 (22 specimens.)



Phoenix Island Petrel <u>Pterodroma alba</u>	♀	USNM 358139	L. P. Schultz	May 19, 1939
Red-tailed Tropicbird <u>Phaethon rubricauda</u>	♂	USNM 189417	L. P. Schultz	May 13, 1939
Blue-faced Booby <u>Sula dactylatra</u>	♂	skelton uncatalogued		
Brown Booby <u>Sula leucogaster</u>	?	USNM 15630	Peale	US Expi. Expedition 1847
Red-footed Booby <u>Sula sula</u>	♀	USNM 40639		
	♀	USNM 40640		
Great Frigatebird <u>Fregata minor</u>	♂	USNM 493921		
	♂	USNM 493922		

Specimens

<u>Lesser Frigatebird</u> <u>Fregata ariel</u>	♂	USNM 358132	L. P. Schultz	May 15, 1939
<u>Golden Plover</u> <u>Pluvialis dominica</u>	♂	USNM 358156	L. P. Schultz	May 16, 1939
<u>Sharp-tailed Sandpiper</u> <u>Erolia acuminata</u>	♂	AMNH 205919	R. H. Beck	March 19, 1924
	♂	USNM 493238		
	♂	USNM 493476		
<u>Gray-backed Tern</u> <u>Sterna lunata</u>	♀	USNM 358150	L. P. Schultz	May 19, 1939
<u>Sooty Tern</u> <u>Sterna fuscata</u>	♂	USNM 40390		
	♂	USNM 40391		
	♂	USNM 40636		
	♂	AMNH 205686	R. H. Beck	March 19, 1924
	♂	AMNH 205885	R. H. Beck	March 19, 1924
	♂	USNM 358142	L. P. Schultz	May 17, 1939
	♀	AMNH 205688	R. H. Beck	March 18, 1924
	♀	AMNH 205689	R. H. Beck	March 18, 1924
	♀	USNM 493262		
	♀	USNM 493742		
	♀	USNM 493743		
	♀	USNM uncatalogued		
<u>Blue-gray Noddy</u> <u>Procelsterna cerulea</u>	♀	USNM 493287		

Specimens

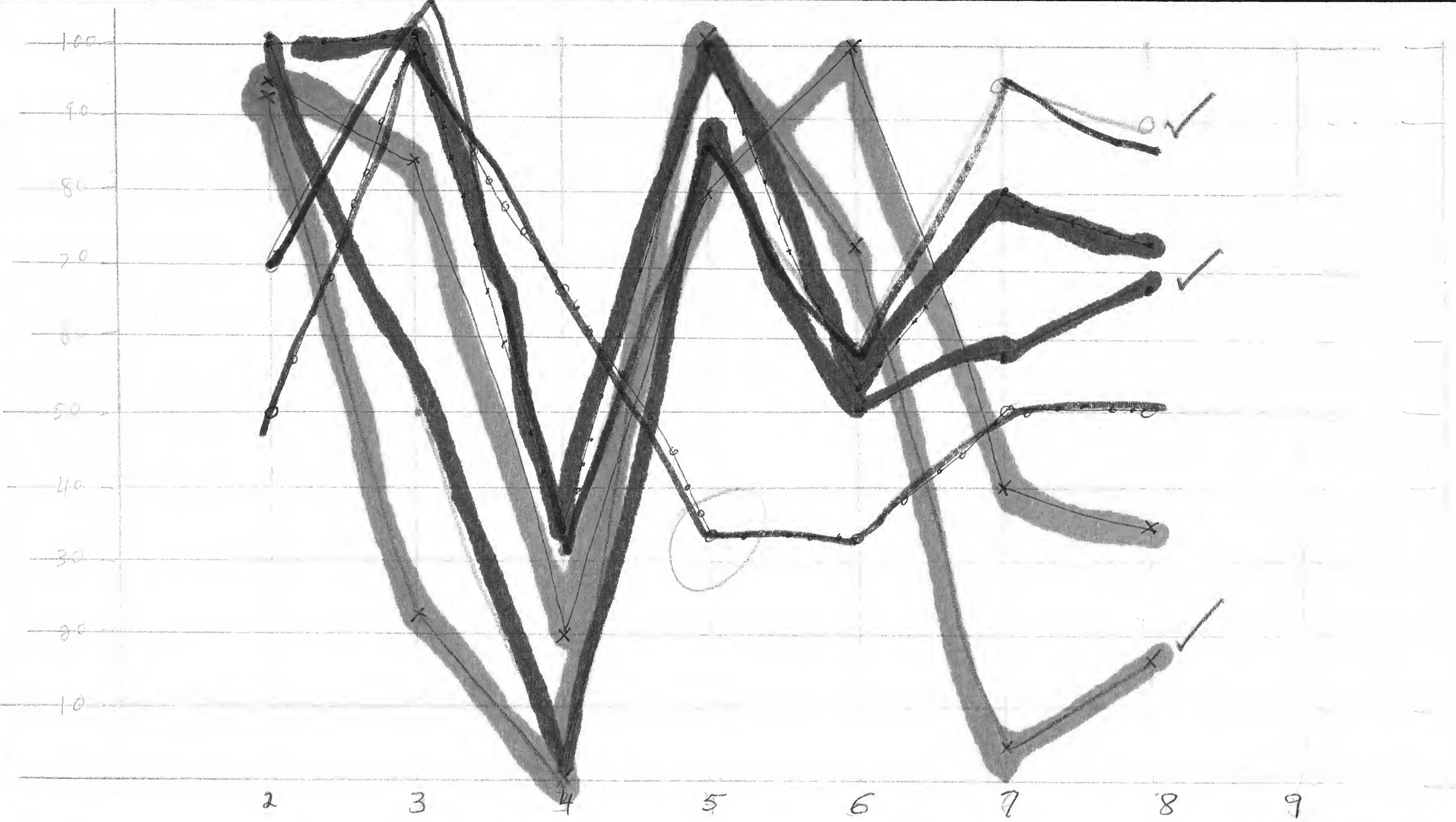
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	♀	AMNH 205564	R. H. Beck	March 19, 1924
	♀	AMNH 205565	R. H. Beck	March 19, 1924
	♀	AMNH 205568	R. H. Beck	March 19, 1924
	♀	AMNH 205571	R. H. Beck	March 19, 1924
	♀	AMNH 205572	R. H. Beck	March 19, 1924
	♀	AMNH 205894	R. H. Beck	March 19, 1924
	♀	MCZ 236970	R. H. Beck	March 19, 1924
	♀	MCZ 236971	R. H. Beck	March 19, 1924
	♀	USNM 358141	L. P. Schultz	May 18, 1939
<u>Phoenix Island Petrel</u> <u>Pterodroma alba</u>	♀	USNM 358139	L. P. Schultz	May 19, 1939
<u>Red-tailed Tropicbird</u> <u>Phaethon rubricauda</u>	♂	USNM 189417	L. P. Schultz	May 13, 1939
<u>Blue-faced Booby</u> <u>Sula dactylatra</u>	♂	skelton uncatalogued		
<u>Brown Booby</u> <u>Sula leucogaster</u>	?	USNM 15630	Peale	US Expl. Expedition 1847
<u>Red-footed Booby</u> <u>Sula sula</u>	♀	USNM 40639		
	♀	USNM 40640		
<u>Great Frigatebird</u> <u>Fregata minor</u>	♂	USNM 493921		
	♂	USNM 493922		

## Pacific Ocean Biological Survey Program Trips to Enderbury

	<u>Date</u>	<u>Personnel</u>
SIC 2	July 11-16, 1963	Fred Sibley (Leader), Peter Marshall, Mike Trevor
SIC 3	November 16-20, 1963	Fred Sibley (Leader), Roger Clapp (Assistant Leader), David Bratley, Lawrence Huber.
SIC 4	February 27 - March 2, 1964	Fred Sibley (Leader), Roger Clapp (Assistant Leader), Douglas Hackman, Lawrence Huber, Raymond Jillson
SIC 5	July 14-17, 1964	Fred Sibley (Leader), Douglas Hackman (Assistant Leader), Lawrence Huber, Peter Marshall, Douglas Gill, Robert Long (Botanist).
SIC 6	November 9-12, 1964	Fred Sibley (Leader), Douglas Hackman (Assistant Leader), Alan Anderson, Richard Merrill, Paul Woodward, Robert Long (Botanist).
SIC 7	February 12-16, 1965	Max Thompson (Leader), Douglas Hackman (Assistant leader), Lawrence Huber, Paul Woodward, Richard Merrill, Ralph Kirkpatrick.
SIC 8	May 30- June 1, 1965	Fred Sibley (Leader), Robert Fleet (Assistant Leader), Lawrence Huber, Dennis Stadel, Robert Standen, Robert Long (Botanist).

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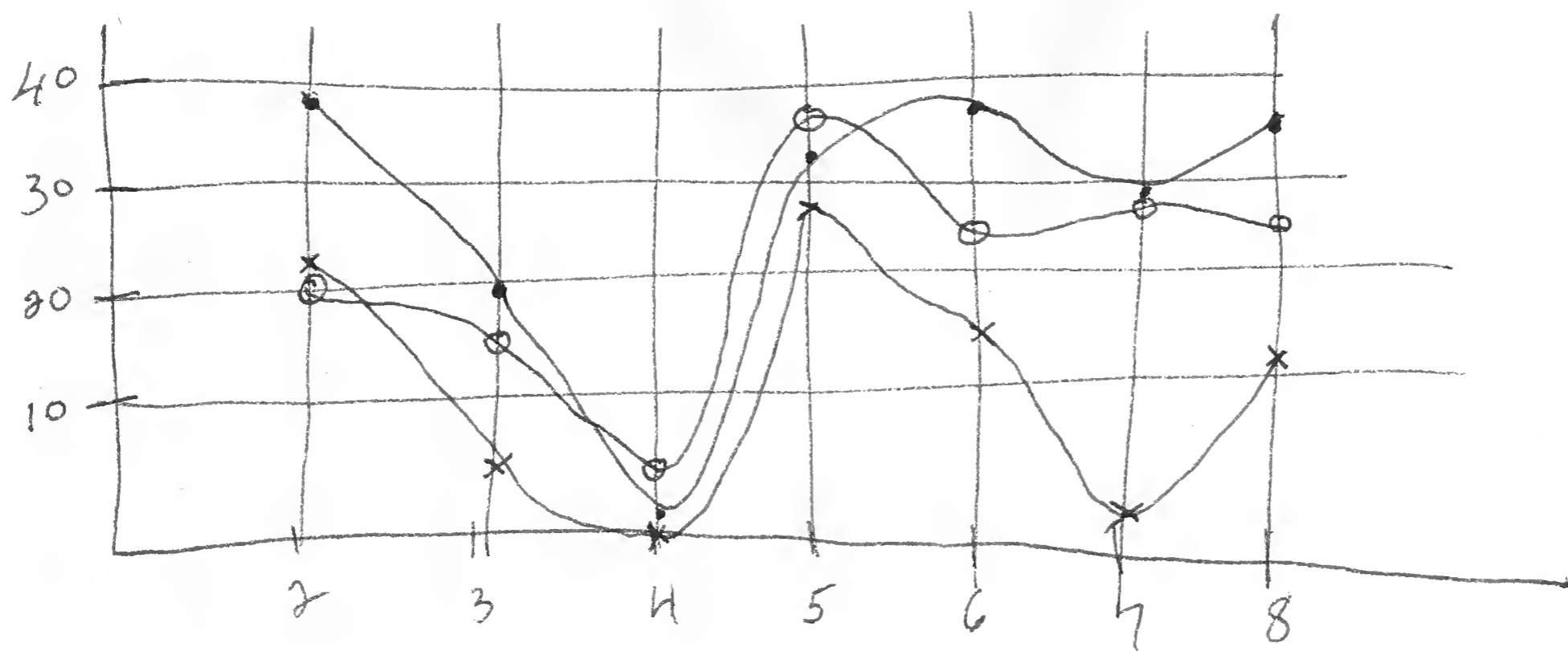
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X 93.4	X 23.8	X 00.0	X 100.0	X 73.3	X 04.2	X 17.5	X
O 50.0	O 106.0	O 66.7	O 33.3	O 33.3	O 50.0	O 50.0	O
O 69.8	O 100.0	O 30.2	O 86.0	O 58.1	O 95.3	O 90.7	O
• 100.0	• 100.0	• 33.3	• 100.0	• 53.3	• 80.0	• 73	•
• 106.0	• 51.7	• 00.0	• 87.7	• 50.7	• 58.2	• 67.8	•

Table \_\_\_\_\_ Nesting cycles of the three boobies on Enderbury Island

Date	○ Brown Booby % of pop. breeding <sup>x<sub>2</sub></sup>	x Blue-faced Booby % etc.	• Red-footed Booby % etc.
July, 63	20.0	20.8	38.4 %
Nov. 63	14.3 ←	05.9 ←	19.9 % ←
Feb. 64	06.5 ←	00.0 ←	00.0 ←
July 64	37.0 →	26.5 →	33.7 % →
Nov. 64	25.0 ←	15.6 ←	36.5 % →
Feb. 65	27.3 →	02.2 ←	27.9 % ←
May 65	26.0 ←	10.6 →	35.5 % →



Specimens

Wedge-tailed Shearwater	'	'	'	'
<u>Puffinus pacificus</u>	'	D	USNM 358142	L. P. Schultz
	'	'	'	May 20, 1939
Audubon's Shearwater	'	'	'	'
<u>Puffinus lherminieri</u>	'	♂	PM 39239	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	PM 39240	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205531	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205532	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205536	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205541	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205542	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205543	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205544	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205546	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205547	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205548	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205549	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	AMNH 205550	R. H. Beck
	'	'	'	March 19, 1924
	'	♂	MCZ 236969	R. H. Beck
	'	'	'	March 19, 1924
	'	♀	AMNH 205540	R. H. Beck
	'	'	'	March 19, 1924
	'	♀	AMNH 205554	R. H. Beck
	'	'	'	March 19, 1924
	'	♀	AMNH 205553	R. H. Beck
	'	'	'	March 19, 1924
	'	♀	AMNH 205555	R. H. Beck
	'	'	'	March 19, 1924
	'	♀	AMNH 205556	R. H. Beck
	'	'	'	March 19, 1924

Specimens

	♀	AMNH 205557	R. H. Beck	March 19, 1924
	♀	AMNH 205559	R. H. Beck	March 19, 1924
	♀	AMNH 205562	R. H. Beck	March 19, 1924
	♀	AMNH 205564	R. H. Beck	March 19, 1924
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<u>Blue-faced Booby</u> <u>Sula dactylatra</u>	♂	skeleton uncatalogued		
<u>Brown Booby</u> <u>Sula leucogaster</u>	?	USNM 15630	Peale	US Expl. Expedition 1847
<u>Red-footed Booby</u> <u>Sula sula</u>	♀	USNM 40639		
	♀	USNM 40640		
<u>Great Frigatebird</u> <u>Fregata minor</u>	♂	USNM 493921		
	♂	USNM 493922		



UNITED STATES GOVERNMENT

# Memorandum

TO : Dr. Philip S. Humphrey  
Division of Birds

DATE: August 3, 1966

FROM : David M. Damkaer *D.M. Damkaer*  
Smithsonian Oceanographic  
Sorting Center

SUBJECT: Completion of bird-stomach contents sorting for POBSP 9

The Sorting Center has finished sorting the stomach contents of samples from the second half of the Pacific Ocean Biological Survey Program (POBSP) 9 (257 birds, SOSC Reference No. 211).

Enclosed are Xerox copies of the original summary sheets, which were compiled from the working cards. Copies of the cards are also enclosed.

Enclosures



Mammals

## Enderby - Draft

Stewart (1945) - 468 p. 59 - Polynesian rats found.

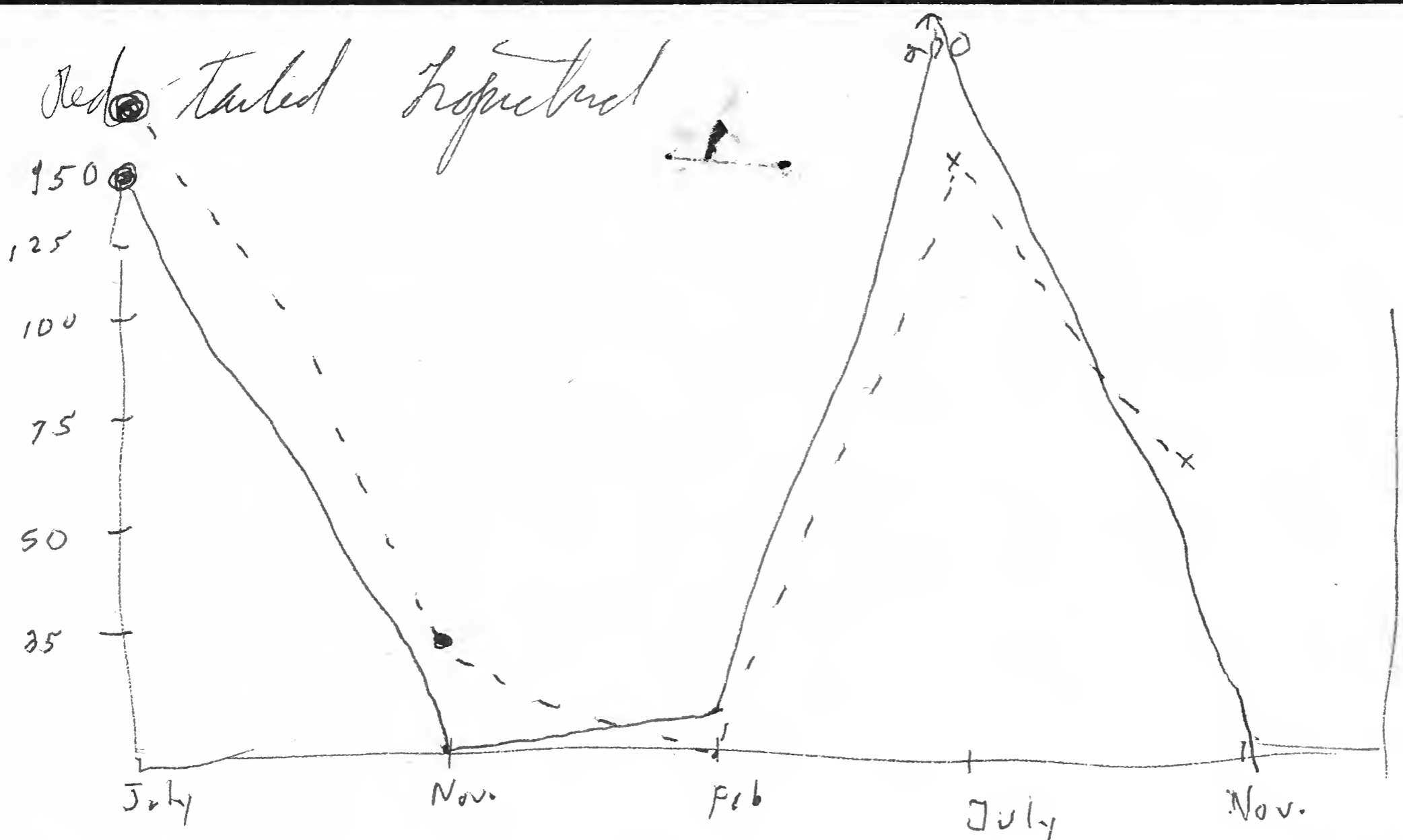
Donaghoo (1952) - 785 p. 43 - dead rat found - two

[1938] also seen raising into holes.

Wilkes (1840) 582 p. 371 - rats here - nest built  
in tussocks of grass about 18 inches or two feet high.

Cato - Selby

Red-tailed Tropicbird

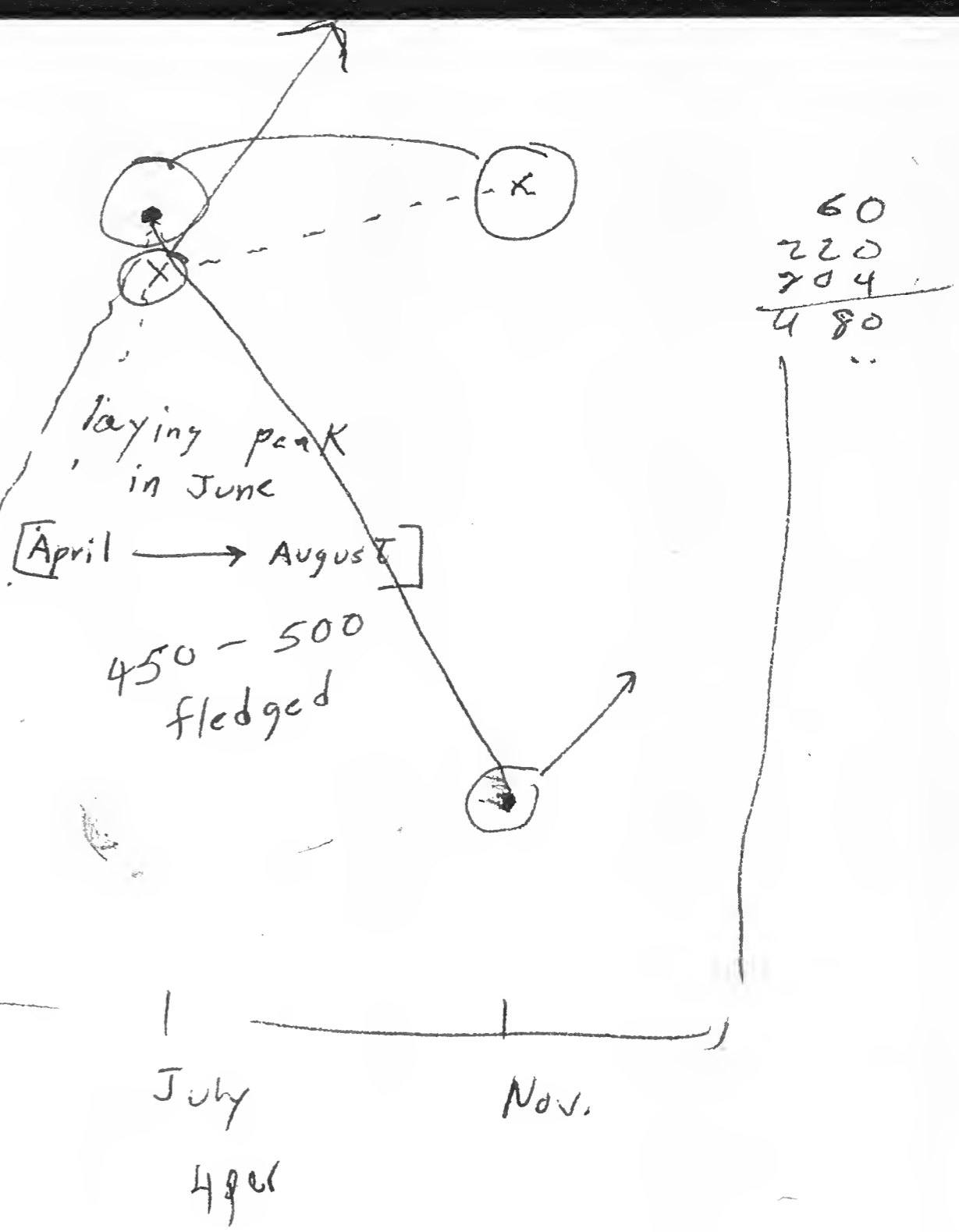
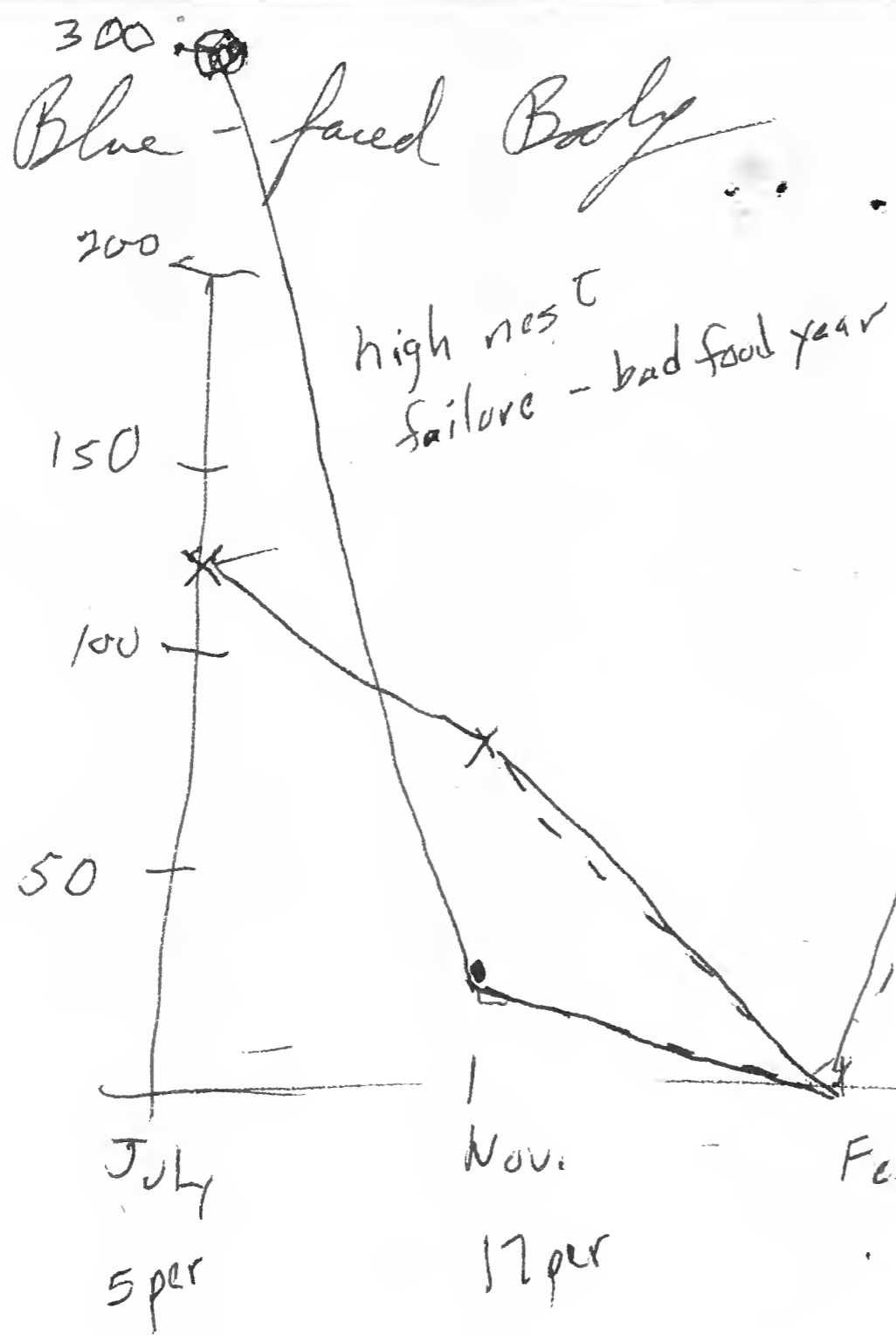


--- 1992  
 — 1991

Trace back to last egg date

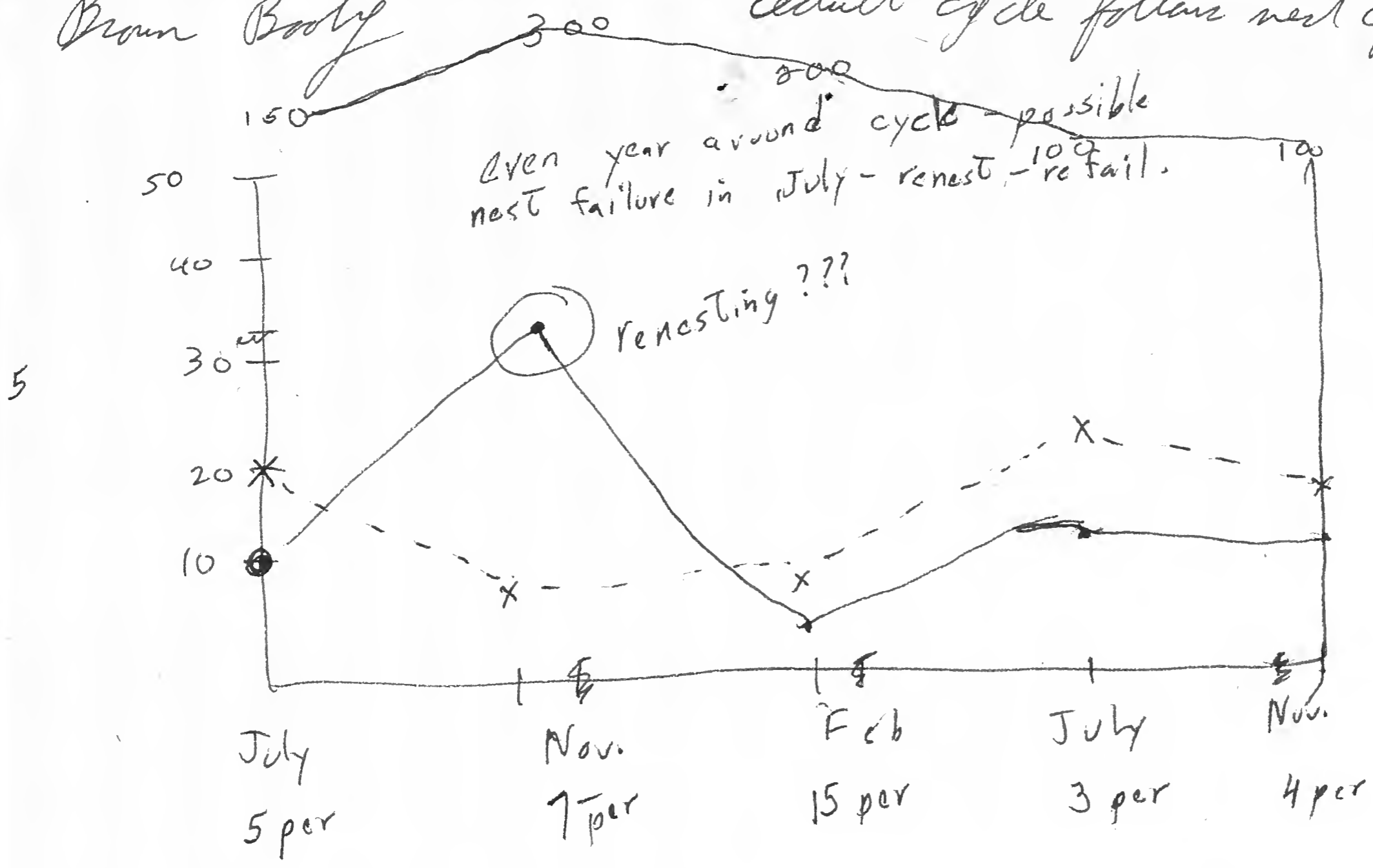
Egg laying starts in February and by October all the eggs have hatched. The peak number of active nests is in July with 400-500 nests with eggs or young being present. In 1964 an estimated 500 young fledged.

270  
 166  
 436



Brown Booby

adult cycle follows next cycle



July  
5 per

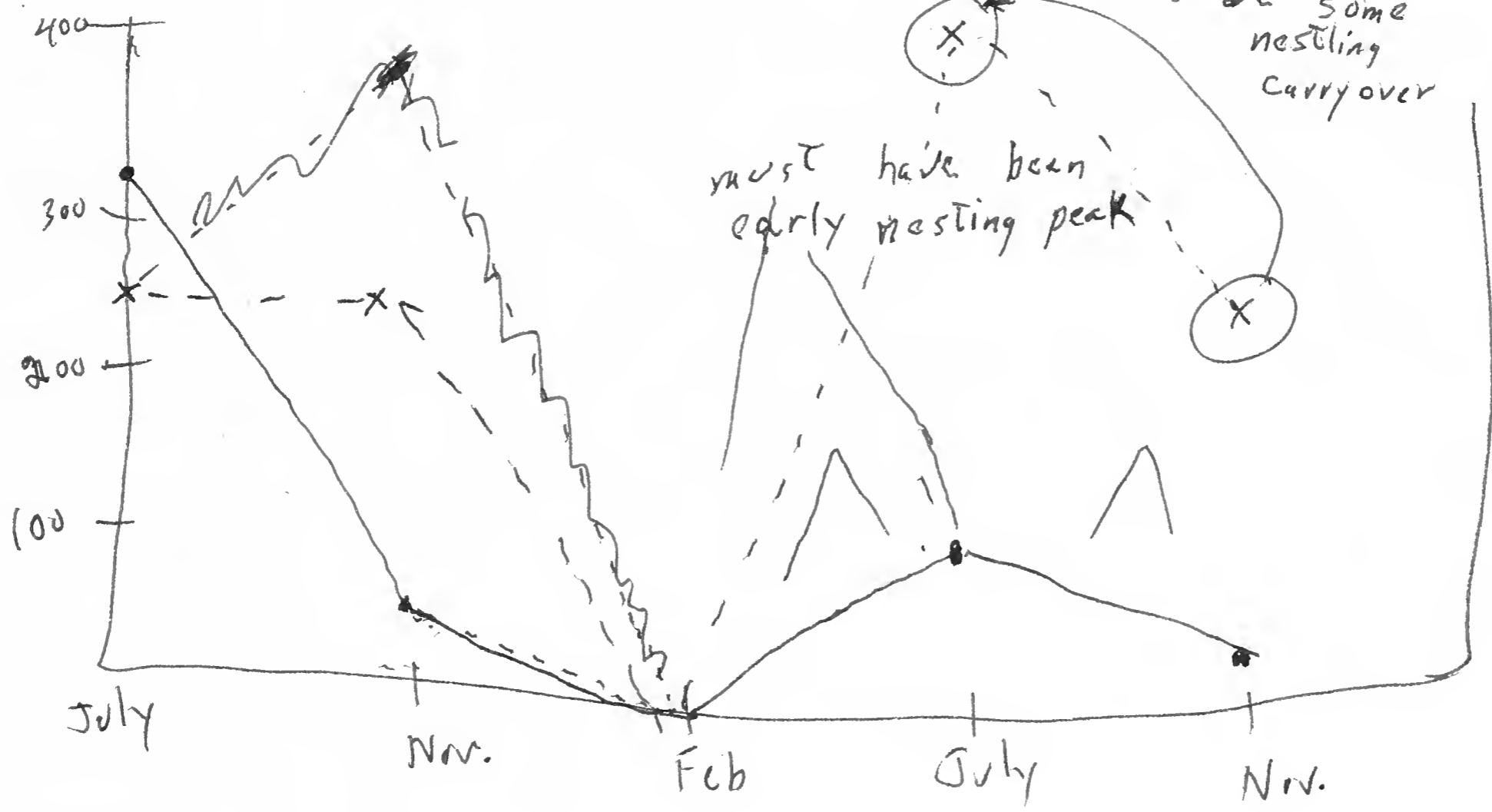
Nov.  
7 per

Feb  
15 per

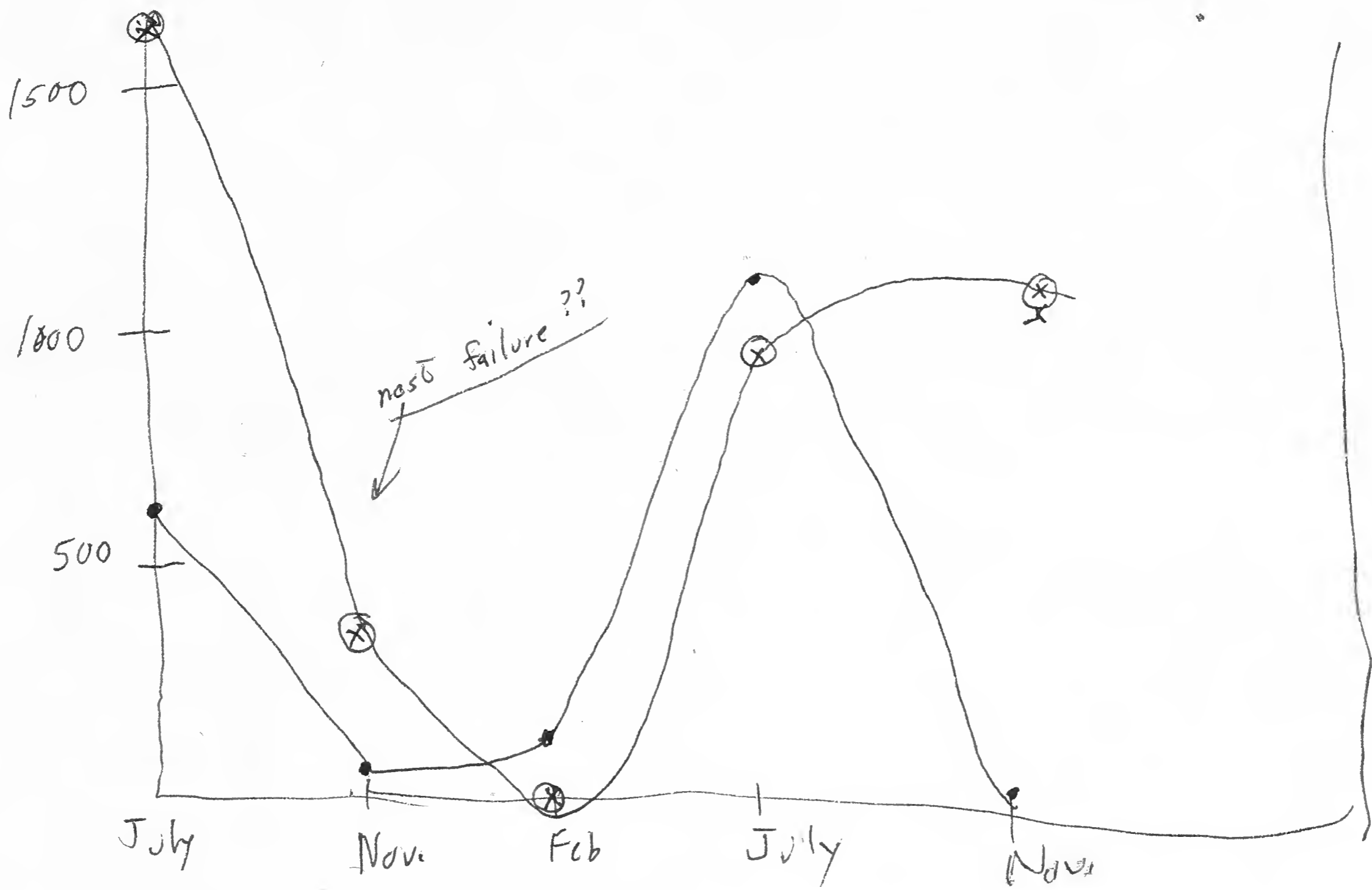
July  
3 per

Nov.  
4 per

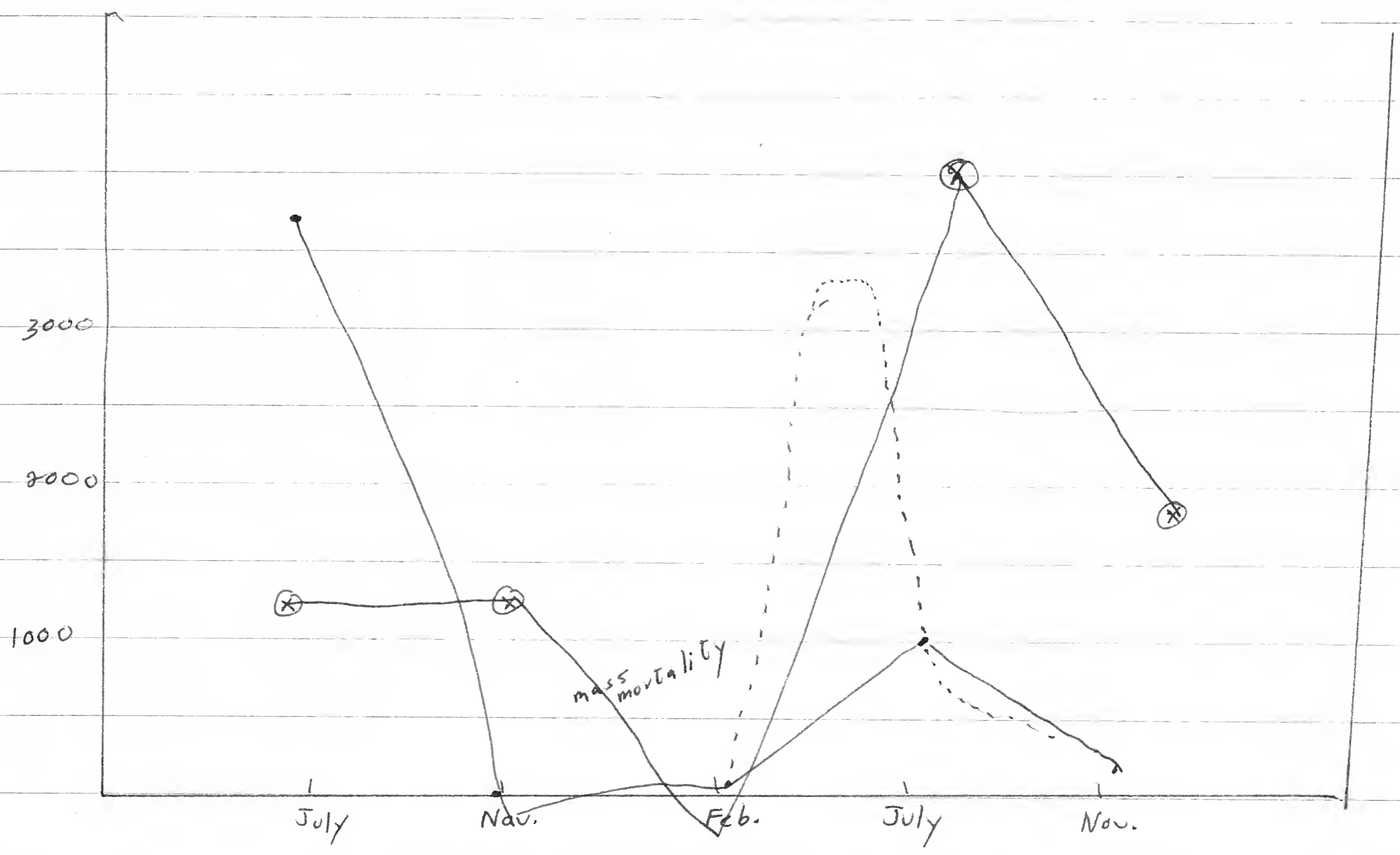
# Red-footed Booby



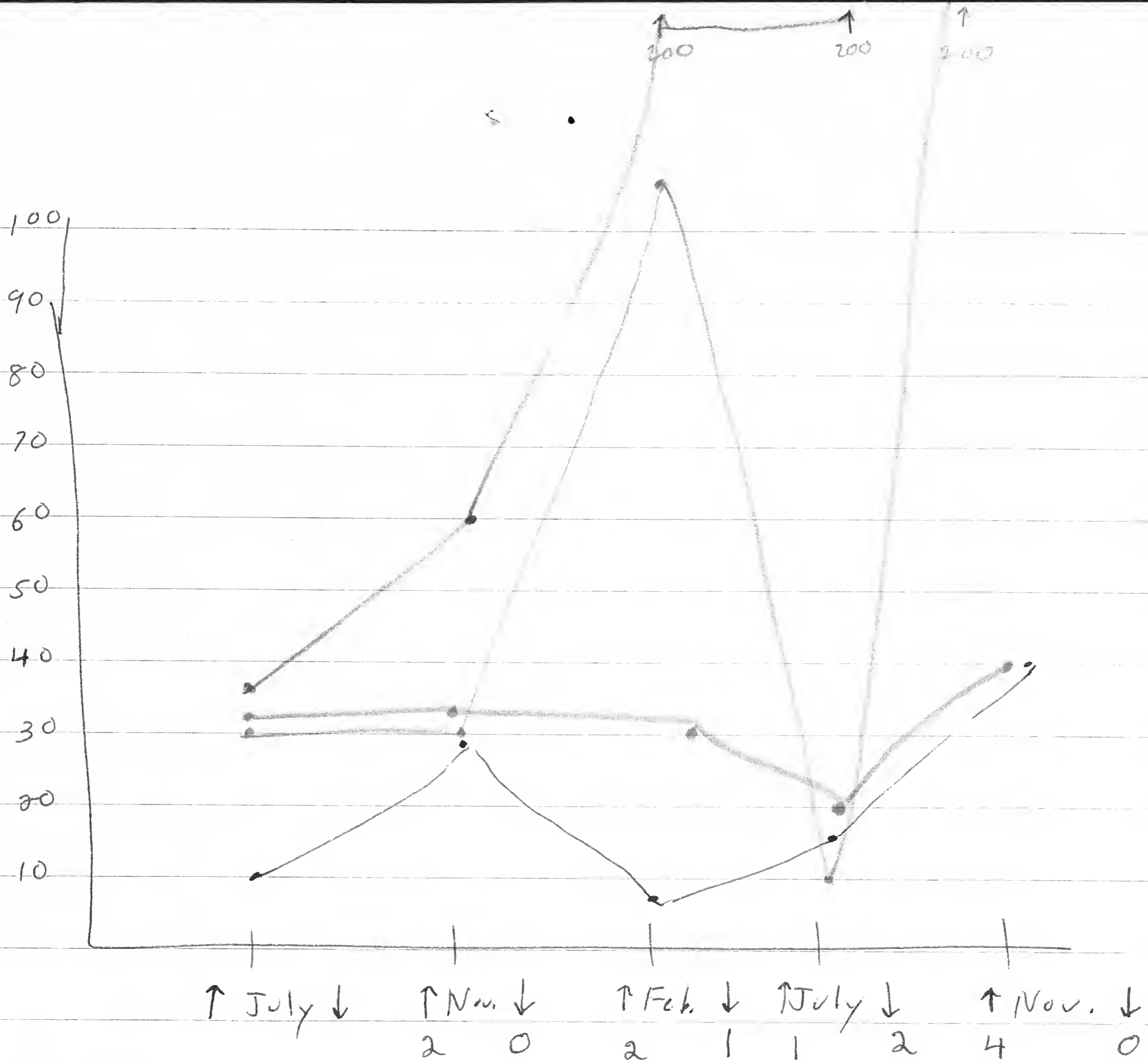
# Great Frigatebird



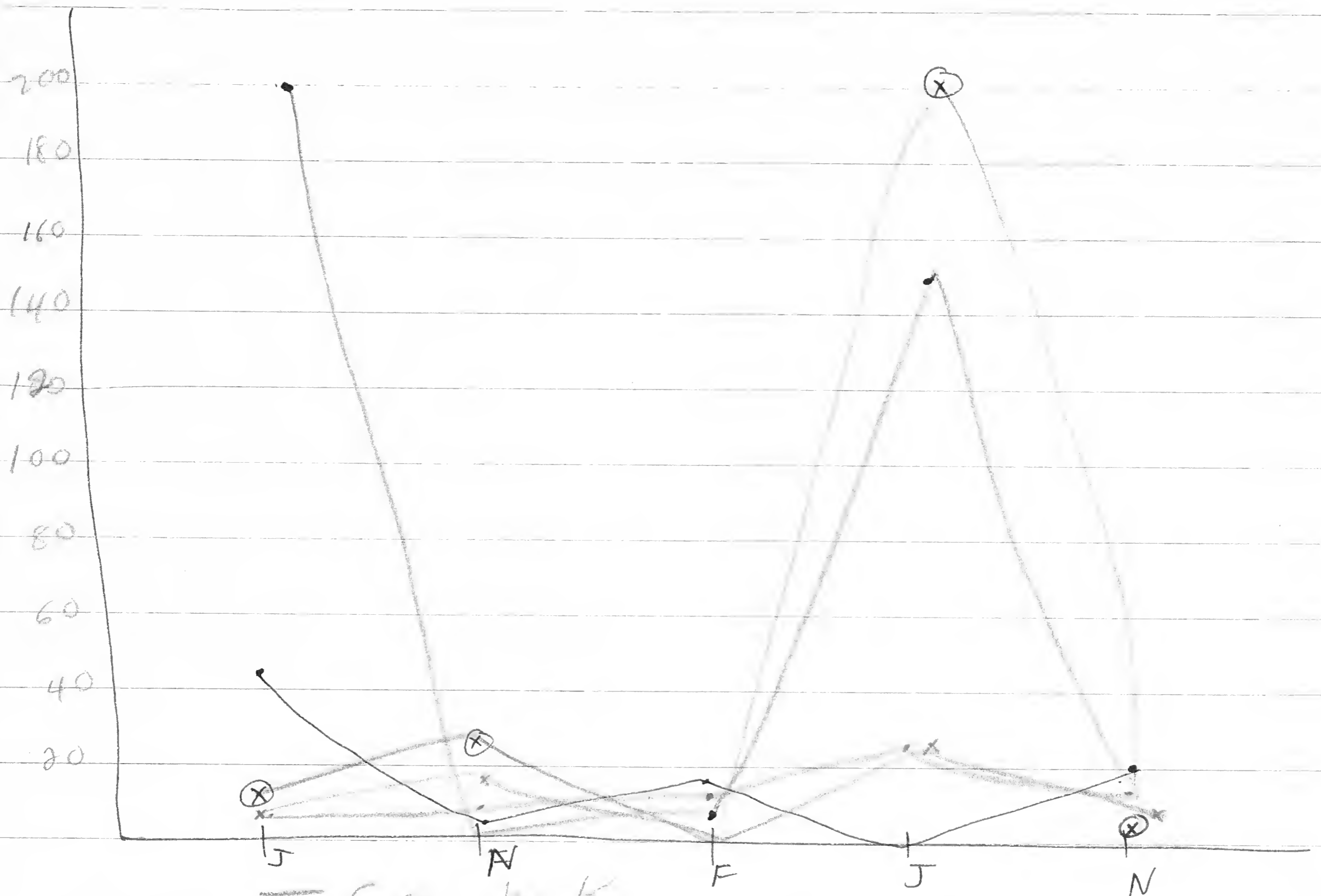
Lesser Frigatebird







- Golden Plover
- Ruby Turnstone
- Wandering Tattler
- B. - winged Curlew

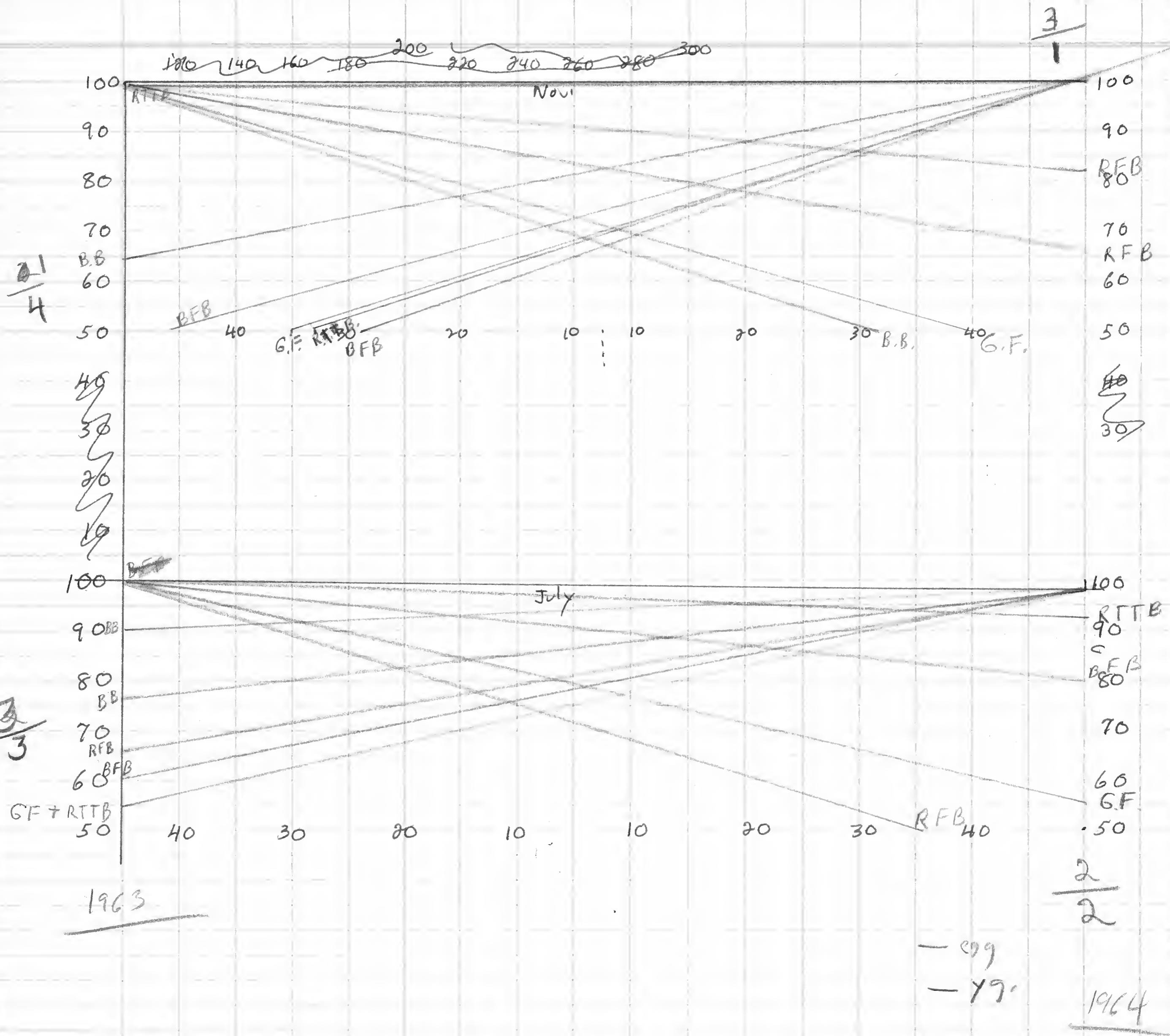


— Gray back

— H. Noddy

— ~~Noddy~~ Noddy

# Enderbury Island



1964 = 100%

	July		Nov.	
RTTB	$\frac{175}{166}$	$\frac{150}{270}$ 56%	$\frac{10}{25}$	100%
BFB	$\frac{272}{220}$	<del>81%</del> <del>24%</del> 61%	$\frac{29}{63}$	46%
	$\frac{124}{204}$		$\frac{72}{248}$	29%
BB	$\frac{10}{11}$	91%	$\frac{34}{11}$	<del>309%</del> 32%
	$\frac{20}{26}$	77%	$\frac{9}{14}$	64%
RFB	$\frac{318}{113}$	<del>281%</del> 36%	$\frac{41}{34}$	<del>121%</del> 83%
	$\frac{258}{392}$	66%	$\frac{392}{258}$	<del>152%</del> 66%
G.F	$\frac{1665}{1204}$	55%	$\frac{46}{19}$	<del>242%</del> 41%
	$\frac{1620}{948}$	56% <del>178%</del>	$\frac{387}{1115}$	35%

	1823	Discovered by James J. Coffin of Nantucket on the whaler "Transit".
Aug. 28	1840	ship Vincennes of U.S. Exploring Expedition
Jan. 9	1841	ships Peacock and Flying Fish of U.S. Exp. Exp. Walker (1845)
April	1860	guano digging started
July	1877	last regular supply ship
	188—	Arundel and company renewed deposits
March 19 <del>March</del>	1924	Beck - Whippoorwill??
March	1938	4 colonists <del>landed</del> landed from the U.S.S. Janey.
May-14-20	1939	Schultz (U.S.N.M.) - collected fish and a few birds. Helped by James Kinney
	1938-1941	Banding by Munroe and assistants.

Enderbury

draft

- 1823 - discovered - Captain James J. Coffin of Nantucket  
on ~~the~~ "Transit".
- Aug. 28, 1840 ✓ - ship Vincennes of U.S. Explor. Exp.
- Jan. 9, 1841 ✓ - " Peacock & Flying Fish of U.S. Expl. Exp.

U.S.S. Tuscarora

- April 1860 - guano digging started
- June 1870 - ~~Eliza~~ ~~Weymouth~~ and 60 Har. arrived - Phoenix Guard Co.
- July 1877 - last regular supply ship
- March 27-29, 1872 - mapped by U.S.S. Narragansett



1880's

Arundel - (see Ellis)

[horse and mule left from American Jays]

March 1938

- 4 boxes loaded on Enderbury from the  
U.S.S. ?? ~~Jays~~

May 14-20

Schultz - helped by James Kinney  
[specimens of fish and birds collected]

Check Wins ref. Waesche (1938)

Progress Report

A Summary of Botanical Field work, Leeward Hawaiian Islands, September 14-26, 1964

1. Four hundred and forty-one sheets of vascular plants were collected from the Hawaiian Leeward Islands: Kure, Midway (Eastern Island), Pearl and Hermes Reef (Southeast Island, North Island, South North Island), Laysan, Lisianski, Necker, Nihoa and French Frigate Shoals (Tern Island, Trig Island, Whale Island, and East Island.)
2. Twenty-seven collection of live material of Portulaca, Euphorbia and Sesuvium. These cuttings have been planted by Dr. C. H. Lamoureux and are to be used for a cytological resume; b. studies to ascertain the effect of environment on growth and form; and c. a living reference collection - especially of Portulaca which is in need of taxonomic study.
3. Thirty-three general algae collections (R. Tsuda, collaborator).
4. Twenty-two sand and soil samples (Dr. G. Baker and C. Steele, collaborators).
5. Forty-five collections of taxonomic and cytological material of the following critical genera: Scaevola, Boerhaavia and Portulaca. Unopened flower buds of Pritchardia remota were also collected.
6. One water sample and two feather collections (C. Steele, collaborator).
7. Five collections of seeds found in beach drift.
8. Two-hundred and sixty 2 x 2 colored slides of native species and the vegetation associations of all the islands visited.
9. One collection of anatomical material of Sesbonia sp.
10. Notes and annotated maps of most of the islands in the Hawaiian Leeward group.

The plant collections constitute the most thorough single survey of the Hawaiian Leewards since the Tananger Expedition of 1923-24.

Stretching 1,200 miles northwest into the Pacific are the tiny reefs, shoals, rocks and islands of Hawaii's leeward chain.

The necklace of islands is inhabited almost exclusively by seals, turtles and thousands upon thousands of sea birds—all under the protection of Federal law.

Rising stark, black and naked from the deep blue of the Pacific, Gardner Pinnacles is perhaps the hardest to land on of all the islands of the National Wildlife Refuge.

On five previous trips scientists were repelled by the raging surf.

This time they landed on the southern slope of the largest rock to inspect the bird population and breeding areas. But even that landing was not easy. As the Coast Guard boat surged up with a wave the wildlife officials would jump one by one onto the rocky ledge—with a four-foot long shark circling the waters nearby.

Gardner Pinnacles are 588 miles northwest of Honolulu. The highest peak is 170 feet; the lowest is 90 feet. The largest of the two islands is about 600 feet long.

Geologists estimate that the volcanic outcrop probably was once the size of Lanai. Wind and high seas have carved it down to a small rock, but submarine banks surround the pinnacles spreading outward from five to 12 miles.

At least 14 species of sea birds have been sighted on the pinnacles. About half of them nest there.

During this trip four Hawaiian Monk seals were seen sleeping in the sun.

The only flowering plant found on the less sloping ledges is *Portulaca*, a low flat-looking plant with succulent leaves.

The scientists made another discovery this time. The military had blasted off the top of one peak for a latitude and longitude sighting, part of the Hiran system of triangulation and aid to navigation.

Angered Wildlife officials noted that the military did receive permission from the U.S. Bureau of Sport Fisheries and Wildlife to land briefly but not to use explosives or to scare the birds.

All the islands of the refuge are protected by Federal law to enable the animal life, many of whose species are endangered of extinction, to thrive.

Entry is restricted to those who receive permission from the bureau, usually biologists who will help the government in its attempts at preservation.

"The military is our biggest problem," said Eugene Kridler, regional head of the bureau and manager of the refuge. Other intruders are occasional fishermen.

The penalty for trespassing on the islands is six months in prison and/or \$500 fine. Disturbing the birds and disturbing nesting areas can also bring stiff penalties.

Gardner Pinnacles were discovered in 1820 by Captain Joseph Allenon of the American whaler *Marco*.

Because his description of the pinnacles was not completely accurate, others reported "discovering" the is-

This fall Star-Bulletin Chief Photographer Warren Roll accompanied officials of the U.S. Bureau of Sport Fisheries and Wildlife and the State Fish and Game Division on an inspection tour of the islands.

His collection of photographs are a unique—and exclusive—report of the islands and their "population" today.

lands later. This accounts for the many names, including Man-of-War Rock and Pollard Rock, given the peaks.

Sea birds are not the only inhabitants of the isolated pinnacles. Insects, including several varieties of spiders, earwigs, silverfish and centipedes, live among the loose rocks of the peaks.

No archaeological remains have been found, which is no surprise to those who have braved a landing on the cliffs.

## Landfall . . .

The Coast Guard ship *Ironwood* approaches Gardner Pinnacles looking for a landing spot in the relatively calm sea. The peaks are surrounded by a shelf rich in sea life extending five to 12 miles from the islands at a depth of about 17 to 20 fathoms.

from:

Honolulu Star-Bulletin, Dec. 13, 1966.

Probable source of identification:

Refuge manager, Eugene Kridler --

he's not botanically inclined, but could probably tell a *Portulaca* from any other plant in the Leewards --

or the possible exception of *Asplenium*.



A Summary of Botanical Field work, Hawaiian Islands, September 11-23, 1930.

1. Four hundred and forty-one sheets of vascular plants were collected from the Hawaiian Islands: Kure, Midway (Eastern Island), Pearl and Hermes Reef (Northwest Island, North Island, South North Island), Laysan, Lisianski, Necker, Nihoa and French Frigate Shoals (Main Island, Fairy Island, Whale Island, and East Island.)
2. Twenty-seven collections of live material of Portulaca, Synedrella and Scaevola. These collections have been planted by Dr. C. H. Loomis and are to be used for a. cytological studies; b. studies to ascertain the effects of environment on growth and form; and c. a living reference collection - especially of Portulaca which is in need of taxonomic study.
3. Thirty-three general algae collections (R. E. Smith, collaborator).
4. Twenty-two sand and soil samples (Dr. C. H. Loomis and C. Steele, collaborators).
5. Forty-five collections of algae and botanical material of the following critical genera: Ulva, Enteromorpha and Porphyra. Japanese Ulva and Enteromorpha were also collected.
6. One water sample and two other collections (C. Steele, collaborator).
7. Five collections of marine invertebrates.
8. One hundred and thirty-five collections of native species and the vegetation of all the islands visited.
9. One collection of invertebrate material of Porphyra sp.
10. One and one-half pages of notes on the Hawaiian Islands group.

The plant collections constitute the most thorough single survey of the Hawaiian Islands since the Challenger Expedition of 1841.

C.R. Long  
1964

SOIL SAMPLES: JUNE - JULY 1964 ATF TRIP

Palmyra

June 6, 1964

Palmyra Island

(5) L123-L127

- L123\*- 1 Under Messerschmidia sp. in interior of island. Much of the ground is bare - beachrock conglomerate beneath thin soil layers. Fleurya sp. common. Sand Island. (0.5-2.5 in layer).
- L124 - 2 Under Cocos sp. Ground littered with dead fronds. Also present in immediate area: Messerschmidia, Asplenium, and Pisonia. Home Island. (0.5-2.5 in. layer.)
- L125 - 3 Collected on causeway leading to radio towers, Paradise Island. Gravel layer in upper surface. (0.5- 2.5 in. layer).
- L126 - 4 Collected on Paradise Island under Cocos, dry surface (0.5-2.5 in. layer)
- L127 - 5 Collected on Kaula under Cocos - Messerschmidia grove. Soil deepest in depressions in the elevated beachrock. Cynodon sp. vigorously rooted in these soil repositories. (0.5-2.5 in. layer)

June 7, 1964

Palmyra Island

(4) L128-L131

- L128 - 1 Under Hibiscus- Coccoloba on the northwest side of the runway. Cooper Island. One-half to three quarter inch of litter. (0.5-2.5 in. layer.)
- L129 - 2 Cooper Island. Collected along the north side of the runway - open grassy area (1.-2. in. layer.)
- L130 - 2a As No. 2, but a surface sample (0.5 in. layer.)
- L131 - 3 Eastern Island. Pisonia - Pandanua forest. (1.-4.in.layer.) Surface coral pebbles. Color: a distinct reddish brown. Appears high in organic matter.

June 9, 1964

Washington Island

(8) L132-L139

Site IV - West Bog near Te Motu.

L132 - 1

L133 - 2

L134 - 3

L135 - 4

L136 - 5

Site V - West Bog near Te Motu.

L137 - 1

L138 - 2

L139 - 3

June 11, 1964

Washington Island

(38) L140-L177

Site I collections I - XVII

In Scirpus bog approx. one-half the distance to the entrance to the fresh water lagoon - on the south side of the canal and approx. seventy feet from the canal edge.

Samples No. I - No. XVII (I - XVI represent 2 inch portions taken from the sampler.)

\* collection numbers : soils - C. R. Long

C.R. Long  
1964

Palmyra

Summary of Botanical Field Work, June - July ATF, 1964

Palmyra Island

June 5, 1964

Collections were made on Cooper Island, Kaula Island and Holei Island, and along the causeway connecting Aviation Island with Kaula Island. The specific areas covered were: south side of Cooper Island along west - east runway; the north - south causeway; the extreme east portion of Kaula and the west half of Holei Island. Photographs and soil samples taken.

The following collection numbers were used: No. 1760 - 1784, C.R. Long. Assisted in banding red footed boobies.

June 6, 1964

Collections were made on Sand Island in the morning, and on Home, Paradise, Kaula and Cooper Islands in the afternoon.

The following collection numbers were used: No. 1785 - 1810, C.R. Long and D. Gill.

June 7, 1964

Collections were made on Cooper, Aviation, Quail, Whippoorwill Eastern, Holei, and Bird Islands, and the causeway connecting Aviation Island to Kaula Island, Photographs and soil samples taken.

The following collection numbers were used: No. 1811 - 1826, C.R. Long.

Washington Island

June 9, 1964

Collection No. 1827 - 1844 C.R. Long, D. Gill, C.D. Hackman, and P. Marshall. Soil samples and photographs taken.

KEY TO THE GENERA OF HAWAIIAN FERNS AND FERN ALLIES

Irwin E. Lane

Keys to the species may be found in Robinson: Bulletin of the Torrey Botanical Club 39: 227-248; 567-601; ibidem 40: 193-228; ibidem 41: 51-59. Descriptions of most species may be found in Hillebrand; Flora of the Hawaiian Islands. Since many of the species are keyed and described in genera in which they are no longer considered to belong, a list of synonyms under which they may be found in the older works is appended.

This key presupposes a knowledge of the ferns such as would be gained from a study of a general botany text. The following special definitions of terms are to be noted: Vernation is the position of the leaves in the bud, circinate if the leaf unrolls in growth. Valvate is opening like a door or lid. Indusium is the membrane which surrounds or covers the sorus or cluster of sporangia. Receptacle is a stem-like projection of tissue, surrounded by the tubular indusium in the Hymenophyllaceae, upon which the sporangia are borne. Articulate means jointed, or falling with a clean break. Alate means winged, with a thin strip of blade on one or both sides of a petiole or rachis. An areola is the mesh or space between the veins in a reticulate venation.

- 1 - Spores produced in capsules on rhizomes, aquatic plants with fronds simple in plan (Salviniales) ..... 2
- 1 - Spores borne upon some aerial part of the plant, if aquatic then fronds deeply dissected ..... 3
  - 2 - Plants floating, tiny; leaves with entire or 2-lobed blades, folded in vernation (Salviniaceae) ..... Azolla
  - 2 - Plants rooted in the mud; leaves 2-4 foliate, circinate in vernation (Marsiliaceae) ..... Marsilia
- 3 - Sporangia borne in the axils of scale-like leaves which are either distant or form compact cones (Lycopodiales) ..... 4
- 3 - Sporangia not borne in the axils of scale-like leaves ..... 6
  - 4 - Sterile leaves in four rows, of two distinct sizes on each branch, Heterosporous; sporangia of two kinds (Selaginellaceae)..... Selaginella
  - 4 - Sterile leaves spiral around the stem, of similar size or none, homosporous; sporangia all of one kind ..... 5
- 5 - Sporangia 1-celled; stems with small or scale-like leaves ..... Lycopodium
- 5 - Sporangia 2- or 3-celled; stems apparently without leaves (Psilotaceae)..... Psilotum
- 6 - Vernation erect or inclined; sporangia sessile and borne on a non-leaf-like branched or unbranched stalk, which may arise from a leaf (Ophioglossaceae)..... 7
- 6 - Vernation circinate; sporangia usually on stalks, or, if sessile, then appearing on the surfaces of leaves ..... 8

- 7 - Leaf blade and sporophyll both ternately compound; veins not reticulate ..... Botrychium
- 7 - Leaf blade simple; sporophyll a simple spike or rarely dichotomously branched, veins reticulate ..... Ophioglossum
- 8 - Sporangia united into boat-shaped or circular structures (synangia); on short thick stalks or sessile, leaves triangular, with "stipules" (Marattiales)..... Marattia
- 8 - Sporangia separate from one another, usually on slender stems (sometimes otherwise); leaves without "stipules" at the base (Filicales) ..... 9
- 9 - Sterile leaves slender, wiry, non-leaf-like; sporangia not on margin, borne in short terminal spikes; on clayey banks at high altitudes (Schizaeaceae) ..... Schizaea
- 9 - Sterile leaves leaf-like; sporangia scattered or in sori on the edges or under surfaces of leaf-like fronds ..... 10
- 10 - Leaves pseudo-dichotomous, usually with a bud between the paired divisions, giving the appearance of indefinite growth; sori with no indusium, small, circular (Gleicheniaceae) ..... 11
- 10 - Leaves simple, pinnately divided, or ternately divided ..... 13
- 11 - Fronds once-pinnate above the highest fork ..... 12
- 11 - Fronds bipinnate above the last fork ..... Hicriopteris
- 12- Lower veins of the leaf segments branched more than twice.... Dicranopteris
- 12- Lower veins of the leaf segments branched twice ..... Sticherus
- 13 - Fronds climbing, pinnate with pinnae ternate, sporangia large, single on margins of midified pinnules (Schizaeaceae) ..... Lygodium
- 13 - Fronds not climbing, pinnae rarely ternate, sporangia small, clustered or in lines or over the surface ..... 14
- 14 - Indusium valvate or tubular (i.e., sorus or sori in a capsule or tubular-like covering)..... 15
- 14 - Indusium neither valvate nor tubular; indusium various or absent ..... 22
- 15 - Indusium valvate, the outer valve formed by a leathery outgrowth from the margin of the leaf, dorsal upon the veins; tree ferns (Cyatheaceae)..... Cibotium
- 15 - Indusium tubular, not leathery; sori terminal on the veins ..... 16

- 16 - Leaf blades more than one layer of cells thick, sporangia stalked, borne on side of the tube, annulus complete ..... Sphenomeris
- 16 - Leaf blades one layer of cells thick, sporangia sessile, borne upon a receptacle, annulus incomplete (Hymenophyllaceae) ..... 17
- 17 - Stipes and fronds hairy ..... 18
- 17 - Stipes and fronds glabrous ..... 20
- 18 - Terrestrial plants, rhizome erect, plants caespitose ..... 19
- 18 - Epiphyte, rhizomes elongate, creeping ..... Sphaeroceronium
- 19 - Rachis alate, stipe to 25 cm. long ..... Callistopteris
- 19 - Rachis not alate, stipe ca 4-8 cm. long ..... Trichomanes
- 20 - Fronds orbicular, minute, less than 1 cm. in diameter.....Gonocormus
- 20 - Fronds deltoid or lanceolate, at least 3-4 cm. long ..... 21
- 21 - Indusium circular, inserted in pinnules, receptacle included..... Mecodium
- 21 - Indusium tubular, free, receptacle long exserted..... Vandenboschia
- 22 - Sporangia scattered over the under surface of the leaf blade in a uniform layer ..... Elaphoglossum
- 22 - Sporangia in definite sori ..... 23
- 23 - Sori marginal or submarginal ..... 24
- 23 - Sori dorsal (i.e. on under surface of leaf)..... 35
- 24 - Indusium present .....25
- 24 - Indusia absent; leaves grass-like; sporangia sunken in a marginal groove .....Vittaria
- 25 - Indusia opening inward .....29
- 25 - Indusia opening outward .....26
- 26 - Sori elongate ..... Diellia
- 26 - Sori circular ..... 27
- 27 - Pinnules articulate ..... Nephrolepis
- 27 - Pinnules not articulate ..... 28
- 28 - Blade of pinnules developed almost entirely on apical side of the midrib ..... Lindsaea
- 28 - Blade of pinnules developed on both sides of midrib..... Microlepia

29 - Sori on a continuous marginal vein .....	30
29 - Sori on unconnected ends of, or on non-continuous marginal vein .....	31
30 - Indusium single .....	<u>Pteris</u>
30 - Indusium double .....	<u>Pteridium</u>
31 - Fertile leaves with whole margins inrolled .....	34
31 - Fertile leaves with only lobes inrolled, simulating indusia.....	32
32 - Leafstalks black, shining .....	<u>Adiantum</u>
32 - Leafstalks brownish, dull .....	33
33 - Sori distinct, each in a depression between two lobes .....	<u>Hypolepis</u>
33 - Sori crowded, not placed between lobes as above .....	<u>Pteris</u>
34 - Branch veins not connecting.....	<u>Pellaea</u>
34 - Branch veins connecting .....	<u>Doryopteris</u>
35 - Indusium present .....	48
35 - Indusium absent .....	36
36 - Sporangia in definite sori .....	38
36 - Sporangia not in definite sori .....	37
37 - Fronds bearing yellow or white dust beneath .....	<u>Pityrogramma</u>
37 - Fronds not bearing yellow or white dust beneath .....	<u>Coniogramme</u>
38 - Fronds jointed to the rootstock (Polypodiaceae).....	39
38 - Fronds not jointed to the rootstock .....	42
39 - Frond deltoid or pinnatifid .....	40
39 - Frond linear and entire (rarely dichotomous) .....	<u>Pleopeltis</u>
40 - Fronds decomposed .....	<u>Polypodium</u>
40 - Fronds entire, pinnatifid, or lobed .....	41
41 - Areolae with simple included vein .....	<u>Phlebodium</u>
41 - Areolae with trichotomously branched included vein .....	<u>Microsorium</u>
42 - Fronds entire subentire, or pinnatifid .....	43
42 - Fronds compound .....	45

- 43 - Fronds entire ..... Grammitis
- 43 - Fronds pinnatifid ..... 44
  - 44 - Sori confluent at apex of frond ..... Xiphopteris
  - 44 - Sori separate or discrete ..... Amphoradenium
- 45 - Sori single on ultimate divisions, with clavate paraphyses..... Amphoradenium
- 45 - Sori numerous on ultimate divisions, without clavate paraphyses ..... 46
  - 46 - Lowest veinlets of adjacent segments meet and unite below the  
Sinus ..... Cyclosorus
  - 46 - Lowest veinlets of adjacent segments neither meet nor unite ..... 47
- 47 - Fronds tapered toward both ends, hairs simple, not articulate..... Lastrea
- 47 - Fronds not tapering toward both ends, hairs jointed ..... Ctenitis
  - 48 - Sori elongate ..... 57
  - 48 - Sori roundish or oval ..... 49
- 49 - Veins anastomosing, with free included veinlets ..... 50
- 49 - Veins free ..... 51
  - 50 - Fronds pinnatifid, texture thin membranous ..... Tectaria
  - 50 - Fronds pinnate, texture coriaceous ..... Cyrtomium
- 51 - Pinnules articulate, stipes not articulate ..... Nephrolepis
- 51 - Pinnules and stipes not articulate ..... 52
  - 52 - Lowest veinlets of adjacent segments meet and unite below the  
sinus ..... Cyclosorus
  - 52 - Veinlets of adjacent segments neither meeting nor uniting ..... 53
- 53 - First basal nerve in pinnule on the apical side of the midrib..... Polystichum
- 53 - First basal nerve in pinnule on the basal side of the midrib..... 54
  - 54 - Fronds with articulate hairs ..... Ctenitis
  - 54 - Fronds paleate, glabrous or hairs not articulate ..... 55
- 55 - Minor axes decurrent on major axes ..... Dryopteris
- 55 - Minor axes not decurrent on major axes ..... 56
  - 56 - Frond tapered at both ends ..... Lastrea
  - 56 - Fronds oblong, scarcely narrowed above and below ..... Cystopteris



- 57 - Veins free, sori oblique to midrib of leaflet ..... 60
- 57 - Veins connecting, sori parallel to the midrib of leaflet..... 58
  - 58 - Sori continuous ..... 59
  - 58 - Sori interrupted ..... Doodia
- 59 - Plants without trunk, fronds pinnate, 8-18 inches long ..... Blechnum
- 59 - Plants with short to long trunk, fronds bipinnatifid to bipinnate,  
often over 18 inches long ..... Sadleria
- 60 - Sori double or crossing vein ..... Athyrium
- 60 - Sori single, on one side of the vein ..... Asplenium

GENERIC SYNONYMY

Adiantum

Amphoradenium  
Polypodium in part

Asplenium  
Excluding presently recognized  
Athyrium

Athyrium  
Asplenium in part  
Diplazium

Azolla

Blechnum

Botrychium

Callistopteris  
Trichomanes in part

Ceratopteris

Cibotium

Coniogramme  
Gymnogramme

Ctenitis  
Aspidium in part  
Dryopteris in part  
Nephrodium in part  
Phegopteris in part

Cyclosorus

Aspidium in part  
Dryopteris in part  
Phegopteris in part

Cyrtomium

Aspidium in part  
Dryopteris in part  
Phanerophlebia

Cystopteris

Filix

Dicranopteris

Gleichenia in part  
Mertensia in part

Diellia

Lindsaya in part  
Excluding presently recognized  
Loxoscaphe

Doodia

Doryopteris

Pteris in part

Dryopteris

Aspidium in part  
Phegopteris  
Polystichum in part  
Excluding the presently recognized  
Ctenitis, Cyclosorus, Lastrea

Elaphoglossum  
Achrostichum in part

Gonocormus  
Trichomanes in part

Grammitis  
Polypodium in part

Hicriopteris  
Dicranopteris in part  
Gleichenia in part  
Mertensia in part

Hypolepis  
Phegopteris in part

Lastrea  
Aspidium in part  
Dryopteris in part

Lindsaea  
Lindsaya  
Odontoloma

Loxoscapha  
Diellia in part  
Lindsaya in part

Lycopodium

Lygodium

Marattia

Marsilia

Mecodium  
Hymenophyllum in part

Microlepis

Microsorium  
Polypodium in part

Nephrolepis

Ophioglossum  
Ophioderma

Pellaea  
Pteris in part

Phlebodium  
Polypodium in part

Xiphopteris  
Polypodium in part

Pityrogramma  
Ceropteris

Pleopeltis  
Polypodium in part

Polypodium  
Excluding presently recognized  
Amphoradenium  
Grammitis  
Microsorium  
Phlebodium  
Pleopeltis  
Xiphopteris

Polystichum  
Aspidium in part

Psilotum

Pteridium

Pteris  
Schizostege

Sadleria

Schizaea

Selaginella

Sphaeroceronium  
Hymenophyllum in part

Sphenopteris  
Odontosoria

Sticheris  
Dicranopteris in part  
Gleichenia in part  
Mertensia in part

Tectaria  
Aspidium in part

Trichomanes  
Excluding presently recognized  
Callistopteris  
Gonocormus  
Vandenboschia

Vandenboschia  
Trichomanes in part

Vittaria

that water enters the lagoon primarily through the opening on the northwestern side of the reef and the boat channel on the south side.

INSERT WEATHER AND CLIMATE SECTION HERE

Southeast Island: Lying, as its name implies, in the southeastern corner of the reef, Southeast is the largest island in the atoll. It is approximately 2600 feet long in an east-west direction, which includes <sup>ing</sup> a lagoon area about 400 feet wide which nearly separates the smaller western portion from the remainder of the island. Excluding a large ledge of reef rock along its southern side, the island is about 1100 feet wide at its maximum. It has a total area of \_\_\_\_\_ acres. The western section has a kidney-shaped central area about 700 by 400 feet which supports a sparse vegetation of Solanum nelsoni, Tribulus cistoides, Boerhavia diffusa, <sup>Legidium</sup> swahicense, and Coronopus didymus, with several clumps of <sup>bunchgrass</sup> Eragrostis variabilis, near the center. Extending southeastward from the western portion, and curving around in front of the western side of the large eastern portion, is a low flat shelf of reef rock. This ledge is broken on its southern side by many cuts into which the ocean moves, so that at high tide the outer portions of the ledge are nearly submerged. The interior of this ledge, toward the north and west, supports a thick growth of Sesuvium portulacastrum.

The large eastern portion is about 1800 feet long in a north-east-southwest direction. The east-central area is dominated by three tidal pools, caused by sea water seepage up through the island, and their influence on local vegetation. The area directly surrounding these pools, ~~in them~~ and extending to the west, is entirely

a total of 22 species have been collected from Pearl and Hermes Reef.

Sesuvium. To the west of the low, wet area is a large flat area dominated by Coronopus and one patch of Cynodon dactylon, the latter probably introduced. Surrounding, and further west of the Coronopus area, is a steadily expanding area dominated by an introduced Brassica. This plant was evidently introduced in late 1961 or in 1962, as it was not noted in March 1961, and was common in February 1963. From this central, heavily-vegetated area out to the beaches is a relatively open coral sand and rubble region with patches of Solanum, Tribulus, Boerhavia, and Sicyos hispidus. The extent of these patches varies with <sup>location</sup> area and season. Solanum is especially dominant toward the southwestern side, Tribulus on the northern, and Sicyos toward the eastern tip. Several very stunted Scaevola taccada bushes grow along the margin between <sup>the</sup> vegetated interior and <sup>the</sup> pure sand beach on the southwestern and southern sides of this half. A narrow sand beach extends around most of the island, except along the lagoon and the rocky shelf. The island is presently being eroded at the extreme western end, where there is an almost vertical drop from the vegetated area to the water.

There is a 15-foot high steel frame tower near the lagoon side of the eastern portion. This tower was built in 1961, but is now badly rusted and lacking the original wooden floor. A <sup>(1965)</sup> small cache of fresh water and C-rations is wired to the tower. Towards the middle of this section are two piles of rusting 55 gallon drums also left in 1961 ~~by military operations~~, and on the shore of the lagoon end of the eastern portion is a steel tank about 20 feet long and 10 feet in diameter, apparently washed up on the island by

Plant Association  
Notes on Soils

severe storms.

There is little available data on vegetative and physiographic changes on this, or any other, island of Pearl and Hermes Reef. There are apparently no notes from the wrecks in 1822. Brooks, in 1859, says merely that "the largest islands are covered with coarse grass and trees". Munro mentions an island "about a mile long, with some low vegetation" seen during his visit in 1891, <sup>which</sup> ~~this~~ is presumably Southeast. ~~The trips of 1912 and 1913 only went to North Island.~~ On April 26, 1923, Dr. Alexander Wetmore recorded in his field notes: "The island is elongate, about 900-1000 yards long by 500 yards wide, rising 15 feet above high water. Along the western portion the beach is of coral sand. Somewhat west of the center there is a tiny, irregular lagoon. A band of blackened and eroded limestone forms the southern shore here and extends out in a broad hook to the eastward. The island rises between 10 and 18 feet at the highest point. Two ridges are covered with clumps of bunch grass one to two feet tall and a sprawling shrub with thick rounded hirsute leaves of grayish green color is abundant. There is a low spot with blackish soil on the eastern portion of the north side that evidently holds water after rains. It was now dry. Near this we found remains of an old camp. Upright sticks had apparently been used to support shelters of canvas and some rubbish, iron cans etc. lay about. indications were that it was a camp of Japanese, perhaps from a wrecked sampan."

The physiography of the island has not changed significantly in the forty odd years since that description, but the vegetation

has been considerably altered. ~~Bunchgrass (Eragrostis variabilis)~~  
~~but this plant~~ ~~these islands today.~~  
 has been almost eliminated from ~~this and also Grass Island to the~~

~~west. In fact the name of the latter island is no longer appropriate.~~ ~~Island~~ ~~Island~~  
 (Dr. Wetmore's photos show much of Southeast<sup>Island</sup> and Grass<sup>Island</sup> to

be covered by clumps of bunchgrass in 1923,) In May 1923 the  
 Tanager Expedition planted hau (Paritium tiliaceum) and ~~coconut~~ <sup>salm</sup> ~~(Coccoloba)~~ <sup>Pritchardia</sup>

trees on Southeast Island, and scattered seeds. Though no record

remains of what seeds were scattered, Dr. Wetmore has a list of

the species given the expedition by the Territory of Hawaii

Department of Agriculture for planting on the Reservation to

replace ~~the vegetation~~ <sup>that</sup> destroyed by the rabbits. With the exception

of Scaevola none of the species on this list are presently growing

on Southeast Island. The sprawling shrub with leaves of grayish

green may have been <sup>Tournefortia argentea</sup> ~~Messerschmidia argentea~~. A few dying plants

of this species occur today on North Island, but none were found

elsewhere in the atoll in March 1965. The ~~hau and coconut~~ <sup>those (Casuarina)</sup> trees

planted in 1923, as well as ~~the ironwood and coconut~~ trees planted

in 1928, and ironwoods planted by the Navy on Southeast in 1963,

have all died; no traces of ~~any~~ trees remains. There is no sign of

the camp mentioned by Dr. Wetmore, though there are still traces

of the brief stay of the mother-of-pearl oyster fisheries. Some

rotting timbers, rusty corrugated roofing, and a pile of oyster

shells are all that remain of the latter venture. It is possible

that the major vegetation change occurred in 1930 when George

Kaufman reported no live vegetation, only tall clumps of dead

bunchgrass, after a severe storm. The 1963 planting of ironwoods (Casuarina sp.)

was in violation of the <sup>regulations</sup> refuge, and those trees which had not

*Eragrostis?*

already died were removed in 1964. Woodside and Kramer report the introduction of foxtail grass (Setaria verticillata) in March 1961, and this species was reintroduced with the ironwoods in 1963, but does not seem to be taking hold on Southeast. The mustard, Brassica <sup>campestris</sup> ~~sp.~~, ~~has~~ <sup>appears to have</sup> spread considerably in the past two years, even though it ~~has~~ but one annual growing cycle. Areas colonized by this plant appear to be preferred nesting sites <sup>sp</sup> for the Laysan Albatross.

Humphrey Island: Listed on the hydrographic chart of Pearl and Hermes Reef for 1937 as a sand bar awash at high tide, this island has assumed permanent dimensions in recent years, and has been named for Dr. Philip S. Humphrey, Director of the ~~Central~~ Pacific Ocean Biological Survey Program. Though less than 200 feet wide it is presently about 1100 feet long in a north-south direction. The long low sand spit at its southern end appears to be extending itself southward and in a curve to the west. Three small, disconnected sand bars, presently just above high tide level, extend the length of the island another 500 feet. Six to eight hundred feet west of the island is another series of sand bars which has not quite broken the surface of the water, but observations ~~on this island~~ for over two years indicate that the area is building ~~fairly rapidly~~ at present. A central portion of the main island, about 400 feet long, rises six to ten feet above sea level, and supports a meager growth of Lepturus repens, Boerhavia diffusa, Small Meserschmidia argentea plants were found in June 1963 and Tribulus cistoides. Three species of seabirds have nested here in small numbers since at least 1963.

but had vanished by March 1965.

Townsendia  
argentea

much more probable correct epithet

of ~~the~~ <sup>acres</sup>

North Island: This polywog-shaped island lies in the north-eastern corner of the reef, approximately 10 miles from Southeast.

7 It and Humphrey Island constitute the only land within the reef not lying along the southern margin of the atoll. The body of the island is about 1000 feet long in a north-south direction, and 800 feet wide. ~~It has a narrow body of~~ The tail, stretching to the south, is another 1000 feet in length. The central, shorter portion of the tail is raised to a height of about five feet above sea level, and is composed primarily of coral rubble with small scattered Lepidium owahuense plants. The body of the island has a steep narrow beach on its east, north, and west sides, <sup>which widens and</sup> ~~and then runs~~ southward into the tail. <sup>extends</sup> The center of vegetated area of the body is primarily Sicyos hispidus, while the northern portion is chiefly Solanum nelsoni. The remainder of the vegetated area is a mixture of Solanum, Sicyos, Tribulus, Boerhavia, and Lepidium. The latter grows among the coral rubble which extends from the densely vegetated interior out to the beach strand. There is a patch of Eragrostis variabilis about 100 by 200 feet at the northeastern side of the island. Several stunted <sup>Tournefortia</sup> ~~Messerschmidia~~ argentea trees grow along the southwestern edge of the body, and out onto the base of the tail, but in March 1965 they all appeared to be <sup>nearly</sup> dead.

In March 1913, George Willett mentions that the island was "topped with a scanty growth of tough grasses". As North has very little bunchgrass at present, the vine-species now dominating the flora, it appears that this island has undergone the same type of change, as recorded for Southeast and Grass. ~~Unfortunately Dr.~~

????



~~Wetmore did not visit the northern islands in 1923.~~ There are some rotting timbers along the west side ~~of the body,~~ and a few pilings to the southeast of the island, which were probably left by the pearl oyster fisheries in the late 1920's.

Grass Island: Located midway along the southern reef, Grass is about 1800 feet long in an east-west direction, and only 400 feet wide at its widest point where a slight peninsula ~~juts~~ <sup>juts</sup> southward at the extreme western end, <sup>and has an area of \_\_\_\_\_ acres.</sup> The western end is presently being eroded by the sea so that there is a vertical drop of five feet from the vegetated area to the water. ~~there is no beach at~~ Only a portion of the western end, less than 700 feet long, in an east-west direction is vegetated. The dominant plant species is Solanum nelsoni, which grows in a dense mat to a height of about a foot in the central 400 feet of this area. Between the Solanum and open beach is a sparsely vegetated area containing Lepturus, Tribulus, Boerhavia and Solanum. Small plants of the first three species are scattered in the coral rubble of the western portion, but not on the beach sand. The rest of the island is composed of coarse to fine sand, with an area of coral rubble in the center of the eastern portion. A spur of reef rock curves westward off the eastern tip of the island.

In 1923 Dr. Wetmore, who named this island, recorded in his field notes, "It is about 450 yards long by 100 yards wide, 15 feet high, surrounded by a beach of coral sand." The crest of the island was covered with bunch grass <sup>and</sup> with a few of the shrubs recorded on Southeast Island. A direct comparison of photographs is possible

to evaluate the vegetative changes that have occurred. In April 1923 the island was dominated by Eragrostis variabilis, as its name <sup>implies</sup>? implies; in March 1965 the vegetated area was a lush mat of Solanum nelsoni with only a few scattered clumps of Eragrostis remaining at the western end. The change in vegetation has brought about a change in the nesting colony composition as well, for in April 1923 Fregata was not breeding on Grass, and in March 1965 there were 300 to 350 birds roosting on the island and 75 to 100 nests with eggs.

Seal Island: This islet <sup>extends</sup> runs roughly east and west, the distance along the axis being about 1400 feet. The islet is about 300 feet wide at its widest point, <sup>and approximately</sup> \_\_\_\_\_ acres in area. The eastern half is made up of coral rubble and sand, with rocky ledges and reef sections on the southern side. The entire area is broken by numerous tidal pools and cuts in the rock. The <sup>inter</sup>tidal zone on the northern side of this section is of fine sand, ~~which apparently changes shape frequently due to the action of wind and currents.~~ A fairly solid ledge of rock runs in a northeast-southwest direction across the eastern half. The western section has a wide, sandy beach on its south side, a narrow, coarse coral rubble beach on its north side, and a point at the western end, made of coarse coral rubble and sand, (which curves to the north.) Portions of the rocky ledge which originates on the eastern half extend across most of the western side, but do not connect with the beach.

An area of about 600 feet in the western half is raised to about six feet above sea level, this being the highest elevation of the island. This area, less than 150 feet wide, supports most

of the vegetation of the island. It contains a central portion of primarily Sicyos hispidus, Solanum nelsoni, and Eragrostis variabilis. Between this densely vegetated central core and the beach rubble is a transition zone of Tribulus cistoides, Boerhavia diffusa, Lepturus repens, and Eragrostis variabilis. Growth of the first three species extends to some extent out among the beach rubble. Coral rubble gradually blends with fine sand which continues into the intertidal zone. One clump of Achyranthes splendens grows at the eastern end of this raised vegetated area. Small plants of Sesuvium portulacastrum var. portulacastrum grow scattered on the rocky ledges of the eastern half.

In 1923, this island, also named by Dr. Wetmore, was "elongate, 100 yards long by 300 yards wide, rising 15 feet above high tide, with a beach of coral sand and a point of limestone rock in the east. The crest was covered with the bunch grass with much of the grayish leaved shrub."

Kittery Island; lying one-half to three-fourths of a mile northwest of Seal, Kittery is a low sand and coral rubble pancake with no vegetation. Its longest north-south and east-west axes are about 1100 feet. The island is roughly triangular in shape, except that the eastern side <sup>was</sup> ~~is indented by~~ a series of irregular and fluctuating <sup>indentations</sup> ~~contours~~ so that the southeastern corner of the triangle is more of a peninsula. Its shape has varied considerably in the few years that the survey has visited the atoll. The north-westerly beach is greatest in height, being about five feet above sea level, and the interior, southern, and eastern portions of the island are just barely above sea level. Tidal marks on the island indicate that

of about —  
acres

water from heavy seas is occasionally washed several hundred feet onto the island from all directions. This probably accounts for the lack of vegetation however. Both species of albatross and the Blue-faced Booby nest in small numbers on the island.

metric system?  
preferable

This island did not exist in 1923 when Dr. Wetmore visited the atoll, but is listed on the Hydrographic Office chart for 1937.

Bird, Sand and Planetree Islands: These islets, though relatively constant in position, are continually-changing sand spits located along the southern reef between Southeast and Grass Islands. They are nowhere wider than 100 feet, and vary in length, depending on winds and tide, from five to fifteen hundred feet in an east-west direction. They support no vegetation, but are occasionally used by nesting Black-footed Albatross and Blue-faced Booby, and as hauling grounds for seals.

the lack of vegetation?

The shifting, splitting, and reforming of sand spits along the southern reef probably accounts for the twelve islets reported for Pearl and Hermes Reef in 1858, though it is quite certain that the two reported by the U.S.S. Lackawanna in 1867 were an omission of the western islands of Seal and Grass named by Dr. Wetmore in 1923.

There is scanty information on the vegetation of Pearl and Hermes Reef prior to 1963. The Tanager Expedition collected some specimens in 1923. At this time the vegetation of Southeast Island was reported as consisting of six species. Eragrostis variabilis and Lepturus repens were distributed indiscriminately on the island. Sesuvium portulacastrum grew on the reef rock areas and in the muddy flats around the ponds at the eastern end of the island.

They  
used?

not clear  
handwritten notes

other  
islet too.

} not likely

Boerhavia diffusa was listed as present, but not abundant, and Tribulus cistoides as present. A few plants of Sicyos hispidus were found. Achyranthes splendens is not reported, nor is Scaevola. One seed each of Mucuna gigantea and M. urens were found on the beaches. In a 1926 paper<sup>by</sup> E. H. Bryan mentions two grasses, Sesuvium, Tribulus, and three herbs; this data is probably from the Tanager reports. Galtsoff (1933) identified two species of algae from the lagoon, Halimeda and Codium. The latter is frequently used as food by sea turtles. This paper also mentions that Casuarina and Cocos were planted on Southeast Island in 1928 and 1929, but that the latter were dead or dying by 1930. The next report of the vegetation of Pearl and Hermes was in 1961 when the Hawaiian Fish and Game Commission reported the introduction of Setaria verticillata on Southeast Island.

In 1963 the Survey recorded 17 species from Southeast Island. Both Tribulus and Boerhavia grew widely scattered over most of the island, and Solanum nelsoni occurred in scattered clumps, while Solanum nigrum grew only locally among the bunchgrass on the eastern portion. Small clumps of Sicyos hispidus were widespread, frequently in association with bunchgrass ~~(Erigeron)~~ <sup>which</sup> variabilis grew primarily around the ponds of the eastern portion and along the lagoon side of the western portion at the edge of the reef rock. Coronopus didymus was common west of the ponds, and on the western portion. Portulaca lutea grew among the bunchgrass west of the ponds, and on the western portion, and Sesuvium portulacastrum was abundant around the ponds and on the large reef

Both Scaevola  
and Achyranthes  
had been collected

rock shelf south of the western portion. One stand of Cynodon dactylon, measuring about 20 by 50 feet, occurred west of the ponds. There were many scattered patches of Lepturus repens, chiefly closer to the beach than ~~the bunchgrass~~, and one clump of Setaria verticillata was found among the bunchgrass. Lepidium oahuense was abundant on the western portion. A few stunted Scaevola taccada bushes grew around the southern edges of the eastern portion, Allium plants growing in a garbage heap were destroyed, and one introduced plant of Borichus <sup>oleraceus</sup> was noted. The most significant floral change since 1961 was the introduction of Brassica campestris which now dominated a large portion of the western end of the eastern portion.

There is less information on the remaining islets in the atoll.

~~There were sandspits reported between Southeast and Grass in 1923;~~

There were sandspits reported between Southeast and Grass in 1923; several still existed there in 1963, but had no vegetation. The

sand bar awash at high tide reported south of North Island on the

1937 charts had several clumps of <sup>Lepturus</sup> ~~Eragrostis~~ on it and an elevation

of five to six feet above sea level in 1963. An additional sand-  
~~found south~~, but by March 1965 one had vanished. <sup>March In June four species were</sup>

spit between Bird and Sand was named Planetree by the Coast Guard buoy tender of that name while on a visit in 1964.

Bryan lists eleven species for North Island in 1923, and

Christopherson and Caum state that Capparis sandwichiana and

Achyranthes splendens were present in that year. In 1963 its

vegetation was similar to that of Southeast, but no detailed list

was made.

why not — ? A list was made and notes  
 in 1964!

The vegetation of Grass Island, in 1923, was dominated by Eragrostis variabilis which was restricted to the central parts of the island. Lepturus repens grew in a fringe around this, and two plants of Achyranthes splendens were found. Boerhavia and Tribulus were present, but not abundant, and Lepidium owahense, though present, was rare. A few small Scaevola bushes were present, and Solanum nelsoni (~~= laysanense~~) was present though not abundant. By the time Grass was revisited in 1963 the interior had become a dense mat of Solanum nelsoni. Lepturus formed a thick cover on the west end of the vegetated area, Lepidium was found along the southern side of the island, and Solanum nigrum was common. Twenty to thirty clumps of Eragrostis were found, and Boerhavia and Tribulus were widespread. Scattered clumps of Setaria verticillata were noted. There were no longer any plants of Scaevola or Achyranthes. In 1965 the Setaria was not found, and the number of Eragrostis clumps had been reduced to 14.

In 1923 ~~Seal Island had 11~~<sup>eleven</sup> species of plants recorded, Both Eragrostis and Lepturus were distributed indiscriminately, and Achyranthes was common. Boerhavia and Tribulus were present. Large flourishing plants of Sicyos hispidus grew on the eastern half of the high end, and Solanum nelsoni was present though not abundant. Lepidium, though present, was rare, Sesuvium portulacastrum was common on the raised reef and low wet flats of the eastern portion, and Capparis sandwichiana was scattered over much of the island except for beach and reef portions. A few small Scaevola bushes were present. The same ~~11~~<sup>eleven</sup> species were present when the for Seal Island.

*How much of the island was surveyed?*

island was surveyed in 1963. Only one clump of Capparis and one Scaevola bush were found. Tribulus and Boerhavia were widespread, and Lepidium common in the transition zone from bunchgrass to beach. There were 40 to 50 clumps of Eragrostis, and Lepturus was common. Solanum nelsoni was also common, and Sicyos was present. Sesuvium still occurred on the rocky and wet areas of the eastern portion. About five plants of Achyranthes were noted.

Kittery Island was not present when the Tanager Expedition visited the atoll in 1923, but appears on the nautical charts for 1937. The first reference to the island is by Survey personnel, and it has had no vegetation since at least 1963.

*new topic*

Pearl and Hermes Reef has been visited by scientific personnel 14 times, beginning with George Willett's stop on North Island in 1913. Elschner (1915) made geological observations, Pietschmann (1930, '32, '38) ~~made~~ marine observations, Galtsoff (1933) hydrographic and marine observations, and the Vanderbilt Expedition <sup>in 1951</sup> ~~(1951)~~ collected fish. Thus prior to the first Survey visit in early 1963 the only ornithological observations <sup>at the atoll</sup> ~~of any consequence~~ had been made by Willett on North only, <sup>Dr. Alexander Wetmore</sup> ~~the Tanager Expedition~~ on Southeast, Seal and Grass in 1923, <sup>and</sup> Woodside and Kramer, who spent an hour and a half on Southeast in March 1961.

Survey personnel have visited the atoll seven times since early 1963, and there are population estimates and breeding biology notes from each of these trips. In the following species accounts reference for population estimates and notes will be given by <sup>month and year</sup> ~~date~~ only, and the reader is referred to Table I for the exact dates





and personnel making each survey. To simplify the text ~~omit~~ <sup>population structure</sup>  
counts for each <sup>islet</sup> ~~island~~ have been omitted, <sup>where deemed unnecessary</sup> and are to be found in  
Tables IV a, b, c, d, e, f, g. In addition, unless a figure is  
stated to be an actual count, all population figures are estimates.

June 4 - 28

F. Sibley  
B. Amerson

### Pearl and Hermes Reef

All six islands which support breeding populations of birds were visited. Camps were set up on Southeast Island, North Island, and Grass Island for various lengths of time. No landing made on Bird Island or Sand Island but these were viewed at close range. A large, sparsely vegetated, island just south of North Island has been designated as South North Island in the report. It is shown on H. O. Chart 4175 as sand awash at high water.

Complete plant collections were made from all islands. Not all of these have been identified but Table 4 gives the distribution in the atoll with unknown plants being designated by number. There is no vegetation on Bird, Sand, or Kittery Islands. South North Island is sparsely vegetated. Southeast, North Seal, and Grass Islands have a good cover of plants.

7428 individuals of 14 species were banded on six islands in the atoll. Table 5 gives a breakdown of this information by species and island.

Estimates were made of the birds on all islands and counts were made of nest and eggs where possible. Bird Island and Sand Island serve only as roosting sites for Common Noddies and Boobies. Table 6 presents this information by species and island.

Turtles were present on all islands, but there was no evidence of egg laying.

Seals were present on all islands and most common on North Island and South North Island. Young seals were seen only on these last two islands. Seal tags recovered indicated considerable movement of seals within the atoll.

A mortality rate of about 1 % per day was observed on Southeast Island among Laysan Albatross young. No mortality was observed on North Island or Grass Island which also have large populations of Albatrosses. The major mortality factor in the Black-footed Albatross population was sharks. Almost any bird sitting on the water for more than 5 minutes would be eaten.

T A B L E 4

## Vegetation of Pearl and Hermes Reef

	South- east	South North	North	Seal	Grass
<u>Tribulus cistoides</u>	X	X	X	X	X
Unidentified crucifer #2	X				
<u>Boerhaavia diffusa</u>	X	X	X	X	X
<u>Solanum nelsonii</u>	X		X	X	X
<u>Eragrostis variabilis</u>	X		X	X	X
<u>Lepturus repens</u>	X	X		X	X
<u>Sicyos hispidus</u>	X			X	
<u>Sesuvium portulacastrum</u>	X				
Plant 8--lettuce like	X				
Unidentified portulaca #9	X				
<u>Cynodon dactylon</u>	X				
Plant 11--nightshade	X				
<u>Setaria verticillata</u>	X				X
<u>Scaevola frutescens</u>	X		X	X	
<u>Lepidium owaihiense</u>	X		X	X	X
<u>Sonchus</u> sp?	X				
<u>Achyranthes splendens</u>			X	X	
<u>Messerschmidia argentea</u>		X	X		
<u>Capparis spinosa</u>				X	

Pearl & Hermes Reef!

## Vegetation

The vegetation of Pearl and Hermes was first reported by Christophersen and Caum (1931), who discussed the eleven species of vascular plants found growing on the islands by the Tanager Expedition in April 1923, and the two species represented by seeds found in beach litter. Galtsoff collected some specimens in 1930.

The previously mentioned photographs by Frear, Wetmore, and Galtsoff make it possible to reconstruct, albeit sketchily, the vegetative history of the atoll in the present century.

Personnel of the POBSP have collected vascular plant specimens, and taken notes and photographs, on most visits to the atoll. The islands and their major floral associations were mapped in March 1965. Specimens have been collected by Dr. Charles H. Lamoureux and C. Robert Long of the University of Hawaii, POBSP cooperators in botany, who prepared the annotated list of species in this section. Plant specimens from Pearl and Hermes collected by the POBSP and its cooperators may be found in the United States National Museum (USNM), by Bishop Museum (BISH), and the herbarium of the University of Hawaii (UH).

## Vascular Plants

Twenty-one species of vascular plants, representing 15 families, have been recorded from Pearl and Hermes Reef. The following discussion of the flora, by island, is based on all previous botanical accounts, as well as the data of the POBSP. Wherever plant associations are discussed the species are listed in the order of decreasing abundance.

## Gramineae

Cynodon dactylon (L.) Pers. Specimens only from Southeast Island.

Lamoureux s.n. (UH); Sibley 10 (USNM); Young 115 (UH).

Eragrostis variabilis (Gaud.) Steud. Specimens from Southeast, Grass

and North islands. Caum 38, 45, (BISH); Lamoureux s.n. (UH);

Sibley 5 (USNM); Young 105, 122 (UH); Long 2272, 2285, 2313 (UH).

Lepturus repens (Frost.) R. Br. Specimens from Grass, Humphrey, North

and Southeast islands. Caum 39, 46 (BISH) as L. repens var. subulatus

Fosb.; Lamoureux s.n. (UH); Young 110, 128 (UH); Long 2270 (appears

to be var. subulatus Fosb.), 2273, 2274, 2277, 2279, 2292, 2293, 2302,

2311, 2312 (UH).

Setaria verticellata (L.) Beauv. Specimens only from Southeast Island

Lamoureux s.n. (BISH); Sibley 12 (USNM); Young 109 (UH); Long 2269 (UH).

## Casuarinaceae

Casuarina equisetifolia L. Specimen only from Southeast Island. Young

120 (UH).

## Amaranthaceae

Achyranthes splendens var. reflexa Hbd. Specimens from Grass and North

Islands. Caum 50 (BISH); Wilder 3 (BISH); Lamoureux s.n. (UH); Long

2298 (UH).

## Nyctaginaceae

Boerhavia diffusa L. Specimens from Southeast, Grass, North and Humphrey islands. Caum 40, 41, 47, 48 (BISH); Galtsoff s.n. (USNM); Lamoureux s.n. (UH); Sibley 3 (USNM); Young 98, 130 (UH); Long 2271, 2291, 2295, 2306, 2307, 2310 (UH).

## Aizoaceae

Sesuvium portulacastrum L. Specimens from Southeast and Seal Islands. Caum 43, 55 (BISH); Galtsoff s.n. (USNM); Sibley 7 (USNM); Lamoureux s.n. (UH); Young 100, 103 (UH); Long 2276 (UH).

## Portulacaceae

Portulaca lutea Sol. Specimens from Southeast and North islands. Sibley 9 (USNM); Young 104, 108, 123 (UH); Long 2283 (UH).

## Capparidaceae

Capparis spinosa var. marina (Jacq.) K. Sch. Specimens only from Seal Island. Wilder 2 (BISH); as C. sandwichiana DC.; Caum 54 (BISH) as C. sandwichiana DC.; Lamoureux s.n. (UH) as C. sandwichiana DC.

## Cruciferae

Brassica campestris L. Specimens from only Southeast Island. Sibley 2 (USNM); Young 106, 107, 111, 116 (UH).

Coronopus didymus (L.) J. E. Smith. Specimen only from Southeast Island. Sibley 8 (USNM).

Lepidium o-waihiense C. and S., Specimens from Southeast, Grass and North islands. Caum 51 (BISH); Lamoureux s.n. (UH); Sibley 14 (USNM); Young 99, 124 (UH); Long 2286, 2289, 2299 (UH).



## Zygophyllaceae

Tribulus cistoides L. Specimens from Grass, Seal, Southeast, North and Humphrey islands. Caum 44 (BISH); Wilder 1 (BISH); Lamoureux s. n. (UH); Sibley 1 (USNM); Young 102, 126 (UH); Long 2268, 2282, 2296, 2305 (UH).

## Malvaceae

Malvastrum coromandelianum (L.) Garcke Specimen only from Southeast Island. Young 114 (UH).

## Boraginaceae

Tournefortia argentea L. f. Specimens from Grass, North and Humphrey islands. Young 118, 129 (UH); Long 2297, 2300 (UH).

## Solanaceae

Solanum nelsoni Dunal Specimens from Grass, Southeast and North islands. Caum 49 (BISH); Wilder 5 (BISH); Lamoureux s.n. (UH); Sibley 4 (USNM); Young 101, 125 (UH); Long 2275, 2301 (UH).

Solanum nigrum L. Specimens only from Southeast Island. Sibley 11 (USNM); Young 112 (UH).

## Cucurbitaceae

Sicyos hispidus Hbd. Specimens from Southeast, Seal and North islands. Caum 42, 53 (BISH); Wilder 4 (BISH); Lamoureux s.n. (UH); Sibley 6 (USNM) as Cucumis sativus L.; Young 119, 117, 121 (UH), probably S. hispidus; Long 2280, 2303 (UH) probably S. hispidus.

## Goodeniaceae

Scaevola taccada (Gaertn.) Roxb. Specimens from Southeast, North and Grass islands. Caum 52 (BISH); Galtsoff s.n. (USNM); Lamoureux s. n. (UH); Young 97, 127 (UH); Long 2265, 2281, 2287, 2304 (UH).

## Compositae

Sonchus oleraceus L. Specimens only from Southeast Island. Young 113 (UH);

Long 2290 (UH).

Southeast Island (Figure V)

The flora is presently [1965] dominated by ten species, two of which are introduced. Seventeen species have been found by the POBSP. One of these, an onion (Allium sp.) growing on the refuse heap, was eradicated by the POBSP in March 1963.

The central portion of the western section has a sparse flora of Solanum nelsoni, Coronopus didymus, Boerhavia diffusa, Tribulus cistoides, and Lepidium o-waihiense. Several clumps of Eragrostis variabilis grow to a height of about three feet near the center of this area.

The ledge of reef rock extending southeastward from the western section has a large patch of Sesuvium portulacastrum in its interior.

A patch of Sesuvium also grows on the reef rock extension at the southwestern corner of the eastern section.

The area in and adjacent to the tidal pools in the eastern half of the eastern section is dominated by a lush growth of Sesuvium. West of these pools is a large area dominated by Coronopus. A large patch of E. variabilis and a smaller one of Cynodon dactylon, presumably introduced, grow adjacent to each other in the center of the Coronopus area. A few plants of Sonchus oleraceus and Solanum nigrum grow among the Cynodon and Coronopus.

Surrounding the Coronopus area on the north and west is a steadily expanding area dominated by an introduced mustard, Brassica campestris. The area also has some Cynodon and some Sicyos hispidus. From this central, heavily-vegetated area out to the beaches is a relatively open coral sand and rubble region with patches of S. nelsoni, Tribulus, Boerhavia, and Sicyos. The extent of these patches varies with location and season. S. nelsoni is especially dominant on the southern side and Tribulus on the north. Tribulus and Sicyos are mixed with the S. nelsoni on the southern two-thirds, and Tribulus and Boerhavia are mixed with the S. nelsoni on the northwestern side. A northern area dominated

by Tribulus has one patch of pure Sicyos and a larger patch of E. variabilis. A second clump of this grass grows further east in the S. nelsoni-Tribulus-Sicyos association. Several very stunted Scaevola taccada bushes grow along the margin between the vegetated area and the beach on the southwestern and southern sides of the eastern section.

Other plant species recorded in small numbers for this island are Setaria verticillata, evidently introduced in 1961 (Woodside and Kramer, 1961); Lepturus repens; Casuarina equisetifolia, introduced in 1963 and now [1965] mostly dead; and Portulaca lutea.

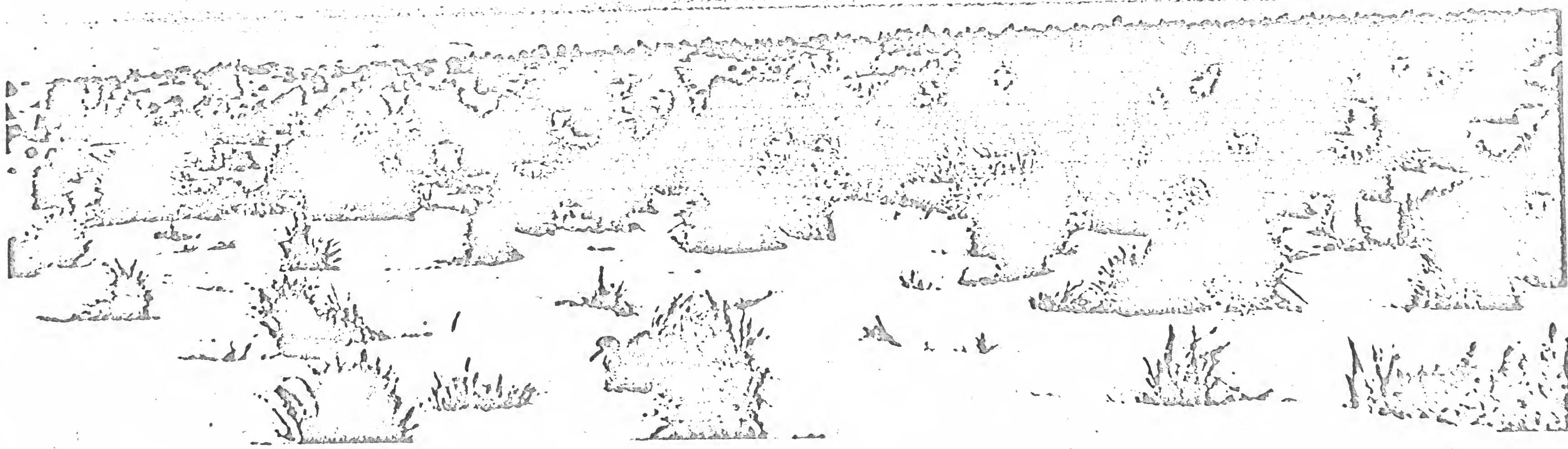
The photographs of W. F. Frear, <sup>Plate I</sup> taken in December 1912, indicate that the island was chiefly tall bunchgrass, presumably E. variabilis. Eleven years later, in April 1923, the photographs of Alexander Wetmore show the island to have a moderate, open cover of E. variabilis. <sup>Plate II</sup> Sesuvium grew abundantly on the large reef rock ledge. <sup>Plate III</sup> The Tanager Expedition collected six species on Southeast Island (Christophersen and Caum, op. cit.). E. variabilis and Lepturus were distributed indiscriminately on the island. Sesuvium grew on the reef rock areas and in the muddy flats around the ponds at the eastern end of the island. Boerhavia was present, but not abundant, and Tribulus was present. Sicyos was represented by a few plants. One seed each of Mucuna gigantea and M. urens were found on the beaches.

In May 1923 the Tanager Expedition planted hau, Paritium tiliaceum, and palm, Pritchardia pacifica, trees on Southeast Island (Gregory, op. cit. and Wetmore, op. cit.), and scattered seeds. Though no record remains of what seeds were scattered, Dr. Wetmore has a list of the species given the expedition by the Territory of Hawaii of the Department of Agriculture for planting on the Reservation to replace vegetation destroyed by rabbits. With the exception of Scaevola none of the species on this list are presently [1965] growing on Southeast Island.



Plate I

Southeast Island, Pearl and Hermes Reef, December 1912, Walter F. Frear, courtesy of Virginia Frear Wild



Southeast Island, Pearl and Hermes Reef, 26 April 1923, Alexander Wetmore

Location

Bomb return - Mon wa - Enbarbury to Tongareva

Observer

Date

Time

to

Weather

Audubon's dusky Shearwater???

? Don't

SPECIES	Abundance				Breeding			Remarks
	1-10	10-100	100-1000	1000 +	Nests	Eggs	Young	
Laysan Albatross								
Black-footed Albatross								
* Wedge-tailed Shearwater	✓							
Christmas I. Shearwater	✓			N				
* Audubon's Shearwater	✓							
Bonin I. Petrel								
* Phoenix I. Petrel	X							Ponagh,
Bulwer's Petrel								
Sooty Petrel								
* Red-tailed Tropicbird	✓							
White-tailed Tropicbird								
X Masked Booby	✓							
X Brown Booby	✓							
* Red-footed Booby	✓							
X Great Frigatebird	✓							
Golden Plover	✓							
Ruddy Turnstone	✓			N				
Wandering Tattler	✓			N				
Sanderling	✓			N				
Bristle-thighed Curlew	✓			<del>N</del>				
X Sooty Tern	✓							
* Gray-backed Tern	✓							
Brown-winged Tern								
X Common Noddy	✓							
X Hawaiian Noddy	✓							
Blue-gray Noddy	✓							
* Don't Fairy Tern	✓							
* Lesser Frigate	✓			<del>N</del>				
sharp-tailed	✓			<del>N</del>				
Crested Tern	✓			N				



Southeast Island, Pearl and Hermes Reef, 26 April 1923, Alexander Wetmore

Plate III

31c



Photographs taken by Dr. Galtsoff in 1930 show that the eastern section was very nearly solid E. variabilis, with some areas of Lepturus and Boerhavia.<sup>Plate IV</sup> A photograph of the buildings<sup>Plate V</sup> of the pearl fisheries venture shows a Casuarina about five feet tall, many plants of Sonchus, and an unidentifiable composite which is apparently no longer present.<sup>Plate VI</sup> One view of the western section shows a flora of scattered Boerhavia and very sparse Lepturus. Galtsoff (op. cit.) identified two species of algae from the lagoon, Halimeda and Codium. The latter is frequently used as food by sea turtles. He also mentions the planting of Casuarina and Cocos sp. in 1928, but further states that they were all dead or dying by 1930.

Jones (unpub. manu., 1956) reported that the predominant noncalcareous algae noted at Pearl and Hermes in the summer of 1956 were Sargassum sp., which grew in clumps in eight to fifteen feet of water within the lagoon. The genus was not found on the reefs or rocks intertidally. A related genus, Turbinaria sp., was found on the reef flats. He notes that "the occurrence of these two members of the Sargassaceae at Pearl and Hermes is somewhat surprising inasmuch as this family is generally considered to be absent on atolls". Occasional specimens of Halimeda were seen, and large patches of blue-green algae on the sands areas within the lagoon were identified as probably Lyngbya sp.

Woodside and Kramer (op. cit.) reported finding the introduction of Setaria verticillata on Southeast Island in March 1961. Ironwood (Casuarina) trees were planted on Southeast Island by the U. S. Navy sometime in 1963. As this planting was in violation of refuge regulations all trees which were not already dead were destroyed in 1964. Setaria was reintroduced with the ironwoods in 1963.

A significant change has occurred in the flora of Southeast Island since it was first described in 1923 and 1930. E. variabilis has been reduced from

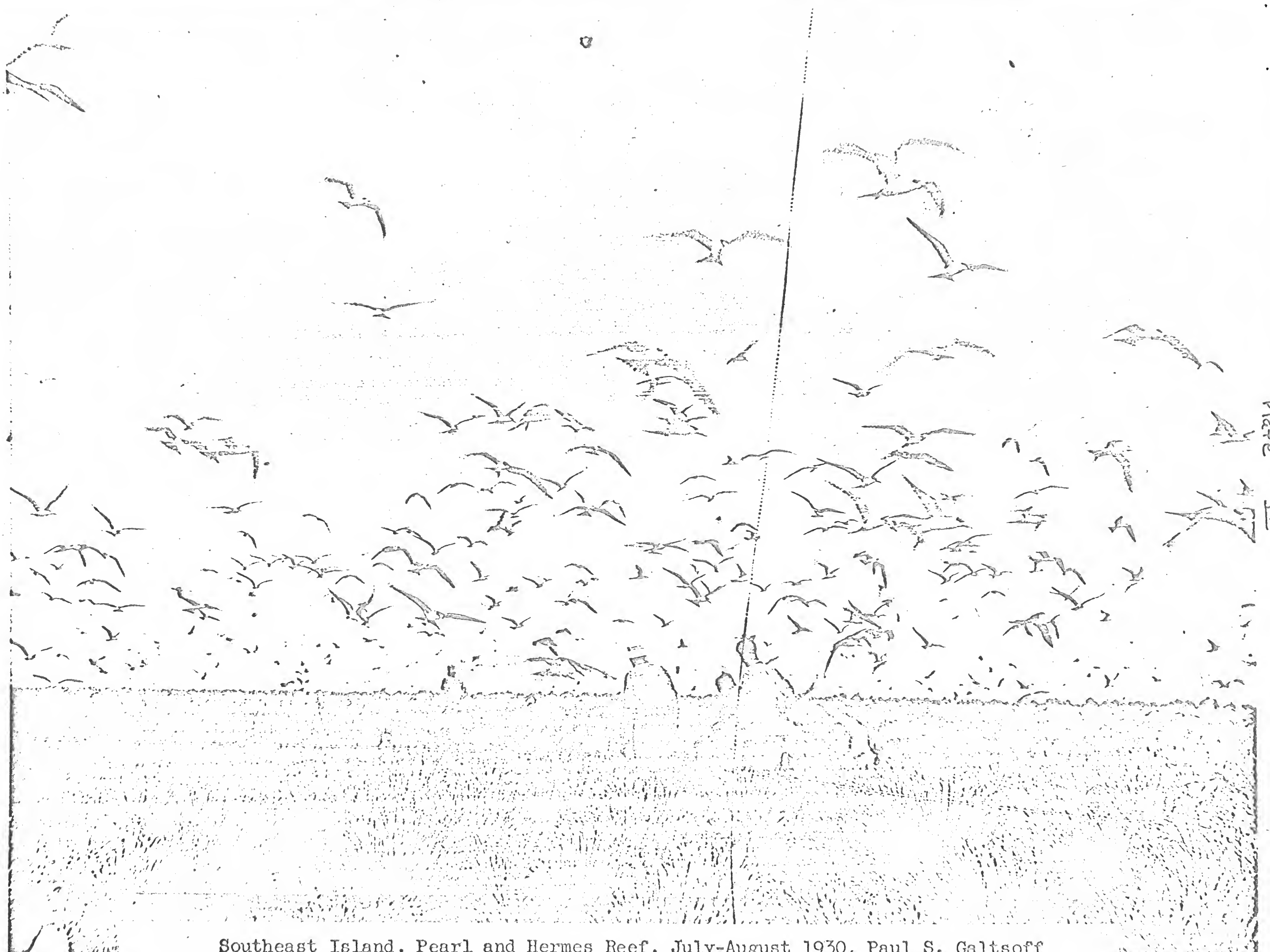


Plate IV

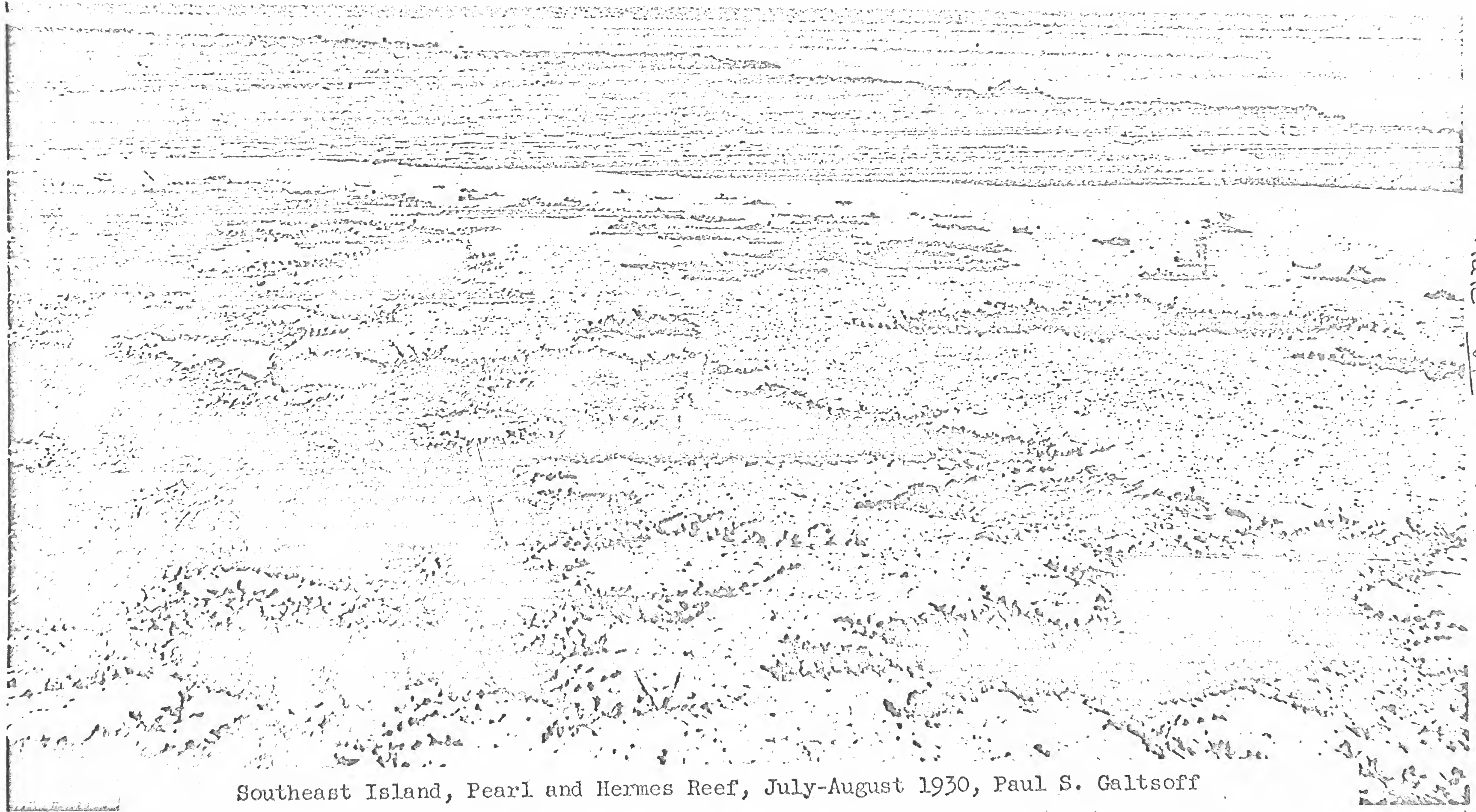
Southeast Island, Pearl and Hermes Reef, July-August 1930, Paul S. Galtsoff



Southeast Island, Pearl and Hermes Reef, July-August 1930, Paul S. Galtsoff

Plate VI

32 b



Southeast Island, Pearl and Hermes Reef, July-August 1930, Paul S. Galtsoff

Plate VI

32

the status of a major plant cover to one of insignificance. Only a few isolated clumps remain on the eastern section, which in 1930 was nearly solid grass. It is possible that the major vegetation change occurred in late 1930 when George Kaufman reported no live vegetation, only tall clumps of dead bunchgrass, after a severe storm (Munro, 1945). As information on plant succession in the Leewards is very limited it is not known whether the floral change observed, from grasses to herbs and vines, is a result of natural succession or caused by some edaphic catastrophe.

## North Island (Figure VI)

The center of the body of the island is dominated by a lush growth of Sicyos hispidus. Some Boerhavia diffusa and Tribulus cistoides also grows in this area. At the northern perimeter of the body is a nearly solid growth of Solanum nelsoni. East of this growth is an area of mixed Tribulus, Boerhavia, and S. nelsoni. At the northeast corner of the island is a nearly pure stand of Eragrostis variabilis about 100 by 200 feet. The remainder of the vegetated area is a sparse mixture of Lepidium o-waihiense, S. nelsoni, Sicyos, Tribulus, and Boerhavia, except for a nearly pure stand of Lepidium along the western side. Plant density decreases from the interior to the beaches, and Lepidium is the last species to be found in the coral rubble closest to the beaches and extending part way south on the tail. Several stunted and nearly dead Tournefortia argentea bushes were found along the southwestern edge of the body in March 1965.

In March 1913 Willett (Bailey, op. cit.) stated that the island was "topped with a scanty growth of tough grasses". Christophersen and Caum (op. cit.) report that the Tanager Expedition collected Achyranthes splendens, Capparis sandwichiana, [= spinosa], and Tribulus on North Island in 1923. No plant species can be identified in the single photograph of North Island by Galtsoff in 1930. <sup>Plate VII</sup>

As the island has only one patch of grass at present [1965], with several species of vines dominating the flora, it appears that this island has undergone the same type of successional changes as recorded for Southeast and Grass islands.



North Island, Pearl and Hermes Reef, July-August 1930, Paul S. Galtsoff

Plate VII

34 a

Humphrey Island (Figure VII)

The raised central portion of the island, about 400 feet long north to south, presently [1965] supports a meager growth of one grass and two herbaceous vines. Lepturus repens is represented by several clumps, small seedlings of Boerhavia diffusa were found, and also a few sprigs of Tribulus cistoides. Small Tournefortia argentea plants were found on the island in June 1963, but were not found in March 1965.



## Grass Island (Figure VIII)

Only a portion of the western end of the island is vegetated. The interior of this vegetated portion is a dense patch of Solanum nelsoni about 400 feet long east to west, and 100 feet wide. It grows to a height of a foot. Between the Solanum and the sandy beach is a sparsely vegetated area of Lepturus repens, Tribulus cistoides, Boerhavia diffusa, and S. nelsoni. About a dozen clumps of Eragrostis variabilis grow among the Solanum.

In April 1923 a photograph by Dr. Wetmore shows that the island was virtually solid E. variabilis.<sup>Plate VIII</sup> He (Wetmore, op. cit.) noted that "the crest of the island was covered with bunch grass with a few of the shrubs recorded on Southeast Island". Eight species were recorded from the island (Christophersen and Caum, op. cit.). The flora was dominated by E. variabilis, which was restricted to the central parts of the island. Lepturus grew in a fringe around the variabilis. Two plants of Achyranthes splendens were found. Boerhavia and Tribulus were present, but not abundant, and Lepidium o-waihiense was rare. A few small Scaevola taccada bushes were present. Solanum laysanense [= nelsoni] was present though not abundant.

By the time Grass was revisited in 1963 the interior had become a dense mat of Solanum nelsoni. Lepturus formed a thick cover on the west end of the vegetated area, Lepidium was found along the southern side of the island, and Solanum nigrum was common. Twenty to thirty clumps of Eragrostis were found, and Boerhavia and Tribulus were widespread. Scattered clumps of Setaria verticellata were noted. There were no longer any plants of Scaevola or Achyranthes. In 1965 the Setaria was not found, and the number of Eragrostis clumps had been reduced to 14.

The change in vegetation, from grasses to herbaceous vines, is thus well-documented for Grass Island also. The vegetation change has brought about a

Grass Island, Pearl and Hermes Reef, 27 April 1923, Alexander Wetmore

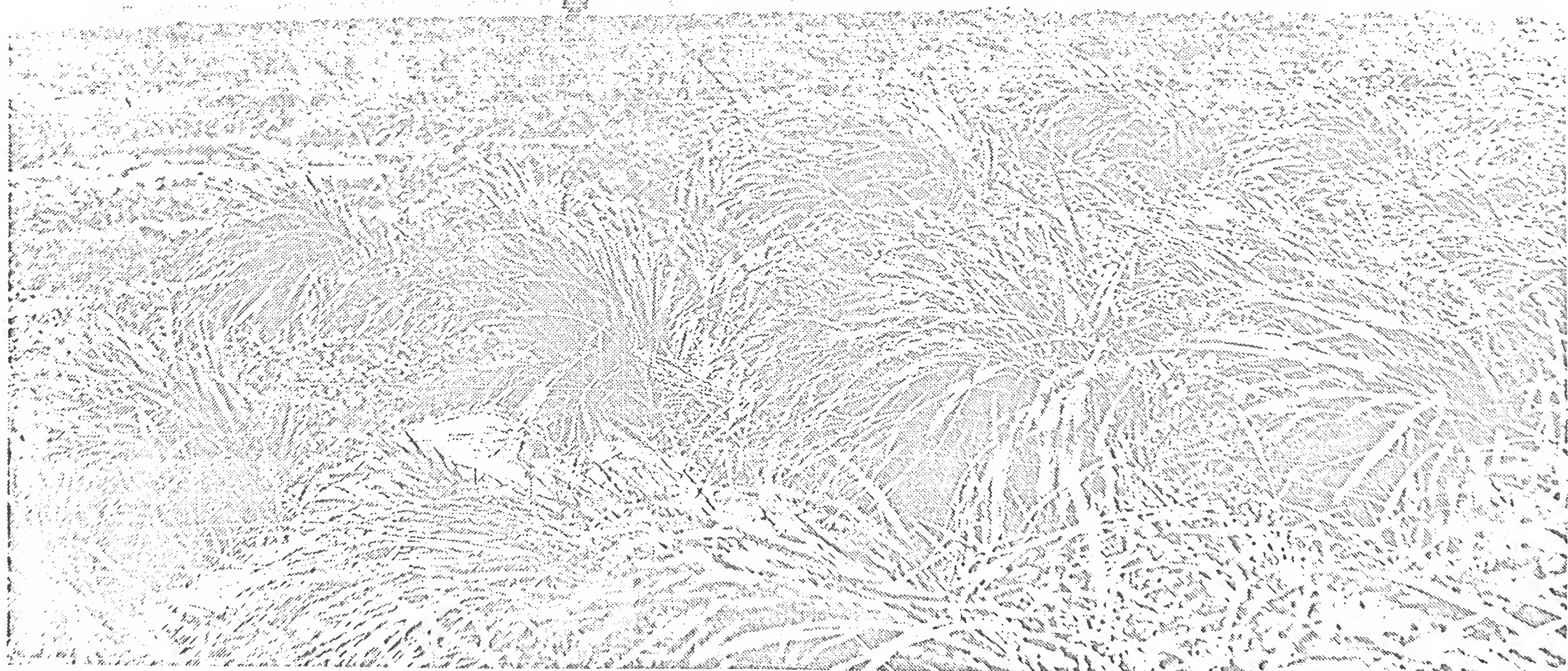


Plate VIII

30 a

change in the nesting colony composition as well. In April 1923 the Great Frigatebird (Fregata minor) was not breeding on Grass Island (Wetmore, op. cit.) In March 1965 there were 300 to 350 birds roosting in the Solanum, and 75 to 100 nests with eggs.

## Seal Island (Figure IX)

The central portion of the western half of the island, about 600 feet east to west and 150 feet wide, contains most of the vegetation of the island. The interior of this vegetated area is primarily Sicyos hispidus, Solanum nelsoni, and Eragrostis variabilis. Between the densely vegetated area and the beach is a transition zone of Tribulus cistoides, Boerhavia diffusa, Lepturus repens, and E. variabilis. Growth of all but the variabilis extends to some extent out among the beach rubble. One clump of Achyranthes splendens grows at the eastern border of this vegetated area. Small Sesuvium portulacastrum plants are scattered on the rocky ledges of the eastern half.

In April 1923 Dr. Wetmore (op. cit.) noted that: "the crest was covered with the bunch grass with much of the grayish leaved shrub"<sup>Plate IX</sup>. Christophersen and Caum (op. cit.) found eleven species on the island in 1923. E. variabilis and Lepturus were distributed indiscriminately, and Achyranthes was common. Boerhavia and Tribulus were present. Large flourishing plants of Sicyos grew on the eastern half of the western section. S. nelsoni was present, though not abundant. Lepidium o-waihiense was rare. Sesuvium grew on the raised reef and low wet flats of the eastern portion.<sup>Plate X</sup> Capparis sandwichiana [= spinosa] was scattered over much of the island except for beach and reef. A few small Scaevola taccada bushes were present.

The same eleven species were present when the island was surveyed in 1963. Only one clump of Capparis and one Scaevola bush were found. Tribulus and Boerhavia were widespread, and Lepidium was common in the transition zone from bunchgrass to beach. There were 40 to 50 clumps of Eragrostis, and Lepturus was common. Solanum nelsoni was also common, and Sicyos was present. Sesuvium still occurred on the rocky and wet areas of the eastern portion. About five plants of Achyranthes were noted.



Seal Island, Pearl and Hermes Reef, 27 April 1923, Alexander Wetmore

Plate IX



Seal Island, Pearl and Hermes Reef, 27 April 1923, Alexander Wetmore

Plate X

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The POBSP has not found any plants on Kittery, Bird, Sand or Planetree islands on visits to Pearl and Hermes since February 1963. These islands are not mentioned in earlier reports on the atoll (Wetmore, op. cit.; Galtsoff, op. cit.).

Vascular Plants recorded from Pearl and Hermes Reef

by C. R. Long and C. H. Lamoureux

Gramineae

Diodon dactylon (L.) Pers.

Lamoureux s.n. (UH), Sibley 10 (USNM), Young 115 (UH).

Eragrostis variabilis (Gaud.) Steud.

Caum 38, 45 (BISH), Lamoureux s.n. (UH), Sibley 5 (USNM), Young 105, 122 (UH), Long 2272, 2285, 2313 (UH).

Lepturus repens (Frost.) R. Br.

Caum 39, 46 (BISH) as L. repens var. subulatus Fosb., Lamoureux s.n. (UH), Young 110, 128 (UH), Long 2270 (appears to be var. subulatus Fosb), 2273, 2274, 2277, 2279, 2292, 2293, 2302, 2311, 2312 (UH).

Setaria verticellata (L.) Beauv.

Lamoureux s.n. (BISH), Sibley 12 (USNM), Young 109 (UH), Long 2269 (UH).

Casuarinaceae

Casuarina equisetifolia L.

Young 120 (UH).

Amaranthaceae

Achyranthes splendens var. reflexa Hbd.

Caum 50 (BISH), Wilder 3 (BISH), Lamoureux s.n. (UH), Long 2298 (UH).

Nyctaginaceae

Boerhavia diffusa L.

Caum 40, 41, 47, 48 (BISH), Galtsoff s.n. (USNM), Lamoureux s.n. (UH), Sibley 3 (USNM), Young 98, 130 (UH), Long 2291, 2295, 2306, 2307, 2310, 2271 (UH).

Aizoaceae

Sesuvium portulacastrum L.

Caum 43, 55 (BISH), Galtsoff s.n. (USNM), Sibley 7 (USNM), Lamoureux s.n. (UH), Young 100, 103 (UH), Long 2276 (UH).



## Portulacaceae

Portulaca cleracea L.

Sibley 9 (USNM), Young 104, 108, 123 (UH), Long 2283 (UH).

## Capparidaceae

Capparis spinesa var. marina (Jacq.) K. Sch.Wilder 2 (BISH) as C. sandwichiana DC., Caum 54 (BISH) as C. sandwichiana DC., Lamoureux s.n. (UH) as C. sandwichiana DC.

## Cruciferae

Brassica campestris L.

Sibley 2 (USNM), Young 106, 107, 111, 116 (UH).

Coronopus didymus (L.) J. E. Smith

Sibley 8 (USNM).

Lepidium o-waihiense C. and S.

Caum 51 (BISH), Lamoureux s.n. (UH), Sibley 14 (USNM), Young 99, 124 (UH), Long 2286, 2289, 2299 (UH).

## Zygophyllaceae

Tribulus cistoides L.

Caum 44 (BISH), Wilder 1 (BISH), Lamoureux s.n. (UH), Sibley 1 (USNM), Young 102, 126 (UH), Long 2268, 2282, 2296, 2305 (UH).

## Malvaceae

Malvastrum coromandelianum (L.) Garcke

Young 114 (UH).

## Boraginaceae

Tournefortia argentea L. f.

Young 118, 129 (UH), Long 2297, 2300 (UH).

## Solanaceae

Solanum nelsoni Dunal

Caum 49 (BISH), Wilder 5 (BISH), Lamoureux s.n. (UH), Sibley 4 (USNM), Young 101, 125 (UH), Long 2275, 2301 (UH).

Solanum nigrum L.

Sibley 11 (USNM), Young 112 (UH).

Cucurbitaceae

Sicyos hispidus Hbd.

Caum 42, 53 (BISH), Wilder 4 (BISH), Lamoureux s.n. (UH), Sibley 6 (USNM) as Cucumis sativus L., Young 119, 117, 121 (UH), probably S. hispidus, Long 2280, 2303 (UH) probably S. hispidus.

Goodeniaceae

Scaevola taccada (Gaertn.) Roxb.

Caum 52 (BISH), Galtsoff s.n. (USNM), Lamoureux s.n. (UH), Young 97, 127 (UH), Long 2265, 2281, 2287, 2304 (UH).

Compositae

Sonchus oleraceus L.

Young 113 (UH), Long 2290 (UH).

McBees checked by Church,  
list apparently complete.

Vascular plants recorded from McKean Island

by C. R. Long

Gramineae

*Digitaria pacifica* Stapf.

C. R. Long 2031, 2032, 2045, 2048, 2426 (UH).

*Lepturus repens* (Forst.) R. Br.

C. R. Long 2027, 2031, 2032, 2042, 2047, 2432 (UH).

Nyctaginaceae

*Boerhavia* sp.

C. R. Long 2028, 2030, 2034, 2037, 2041, 2046, 2428, 2439,  
2443 (UH).

Aizoaceae

*Sesuvium portulacastrum* var. *griseum* Deg. and Fosb.

C. R. Long 2035, 2430 (UH).

Portulacaceae

*Portulaca lutea* Sol.

C. R. Long 2026, 2029, 2427 (UH).

*Portulaca oleracea* L.

C. R. Long 2029 (UH).

Zygophyllaceae

*Tribulus cistoides* L.

C. R. Long 2033, 2044, 2441 (UH).

Malvaceae

*Sida fallax* Walp.

C. R. Long 2034, 2036, 2043, 2429 (UH).

Biological Survey, U.S. Dept. of the Interior

New Mexico:

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VOSTOK

# Vegetation and Flora of Vostok Island

by C. R. Long

The flora of Vostok island consists of two species of vascular plants, Boerhavia repens L. and Pisonia grandis L. (Fosberg, 1937). Collections of these species were made in 1935 by W. J. Anderson and in 1965 by C. R. Long. The sheets <sup>were</sup> filed at the B. P. Bishop Museum and the University of Hawaii respectively.

The island remains much as Anderson reported <sup>via a</sup> the dense growth of Pisonia ~~with~~ trees to approximately 20 m. <sup>high.</sup> Towards the middle east portion of the island are random clearings with thick layers (to <sup>4</sup> m.) of decayed leaves and wood. On the sandy edges of these clearings several Boerhavia plants were observed. Several holes were dug in the thick humus both in the open areas of the forest and under the canopy. Underlying the humus was phosphatic hardpan which was very friable in the top layers increasing in hardness with depth. The highest branches of the Pisonia were used by the greater frigatebird for nesting. Some of the upper branches were bare due perhaps to nesting activities and guano deposition. On the north and east sides were open sand and coral rubble with Boerhavia in vigorous masses. This area was used as a nesting site for Bluefaced boobies (Sula dactylatra). This strip of open vegetated <sup>coral</sup> sand and <sup>rubble</sup> coral varied from 3 to 20 m. in width. Despite the paucity of the flora an intensive search of the island revealed no evidence of Portulaca sp. as reported by Bryan (1942). The absence of this herb seems quite remarkable. The Polynesian rat was common. It may be that any chance introductions of Portulaca are eaten by this species. At the southwest end there is an outcrop of consolidated beachrock. It seems most probable that both of the native species of Vostok Island were introduced by nesting birds. No evidence of Pisonia seedlings were observed but numerous sprouts from fallen trunks and exposed roots were seen. No fruits were observed on the trees with the use of binoculars. Along the west side areas of eroded soil and deposited or uncovered sand were observed. This can only be explained by supposing high wave action <sup>and/or heavy rains</sup> prior to our visit. This inundation probably seeps through the porous central portion which is at a lower elevation than the beach crest and inner slopes. The portions under the Pisonia canopy are entirely devoid of vegetation with the exception of crust of blue-green algae which are found on rotting trunks, on exposed phosphatic rocks and on damp edges of the inner clearing. No thick guano depositions were seen. Small coconut crabs were found. The varying depths of humus <sup>under the Pisonia canopy</sup> suggests that a small saline lagoon may have at one time existed on the island.

Some attention was paid to the relationship of the roots of Pisonia and the occurrence of phosphatic hardpan layers. Excavations were made near the trunk and at some distance to determine the coincidence of roots with the hard materials. In two instances, relatively hard phosphatic material was found near older roots. <sup>The area</sup> next to the root <sup>consists of</sup> made up of very friable ~~but~~ consolidated phosphatic material. <sup>and sand</sup> Near the base of the larger trees <sup>large</sup> boulders of hard phosphatic stone <sup>were</sup> forced to the surface presumably by the growth of the larger roots underneath. There is a distinct possibility that the upper layers of phosphatized materials were formed after the tree had become established, or that previous stands of the Pisonia were ~~responsible~~ <sup>responsible for</sup> central to the formation of this type of rock as has been suggested by Fosberg (1957).

This could be mistaken by hand.

Similar observations were made on the Pisonia stands of Palmyra Island except that the layers of humus were not as thick. *This can be explained by the disruption of the litter layer during the second w w.*

Observations on twenty odd central Pacific atolls seems to bear out the conclusions of Fosberg (1957) that the sooty tern is relatively unimportant in the deposition of large, concentrated amounts of guano on atolls. Personal observations seems to indicate that massed amounts of humus and guano are formed by the greater and lesser frigatebirds and by the redfooted booby. The bluefaced booby also tends to evacuate on bare cleared areas about the nest site. On Palmyra Island large deposits of guano pepper the surface of the Eastern Island which supports a Pisonia forest and large rookeries of Redfooted boobies. A similar phosphatic hardpan exists on the east end of Washington Island where a remnant of a ~~once island wide Pisonia forest~~ <sup>remains</sup>. Nesting Redfooted boobies were nesting in the upper canopy. On Caroline Island and other atolls sooty terns nest under vegetation of Tournefortia and Scaevola <sup>and in the open</sup> but no sign of phosphatization of the layers was observed. The presence of guano on Caroline <sup>atree</sup> may be supposed to have been deposited when an extensive Pisonia forest existed on the island or under very dry conditions as reported for the Phoenix Island deposits.

Guano deposition is hard to determine varying with size and number of birds and the climatic zone in which the deposition is made. Very little is known about the annual deposition of guano of any certain species.

*with regard to Christmas Island*

Rougier <sup>(19)</sup> mentions the Tournefortia in connection with phosphatized soils: "There is always a certain amount of phosphate where it grows."

Heavy phosphatic odor and humus layer under Tournefortia noted on the east end of Palmyra Island. Phosphatized litter and deep humus on Vaiari Island, Tongareva Atoll. <sup>under Pandanus tree</sup> On Palmyra redfooted boobies accounted for most of the accumulation whereas on Tongareva it was the common noddy tern whose nests were thick along the branches of Pandanus <sup>the</sup> sp. - the plant having many yellowed leaves, ~~and most of the litter and humus derived from sand.~~ In both cases there was no evidence of phosphatization <sup>underneath</sup> nor in Penohis groves on Vaiari Island where redfooted boobies and greater frigatebirds were nesting. On Cook Island, Christmas Atoll common noddy terns were using Turbinaria <sup>and Tournefortia</sup> sp. for nest material ~~and Tournefortia leaves~~. No noticeable phosphatization has occurred <sup>there or on</sup> on Motu Tabu as yet but the litter layer and underlying humus are thick. ~~The parent material is sand.~~

Fosberg, F.R. 1937. Vegetation of Vostok Island, Central Pacific.  
Proc. Hawaii Acad Sci : 19.

Fosberg, F.R. 1957 Description and occurrence of Atoll Phosphate Rock  
in Micronesia. Am. Jm. Sci. 255: 584-592.

## Vegetation and Flora of Vostok Island

by C. R. Long

The flora of Vostok Island consists of two species of vascular plants, Boerhavia repens L. and Pisonia grandis L. (Fosberg, 1937). Collections of these species were made in 1935 by W. J. Anderson and in 1965 by C. R. Long. These collections are summarized below. The sheets are filed at the B. P. Bishop Museum and the University of Hawaii.

### Nyctaginaceae

#### Boerhavia repens L.

Anderson s.n. (BISH) as Boerhavia diffusa; Long 3191, 3202, 3203, 3204, 3208 (UH).

#### Pisonia grandis R. Br.

Anderson s.n. (BISH); Long 3192 (UH).

The island remains much as Anderson reported with a dense growth of Pisonia trees to approximately 20 m. high. Towards the middle of the island are random clearings with thick layers (to .35 m.) of decayed leaves and wood. On the sandy edges of these clearings several Boerhavia plants were observed. Several excavations were made in the open areas and under the canopy. Underlying the humus was a phosphatic hardpan which was very friable in the top layers. The high branches of the Pisonia were used by the Great Frigatebird as nesting sites. Some of the upper branches were bare in the vicinity of the nest sites due perhaps to the activities of these birds. On the north and east sides of the island were open coral sand and rubble with Boerhavia in vigorous masses. This site was used by nesting Blue-faced Boobies (Sula dactylatra). This strip of low vegetation varied from 3 to 20 m. in width. An intensive search of the island failed to reveal other plant species particularly the Portulaca reported by Bryan (1942). The Polynesian rat was common within the forest canopy. It may be that the Portulaca is eaten by this species.

At the southwest end there is an outcrop of consolidated beachrock. It seems highly probably that both of the native species were introduced by birds as the seeds of both are sticky and thus easily transported. No evidence of Pisonia seedlings was found but numerous sprouts from fallen trunks and exposed roots were seen. Binoculars were used to scan the upper branches but no fruits were observed. Along the west side areas of eroded soil and newly deposited sand were observed. This evidence together with the clearing in the center of the island probably indicates high wave action prior to the visit of the Pacific Project party in June 1965. Sea water and heavy rains probably seep through the porous central area which is at a lower elevation than the beach crests and inner slopes.

The areas beneath the Pisonia canopy are devoid of vegetation with the exception of crusts of bluegreen algae which cover the soils surface, rotting trunks and coralline boulders. No thick recent guano deposits were observed on the soil surface under the canopy. The humus depths vary under



the canopy suggesting that a lagoon may have existed at one time. The deepest litter and humus layers are found in the central area. Small coconut crabs were found but there was no evidence of Cocos on the island. The absence of such species as Lepturus and Portulaca is remarkable. The common bunchgrass is also absent from Birnie Island where there is good evidence of frequent shifts in the sandy soil due to high wave action. This may explain the absence of Lepturus from these small islands.

Bryan, E. H., Jr. 1942.

American Polynesia and the Hawaiian Chain. 1-253, Honolulu.

Fosberg, F. R. 1937.

Bishop Mus. Spec. Publ. 30: 19.

NIHOA

NIHOA

4

## The Vegetation

The vegetation of Nihoa is dominated by a low herbaceous cover comprised of the following: Sida fallax, Chenopodium oahuense, and Panicum torridum. Solanum nelsoni and Euphorbia celastroides are important members of this vegetation type. At the time of our visit (September, 1964) the island was very dry and the common grass Eragrostis variabilis did not appear as plentiful as previous reports on the vegetation of the island would indicate. This grass is probably a seasonal dominant after the rainy season. The Euphorbia appears to prefer exposed volcanic rock sites. No leaves were present on the plants observed in 1964.

Portulaca caunii was common in the soil pockets of crevices on the middle and upper slopes. Portulaca lutea was dry on the lower and middle slopes and not obviously abundant in these areas while on the flat area near Miller's Peak which receives more precipitation the plants were plump and in flower.

Rumex giganteus was found on the north cliff face near the top of Tanager Peak. Collections of lichens were made and determinations of these are being made by various collaborators. The Rumex was sterile at this time. Panicum torridum was most conspicuous on the upper slopes. Sesbania tomentosa and Tribulus cistoides were found on the south side of the cliffs on the upper slopes - the plants flattened and very dry. Most of these herbs shed much of their leaves during the dry season.

Pritchardia remota, endemic to Nihoa Island, is found in the dry stream beds and middle slopes of the east and west canyons and on the east upper slope of East Palm Canyon and on the upper west side of West Palm Canyon. A count of the Pritchardia revealed the following numbers: a) West Palm Canyon: 107 seedlings, 148 non-flowering and fruiting trees, 127 flowering and fruiting trees; b) East Palm Canyon: 32 seedlings, 69 non-flowering and fruiting trees, 46 flowering and fruiting trees.

The following plant associations were observed: a) on rocky upper slopes with thin soils: Euphorbia - Chenopodium - Sida - Solanum; Panicum - Portulaca; Eragrostis - Sida - Chenopodium; b) middle and lower slopes with deeper soils, some formerly held by terraces: Chenopodium - Sida - Eragrostis; Euphorbia on volcanic rock ridges; c) wet north face cliffs with soil pockets or bare rock: lichens; Panicum - Rumex - Portulaca lutea; on middle and upper slopes in soil pockets: Portulaca caunii; wet west and south face cliffs, thin soil on bare rocks: Chenopodium - Portulaca; dry lichens; stream beds and sheltered cliff bases: Pritchardia; Chenopodium - Sida - Solanum. At the base of West Palm Valley is a sand beach which shifts probably on a seasonal basis. Heliotropium was collected from this site in 1964. Boerhavia diffusa was collected from this site in 1923. No evidence of Tetragonia or Schiedea was found in 1964. Both were very local in distribution in 1923 (Christophersen and Caum, 1931). Twenty-seven plants of Heliotropium were counted, mainly on the slopes above the beach.

Reseeding probably occurs from these plants which are above the waves during high tides.

Christophersen, E. and E. L. Caum. 1931.  
Vascular Plants of the Leeward Islands, Hawaii.  
Bishop Museum Bulletin 81: 1-41.

Notes on the flora and vegetation of Nihoa Island

by C. R. Long

Plants collected from Nihoa Island, 1911-1964.

Gramineae

Eragrostis variabilis (Gaud.) Steud.  
Caum 61 (BISH), Long 2417 (UH).

Panicum terridum Gaud.  
Caum 60 (BISH), Christophersen 5 (BISH), Kramer and Swedberg 7 (BISH),  
Long 2408, 2432 (UH).

Palmae

Pritchardia remota Becc.  
Brown s.n. (BISH), - two sheets, one with Rock's Number 10347, Caum  
s.n. (BISH), Cooke 299 (BISH), Christophersen 9a (BISH), Long 2412, 2440,  
2443 (UH).

Polygonaceae

Rumex giganteus Ait.  
Caum 71 (BISH), Christophersen 8 (BISH), Long 2411 (UH).

Chenopodiaceae

Chenopodium oahuense (Mey.) Aellen.  
Caum 58, 67 (BISH), Judd 1 (BISH), Christophersen 7 (BISH), Kramer  
and Swedberg 6 (BISH), Long 2410, 2413, 2418, 2444 (UH).

Amaranthaceae

Amaranthus brownii C. and C.  
Caum 73 (BISH), Judd 2 (BISH). Not found in 1964.

Nyctaginaceae

Boerhavia diffusa L.  
Bryan 3a (BISH), Caum 79 (BISH).

Aizoaceae

Tetragonia tetragonioides (Pallas) O. Kuntze  
Caum 80 (BISH).

## Portulacaceae

Portulaca caunii F. Br.

Caum 66 (BISH), Kramer and Swedberg 3 (BISH), Long 2414, 2433 (UH).

Portulaca lutea Sol.

Caum 65 (BISH), Christophersen 13 (BISH), Kramer and Swedberg 1 (BISH), Long 2431 (UH).

## Caryophyllaceae

Schiedea verticellata F. Br.

Caum 70 (BISH), Bryan 2 (BISH), Christophersen 3 (BISH).

## Leguminosae

Sesbania tomentosa H. and A.

Bryan 5 (BISH), Caum 63 (BISH), Judd 3 (BISH), Christophersen 4 (BISH), Kramer and Swedberg 2 (BISH), Long 2409, 2428 (UH).

## Zygophyllaceae

Tribulus cistoides L.

Bryan 2a (BISH), Caum 78 (BISH), Long 2420 (UH).

## Euphorbiaceae

Euphorbia celastroides Boiss.

Bryan 6 (BISH), Caum 64 (BISH), Judd 5 (BISH), Kramer and Swedberg 10 (BISH), Long 2405, 2430 (UH).

## Malvaceae

Sida fallax Walp.

Caum 69 (BISH), Judd 4 (BISH), Bryan 1a (BISH), Kramer and Swedberg 8, 11 (BISH), Long 2421, 2429, 2437 (UH).

## Convolvulaceae

Ipomoea indica (Burm.) Merr.

Caum 83 (BISH), Christophersen 1 (BISH), Kramer and Swedberg 9 (BISH), Long 2427 (UH).

## Boraginaceae

Heliotropium curassavicum L.

Bryan 4 (BISH), Caum 77 (BISH), Christophersen 6 (BISH), Long 2436 (UH).

## Solanaceae

Solanum nelsoni Dunal.

Bryan 3 (BISH), Caum 62, 68, 84 (BISH), Judd 6, 7, 8 (BISH), Kramer and Swedberg 5, 12 (BISH), Long 2424, 2434, 2439 (UH).

## Cucurbitaceae

Sicyos pachycarpus H. and A.

Christophersen and Dranga 9 (BISH). This specimen is probably referable to S. microcarpus.

Sicyos microcarpus Mann

Kramer and Swedberg 4 (BISH), Beardsley s.n. (BISH).

## The Vegetation

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Reseeding probably occurs from these plants which are above the waves during high tides.

Christophersen, E. and E. L. Caum. 1931.  
Vascular Plants of the Leeward Islands, Hawaii.  
Bishop Museum Bulletin 81: 1-41.

NECKOR

Notes on the flora and vegetation of Necker Island

by C. R. Long

Plants collected from Necker Island, 1902-1964.

Gramineae

Panicum torridum Gaud.

Caum 56 (BISH), Christophersen 10 (BISH), Kridler 3 (UH), Long 2445, 2450, 2455 (UH).

Chenopodiaceae

Chenopodium oahuense (Mey.) Aellen

Christophersen 14 (BISH), Kridler 2, 5 (UH), Long 2448, 2452, 2454, 2458 (UH).

Aizoaceae

Sesuvium portulacastrum L.

Caum 93 (BISH), Christophersen 12 (BISH), Long 2456 (UH).

Portulacaceae

Portulaca lutea Sol.

Gilbert s.n. (USNM), Caum 59 (BISH), Kridler 4 (UH), Long 2457 (UH).

Leguminosae

Sesbania tomentosa H. and A.

Caum 57 (BISH), Christophersen 11 (BISH), Kridler 11 (UH), Long 2449, 2451, 2453, 2460 (UH).

## The Vegetation

About half of the land area of Necker Island is covered with vegetation composed of the following species associations: Sesbania - Chenopodium, Portulaca - Chenopodium - Panicum and pure stands of Sesbania and Sesuvium. On the south side steep cliffs fall almost sheer into the sea and the vegetation is therefore limited to above 100 foot altitudes. On the north side the vegetation is found intermittently at the 50 foot level and above except in those places where the cliff is too steep to provide even soil pockets. Some of the steep north slopes are clothed with a solid stand of Chenopodium. Most of the Sesbania is found near the upper areas of the four hills in sheltered sites or if in the open the plants are prostrate. The only Sesuvium found on the island occurred on the crumbly volcanic rock on the south side of the saddle between Annexation and Flagpole Hills. It was not abundant as reported by Christophersen and Caum in 1931. The white form of Portulaca lutea was found on the island by Dr. J. Beardsley.

Necker Island Vegetation Bibliography

Christophersen, E. and E. C. Caum. 1931.  
Vascular Plants of the Leeward Islands, Hawaii.  
Bishop Museum Bulletin. 81: 1-41.

KORE

Vascular Plants recorded from Kure Island

by C. H. Lamoureux and C. R. Long

Gramineae

Brachymenium sp.

Lamoureux 2808 (UH). Probably B. melanothecium (C. Mull.) Jaeg.  
Found on packed coral of the aircraft parking area.

Cenchrus agrimonioides Trin. var. laysanensis F.B.H. Brown

Caum 8 (BISH). Not collected since 1923 but observed by the junior author growing at the edge of the former central plain in 1964.

Cenchrus echinatus L.

Lamoureux 2771 (UH), Long 2227 (UH). Common in disturbed areas near the quarters and along the north side of the runway.

Chloris inflata Link

Lamoureux 2793 (UH). Found in area near the edge of the runway, cleared at one time and used as a nesting area by the Laysan albatross.

Chloris virgata Swartz

Lamoureux 2774, 2805 (UH). Scattered plants along runway and buildings.

Cynodon dactylon (L.) Pers.

Clay s.n. (BISH), Lamoureux 2780 (UH). Used as a lawn around quarters and in a few open places throughout the island.

Digitaria henryi Rendle.

Lamoureux 2777 (UH). On the beach NW side toward the lagoon.

Eleusine indica (L.) Gaertn.

Lamoureux 2772 (UH), Long 2236 (UH). Common in disturbed areas.

Eragrostis variabilis (Gaud.) Steud.

Caum 10 (BISH), Clay s.n. (BISH), Lamoureux 2781, 2782 (UH), Long 2235 (UH). Found in the central area and in cleared areas. Common in open sandy sites amid the dense Scaevola taccada thickets.

Eragrostis whitneyi var. caumii Fosb.

Caum 7 (BISH), Clay s.n. (BISH). Found by Caum on the north side along exposed sides of dunes and by Clay on dunes along the lagoon. Not collected since 1959.

Lepturus repens (Forst.) R. Br.

Caum 19 (BISH), Clay s.n. (BISH), Lamoureux 2783, 2792 (UH), Long 2246 (UH). Scattered clumps on the north end of the island on dunes and along the runway on the south side.

Setaria verticellata (L.) Beauv.

Long 2246 (UH). Found in the cleared central area and along the north side of the runway in disturbed areas.

## Cyperaceae

Cyperus rotundus L.

Lamoureux 1905, 2801 (UH). Weed near buildings.

## Casuarinaceae

Casuarina equisetifolia L.

Clay s.n. (BISH), Lamoureux 1886, 2799 (UH). Small tree planted near buildings and among dunes on the lagoon side.

## Amaranthaceae

Achryanthes splendens var. reflexa Hbd.

Caum 17 (BISH), Lamoureux 1876, 1894, 2794 (UH), Long 2239 (UH). Several clumps were found in the central plain and on the NE end.

Amaranthus spinosus L.

Lamoureux 2804 (UH). Found near buildings.

## Nyctaginaceae

Boerhavia diffusa L.

Caum 6, 11 (BISH), Clay s.n. (BISH), Lamoureux 1860, 1876, 1877, 1881, 1882, 2784, 2785, 2786, 2791 (UH), Long 2228, 2232, 2237, 2249 (UH). Common in sand throughout the island. A pioneer in cleared areas about the buildings and along the sides of the runway.

## Caryophyllaceae

Spergularia marina (L.) Griseb.

Lamoureux 1910, 2807 (UH), Long 2247 (UH). Found on the airstrip and along the sides of the runway and roadways.

## Cruciferae

Lepidium owaihiense C. and S.

Caum 5 (BISH), Clay s.n. (BISH), Lamoureux 1872, 1891, 2787 (UH), Long 2234, 2242 (UH). Abundant in central plain.

Lepidium virginicum L.

Lamoureux 2803 (UH). Weed in lawn near buildings.

## Zygophyllaceae

Tribulus cistoides L.

Caum 15 (BISH), Clay s.n. (BISH), Lamoureux 1874, 2788 (UH), Long 2241 (UH). Found in the central plain and in cleared areas especially along the



runway.

Euphorbiaceae

Euphorbia glomerifera (Millsp.) Wheeler

Lamoureux 1863, 1904, 2800 (UH). Weed near buildings at base of planted shrubs.

Euphorbia hirta L.

Lamoureux 2810 (UH). Weed in lawn of Cynodon dactylon.

Convolvulaceae

Ipomoea indica (Burm.) Merr.

Caum 9 (BISH), Clay s.n. (BISH), Lamoureux 1880, 2779 (UH). Commonly found climbing over Scaevola.

Boraginaceae

Tournefortia argentea (L. f.)

Lamoureux 1895, 2809 (UH). A few trees at the NW end of the island. Fairy terns and red-footed boobies nest in the branches.

Labiatae

Phyllostegia variabilis Bitter

Lamoureux 1926 (UH). Weed found in opening among Scaevola shrubs about 100 m. south of buildings.

Solanaceae

Solanum nelsoni Dunal

Caum 12 (BISH), Clay s.n. (BISH), Lamoureux 1878, 1879, 1898, 2770 (UH), Long 2245 (UH). Found in the central plain and in openings among Scaevola.

Solanum nigrum L.

Lamoureux 1879, 2789 (UH), Long 2238. Found in the central plain area and in scattered openings among Scaevola shrubs and occasionally along the beach.

## Cucurbitaceae

Sicyos hispidus Hbd.

Caum 13 (BISH), Clay s.n. (BISH), Lamoureux 1899, 1900, 1901, 1902, 1903, 2795, (UH). Common in the central plain of the island.

## Goodeniaceae

Scaevola taccada (Gaertn.) Roxb.

Caum 8, 16 (BISH), Clay s.n. (BISH), Lamoureux 1871, 1890, 2796, 2797 (UH), Long 2223, 2230, 2244, 2248, 2250 (UH). Abundant except in the central plain.

## Compositae

Conyza bonariensis (L.) Cronq.

Lamoureux 1909, 2796 (UH), Long 2240 (UH). Found in disturbed sites near buildings and along the runway.

Emilia javanica (Burm.) Rab.

Lamoureux 1964 (UH). Weed near buildings.

Gnaphalium sandwicheum Gaud.

Lamoureux 1889, 1892, 2776 (UH). Pioneer in cleared areas.

Lipochaeta integrifolia Gray

Caum 14 (BISH), Clay s.n. (BISH), Lamoureux 1911, 2798 (UH), Long 2243 (UH). Found in the central area spreading into open spaces.

Pluchea odorata (L.) Cass.

Clay s.n. (BISH), Lamoureux 2802 (UH). Along roads probably planted as ornamentals.

Sonchus cleraceus L.

Lamoureux 1883, 2790 (UH), Long 2231 (UH). Common in disturbed sites.

Verbesina encelicides (Cav.) B. and H.

Clay s.n. (BISH), Lamoureux 1896, 2773 (UH). Common in disturbed areas and spreading rapidly, especially in the central plain.

SYDNEY

October 24, 1964

- | <u>Collection Number</u> | <u>Description</u>   |
|--------------------------|--|
| 2535.                    | <u>Pandanus</u> sp. - lvs. to 4 ft., tree to 12 ft. with 3 or 4 branches at $\pm$ 4 ft. - bent limbs, picture of aggregate fruit taken.                                  |
| 2536.                    | <u>Euphorbia heterophylla</u> - rooted in coral gravel under <u>Cocos</u> litter near abandoned huts in village.   |
| 2537.                    | <u>Tribulus cistoides</u> - long stems to 5 ft. in dry area, gravel of village, in flower.   |
| 2538.                    | <u>Ipomoea</u> sp. - planted (?) near abandoned huts of village, in fruit.   |
| 2539.                    | <u>Morinda citrifolia</u> - in flr. and fruit, near abandoned huts of the village and naturalized in grove throughout <u>Cocos</u> stand - to 13 ft., in flr. and fruit. |
| 2540.                    | <u>Sida</u> sp. - in flr. and fruit, shrub to 4.5 ft. in coral gravel of abandoned village, most of the lvs. dry and fallen, a few green sprouts flowering.              |
| 2541.                    | <u>Boerhaavia diffusa</u> L. - white flrs <sup>with stems</sup> to 2.5 ft., in flr. and fruit, in coral gravel of abandoned village, pressed and cytological material.   |
| 2542.                    | Sedge - dry, in coral gravel of abandoned village, west side of lagoon.  |
| 2543.                    | Cyperaceae - ( <u>Fimbristylis</u> ?) in sunken area behind the north beach associated with <u>Sesuvium</u> - very dry.  |
| 2544.                    | <u>Lepturus repens</u> - in shaded depression of coral rock near first angle of tramway and near the edge of the lagoon.   |
| 2545.                    | <u>Euphorbia hirta</u> - in <u>Cocos</u> forest, west side in formerly cultivated area, now very dry.  |
| 2546.                    | Compositae - common on gravel and coral rubble under <u>Cocos</u> stand near the village, very dry.  |
| 2547.                    | <u>Portulaca lutea</u> - on rock, in crevice, above the lagoon on the west side, low prostrate stems.  |
| 2548.                    | Growing in dry pond area, north end, associated with <u>Lepturus</u> , <u>Sesuvium</u> and <u>Ipomoea</u> .  |
| 2549.                    | In dry ponds, north side of island, in fruit.  |
| 2550.                    | algae - growing in the saline water of lagoon, west side.  |

- | Collection Number | Description  |
|-------------------|--|
| 2551.             | Algae growing in sand on exposed beach rocks, partly exposed at low tide, area 150 ft. wide on west reef.                      |
| 2552.             | algae: on protected rocks, nw point - attached to rock on wave sheltered side.   |
| 2553.             | algae: on nw reef; drift from the outer reef.  |
| 2554.             | algae: nw reef at the edge of reef in surge channel.   |
| 2555.             | algae: nw reef, at edge of outer reef at low tide.   |
| 2556.             | algae: nw reef, in drift, from the outer reef.   |
| 2557.             | <u>Scirpus</u> sp. - in damp soil of old taro pit, near central area of the village but towards the lagoon, in flr. and fruit. |
| 2558.             | <u>Scaevola taccada</u> - dry coral rubble hillside in back of village towards the lagoon, small flrs.                         |
| 2559.             | Same area as # 2558 but larger flrs. - perhaps a better watered plant.   |
| 2560.             | Plant in flr. and fruit, near lagoon, west side of island, fruits preserved.   |
| 2561.             | <u>Sesuvium</u> - live collection, from mat, west side of lagoon, in flr.  |
| 2562.             | Erect Composite - 16-24 in. growing in the village area se side in sand and gravel.  |
| 2563.             | Erect plant 16-24 in. growing in village area se side in sand and coral.   |
| 2564.             | Erect herb growing in coral rubble in shade of small <u>Cocos</u> on ne side.  |
| 2565.             | Erect herb growing in coral rubble under small <u>Cocos</u> - se side.   |
| 2566.             | lichen - growing on bark of dead coconut.  |
| 2567.             | Small tree growing in coral rubble on sw side in open area.  |
| 2568.             | Low succulent forming a large mat by lagoon on sw side in open area.   |
| 2569.             | Creeping plant growing on coral rubble near <u>Cocos</u> grove s side of island.   |
| 2570.             | Tree 5.5 ft. tall growing in sand area on s side of island, in the open.   |
| 2571.             | Low erect plant growing in coral and sand under <u>Cocos</u> trees on the s side of the island.                                |
| 2572.             | Vine growing over <u>Messerschmidia</u> in large hill of coral rubble with <u>Scaevola</u> on s side of island.                |

Collection NumberDESCRIPTION

2573. Low plant growing in coral and sand in open area by lagoon on the S side of the island.
2574. low semi-erect plant growing in an open area on the south side of the island in coral and sand.
2575. Erect plant growing in coral rubble by the south shore of the lagoon.
2576. low succulent forming large mats by the south shore of the lagoon.
2577. Tree growing in open coral rubble; fls. with 5-7 stamens.
2578. Small tree growing by Cordia on se side of the island.
2579. medium-sized tree growing in coral rubble on se side of island associated with Sida and Boerhaavia.
2580. low creeping herb in coral rubble on sw side of the island.
2581. low succulent by se side of lagoon growing in coral rubble.
2582. Portulaca - live collection, growing in coral rubble on se side assoc. with Sida.
2583. Dry grass in abandoned roadway of village, west side.
2584. Ipomoea - in waste area behind village on lagoon side - white fls.
2585. Compositae - at bottom of dry well in village, west side, blue fls.

Long, C. R.  
1964

12.

October 24, 1964

<u>Collection Number</u>	<u>Description</u>
2535	<u>Pandanus</u> sp. - leaves to 4 feet, tree to 12 feet with 3 or 4 branches at $\pm$ 7 feet - bent limbs picture of aggregate fruit taken
2536	<u>Eupharbia heterophylla</u> - rooted in coral gravel under <u>Cocos</u> litter near abandoned huts in village.
2537	<u>Tribulus cistoides</u> - long stems to 5 ft. in dry area, gravel of village, in flower.
2538	<u>Ipomoea</u> sp. - planted (?) near abandoned huts of village, in fruit.
2539	<u>Morinda citrifolia</u> - in flower and fruit, near abandoned huts of the village and naturalized in groves throughout <u>Cocos</u> stand - to 13 ft. in flower and fruit.
2540	<u>Sida</u> sp. in flower and fruit, shrub to 4.5 ft. in coral gravel of abandoned village, most of the leaves dry and fallen, a few green sprouts flowering.
2541	<u>Boerhaavia diffusa</u> L. - white flowers with stems to 2.5 ft. in flower and fruit, in coral gravel of abandoned village, pressed and cytological material.
2542	Sedge - dry, in coral gravel of abandoned village west side of lagoon.
2543	Cyperaceae -( <u>Fimbristylis</u> ?) in sunken area behind the north beach associated with <u>Sesuvium</u> - very dry.
2544	<u>Lepturus repens</u> - in shaded depression of coral rock near first angle of tromway and near the edge of the lagoon.
2545	<u>Eupharbia hirta</u> - in <u>Cocos</u> forest, west side in formerly cultivated area, now very dry.
2546	Compositae - common on gravel and coral rubble under <u>Cocos</u> stand near the village, very dry.
2547	<u>Portulaca lutea</u> - on rock, in crevice, above the lagoon on west side, low prostrate stems.
2548	Growing in dry pond area north end, associated with <u>hepturus</u> , <u>Sesuvium</u> and <u>Ipomoea</u>

Long, C. R.  
1964

13.

<u>Collection Number</u>	<u>Description</u>
2549	In dry ponds, north side of island, in fruit.
2550	Algae - growing in the saline water of lagoon, west side.
2551	Algae: growing in sand on exposed beach rock, partly exposed at low tide, area 150 ft. wide on west reef.
2552	Algae: on NW reef; drift from the outer reef.
2553	Algae: on NW reef; drift from the outer reef.
2554	Algae: NW reef at the edge of reef in surge channel.
2555	Algae: NW reef, at edge of outer reef at low tide.
2556	Algae: NW reef, in drift, from the outer reef.
2557	<del>Surpus</del> <sup>Scirpus</sup> sp. - in damp soil of old taro pit, near central area of the village but towards the lagoon, in flower and fruit.
2558	<u>Scaevola taccada</u> - dry coral rubble hillside in back of village towards the lagoon, small flowers.
2559	Same area as No. 2558 but larger flowers - perhaps a better watered plant.
2560	Plant in flower and fruit, near lagoon, west side of island, fruits preserved.
2561	<u>Sesuvium</u> - live collection, from mat, west side of lagoon, in flower.
2562	Erect Composite - 16 - 24 in. growing in the village area SE side in sand and gravel.
2563	Erect plant 16 - 24 in. growing in village area SE side in sand and coral.
2564	Erect herb growing in coral rubble in shade of small <u>Cocos</u> on NE side.
2565	Erect herb growing in coral rubble under small <u>Cocos</u> - SE side.
2566	Lichen - growing on bark of dead coconut.
2567	Small tree growing in coral rubble on SW side in open area.



<u>Collection Number</u>	<u>Description</u>
2568	Low succulent forming a large mat by lagoon on SW side in open area.
2569	Creeping plant growing on coral rubble near <u>Cocos</u> grove S side of island.
2570	Tree 5.5 ft. tall growing in sand area on S side of island, in the open.
2571	Low erect plant growing in coral and sand under <u>Cocos</u> trees on the S side of the island.
2572	Vine growing over <u>Messerschmidia</u> in large hill of coral rubble with <u>Scaevola</u> on S side of island.
2573	Low plant growing in coral and sand in open area by lagoon on the S side of the island.
2574	Low semi-erect plant growing in an open area on south side of the island in coral and sand.
2575	Erect plant growing in coral rubble by the south shore of the lagoon.
2576	Low succulent forming large mats by the south shore of the lagoon.
2577	Tree growing in open coral rubble; flowers with 5-7 stamens.
2578	Small tree growing by <u>Cordia</u> on SE side of the island.
2579	Medium - sized tree growing in coral rubble on SE side of island associated with <u>Sida</u> and <u>Boerhaavia</u> .
2580	Low creeping herb in coral rubble on SW side of the island.
2581	Low succulent by SE side of lagoon growing in coral rubble.
2582	<u>Portulaca</u> - live collection, growing in coral rubble on SE side associated with <u>Sida</u> .
2583	Dry grass in abandoned roadway of village, west side.
2584	<u>Ipomoea</u> - in waste area behind village on lagoon side- white flowers.
2585	<u>Compositae</u> - at bottom of dry well in village, west side, blue flowers.

Data on the Plants of Sydney Island from McBee Cards in the University of Hawaii  
(Obtained by Jane Church, August 1969)

All are listed as collected by C.R. Long and all but the last entry are listed as collected 24 October 1964. The last entry (field number 2586) was collected on 25 October

Field Number	Identification	Remarks
2547	<u>Portulaca lutea</u> Sol. (2 sheets)	Rooted in hardpan just above the lagoon on the west side, low and almost prostrate.
2549	<u>Ipomoea</u> (1 sheet)	In dry pond on the NW side, rooted in cracks in the hardpan.
2558	<u>Scaevola taccada</u> (Gaertn.) Roxb. (1 sheet)	In back of the village towards the lagoon - rooted in a dry coral hillock
2559	<u>Scaevola taccada</u> (Gaertn.) Roxb. (2 sheets)	Plant to 7 ft. well watered, moist site, coral rubble, no leaf chlorosis, on the west side of the lagoon.
2560	<u>Scaevola taccada</u> (Gaertn.) Roxb. (2 sheets)	Rooted in the hardpan near the edge of the the lagoon flats on the west side of the island.
2562	Compositae (2 sheets)	Erect herb, 16-24 in. high, village area on the northeast side, the soil sand with dark humus
2563	Compositae (2 sheets)	Erect herb to 24 in. common in the village rooted in coral sand and gravel on the southeast side.
2564	<u>Tribulus cistoides</u> L. (2 sheets)	Growing in coral rubble under the shade of low <u>Cocos</u> trees on the northeast side of the island.
Long# 2568	<u>Sesuvium portulacastrum</u> L. (1 sheet)	Collected by P. Woodward and determined by C.R. Long. Forms mat near lagoon, south side, flat open areas.
2572	<u>Ipomoea tuba</u> (Schlect.) Don. (1 sheet)	Vine growing over <u>Messerschmidia</u> , rooted in coral rubble with <u>Scaevola</u> on the south side of the island.
2573	<u>Portulaca lutea</u> Sol. (1 sheet)	A low plant growing in coral and sand in open area by the lagoon on the south side of the island.
Long# 2575	<u>Fimbristylis cymosa</u> R.Br. (1 sheet)	Collected by Paul Woodward. Evidently determined by Long. Erect plant growing in coral rubble along the south shore of the lagoon.
2579	<u>Tournefortia argentea</u> L.f. (1 sheet)	Medium sized tree, rooted in coral rubble, on the southeast side and assoc. with <u>Sida</u> and <u>Boerhavia</u> .
2584	<u>Ipomoea tuba</u> (Schlecht.) Don. (3 sheets)	Growing in waste area behind village on the lagoon side. White flowers.
2586	<u>Scaevola taccada</u> (Gaertn.) Roxb.	North shore of the lagoon, plant very dry, yellow leaves, flos.(??) and fruits.

Vascular plants recorded from Sydney Island

by C. R. Long.

Pandanaceae

Pandanus sp.  
C. R. Long 2535 (UH).

Gramineae

Cenchrus echinatus L.  
C. R. Long 2583 (UH).

Eragrostis whitneyi Fosberg  
C. R. Long 2591.

Lepturus repens (Forst.) R. Br.  
E. H. Bryan s.n. (BISH), C. R. Long 2544 (UH).

Cyperaceae

Fimbristylis cymosa R. Br.  
E. H. Bryan, Jr. s.n. (BISH), C. R. Long 2543, 2548, (UH).

Palmae

Cocos nucifera L.  
E. H. Bryan, Jr. 42 (BISH).

Amaryllidaceae

Crinum asiaticum L.  
E. H. Bryan, Jr. 45 (BISH).

Nyctaginaceae

Boerhavia sp.  
C. R. Long 2541, 2580, 2588, (UH).  
Pisonia grandis R. Br. E. H. Bryan, Jr. s.n. (BISH).

Aizoaceae

Sesuvium portulacastrum L. var. griseum Deg. and Fosb.  
C. R. Long 2576.

Zygophyllaceae

Tribulus cistoides L. , 37  
E. H. Bryan, Jr. s.n. (BISH), C. R. Long 2537, 2574 (UH).

Euphorbiaceae

Euphorbia cyathophora Murr.  
C. R. Long 2536 (UH).

Euphorbia hirta L.  
C. R. Long 2545, 2571 (UH).

Tiliaceae

*Triumfetta procumbens* Forst. f.  
C. R. Long 2569 (UH).

Cucurbitaceae

*Cucurbita pepo* L.  
E. H. Bryan, Jr. 44 (BISH).

Malvaceae

*Sida fallax* Walp.  
C. R. Long 2540, 2589 (UH).

Convolvulaceae

*Ipomoea* sp.  
C. R. Long 2538 (UH).

Boraginaceae

*Cordia subcordata* Lam.  
C. R. Long 2577, 2590, (UH).

Rubiaceae

*Guettarda speciosa* L.  
C. R. Long 2587 (UH).

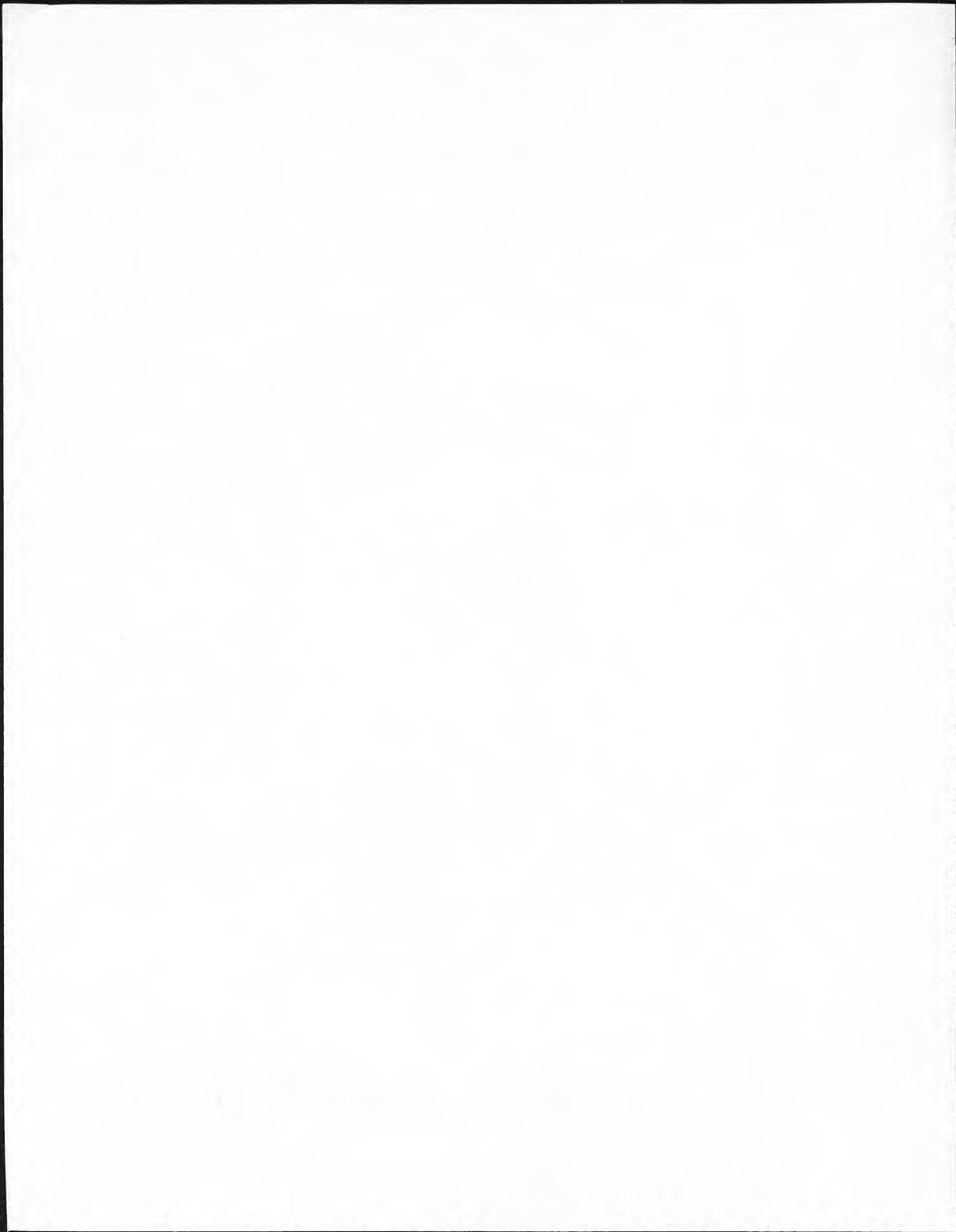
*Morinda citrifolia* L.  
C. R. Long 2539 (UH).  
, 2570

Goodeniaceae

*Scaevola taccada* (Gaertn.) Roxb.  
E. H. Bryan, Jr. 43, (BISH).

Compositae

*Vernonia cinerea* (L.) Less.  
C. R. Long 2546, 2585 (UH).



SI-USNM-196  
11-24-58

United States National Museum  
Washington 25, D.C., U.S.A.

REPORT OF IDENTIFICATIONS

A letter ~~has~~, has not,  
been written.

Registrar File No. ---

To Dr. F. C. Sibley - Div. of Birds  
608 Natural History Building  
Smithsonian Institution

Date 7 Feb 1964

Initiated by C. V. Morton Department of Botany Division of Ferns

Collector                      Specimen                      Locality                      Identifier

All collections are F. C. Sibley.

Howland Island

✓	Cordia subcordata Lam.		C. V. Morton
✓	Coccoloba uvifera L.		"
✓	Tribulus cistoides L.		"
✓	Boerhaavia diffusa L. var. tetrandra (Forst.) Heim		"
✓	Portulaca lutea Solander		"
✓	Lepturus repens (Forst.) R. Br.		J. R. Swallen

Baker Island

	Boerhaavia diffusa L. var. tetrandra (Forst.) Heim		C. V. Morton
	Triumfetta procumbens Forst.		"
	Portulaca lutea Solander		"
	Lepturus repens (Forst.) R. Br.		J. R. Swallen
	Abutilon indicum Sweet ?		C. V. Morton
	Sida fallax Walp.		"
	Digitaria pacifica Stapf		J. R. Swallen

Lisianski Island

	Ipomoea indica (Burm.) Merrill		C. V. Morton
	Tribulus cistoides L.		"
	Boerhaavia diffusa L. var. tetrandra (Forst.) Heim		"
	Casuarina equisetifolia Forst.		"

Pearl and Hermes Reef

1	Tribulus cistoides L.		C. V. Morton
2	Brassica campestris L.		"
3	Boerhaavia diffusa var. tetrandra (Forst.) Heim		"

4	<i>Solanum auriculatum</i> Ait.	C. V. Morton
5	<i>Eragrostis variabilis</i> (Gaud.) Steud.	J. R. Swallen
6	<i>Cucumis sativus</i> L.	C. V. Morton
7	<i>Sesuvium portulacastrum</i> L.	"
8	<i>Coronopus didymus</i> (L.) Smith	"
9	<i>Portulaca oleracea</i> L.	"
10	<i>Cynodon dactylon</i> (L.) Pers.	J. R. Swallen
11	<i>Solanum nigrum</i> L.	C. V. Morton
12	<i>Setaria adhaerans</i> (Forsk.) Chiov.	J. R. Swallen
14	<i>Lepidium owaihiense</i> C. & S.	C. V. Morton

5 Nov. 1964

Sesuvium growth

Site I - N.E. met perimula, inside,  
stakes 1-13

- 1  $\frac{3}{4}$  in (2)
- 2  $\frac{3}{4}$  in (2)
- 3  $\frac{3}{4}$  in (2)
- 4  $\frac{3}{4}$  in (2)
- 5 1.0 in (3)
- 6 2.5 in (2)
- 7 3 in (2)
- 8 2 in (2)
- 9
- 10
- 11
- 12 3 in (1)
- 13 6 in (1)



(17)

5 L in

Site II - above but lost #1

- |                 |                 |                 |                  |
|-----------------|-----------------|-----------------|------------------|
| 1 4 in (1)      | 4 <del>in</del> | 7 <del>in</del> | 10 <del>in</del> |
| 2 1 in (1)      | 5 <del>in</del> | 8 <del>in</del> | 11 <del>in</del> |
| 3 <del>in</del> | 6 in (1)        | 9 die back 5 in | 12 <del>in</del> |
| 4 <del>in</del> | 7 <del>in</del> | 10 in           | 13 die back 6 in |



Malden

a 33 series was used plus a 19

- Add: *Eriogonum Kenella* Hackman # 903  
 " : *Boerhavia repens* Long # 3382  
 " : *Portulaca leucae* Long # 3377  
 Is correct name *Euphorbia prostrata* Ait.?  
 Add: *Ipomoea tuba* (Schlecht.) Don.  
 Correct: *Bidens pilosa* - Wilder is # 24

fanning  
 Canton  
 Howland  
 Baker  
 Gardner  
 Hull  
 Vostok  
 Caroline  
 Washington

Enderbury  
 Phoenix  
 (Midway)  
 Hull  
 Malden  
 Starbuck  
 Birnie  
 Jarvis  
 Palmyra  
 McKean  
 Tokelau  
 Sydney

Starbuck looks all right.

Could not locate the (3) Birnie cards.

✓ Jarvis

See species list

See species list

Palmyra ✓

McKean ✓

Tokelau

- Add: ~~*Pemphis acidula* L. + Akapu~~ PW (159, 160, 161, 169)<sup>A</sup>, N79-81,  
*Ipomoea tuba* (Schlecht.) G. Don. Akapu, 154; f59-61  
*Cassytha filiformis* L., A186 PW, A177, A178; N95-97; f22-24; Isidore n.d.  
*Boerhavia diffusa* var. *kekandha* PW-A 173, 179, 183; f Isidore n.d.  
*Amaranthus velutina* H. + A. Bryan 68 (f)  
*Achrysanthes velutina* H. and A. PW-A 180-182; N69-71;  
*Prochnis pedunculata* Wedd. PW-A 140-142; N76-78; f62  
*Vernonia cinerea* (L.) Lus. PW N132  
*Boerhavia* sp. PW-N 75; f44-46; f14, 15;  
*Pipturus velutinus* Wedd. PW-N 121-123  
*Synichella nodiflora* (L.) Gaertn. Bryan 55,  
*Davrelia solida* (fowt.) Swartz. Isidore (Bryan)  
*Polypodium scolopendria* Burm. f. PW-~~12~~, f8-10  
*Syntherisma pruriens* (Trin) Arthur. f. Bryan (coll. by Isadore)  
*Mimosa pudica* Linn. var. *uniyuga* (Duchoss + Walp.) Griseb. Bryan f57  
*Hennandia ovigera* L. PW-~~12~~ f41-43; Bryan f70;  
*fimbristylis pygnocephala* Hdd. PW-f16-18

Midway - Jong

~~Catch~~ 1701, 1754, 1722, 1729, 2251, 1711, 1714, 1718, 1723, 2253, 2260, 1727, 1756,  
1706, 1751, 1719, 1720, 1702, 1748B, 1726, 1746, 1750, 2261, 2263, 1717, 1755, 2254,  
1737, 1736, 1748A, 1725, 1758, 2259, 1738, 1745, 1710, 1708, 1747, 1724, 1721, 1704, 1752,  
1712, 1715, 2258, 1735, 1757, 2255, 2256, 2257, 2262, 2264, 1728, 2252, 1733, 1713, 1705,  
1734, 1753, 1707, 1749,

Hue

Pandanus #2041 = P. Keekories Park.

Digitaria aliaris (Retz.) Koel. #2009

Add: Lepturus repens #2049,

" : Boerhaavia sp #s 52 + 53 = B. tetronda Forst.

" : Euphorbia prostrata L. - #2040

" : Pedilanthus tithymaloid (L.) Ait? #2016

" : Phyllanthus amarus Schum. & Thonn ~~(comes before Triumfetta)~~ Long #2005

" : Triumfetta procumbens #2042

" : Sida fallax Walp. / L.P. Schultz #43 (USNM)

" : Ipomoea #2011 = I. kuba (Schlecht) Don

" : Tournefortia argentia L.f. L.P. Schultz s.n. (museum not given on card)

" : Guettarda speciosa L. #2012

" : ~~Marinda citrifolia L. #2055~~ there is another <sup>collection</sup> sheet (specimens) which is not numbered.

Change Portulaca sp. to Portulaca oleracea L. for doug 2043

Vascular plants recorded from Hull Island

By C. R. Long

Pandanaceae

*Pandanus* sp.

C. R. Long 2041 (UH).

Gramineae

*Cenchrus echinatus* L.

C. R. Long 2005, 2052 (UH).

*Digitaria pacifica* Stapf.

E. H. Bryan, Jr. 46 (BISH), C. R. Long 2045, 2063 (UH).

*Eleusine indica* (L.) Gaertn.

E. H. Bryan, Jr. 50 (BISH), C. R. Long 2003, 2019 (UH).

*Eragrostis tenella* (Link.) Beauv.

E. H. Bryan, Jr. 47 (BISH), C. R. Long 2024 (UH).

*Lepturus repens* (Forst.) R. Br.

C. R. Long 2013, 2017, 2050, 2056, 2057 (UH).

Cyperaceae

*Fimbristylis cymosa* R. Br.

C. R. Long 2048, 2059 (UH).

Amaryllidaceae

*Crinum asiaticum* L.

C. R. Long 2020 (UH).

Polygonaceae

*Coccoloba uvifera* (L.) Jacq.

C. R. Long 1998 (UH).

Nyctaginaceae

*Boerhavia* sp.

E. H. Bryan, Jr. 52, 53 (BISH), C. R. Long 2010, 2061, 2062, 2064, 2065, 2066, 2068, 2069 (UH).

Portulacaceae

*Portulaca lutea* Sol.

C. R. Long 2046 (UH).

*Portulaca* sp.

C. R. Long 2043 (UH).

## Euphorbiaceae

*Euphorbia cyathophora* Murr.

E. H. Bryan, Jr. 49 (BISH), C. R. Long 2018 (UH).

*Euphorbia prostrata* Ait.

E. H. Bryan, Jr. 48 (BISH).

## Tiliaceae

*Triumfetta procumbens* Forst. f.

C. R. Long 2011, 2047, 2051, 2060 (UH).

## Malvaceae

*Sida fallax* Walp.

C. R. Long 2007, 2067 (UH).

## Lythraceae

*Pemphis acidula* Forst.

E. H. Bryan, Jr. 54 (BISH), C. R. Long 2054 (UH).

## Convolvulaceae

*Ipomoea* sp.

C. R. Long 2071 (UH).

## Rubiaceae

*Morinda citrifolia* L.

C. R. Long 2055 (UH).

*Guettarda speciosa* L.

C. R. Long 2000, 2001, 2070 (UH).

## Goodeniaceae

*Scaevola taccada* (Gaertn.) Roxb.

E. H. Bryan, Jr. a.n. (BISH), C. R. Long 2002 (UH).

## Compositae

*Vernonia cinerea* (L.) Less.

C. R. Long 2006, 2012, 2044 (UH).

McBee cards at U of Hawaii for Fanning Island

- Cyrtosperma chomissonis* (Schoff.) Merr. Long 3502  
*Russelia equisetiformis* Schlecht. and Chan. Long 3586  
*Spathodea camponulata* Beauv. Long 3519  
*Bryophyllum pennatum* (Com.) Kurz. = *Kalanche pinnata* (Lam.) Pers. Long 3526  
*Passiflora foetida* L. Long 3497  
*Carica papaya* (?) Long 3504  
*Polyscias P. Fucosa* (L.) Harms, H. St. John 14114  
*Nothoparox quilfoylei* (Cogn. and March.) Merr. Long 3517, 3499  
*Polypodium scolopendria* Burm. f. Ball 6, Christophersen 19, Long 3523, 3549.  
*Cenchrus echinatus* L. St. John 14117  
*Eleusine indica* (L.) Gaertn. Fosberg 11002, Long 3537  
*Eragrostis tenella* (Link.) Beauv. Long 3560  
*E. whitneyi* Fosberg, Sibley 3507 (Long number)  
*Lepturus repens* (Forst.) R. Br., Ball 7, Christophersen 18, Wilder 1, Long 3506,  
 3510, 3538, 3553, 3571  
*Stenotaphrum secundatum* (Walt.) Ktze, Long 3581  
*Fimbristylis spathacea* Roth + F. Cymos R. Br., Ball 8, Christophersen 17, Wilder 3,  
 Long 3512, 3514, 3552, ~~3525, 3569~~  
*Cocos nucifera* L. Long 3525, 3569  
*Rhoco spathacea* (Sw.) Stern, Long 3599  
*Gloriosa rothschildiana* O'Brien, Long 3511, 3513  
*Tacca lentopetaloides* (L.) O. Ktze. Long ~~3526~~ 3496  
*Casuarina equisetifolia* L. Long 3515  
*Artocarpes* (?) *aetilis* (Park.) Fosb. Long 3568  
*Ficus carica* L., Long 3547  
*Fleurya ruderalis* (Forst.) Gaud. Ball 10, Christophersen 20, Long 3521, 3550  
*Antigonon leptopus* H. and A., Long 3498  
*Gomphrena globosa* L., Long 3501  
*Boerhaavia tetrandra* Forst., Ball 5, Christophersen 16, Wilder 2, Emery s.d.,  
*B. repens* L. Long 3532, 3539, ~~xxxx~~ 3548, 3592  
*Bougainvillea spectabilis* Wild., Long 3565  
*Pisonia grandis* R. Br., Wilder s.d., St. John 14111, Long 3555, 3557  
*Sesuvium portulacastrum* var. *griseus* Deg.??? Fosb., Long 3533, 3578, 3591  
*Portulaca lutea* Sol, Christophersen 22  
*P. oleracea* L. Long 3508, 3535  
*Cassytha filiformis* L., Long 3534, 3575  
*Lepidium bidentaten* Mont., Christophersen 16, St. John 14108, Long 3554  
*Baihinia monandra* Kurz, Long 3513  
*Crotolaria retusa* L., Long 3516  
*Acalypha wilsona* (cant read rest), Long 3566  
*Codiaeum variegatum* var. *pictum* (Ladd.) Muell.-Arg., Long 3493  
*Euphorbia cyathophora* (Murr.) can read, Long ~~3518~~ 3518  
*E. hirta* L., Ball 17, Long 3542  
*Phyllanthus niruri* L. = *P. emerus* Schum. and Thom., Ball 2, Christophersen s.n.,  
 Long 3544  
*Triumfetta procumbens* Forst., Ball 13  
*Hibiscus rosa-sirersis* L., Long 3584  
*Sida fallax* Walp., Long 3536, 3556, 3579  
*Calophyllum inophyllum* L., Long 3583  
*Ipomoea glaberrima* Baj. (= tuba?) St. John 14120, Long 3540  
*Cordia subcordata* Lam., Ball 12  
*Heliotropium anomalum* H. and A. var. *mediale* Johnston, Ball 14, Long 3551, 3559, 3576  
*Tournefortia argentea* L. f., Ball 1, Long 3520  
 \*Cleroden *Clerodendrum ~~maxima~~* (L.) Gaertn., Long 3546, 3561, 3569, 3570  
                   *inerme*  
*Ocimum basilicum* L., St. John 14113  
*Borreria laevis* (Lam.) Griseb., St. John 14115, Long 3505, 3543  
*Merinda citrifolia* L., Long 3545, 3580  
*Scaevola frutescens* = *S. taccada* (Gaerdn.) Roxb., Ball 3, St. John 14116, 14119  
 Long 3572, 3590  
*Gaillardia pulchella* Foug., Long 3503  
*Syndrella nodiflora* (L.) Gaertn., Long 3522 and *Vernonia cinerea* (L.) Less, Long 3573

McBee cards at U. of Hawaii (August 1969) for Caroline Atoll

*Psilotum cant read* (L.) Beauv., Long 3233  
*Polypodium scolopendria* Burm. f., Long 3244, 3250, 3287  
*Pandomis* (?), Long 3227  
?gramineae, Long 3235  
*Digitaria ciliaris* (Retz.) Koch, Long 3235  
*Lepturus repens* (Forst.) R. Br., Long 3236, 3238, 3247, 3286, 3221, 3259, 3211  
*Cocos nucifera* L., Long 3285  
*Tacca leontopetaloides* (L.) O. Ktze., Long 3234, 3212, 3219  
*Fleurya ruderalis* (Forst.) Gaud - ex Wedd., Long 3253, 3215, 3290, 3229, 3263  
*Boerhavia diffusa* va. tet????, Long 3239, 3225, 3224, 3210  
*Boerhavia*, Long 3243, 3252, 3289, 3291, 3262  
*Pisonia grandis* R. Br., Long 3280  
*Portulaca lutea* Sol, Long 3237, 3255, 3292, , 3257, 3223, 3231,  
*Tribulus cistoides* L., Long 3245  
*Suriana maritima* L., Long 3279, 3220  
*Phyllonthus amarus* Schumk. & Thom., Long 3283  
*Ipomoea tuba* (Schlecht.) Don., Long 3242, 3251, 3218, 3298  
*I. pes-caprae* ssp. *brasiliensis* (L.) Von Costotn, Long 3281  
*Cordia subcordata* Lam, Long 3246, 3213, 3284, 3261, 3228, ~~3240~~  
*Heliotropium aanomalum* (?) H. and A., Long 3240, 3248, 3288, 3256, 3230, 3222  
*Tournefortia argentea* L. F., Long 3241, 3249, 3216, 3258, 3226  
*Merinda citrifolia* L., Long 3232, 3254, 3214, 3217, 3282

MIDWAY

Photographs: \*Midway Island, May 23-25, 1964, C.R. Long

May 23 - 24, 1964 (May, in black)

Eastern Island - May 23, 1964

2. large Casuarina growing on the west end; Verbesina, Lobularia, and Scaevola.
3. as in 2.
4. Lobularia, Scaevola, Verbesina, Casuarina; nestling black-footed albatross.
5. Anagalis, Gnaphalium on the ne. side of the ne-sw runway.
6. Black-footed albatross nestlings in Lobularia; bare nest areas.
7. Tribulus, Lobularia; west end of the e-w runway.
8. Lobularia stand; black-footed albatross nestlings; Scaevola in back; w. end of the w-e runway.
9. Scaevola - roots exposed by high waves of storm; erosion along the sw. shore of Eastern Island.
10. Along the south shore of Eastern Island; young Messerschmidia and Casuarina.
11. Pluchea, Casuarina, Lobularia - on the n. side of the w-e runway near the intersection with the ne-sw runway.
12. Nestling black-footed albatross in Fimbristylis, Lobularia, Verbesina; at the sw. end of Eastern Island.

Sand Island, Frigate Point - May 24, 1964

13. Scaevola and Terminalia in strip parallel to and between the shore and the runway, on se. point.
14. Scaevola, Terminalia and Casuarina; in se. strip.
15. Euphorbia heterophylla under Casuarina.
16. Old bunker on se. shore; Casuarina, Cynodon.
17. Coccoloba, Setaria, young Casuarina, Boerhaavia along the se. shore.
18. Coccoloba and Casuarina trees along the se. shore.
19. Scaevola on hillocks of sand on the se. point; nestling black-footed albatross.
20. Scaevola on the se. end of the w-e runway.
21. Scaevola on the se. side of the w-e runway stabilizing and forming sand hillocks.

May 24 - 25, 1964 (May, in red)

Sand Island, Frigate Point - May 24, 1964

1. Scaevola on sand mounds; in bloom.
2. (as in 1.)
3. Litter accumulation under Scaevola.
4. Lobularia, Verbesina and Euphorbia seedlings along the Frigate Pt. road.

Eastern Island - May 25, 1964

5. Nestling black-footed albatross in Lobularia; Conyza seedlings; ne. end of the island.



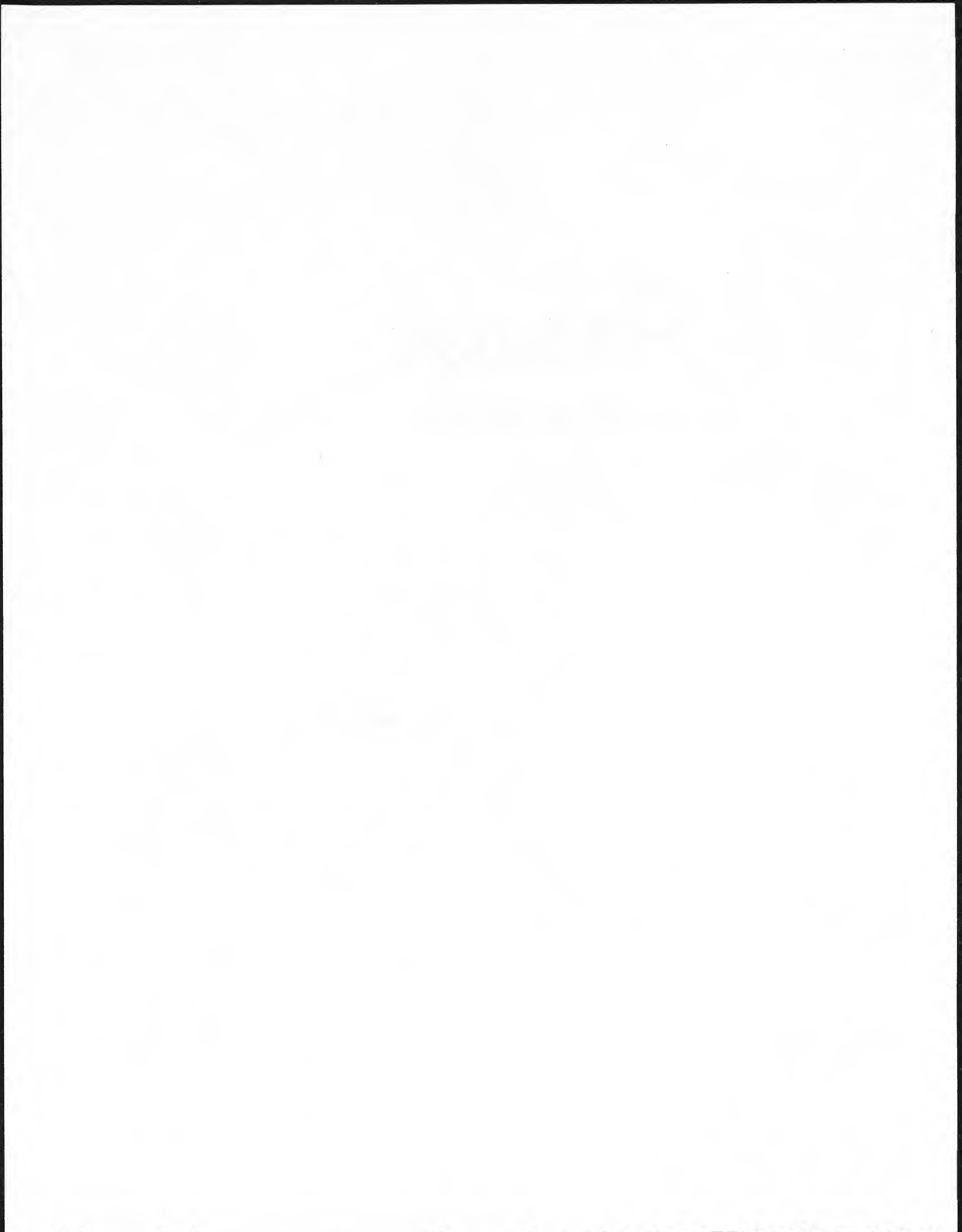
6. Verbesina, Lobularia; south side of the w-e runway.
7. Black-footed albatross - adult and nestling - in Lobularia; s. side of the e-w runway.
8. Lobularia, Boerhaavia in old nest area; w. end of the w-e runway.
9. (as in 8.)
10. Sooty terns nesting in Lobularia and Fimbristylis; e. side.
11. Black-footed albatross nestling; Lobularia and young Scaevola at the e. end of the ne-sw runway.
12. Shore vegetation opposite the end of the ne-sw runway; young Scaevola.
13. Lobularia, Conyza, Pluchea; e. end of the ne-sw runway.
14. Lobularia, young Scaevola, Messerschmidia; on the beach e. end of the ne-sw runway.
15. Beach at the e. end of the ne-sw runway; looking n.; note Lobularia growing in sand.
16. Scaevola, Messerschmidia; low branches layering out into bare areas; on the e. shore; prevailing wind from the east.
17. Low Messerschmidia shrubs on beach; e. shore.
18. Solid stand of Messerschmidia, Scaevola; note the Lobularia on the formerly "bare" break.
19. Ipomoea in flower; on e. side.
20. Verbesina on se. end of island; nestling black-footed albatross.

May 25, 1964 (May, in black)

Eastern Island, May 25, 1964

1. Red-tailed tropicbird on egg; nest of Casuarina litter; just w of the boat dock.
2. Casuarina in back; open area with Verbesina; nestling black-footed albatross; w. end of island.
3. Open area in Casuarina grove, Lobularia; w. end.
4. Boerhaavia forming a thick mat under Casuarina and Scaevola.
5. Verbesina - thick patch on the ne. end.
6. Lobularia, Scaevola, Casuarina; ne. end.
7. Young Casuarina, Verbesina, Lobularia and Scaevola.
8. Portulaca oleracea L. and Verbesina seedlings.
9. Scaevola - Messerschmidia association on the e. end with Casuarina.
10. Scaevola - close-up of the flower and leaves.
11. Red-tailed tropicbird nest in Casuarina litter.
12. Pluchea stand on the nw. side, w. of the e-w runway; nestling black-footed albatross in the Lobularia.
13. Pluchea stand further west along the e-w runway.
14. Blackfooted albatross nestlings in Lobularia with Scaevola in back; nw. side of e-w runway.
15. (as in 14.) - further west along the n. side of the runway.
16. (as in 14 and 15.) - further w. along the n. side of the runway.
17. At the extreme w. end of the e-w runway; Lepidium and Boerhaavia.
18. Raised coral gravel nest of black-footed albatross in Lobularia; w. end of the e-w runway.
19. Fimbristylis, Lobularia and Conyza; w. end of e-w runway.
20. Messerschmidia, Scaevola; n. side of the e-w runway; Fimbristylis and Lobularia.
21. Northwest side of e-w runway; nestling black-footed albatross; Fimbristylis, Lobularia, Scaevola, Messerschmidia, Casuarina.

22. Pluchea, Fimbristylis; nw. side of the e-w runway; nestling black-footed albatross.
23. Fimbristylis in bare coral gravel.
24. (as in 21.)
25. Nesting sooty terns on eggs; nw. side of the e-w runway; young Scaevola; nestling black-footed albatross.
26. Nesting sooty terns; Scaevola shrub; Casuarina and Lobularia.
27. (as in 25.) - close-up of bare nesting areas of the black-footed albatross.
28. Close-up of a black-footed albatross nestling; nw. side of the e-w runway.
29. (as in 28).
30. Coronopus, Anagalis, Lobularia; ne. side of the e-w runway.
31. Coronopus, Pluchea, Fimbristylis; mid-n. side of the e-w runway.
32. Lobularia, Pluchea, Fimbristylis; nw side of the runway.
33. Dead sooty tern on nw. end in Fimbristylis and Lobularia.
34. Many sooty tern dead; nw. side of the e-w runway; young Casuarina.
35. Long view (looking n.) of the nw. side and vegetation strip - of the e-w runway.
36. Red-tailed tropicbird nest on ground, in litter, under Scaevola.
37. Scaevola - flower and leaves close-up.



PTERIDOPHYTA

- Psilotinae
- Psilotaceae ----- psilotums
- Filices or Filicinae
- Polypodiaceae
- Lichenes
- Pyrenulaceae
- Physciaceae

SPERMATOPHYTA

- Gymnospermae
- Araucariaceae
- Angiospermae
- Monocotyledonae
- Pandanaceae ----- Pandanus, Freycineta
- Graminae ----- Lepturus, Digitaria, Cenchrus, Eragrostis, Panicum, Corn
- ✓ Bromeliaceae ----- Pineapples (Ananas)
- Cyperaceae ----- sedges, Cyperus, Fimbristylis, Scirpus
- Palmae ----- palms
- Araceae ----- taro
- Commelinaceae
- Pontederiaceae
- Liliaceae ----- onion (Allium)
- Amaryllidaceae
- Taccaceae ----- Polynesian arrowroot (Tacca)
- Dioscoraceae ----- yam (Discorea)
- Musaceae ----- bananas (Musa)

Dicotyledonae

- Casuarinaceae ----- ironwood
- ✓ Moraceae ----- mulberry, figs (Ficus) breadfruit (Artocarpus)
- ✓ Urticaceae ----- Fleurya
- Santalaceae ----- sandlewood
- Polygonaceae ----- sea-grape (Coccoloba)
- Chenopodiaceae ----- Chenopodium, Atriplex, beet (Beta)
- Amaranthaceae
- Nyctaginaceae ----- Boerhavia, Bougainvillea, Pisonia
- Aizoaceae ----- Sesuvium
- Portulacaceae ----- Portulaca
- Caryophyllaceae ----- pinks
- Annonaceae
- Lauraceae ----- love vine (Cassytha)
- Hernandiaceae
- Capparidaceae ----- Capparis
- ✓ Cruciferae ----- broccoli, mustard (Brassica), Lepidium, radish (Raphanus)
- Crassulaceae
- Rosaceae
- Leguminosae ----- Mimosa, beach pea (Vigna), clover (Prosopis), Phaseolus, Sesbania, alfalfa (Medicago), coral tree (Erythrina)
- Oxalidaceae

Zygophyllaceae ----- Tribulus  
Rutaceae ----- Citrus  
*Suriana* ✓ Simaroubaceae ----- Suriana  
✓ Euphorbiaceae ----- castor bean (Ricinus), poinsettia, spurge (Euphorbia)  
candlenut (Aleurites), Phyllanthus.  
Anacardiaceae ----- mango (Mangifera)  
  
Tiliaceae ----- trailing burbush (Triumfetta)  
✓ Malvaceae ----- Sida, milo (Thespesia), Abutilon, Hibiscus, (incl. hau)  
Sterculiaceae  
✓ Guttiferæ ----- kamani (Calophyllum)  
Tamaricaceae  
  
Passifloraceae  
✓ Caricaceae ----- papaya (Carica)  
Lythraceae ----- Pemphis  
Lecythidaceae ----- Barringtonia  
Rhizophoraceae ----- mangrove (Rhizophora)  
  
Analiaceae  
Umbelliferae ----- carrot (Daucus), parsley (Apium)  
Primulaceae  
Sapotaceae  
Apocynaceae ----- Plumeria, oleander (Nerium) Thevetia  
  
Asclepiadaceae  
✓ Convolvulaceae ----- Ipomoea  
Hydrophyllaceae ----- Nama  
✓ Boraginaceae ----- Cordia, Tournefortia, Heliotropium  
Verbenaceae  
  
Labiatae  
Solanaceae ----- tomato (Lycopersicon), tobacco (Nicotiana), Petunia,  
eggplant, nightshade (Solanum) pepper (Capsicum)  
✓ Scrophulariaceae ----- Russelia  
Bignoniaceae  
Acanthaceae  
  
Plantaginaceae  
✓ Rubiaceae ----- Morinda, Guettarda  
✓ Cucurbitaceae ----- Sicyos, pumpkin (Cucurbita) watermelon (Citrullus)  
cucumber, muskmelon (Cucumis)  
Goodeniaceae ----- Scaevola-  
Compositae ----- horseweed (Conyza), Pluchea, Verbesina, lettuce (Lactua)  
marigold (Tagetes)