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Canopy bridges: Preventing and mitigating anthropogenic impacts on mantled howler monkeys in Costa Rica

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Supplementary material

Table S1. Demographics of the howler monkey population (positive numbers) in Playa Hermosa and deaths by cause (negative numbers) between 2015 and 2021. Data on the composition of the population were not gathered in 2017.

	2015	2016	2017	2018	2019	2020	2021
Adult Females	28	37		34	32	25	37
Adult Males	12	13		13	14	13	18
Juveniles	8	10		12	9	21	17
Infants	11	21		19	29	20	27
Electrocution	–5	–10	–5	–7	–4	–4	0
Roadkill	0	–2	0	0	0	–1	0
Fall	–1	0	0	0	0	–1	0
Other	–4	–2	0	0	0	–1	0

Table S2. Size of each howler monkey troop in Playa Hermosa between 2015 and 2021 (except 2017 when data were not collected). Troops 6 and 7 did not exist in 2015.

	2015	2016	2018	2019	2020	2021
Troop 1	10	12	15	15	6	8
Troop 2	11	14	13	13	19	14
Troop 3	18	20	17	20	18	23
Troop 4	7	8	13	12	11	17
Troop 5	13	12	20	24	25	24
Troop 6	0	6	5	5	7	7
Troop 7	0	9	4	4	6	6

Table S3. Number of bridges installed, and length of electrical cable insulated in 2010 and from 2015 to 2020 in Playa Hermosa.

Year	Total bridges	Length of cable insulated (m)
2010	11	500
2015	29	971
2016	47	1675
2017	60	6375
2018	83	7500
2019	92	8841
2020	102	8841

Table S4. Characteristics of the 111 canopy bridges, including width, location, and year of installation.

Bridge Number	Width (m)	Latitude (W)	Longitude (N)	Year
1	6	85.682	10.571	2015
2	14	85.681	10.572	2015
3	10	85.681	10.572	2015
4	15	85.681	10.572	2015
5	10	85.680	10.572	2015
6	11	85.680	10.572	2015
7	8	85.680	10.571	2015
8	6	85.680	10.572	2015
9	9	85.680	10.571	2015
10	13	85.680	10.571	2015
11	10	85.680	10.571	2015
12	9	85.681	10.571	2015
13	15	85.681	10.571	2015
14	16	85.681	10.571	2015
15	18	85.681	10.571	2015
16	20	85.681	10.571	2015
17	15	85.680	10.570	2015
18	9	85.677	10.568	2015
19	9	85.679	10.570	2015
20	10	85.678	10.570	2015
21	25	85.680	10.571	2015
22	16	85.680	10.571	2015
23	22	85.679	10.571	2015
24	33	85.679	10.571	2015
25	7	85.679	10.571	2015
26	9	85.679	10.572	2015
27	18	85.678	10.572	2015
28	14	85.677	10.571	2015
29	18	85.678	10.571	2015
30	10	85.677	10.571	2016
31	12	85.677	10.571	2016
32	18	85.677	10.573	2016
33	13	85.677	10.572	2016
34	15	85.677	10.574	2016
35	10	85.677	10.574	2016
36	18	85.677	10.574	2016
37	20	85.678	10.574	2016

38	13	85.678	10.575	2016
39	22	85.678	10.575	2016
40	15	85.678	10.575	2016
41	16	85.677	10.576	2016
42	22	85.677	10.576	2016
43	20	85.678	10.576	2016
44	13	85.678	10.576	2016
45	15	85.678	10.576	2016
46	20	85.677	10.576	2016
47	18	85.677	10.576	2016
48	16	85.677	10.576	2017
49	22	85.678	10.576	2017
50	16	85.677	10.576	2017
51	14	85.678	10.576	2017
52	16	85.677	10.576	2017
53	18	85.677	10.576	2018
54	15	85.677	10.576	2018
55	25	85.678	10.576	2018
56	10	85.677	10.576	2018
57	10	85.677	10.576	2018
58	25	85.677	10.577	2018
59	20	85.677	10.577	2018
60	18	85.677	10.576	2018
61	20	85.677	10.576	2019
62	18	85.676	10.576	2019
63	15	85.677	10.576	2019
64	18	85.676	10.576	2019
65	16	85.677	10.577	2019
67	20	85.677	10.577	2019
68	16	85.677	10.577	2019
69	18	85.676	10.577	2019
70	20	85.676	10.578	2019
71	12	85.676	10.578	2019
72	16	85.676	10.578	2019
73	25	85.676	10.578	2019
74	25	85.676	10.578	2019
75	20	85.676	10.578	2019
76	10	85.676	10.578	2019
77	14	85.675	10.578	2019
78	10	85.676	10.578	2019
79	20	85.676	10.578	2019

80	7	85.676	10.578	2019
81	9	85.676	10.578	2019
82	7	85.676	10.578	2019
83	13	85.676	10.576	2019
84	14	85.676	10.579	2020
85	16	85.676	10.576	2020
86	16	85.674	10.576	2020
87	15	85.674	10.576	2020
88	14	85.675	10.577	2020
89	20	85.675	10.577	2020
90	10	85.674	10.576	2020
91	14	85.675	10.577	2020
92	18	85.675	10.577	2020
93	16	85.675	10.577	2021
94	18	85.675	10.577	2021
95	16	85.672	10.577	2021
96	10	85.669	10.577	2021
97	7	85.669	10.577	2021
98	10	85.668	10.577	2021
99	9	85.667	10.577	2021
100	6	85.673	10.581	2021
101	7	85.673	10.581	2021
102	8	85.676	10.580	2021
103	14	85.676	10.580	2021
104	16	85.677	10.567	2021
105	18	85.678	10.566	2021
106	25	85.678	10.565	2021
107	7	85.678	10.565	2021
108	10	85.679	10.565	2021
109	14	85.679	10.564	2021
110	8	85.681	10.566	2021
111	14	85.678	10.566	2021

Table S5. Mean weekly crossing rate of four arboreal species in 20 locations in which canopy bridges were installed in Playa Hermosa. Path = the canopy path before bridge installation and bridge = the artificial canopy bridge (#1–20).

Bridge	*Alouatta palliata*		*Sciurus variegatoides*		*Didelphis marsupialis*	*Potos flavus*	
	Path	Bridge	Path	Bridge	Bridge	Path	Bridge
1	1.15	0.92	1.62	1.15	0.23	0.23	0.23
2	0.69	1.15	1.15	0.92	0	0	0
3	1.38	0.92	1.38	1.62	0	0	0
4	0.92	0	0.69	1.85	0	0	0
5	0.23	1.15	0.92	0.92	0	0	0
6	1.15	0.92	1.15	1.15	0	0	0
7	0	0.69	2.08	1.62	0.23	0	0
8	0.92	0.23	0.46	1.15	0	0	0
9	1.62	1.15	0.69	1.38	0	0	0
10	1.85	0.46	1.15	2.08	0	0	0
11	0.92	0.69	1.38	0.92	0.46	0	0
12	1.15	0.92	1.62	1.38	0	0	0
13	2.08	1.15	2.77	1.85	0	0	0
14	0.46	1.38	0.46	0.92	0	0	0
15	2.31	1.15	3	1.38	0	0	0
16	0.92	1.38	5.54	0.46	0.23	0.23	0.23
17	0.69	1.15	0.23	0.69	0.23	0	0
18	1.62	0.92	0.69	1.15	0.46	0	0
19	2.08	0.92	1.15	0.69	0.69	0	0
20	0.46	0.23	1.85	0.23	0	0	0