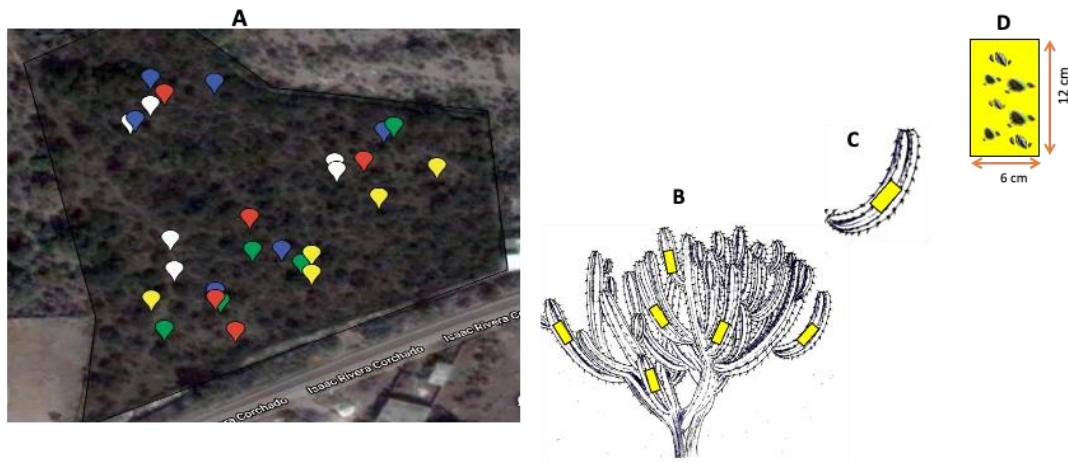


Supporting Information

Temporal dynamics of competition for space between two phytophagous Hemiptera associated with the garambullo *Myrtillocactus geometrizans*

Alejandra J. Moncada-Orellana, Alicia Callejas-Chavero, Salvador Sánchez-Colón; Carlos F. Vargas-Mendoza



S.I. Fig. 1. A) Distribution of garambullos in the field, each color represents a condition (White = (Op): *Opuntiaspis philococcus* without competition (1); blue= ($Tm_{Ant-allowed}$): *Toumeyella martinezae* plus the mutualistic ant, *Liometopum apiculatum*, without competition (2); green= ($Tm_{Ant-excluded}$): *T. martinezae* without mutualistic ant, without competition (3); red = ($Tm + Op_{Ant-allowed}$): *T. martinezae* and *O. philococcus* in competition, with the mutualistic ant (4); and yellow= ($Tm + Op_{Ant-excluded}$): *T. martinezae* and *O. philococcus* in competition, without the mutualistic ant (5). B) Selected branches within the plant, for each condition C) Fixed quadrats inside the branch and D) Fixed quadrats (72 cm²) with scales.

Data and models that related total length with surface occupied by each species of scale insects

We fitted separately using two third-order polynomial models, one per species, to estimate the occupied area for all individuals in the sample (n=42512 in total, which soft scale was 25393 and 17119 of armoured scale).

The following models were obtained:

Tm= $1.15550 - (2.03147 * \text{Length}) + (1.40832 * \text{Length}^2) - (0.07000 * \text{Length}^3)$ residual standard error= 1.835 on 164 degrees of freedom; Multiple $R^2 = 0.9707$, Adjusted $R^2 = 0.9701$; $F_{3,164} = 1810$, P-value: < 0.0000 .

Op= $0.19612 - (0.01694 * \text{Length}) + (0.42044 * \text{Length}^2) - (0.03148 * \text{Length}^3)$, residual standard error= 0.3342 on 134 degrees of freedom; Multiple $R^2 = 0.9577$, Adjusted $R^2 = 0.9568$; $F_{3,134} = 1012$, P-value: < 0.00001 .

These values indicated that the adjusted models provide a very reasonable estimate of the coverage of each individual based on its length. Analyses were performed in the R v4.1.1 (2021) software.

Data:

We register anteroposterior length, area covered and perimeter of a sample of 168

individuals of *Toumeyella martinezae*

N	Length	Area	Peimeter
1	5.5	17.4	15.2
2	7.3	30.4	20
3	6.1	22.7	17.2
4	6.3	28.8	19.3
5	7.7	38.2	22.3
6	7.1	28.3	19.3
7	5.5	22.8	17.4
8	6.2	30.4	19.9
9	6.8	24.6	18.6
10	5.6	22.2	17.1
11	2.6	2.4	5.7
12	2.1	2.1	5.5
13	2.2	2.4	5.9
14	2.1	2.3	5.6
15	2.3	2.8	6.2
16	1.8	1.8	5
17	2.5	2.4	6
18	2.6	3.4	7
19	2.3	3	6.4
20	2.2	3.3	6.8
21	2.7	3.2	6.9
22	2.6	3.1	6.6
23	3.9	7.8	10.3
24	3.3	7.4	9.9
25	2.9	5.9	8.8
26	3.6	7.6	10
27	1.2	0.8	3.5
28	1.6	1.2	4.3
29	2.7	5.3	8.3
30	2.8	5.2	8.3
31	3	6	8.9
32	3.6	6.9	9.6
33	3.1	6.5	9.2

34	3.2	6	8.9
35	2.3	3.6	7
36	3.2	6	8.9
37	3.4	6.4	9.3
38	2.6	4.8	8
39	2.2	2.4	5.8
40	3.2	4.9	8.3
41	2.7	4.1	7.3
42	2	2.7	6
43	2.6	4.7	8
44	2.5	3.7	7.1
45	2.5	3.2	6.7
46	3.5	6.8	9.6
47	1.8	2.2	5.4
48	2.4	4.1	7.4
49	2.4	4.9	8.1
50	3.4	5.3	8.6
51	1.7	2.1	5.4
52	2.1	2.5	5.9
53	1	0.5	2.8
54	1.2	0.7	3.2
55	1.2	0.8	3.3
56	1.3	0.8	3.4
57	3	5	8.3
58	1.4	0.8	3.8
59	1.4	0.9	3.6
60	2.4	2.5	5.8
61	2.2	2.7	6
62	2.1	2.6	5.9
63	2.8	3.7	7.1
64	1.3	0.8	3.7
65	1.5	1.8	4.9
66	1.3	1	3.8
67	3.1	8.3	10.5
68	2	2.2	5.7
69	4.2	11	12
70	2.9	6.7	9.4
71	4.5	14.8	13.9
72	3.6	8.1	10.5

73	3.6	9.4	11.2
74	4.1	10.4	11.8
75	3.6	7.9	10.3
76	3.2	6.1	9.1
77	2.1	2.9	6.2
78	2.5	4.4	7.6
79	2.4	4.2	7.5
80	4	11.9	12.6
81	3.1	7.7	10.1
82	2.7	5.5	8.6
83	3.5	8.2	10.6
84	4.1	10.2	11.8
85	1.8	2.3	5.6
86	1	0.6	3
87	1.1	0.8	3.3
88	0.9	0.5	2.9
89	0.8	0.4	2.5
90	0.7	0.3	2.3
91	0.7	0.3	2.2
92	0.7	0.4	2.3
93	0.7	0.3	2.2
94	0.6	0.3	2.1
95	0.6	0.2	1.8
96	0.6	0.2	1.7
97	0.4	0.2	1.7
98	0.5	0.2	1.6
99	0.5	0.2	1.9
100	0.6	0.2	2
101	0.8	0.7	3.1
102	0.6	0.3	1.9
103	0.6	0.2	1.9
104	0.7	0.4	2.4
105	0.6	0.2	2.1
106	0.6	0.3	2.2
107	0.8	0.4	2.6
108	0.9	0.4	2.5
109	0.5	0.2	1.9
110	0.9	0.6	2.9
111	0.8	0.4	2.5

112	0.5	0.2	1.8
113	0.6	0.3	2.2
114	0.7	0.4	2.4
115	0.5	0.3	2.1
116	0.9	0.5	2.6
117	0.8	0.4	2.8
118	1.4	1.4	4.5
119	0.9	0.5	2.9
120	1.1	0.9	3.6
121	0.9	0.7	3
122	1.1	0.7	3.3
123	1.1	0.8	3.3
124	0.9	0.6	2.9
125	0.9	0.4	2.6
126	1.1	0.6	2.9
127	1	0.5	2.7
128	1	0.5	2.7
129	0.8	0.4	2.6
130	0.9	0.5	2.8
131	1.1	1	3.7
132	1.3	0.7	3.4
133	1.2	0.6	3.4
134	1	0.5	2.8
135	3.3	8.6	10.6
136	4.6	13	13.2
137	5.8	22.5	17.1
138	6.1	28.1	19.1
139	5.7	20.1	16.4
140	5.3	20.2	16.4
141	7.1	28.3	19.7
142	4.8	18.3	15.5
143	4.1	14.8	14
144	7.6	38.1	22.4
145	7	34	21.4
146	4.3	19.9	16.1
147	5.1	26	18.6
148	4.7	10.3	11.9
149	6.4	27.1	18.8
150	5.5	23.5	17.4

151	6.4	28.5	19.4
152	6	18.3	16.2
153	5.5	18.1	15.7
154	6.4	26.5	19
155	6.3	25.5	18.4
156	5.6	22.3	17.1
157	7.6	33.4	21.3
158	6.1	26.9	18.8
159	6.3	27.4	18.9
160	7.4	38.2	22.7
161	6.1	31.1	20.3
162	7.5	41.9	23.4
163	6	22	17.4
164	5.8	25.4	18.4
165	5.2	20.2	16.4
166	5.7	22	17
167	6.1	24.1	17.9
168	4.7	17.2	15

Data:

We register: anteroposterior length, area covered and perimeter of a sample of 138

individuals of *Opuntiaspis philococcus*

N	Length	Area	Peimeter
1	0.7	0.3	2.2
2	0.7	0.3	2.2
3	0.7	0.3	2.4
4	0.6	0.3	2.3
5	0.7	0.3	2.2
6	1.1	0.6	3.5
7	0.9	0.4	2.5
8	0.7	0.4	2.5
9	0.7	0.3	2.4
10	0.9	0.5	2.9
11	0.8	0.5	2.8
12	0.9	0.5	2.9
13	0.7	0.4	2.7
14	1	0.4	2.9
15	0.7	0.5	2.9
16	1.2	0.8	3.7
17	0.7	0.4	2.7
18	0.7	0.3	2.3
19	1.1	0.8	3.4
20	0.6	0.3	2.1
21	0.6	0.3	2.2
22	1	0.5	3.2
23	1.5	0.9	4
24	0.8	0.5	3.3
25	0.7	0.5	2.7
26	1.2	0.8	3.7
27	1	0.5	3.3
28	1.7	1.2	4.5
29	1.7	1	4.3
30	1.4	0.8	3.6
31	1.3	0.6	3.8
32	1.5	0.9	4.3
33	3.1	4.1	8.3

34	3.8	4.3	9.1
35	3.9	5.1	9.8
36	1.1	0.8	3.6
37	1.7	1	4.4
38	2.8	3.3	7.7
39	4	5.2	10
40	3.2	3.7	8.4
41	3.3	3.9	8.7
42	1.6	0.9	4.7
43	1.1	0.6	3.6
44	4.2	5.2	10.3
45	2	1.1	5
46	0.7	0.3	2.7
47	3.3	3.6	8.4
48	1.6	0.8	4
49	1.7	1.1	4.7
50	1	0.5	3.1
51	4	5.1	9.9
52	1.8	0.9	4.5
53	1.6	1	4.1
54	1.5	0.9	4.2
55	3.5	4	8.2
56	0.7	0.4	2.6
57	1.6	0.9	4.2
58	1.6	1.1	4.5
59	1.4	0.8	3.9
60	0.7	0.6	3
61	0.6	0.2	2
62	0.5	0.3	2.2
63	1.1	0.7	3.4
64	0.7	0.4	2.7
65	0.5	0.3	2.3
66	0.7	0.6	2.9
67	0.7	0.5	2.8
68	0.7	0.3	2.4
69	1.3	0.9	4.1
70	0.9	0.6	3.2
71	0.8	0.5	2.9
72	1.1	0.7	3.5

73	1.2	0.8	3.9
74	1.1	0.7	3.6
75	1.3	1	4
76	0.9	0.6	3.3
77	2	1.3	5.4
78	1.6	0.9	4.4
79	1.3	0.8	4.2
80	1.1	0.7	3.6
81	1	0.6	3.3
82	1.5	1.1	4.4
83	1.5	1.2	4.6
84	4.4	6.2	10.8
85	1.3	1	4.3
86	1.8	1.5	5.4
87	1.1	0.7	3.5
88	1	0.6	3.4
89	1.1	0.7	3.5
90	0.7	0.6	2.9
91	2.2	3.1	6.8
92	2.8	3.5	7.5
93	2.2	2.5	6.2
94	3.8	4.5	9.6
95	3.7	4.6	9.6
96	3.8	4.1	9.7
97	3.8	3.8	9.1
98	1.5	0.8	4.2
99	3.2	3.2	7.7
100	1.9	2.1	5.9
101	3.8	6	10.1
102	2.9	3	7.3
103	1.2	0.6	3.4
104	1.5	0.8	4.1
105	1.1	0.6	3.3
106	1.5	1	4.3
107	1.4	1.1	4.2
108	2.9	2.8	7.2
109	2.4	2	6.2
110	2.2	2	5.7
111	2	1.3	5.2

112	1.9	1.4	5.1
113	2.7	2.8	6.8
114	0.5	0.3	2.3
115	1	0.5	2.8
116	2.8	2.6	7.1
117	3.4	3.2	8.2
118	3.4	4	8.6
119	3.4	3.4	8.2
120	3.5	3.5	8.7
121	2.2	1.5	5.8
122	4	4	9.4
123	4	4.4	9.4
124	3.7	3.5	8.7
125	2.5	2.6	6.6
126	3.5	4.7	8.8
127	1.6	1	4.4
128	5.3	7.5	12.3
129	4.7	5.6	10.8
130	2.2	2.2	6.3
131	3.7	3.4	8.9
132	3.2	2.7	7.5
133	1.5	0.9	4.2
134	3	2.9	7.2
135	1.7	1.3	4.7
136	2.7	2.3	6.7
137	2.2	1.9	5.7
138	1.7	1	4.5