

Technical Report No. 48

A VEGETATIONAL DESCRIPTION OF THE IBP SMALL MAMMAL

TRAPLINE TRANSECTS - MAUNA LOA TRANSECT

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ABSTRACT

Eighteen small mammal traplines were established along the IBP Mauna Loa transect to sample small mammal populations and their associated ectoparasites. The locations and vegetation descriptions of the lines are presented with emphasis on: 1) substrate, 2) major plant species, with an indication of their abundance, and 3) vegetation stratification of the different community segments encountered.

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INTRODUCTION

Eighteen mammal traplines were established along the IBP Mauna Loa transect to sample small mammal populations, (P. Q. Tomich - subproject D2), and their associated ectoparasites, (F. J. Radovsky and J. Tenorio - subproject C9). Trapping was conducted between October 1971 and September 1972. The results of both studies are presently in preparation. Important to an ecological interpretation for both the mammal and ectoparasite projects is the description of the vegetation along the trapline transects. As several other of the Hawaii IBP Principle Investigators conducted research in the area of the traplines, it was felt necessary to present these vegetation descriptions for use at this time.

The vegetation zonation of the Mauna Loa transect has been generally described by Mueller-Dombois (1966) in The Atlas for Bioecology Studies in Hawaii Volcanoes National Park, and again in IBP Technical Report No. 2, (Mueller-Dombois, 1972). A more detailed study was undertaken in order to further define the community zonation along each of the traplines which run off the main transect at elevations from 3040 m (10,000 ft) to 836 m (2750 ft). The majority of the traplines run for 585 m, with traps spaced 15 m apart. Transects 11, 12, 13, and 14 consist of nine traps spaced 15 m apart. The distance an intersected community runs can be found by multiplying the number of traps in the segment by 15 m.

Three basic vegetation types^{are}/distinguished in the study area: tree communities, shrub communities, and grassland. The tree communities are dominated either by Metrosideros collina, Acacia koa, or a mixture of these two tree species. An exception occurs along trapline #16 (Kipuka Puau), which runs through a mesophytic kipuka forest which typically includes both Metrosideros and Acacia, and additionally includes Sapindus saponaria, with a mixture of other less abundant subcanopy forest trees: Pelea sp., Charpentiera obovata, Myrsine lessertiana, Osmanthus sandwicensis, Pisonia umbellifera, Coprosma rhynchocarpa, and Zanthoxylum sp. The shrub communities are dominated primarily by Styphelia spp. and to a lesser extent by Vaccinium spp. and Dodonaea sandwicensis. Several different grassland types are present, the most important of which are dominated by Paspalum dilatatum, Deschampsia australis subsp. nubigena, Pennisetum clandestinum, Andropogon glomeratus, A. virginicus, and Melinis minutiflora.

The communities present reflect elevation, substrate, available moisture, and successional age. The frequent eruptions originating on the northeast rift of Mauna Loa have resulted in a mosaic of volcanic substrates of varying age. Additionally the community structure reflects vegetation recovery from intense cattle

grazing from the early 1820's to 1940 (Baldwin and Fagerlund, 1943). Feral goat populations have also been high over the past century and are only now being reduced. As a result, most of the mammal traplines traverse several, often distinct, communities within a relatively short distance.

METHODS

Each transect is divided into segments along the boundaries of the vegetation communities intersected. For each of these segments are recorded: 1) substrate, 2) major plant species, 3) vegetation stratification, with estimates of percent cover for each primary stratum, and 4) species presence and abundance for each level, using the modified Domin-Krajina cover-abundance scale (TABLE 1). This method is described by Mueller-Dombois (1972), in IBP Technical Report No. 2:31-41. The vegetational strata are as follows:

- A (trees): A1 > 15 m
A2 = 5 - 15 m
- B (shrubs and tree ferns): B1 = 2 - 5 m
B2 = 0.2 - 2 m
- C (herbs and small ferns): C1 > 0.2 m
C2 < 0.2 m

For most community segments, the vegetation was recorded from 15 x 15 m plots centered on the transect. Smaller plots were used when the vegetation segments were of small area. No attempt was made to measure stem density or basal areas for trees or shrubs.

Plot references in the descriptions correspond to Transect Profile Segments in IBP Technical Report No. 2:22-26 (Mueller-Dombois, 1972), and to vegetation relevés sampled by Mueller-Dombois and G. Spatz along the major IBP transects. Plant names follow Fosberg's⁽¹⁹⁶⁶⁾ Check List of Vascular Plants in Hawaii Volcanoes National Park as modified by St. John (1973).

TABLE 1. The modified Domin-Krajina cover-abundance estimate scale. (From Mueller-Dombois 1972:41).

SCALE	COVER AND % RANGE
10	95 - 100
9	75 - 95
8	50 - 75
7	33 - 50
6	20 - 33
5	10 - 20
4	5 - 10
3	1 - 5
2	< 1
1	very small (.1%to<1%)
+	solitary (< .1%)

RESULTS

SECTION 1

Location and vegetational zonation of the mammal trap lines along Mauna Loa transect:

Transect #1

Location: Mauna Loa Trail, elevation 7000'--follows the contour to the S

Substrate: pahoehoe

Refs: Transect Profile #1, segment 5; relevé #16

Segment communities:

- a: open subalpine scrub Metrosideros forest, all traps

Transect #2

Location: Mauna Loa Strip Road, elevation 6050'--follows contour SW

Substrate: pahoehoe covered w/shallow ash

Refs: Transect Profile #1, segment 6; relevés #24, 25, 26A, 26B

Segment communities:

- a: open Metrosideros-Sophora forest w/mixed native shrubs, traps 1-28
- b: broken Deschampsia grassland, traps 29-32
- c: A. koa stand, traps 33-39

Transect #3

Location: Mauna Loa Strip Road, elevation 4900'--runs W from junction w/Powerline Rd.

Substrate: (see community segments)

Refs: Transect Profile #1, segment 7; relevés #70, 71, 72A, 72B

Segment communities:

- a: Styphelia-Dodonaea shrub community; substr: ash covered pahoehoe; traps 1-3
- b: A. koa-Sophora tree community; substr: aa; traps 4-11
- c: Mixed grassland; substr: ash covered pahoehoe; traps 12-22
- d: dense Styphelia-Dodonaea shrub community; substr: pahoehoe w/shallow ash; traps 23-39

Transect #4

Location: Kipuka Ki, elevation 4200'--line heads N from IBP weather station

Substrate: (see community segments)

Refs: Transect Profile #1, segment 8; relevé #39

Segment communities:

- a: mixed grassland; substr: deep ash; traps 1-10
- b: open A. koa savanna forest; substr: deep ash; traps 11-15
- a₂: mixed grassland; substr: deep ash; traps 16-18
- b₂: A. koa-Metrosideros savanna forest; substr: deep ash; traps 19-25
- a₃: mixed grassland; substr: deep ash; traps 26-29
- b₃: A. koa-Metrosideros savanna forest; substr: deep ash; traps 30-32
- c: lichen-fern pioneer community; substr: aa; traps 33-35
- a₄: mixed grassland; substr: ash; traps 36-39

Transect #5

Location: (KMC) elevation 4000'--line runs SW off road joining Highway 11 and Crater Rim Road

Substrate: pahoehoe covered w/shallow cinder

Refs: Transect Profile #1, segment 10; relevé #50

Segment community:

- a: open Metrosideros-lichen (Cladonia) forest with low shrubs; all traps

Transect #6

Location: Thurston Lava Tube Area, elevation 3900'--line runs NE off the Escape Road, 100 m S of the lava tube entrance.

Substrate: shallow ash and litter layer on pahoehoe

Refs: Transect Profile #1, segment 12

Segment community:

- a: closed Metrosideros-Cibotium montane rain forest

Transect #7

Location: Kipuka Nene--line runs off Hilina Pali Road on N side of the kipuka

Substrate: (see community segments)

Refs: none

Segment communities:

- a: open Metrosideros-Sophora forest; substr: ash; traps 1-9
- b: open Metrosideros-Sophora burned forest; substr: ash; traps 10-18
- c: mixed exotic grassland; substr: shallow cinder covered pahoehoe; traps 19-39

Transect #8

Location: Glenwood, Highway 11 at jct. w/Alii Kane Road, elevation 2950'--line runs E off Alii Kane Road

Substrate: shallow ash and litter layer on pahoehoe

Refs: relevé #55

Community: open scrub Metrosideros-Gleichenia rain forest

Transect #9

Location: Olaa Forest Reserve, elevation 2950'--line runs NW into the forest across Highway 11 from Alii Kane Road

Substrate: shallow ash and litter layer on pahoehoe

Refs: relevé #54

Community: semi-closed Metrosideros-Gleichenia rain forest

Transect #10

Location: Mauna Loa Trail, elevation 8000'--runs NE off the trail

Substrate: (see community segments)

Refs: Transect Profile #1, segment 5

Segment communities:

- a: small Metrosideros community; substr: ash pocket on pahoehoe, trap 1
- b: open Styphelia-Vaccinium scrub; substr: aa; traps 2-6
- c: open Styphelia-Vaccinium scrub; substr: pahoehoe; trap 7
- b₁: open Styphelia-Vaccinium scrub; substr: aa, traps 8-13
- c₁: open Styphelia-Vaccinium scrub; substr: pahoehoe, traps 14-23
- b₂: open Styphelia-Vaccinium scrub; substr: as; trap 24
- c₂: open Styphelia-Vaccinium scrub; substr: pahoehoe; traps 25-32
- d: large semi-open Metrosideros community; substr: ash pocket on pahoehoe, traps 33-35
- b₃: open Styphelia-Vaccinium scrub; substr: aa; traps 36-39

Transect #11

Location: Mauna Loa Trail, elevation 8500'--runs parallel to trail on Hilo side

Substrate: pahoehoe

Refs: Transect Profile #1, segment 4

Community: Vaccinium-Styphelia low scrub desert

Transect #12

Location: Mauna Loa Trail, elevation 9000'--line parallels Hilo side of the trail
Substrate: pahoehoe
Refs: Transect Profile #1, segment 4
Community: Vaccinium-Styphelia low scrub desert; total vegetation cover 10%

Transect #13

Location: Mauna Loa Trail, elevation 9500'--line parallels the trail on the Ka'u side
Substrate: pahoehoe
Refs: Transect Profile #1, segment 3
Community: Vaccinium-Styphelia low scrub desert, less than 10% vegetation cover

Transect #14

Location: Puu Ulaula Ranger cabin, Mauna Loa trail, elevation 10000'--9 traps placed around the cabin
Substrate: cinder
Refs: none
Community: Cinder desert--no established vegetation

Transect #15

Location: Kipuka Puauulu, elevation 4000'--line runs N from beginning of circle trail
Substrate: deep ash
Refs: Transect Profile #1, segment 9
Segment communities:
a: closed Sapindus kipuka forest; trap 1
b: open forest-mixed grassland; trap 2
c: semi-closed Sapindus-Metrosideros forest; trap 3
d: mixed exotic grassland; traps 4 & 5
e: semi-closed Coprosma stand; trap 6
f: closed Metrosideros-Sapindus forest; traps 7 & 8
g: open Metrosideros forest-mixed exotic grassland; traps 9-12
h: semi-closed Metrosideros-Sapindus forest; traps 13-20
i: mixed exotic grassland interspersed with Pipturus clumps; traps 21-24
j: Pipturus shrub thicket; traps 25-27
k: closed mixed forest; traps 28-35
l: open Metrosideros forest-mixed grassland; traps 36-39

Transect #16

Location: above "Sulfur Banks" along Highway 11, elevation 4000'
Substrate: shallow ash and litter layer over pahoehoe
Refs: Transect Profile #1, segment 11
Segment communities:
a: open scrub Metrosideros-Gleichenia forest; traps 1-8
b: open scrub Metrosideros-Lycopodium forest; traps 9-11
c: semi-closed Metrosideros-Cibotium-Gleichenia forest; traps 12-16
d: open Metrosideros forest over mixed exotic grassland; traps 17-20
c₁: semi-closed Metrosideros-Cibotium-Gleichenia forest; traps 21-39

Transect #17

Location: Hilina Pali Road below Kipuka Nene, elevation 2850'

Substrate: (see segment communities)

Refs: Transect Profile #2, segments 4 & 5

Segment communities:

- a: open Metrosideros forest w/native shrub understory; substr: shallow ash on pahoehoe; traps 1 & 2
- b: open Metrosideros forest w/fairly open understory; substr: pahoehoe--follows flood gulch; traps 3-10
- c: open scrub Metrosideros forest; substr: pahoehoe; traps 11-18
- d: open scrub vegetation; substr: aa; traps 19 & 20
- c₁: open scrub Metrosideros forest; substr: pahoehoe; traps 21-25
- e: Melinis grassland under partially burned open Metrosideros forest; substr: ash layer on pahoehoe; traps 26-34
- a₁: open Metrosideros forest w/native shrub understory; substr: shallow ash on pahoehoe; traps 35-39

Transect #18

Location: Hilina Pali Road, elevation 2750'--starts on pahoehoe flow below Transect #17

Substrate: (see segment communities)

Refs: Transect Profile #2, segments 4 & 5

Segment communities:

- a: very open scrub Metrosideros forest; substr: pahoehoe; traps 1-20
- b: perennial Andropogon-Melinis grassland; substr: shallow ash layer on pahoehoe; traps 21-39

SECTION 2 Vegetation stratification and species cover-abundance along the transects

TRANSECT #1

A = 5%
 A₂ = 5%
 B = 45
 B₁ = 40
 B₂ = 5
 C = 5
 C₁ = 5

COVER SCALE

A ₂	<u>Metrosideros collina</u>	3
B ₁	<u>Styphelia tameiameia</u>	5
	<u>Dodonaea sandwicensis</u>	4
	<u>Vaccinium</u> spp.	4
B ₂	<u>Coprosma ernodeoides</u>	3
	<u>Geranium cuneatum</u>	1
C ₁	<u>Deschampsia australis</u> subsp. <u>nubigena</u>	3
	<u>Asplenium adiantum-nigrum</u>	1
	<u>A. trichomanes</u>	1
	<u>Pellaea ternifolia</u>	1
	<u>Hypochoeris radicata</u>	3

TRANSECT #2

Segment A	Segment B	Segment C
A = 5	A = 0	A = 60
A ₂ = 5		A ₂ = 60
B = 65	B = 5	B = 5
B ₂ = 65	B ₂ = 5	B ₂ = 5
C = 35-40	C = 95-100	C = 75-80
C ₁ = 25-30	C ₁ = 90	C ₁ = 70
C ₂ = 10	C ₂ = 10	C ₂ = 80

	Segment a	Segment b	Segment c	
A ₂	<u>Acacia koa</u>	3	0	8
	<u>Sophora chrysophylla</u>	3	0	5
B ₂	<u>Styphelia tameiameia</u>	7	3	1
	<u>Vaccinium reticulatum</u>	3	1	0
	<u>Dodonaea sandwicensis</u>	3	1	2
	<u>Coprosma ernodeoides</u>	3	0	0
	<u>Lythrum maritimum</u>	3	0	3
C ₁	<u>Pteridium aquilinum</u>	3	5	3
	<u>Deschampsia australis</u> subsp. <u>nubigena</u>	5	8	7
	<u>Panicum tenuifolium</u>	3	3	4
	<u>Holcus lanatus</u>	3	2	5
	<u>Andropogon virginicus</u>	1	1	1
	<u>Microlaena stipoides</u>	0	0	1
	<u>Machaerina gahniaeformis</u>	1	1	0
	<u>Carex wahuensis</u>	1	0	1
C ₂	<u>Rumex acetosella</u>	3	3	3
	<u>Asplenium trichomanes</u>	1	0	0
	<u>Pellaea ternifolia</u>	1	0	0

TRANSECT #3

Segment a	Segment b	Segment c	Segment d
A = 0	A = 70	A = 0	A = 0
B = 75-80	A ₂ = 70	B = +	B = 95
B ₂ = 75-80	B = 20	C = 100	B ₂ = 95
C = 40-45	B ₁ = 2	C ₁ = 90-95	C = 15-20
C ₁ = 37	B ₂ = 18	C ₂ = 5-10	C ₁ = 15
C ₂ = 7	C = 25		C ₂ = 5
	C ₁ = 18		
	C ₂ = 7		

	Segment a	Segment b	Segment c	Segment d
A ₂ <u>Acacia koa</u>		7		
<u>Sophora chrysophylla</u>		7		
B ₁ <u>Dodonaea sandwicensis</u>		3		
B ₂ <u>Styphelia tameiameia</u>	8	0	0	8
<u>Dodonaea sandwicensis</u>	5	0	0	6
<u>Coprosma rhynchocarpa</u>		2		
<u>Coprosma ernodeoides</u>	3		1	3
<u>Lythrum maritimum</u>	3	5		3
<u>Acacia koa</u> (root suckers)	1	1	1	1
C ₁ <u>Pteridium aquilinum</u>	3	1	6	4
<u>Deschampsia australis</u> subsp. <u>nubigena</u>	5	3	7	5
<u>Holcus lanatus</u>	3	3	6	3
<u>Anthoxanthum odoratum</u>	+	3	1	1
<u>Andropogon virginicus</u>	1		1	3
<u>Panicum tenuifolium</u>		3	3	
<u>Carex macloviana</u>	1		1	1
<u>C. wahuensis</u>		3		
<u>Cyperus</u> sp.		+		
<u>Bromus catharticus</u>		3		
<u>Paspalum dilatatum</u>	3		6	3
C ₂ <u>Hypochoeris radicata</u>	3	3	3	1
<u>Anagallis arvensis</u>			1	
<u>Rumex acetosella</u>	3	3	3	3

TRANSECT #4

Seg a	Seg b	Seg a ₂	Seg b ₂	Seg a ₃	Seg b ₃
A = 0	A = 50-55	A = 0	A = 45-50	A = 2	A = 45-50
B = 15	A ₁ = 40	B = +	A ₁ = 45	A ₁ = 1	A ₁ = 45
B ₂ = 15	A ₂ = 15	C = 100	A ₂ = 4	A ₂ = 1	A ₂ = 2
C = 100	B = 35	C ₁ = 100	B = 2	B = 25	B = 20
C ₁ = 90-100	B ₂ = 35	C ₂ = +	B ₂ = 2	B ₂ = 25	B ₂ = 20
C ₂ = 10-20	C = 60-65		C = 90	C = 85-90	C = 70
	C ₁ = 55-60		C ₁ = 90	C ₁ = 85	C ₁ = 65
	C ₂ = 6			C ₂ = 2	C ₂ = 5

TRANSECT #4 (cont)

		Segment c		Segment a ₄					
		A = 0	B = 0	A = +					
		C = 35		B = 10					
		C ₁ = 17		B ₂ = 10					
		C ₂ = 27		C = 90-95					
				C ₁ = 90					
				C ₂ = +					
		Seg a	Seg b	Seg a ₂	Seg b ₂	Seg a ₃	Seg b ₃	Seg c	Seg a ₄
A ₁	<u>Acacia koa</u>		7		7	2	7		
A ₂	<u>Acacia koa</u>								
	<u>Metrosideros collina</u>		5		3	3	3		2
	<u>Myoporum sandwicense</u>		3		3		3		
B ₂	<u>Lythrum maritimum</u>	4	4						4
	<u>Rubus penetrans</u>		5		3	4	4		2
	<u>Solanum pseudocapsicum</u>		5	1		4	5		2
	<u>Cibotium chamissoi</u>					2			
	<u>C. glaucum</u>						1		
C ₁	<u>Paspalum dilatatum</u>	7	5	8		4			7
	<u>Holcus lanatus</u>	6	4	7		7	7	4	7
	<u>Bromus catharticus</u>	3	2			3	3	3	
	<u>Cynodon dactylon</u>		6			3	2	3	3
	<u>Poa pratensis</u>		3				3		
	<u>Pennisetum clandestinum</u>				9	3			
	<u>Anthoxanthum odoratum</u>					2			
	<u>Pteridium aquilinum</u>	6	3	4	3	5	5		5
	<u>Dryopteris hawaiiensis</u>				2		2	2	
	<u>Pteris cretica</u>		2						
	<u>Verbena litoralis</u>	3	3	2		3		3	2
C ₂	<u>Veronica plebeia</u>	3	2	2		3	3		2
	<u>Geranium carolinianum</u>						3	2	2
	<u>Fragaria vesca</u>		3						
	<u>Senecio sylvaticus</u>							5	
	<u>Pellaea ternifolia</u>							2	
	<u>Asplenium trichomanes</u>							2	
	<u>Hypochoeris radicata</u>							2	
	<u>Rumex acetosella</u>							3	
	<u>Commelina diffusa</u>	4							
	<u>Ipomoea congesta</u>	2							

TRANSECT #5

A = 5	A ₂ <u>Metrosideros collina</u>	3	C ₁ (cont)	
A ₂ = 5			<u>Machaerina gahniaeformis</u>	2
B = 85	B ₂ <u>Styphelia tameiameia</u>	7	<u>Luzula hawaiiensis</u>	1
B ₂ = 85	<u>Dodonaea sandwicensis</u>	6	<u>Anthoxanthum odoratum</u>	2
C = 20	<u>Coprosma ernodeoides</u>	3	<u>Polypodium pellucidum</u>	2
C ₁ = 10	<u>Railliardia ciliolata</u>	3	<u>Elaphoglossum reticulatum</u>	2
C ₂ = 10	<u>Vaccinium reticulatum</u>	5	<u>Pteridium aquilinum</u>	2
	<u>Wikstroemia</u> sp.	3	<u>Psilotum nudum</u>	2
	<u>Sadleria cyatheoides</u>	3		
	C ₁ <u>Erigeron canadensis</u>	3	C ₂ <u>Bulbostylis capillaris</u>	3
	<u>Deschampsia australis</u>		<u>Hypochoeris radicata</u>	3
	subsp. <u>nubigena</u>	3		
	<u>Andropogon virginicus</u>	3		
	<u>Holcus lanatus</u>	2		
	<u>Dianella sandwicensis</u>	1		

TRANSECT #6

A = 45-50	A ₂ <u>Metrosideros collina</u>	7	C ₁ <u>Nephrolepis cordifolia</u>	1
A ₂ = 45-50	<u>Ilex anomala</u>	4	<u>Sphenomeris chusana</u>	1
B = 90	<u>Coprosma ochracea</u>	3	<u>Gleichenia emarginata</u>	5
B ₁ = 10	<u>Myrsine lessertiana</u>	3	<u>Lycopodium cernuum</u>	3
B ₂ = 80	B ₁ <u>Psidium cattleianum</u>	3	<u>Astelia menziesiana</u>	3
C = 35	<u>Coprosma ochracea</u>	4	<u>Machaerina angustifolia</u>	3
C ₁ = 35	<u>Perrottetia sandwicensis</u>	2	<u>Uncinia uncinata</u>	4
C ₂ = +			<u>Isachne distichophylla</u>	4
	B ₂ <u>Sadleria</u> spp.	4	<u>Phaius tankervilleae</u>	1
	<u>Cibotium</u> spp. (3)	8	<u>Anemone hupehensis</u>	3
	<u>Cyrtandra platyphylla</u>	3	<u>Andropogon virginicus</u>	3
	<u>Clermontia</u> spp. (2)	2		
	<u>Vaccinium calycinum</u>	3	C ₂ <u>Psilotum complanatum</u>	2
	<u>Rubus penetrans</u>	3	<u>Fragaria vesca</u>	2
	<u>Eupatorium riparium</u>	3		
	<u>Pipturus albidus</u>	3		

TRANSECT #7

Segment a	Segment b	Segment c
A = 30-35	A = 15	A = 5
A ₁ = 15	A ₂ = 15	A ₂ = 5
A ₂ = 17-20	B = 25-30	B = 10
B = 25	B ₂ = 25-30	B ₂ = 10
B ₂ = 25	C = 50	C = 95-100
C = 75-80		

TRANSECT #7 (cont)

	Segment a	Segment b	Segment c
A ₁ <u>Metrosideros collina</u>	5		
A ₂ <u>Metrosideros collina</u>	3	4	3
<u>Sophora chrysophylla</u>	5	4	3
B ₂ <u>Dodonaea sandwicensis</u>	4	4	
<u>Bidens pilosa</u>	3	3	
<u>Stachytarpheta cayennensis</u>	3	3	
<u>Styphelia tameiameia</u>	3	4	
<u>Rubus rosaefolius</u>	3	3	2
<u>Psidium guajava</u>	3	3	3
<u>Osteomeles anthyllidifolia</u>	2	2	
<u>Solanum nigrum</u>	1		3
<u>Pluchea odorata</u>	1	1	1
C <u>Cocculus ferrandianus</u>	3	3	
<u>Physalis peruviana</u>	3	3	2
<u>Desmodium uncinatum</u>	2	2	3
<u>Pteridium aquilinum</u>	5	5	4
<u>Erigeron canadensis</u>	2	3	2
<u>Sonchus oleraceus</u>	2	2	
<u>Andropogon spp.</u>	5	7	7
<u>Melinis minutiflora</u>	5	7	7
<u>Rhynchelytrum repens</u>	4	5	5
<u>Sporobolus africanus</u>	2	2	
<u>Cynodon dactylon</u>	3	3	
<u>Setaria geniculata</u>	3	2	
<u>Gnaphalium sp.</u>		2	2
<u>Bulbostylis capillaris</u>	2	3	3
<u>Geranium carolinianum</u>	2	2	

TRANSECT #8

A = 15	A ₂ <u>Metrosideros collina</u>	5	C <u>Arundina bambusaefolia</u>	4
A ₂ = 15	<u>Ilex anomala</u>	2	<u>Machaerina angustifolia</u>	5
B = 55-60			<u>Machaerina mercanioides</u>	5
B ₂ = 55-60	B ₂ <u>Metrosideros collina</u>	7	<u>Andropogon virginicus</u>	5
C = 95-100	<u>Scaevola chamissoniana</u>	3	<u>Gleichenia emarginata</u>	7
	<u>Rubus penetrans</u>	3	<u>Lycopodium cernuum</u>	4
	<u>Cibotium glaucum</u>	3	<u>Setaria geniculata</u>	3
	<u>Psidium cattleianum</u>	3	<u>Eupatorium riparium</u>	4
			<u>Paspalum sp.</u>	2
			<u>Digitaria sp.</u>	4

TRANSECT #9

A = 45	A ₂ = 45	B = 25	B ₁ = 10	B ₂ = 15	C = 95-100	C ₁ = 95-100	A ₂ <u>Metrosideros collina</u>	7	C ₁ <u>Andropogon virginicus</u>	2
							<u>Ilex anomala</u>	3	<u>Lycopodium cernuum</u>	4
							<u>Cryptomeria japonica</u>	3	<u>Gleichenia emarginata</u>	9
							B ₁ <u>Scaevola chamissoniana</u>	3	<u>Isachne distichophylla</u>	3
							<u>Gouldia terminalis</u>	3	<u>Machaerina angustifolia</u>	4
							B ₂ <u>Cibotium glaucum</u>	3	<u>Machaerina mariscoides</u>	4
							<u>Sadleria cyatheoides</u>	3		
							<u>Vaccinium calycinum</u>	3		
							<u>Coprosma sp.</u>	3		
							<u>Railliardia scabra</u>	3		
							<u>Hedyotis centranthoides</u>	3		

TRANSECT #10

Segment a	Segment b	Segment c	Segment d	Segment e
A = 45	B = 75-80	A = 5	A = 1	A = 60
A ₂ = 45	B ₂ = 75-80	A ₂ = 5	A ₂ = 1	A ₂ = 60
B = 85	C = 1	B = 40	B = 45-50	B = 80
B ₂ = 85		B ₂ = 40	B ₂ = 45-50	B ₂ = 80
C = 11		C = 3	C = 3	C = 30
C ₁ = 10		C ₁ = 3	C ₁ = 2	C ₁ = 30
C ₂ = 1		C ₂ = +	C ₂ = 1	C ₂ = +

	Segment a	Segment b	Segment c	Segment d	Segment e
A ₂ <u>Metrosideros collina</u>	7		3	3	8
B ₂ <u>Vaccinium peleanum</u>	6	6	4	5	5
<u>Styphelia tameiameia</u>	7	6	5	5	7
<u>Railliardia ciliolata</u>		3		2	
<u>Coprosma montana</u>	4	3	4		4
<u>Dodonaea sandwicensis</u>	4	5	3	4	4
<u>Coprosma ernodeoides</u>	4	5	3	3	5
<u>Tetramolopium humile</u>		1		1	
<u>Geranium cuneatum</u>					1
C ₁ <u>Deschampsia australis</u>					
subsp. <u>nubigena</u>	4	2	3	3	6
<u>Machaerina gahniaeformis</u>		2	2	2	
C ₂ <u>Hypochoeris radicata</u>	3				2
<u>Pellaea ternifolia</u>		2	2	2	
<u>Asplenium adiantum-nigrum</u>	2	2			2
<u>Polypodium pellucidum</u>		2			

TRANSECT #11

B = 11	B ₂ <u>Styphelia tameiameia</u>	4	C ₁ <u>Trisetum glomeratum</u>	+
B ₂ = 11	<u>Vaccinium peleanum</u>	4	C ₂ <u>Pellaea ternifolia</u>	+
C = +	<u>Dodonaea sandwicensis</u>	2		

TRANSECT #12

B = 4	B ₂	<u>Vaccinium peleanum</u>	2	C ₁	<u>Trisetum glomeratum</u>	+
B ₂ = 4		<u>Styphelia tameiameia</u>	2	C ₂	<u>Asplenium trichomanes</u>	+
C = +					<u>Pellaea ternifolia</u>	+

TRANSECT #13

B = 1	B ₂	<u>Vaccinium peleanum</u>	+	C	<u>Asplenium trichomanes</u>	+
B ₂ = 1		<u>Styphelia tameiameia</u>	+		<u>Pellaea ternifolia</u>	+
C = +						

TRANSECT #14 No established vegetation

TRANSECT #15

Segment a	Segment b	Segment c	Segment d	Segment e	Segment f
A = 95-100	A = 32	A = 95	A = 30	A = 0	A = 40
A ₁ = 55	A ₁ = 30	A ₁ = 60	A ₂ = 30	B = 65	A ₂ = 40
A ₂ = 50	A ₂ = 2	A ₂ = 35-40	B = 2	B ₁ = 65	B = 70-75
B = 45	B = 30	B = 55-60	B ₁ = 2	B ₂ = 65	B ₁ = 60
B ₁ = 36	B ₁ = 20	B ₁ = 50	C = 100	C = 86	B ₂ = 12
B ₂ = 9	B ₂ = 10	B ₂ = 10			C = 40
C = 5	C = 100	C = 15			

Segment g	Segment h	Segment i	Segment j	Segment k	Segment l
A = 45-50	A = 50	A = 8	A = 5	A = 70	A = 30
A ₂ = 45-50	A ₁ = 50	A ₁ = 8	A ₂ = 5	A ₁ = 45	A ₁ = 10
B = 10-15	B = 85	B = 22	B = 95-100	A ₂ = 25	A ₂ = 20
B ₁ = 7	B ₁ = 70	B ₁ = 22	B ₁ = 95	B = 100	B = 20
B ₂ = 5	B ₂ = 15	C = 100	B ₂ = 30	B ₁ = 65	B ₁ = +
C = 100	C = 15		C = 10	B ₂ = 85	B ₂ = 20
				C = 5	C = 80

		Seg a	b	c	d	e	f	g	h	i	j	k	l
A ₁	<u>Sapindus saponaria</u>	7		6					6				
	<u>Metrosideros collina</u>			6					6			7	5
	<u>Sophora chrysophylla</u>	5											
	<u>Acacia koa</u>							3					5
A ₂	<u>Metrosideros collina</u>	2	6		5		5	7		3			
	<u>Sophora chrysophylla</u>	7		6							3	4	
	<u>Coprosma rhynchocarpa</u>	2		3			5						
	<u>Osmanthus sandwicensis</u>			3									
	<u>Myrsine lessertiana</u>			3			3			3		4	4
	<u>Persea americana</u>			3									
	<u>Charpentiera obovata</u>												3
	<u>Sapindus saponaria</u>		3		4		5	3					

TRANSECT #15 (cont)

	Seg	a	b	c	d	e	f	g	h	i	j	k	1
B ₁	<u>Coprosma rhynchoarpa</u>	6		7		7	7	2	8	3	6	8	2
	<u>Psychotria hawaiiensis</u>	4		4		4	5	3	4		3	4	2
	<u>Pelea volcanica</u>	2						1	3	3	2	2	
	<u>Pisonia umbellifera</u>	2				3							
	<u>Sapindus saponaria</u> (saplings)	3		3		4							
	<u>Hibiscadelphus</u> sp.		3										
	<u>Pipturus albidus</u>			3	3					5	8		2
	<u>Sophora chrysophylla</u>		4			5		2			5		
	<u>Myrsine lessertiana</u>						3	3	4				
B ₂	<u>Coprosma rhynchoarpa</u> (seedlings)	3	4	4			4		4		6	7	2
	<u>Sapindus saponaria</u> (seedlings)	3		3					3				
	<u>Psychotria hawaiiensis</u> (seedlings)	2				3			3			7	
	<u>Sadleria</u> sp.		2										
	<u>Cibotium glaucum</u>												
	<u>Rubus penetrans</u>						3	4			2		
	<u>Alyxia olivaeformis</u>								2			4	5
C	<u>Pteridium aquilinum</u>		4		5					5			
	<u>Microlepia setosa</u>	3		5			7		2				
	<u>Thelypteris cyatheoides</u>											2	
	<u>Athyrium sandwichianum</u>								3				
	<u>Hedychium</u> sp.		3										
	<u>Cynodon dactylon</u>		7							6			5
	<u>Holcus lanatus</u>		6		7			7		7			7
	<u>Paspalum dilatatum</u>				7		2	7		6			
	<u>Microlaena stipoides</u>	3	3	3		9			3	4			5
	<u>Cyperus brevifolius</u>							5		4			
	<u>Ipomoea congesta</u>	3	4				2	6	3	4	2	2	3
	<u>Mentha piperita</u>		5										
	<u>Cirsium vulgares</u>		2		3								
	<u>Fragaria vesca</u>	3							5		5	3	3
	<u>Commelina diffusa</u>		3		4								
	<u>Geranium carolinianum</u>		3		3					2			

TRANSECT #16

Segment a	Segment b	Segment c	Segment d
A = 0	A = 30	A = 10	A = +
B = 75-80	A ₂ = 30	A ₂ = 10	B = 60
B ₁ = 40	B = 90-95	B = 95-100	B ₁ = 50
B ₂ = 35-40	B ₁ = 42	B ₁ = 70	B ₂ = 10
C = 95-100	B ₂ = 50	B ₂ = 30	C = 100
	C = 85	C = 100	

	Segment a	Segment b	Segment c	Segment d	
A ₂	<u>Metrosideros collina</u>		6	4	2
B ₁	<u>Metrosideros collina</u>	6	6	8	7
	<u>Ilex anomala</u>	4	3	4	4
	<u>Myrica faya</u>	+			
	<u>Coprosma rhynchocarpa</u>	1	5		
B ₂	<u>Vaccinium calycinum</u>	2			
	<u>Smilax sandwicensis</u>	3			
	<u>Wikstroemia sp.</u>	2			
	<u>Sadleria cyatheoides</u>	5		3	
	<u>Dodonaea sandwicensis</u>	3			
	<u>Rubus penetrans</u>	2	5		
	<u>Styphelia tameiameia</u>	3			3
	<u>Railliardia ciliolata</u>	2			
	<u>Cibotium spp.</u>		4	5	4
	<u>Eupatorium riparium</u>	2	5	4	
	<u>Cyrtandra platyphylla</u>			2	
	<u>Coprosma ernodeoides</u>	3	4		
C	<u>Gleichenia emarginata</u>	8	5	9	5
	<u>Lycopodium cernuum</u>	5	7	4	6
	<u>Tritonia crocosmifolia</u>				3
	<u>Paspalum sp.</u>				3
	<u>Paspalum conjugatum</u>				4
	<u>Holcus lanatus</u>		2		6
	<u>Cynodon dactylon</u>				6
	<u>Isachne distichophylla</u>	3	4	3	
	<u>Cyperus sp.</u>		4	5	
	<u>Phaius tankervilleae</u>			2	
	<u>Commelina diffusa</u>		2	3	
	<u>Astelia menziesiana</u>	4			
	<u>Carex sp.</u>		2		
	<u>Machaerina angustifolia</u>	3			
	<u>Hypochoeris radicata</u>	2	2		
	<u>Hedychium sp.</u>		2		
	<u>Uncinia uncinata</u>	2			

TRANSECT #17

Segment a	Segment b	Segment c	Segment d	Segment e
A = 40	A = 40	A = 5	A = 1	A = 10
B = 70	B = 25	B = 30	B = 10	B = 3
B ₁ = 15	B ₁ = 15	B ₂ = 30	B ₂ = 10	B ₂ = 3
B ₂ = 55	B ₂ = 10	C = 30	C = 2	C = 100
C = 95	C = 60	C ₁ = 30	C ₁ = 2	C ₁ = 100
C ₁ = 90-95	C ₁ = 60	C ₂ = +	C ₂ = +	C ₂ = +
C ₂ = +	C ₂ = +			

	Segment a	Segment b	Segment c	Segment d	Segment e
A ₁	<u>Metrosideros collina</u> (live)	6	6		2
	<u>Metrosideros collina</u> (dead)				4
A ₂	<u>Metrosideros collina</u>	6	6	3	2
B ₁	<u>Sophora chrysophylla</u>	2	2		
	<u>Metrosideros collina</u>	5	5		
B ₂	<u>Dodonaea sandwicensis</u>	6	4	5	3
	<u>Styphelia tameiameia</u>	6	4	5	3
	<u>Psidium guajava</u>	2			
	<u>Stachytarpheta cayennensis</u>	2	2		
	<u>Pluchea odorata</u>				2
	<u>Bidens pilosa</u>				3
C ₁	<u>Pteridium aquilinum</u>	3			2
	<u>Melinis minutiflora</u>	8	7	5	2
	<u>Andropogon</u> spp.	6	6	4	2
	<u>Rhynchelytrum repens</u>	4	4		2
	<u>Erigeron canadensis</u>	1			
	<u>Cocculus ferrandianus</u>	2	2		
	<u>Doryopteris decora</u>				2
	<u>Carex wahuensis</u>	2	2	2	
	<u>Sporobolus africanus</u>	2	2		
	<u>Nephrolepis exaltata</u>	2			
C ₂	<u>Emilia javanica</u>	2	2		
	<u>Bulbostylis capillaris</u>	2	2		
	<u>Commelina diffusa</u>	2			
	<u>Pellaea ternifolia</u>			2	2

TRANSECT #18

Segment a

A = 0
B = 20
 B₁ = 2
 B₂ = 18
C = 15
 C₁ = 8-10
 C₂ = 5

Segment b

A = 0
B = 31
 B₁ = 1
 B₂ = 30
C = 90-95
 C₁ = 90-95
 C₂ = 1+

	Segment a	Segment b	
B ₁	<u>Metrosideros collina</u>	3	2
B ₂	<u>Dodonaea sandwicensis</u>	4	5
	<u>Styphelia tameiameia</u>	4	5
	<u>Metrosideros collina</u>	2	
	<u>Railliardia ciliolata</u>	2	
	<u>Silene struthioloides</u>	2	
	<u>Asclepias curassavica</u>		2
C ₁	<u>Nephrolepis sp.</u>	2	
	<u>Andropogon spp.</u>	3	7
	<u>Melinis minutiflora</u>	3	7
	<u>Pteridium aquilinum</u>		4
	<u>Rhynchelytrum repens</u>	3	2
	<u>Erigeron canadensis</u>		2
	<u>Psilotum nudum</u>	2	
	<u>Sadleria cyatheoides</u>	2	
C ₂	<u>Doryopteris decora</u>	3	
	<u>Bulbostylis capillaris</u>	2	2
	<u>Pellaea ternifolia</u>	2	2
	<u>Pityrogramma calomelanos</u>	2	
	<u>Waltheria americana</u>	3	3

DISCUSSION

With this vegetation data, relationships may be drawn between individual trap success and the vegetational and phenological characters of the trapline transects. A preliminary interpretation of the small mammal trapline success indicates a degree of correlation between the vegetation communities and the distribution of the mammal species, (P. Q. Tomich, pers. com.). Important factors may be food: types and abundance; and cover: for normal activities, and for breeding. With further analysis of the mammal and ectoparasite data, these and other relationships may become more evident.

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