

SUPPLEMENTAL INFORMATION

DENSITY OF THREE SKINK SPECIES ON A SUB-TROPICAL PACIFIC ISLAND ESTIMATED WITH HIERARCHICAL DISTANCE SAMPLING

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Table S1.—Model selection table showing all hierarchical distance sampling models for estimating density and detection probability and availability of three skink species on Henderson Island in 2015 (*Cp* = *Cryptoblepharus poecilopleurus*, *Ec* = *Emoia cyanura*, *Ln* = *Lipinia noctua*). Models have three components accounting for variation in density, availability for detection, and detection probability. *k* = number of estimable parameters, Δ AIC = difference in AIC units to the most parsimonious model.

Species	density	availability	detection	<i>k</i>	\square AIC	\square AIC	<i>R</i> ²
	constant	day	constant	4	0.00	0.24	0.195
	canopy	day	constant	5	0.85	0.16	0.232
	constant	day	observer	5	1.57	0.11	0.209
	tree size	day	constant	5	1.59	0.11	0.208
	litter cover	day	constant	5	1.92	0.09	0.198
<i>Ec</i>	vegetation density	day	constant	7	3.15	0.05	0.282
	constant	constant	constant	3	3.44	0.04	0.000
	constant	day	observer + wind	6	3.57	0.04	0.209
	constant	time of day	constant	4	4.56	0.02	0.035
	constant	morning	constant	4	4.69	0.02	0.030
	constant	cloud cover	constant	4	5.07	0.02	0.015

	substrate	day	constant	8	5.21	0.02	0.280
	constant	constant	wind	4	5.28	0.02	0.006
	constant	constant	observer	4	5.39	0.02	0.002
	constant	time of day	observer	5	6.52	0.01	0.036
	constant	morning	observer	5	6.64	0.01	0.031
	constant	cloud cover	observer	5	6.94	0.01	0.020
	constant	time of day	observer + wind	6	8.48	0.00	0.038
	constant	morning	observer + wind	6	8.60	0.00	0.033
	constant	cloud cover	observe + wind	6	8.86	0.00	0.023
	substrate	cloud cover	constant	8	0.00	0.78	0.551
	constant	cloud cover	constant	4	5.01	0.06	0.244
	litter cover	cloud cover	constant	5	5.68	0.05	0.283
	tree size	cloud cover	constant	5	6.64	0.03	0.255
	canopy	cloud cover	constant	5	7.00	0.02	0.244
	constant	cloud cover	observer	5	8.34	0.01	0.202
	vegetation density	cloud cover	constant	7	9.51	0.01	0.288
	constant	cloud cover	observe + wind	6	9.90	0.01	0.217
	constant	constant	constant	3	10.00	0.01	0.000
	constant	constant	observer	4	10.08	0.01	0.074
<i>C_p</i>	constant	morning	constant	4	11.31	0.00	0.027
	constant	morning	observer	5	11.32	0.00	0.102
	constant	day	constant	4	11.50	0.00	0.020
	constant	constant	wind	4	11.64	0.00	0.014
	constant	time of day	constant	4	11.79	0.00	0.008
	constant	time of day	observer	5	11.81	0.00	0.084
	constant	day	observer	5	11.86	0.00	0.082
	constant	morning	observer + wind	6	13.01	0.00	0.113
	constant	time of day	observer + wind	6	13.54	0.00	0.094
	constant	day	observer + wind	6	13.64	0.00	0.090
	tree size	time of day	constant	5	0.00	0.27	0.439
	constant	time of day	constant	4	0.18	0.25	0.388
<i>L_n</i>	litter cover	time of day	constant	5	0.26	0.24	0.433
	canopy	time of day	constant	5	2.16	0.09	0.388

constant	time of day	observer	5	2.18	0.09	0.388
substrate	time of day	constant	8	5.24	0.02	0.456
vegetation density	time of day	constant	7	5.79	0.02	0.397
constant	morning	constant	4	7.12	0.01	0.192
constant	morning	observer	5	9.09	0.00	0.193
constant	constant	constant	3	10.46	0.00	0.000
constant	day	constant	4	10.88	0.00	0.061
constant	cloud cover	constant	4	12.16	0.00	0.012
constant	constant	observer	4	12.42	0.00	0.002
constant	day	observer	5	12.57	0.00	0.073
constant	cloud cover	observer	5	14.15	0.00	0.012

Table S2.—Mean (\pm standard error) availability for detection, and 95% confidence limits (CI) of three skink species on Henderson Island in 2015 of three skink species on Henderson Island in 2015 (*Cp* = *Cryptoblepharus poecilopleurus*, *Ec* = *Emoia cyanura*, *Ln* = *Lipinia noctua*), estimated using repeated distance sampling point counts and hierarchical mixture models; estimates for each species are derived from the most parsimonious model with levels of the continuous availability covariate set at mean \pm 1 standard deviation.

Species	Level of covariate	mean availability for detection	standard error	lower 95% CI	upper 95% CI
<i>Cp</i>	8% cloud cover	0.765	0.186	0.301	0.961
	38% cloud cover	0.673	0.180	0.294	0.911
	68% cloud cover	0.566	0.159	0.269	0.822
<i>Ec</i>	27-Sep	0.424	0.093	0.259	0.608
	12-Oct	0.496	0.105	0.302	0.692
	22-Oct	0.569	0.122	0.332	0.777
<i>Ln</i>	10:00 hrs	0.698	0.153	0.357	0.906
	13:00 hrs	0.993	0.019	0.440	1.000
	15:45 hrs	1.000	0.001	0.464	1.000

Table S3.—Raw observation data of distance sampling point counts of three skink species on Henderson Island in 2015 (*Cp* = *Cryptoblepharus poecilopleurus*, *Ec* = *Emoia cyanura*, *Ln* = *Lipinia noctua*); individuals were recorded in two distance bands, 0–2 m and 2–6 m from the observer.

Count	Point	Date	Observer	Time	Wind	Cloud cover %	Ec <2m	Ec >2m	Cp <2m	Cp >2m	Ln <2m	Ln >2m
1	1	09/11/2015	SH	14:48	Light	35	0	1	3	0	1	0
2	1	17/11/2015	SH	14:30	Light	65	0	1	2	0	0	0
3	1	18/11/2015	ND	15:05	Light	5	1	2	2	0	0	1
4	1	29/10/2015	ND	08:38	Still	30	1	2	1	0	0	0
5	1	09/11/2015	SH	09:50	Light	85	0	1	1	1	0	0
6	1	13/11/2015	SH	10:00	Light	50	0	2	0	1	0	0
1	2	09/11/2015	SH	15:09	Light	40	3	0	0	1	0	1
2	2	17/11/2015	SH	14:50	Light	80	0	0	0	0	1	0
3	2	18/11/2015	ND	15:21	Light	5	2	1	1	0	0	0
4	2	28/10/2015	SH	11:25	Moderate	100	1	0	0	0	2	0
5	2	29/10/2015	SH	08:42	Still	45	1	3	1	0	0	0
6	2	09/11/2015	SH	09:23	Light	90	4	4	1	1	0	0
1	3	09/11/2015	SH	15:31	Light	40	1	0	1	2	0	1
2	3	17/11/2015	SH	15:10	Light	65	1	0	4	2	0	1
3	3	18/11/2015	ND	15:39	Light	5	1	0	1	0	1	0
4	3	28/10/2015	SH	11:02	Still	95	0	0	1	0	0	2

5	3	29/10/2015	SH	08:42	Still	60	0	2	1	0	0	0
6	3	09/11/2015	SH	09:03	Light	85	0	2	0	2	0	0
1	4	13/10/2015	SH	15:15	Light	95	0	0	0	0	0	1
2	4	29/10/2015	SH	14:44	Still	20	0	0	0	0	2	0
3	4	13/11/2015	ND	16:05	Light	40	1	0	1	2	2	0
4	4	03/11/2015	SH	10:32	Still	80	1	1	2	1	1	0
5	4	15/11/2015	SH	08:30	Light	25	1	0	2	0	0	0
6	4	16/11/2015	SH	09:59	Moderate	5	1	0	2	0	0	0
1	5	16/10/2015	SH	14:33	Light	40	0	2	2	0	0	0
2	5	29/10/2015	SH	15:06	Light	15	0	1	0	0	0	0
3	5	05/11/2015	SH	15:21	Light	100	0	1	0	0	0	0
4	5	14/10/2015	SH	09:47	Light	20	0	1	1	1	0	0
5	5	03/11/2015	SH	10:53	Light	80	1	1	0	0	0	0
6	5	15/11/2015	SH	08:50	Moderate	25	0	5	0	0	0	0
1	6	11/10/2015	SH	14:45	Moderate	40	1	0	0	0	2	0
2	6	01/11/2015	ND	15:08	Moderate	10	1	0	0	1	1	1
3	6	10/11/2015	ND	14:58	Moderate	80	2	1	0	1	1	0
4	6	21/10/2015	ND	10:20	Light	10	0	2	2	1	0	0
5	6	03/11/2015	SH	11:12	Light	80	0	0	0	1	0	0
6	6	15/11/2015	ND	09:58	Light	10	1	1	1	0	0	1
1	7	11/10/2015	SH	15:12	Moderate	40	1	4	0	0	0	1

2	7	01/11/2015	ND	15:31	Light	10	3	2	1	0	0	3
3	7	10/11/2015	ND	15:17	Light	80	1	2	1	0	2	0
4	7	21/10/2015	ND	10:39	Light	10	0	0	2	0	1	1
5	7	23/10/2015	SH	10:22	Light	5	0	0	0	0	0	1
6	7	15/11/2015	ND	10:15	Light	10	0	1	0	0	0	0
1	8	11/10/2015	SH	15:33	Moderate	45	0	1	0	0	0	0
2	8	01/11/2015	ND	15:50	Light	10	2	3	1	1	0	1
3	8	10/11/2015	ND	15:36	Light	80	2	1	0	0	1	2
4	8	21/10/2015	ND	11:01	Light	10	1	0	2	0	1	0
5	8	23/10/2015	SH	10:43	Light	20	3	2	1	0	0	0
6	8	15/11/2015	ND	10:33	Light	10	1	1	1	1	0	1
1	9	11/10/2015	SH	15:54	Moderate	70	0	0	0	0	0	0
2	9	01/11/2015	ND	16:10	Moderate	10	1	2	0	1	3	0
3	9	10/11/2015	ND	15:55	Light	80	0	1	0	1	0	1
4	9	21/10/2015	ND	11:21	Moderate	40	1	0	0	1	0	1
5	9	23/10/2015	SH	11:04	Light	15	1	3	1	0	0	1
6	9	15/11/2015	ND	10:53	Light	10	2	1	2	1	0	0
1	10	11/10/2015	SH	16:20	Moderate	65	0	0	3	0	0	0
2	10	01/11/2015	SH	16:08	Light	10	3	0	0	0	0	0
3	10	10/11/2015	ND	16:14	Light	80	2	0	1	0	1	0
4	10	26/10/2015	SH	10:57	Light	45	0	0	0	0	0	0

5	10	15/11/2015	ND	11:11	Light	10	1	0	0	1	0	1
6	10	16/11/2015	SH	08:38	Moderate	20	0	0	0	0	0	0
1	11	16/10/2015	SH	15:15	Light	60	0	0	0	0	1	2
2	11	01/11/2015	SH	15:48	Light	10	0	1	0	0	2	0
3	11	10/11/2015	SH	15:05	Light	100	0	1	0	0	0	3
4	11	21/10/2015	SH	08:42	Light	35	0	1	1	0	0	0
5	11	26/10/2015	SH	10:36	Light	55	0	2	1	0	0	0
6	11	12/11/2015	SH	09:08	Light	10	0	2	0	0	0	2
1	12	16/10/2015	SH	14:53	Light	40	0	1	0	2	0	0
2	12	01/11/2015	SH	15:07	Light	20	0	0	1	0	1	0
3	12	05/11/2015	SH	15:42	Light	100	0	2	0	0	0	0
4	12	12/11/2015	SH	08:47	Light	50	0	6	0	1	0	1
5	12	15/11/2015	SH	10:47	Moderate	20	0	1	0	1	0	1
6	12	16/11/2015	ND	09:10	Moderate	10	1	0	3	0	0	0
1	13	15/10/2015	ND	16:23	Still	0	1	0	3	0	0	0
2	13	18/10/2015	SH	16:28	Light	40	0	1	0	1	0	1
3	13	10/11/2015	SH	15:25	Light	100	1	0	0	0	0	0
4	13	21/10/2015	SH	09:05	Light	25	0	0	0	0	0	0
5	13	02/11/2015	ND	10:42	Light	10	1	0	2	1	0	0
6	13	16/11/2015	SH	09:00	Moderate	5	2	1	0	0	0	0
1	14	15/10/2015	ND	16:00	Still	0	1	0	1	0	1	1

2	14	18/10/2015	SH	16:04	Light	20	1	2	0	1	0	2
3	14	10/11/2015	SH	15:45	Light	100	0	3	0	1	0	0
4	14	21/10/2015	SH	09:29	Light	5	0	0	3	0	1	0
5	14	02/11/2015	ND	11:01	Light	10	0	3	1	0	1	0
6	14	16/11/2015	SH	09:22	Moderate	5	0	0	2	0	1	0
1	15	15/10/2015	SH	16:14	Light	0	0	0	0	3	0	0
2	15	18/10/2015	SH	15:44	Light	20	0	2	0	0	0	1
3	15	10/11/2015	SH	16:03	Light	100	0	0	0	0	0	0
4	15	21/10/2015	SH	09:57	Light	25	0	0	0	1	0	0
5	15	31/10/2015	SH	08:56	Light	50	0	0	0	0	0	1
6	15	02/11/2015	ND	11:19	Light	10	1	1	1	2	0	0
1	16	15/10/2015	SH	15:53	Light	0	0	2	2	0	0	1
2	16	10/11/2015	SH	16:23	Light	100	0	0	1	1	0	1
3	16	13/11/2015	SH	16:11	Moderate	65	0	0	1	2	0	0
4	16	21/10/2015	SH	10:13	Moderate	25	0	0	0	0	0	0
5	16	31/10/2015	SH	08:37	Moderate	45	0	0	0	1	0	0
6	16	02/11/2015	ND	11:34	Light	10	0	4	1	3	1	1
1	17	15/10/2015	SH	15:27	Light	0	1	1	0	4	0	2
2	17	03/11/2015	SH	16:02	Still	30	0	3	0	0	0	3
3	17	13/11/2015	SH	15:53	Moderate	35	1	2	0	0	0	1
4	17	21/10/2015	SH	10:34	Light	45	1	2	0	0	0	2

5	17	31/10/2015	SH	09:22	Light	45	1	4	1	1	1	0
6	17	12/11/2015	SH	10:34	Moderate	0	1	5	1	2	1	0
1	18	16/10/2015	SH	16:02	Light	40	0	0	0	0	0	4
2	18	20/10/2015	SH	15:35	Light	20	0	0	0	0	1	1
3	18	13/11/2015	SH	15:34	Moderate	30	1	1	0	0	0	0
4	18	21/10/2015	SH	11:07	Light	35	1	2	0	0	1	2
5	18	26/10/2015	SH	10:11	Light	70	0	1	0	0	0	2
6	18	31/10/2015	SH	10:36	Moderate	65	0	2	0	1	0	2
1	19	16/10/2015	SH	15:42	Light	50	1	1	1	0	1	0
2	19	03/11/2015	SH	14:54	Light	50	1	0	0	1	1	0
3	19	13/11/2015	SH	15:15	Moderate	20	3	1	1	0	0	0
4	19	12/11/2015	SH	09:27	Moderate	10	2	0	2	0	0	0
5	19	15/11/2015	SH	10:20	Moderate	15	0	3	0	0	0	1
6	19	16/11/2015	ND	09:35	Moderate	10	1	3	0	0	0	0
1	20	16/10/2015	SH	16:25	Light	60	0	0	0	0	0	0
2	20	20/10/2015	SH	15:55	Light	35	0	0	0	0	0	0
3	20	02/11/2015	SH	16:04	Light	70	2	1	0	0	0	0
4	20	31/10/2015	SH	11:00	Moderate	60	0	0	0	0	0	0
5	20	12/11/2015	SH	10:56	Moderate	20	0	0	0	0	2	1
6	20	15/11/2015	SH	09:58	Moderate	50	0	3	0	0	0	0
1	21	20/10/2015	ND	15:42	Still	10	0	0	0	0	0	0

2	21	29/10/2015	SH	15:44	Light	45	0	0	2	0	0	0
3	21	31/10/2015	SH	15:22	Moderate	60	0	2	0	1	0	0
4	21	14/10/2015	SH	11:06	Moderate	20	0	5	0	2	0	0
5	21	31/10/2015	SH	11:22	Moderate	70	0	2	2	1	0	0
6	21	02/11/2015	SH	10:57	Moderate	5	0	0	2	1	0	0
1	22	31/10/2015	ND	15:17	Moderate	35	1	0	1	1	0	0
2	22	29/10/2015	SH	15:26	Light	10	0	0	0	2	1	0
3	22	02/11/2015	SH	15:16	Light	35	0	1	0	0	0	0
4	22	14/10/2015	SH	10:20	Moderate	10	1	1	0	0	0	0
5	22	02/11/2015	SH	10:39	Light	10	0	0	0	0	0	0
6	22	15/11/2015	SH	09:10	Light	50	0	0	0	0	0	1
1	23	31/10/2015	SH	16:23	Light	35	0	3	0	4	0	0
2	23	03/11/2015	SH	15:40	Light	40	3	2	0	0	1	0
3	23	05/11/2015	ND	15:10	Still	95	2	0	2	0	0	0
4	23	31/10/2015	SH	09:47	Light	40	1	0	1	1	0	1
5	23	12/11/2015	SH	10:13	Moderate	5	0	1	2	1	0	1
6	23	16/11/2015	ND	09:57	Light	10	2	1	1	0	0	2
1	24	31/10/2015	SH	15:54	Light	65	4	3	0	1	1	1
2	24	03/11/2015	SH	15:17	Light	55	0	1	0	0	0	4
3	24	05/11/2015	ND	15:32	Still	95	3	0	1	0	0	0
4	24	31/10/2015	SH	10:14	Moderate	40	0	1	0	0	0	3

5	24	12/11/2015	SH	09:50	Moderate	5	1	0	0	0	1	0
6	24	16/11/2015	ND	10:19	Light	10	1	1	0	2	0	1
1	25	20/10/2015	ND	16:03	Still	10	0	1	0	0	1	1
2	25	22/10/2015	SH	14:37	Light	50	0	0	0	0	0	1
3	25	02/11/2015	SH	15:38	Light	40	0	1	0	0	0	0
4	25	02/11/2015	SH	11:17	Light	15	0	1	0	0	0	0
5	25	12/11/2015	SH	11:20	Moderate	60	0	0	0	0	0	1
6	25	15/11/2015	SH	09:33	Light	10	0	0	1	0	0	1

Table S4.—Measured microhabitat covariates at all 25 point count locations where reptiles were surveyed on Henderson Island in 2015.

Point	% canopy cover	understory density	substrate	% leaf litter cover of ground	mean diameter at breast height
1	80	closed	gravel and rock	75	44.75
2	80	closed	gravel and rock	70	18.5
3	45	closed	gravel	40	24
4	80	closed	gravel and rock	70	20.75
5	60	moderate/closed	gravel, rock and sandy soil	90	38.25
6	60	open/moderate	gravel	85	41.75
7	85	closed	gravel	90	35.25
8	70	moderate	gravel	85	52
9	80	moderate	gravel and sandy soil	90	49.75
10	90	closed	gravel	50	25.5
11	50	closed	gravel and rock	20	77.75
12	40	closed	gravel and sandy soil	90	40.25
13	60	moderate	gravel	85	29.25
14	50	closed	gravel	40	37.5
15	70	closed	gravel	95	27.25
16	40	moderate	gravel	50	46.25
17	60	closed	gravel and rock	60	25.75
18	50	closed	sandy soil	100	42.5
19	50	moderate/closed	gravel and sandy soil	80	21.5
20	40	closed	gravel, rock and sandy soil	90	37.5
21	60	closed	gravel and rock	100	30.75
22	50	closed	sandy soil	100	40.75
23	50	closed	gravel	75	27
24	70	moderate/closed	gravel	95	29.75
25	60	moderate	gravel and sandy soil	95	33.25

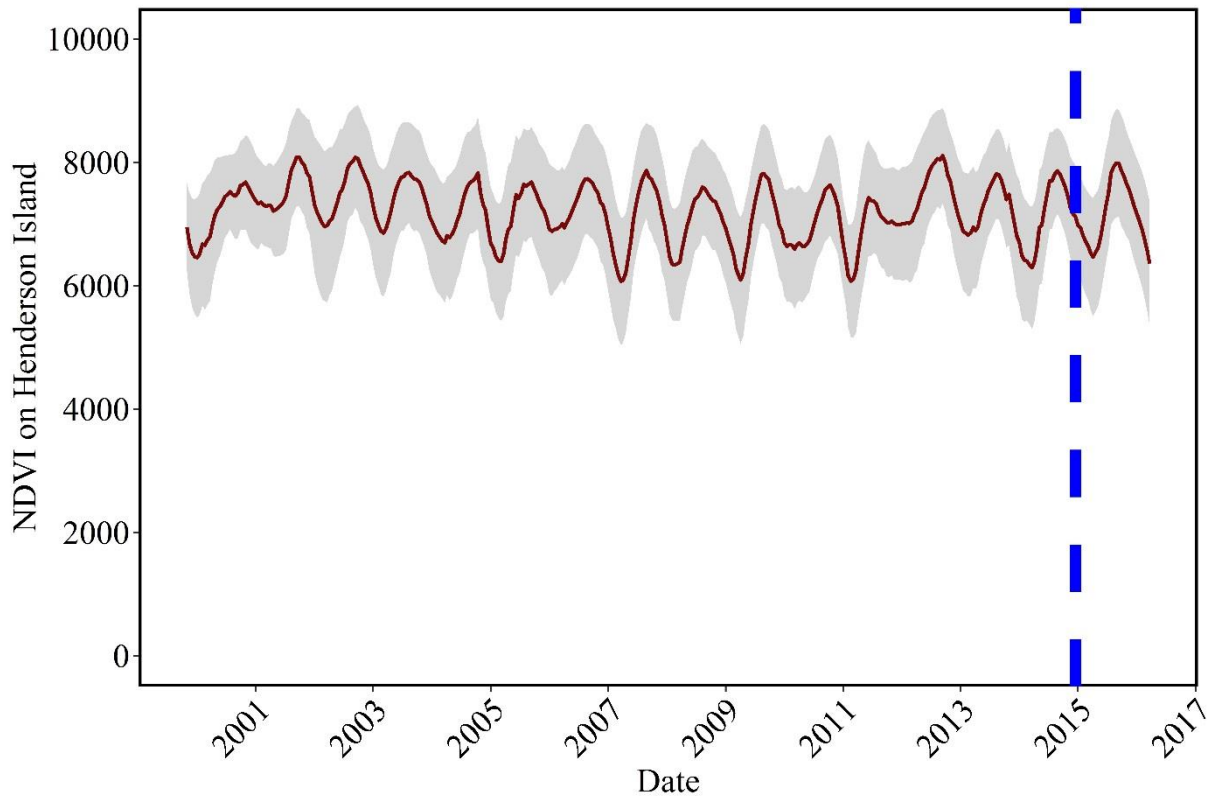


Figure S1.—Normalized Difference Vegetation index (NDVI) – an index of vegetation greenness – derived from satellite remote sensing for Henderson Island from 2000 – 2017. The blue dashed line shows the time at which reptile surveys were conducted.

Appendix 1.—Photographs of (a) *Hemiphyllodactylus typus* and (b) *Gehyra mutilata*, the newly recorded lizard species from Henderson Island (Photographed by Sarah Havery).

(a)



(b)



Appendix 2.—Photographs of (a) an unusually patterned *Cryptoblepharus poecilopleurus* on Henderson Island, note the distinctive central stripe from the neck down the spine (photographed by Andrew Skinner), and (b) the commonly observed pattern of *Cryptoblepharus poecilopleurus* on Henderson Island (Photographed by Sarah Havery).

(a)



(b)

