Appendix 1. Description of Habitat Categories

"Forest" includes all stands of mature forest, which at La Selva have not been disturbed in historical times. The canopy of this forest is 30-40 meters in height but is occasionally interrupted by tree fall clearings, which are included in the "forest" category. Because this definition includes forest adjacent to clearings, pasture, and second growth areas, a "Central" forest category was defined as being "areas more than 500 meters from any disturbance". These areas consist of the loop trail, the southwest trail, area III, and the central trail, as shown in Figure 2.2. These areas are all principally hilltop areas, and include very little streamside habitat.

"Old second growth" or "old clearing" includes all areas with a closed canopy at least 5 meters high. This includes the cacao plantations, which are no longer maintained, most of the east boundary area excepting the successional strips, and most of the area near the field station buildings, excepting the garden area (see below), the Pejibaye plantation, and the station yard. The arboretum is considered to be "old second growth" because of its high canopy of tall trees which shade the ground most of the time. "Arboretum II" (east trail, line 800) is considered to be "old second growth" for the same reason.

"Edge" is habitat at the boundary between forest or old second growth and other habitats. This includes the west boundary line, the trail along the Quebrada Esquina where it borders on pasture, the field station yard, and the edges of the 1973 University of Washington treatment plot (East trail, line 1700). "Edge" also includes the edges of the successional plots for plant data, but it was not possible in the butterfly capture data to separate the butterflies on the edge of the plot from those inside. Therefore all butterflies captured in the successional strips were classified as being in "early second growth" habitat.

"Early succession", "early second growth", or "clearing" habitats include the successional strips (east trail, line 900-1200) and in some cases (Figure 2.5) the garden area. Thus some of the older successional strips are nearly as old as some of the "old second growth" habitats. The oldest such strip is 5 years of age.

The "garden" is a two hectare area across the Quebrada El Sura from the field station building, and contains three small buildings. Half of this area is a maintained plantation of Pejibaye palm trees (*Guilielmo gasipaes*), while the other half is a vegetable garden. Next to the plantation a *Passiflora* garden was established, containing 10-15 species of *Passiflora* as well as *Anguria limonensis*, a pollen-producing cucurbit which is very attractive to *Heliconius* (see Gilbert 1972). With few exceptions the plants in the *Passiflora* garden were transplants or cuttings from wild-growing plants at the field station.

APPENDIX 2.1 Capture-Recapture Study of *Heliconius* at La Selva: Field Data as Described in Chapter 2.3

Each *Heliconius* captured for the first time had three body size measurements taken. The measurements are obtained by holding the butterfly over a sheet of paper with the plane of the wings parallel to the paper. Lines are then drawn to represent the distances from 1) forewing base to forewing tip (Winglength), 2) tip of abdomen to front of head (Body length), and 3) outer edge of right eye to outer edge of left eye (Head Width). The distances between the lines are later measured and recorded for each butterfly. This measurement technique eliminates certain kinds of measurement biases, since the actual distances are determined after the lines are drawn.

The amount of pollen was estimated for each captured butterfly, using the following subjective scale:

0=no pollen
tr.=slight trace of pollen on proboscis
.5=small, definite pollen load
1.0=substantial pollen load
1.5=between 1.0 and 2.0
2.0=large pollen load
2.5=between 2.0 and 3.0
3.0=very large pollen load

An average "large" pollen load contains 3-6 thousand pollen grains of *Anguria umbrosa*, weighing about .7 mg dry weight (C.Boggs. personal communication).

The condition of the butterfly was also subjectively scaled, giving approximate relative ages for each individual:

F = Fresh individual, wings still slightly soft, less than one day old.

F/I = Fresh/Intermediate, wings hard but with no wear or scales missing.

I1 = Intermediate, slight wear as indicated by less depth of color.

I2 = Intermediate, wear evident, colors pale.

I3 = Intermediate, wear very evident, colors very pale; few scales remain.

W = Worn, wings tattered, almost translucent.

Capture-recapture study: Data Code.

Yr = year of capture

Day = day of year

Pl = locality; 1=La Selva

C = Card type; 2=capture data

HR = hour of day

MIN = minute of hour

SP = Butterfly species
1. H.sara
2. H.cydno
3. H.hecale
4. H.erato
5. H.melpomene
6. H.sappho
7. Dryas julia
8. H. ismenius
9. Euides aliphera
10. Euides lybia
11. H. hecalesia
12. Euides isabella
13. H.charitonia
14. H.doris

I.D. = number on wing

Sx = sex; 1=female, 2=male

RC = event category
1. capture
2. recapture
3. release marked individual
4. sample

CN = condition

1. Fresh	6. I2
2. F/I	7. I2.5
3. Intermediate	8. I3(I/W)
4. I1	9. Worn
5. I1.5	

WL = Winglength
BL = Body length
HW = Head width

PA = Pollen amount

1. no pollen	5. 1.5
2. trace of pollen	6. 2.0
3. .5	7. 2.5
4. 1.0	8. 3.0

PC = Pollen color; 1=white, 2=yellow, 3=1+2

C = Comments
1. torn or injured wing
2. beak marked
3. split in abdomen

LOC = where caught at La Selva

1. Garden area	G*
2. 73 plot	S
3. 74 plot	S
4. 75 plot	S
5. 76 plot	S
6. 72 plot	S
7. Station yard	E
8. Forest by station	F
9. E. trail 1800	E
10. E. trail 1650	E
11. Q. Esquina 00	E
12. Q. Esquina 1800	E
13. Loop trail (W) x River trail	F
14. Q. Sabalo 1400	O
15. E. trail 800	O
16. W. Loop Trail 1000	F
17. E. trail 700	O
18. E. trail 1400	F
19. E. trail 2800	F
20. C. trail 2100	F
21. C. trail 3300	F
22. C. trail 2400	F
23. C. trail 1400	F
24. C. trail 3100	F

Data code, continued

25.	C.trail 2000	F*
26.	C. trail 2700	F
30.	River trail x El Salto	F
31.	W. Loop trail 800	F
32.	E. trail 3200	F
33.	Area III, S. side	F
34.	E. Loop trail 1200	F
35.	Area III N.E. corner	F
36.	S.W. trail 1600	F
37.	E. Loop trail x El Salto	F
38.	S.W. trail 2000	F
41.	Tower (Area I)	F
42.	Research trail x W.River trail	O
43.	Research trail near W. trail	F
51.	El Sura trail x Q. El Sura	F
52.	Arboretum	O
53.	Q. Esquina 2200	E
54.	W. trail 1100	E
55.	W. trail 1300	E
56.	W. trail 2000	E
57.	W. trail 1700	E
58.	El Sura trail x Q. Taconazo	F

* G=garden
S=Successional plots
E="Edge"
O=old second growth
F=forest

H.sara

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC C
75	172	1	2	-0	-0	1	205	2	1	1	4	-0	-0	-0	-0	-0-0
75	193	1	2	-0	-0	1	223	2	1	3	1	-0	-0	-0	-0	-0-0
75	193	1	2	-0	-0	1	224	2	1	3	1	-0	-0	-0	-0	-0-0
75	193	1	2	-0	-0	1	-0	1	4	3	1	-0	-0	-0	-0	-0-0
75	187	1	2	10	10	1	300	1	1	2	4	-0	-0	-0	6	-0 1
75	187	1	2	10	45	1	301	1	1	2	4	-0	-0	-0	4	-0-0
75	50	1	2	-0	-0	1	1·	2	1	2	3	-0	-0	-0	1	-0-0
75	50	1	2	-0	-0	1	2·	2	1	2	-0	-0	-0	-0	1	-0-0
75	50	1	2	-0	-0	1	3	2	1	2	-0	-0	-0	-0	-0	-0-0
75	50	1	2	-0	-0	1	2·	2	2	2	-0	-0	-0	-0	1	-0-0
75	50	1	2	-0	-0	1	4·	1	1	2	3	-0	-0	-0	1	-0-0
75	51	1	2	-0	-0	1	5	2	1	1	1	-0	-0	-0	6	1-0
75	52	1	2	10	-0	1	1·	2	2	2	3	-0	-0	-0	1	-0-0
75	52	1	2	11	-0	1	6	1	1	9	3	-0	-0	-0	6	1-0
75	52	1	2	11	-0	1	7·	2	1	9	3	-0	-0	-0	1	-0-0
75	53	1	2	9	-0	1	2·	2	2	2	3	-0	-0	-0	1	-0-0
75	53	1	2	10	40	1	8	2	1	9	1	-0	-0	-0	1	-0-0
75	53	1	2	11	-0	1	9·	1	1	12	2	-0	-0	-0	8	1-0
75	53	1	2	15	-0	1	10	2	1	12	3	-0	-0	-0	4	1-0
75	53	1	2	15	5	1	11	2	1	12	2	-0	-0	-0	1	-0-0
75	53	1	2	15	50	1	12	2	1	-0	3	-0	-0	-0	4	1-0
75	53	1	2	15	55	1	13	2	1	-0	3	-0	-0	-0	4	1-0
75	58	1	2	-0	-0	1	4·	1	2	2	3	-0	-0	-0	-0	-0-0
75	60	1	2	9	10	1	9·	1	2	12	-0	-0	-0	-0	-0	-0-0
75	60	1	2	9	15	1	14·	1	1	12	-0	-0	-0	-0	-0	-0-0
75	60	1	2	10	10	1	15	1	1	53	4	-0	-0	-0	4	1-0
75	63	1	2	8	25	1	16·	2	1	10	4	-0	-0	-0	1	-0-0
75	63	1	2	9	-0	1	17	2	1	9	4	-0	-0	-0	1	-0-0
75	63	1	2	9	-0	1	18	1	1	9	2	-0	-0	-0	4	1-0
75	63	1	2	9	-0	1	19	2	1	12	4	-0	-0	-0	2	1-0
75	63	1	2	9	-0	1	20	2	1	2	4	-0	-0	-0	1	-0-0
75	65	1	2	-0	-0	1	-0	2	1	9	2	-0	-0	-0	1	-0-0
75	65	1	2	-0	-0	1	-0	1	4	9	4	-0	-0	-0	4	1-0
75	65	1	2	-0	-0	1	22	2	1	12	4	-0	-0	-0	1	-0-0
75	65	1	2	-0	-0	1	-0	1	4	12	4	-0	-0	-0	6	1-0
75	65	1	2	-0	-0	1	-0	1	4	12	4	-0	-0	-0	6	1-0
75	65	1	2	-0	-0	1	23	2	1	12	4	-0	-0	-0	1	-0-0
75	65	1	2	-0	-0	1	24	2	1	12	9	-0	-0	-0	1	-0-0
75	65	1	2	-0	-0	1	7·	-0	2	10	4	-0	-0	-0	-0	-0-0
75	74	1	2	9	-0	1	25	1	1	17	4	-0	-0	-0	6	1-0
75	74	1	2	10	-0	1	26	1	1	17	2	-0	-0	-0	4	1-0
75	74	1	2	12	50	1	27	1	1	8	4	32	20	-0	-0	-0-0
75	74	1	2	14	-0	1	28	1	1	9	4	31	19	-0	6	1-0
75	74	1	2	14	30	1	14·	1	2	12	4	33	21	-0	5	1-0
75	74	1	2	14	35	1	29	1	1	12	4	33	20	-0	8	1-0
75	74	1	2	15	5	1	30	2	1	14	4	31	22	-0	1	-0-0
75	74	1	2	15	15	1	31	2	1	14	4	29	19	-0	4	1-0
75	85	1	2	10	10	1	100	2	1	54	8	31	21	-0	1	-0-0
75	87	1	2	8	50	1	32	1	1	17	4	32	19	-0	8	1-0
75	88	1	2	13	40	1	33	2	1	54	4	31	22	-0	-0	-0-0

H.sara

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC C
75	89	1	2	10	50	1	34	1	1	3	8	34	21	-0	5	1-0
75	90	1	2	9	50	1	37	1	1	2	4	30	20	39	1	-0-0
75	90	1	2	9	50	1	38·	2	1	2	8	32	22	37	2	1-0
75	99	1	2	14	30	1	16·	2	2	10	-0	-0	-0	-0	6	1-0
75	126	1	2	16	-0	1	39	2	1	55	4	30	21	41	1	-0-0
75	127	1	2	9	30	1	1·	2	2	6	-0	-0	-0	-0	1	-0-0
75	255	1	2	9	30	1	40	1	1	3	4	39	24	44	8	-0-0
75	255	1	2	9	30	1	41	1	1	3	4	35	20	38	8	-0-0
75	255	1	2	9	30	1	42	2	1	3	4	33	21	40	1	-0-0
75	255	1	2	9	30	1	43	1	1	3	4	34	21	42	8	-0-0
75	255	1	2	11	30	1	60	2	1	7	4	42	28	50	2	-0-0
75	256	1	2	14	-0	1	44	2	-0	52	4	33	22	41	1	-0-0
75	257	1	2	10	-0	1	45	1	1	2	4	34	22	42	1	-0-0
75	257	1	2	10	-0	1	46	2	1	2	4	33	21	45	1	-0-0
75	257	1	2	10	-0	1	47	2	1	2	4	31	20	41	4	2-0
75	257	1	2	13	-0	1	48	1	1	6	1	36	20	41	1	-0-0
75	260	1	2	9	10	1	49·	1	1	9	4	34	20	40	4	1-0
75	260	1	2	13	-0	1	50	2	1	2	4	34	22	40	4	2-0
75	260	1	2	15	-0	1	51	2	1	3	4	-0	-0	-0	-0	-0-0
75	261	1	2	8	-0	1	52	1	1	2	4	-0	-0	-0	1	-0-0
75	262	1	2	14	45	1	53	-0	1	55	4	-0	-0	-0	1	-0-0
75	203	1	2	9	30	1	54	2	1	2	4	34	23	47	2	2-0
75	203	1	2	10	-0	1	56	2	1	2	1	-0	-0	-0	4	2-0
75	203	1	2	14	-0	1	57	1	1	1	2	34	21	41	4	1-0
75	203	1	2	15	30	1	58	1	1	3	2	-0	-0	-0	1	-0-0
75	264	1	2	14	15	1	59	1	1	3	4	35	22	43	6	2-0
75	264	1	2	14	15	1	60	1	1	3	4	35	22	40	8	2-0
75	264	1	2	15	-0	1	61	1	1	2	4	34	21	40	4	2-0
75	264	1	2	15	-0	1	63	2	1	3	4	33	22	39	1	-0-0
75	266	1	2	14	40	1	64	1	1	2	2	36	22	41	6	2-0
75	266	1	2	14	40	1	65	2	1	2	4	34	22	41	1	-0-0
75	268	1	2	8	30	1	66	1	1	3	2	35	21	39	1	-0-0
75	268	1	2	9	45	1	67	1	1	2	4	34	23	41	2	1-0
75	268	1	2	9	45	1	68	1	1	2	8	34	20	41	1	-0-0
75	268	1	2	10	30	1	49.	1	2	9	-0	-0	-0	-0	8	2-0
75	282	1	2	-0	-0	1	-0	1	4	2	1	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	1	-0	1	4	2	4	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	1	-0	1	4	2	4	-0	-0	-0	-0	-0-0
76	261	1	2	12	-0	1	1	2	1	1	3	-0	-0	-0	1	-0-0
76	261	1	2	12	-0	1	2·	1	1	3	2	33	20	40	5	2-0
76	261	1	2	12	-0	1	3·	1	1	3	3	36	23	40	1	-0-0
76	261	1	2	13	-0	1	4	2	1	9	3	34	23	40	1	-0 1
76	261	1	2	13	-0	1	4	2	1	11	3	33	22	-0	1	-0-0
76	262	1	2	8	-0	1	2·	1	2	4	3	-0	-0	-0	1	-0-0
76	262	1	2	8	40	1	6·	1	1	3	2	34	26	39	3	2-0
76	262	1	2	8	50	1	7	1	1	3	3	34	23	41	2	2-0
76	262	1	2	9	-0	1	8	1	1	3	1	35	23	41	1	-0-0
76	262	1	2	9	-0	1	9	1	1	3	1	-0	-0	-0	1	-0-0
76	262	1	2	9	-0	1	10	1	1	3	2	-0	-0	-0	1	-0-0
76	262	1	2	9	-0	1	11	1	1	3	3	-0	-0	-0	4	2-0

A2.1 Capture-recapture data

H.sara

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
76	262	1	2	9	30	1	12	1	1	3	3	-0	-0	-0	1	-0	-0
76	262	1	2	10	30	1	13	2	1	9	3	36	24	40	8	1	-0
76	262	1	2	11	-0	1	14	2	1	12	3	32	21	38	8	1	-0
76	262	1	2	11	-0	1	15	1	1	12	3	33	22	42	2	1	-0
76	262	1	2	11	20	1	16	2	1	9	3	31	21	40	8	1	-0
76	262	1	2	11	20	1	17	1	1	9	3	30	20	39	4	1	-0
76	264	1	2	13	30	1	18	1	1	1	4	-0	-0	-0	4	1	-0
76	268	1	2	7	50	1	19	1	1	3	4	-0	-0	-0	1	-0	-0
76	268	1	2	7	50	1	20·	1	1	3	4	-0	-0	-0	2	-0	-0
76	268	1	2	8	-0	1	21	1	1	3	4	-0	-0	-0	1	-0	-0
76	268	1	2	8	-0	1	22	2	1	3	4	-0	-0	-0	2	-0	-0
76	268	1	2	8	15	1	23	1	1	3	4	-0	-0	-0	3	1	-0
76	268	1	2	8	30	1	2·	1	2	3	-0	-0	-0	-0	-0	-0	-0
76	268	1	2	8	40	1	24	1	1	3	4	-0	-0	-0	5	2	-0
76	268	1	2	8	40	1	25	2	1	3	4	-0	-0	-0	1	-0	-0
76	268	1	2	9	20	1	26	2	1	5	4	30	21	40	3	2	-0
76	280	1	2	12	15	1	27	1	1	5	4	33	21	43·	1	-0	-0
76	282	1	2	10	-0	1	28	2	1	5	4	33	21	40	1	-0	-0
76	282	1	2	10	-0	1	29	2	1	5	4	32	22	39	1	-0	-0
76	289	1	2	8	45	1	30	1	1	4	4	-0	-0	-0	1	-0	-0
76	289	1	2	8	45	1	31·	1	1	3	4	33	20	39	6	2	-0
76	289	1	2	9	-0	1	32	1	1	3	4	-0	-0	-0	-0	-0	-0
76	289	1	2	9	-0	1	33	2	1	3	4	-0	-0	-0	-0	-0	-0
76	289	1	2	9	10	1	34·	2	1	3	4	-0	-0	-0	-0	-0	-0
76	289	1	2	9	20	1	6·	1	2	5	5	-0	-0	-0	-0	-0	-0
76	289	1	2	9	20	1	35·	2	1	5	4	-0	-0	-0	-0	-0	-0
76	289	1	2	9	20	1	36	2	1	5	4	-0	-0	-0	3	-0	-0
76	289	1	2	10	5	1	37·	2	1	5	4	-0	-0	-0	3	2	-0
76	289	1	2	10	30	1	20·	1	2	2	5	-0	-0	-0	6	2	-0
76	289	1	2	10	30	1	38	2	1	2	4	-0	-0	-0	1	-0	-0
76	289	1	2	9	45	1	40·	1	1	3	4	-0	-0	-0	6	2	-0
76	293	1	2	9	20	1	39·	2	1	4	4	32	21	39	1	-0	-0
76	293	1	2	9	45	1	41	2	1	3	4	-0	-0	-0	1	-0	-0
76	293	1	2	9	45	1	42	2	1	3	4	-0	-0	-0	1	-0	-0
76	293	1	2	9	45	1	43·	2	1	3	4	-0	-0	-0	1	-0	-0
76	293	1	2	9	45	1	3·	1	2	3	6	-0	-0	-0	8	1	-0
76	293	1	2	9	45	1	44	2	1	3	5	-0	-0	-0	1	-0	-0
76	293	1	2	10	45	1	3·	1	2	2	-0	-0	-0	-0	-0	-0	-0
76	293	1	2	10	45	1	37·	-0	2	2	-0	-0	-0	-0	-0	-0	-0
76	293	1	2	10	45	1	43·	-0	2	2	-0	-0	-0	-0	-0	-0	-0
76	293	1	2	10	45	1	47	1	1	2	4	-0	-0	-0	-0	-0	-0
76	293	1	2	10	45	1	35·	-0	2	2	-0	-0	-0	-0	-0	-0	-0
76	293	1	2	11	30	1	48	-0	1	2	-0	-0	-0	-0	-0	-0	-0
76	293	1	2	11	30	1	49	2	1	2	4	-0	-0	-0	-0	-0	-0
76	293	1	2	11	30	1	50·	2	1	2	4	-0	-0	-0	-0	-0	-0
76	294	1	2	8	-0	1	51	2	1	3	6	-0	-0	-0	-0	-0	1
76	294	1	2	8	-0	1	52·	2	1	3	4	-0	-0	-0	-0	-0	-0
76	299	1	2	8	15	1	53	2	1	1	4	34	23	43	2	-0	-0
76	299	1	2	10	-0	1	54·	2	1	3	5	-0	-0	-0	-0	-0	-0
76	299	1	2	10	15	1	55	2	1	3	5	-0	-0	-0	-0	-0	-0

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YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
76	299	1	2	10	30	1	56·	1	1	3	4	-0	-0	-0	6	2	-0
76	299	1	2	10	30	1	57	1	1	3	4	-0	-0	-0	6	2	-0
76	299	1	2	10	30	1	58·	2	1	3	5	-0	-0	-0	4	2	-0
76	299	1	2	10	30	1	54·	2	2	3	-0	-0	-0	-0	-0	-0	-0
76	299	1	2	10	30	1	59·	2	1	3	4	-0	-0	-0	2	2	-0
76	299	1	2	10	30	1	52·	-0	2	3	-0	-0	-0	-0	-0	-0	-0
76	299	1	2	10	45	1	60·	2	1	2	4	-0	-0	-0	3	-0	-0
76	299	1	2	10	45	1	58·	2	2	2	-0	-0	-0	-0	-0	-0	-0
76	299	1	2	10	45	1	61	1	1	2	5	-0	-0	-0	4	2	-0
76	299	1	2	10	45	1	62	2	1	2	6	-0	-0	-0	1	-0	-0
76	299	1	2	11	45	1	63·	2	1	5	5	-0	-0	-0	-0	-0	-0
76	299	1	2	11	45	1	64	2	1	5	4	-0	-0	-0	2	-0	-0
76	299	1	2	11	45	1	3·	1	2	5	6	-0	-0	-0	8	3	-0
76	299	1	2	11	45	1	66	2	1	5	5	-0	-0	-0	2	-0	-0
76	299	1	2	11	45	1	65	1	1	5	2	-0	-0	-0	1	-0	-0
76	299	1	2	11	45	1	67	2	1	5	4	-0	-0	-0	1	-0	-0
76	299	1	2	11	45	1	39·	2	2	2	6	-0	-0	-0	4	-0	-0
76	299	1	2	11	45	1	68	2	1	3	4	-0	-0	-0	1	-0	-0
76	299	1	2	11	45	1	69	2	1	3	4	-0	-0	-0	2	-0	-0
76	299	1	2	11	45	1	56·	-0	2	4	4	-0	-0	-0	6	2	-0
76	299	1	2	14	-0	1	40·	2	1	1	4	31	21	40	2	-0	-0
76	301	1	2	8	30	1	71	1	1	3	4	-0	-0	-0	4	2	-0
76	301	1	2	8	35	1	40·	1	2	2	5	-0	-0	-0	-0	-0	-0
76	301	1	2	9	-0	1	72·	2	1	2	1	-0	-0	-0	1	-0	-0
76	301	1	2	9	-0	1	972	1	1	2	5	-0	-0	-0	6	2	-0
76	301	1	2	10	-0	1	73	1	1	6	4	-0	-0	-0	5	1	-0
76	301	1	2	11	-0	1	74	2	1	5	4	-0	-0	-0	2	1	-0
76	301	1	2	11	-0	1	75·	1	1	5	4	-0	-0	-0	4	1	-0
76	301	1	2	11	-0	1	63·	2	2	5	5	-0	-0	-0	1	-0	-0
76	301	1	2	11	30	1	35·	2	2	3	5	-0	-0	-0	-0	-0	-0
76	301	1	2	11	30	1	76	2	1	3	5	-0	-0	-0	1	-0	-0
76	301	1	2	11	45	1	77	2	1	3	2	-0	-0	-0	1	-0	-0
76	301	1	2	12	-0	1	59·	2	2	3	4	-0	-0	-0	3	2	-0
76	301	1	2	12	30	1	78	2	1	3	2	-0	-0	-0	1	-0	-0
76	301	1	2	12	45	1	79	1	1	3	4	-0	-0	-0	4	2	-0
76	301	1	2	12	45	1	80·	1	1	3	4	-0	-0	-0	8	2	-0
76	302	1	2	10	-0	1	81	2	1	1	2	34	22	42	1	-0	-0
76	302	1	2	13	30	1	82	1	1	4	2	-0	-0	-0	2	-0	-0
76	302	1	2	13	30	1	34·	2	2	4	5	-0	-0	-0	3	2	-0
76	302	1	2	13	30	1	83	2	1	4	5	-0	-0	-0	1	-0	-0
76	302	1	2	13	30	1	84·	2	1	4	4	-0	-0	-0	2	-0	-0
76	302	1	2	14	-0	1	80·	2	2	3	-0	-0	-0	-0	6	2	-0
76	302	1	2	14	-0	1	85	1	1	3	4	-0	-0	-0	5	2	-0
76	302	1	2	14	-0	1	86	2	1	3	4	-0	-0	-0	3	2	-0
76	302	1	2	14	30	1	87	2	1	3	4	-0	-0	-0	2	-0	-0
76	302	1	2	14	30	1	75·	1	2	3	-0	-0	-0	-0	6	2	-0
76	302	1	2	14	30	1	88	1	1	6	4	-0	-0	-0	5	2	-0
76	302	1	2	14	30	1	89	1	1	5	2	-0	-0	-0	1	-0	-0
76	302	1	2	14	30	1	72·	1	2	5	4	-0	-0	-0	6	3	-0
76	302	1	2	14	30	1	90·	1	1	5	4	-0	-0	-0	5	2	-0

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YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	63	1	2	8	30	2	13·	-0	2	9	-0	-0	-0	-0	-0	-0	-0
75	63	1	2	8	35	2	18	2	1	9	4	-0	-0	-0	5	1	-0
75	63	1	2	9	-0	2	13·	-0	2	9	-0	-0	-0	-0	-0	-0	-0
75	64	1	2	-0	-0	2	21·	-0	2	7	-0	-0	-0	-0	-0	-0	-0
75	65	1	2	-0	-0	2	101	2	1	7	4	-0	-0	-0	-0	-0	-0
75	65	1	2	-0	-0	2	102	2	1	7	2	-0	-0	-0	-0	-0	-0
75	65	1	2	-0	-0	2	11·	-0	2	7	-0	-0	-0	-0	-0	-0	-0
75	65	1	2	-0	-0	2	103	2	1	9	4	-0	-0	-0	-0	-0	-0
75	74	1	2	9	40	2	21·	2	1	30	4	-0	-0	-0	1	-0	-0
75	74	1	2	9	15	2	22	2	1	17	8	-0	-0	-0	1	-0	2
75	74	1	2	9	20	2	23·	2	1	17	4	-0	-0	-0	5	1	-0
75	74	1	2	10	45	2	24	2	1	17	9	41	24	-0	4	1	-0
75	74	1	2	11	-0	2	25	1	1	17	4	43	29	-0	6	1	2
75	74	1	2	12	50	2	2·	2	2	7	4	40	30	-0	-0	-0	-0
75	66	1	2	9	20	2	20	2	1	7	4	-0	-0	-0	1	-0	-0
75	66	1	2	9	20	2	2·	2	2	7	4	-0	-0	-0	1	-0	-0
75	66	1	2	10	-0	2	13·	2	2	10	4	-0	-0	-0	5	1	-0
75	66	1	2	10	15	2	4·	2	2	12	-0	-0	-0	-0	4	1	-0
75	66	1	2	10	15	2	7·	2	2	9	-0	-0	-0	-0	2	-0	-0
75	66	1	2	10	20	2	5·	2	2	6	-0	-0	-0	-0	2	-0	-0
75	85	1	2	9	50	2	30	2	1	54	4	39	29	-0	1	-0	-0
75	85	1	2	10	-0	2	31	2	1	54	2	42	29	-0	4	1	-0
75	86	1	2	9	20	2	26	2	1	55	4	35	26	-0	1	-0	-0
75	88	1	2	12	-0	2	21·	2	2	7	-0	-0	-0	-0	2	1	-0
75	88	1	2	14	-0	2	104·	2	1	1	-0	-0	-0	-0	-0	-0	-0
75	89	1	2	9	30	2	23·	2	2	17	4	-0	-0	-0	3	1	-0
75	89	1	2	9	-0	2	-0	1	4	17	-0	-0	-0	-0	-0	-0	-0
75	90	1	2	8	5	2	29	2	1	17	4	39	28	-0	1	-0	-0
75	97	1	2	-0	-0	2	2·	-0	2	7	-0	-0	-0	-0	-0	-0	-0
75	97	1	2	-0	-0	2	105	1	1	7	1	-0	-0	-0	-0	-0	-0
75	99	1	2	14	30	2	28	2	1	9	4	-0	-0	-0	1	-0	-0
75	99	1	2	15	30	2	27	2	1	18	4	-0	-0	-0	4	1	-0
75	100	1	2	12	30	2	32	2	1	56	1	-0	-0	-0	1	-0	-0
75	113	1	2	9	5	2	33	2	1	10	4	-0	-0	-0	5	1	-0
75	113	1	2	9	15	2	34	2	1	9	4	-0	-0	-0	2	1	-0
75	113	1	2	9	30	2	5·	2	2	9	-0	-0	-0	-0	2	1	-0
75	114	1	2	11	40	2	35	2	1	18	4	-0	-0	-0	4	1	-0
75	122	1	2	10	30	2	104·	2	2	1	4	41	29	40	1	-0	-0
75	123	1	2	11	-0	2	5·	2	2	9	8	40	30	53	1	-0	-0
75	123	1	2	11	-0	2	13·	2	2	10	4	39	29	45	5	1	-0
75	123	1	2	12	30	2	2·	2	2	7	8	41	30	44	4	1	-0
75	123	1	2	13	-0	2	36	2	1	7	4	40	30	48	4	1	-0
75	127	1	2	9	30	2	4·	2	2	9	9	41	30	45	1	-0	-0
75	256	1	2	10	-0	2	61	2	-0	34	4	44	31	54	2	-0	-0
75	256	1	2	10	-0	2	62	2	-0	15	4	39	27	45	4	1	-0
75	257	1	2	10	-0	2	63·	1	1	15	4	41	27	46	4	1	-0
75	260	1	2	9	40	2	64	2	1	9	4	42	30	50	4	1	-0
75	260	1	2	11	-0	2	65	2	1	15	4	42	29	49	4	1	2
75	260	1	2	11	-0	2	66·	2	1	7	4	40	29	48	4	1	-0
75	260	1	2	14	-0	2	67	2	1	9	4	40	29	50	1	-0	-0

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YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
76	304	1	2	11	30	1	91	1	1	3	4	-0	-0	-0	2	1	-0
76	304	1	2	12	-0	1	84·	2	2	4	-0	-0	-0	-0	2	-0	-0
76	304	1	2	12	-0	1	93	2	1	4	4	-0	-0	-0	2	-0	-0
76	304	1	2	12	-0	1	92	1	1	4	2	-0	-0	-0	3	2	-0
76	304	1	2	12	5	1	95	2	1	2	4	-0	-0	-0	1	-0	-0
76	304	1	2	12	5	1	96	2	1	2	5	-0	-0	-0	1	-0	-0
76	304	1	2	12	5	1	97	2	1	2	5	-0	-0	-0	-0	-0	-0
76	304	1	2	12	5	1	98	2	1	3	-0	-0	-0	-0	-0	-0	-0
76	304	1	2	12	5	1	99	1	1	3	-0	-0	-0	-0	5	2	-0
76	304	1	2	12	5	1	80·	-0	2	3	-0	-0	-0	-0	5	3	-0
76	304	1	2	-0	-0	1	31·	-0	2	3	-0	-0	-0	-0	-0	-0	-0
76	309	1	2	11	20	1	100	1	1	2	2	-0	-0	-0	1	-0	-0
76	309	1	2	11	20	1	101·	2	1	2	4	-0	-0	-0	2	-0	-0
76	309	1	2	12	-0	1	102	2	1	5	2	-0	-0	-0	1	-0	-0
76	313	1	2	8	45	1	103	2	1	5	5	-0	-0	-0	1	-0	-0
76	313	1	2	8	45	1	60·	2	2	5	-0	-0	-0	-0	1	-0	-0
76	313	1	2	8	45	1	50·	2	2	5	-0	-0	-0	-0	1	-0	-0
76	313	1	2	8	45	1	90·	1	2	5	4	-0	-0	-0	2	-0	-0
76	313	1	2	8	45	1	63.	2	2	5	6	-0	-0	-0	-0	-0	-0
76	313	1	2	8	45	1	104	2	1	5	4	-0	-0	-0	1	-0	-0
76	313	1	2	8	45	1	105	2	1	5	4	-0	-0	-0	-0	-0	-0
76	313	1	2	8	45	1	106	2	1	5	5	-0	-0	-0	1	-0	-0
76	313	1	2	8	45	1	107	2	1	5	4	-0	-0	-0	1	-0	-0
76	313	1	2	10	30	1	101·	1	2	5	4	-0	-0	-0	1	-0	-0
76	322	1	2	13	40	1	108	2	1	4	2	-0	-0	-0	1	-0	-0
76	322	1	2	13	40	1	109	1	1	4	4	-0	-0	-0	3	2	-0
76	322	1	2	13	40	1	110	1	1	4	5	-0	-0	-0	7	1	-0
76	322	1	2	13	40	1	111	2	1	4	4	-0	-0	-0	1	-0	-0
76	322	1	2	14	-0	1	112	1	1	3	5	-0	-0	-0	6	3	-0
76	322	1	2	14	-0	1	113	2	1	3	4	-0	-0	-0	1	-0	-0
76	322	1	2	14	-0	1	80·	-0	2	3	5	-0	-0	-0	5	2	-0
76	322	1	2	14	-0	1	114	2	1	3	5	-0	-0	-0	2	-0	-0
76	322	1	2	14	-0	1	115	1	1	3	6	-0	-0	-0	8	1	-0
76	322	1	2	14	20	1	116	2	1	3	4	-0	-0	-0	1	-0	-0
76	322	1	2	14	20	1	117	1	1	3	4	-0	-0	-0	4	2	-0

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YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	166	1	2	13	-0	2	13·	2	2	4	9	-0	-0	-0	-0	-0	-0
75	167	1	2	-0	-0	2	201	1	1	17	1	-0	-0	-0	6	-0	-0
75	169	1	2	13	-0	2	203	1	1	13	2	-0	-0	-0	-0	-0	-0
75	170	1	2	7	30	2	11·	2	2	7	4	-0	-0	-0	-0	-0	-0
75	170	1	2	9	30	2	204	1	1	41	1	-0	-0	-0	8	-0	-0
75	172	1	2	-0	-0	2	206	1	1	1	8	-0	-0	-0	-0	-0	-0
75	172	1	2	-0	-0	2	207·	1	1	1	1	-0	-0	-0	-0	-0	-0
75	172	1	2	-0	-0	2	212	2	1	1	2	-0	-0	-0	-0	-0	-0
75	190	1	2	14	30	2	213	2	1	58	2	-0	-0	-0	4	-0	-0
75	190	1	2	16	5	2	214	2	1	38	4	-0	-0	-0	-0	-0	-0
75	191	1	2	13	-0	2	217	2	1	18	2	-0	-0	-0	3	-0	-0
75	191	1	2	13	40	2	219	2	1	6	2	-0	-0	-0	-0	-0	-0
75	194	1	2	-0	-0	2	-0	1	4	1	1	-0	-0	-0	-0	-0	-0
75	194	1	2	11	25	2	21·	2	2	7	8	-0	-0	-0	-0	-0	-0
75	194	1	2	12	-0	2	225	1	1	16	9	-0	-0	-0	-0	-0	-0
75	194	1	2	12	-0	2	226	2	1	16	8	-0	-0	-0	-0	-0	-0
75	194	1	2	12	15	2	227	2	1	33	4	-0	-0	-0	-0	-0	-0
75	188	1	2	11	25	2	302	2	1	9	1	-0	-0	-0	6	-0	-0
75	188	1	2	11	55	2	303	1	1	-0	1	-0	-0	-0	1	-0	-0
75	50	1	2	-0	-0	2	1	2	1	9	8	-0	-0	-0	1	-0	-0
75	50	1	2	-0	-0	2	2·	2	1	7	3	-0	-0	-0	4	1	-0
75	51	1	2	-0	-0	2	3	2	1	1	2	-0	-0	-0	4	1	-0
75	52	1	2	8	15	2	4·	2	1	9	3	-0	-0	-0	1	-0	-0
75	52	1	2	8	45	2	5·	2	1	9	3	-0	-0	-0	4	1	-0
75	52	1	2	8	55	2	6	2	1	9	3	-0	-0	-0	4	1	-0
75	52	1	2	9	10	2	7·	2	1	9	3	-0	-0	-0	1	-0	-0
75	52	1	2	9	25	2	4	2	2	9	3	-0	-0	-0	4	1	1
75	52	1	2	11	-0	2	8	2	1	15	3	-0	-0	-0	4	1	-0
75	53	1	2	9	-0	2	1	2	2	9	7	-0	-0	-0	4	1	-0
75	53	1	2	11	30	2	7	2	2	12	-0	-0	-0	-0	-0	-0	-0
75	53	1	2	16	-0	2	9	1	1	52	-0	-0	-0	-0	-0	-0	-0
75	53	1	2	16	35	2	10	2	1	53	2	-0	-0	-0	1	-0	-0
75	53	1	2	17	20	2	11·	2	1	7	2	-0	-0	-0	1	-0	-0
75	56	1	2	11	10	2	4	2	2	9	3	-0	-0	-0	6	1	-0
75	56	1	2	11	18	2	6	2	2	9	3	-0	-0	-0	4	1	-0
75	58	1	2	-0	-0	2	7	2	2	10	3	-0	-0	-0	-0	-0	-0
75	59	1	2	9	25	2	12	1	1	7	8	-0	-0	-0	8	1	-0
75	59	1	2	10	25	2	5	2	2	9	3	-0	-0	-0	4	1	-0
75	59	1	2	10	30	2	13-	2	1	9	1	-0	-0	-0	4	1	-0
75	59	1	2	10	35	2	6	2	2	9	3	-0	-0	-0	1	-0	-0
75	59	1	2	10	40	2	5	2	2	9	-0	-0	-0	-0	-0	-0	-0
75	59	1	2	10	45	2	7	2	2	9	-0	-0	-0	-0	4	1	-0
75	59	1	2	11	30	2	7	2	2	12	-0	-0	-0	-0	-0	-0	-0
75	59	1	2	11	30	2	14	2	1	10	2	-0	-0	-0	4	1	-0
75	60	1	2	8	15	2	15	1	1	10	-0	-0	-0	-0	-0	-0	-0
75	60	1	2	8	20	2	5	2	2	9	-0	-0	-0	-0	-0	-0	-0
75	60	1	2	8	45	2	4	2	2	9	-0	-0	-0	-0	-0	-0	-0
75	60	1	2	10	35	2	13	2	2	9	-0	-0	-0	-0	-0	-0	-0
75	61	1	2	12	35	2	16	1	1	22	4	-0	-0	-0	8	1	-0
75	62	1	2	11	15	2	17	1	1	1	4	-0	-0	-0	6	1	-0

H.cydno

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	261	1	2	8	-0	2	63·	1	2	15	-0	-0	-0	-0	-0	-0	-0
75	262	1	2	10	50	2	68	2	1	35	4	43	30	56	4	1	-0
75	262	1	2	11	-0	2	69	1	1	36	4	-0	-0	-0	-0	-0	-0
75	262	1	2	11	-0	2	70	2	1	13	4	-0	-0	-0	4	1	-0
75	262	1	2	-0	-0	2	66·	-0	2	7	-0	-0	-0	-0	-0	-0	-0
75	203	1	2	8	-0	2	63'	1	2	15	4	-0	-0	-0	8	1	-0
75	203	1	2	10	30	2	71	2	1	15	2	40	32	52	4	1	-0
75	203	1	2	11	-0	2	72	2	1	7	4	41	33	49	4	1	-0
75	264	1	2	13	40	2	73	2	1	7	4	42	30	49	4	1	-0
75	266	1	2	12	30	2	74	2	1	7	4	40	26	49	6	1	-0
75	266	1	2	13	25	2	75	1	1	37	4	37	27	48	1	-0	-0
75	266	1	2	11	-0	2	207·	-0	2	1	-0	-0	-0	-0	-0	-0	-0
75	268	1	2	8	30	2	-0	2	2	15	-0	-0	-0	-0	-0	-0	-0
75	268	1	2	10	30	2	24	2	1	9	4	39	28	47	2	1	-0
75	268	1	2	11	-0	2	75	1	1	9	4	42	32	51	2	1	-0
75	282	1	2	-0	-0	2	76	1	1	7	1	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	2	70	2	2	4	4	-0	-0	-0	-0	-0	-0
76	261	1	2	14	-0	2	1	2	1	12	3	41	28	49	1	-0	-0
76	261	1	2	14	30	2	2	1	1	12	3	43	30	50	1	-0	1
76	261	1	2	15	-0	2	3	1	1	13	9	38	26	49	1	-0	-0
76	262	1	2	12	-0	2	4	1	1	15	8	36	25	42	1	-0	-0
76	264	1	2	11	30	2	6	2	1	14	6	-0	-0	-0	1	-0	-0
76	264	1	2	11	45	2	7	2	1	17	6	-0	-0	-0	1	-0	-0
76	265	1	2	10	45	2	8	2	1	7	2	42	30	52	1	-0	-0
76	265	1	2	12	-0	2	9	2	1	7	4	40	30	49	3	1	-0
76	265	1	2	12	20	2	10	2	1	7	4	41	32	50	6	1	-0
76	265	1	2	12	30	2	11	2	1	7	5	41	29	49	1	-0	-0
76	265	1	2	13	-0	2	3	1	2	13	7	-0	-0	-0	-0	-0	-0
76	268	1	2	9	-0	2	12	2	1	5	6	39	27	49	1	-0	-0
76	268	1	2	10	55	2	13	2	1	12	6	40	28	51	2	1	-0
76	281	1	2	11	-0	2	14	2	1	1	6	40	28	50	4	1	-0
76	282	1	2	10	-0	2	15	2	1	18	5	35	25	47	3	1	1
76	282	1	2	11	30	2	16	2	1	19	4	41	30	50	2	-0	-0
76	282	1	2	12	30	2	17	1	1	20	5	44	31	52	3	1	-0
76	282	1	2	13	30	2	18	2	1	21	4	43	30	50	1	-0	-0
76	282	1	2	14	15	2	19	1	1	22	8	41	28	49	1	-0	-0
76	282	1	2	14	25	2	20	2	1	22	6	40	28	50	2	-0	-0
76	282	1	2	15	-0	2	21	2	1	23	6	42	30	50	1	-0	-0
76	282	1	2	-0	-0	2	22	2	1	30	5	39	28	49	1	-0	-0
76	282	1	2	-0	-0	2	14	2	2	30	5	-0	-0	-0	-0	-0	-0
76	283	1	2	10	15	2	23	1	1	22	5	43	29	50	5	1	-0
76	283	1	2	12	45	2	24	2	1	31	4	40	29	49	4	1	-0
76	288	1	2	11	-0	2	25	2	1	21	4	45	32	52	3	1	-0
76	288	1	2	12	-0	2	26	2	1	24	5	38	27	48	1	-0	-0
76	289	1	2	13	15	2	27	1	1	7	2	40	28	47	2	-0	-0
76	290	1	2	10	30	2	28	2	1	25	4	44	31	52	2	1	-0
76	291	1	2	12	-0	2	29	2	1	41	4	40	28	49	4	1	-0
76	293	1	2	10	-0	2	30	2	1	3	2	40	26	49	2	-0	-0
76	293	1	2	14	30	2	24	2	2	13	5	-0	-0	-0	2	-0	-0
76	294	1	2	9	-0	2	31	1	1	10	4	41	29	48	-0	-0	-0

A2.1 Capture-recapture data

H.hecale

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	50	1	2	-0	-0	3	1	2	1	2	3	-0	-0	-0	3	1	-0
75	59	1	2	10	20	3	2	2	1	9	3	-0	-0	-0	1	-0	-0
75	60	1	2	11	45	3	4	2	1	2	2	-0	-0	-0	4	1	-0
75	63	1	2	9	-0	3	3	2	1	9	4	-0	-0	-0	4	1	-0
75	65	1	2	-0	-0	3	4	2	1	8	4	-0	-0	-0	4	1	-0
75	86	1	2	10	45	3	6	2	1	56	4	41	31	-0	2	1	2
75	89	1	2	10	30	3	-0	1	4	3	-0	-0	-0	-0	-0	-0	-0
75	254	1	2	10	-0	3	5	2	1	1	2	48	36	55	4	-0	-0
75	254	1	2	10	-0	3	6	1	1	1	4	46	33	48	4	-0	-0
75	255	1	2	9	30	3	7	1	1	2	4	46	32	51	4	1	-0
75	256	1	2	14	-0	3	8	2	-0	54	4	46	34	51	4	1	-0
75	260	1	2	8	30	3	9	2	1	2	4	43	33	50	1	-0	-0
75	260	1	2	9	50	3	10	2	1	9	4	44	36	52	2	1	-0
75	260	1	2	9	50	3	11	2	1	9	2	48	37	53	2	1	-0
75	260	1	2	14	50	3	12	2	1	3	2	48	37	51	3	1	-0
75	260	1	2	14	50	3	13	2	1	3	4	40	33	51	1	-0	-0
75	260	1	2	15	-0	3	14	2	1	3	2	47	33	52	1	-0	-0
75	261	1	2	10	-0	3	15	2	1	1	4	41	32	51	1	-0	-0
75	261	1	2	13	50	3	-0	2	4	52	-0	-0	-0	-0	-0	-0	-0
75	261	1	2	14	30	3	-0	2	4	55	-0	-0	-0	-0	-0	-0	-0
75	261	1	2	14	30	3	16	2	1	55	4	46	34	52	4	1	-0
75	203	1	2	8	-0	3	17	2	1	3	4	47	37	52	1	-0	-0
75	203	1	2	12	-0	3	15	2	2	1	-0	-0	-0	-0	-0	-0	-0
75	264	1	2	7	25	3	6	1	2	1	-0	-0	-0	-0	-0	-0	-0
75	266	1	2	8	20	3	18	1	1	3	4	46	33	51	6	2	-0
75	266	1	2	11	-0	3	19	1	1	1	4	49	35	50	4	1	-0
75	266	1	2	11	30	3	15	-0	2	1	-0	-0	-0	-0	-0	-0	-0
75	268	1	2	9	35	3	20	1	1	2	1	43	30	52	1	-0	-0
75	268	1	2	10	20	3	21	2	1	2	4	50	36	52	2	1	-0
75	268	1	2	15	-0	3	22	2	1	54	2	45	35	50	1	-0	-0
75	268	1	2	12	-0	3	15	2	2	1	-0	-0	-0	-0	-0	-0	-0
75	270	1	2	8	-0	3	23	2	1	1	1	46	38	51	2	1	-0
75	270	1	2	8	-0	3	15	2	2	1	-0	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	3	24	2	1	3	4	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	3	25	2	4	2	2	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	3	-0	2	4	2	4	-0	-0	-0	-0	-0	-0
76	261	1	2	12	30	3	1	1	1	5	2	44	35	50	6	1	-0
76	262	1	2	7	30	3	2	2	1	1	3	45	32	51	1	-0	-0
76	262	1	2	10	-0	3	3	2	1	14	3	47	34	50	2	1	-0
76	265	1	2	9	10	3	5	1	1	1	4	45	31	49	5	1	-0
76	265	1	2	9	30	3	6	1	1	1	4	46	34	52	3	1	-0
76	268	1	2	8	15	3	7	2	1	3	4	48	33	50	2	-0	1
76	268	1	2	9	10	3	8	2	1	5	6	45	32	50	2	1	-0
76	280	1	2	12	10	3	8	2	2	5	6	-0	-0	-0	2	-0	-0
76	282	1	2	8	45	3	9	2	1	4	5	42	30	50	4	1	-0
76	289	1	2	9	15	3	11	2	1	3	4	43	34	50	3	1	-0
76	289	1	2	9	40	3	5	1	2	5	5	-0	-0	-0	6	1	-0
76	289	1	2	10	30	3	12	1	1	3	5	45	31	50	6	1	-0
76	289	1	2	11	-0	3	10	-0	2	1	-0	-0	-0	-0	-0	-0	-0
76	290	1	2	7	30	3	13	2	1	1	5	43	30	49	2	-0	-0

H.cydno

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
76	294	1	2	12	-0	2	32	2	1	21	2	-0	-0	-0	-0	-0	-0
76	296	1	2	10	30	2	7	-0	2	30	-0	-0	-0	-0	-0	-0	-0
76	299	1	2	8	30	2	33	2	1	1	5	40	29	49	3	1	-0
76	299	1	2	12	30	2	34	1	1	7	7	41	28	50	6	1	-0
76	300	1	2	-0	-0	2	35	1	1	22	4	42	29	48	4	1	-0
76	300	1	2	-0	-0	2	36	2	1	23	2	42	31	53	1	-0	-0
76	301	1	2	-0	-0	2	33	2	2	7	4	-0	-0	-0	1	-0	-0
76	302	1	2	9	30	2	37	2	1	8	2	40	30	50	3	1	-0
76	302	1	2	14	50	2	38	1	1	30	2	39	26	46	-0	-0	-0
76	304	1	2	11	-0	2	27	1	2	51	5	-0	-0	-0	3	1	-0
76	304	1	2	12	5	2	39	2	1	2	4	41	28	51	3	1	-0
76	306	1	2	10	15	2	40	2	1	32	6	40	28	49	3	1	1
76	306	1	2	12	30	2	901	1	3	1	-0	-0	-0	-0	-0	-0	-0
76	309	1	2	12	-0	2	41	1	1	5	6	37	25	47	3	1	-0
76	316	1	2	12	30	2	42	1	1	33	5	34	24	42	4	1	-0
76	317	1	2	9	30	2	43	2	1	26	4	42	30	51	3	1	-0
76	317	1	2	9	45	2	44	2	1	26	4	40	27	49	3	1	2
76	318	1	2	14	20	2	45	2	1	7	4	40	28	50	1	-0	-0
76	322	1	2	9	30	2	46	1	1	26	4	41	29	48	6	1	3
76	322	1	2	9	30	2	44	2	2	26	-0	-0	-0	-0	1	-0	-0
76	322	1	2	9	30	2	43	2	2	26	-0	-0	-0	-0	1	-0	-0
76	322	1	2	11	30	2	903	-0	2	7	4	-0	-0	-0	-0	-0	-0
76	322	1	2	11	30	2	24	2	2	7	6	-0	-0	-0	3	1	-0
76	322	1	2	11	30	2	49	2	1	7	4	41	29	49	2	1	-0
76	322	1	2	11	30	2	47	2	1	7	5	42	28	51	1	-0	-0
76	322	1	2	11	30	2	48	2	1	7	4	42	30	-0	3	1	-0

H.hecale

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
76	290	1	2	7	30	3	10	-0	2	1	-0	-0	-0	-0	-0	-0	-0
76	298	1	2	11	-0	3	13	-0	2	1	-0	-0	-0	-0	4	1	-0
76	298	1	2	13	30	3	14	1	1	1	4	43	30	46	1	-0	-0
76	298	1	2	13	30	3	15	2	1	1	4	45	33	50	1	-0	-0
76	298	1	2	13	45	3	16	2	1	1	4	44	33	51	2	1	-0
76	299	1	2	8	10	3	16	2	2	1	-0	-0	-0	-0	-0	-0	-0
76	299	1	2	11	35	3	17	2	1	5	4	48	34	53	4	1	-0
76	302	1	2	10	42	3	18	1	1	1	4	48	36	52	4	1	-0
76	304	1	2	10	30	3	19	1	1	1	4	43	30	47	5	1	-0
76	306	1	2	12	30	3	20	1	1	1	6	45	31	50	2	1	-0
76	306	1	2	12	30	3	21	2	1	1	-0	-0	-0	-0	-0	-0	-0
76	309	1	2	8	30	3	15	-0	2	1	-0	-0	-0	-0	-0	-0	-0
76	311	1	2	-0	-0	3	901	2	3	1	-0	-0	-0	-0	-0	-0	-0
76	318	1	2	11	5	3	22	2	1	1	4	45	34	51	2	-0	-0

A2.1 Capture-recapture data

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	RL	HW	PA	PC C
75	172	1	2	-0	-0	4	210	2	1	1	4	-0	-0	-0	-0	-0-0
75	191	1	2	12	-0	4	216	2	1	6	4	-0	-0	-0	-0	-0-0
75	193	1	2	-0	-0	4	210	2	2	6	-0	-0	-0	-0	-0	-0-0
75	193	1	2	-0	-0	4	-0	1	4	3	1	-0	-0	-0	-0	-0-0
75	187	1	2	9	15	4	210	2	2	2	8	-0	-0	-0	1	-0-0
75	187	1	2	9	30	4	300	2	1	2	4	-0	-0	-0	1	-0-0
75	187	1	2	10	-0	4	301	1	1	2	4	-0	-0	-0	4	-0-0
75	50	1	2	-0	-0	4	1	2	1	2	3	-0	-0	-0	4	2-0
75	51	1	2	-0	-0	4	2	1	1	1	8	-0	-0	-0	3	-0-0
75	53	1	2	9	-0	4	3	2	1	2	2	-0	-0	-0	4	1-0
75	54	1	2	12	45	4	4	1	1	1	8	-0	-0	-0	6	1-0
75	58	1	2	-0	-0	4	6	2	1	2	3	-0	-0	-0	1	-0-0
75	60	1	2	9	40	4	5	2	1	12	-0	-0	-0	-0	-0	-0-0
75	60	1	2	9	55	4	7	2	1	12	-0	-0	-0	-0	-0	-0-0
75	60	1	2	9	55	4	5	2	2	12	-0	-0	-0	-0	-0	-0-0
75	88	1	2	12	-0	4	9	1	1	57	4	32	23	-0	6	1 1
75	89	1	2	11	5	4	9	1	1	3	4	34	23	-0	1	-0-0
75	97	1	2	7	30	4	1	2	2	3	4	-0	-0	-0	1	-0-0
75	113	1	2	14	0	4	10	2	1	54	4	-0	-0	-0	1	-0-0
75	117	1	2	-0	-0	4	11	2	1	2	8	32	23	35	1	-0-0
75	123	1	2	9	-0	4	1	2	2	2	4	29	20	32	1	-0-0
75	123	1	2	9	-0	4	11	2	2	2	4	32	22	37	4	1-0
75	123	1	2	9	30	4	12	2	1	2	1	33	25	29	1	-0-0
75	127	1	2	9	-0	4	13	2	1	2	2	34	24	38	1	-0-0
75	255	1	2	9	30	4	16	2	1	2	4	33	23	39	4	1-0
75	255	1	2	9	30	4	300	2	2	2	8	33	25	42	2	-0-0
75	255	1	2	9	30	4	17	2	1	2	4	35	25	45	4	2-0
75	255	1	2	11	-0	4	18	2	1	2	2	34	24	38	2	-0-0
75	256	1	2	13	-0	4	15	1	-0	2	-0	-0	-0	-0	-0	-0-0
75	257	1	2	10	-0	4	19	1	1	2	4	30	21	37	4	2-0
75	257	1	2	10	-0	4	20	1	1	2	4	34	23	48	6	2-0
75	260	1	2	9	10	4	21	1	1	9	2	34	24	40	4	1-0
75	261	1	2	8	-0	4	22	2	1	3	2	30	22	40	1	-0-0
75	282	1	2	-0	-0	4	15	1	2	2	4	-0	-0	-0	-0	-0-0
75	282	1	2	-0	-0	4	-0	2	4	2	1	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	4	16	2	2	2	4	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	4	-0	2	4	2	4	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	4	-0	2	4	2	4	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	4	-0	1	4	2	4	-0	-0	-0	-0	-0-0
75	283	1	2	-0	-0	4	15	1	2	2	4	-0	-0	-0	-0	-0-0
75	240	2	3	4	2	4	50	2	8	-0	-0	24	0	-0	-0z	2[illegible]0
76	261	1	2	14	-0	4	1	2	1	10	2	36	23	41	1	-0-0
76	262	1	2	7	-0	4	2	2	1	1	3	34	25	41	1	-0-0
76	262	1	2	7	30	4	3	2	1	1	3	37	24	43	3	2-0
76	262	1	2	8	20	4	4	1	1	3	3	36	25	41	6	2-0
76	262	1	2	8	30	4	5	2	1	3	3	35	23	42	1	-0-0
76	262	1	2	9	-0	4	6	1	1	3	3	36	23	41	1	-0-0
76	262	1	2	9	-0	4	7	1	1	3	3	32	22	38	2	1-0
76	262	1	2	9	30	4	8	1	1	2	3	35	22	40	1	-0-0
76	265	1	2	8	30	4	2	2	2	1	-0	-0	-0	-0	2	1-0

H.erato

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	RL	HW	PA	PC C
76	266	1	2	7	40	4	2	2	2	1	-0	-0	-0	-0	1	-0-0
76	267	1	2	7	30	4	2	2	2	1	-0	-0	-0	-0	-0	-0-0
76	268	1	2	7	30	4	9	2	1	4	4	35	25	43	1	-0-0
76	268	1	2	7	30	4	5	-0	2	4	-0	-0	-0	-0	1	-0-0
76	268	1	2	7	50	4	7	2	2	3	5	-0	-0	-0	2	-0-0
76	268	1	2	8	-0	4	10	2	1	3	5	33	23	40	1	-0-0
76	268	1	2	8	-0	4	8	-0	2	3	-0	-0	-0	-0	-0	-0-0
76	268	1	2	8	40	4	9	2	2	3	-0	-0	-0	-0	-0	-0-0
76	268	1	2	8	30	4	5	2	2	3	-0	-0	-0	-0	-0	-0-0
76	268	1	2	8	30	4	11	2	1	3	8	38	26	42	1	-0-0
76	268	1	2	9	-0	4	9	2	2	5	-0	-0	-0	-0	-0	-0-0
76	268	1	2	9	20	4	8	2	2	5	-0	-0	-0	-0	-0	-0-0
76	268	1	2	9	40	4	7	-0	2	5	-0	-0	-0	-0	-0	-0-0
76	268	1	2	10	10	4	12	1	1	9	4	35	22	41	4	1-0
76	268	1	2	11	-0	4	13	1	1	14	5	33	23	40	4	3-0
76	280	1	2	12	5	4	14	2	1	5	4	33	23	39	1	-0-0
76	280	1	2	12	30	4	8	2	2	5	-0	-0	-0	-0	1	-0-0
76	281	1	2	8	45	4	15	2	1	1	4	34	24	41	4	1-0
76	282	1	2	8	30	4	10	2	2	4	6	-0	-0	-0	2	-0-0
76	282	1	2	8	30	4	7	2	2	4	-0	-0	-0	-0	3	2-0
76	282	1	2	9	-0	4	10	2	2	3	-0	-0	-0	-0	-0	-0-0
76	282	1	2	9	-0	4	7	2	2	3	-0	-0	-0	-0	-0	-0-0
76	282	1	2	10	-0	4	16	1	1	5	4	35	24	40	6	2-0
76	289	1	2	9	-0	4	17	2	1	3	4	30	19	38	4	2-0
76	289	1	2	9	-0	4	10	2	2	3	-0	-0	-0	-0	2	-0-0
76	289	1	2	9	10	4	4	-0	2	3	5	-0	-0	-0	3	1-0
76	289	1	2	10	5	4	14	2	2	5	4	-0	-0	-0	2	-0-0
76	289	1	2	10	5	4	9	2	2	5	5	-0	-0	-0	-0	-0-0
76	289	1	2	10	30	4	8	2	2	2	5	-0	-0	-0	1	-0-0
76	289	1	2	10	30	4	9	2	1	2	-0	-0	-0	-0	-0	-0-0
76	290	1	2	7	40	4	2	2	2	1	6	-0	-0	-0	2	-0-0
76	293	1	2	9	45	4	4	1	2	3	-0	-0	-0	-0	-0	-0-0
76	293	1	2	10	45	4	17	2	2	2	5	-0	-0	-0	-0	-0-0
76	294	1	2	8	15	4	18	1	1	3	2	36	23	41	-0	-0-0
76	296	1	2	10	30	4	19	2	1	5	2	33	23	-0	1	-0-0
76	299	1	2	10	30	4	20	1	1	3	4	33	21	40	4	2-0
76	299	1	2	10	45	4	17	-0	2	2	-0	-0	-0	-0	-0	-0-0
76	299	1	2	10	45	4	21	2	1	2	5	35	24	41	2	-0-0
76	301	1	2	9	-0	4	4	2	2	2	6	-0	-0	-0	2	2-0
76	301	1	2	9	15	4	22	2	1	2	2	33	22	40	2	2-0
76	301	1	2	12	5	4	17	2	2	3	4	-0	-0	-0	5	2-0
76	309	1	2	12	-0	4	14	2	2	5	5	-0	-0	-0	1	-0-0
76	313	1	2	8	45	4	23	1	1	3	4	33	24	39	1	-0-0
76	313	1	2	9	-0	4	24	2	1	5	5	33	23	40	1	-0-0
76	321	1	2	11	30	4	15	-0	2	1	5	-0	-0	-0	1	-0-0

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A2.1 Capture-recapture data

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YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	166	1	2	13	-0	5	200	2	1	3	4	-0	-0	-0	-0	-0	-0
75	169	1	2	12	30	5	202	2	1	3	2	-0	-0	-0	4	-0	-0
75	193	1	2	-0	-0	5	220	2	1	3	4	-0	-0	-0	-0	-0	-0
75	193	1	2	-0	-0	5	221	2	1	3	9	-0	-0	-0	-0	-0	-0
75	193	1	2	-0	-0	5	222	2	1	3	2	-0	-0	-0	-0	-0	-0
75	194	1	2	9	-0	5	200	2	2	4	9	-0	-0	-0	1	-0	-0
75	194	1	2	9	30	5	304	1	1	14	4	-0	-0	-0	6	-0	-0
75	48	1	2	-0	-0	5	1	2	1	2	6	-0	-0	-0	4	1	-0
75	52	1	2	10	50	5	3	2	1	9	8	-0	-0	-0	4	1	-0
75	52	1	2	10	55	5	4	2	1	9	2	-0	-0	-0	4	1	-0
75	53	1	2	10	10	5	5	2	1	9	3	-0	-0	-0	4	1	-0
75	59	1	2	10	40	5	7	2	1	9	8	-0	-0	-0	1	-0	1
75	60	1	2	9	50	5	8	2	1	12	-0	-0	-0	-0	-0	-0	-0
75	60	1	2	9	50	5	3	2	2	12	-0	-0	-0	-0	-0	-0	-0
75	60	1	2	11	45	5	9	1	1	4	2	-0	-0	-0	6	1	-0
75	61	1	2	16	15	5	10	2	1	12	1	-0	-0	-0	4	1	-0
75	63	1	2	9	-0	5	6	2	2	9	8	-0	-0	-0	4	1	-0
75	74	1	2	7	30	5	1	-0	2	3	8	-0	-0	-0	-0	-0	-0
75	74	1	2	14	20	5	11	2	1	12	8	39	26	-0	2	-0	-0
75	85	1	2	10	-0	5	100	2	1	54	9	39	29	-0	1	-0	-0
75	89	1	2	10	5	5	12	2	1	3	4	36	26	-0	1	-0	-0
75	89	1	2	11	-0	5	13	1	1	3	2	37	27	-0	4	1	-0
75	113	1	2	9	15	5	2	2	2	9	9	-0	-0	-0	2	1	-0
75	113	1	2	9	50	5	13	2	1	9	4	-0	-0	-0	1	-0	-0
75	123	1	2	11	30	5	13	2	2	9	4	39	29	42	1	-0	-0
75	127	1	2	9	45	5	2	2	2	9	9	34	27	41	2	1	-0
75	127	1	2	9	54	5	14	2	1	9	2	39	29	43	1	-0	-0
75	127	1	2	10	20	5	15	2	1	54	9	37	27	46	4	1	-0
75	255	1	2	9	30	5	20	1	1	3	4	38	28	45	6	-0	-0
75	255	1	2	9	30	5	21	1	1	3	2	41	30	47	4	1	-0
75	256	1	2	12	35	5	21	1	-0	2	-0	-0	-0	-0	-0	-0	-0
75	203	1	2	8	-0	5	22	2	1	3	4	38	29	50	1	-0	2
75	203	1	2	8	-0	5	20	1	2	3	-0	-0	-0	-0	-0	-0	-0
75	268	1	2	9	-0	5	23	2	1	3	8	38	27	34	2	1	-0
75	282	1	2	-0	-0	5	23	2	2	2	4	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	5	-0	2	4	2	4	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	5	-0	2	4	2	2	-0	-0	-0	-0	-0	-0
76	261	1	2	14	-0	5	1	2	1	12	3	38	27	48	1	-0	-0
76	261	1	2	14	30	5	2	1	1	3	3	38	27	47	1	-0	-0
76	262	1	2	7	-0	5	3	2	1	1	3	38	29	45	3	1	1
76	262	1	2	7	15	5	4	2	1	1	2	40	28	46	2	-0	-0
76	262	1	2	7	30	5	5	2	1	1	3	40	28	48	2	1	-0
76	262	1	2	8	10	5	6	2	1	3	3	39	28	42	1	-0	-0
76	262	1	2	10	30	5	7	1	1	9	3	39	28	45	2	-0	2
76	262	1	2	10	30	5	8	1	1	9	2	38	28	45	2	1	-0
76	262	1	2	11	50	5	9	2	1	4	2	38	26	40	1	-0	-0
(76	262	1	2	13	30	2	5	2	1	16	3	36	25	43	1	-0	-0)
76	265	1	2	8	-0	5	4	2	2	1	-0	-0	-0	-0	-0	-0	-0
76	265	1	2	8	-0	5	6	2	2	1	-0	-0	-0	-0	2	1	-0
76	265	1	2	8	30	5	5	2	2	1	-0	-0	-0	-0	-0	-0	-0

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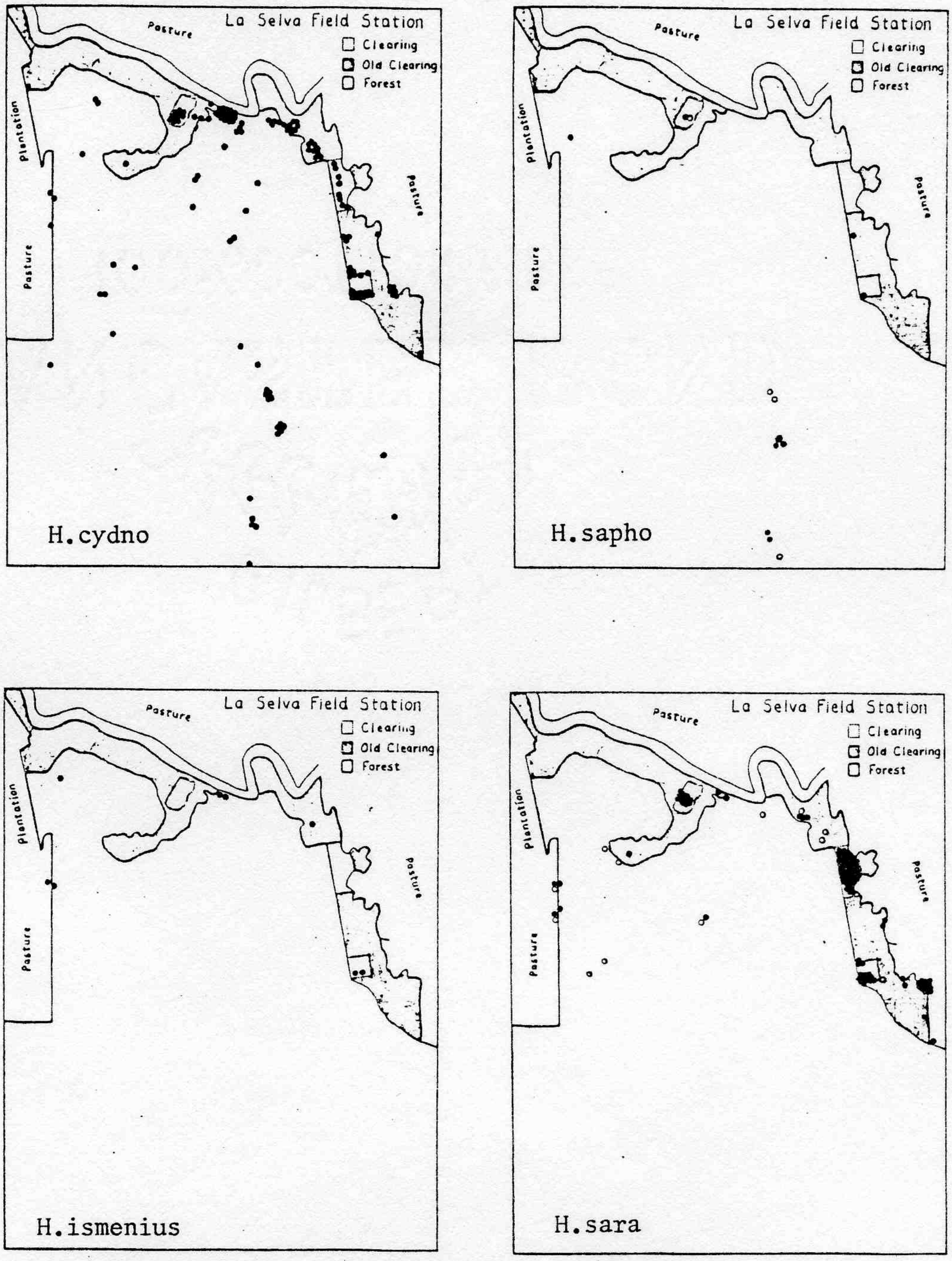
YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
76	265	1	2	9	20	5	10	2	1	1	6	40	28	49	2	1	-0
76	266	1	2	8	5	5	6	2	2	1	-0	-0	-0	-0	1	-0	-0
76	268	1	2	8	50	5	11	2	1	5	4	38	25	46	3	1	-0
76	268	1	2	9	15	5	12	1	1	5	4	38	27	47	4	1	-0
76	268	1	2	9	30	5	13	2	1	5	6	40	29	49	6	1	-0
76	268	1	2	9	40	5	9	2	2	5	-0	-0	-0	-0	1	-0	-0
76	268	1	2	10	15	5	14	2	1	9	5	41	27	49	1	-0	-0
76	268	1	2	10	30	5	8	-0	2	9	-0	-0	-0	-0	2	-0	-0
76	268	1	2	10	30	5	7	-0	2	9	-0	-0	-0	-0	-0	-0	1
76	280	1	2	12	10	5	15	2	1	5	4	39	26	41	1	-0	-0
76	281	1	2	7	40	5	16	2	1	1	4	39	28	45	2	-0	-0
76	281	1	2	7	45	5	17	2	1	1	4	39	26	46	1	-0	-0
76	281	1	2	7	45	5	18	1	1	1	4	40	25	47	6	1	-0
76	281	1	2	7	45	5	5	-0	2	1	-0	-0	-0	-0	-0	-0	-0
76	289	1	2	9	15	5	19	2	1	3	4	38	27	45	2	-0	-0
76	289	1	2	10	30	5	9	2	2	5	4	-0	-0	-0	2	-0	-0
76	289	1	2	10	30	5	15	2	2	5	4	-0	-0	-0	2	-0	-0
76	290	1	2	7	45	5	20	2	1	1	2	41	28	47	1	-0	-0
76	290	1	2	8	15	5	21	1	1	1	2	41	28	46	1	-0	-0
76	290	1	2	8	30	5	4	-0	2	1	4	-0	-0	-0	1	-0	-0
76	290	1	2	8	30	5	5	-0	2	1	6	-0	-0	-0	1	-0	-0
76	290	1	2	8	30	5	22	2	1	1	2	37	26	46	2	-0	-0
76	293	1	2	9	45	5	15	2	2	3	-0	-0	-0	-0	-0	-0	-0
76	298	1	2	10	20	5	16	2	2	1	4	-0	-0	-0	1	-0	-0
76	298	1	2	10	20	5	5	-0	2	1	-0	-0	-0	-0	-0	-0	-0
76	298	1	2	11	-0	5	23	1	1	1	4	38	27	45	1	-0	-0
76	301	1	2	11	-0	5	24	2	1	5	5	40	28	47	4	1	-0
76	301	1	2	11	-0	5	15	2	2	5	4	-0	-0	-0	2	2	-0
76	302	1	2	10	-0	5	5	2	2	1	6	-0	-0	-0	-0	-0	-0
76	302	1	2	10	30	5	4	2	2	1	4	-0	-0	-0	-0	-0	-0
76	302	1	2	10	-0	5	24	2	1	1	2	39	27	46	2	1	-0
76	302	1	2	11	30	5	4	1	1	1	6	41	27	46	4	1	-0
76	302	1	2	11	30	5	25	1	1	1	2	37	25	41	2	1	-0
76	302	1	2	11	30	5	26	2	1	1	2	38	26	41	2	1	-0

A2.1 Capture-recapture data

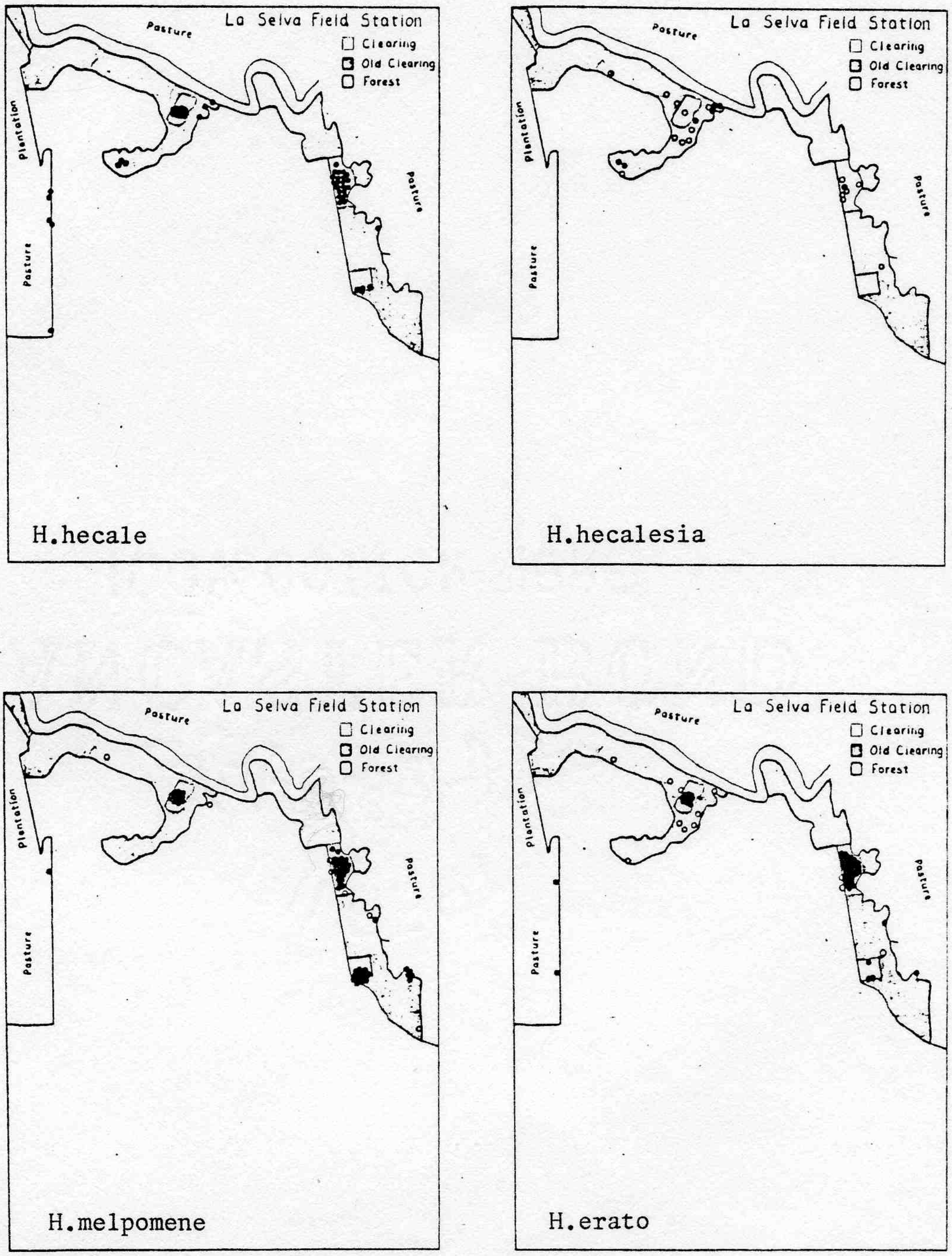
YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	50	1	2	-0	-0	6	1	2	1	9	3	-0	-0	-0	4	1	-0
75	52	1	2	10	-0	6	2	1	4	18	3	-0	-0	-0	6	1	-0
75	127	1	2	12	30	6	2	2	1	43	9	36	26	40	4	1	-0
76	282	1	2	13	10	6	1	2	1	21	4	40	26	48	1	-0	-0
76	282	1	2	13	10	6	2	1	1	21	4	42	25	41	1	-0	-0
76	290	1	2	11	30	6	3	1	1	26	4	40	26	41	1	-0	-0
76	303	1	2	11	-0	6	3	1	2	26	-0	-0	-0	-0	-0	-0	-0
76	322	1	2	9	30	6	5	1	1	26	4	42	26	48	1	-0	-0
75	256	1	2	10	-0	7	10	1	-0	15	8	43	26	47	1	-0	-0
75	268	1	2	9	35	7	12	1	1	3	8	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	7	-0	1	4	2	9	-0	-0	-0	-0	-0	-0
76	261	1	2	12	-0	7	1	2	1	3	3	41	25	49	1	-0	1
76	268	1	2	10	30	7	2	2	1	9	4	42	24	48	1	-0	-0
76	282	1	2	8	50	7	2	1	1	4	4	42	24	50	-0	-0	-0
76	282	1	2	10	-0	7	3	2	1	5	4	42	25	49	1	-0	-0
76	289	1	2	10	-0	7	4	1	1	5	6	41	23	43	-0	-0	-0
76	289	1	2	10	10	7	6	2	1	5	5	40	23	46	1	-0	-0
76	293	1	2	10	45	7	7	2	1	2	5	43	25	48	1	-0	-0
76	301	1	2	11	-0	7	8	-0	1	5	5	41	24	46	-0	-0	-0
76	301	1	2	11	10	7	9	2	1	5	5	43	24	48	-0	-0	2
76	301	1	2	12	-0	7	10	2	1	3	1	43	34	47	-0	-0	-0
75	52	1	2	8	45	8	1	2	1	9	3	-0	-0	-0	4	1	-0
75	52	1	2	9	35	8	1	2	2	9	3	-0	-0	-0	4	1	-0
75	85	1	2	9	50	8	100	2	1	54	4	-0	-0	-0	1	-0	-0
75	85	1	2	10	-0	8	3	2	1	54	4	45	35	-0	5	1	-0
75	90	1	2	9	10	8	5	2	1	15	9	48	39	50	1	-0	-0
76	262	1	2	13	-0	8	1	2	1	7	9	60	36	51	1	-0	-0
76	265	1	2	12	-0	8	1	2	2	7	6	-0	-0	-0	1	-0	-0
75	261	1	2	11	25	9	11	1	1	1	8	30	18	36	1	-0	-0
75	263	1	2	15	30	9	12	1	1	3	4	-0	-0	-0	1	-0	-0
75	266	1	2	11	-0	9	13	1	1	1	4	31	16	31	1	-0	-0
75	266	1	2	12	-0	9	14	1	1	1	4	35	19	33	1	-0	-0
76	280	1	2	12	20	9	1	2	1	5	5	30	18	33	1	-0	-0
76	280	1	2	12	30	9	2	1	1	5	4	-0	-0	-0	-0	-0	-0
76	282	1	2	10	-0	9	3	1	1	5	4	30	18	31	1	-0	-0
76	290	1	2	8	30	9	4	2	1	1	4	29	19	37	1	-0	-0
76	299	1	2	11	30	9	5	1	1	5	4	30	17	34	1	-0	-0
75	85	1	2	10	20	10	1	1	1	54	4	30	20	-0	1	-0	-0
75	282	1	2	-0	-0	10	-0	2	4	2	4	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	10	-0	2	4	2	4	-0	-0	-0	-0	-0	-0
75	282	1	2	-0	-0	10	-0	2	4	2	4	-0	-0	-0	-0	-0	-0
76	281	1	2	9	40	10	1	1	1	1	4	-0	-0	-0	-0	-0	-0
75	283	1	2	-0	-0	11	-0	1	4	2	9	-0	-0	-0	-0	-0	-0
76	293	1	2	6	50	11	1	1	1	8	5	48	29	49	6	1	-0
76	322	1	2	11	40	11	2	1	1	8	6	43	29	50	2	1	-0
75	261	1	2	10	-0	12	1	1	1	1	4	-0	-0	-0	1	-0	-0
76	304	1	2	10	30	12	1	1	1	1	5	37	24	42	-0	-0	-0
75	65	1	2	-0	-0	13	1	2	1	53	4	-0	-0	-0	1	-0	-0
75	91	1	2	8	30	13	2	2	1	55	4	-0	-0	-0	1	-0	-0
75	120	1	2	-0	-0	13	2	2	1	57	4	39	24	-0	1	-0	-0

YR	DAY	PL	C	HR	MIN	SP	ID	SX	RC	LOC	CN	WL	BL	HW	PA	PC	C
75	254	1	2	13	-0	13	3	1	1	1	4	45	25	41	8	-0	-0
75	256	1	2	14	-0	13	4	1	-0	1	4	42	24	47	8	1	-0
75	260	1	2	11	-0	13	4	2	1	1	-0	-0	-0	-0	-0	-0	-0
75	266	1	2	12	-0	13	11	-0	2	1	-0	-0	-0	-0	-0	-0	-0
75	283	1	2	-0	-0	13	-0	1	4	2	4	-0	-0	-0	-0	-0	-0
75	191	1	2	-0	-0	14	-0	1	4	4	-0	-0	-0	-0	-0	-0	-0
75	87	1	2	9	-0	14	1	1	1	17	4	43	30	-0	2	1	1

A2.1 Capture-recapture data

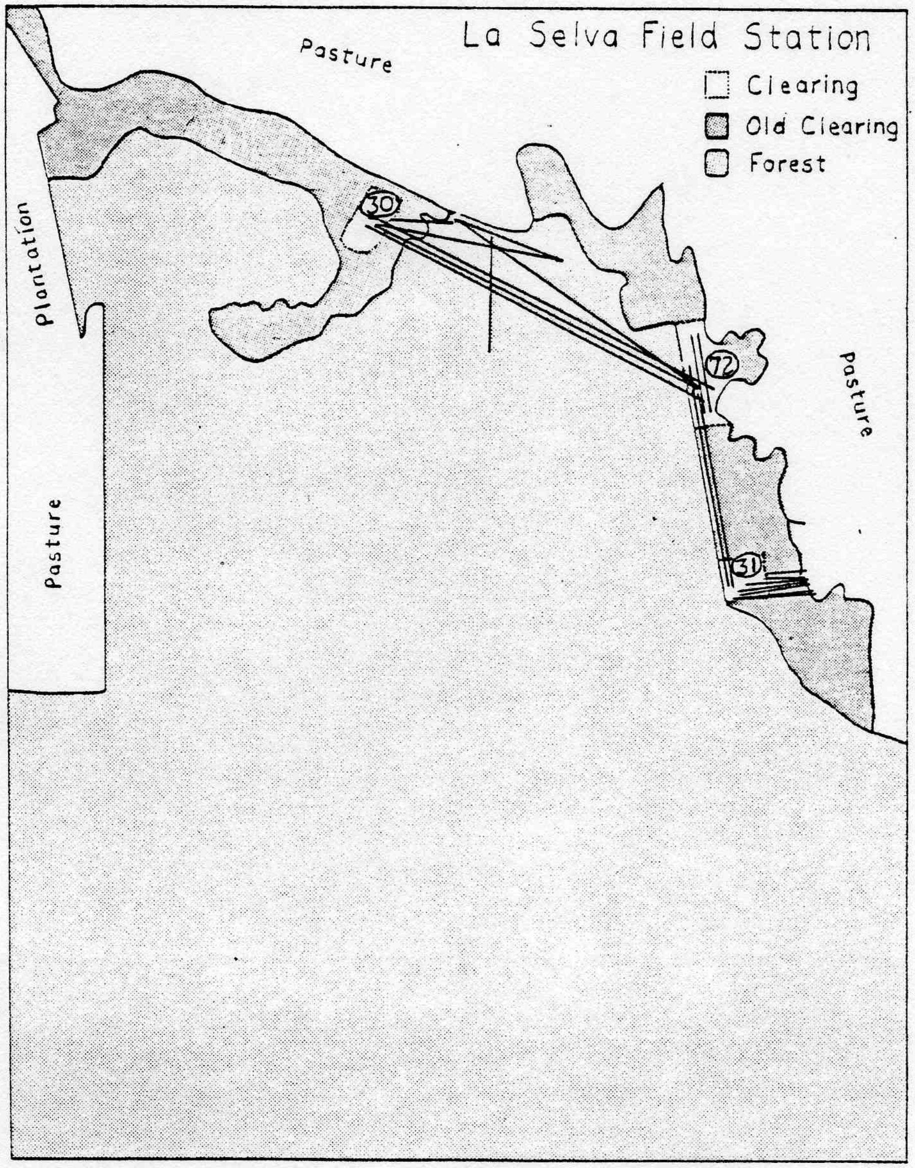


Appendix 2.2 Point of capture for La Selva Heliconius (solid dots). Host plants are represented as open circles.



Appendix 2.2 Point of capture for La Selva Heliconius (solid dots). Host plants are represented as open circles.

HELICONIUS MOVEMENT : ALL SPECIES



Appendix 2.3 Heliconius movements as indicated by captures and recaptures. Long range meovements connected by lines. Circled number indicates the number of recaptures within 100 meters of earlier capture points.

Heliconiine species	N	$\overline{X}$	SD
H.sara	21	33.0	1.7
female only	9	33.4	1.7
male only	12	32.7	1.7
H.cydno	43	40.5	2.2
female only	12	40.0	3.1
male only	31	40.7	1.8
H.hecale	19	44.9	1.8
female	8	44.9	1.6
male	11	45.0	2.0
H.erato	23	34.2	1.8
female	9	34.2	1.5
male	14	34.2	2.0
H.melpomene	29	38.9	1.3
female	9	38.9	1.5
male	20	38.9	1.3
Euides aliphera	4	18.0	.82
H.sappho	4	41.0	1.2
female	3	41.3	1.2
male	1	40.0	-
H. hecalesia female	2	45.5	3.5
Dryas julia	10	41.8	1.0
female	2	41.5	.71
male	7	42.0	1.2
H.ismenius male	1	60.0	-
Euides isabella female	1	37.0	-
H.charitonia	3	42.0	3.0

Appendix 2.4 Winglengths for La Selva Heliconiines. N=sample size, $\overline{X}$=mean winglength, SD=standard deviation.

Appendix 2.5 Correcting for Male-biased Sampling in Population-Estimation (Lincoln Index).

One assumption of the Lincoln Index (Southwood 1966) is that all the members of the population sampled be equally subject to capture. In particular, if males are more easily caught than females, as is often the case with butterflies, the total population size will be underestimated. This can be shown by considering the formula for the Lincoln Index:

$\hat{N} = MC/R$

$\hat{N}$=est. population size
M=number previously marked
C=number captured in sample
R=number of recaptures in sample

Suppose the sex ratio in the wild population is actually 1:1, but that females are caught with probability q and males with probability p (given that a butterfly was captured). The estimated population size will than be, for the total population:

$$\hat{N} = M(p+q)C(p+q)/R(p+q) = MC/R \qquad (p+q)=1$$

For males only, the estimated population size would be:

$$\hat{N}(\text{male}) = MpCp/Rp = MCp/R$$

Then, $\hat{N}/\hat{N}(\text{male}) = (MC/R)/(MCp/R) = 1/p$

Thus, the estimated population size will be 1/p times the estimated male population size, an underestimate of the true population size. Only when p=q=.5 will $\hat{N} = 2\hat{N}(\text{male})$. Therefore, a better overall estimate of population size would be $2\hat{N}(\text{male})$.

Of course, this is based on the assumption that the actual sex ration is 1:1.

The same reasoning should apply to the Jolly method of population estimation (Southwood 1966). However, deriving the value of N/N(male) is much more complex than for the Lincoln Index.

Appendix 2.6 Pollen gathering in La Selva *Heliconius*

Habitat differences: mean pollen load size

all species	males	females	area*	
.51±.06	.15±.04	.99±.12	S	
.33±.13	.13±.07	.63±.28	F	not significant
.45±.04	.22±.04	.84±.09	all areas	

Sex differences: mean pollen load size

male = .22±.04 $p<.005$
female = .84±.09

Species differences: female mean pollen load

H.sara	N=56	$\bar{x}$=1.04±.13	
H.cydno	13	.69±.21	
H.hecale	10	1.15±.25	not significant
H.erato	12	.63±.22	
H.melpomene	12	.33±.19	

Habitat differences: pollen color

white	yellow	both	habitat*	
N=40	N=54	N=4	S	$p<.005$
35	0	0	F	
75	54	4	all areas	

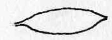
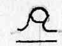
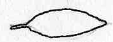
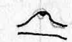
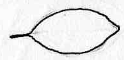
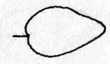
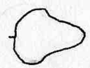
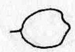
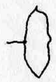
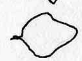
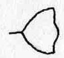
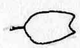
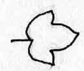
Species differences: pollen color

	white	yellow	both	Total	
H.sara	N=40	N=42	N=4	N=86	
H.cydno	73	0	0	73	
H.hecale	29	1	0	30	$p<.005$
H.erato	11	13	1	25	
H.melpomene	28	0	0	28	

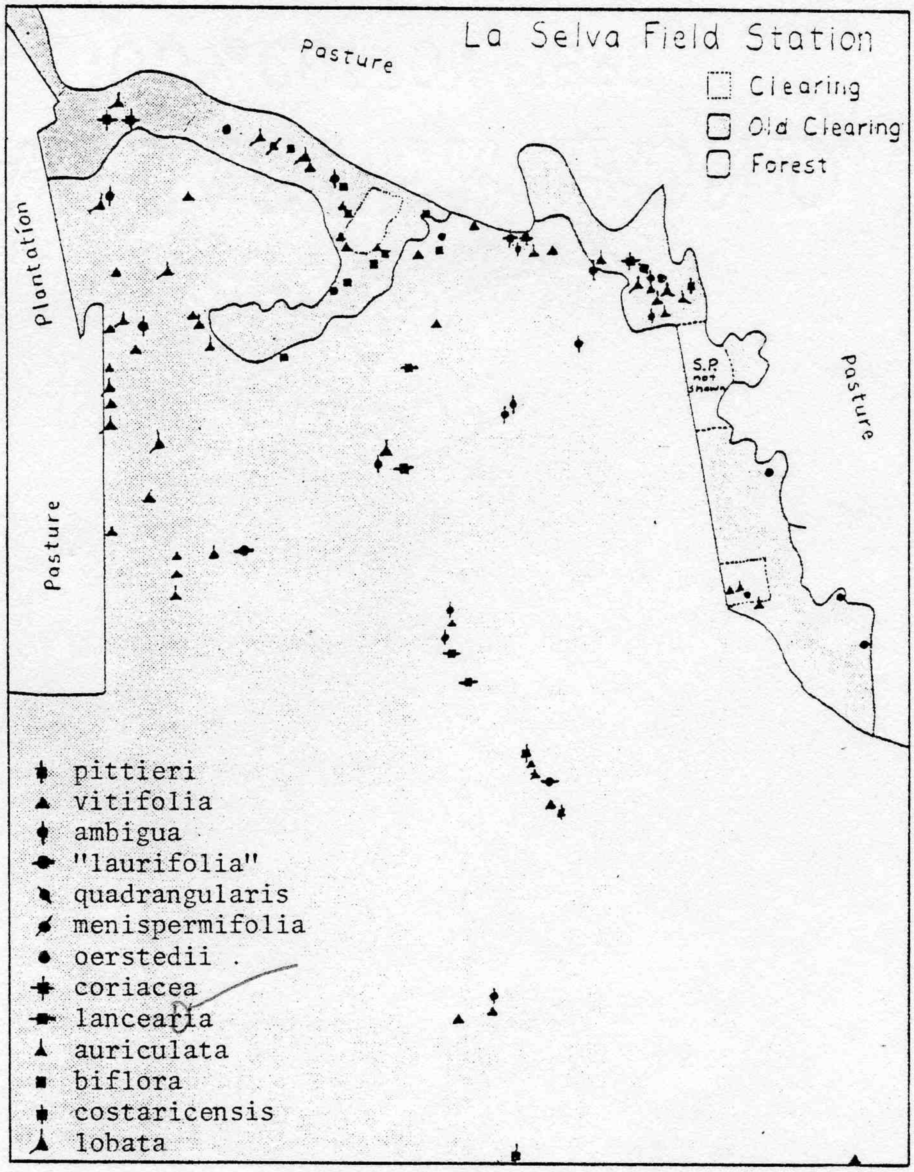
Species group differences: Pollen color in one habitat (S*)

	white	yellow(or both)	
"Granadilla feeders"	N=24	N= 1	p<.005
"Plectostemma feeders"	16	57	

All statistics are contingency table G-tests of association (Sokal and Rohlf 1969) on field data from which the above means were calculated. *S= successional plots, F= forest.

Species:	Max. stem diam.	Leaf shape	Leaf thickness (mm)	Leaf surface (upper)	Nectary structure Foliar	Petiolar
pittieri	30+		.24 ± .02	smooth	none	
vitifolia	25		.10 ± .03	smooth	leaf margins	
"laurifolia"	30		.15 ± .03	smooth	none	
ambigua	25		.15 ± .01	smooth	none	
quadrangularis	--		.14 ± .02	smooth	none	
oerstedii	12		.14 ± .01	smooth	none	
menispermifolia	--		.21**	hirsute	none	
lancearia	--		.12 ± .02	smooth	ocellate	none
coriacea	5		.21 ± .02	smooth	none	
auriculata	11		.12 ± .02	smooth	ocellate	
biflora	10		.09 ± .01	smooth	ocellate	none
costaricensis	10		.11**	hirsute	none	none
lobata	20		.10 ± .02	hispidulous with hooked trichomes	ocellate	

Appendix 3.1 Some vegetative characteristics of La Selva <u>Passiflora</u> species. Maximum stem diameter is that of the largest La Selva stem known to be capable of flowering. Leaf thickness was determined on mature leaves of three plants grown in greenhouses, except for two species where only one plant was available (*).



Appendix 3.2 Location of tagged Passiflora vines at La Selva.

Passiflora species	Heliconius species: cydno	melpomene	hecale (C.R.)	erato	charitonia	ethilla	hecale (Venez.)	hecale (hybrid)
coriacea 6,14*	3 (6)	0 (3)	---	2 (3)	2 (2)	1 (9)	0 (2)	0 (3)
auriculata 2	7 (8)	0 (1)	---	1 (2)	---	4 (7)	5 (5)	4 (4)
(lutea) (Austin)	1 (1)	0 (1)	---	---	---	1 (1)	1 (1)	1 (1)
(helleri) 22	1 (1)	---	---	2 (2)	1 (2)	2 (2)	1 (1)	2 (2)
biflora 1	0 (5)	0 (3)	---	1 (2)	---	6 (7)	3 (4)	1 (4)
(tuberosum) 33	2 (2)	---	---	1 (1)	---	2 (2)	1 (1)	1 (1)
(rubra) (Peru)	2 (2)	0 (1)	1 (1)	0 (1)	0 (1)	0 (3)	---	1 (2)
costaricensis 7	0 (1)	---	---	---	---	0 (1)	1 (1)	0 (1)
(brevifolia) 26	1 (1)	---	0 (1)	0 (1)	---	2 (2)	---	0 (1)
(foetida) 19	0 (9)	0 (5)	1 (1)	---	---	7(15)	2 (5)	3 (6)
vitifolia 3	4 (4)	0 (2)	1 (1)	0 (3)	---	4 (4)	3 (4)	4 (5)
(near subulata)32	---	0 (1)	1 (1)	---	0 (1)	3 (3)	---	1 (2)
(jamesoni) 23	2 (2)	0 (1)	0 (1)	1 (1)	0 (1)	3 (3)	0 (1)	1 (2)
(mollissima) 25	---	1 (2)	---	0 (1)	---	---	---	---
quadrangularis 9	4 (4)	0 (1)	0 (1)	2 (2)	---	3 (5)	0 (3)	0 (3)
(serrato-digitata)	1 (1)	---	1 (1)	0 (1)	---	2 (2)	---	2 (2)
ambigua 5	7 (7)	0 (3)	0 (1)	0 (5)	---	10(10)	0 (4)	0 (6)
(laurifolia) 38	1 (1)	0 (1)	---	---	---	1 (1)	---	2 (2)
(serratifolia) 28,29	0 (3)	0 (2)	0 (1)	0 (1)	---	3 (3)	---	2 (4)
(pedata) 27	0 (2)	---	1 (1)	0 (1)	---	1 (3)	---	1 (1)
(edulis) 17	1 (2)	0 (2)	---	0 (1)	---	2 (2)	1 (1)	2 (2)
oerstedii 4	14(14)	10(11)	---	0 (5)	0 (1)	23(23)	1 (5)	3 (9)
menispermifolia 24	0 (1)	---	0 (1)	0 (1)	---	0 (2)	0 (1)	0 (2)
(caerulea) 12	2 (2)	0 (1)	1 (1)	2 (2)	1 (2)	5 (5)	1 (1)	2 (2)
(cyanea) 15	1 (1)	0 (1)	---	---	0 (1)	3 (3)	---	0 (2)
lobata 8	1 (3)	0 (2)	---	0 (1)	---	0 (3)	0 (2)	0 (1)

(* see Appendix 5.1 for locality data.)

Appendix 4.1 Single plant presentation oviposition tests (May-June 1976). The number in parentheses is the number of tests in which foretarsal drummung occurred; the other number is the number of tests in which oviposition occurred. The number of females is underlined.

H.cydno - 20 females

vitifolia (M)	7
oerstedii (M)	4
coriacea (L)	1
ambigua (L)	1
biflora (M)	3
costaricensis (M)	1
laurifolia (L)	6
menispermifolia (M)	0
auriculata (M)	6

H.charitonia - 10 females

vitifolia (M)	0
oerstedii (M)	0
coriacea (L)	6
ambigua (L)	0
biflora (M)	8
costaricensis (M)	0
laurifolia (L)	0
alata(quadrangularis) (M)	1
menispermifolia (M)	0
auriculata (M)	0

H.hecale - 8 females

oerstedii (M)	17
menispermifolia (M)	0
auriculata (M)	0
ambigua (L)	0
vitifolia (M)	11
alata(quadrangularis)(M)	1
serratifolia (M)	1
biflora (M)	1
pittieri (S)	0

H.cydno - 19 females

vitifolia (M)	2
oerstedii (M)	6
coriacea (L)	1
ambigua (L)	6
biflora (M)	0
costaricensis (M)	5
laurifolia (L)	8
alata(quadrangularis)(M)	6
menispermifolia (M)	0
auriculata (M)	12

H.ismenius(Mex.) - 9 females

serratifolia (M)	1
biflora (M)	0
alata(quadrangularis)(M)	26
vitifolia (M)	9
ambigua (L)	0
auriculata (M)	0
oerstedii (M)	33

H.cydno - 20 females

ambigua (L)	14
costaricensis (M)	2
coriacea (L)	2
menispermifolia (M)	3
alata(quadrangularis)(M)	12

H.cydno - 11 females

laurifolia (L)	26
ambigua (L)	8

Appendix 4.2 Multiple-plant oviposition tests on Heliconius species. Passiflora species not underlined. L=large Passiflora plant; M=medium; S=small. Number of eggs given at right.

H.charitonia - 5 females

ambigua (L)	0
costaricensis (M)	0
coriacea (L)	5
menispermifolia (M)	0
alata(quadrangularis)(M)	17

H.cydno - 9 females

laurifolia (L)	10
ambigua (L)	1
lancearea (M)	0
pittieri (S)	0
vitifolia (M)	5

H.charitonia - 3 females

laurifolia (L)	10
ambigua (L)	0

H.erato - 3 females

ambigua (L)	0
costaricensis (M)	0
coriacea (L)	5
menispermifolia (M)	0
alata(quadrangularis)(M)	1

Appendix 4.2 continued.

Heliconius species	"Meristem"	Tendril	Young Tissues	Mature Tissues	Off plant
H.cydno	0	30	13	10	1
H.melpomene	9	4	3	7	0
H.erato	8	3	1	0	0
H.charitonia	8	0	0	0	0
H.hecale (C.R.)	1	9	1	2	0
H.hecale (Venez.)	1	6	4	4	21
H.hecale (hybrid)	15	4	12	12	10

Appendix 4.3 Egg placement in ovipositing female *Heliconius*. "Meristem" refers to shoot tip leaf cluster, Tendril = uncoiled green tendril, young tissues= all other immature shoot tissues.

Appendix 5.1 Larval growth data as described in Chapter 4.3

Data Code:

Comm = Comments
1. cannibalism
2. N-determination done
3. 1 and 2
4. host switch during growth
5. dead larva
6. died at eclosure
7. died in pupation
8. deformed adult
9. larva hybrid origen
10. plant unhealthy
11. 1 and 5

Sp = butterfly species
1. H.sara, La Selva
2. H.cydno, La Selva
3. H.hecale, La Selva
4. H.erato, La Selva
5. H.melpomene, La Selva

20. Agraulis vannillae, Austin
21. H.charitonia, near La Selva
22. H.clysonimus, Monteverde, C.R.
23. Dryas julia, Austin
24. H.erato, S. Tamaulipas, Mex.
25. H.ethilla, S.E.Brazil
26. H.hecalesia, Monteverde, C.R.
27. H.hecale, L.S.x Venezuelan
28. H.hecale, Monteverde, C.R.
29. H.ismenius, S.Tamaulipas, Mex.

We = egg weight in .01 milligrams

Tp = days in pupal stage

PL = pupal length in millimeters
WL = winglength in millimeters
BL = bodylength in millimeters
HW = head width in millimeters

T = days from hatching to pupa

Wp = pupal weight in milligrams

Sx = sex; 1=female, 2=male.

T5 = days from hatching to 5th. instar moult

Plant = plant species
1. P.biflora, La Selva
2. P.auriculata, La Selva
3. P.vitifolia, La Selva
4. P.oerstedii La Selva
5. P.ambigua, La Selva
6. P.coriacea, La Selva
7. P.costaricensis, La Selva
8. "Tetrastylis" lobata, L.S.
9. P.quadrangularis (P.alata?) Osa Peninsula, Costa Rica
10. Adenia sp., Lombe, Africa
11. Adenia manii, Cameroons, West Africa.
12. P.caerulea, Hawaiian seed
13. P.caerulea, other?
14. P.coriacea, Turrialba, C.R.
15. P.cyanea, Trinidad, W.I.
16. P.edulis, Hawaiian seed
17. P.edulis, farm near La Selva
18. P.foetida, Hawaiian seed.
19. P.foetida, Austin
20. P.foetida, Guanacaste, C.R.
21. P.foetida, Peru
22. P.helleri, ?
23. P.jamesoni, ?
24. P.menispermifolia, Osa Pen.
25. P.mollissima, Hawaiian seed
26. P.brevifolia , Monteverde
27. P.pedata, Santa Rosa, C.R.
28. P.serratifolia,Tamaulipas,Mex.
29. P.serratifolia, Turrialba, C.R
30. P.suberosa, Virgin Islands
31. P.talamancensis, Osa Pen., C.R
32. P.sp. near subulata, Peru
33. P.tuberosa, Trinidad, W.I.
34. P.capsularis, ?
35. P.oerstedii,Alajuela, C.R.
36. P.triloba, Peru
37. P.oerstedii,San Vito, C.R.
38. P.laurifolia, Trinidad, W.I.
39. P.membranacea, Costa Rica
40. P.lancearia, Costa Rica
41. "Tetrastylis" dioscoreifolia, Costa Rica.

Mg/Day = Wp/T

$I^{1/5}$ = within-instar size change

Comm.	Sp	I.D.	Plant	I.D.	Day	We	Tp	PL	WL	BL	HW	T	Wp	Sx	T5	R	Mg/Day		$I^{1/5}$
-0	3	301	4	75526	26	-0	10	30	42	31	53	15	574	2	9	.92	38.2	hecale	3.77
-0	3	330	1	70075	62	-0	10	-0	44	33	54	12	692	2	8	1.22	57.6		3.92
-0	3	341	3	75186	68	-0	10	33	43	32	51	16	769	2	11	.94	48.0		4.00
-0	3	344	3	75131	71	-0	10	31	45	32	50	14	776	1	8	1.07	55.4		4.01
-0	310356		7	75219	84	-0	9	30	41	33	47	16	637	1	-0	.89	39.8		3.85
1	3	502	1	70060	102	99	10	31	42	37	55	14	757	2	8	.99	54.0		3.77
6	3	510	1	70076	105	-0	-0	-0	-0	-0	-0	15	480	1	9	.88	31.9		3.64
-0	3	573	27	75246	132	-0	10	33	45	33	52	14	849	1	9	1.10	60.6		4.08
-0	3	582	6	75223	138	60	10	30	41	30	49	14	656	1	-0	1.09	46.8		4.05
-0	3	619	2	80000	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	0		0
-0	3	619	2	75067	163	84	9	27	40	27	51	14	575	2	10	.96	41.0		3.69
-0	3	652	27	-0	181	68	10	31	46	34	-0	16	788	-0	11	.97	49.2		4.10
-0	3	667	16	-0	190	67	11	32	-0	-0	-0	15	809	2	11	1.04	53.9		4.13
-0	310669		1	70049	190	-0	11	33	42	36	-0	13	825	1	9	1.18	63.4		4.06
-0	320669		1	70049	190	-0	9	30	44	31	-0	12	624	1	8	1.18	51.9		3.84
-0	3	722	5	75217	226	74	10	32	45	35	52	15	800	2	10	1.01	53.3		4.04
-0	28	821	3	75158	240	-0	-0	32	-0	-0	-0	12	877	1	-0	1.29	73.0		4.11
9	27	501	4	90114	402	-0	10	30	44	31	51	3	626	1	8	4.73	208.4		3.84
9	27	505	1	75229	103	-0	10	33	47	36	60	13	820	1	8	1.17	63.0		4.05
9	27	508	4	70114	403	-0	10	33	48	34	57	13	830	2	8	1.18	63.8		4.06
9	27	515	4	70114	108	-0	10	31	43	35	53	12	669	2	8	1.20	55.7		3.89
9	27	513	1	75215	108	-0	10	30	42	34	48	13	568	1	9	1.06	43.6		3.77
9	27	514	1	75215	108	-0	10	30	41	33	52	13	605	1	8	1.08	46.5		3.81
9	27	606	3	126	160	84	10	31	44	34	50	11	753	2	7	1.32	68.4		3.89
9	27	621	32	75299	163	76	10	29	43	32	49	13	597	2	8	1.07	45.9		3.79
9	27	612	19	70447	161	78	9	29	42	30	49	16	573	2	11	.86	35.8		3.74
9	27	611	30	70019	161	78	9	29	40	31	49	19	649	1	14	.75	34.1		3.84
9	27	624	2	75151	166	-0	9	29	42	31	50	13	600	1	8	1.08	46.1		3.81
9	27	628	2	75151	170	-0	10	32	45	35	56	13	782	2	9	1.16	60.1		4.01
10	27	641	4	75054	179	81	10	33	46	37	-0	13	840	2	9	1.16	64.6		4.01
10	27	644	32	75299	179	77	10	27	42	32	-0	15	504	2	10	.89	33.5		3.66
10	27	645	4	75516	179	76	10	30	42	34	-0	13	681	1	8	1.11	52.3		3.89
-0	5	339	4	70114	67	-0	9	27	38	28	41	12	508	2	8	1.22	42.3	melpomene	3.92
-0	5	349	4	75230	72	-0	10	29	39	29	41	12	546	2	7	1.24	45.5		3.98
-0	510360		13	75077	76	-0	-0	28	-0	-0	-0	13	551	2	8	1.15	42.3		3.98
7	520360		13	75077	76	-0	9	27	-0	-0	-0	13	405	1	8	1.06	31.1		3.74
-0	5	357	4	70114	84	-0	9	27	38	27	43	13	562	2	8	1.15	43.2		4.00
-0	5	902	35	-0	-0	-0	-0	21	30	20	37	-0	198	2	-0	0	0		0
-0	5	364	1	75229	90	-0	-0	26	-0	-0	-0	14	468	2	9	1.02	33.4		3.85
-0	5	367	1	70060	91	-0	8	27	38	26	45	14	480	2	9	1.03	34.2		3.87
7	5	268	1	70342	91	-0	-0	-0	-0	-0	-0	14	277	-0	10	.88	19.7		3.47
-0	5	358	2	-0	87	-0	9	29	39	26	45	12	512	2	8	1.22	42.6		3.92
-0	510374		2	75151	97	-0	-0	28	38	27	46	13	481	1	8	1.11	37.0		3.88
-0	520374		2	75151	97	-0	-0	23	32	23	39	13	308	1	9	.98	23.7		3.55
-0	5	371	1	75215	95	-0	9	26	37	26	49	14	390	2	9	.97	27.8		3.72
7	5	518	3	75190	109	-0	-0	-0	-0	-0	-0	13	441	-0	8	1.08	33.9		3.81
7	5	554	4	70141	120	42	9	26	36	-0	42	12	386	2	8	0	0		0
-0	5	556	1	75229	123	63	8	28	40	29	51	13	478	2	8	1.06	36.7		3.77
-0	5	555	1	75229	121	40	9	27	38	27	45	13	457	1	8	1.19	35.1		4.09
6	5	519	3	75190	409	-0	-0	-0	-0	-0	-0	17	442	2	10	.83	26.0		3.81
-0	5	564	4	75226	126	-0	9	29	39	27	41	13	520	1	8	1.13	40.0		3.94
-0	5	587	4	75226	139	40	9	28	39	26	43	14	512	1	9	1.14	36.5		4.18
-0	5	593	2	75054	142	53	9	25	36	25	52	14	386	2	-0	.98	27.5		3.74
6	5	591	4	75054	142	59	-0	-0	-0	-0	-0	15	505	2	-0	.95	33.6		3.86
-0	5	601	3	70131	156	42	9	29	39	29	44	12	563	2	8	1.34	46.9		4.22
-0	5	603	2	75241	160	-0	9	26	36	25	41	13	419	2	-0	1.07	32.2		3.77
-0	5	605	2	75342	160	55	9	27	32	22	37	12	262	2	8	1.01	21.8		3.43
-0	5	602	5	75217	158	49	-0	22	37	25	40	16	485	1	11	.93	30.3		3.97
-0	5	630	5	75217	501	60	9	26	39	26	48	16	483	2	11	.88	30.1		3.81
-0	510630		5	75217	201	59	9	27	37	27	50	16	514	2	11	.90	32.1		3.87
11	5	634	7	75036	171	58	10	23	31	22	-0	16	330	-0	19	.80	20.6		3.56
-0	5	638	24	75206	179	59	9	25	40	27	-0	14	450	2	9	.99	32.1		3.77
-0	5	639	4	75054	179	66	11	26	39	25	40	12	492	2	8	1.15	40.9		3.75
-0	5	654	24	75042	181	69	10	26	32	26	45	12	465	1	8	1.12	38.7		3.68
-0	5	655	35	75017	181	61	10	29	35	26	40	12	458	1	8	1.15	38.1		3.76
-0	5	662	1	75098	190	56	10	24	38	25	40	13	379	1	9	1.03	29.1		3.68
-0	510664		25	-0	190	51	10	27	40	26	43	16	449	1	11	.90	28.0		3.88
-0	520664		25	-0	190	-0	10	-0	33	24	42	13	350	2	-0	1.01	26.9		3.64
12	5	665	11	-0	187	92	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	0		0
-0	5	718	2	75037	195	-0	-0	23	31	24	38	13	322	1	9	.99	24.7		3.58
-0	5	804	37	75051	198	46	10	27	37	26	43	13	479	2	9	1.16	36.8		4.01

Appendix 5.1

Comm.	Sp. I.D.	Plant I.D.		W_e	T_p	PL	WL	BL	HW	T	W_p	Sx	T5	R	Mg/DAY	$I^{1/5}$
-0	2 305	4 75230	47	-0	9	29	43	30	51	13	647	2	8	1.11	49.7	3.90
7	2 306	1 70060	51	-0	-0	-0	-0	-0	-0	13	501	-0	7	1.04	38.5	3.70
-0	2 307	3 75189	48	-0	-0	29	42	32	53	12	682	2	8	1.22	54.8	3.94
-0	2 308	6 75223	49	-0	9	30	41	32	50	14	607	2	10	1.02	43.3	3.85
-0	2 309	1 70075	48	-0	-0	29	41	34	51	12	609	2	8	1.19	50.7	3.85
-0	2 310	3 75126	49	-0	-0	31	-0	-0	-0	12	688	1	8	1.23	57.3	3.95
-0	2 311	1 70083	49	-0	-0	31	43	30	50	13	610	2	8	1.10	46.9	3.85
-0	2 312	3 75187	50	-0	-0	30	41	31	51	11	590	2	7	1.28	53.6	3.83
-0	220312	9 75117	50	-0	9	29	41	29	49	13	632	2	8	1.11	48.6	3.88
-0	230312	9 75117	50	-0	9	27	37	27	49	13	473	2	9	1.02	36.3	3.66
-0	2 317	4 -0	60	-0	9	29	43	31	51	11	594	2	8	1.29	53.9	3.83
1	2 325	12 -0	60	-0	9	31	44	36	56	11	759	1	7	1.37	68.9	4.02
-0	2 324	12 -0	60	-0	9	31	42	31	52	11	725	1	7	1.36	65.8	3.99
1	2 316	4 70114	60	-0	-0	30	41	29	-0	10	598	1	7	1.42	59.7	3.84
2	2 337	35 75017	66	-0	-0	29	43	31	-0	12	572	2	8	1.17	47.6	3.80
-0	2 318	25 -0	60	-0	9	28	38	27	49	14	530	1	8	.98	37.8	3.74
-0	2 320	23 75040	60	-0	10	29	41	28	50	14	536	2	10	.98	38.2	3.75
2	2 326	2 75151	60	-0	10	29	42	26	50	12	572	1	8	1.17	47.6	3.80
3	2 356	7 75219	87	-0	-0	29	40	29	-0	11	540	2	7	1.25	49.0	3.76
-0	2 901	36 -0	81	-0	-0	28	40	29	-0	16	602	2	10	.89	37.6	3.84
2	2 354	6 75222	83	-0	-0	30	41	30	-0	16	608	1	11	.89	38.0	3.85
2	210503	9 75117	102	-0	10	31	42	32	51	11	713	2	7	1.35	64.8	3.97
2	220503	9 75117	102	-0	10	31	44	28	51	13	698	1	8	1.14	53.6	3.96
2	230503	9 75117	102	-0	10	31	42	33	54	15	735	2	10	1.00	49.0	4.00
6	240503	9 75117	102	-0	10	31	-0	-0	-0	14	732	1	-0	1.07	52.2	3.99
2	2 509	1 70075	103	91	10	30	41	26	50	13	707	2	8	1.07	54.3	3.79
7	2 508	1 70075	103	68	-0	-0	-0	-0	-0	15	395	2	9	.86	26.3	3.57
-0	2 523	25 75083	111	-0	9	30	43	32	49	13	640	2	7	1.11	49.2	3.89
2	2 526	25 75083	113	-0	10	30	40	28	51	11	629	1	8	1.31	57.1	3.87
-0	2 543	5 75215	115	91	9	28	42	26	28	13	531	1	9	.99	40.8	3.57
2	220523	25 -0	113	-0	10	29	39	31	51	12	564	1	8	1.16	46.9	3.79
-0	2 550	6 75222	119	-0	9	30	41	-0	42	13	576	1	9	1.08	44.3	3.81
-0	2 551	31 75200	119	-0	10	30	42	-0	50	11	666	2	7	1.33	60.5	3.92
2	2 556	1 75229	122	63	9	28	40	29	51	13	478	2	8	1.06	36.7	3.77
2	2 557	5 70449	122	81	9	31	46	32	55	13	716	2	9	1.11	55.0	3.88
2	2 558	3 70132	122	75	10	31	44	31	50	12	649	2	8	1.19	54.0	3.87
2	2 559	2 75213	122	80	9	27	39	27	52	11	491	2	7	1.19	44.6	3.61
-0	2 566	3 75189	134	82	9	31	43	30	53	11	679	1	7	1.29	61.7	3.83
-0	2 570	2 70342	134	-0	10	30	40	28	50	12	650	2	8	1.21	54.1	3.90
2	2 568	16 75244	135	65	9	28	41	27	51	12	602	1	8	1.22	50.1	3.92
1	2 579	3 75158	137	99	9	32	44	33	56	11	779	2	7	1.27	70.7	3.79
-0	2 592	2 70342	145	80	10	27	38	28	49	13	511	2	8	1.02	39.2	3.64
2	2 582	6 75223	138	60	10	30	41	30	49	14	656	1	-0	1.09	46.8	4.05
-0	2 607	3 75188	160	78	9	31	43	32	50	12	732	2	8	1.22	60.9	3.93
2	2 626	2 75223	167	66	9	28	41	29	-0	17	568	2	12	.84	33.4	3.86
5	2 631	11 -0	180	79	-0	-0	-0	-0	-0	16	-0	-0	9	-.31	-.0	0
2	210631	15 70246	179	75	10	-0	39	29	-0	14	547	2	10	.98	39.0	3.74
2	2 643	4 74014	179	-0	10	-0	42	30	-0	12	656	1	8	1.21	54.6	3.91
2	2 658	9 -0	182	-0	10	-0	40	29	-0	12	654	1	8	1.21	54.4	3.91
2	2 663	26 -0	187	85	10	-0	39	29	50	14	576	2	9	.96	41.1	3.68
2	2 666	7 75219	190	76	10	-0	41	29	45	14	603	1	10	1.00	43.0	3.80
2	2 670	32 75299	191	79	10	-0	40	30	51	15	629	2	10	.93	41.9	3.80
2	2 704	2 75241	192	-0	10	30	43	30	52	11	702	2	7	1.35	63.8	3.96
2	2 706	3 75186	192	78	10	30	43	30	-0	11	658	2	7	1.29	59.7	3.85
2	2 710	2 75212	192	77	10	29	40	28	-0	11	560	2	7	1.24	50.8	3.74
2	2 713	3 75187	192	69	10	30	41	29	-0	11	707	1	7	1.36	64.2	4.00
2	2 708	2 75067	192	76	10	29	42	30	-0	12	657	2	8	1.19	54.7	3.87
2	2 707	2 75255	192	67	10	29	42	29	52	13	625	2	9	1.13	48.0	3.93
2	2 711	3 75158	192	73	10	32	43	31	51	13	711	2	8	1.14	54.6	3.96
2	2 801	22 75110	192	-0	10	30	43	30	-0	12	714	2	8	1.24	59.4	3.97
2	2 802	5 -0	192	-0	10	31	43	32	-0	12	724	2	8	1.24	60.3	3.99
2	2 806	37 75051	198	68	10	29	40	28	49	14	580	1	10	1.02	41.4	3.86
2	2 808	33 70059	198	59	10	28	40	28	48	12	543	1	8	1.21	45.2	3.92

cydno

Appendix 5.1

Comm.	Sp	I.D.	Plant	I.D.	Day	We	Tp	PL	WL	BL	Hw	T	Wp	Sx	T5	R	Mg/Day		$I^{1/5}$
-0	20	407	34	39	240	-0	-0	28	-0	-0	-0	14	661	2	-0	1.15	47.2	*	4.21
-0	20	409	13	32	240	-0	-0	27	-0	-0	-0	20	604	2	-0	.78	30.2	*	4.13
-0	20	410	1	1	240	-0	-0	-0	-0	-0	-0	10	-0	-0	-0	-.50	-.1	0	0
5	21	321	19	6021	60	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	0	charitonia	0
-0	21	333	25	70412	64	-0	8	23	40	23	43	14	315	2	10	.98	22.5		3.74
-0	21	323	8	-0	60	-0	8	28	48	28	53	12	516	1	8	1.30	43.0		4.13
-0	21	332	3	70132	64	-0	8	26	45	26	44	13	467	1	8	1.17	35.9		4.05
6	21	342	18	-0	68	-0	-0	20	-0	-0	-0	22	238	2	11	.58	10.8		3.54
-0	21	10566	8	75220	70	-0	8	26	45	27	42	11	455	2	7	1.36	41.3		4.03
-0	21	20566	8	75220	70	-0	8	25	42	26	42	11	467	1	7	1.39	42.4		4.05
-0	21	30566	8	75220	71	-0	9	24	42	25	48	11	438	2	7	1.36	39.8		4.00
-0	21	40566	8	75220	71	-0	9	26	45	25	45	12	482	1	7	1.28	40.1		4.07
-0	21	50566	8	75220	70	-0	8	27	45	16	44	12	487	1	7	1.28	40.5		4.08
-0	21	70566	8	75220	71	-0	9	28	48	27	48	11	583	1	7	1.47	53.0		4.23
-0	22	808	22	75110	236	76	-0	28	-0	-0	-0	11	542	1	8	1.24	49.2	Dryas	3.72
-0	22	810	33	70029	237	-0	-0	28	-0	-0	-0	11	568	2	7	1.26	51.6		3.77
-0	22	815	31	75200	238	-0	-0	-0	-0	-0	-0	11	605	2	7	1.28	54.9		3.81
-0	23	403	6	24	-0	-0	-0	25	-0	-0	-0	15	507	2	-0	1.00	33.8		4.01
-0	23	340	1	70075	68	-0	9	25	45	25	51	12	606	1	-0	1.31	50.5		4.15
-0	23	345	1	70075	71	-0	8	26	46	25	49	13	593	1	-0	1.21	45.6		4.14
-0	23	521	7	75219	111	-0	8	27	46	28	52	15	625	2	11	1.06	41.6		4.18
-0	23	528	2	75241	113	57	8	27	47	28	52	14	717	2	9	1.13	51.2		4.17
-0	23	541	6	75222	114	-0	9	24	42	22	49	24	486	1	12	.62	20.2		3.97
-0	24	348	1	70078	72	-0	9	28	42	27	43	11	465	2	7	1.24	42.2	erato	3.72
-0	24	343	4	70114	71	-0	9	23	35	22	40	20	277	1	14	.59	13.8		3.36
-0	24	516	1	70060	108	-0	9	25	39	27	45	11	407	1	7	1.19	36.9		3.63
-0	24	525	22	75110	112	65	9	30	43	32	49	13	640	2	7	1.14	49.2		3.97
-0	24	524	3	75189	112	62	9	25	36	24	40	17	326	2	12	.74	19.1		3.50
-0	24	530	2	-0	113	65	9	24	36	25	39	13	375	2	9	.99	28.8		3.57
-0	24	627	7	-0	68	69	9	-0	-0	-0	-0	15	330	1	10	.81	22.0		3.44
-0	24	635	2	70342	77	76	9	24	36	24	35	12	326	1	8	.98	27.1		3.36
-0	24	650	1	75098	80	84	9	26	37	25	40	11	411	1	7	1.11	37.3		3.45
5	24	662	4	75031	187	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	0		0
-0	25	109	14	60	-0	-0	-0	24	30	23	-0	20	230	2	-0	.54	11.5	ethilla	3.14
8	25	110	14	66	-0	-0	-0	21	-0	-0	-0	26	224	2	-0	.41	8.6		3.13
-0	25	112	1	62	-0	-0	-0	30	38	28	40	13	420	2	-0	.98	32.3		3.55
-0	25	114	34	18	-0	-0	-0	24	-0	-0	-0	11	395	2	-0	1.14	35.8		3.50
-0	25	256	13	75053	-0	-0	-0	-0	42	31	50	12	584	2	-0	1.16	48.6		3.79
-0	25	278	23	-0	-0	-0	-0	-0	38	24	40	11	453	2	-0	1.18	41.1		3.60
-0	25	504	7	75219	108	-0	9	28	42	31	45	14	493	1	8	.95	35.2		3.66
-0	25	517	1	70060	108	-0	10	27	39	29	46	13	406	1	8	.97	31.2		3.52
-0	25	608	3	75188	60	81	10	31	44	32	46	13	613	1	9	1.06	47.1		3.77
-0	25	610	30	70019	61	83	9	-0	38	30	46	20	405	2	13	.61	20.2		3.45
-0	26	811	31	75200	237	-0	-0	32	-0	-0	-0	12	765	2	8	1.43	63.7	*	4.43

Appendix 5.1

Appendix 5.2 Measuring Larval Growth Rates: A Discussion.

I have defined the growth rate R as being:

$$R = ((Wp/We)^{1/N} - 1)/(T/N)$$

where Wp=pupal weight, We=egg weight, T is the time from hatching to pupation, and N is the number of instars. This quantity has several characteristics that make it useful as a measure of larval growth rate in insects.

One characteristic of R is that the overall growth of the insect is measured as the ratio of the final weight (Wp) to the starting weight (We), and is completely independent of the absolute sizes of the eggs or pupae. In addition, R is an exponential function of overall growth. Many insects that have been investigated have an approximately exponential growth curve when size or weight is plotted against instar number (Wigglesworth 1974; Dyar 1890), although some do not (Richards 1949). When growth is exactly exponential the ratio of one instar's weight to that of the preceeding instar is the quantity $((Wp/We)^{1/N})$. When growth is not exactly exponential, this quantity is the geometric mean of the ratios of the successive instars.

Another characteristic of R is that it measures growth as the weight increase within an average instar, relative to the weight at the beginning of the instar. Since $((Wp/We)^{1/N})$ is the ratio of one instar's weight to that of the preceeding instar, $((Wp/We)^{1/N} - 1)$ is equal to the relative weight increase which takes place in the average instar. Algebraically, let W and W' represent the weights of two successive instars, measured at the same point within the instar. Then the relative weight increase during one instar will be (W' - W)/W (Waldbauer 1968). Since $W'/W = ((Wp/We)^{1/N})$,

$$\frac{W' - W}{W} = \frac{\frac{W'}{W} - \frac{W}{W}}{\frac{W}{W}} = \frac{W'}{W} - 1 = \left(\frac{Wp}{We}\right)^{1/N} - 1$$

This gives the expression above for the relative weight increase in the average instar. Since the duration of the average instar is approximately T/N, the relative weight increase per day will be $((Wp/We)^{1/N} - 1)/(T/N)$, which is the expression for R. This assumes a linear growth rate within the average instar, a reasonable assumption (Gordon 1968).

Figure A5.2 graphs the growth rates of three species of Heliconius butterfly larvae, expressed as milligrams of weight gained per day. This conventional measure of growth rate was obtained by dividing pupal weight by the time interval between hatching and pupation (Wp/T). Egg weight is ignored; subtracting it from pupal weight would make only a negligible difference. Two of the species, H.cydno and H.melpomene, are very closely related, with very similar behavior and morphology. Consequently, there is no *a priori* reason to expect *H.cydno* to have consistently faster growth than *H.melpomene*, as indicated in Figure A5.2 . In particular, it was expected that *H.melpomene* should have a growth rate at least equal to or greater than *H.cydno* when raised on *Passiflora oerstedii*, the host plant of *H.melpomene*. However, when the egg weights of the two species were compared the reason for the discrepancy became obvious. *H.cydno* larvae develop from eggs that are almost twice as heavy as *H.melpomene* eggs. Since it takes a newly hatched first instar learva about a day's feeding to double its weight, the difference in egg size is giving *H.cydno* a full day's head start in growth. This accounts for much of the 20% difference between the two species in growth rate as expressed in Figure A5.2 .

When growth rate is expressed in terms of R, as defined above, *H.cydno* and *H.melpomene* have very similar growth rates, as shown in Figure 4.6. The hypothesis that these two species are physiologically very similar is supported. Since R is an instantaneous measure of growth rate, it should reflect physiological growth ability rather than egg size, which is highly variable among *Heliconius* species. Physiological growth ability is the parameter of interest in studying the effects of host plant chemistry, and R is therefore a better measure of larval growth rate for the purposes of this study than Wp/T .

One possible criticism of using R to estimate instantaneous growth rate is that a similar result could be obtained using the standard exponential growth equation:

$$r = (\ln(Wp/We))/T$$

where ln is the natural logarithm. Like R, r measures the overall growth relative to the starting size and is an exponential function of time. Also, r is the expression most widely used to express growth in continuously growing, non-moulting organisms, and thus has the advantage of being widely known (Thospson 1942). However, r as applied to insect larval growth does not divide growth into its two logical components: within-instar and between-instar growth. Also, because r is the exponent in the growth equation:

$$Wp = We \cdot e^{rT}$$

the significance of a given value of r is not intuitively obvious. In contrast, R has a readily understood meaning. A value of 1.0 per day, for instance, means an increase in weight by a factor of 1.0 (i.e., it doubles in size) on the first day after any given moult (or after hatching, in the case of first instar larvae). This assumes a linear rate of growth within the instar, as discussed above; however, the formula for R can be modified to take into account non-linear growth.

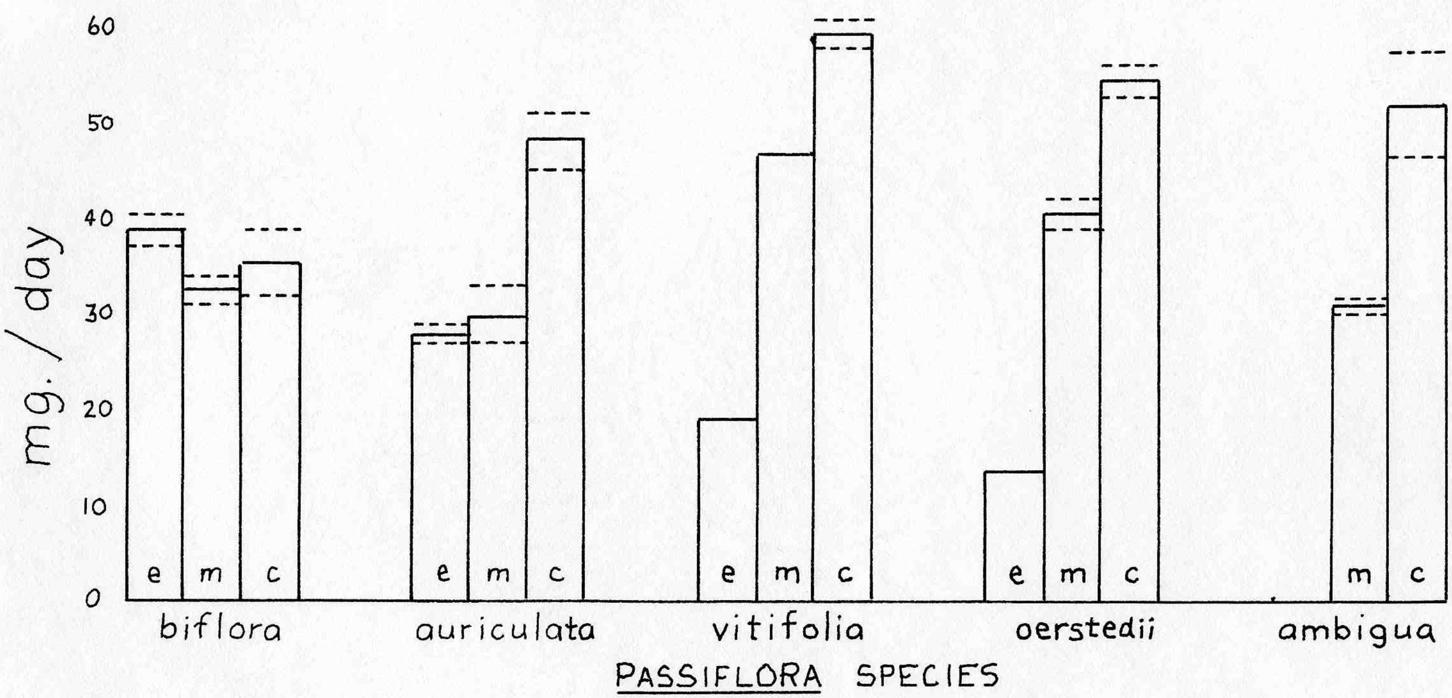


FIGURE A5.2 GROWTH RATE OF THREE HELICONIUS SPECIES, RAISED ON FIVE PASSIFLORA SPECIES.

e = H. erato m = H. melpomene c = H. cydno

Heliconius species	We	T5	T	Wp	R	Tp	PL	WL	BL	HW
cydno (La Selva) (62)	.755	8.25	12.7	623	1.14	9.62	29.6	41.4	29.7	5.01
female only (22)	.712	8.20	12.4	631	1.17	9.63	29.7	41.1	29.0	4.83
male only (39)	.772	8.28	12.7	621	1.13	9.61	29.6	41.5	30.0	5.10
hecale (La Selva) (15)	.753	9.31	14.3	707	1.03	9.93	31.0	43.0	32.6	5.14
female only (7)	.600	8.60	14.0	692	1.05	9.83	31.2	43.0	32.5	4.95
male only (7)	.810	9.57	14.4	711	1.01	10.0	30.8	42.7	32.5	5.27
melpomene (La Selva)	.567	9.09	13.6	441	1.04	9.31	26.3	36.6	25.7	4.32
female only (12)	.523	8.83	13.4	437	1.05	9.50	26.0	36.3	25.6	4.18
male only (21)	.562	8.71	13.5	456	1.06	9.18	26.6	37.0	25.9	4.40
erato (Mexico)	.701	9.00	13.7	395	.972	9.00	25.6	38.0	25.7	4.14
female only (5)	.763	9.20	13.8	350	.934	9.00	24.5	36.7	24.5	4.00
male only (4)	.640	8.75	13.5	451	1.02	9.00	26.7	39.2	27.0	4.27
charitonia (Costa Rica)	--	7.33	12.9	445	1.21	8.33	25.3	44.4	24.8	4.54
female only (6)	--	8.75	11.8	500	1.31	8.33	26.7	45.5	24.7	4.60
male only (4)	--	7.90	14.5	361	1.07	8.33	23.2	42.3	25.0	4.43
Dryas julia (Austin) (6)	.570	10.7	15.5	589	1.05	8.40	25.7	45.2	25.5	5.06
female only (3)	--	12.0	16.3	562	1.04	8.67	25.0	44.3	24.0	4.97
male only (3)	.570	10.0	14.7	616	1.06	8.00	26.3	46.5	28.0	5.20
ethilla (S.E.Brazil)	.820	9.50	15.3	422	.895	9.50	26.4	38.8	28.5	4.47
female only (3)	.810	8.33	13.3	505	.990	9.67	28.7	41.7	30.7	4.57
male only (7)	.830	13.0	16.1	387	.854	9.00	24.7	37.2	27.2	4.40

Appendix 5.3 Mean values for 10 parameters of growth in Heliconiine larvae. Sample size is in parentheses. See A5.1 for parameter definitions.

	R(N=15)	T(days)	Wp(mg.)
fast	1.16	11.7	635
slow	.96	14.3	555

Appendix 5.4 Components of larval growth rate in <u>H.cydno</u>. 15 individuals with R>1.10 were compared to 15 with R>1.10.

Passiflora species	Habitat					
	Forest	Cacao	Old second growth	Edge	Garden	Succes-sional plots
vitifolia	3	3	1	6	10	2
ambigua	7	2	3	0	5	0
oerstedii	0	1	3	0	5	1
coriacea	2	3	0	0	2	0
auriculata	2	0	5	4	2	6
lobata	3	3	0	0	2	4
biflora	0	8	2	0	2	4
costaricensis	0	0	0	0	1	3

Appendix 6.1 Habitats of *Passiflora* vines used in assessing ants and parasitoids found on host plants.

Ant species:	Habitat: Forest	Cacao	Old 2nd growth	Edge	Garden	Early 2nd growth	Size: Small	Medium	Large
Ectatomma tuberculatum	0	3	3	38	2	4	7	26	18
E. sp. (nr.ruidum)	2	25	7	2	24	4	22	38	8
Pachycondyla	1	0	3	0	0	3	1	2	4
Neoponera	1	0	0	0	0	0	0	0	1
Odontomachus	0	0	0	0	1	0	1	0	0
Camponotus	0	0	1	0	23	2	11	7	8
Pseudomyrmex (15mm)	4	1	0	0	17	3	14	6	6
Crematogaster ssp.	4	0	8	9	1	8	3	16	11
Apterostigma	0	4	0	0	0	4	0	7	0
Pheidole	6	0	0	0	0	0	2	4	0
Undetermined (small, $<$ 4mm)	31	1	9	5	4	9	26	21	11
No ants present	46	47	28	2	91	61	106	157	34

Appendix 6.2 Distribution of ant species on <u>Passiflora</u> vines, divided by habitat and by size of individual vine.

Ant species:	Passiflora species: lobata	biflora	costaricensis	coriacea	auriculata	vitifolia	oerstedi	ambigua
Ectatomma tuberculatum	0	2	0	0	22	24	3	1
E. sp. (nr. ruidum)	5	2	0	0	9	31	3	13
Pachycondyla	0	3	0	1	1	0	0	2
Neoponera	0	0	0	1	0	0	0	0
Odontomachus (or Anochetus)	0	0	0	0	0	1	0	0
Camponotus	4	0	0	0	4	5	3	12
Pseudomyrmex (15 mm)	2	0	0	4	2	6	1	10
Crematogaster ssp.	0	1	0	1	12	5	0	11
Apterostigma	0	3	0	0	4	1	0	0
Pheidole sp.	0	0	0	0	4	0	0	5
Undetermined (small, < 4mm)	3	5	0	3	18	14	1	13
No ants present	46	53	18	19	38	42	46	31

Appendix 6.3 Distribution of ant species on Passiflora species. Numbers are separate occurrances of ants on plants; i.e. several ants together are counted as one occurrance.

Flea beetle species	cost	bi	aur	quad	vit	oer	amb	lob
	Passiflora species							
Altica sp. (blue-green)	3	2	2	0	1	2	0	9
Disonycha sp. (yellow-black striped)	0	4	1	0	0	0	0	0
? sp. (red-brown-white)	0	3	4	0	0	0	0	0
Monomacra sp. (yellow)	0	4	4	8	5	10	0	0
Strabala sp. (yellow)	0	0	0	0	2	4	8	0
Strabala sp. (red)	0	0	0	0	0	0	1	11
? sp. (red-black)	0	0	0	0	0	0	0	3
? sp. (brown)	1	0	0	0	0	0	0	0
? sp. (red)	0	0	0	0	0	0	0	2

Appendix 6.4 Flea beetles (Chrysomelidae subfamily Alticini) found on Passiflora species at La Selva. cost=costaricensis, bi=biflora, aur=auriculata, quad=quadrang laris, vit=vitifolia, oer=oerstedi, amb=ambigua, lob="Tetrastylis" lobata.

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