

Electronic Supplementary Material

Distress Calls of Nectarivorous Bats (*Glossophaga soricina*) Encode Individual and Species Identity

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Figure S1

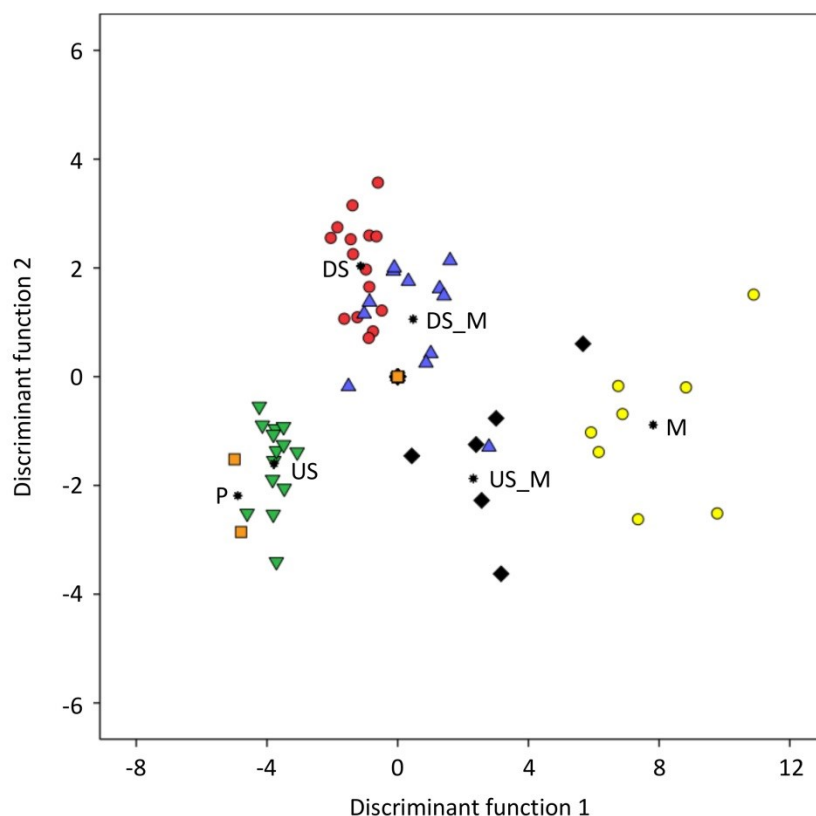


Figure S1: Signal space of a DFA depicting six distress call syllable types. The first two functions of a DFA define a signal space in which the location of each syllable type (centroid) is marked with a black star symbol. Other symbols with different shapes and colors refer to the averages for each individual and syllable type.

Table S1: Assessment of model fit for three discriminant function analyses.

Analysis	Function	Eigenvalue	% of variance	Cumulated variance [%]	Test of function	Wilk's λ	χ^2	df	p
DFA 1 (distress call syllable types)	1	15.713	81.8	81.8	1 to 5	0.009	225.208	40	<0.0001
	2	2.890	15.0	96.8	2 to 5	0.153	90.032	28	<0.0001
	3	0.493	2.6	99.4	3 to 5	0.596	24.823	18	0.130
	4	0.114	0.6	100.0	4 to 5	0.890	5.569	10	0.850
	5	0.008	0.0	100.0	5	0.992	0.404	4	0.982
DFA 2 (individual signature; all 6 distress call syllables types)	1	1.182	53.0	53.0	1 to 13	0.177	3311.054	182	<0.0001
	2	0.332	14.9	67.9	2 to 13	0.385	1820.973	156	<0.0001
	3	0.240	10.8	78.7	3 to 13	0.513	1273.244	132	<0.0001
	4	0.172	7.7	86.4	4 to 13	0.637	862.491	110	<0.0001
	5	0.100	4.5	90.9	5 to 13	0.746	558.853	90	<0.0001
	6	0.082	3.7	94.6	6 to 13	0.821	377.146	72	<0.0001
	7	0.047	2.1	96.7	7 to 13	0.888	226.217	56	<0.0001
	8	0.028	1.3	98.0	8 to 13	0.930	138.254	42	<0.0001
	9	0.019	0.9	98.8	9 to 13	0.956	85.673	30	<0.0001
	10	0.014	0.6	99.5	10 to 13	0.975	48.997	20	<0.0001
	11	0.009	0.4	99.9	11 to 13	0.989	21.684	12	0.041
	12	0.002	0.1	100.0	12 to 13	0.997	5.229	6	0.515
	13	0.000	0	100.0	13	1.000	0.755	2	0.686
DFA 3 (individual signature; 3 most common distress call syllables types)	1	1.440	54.2	54.2	1 to 13	0.138	3538.817	182	<0.0001
	2	0.399	15.0	69.3	2 to 13	0.336	1946.755	156	<0.0001
	3	0.248	9.4	78.6	3 to 13	0.470	1347.496	132	<0.0001
	4	0.230	8.7	87.3	4 to 13	0.587	951.356	110	<0.0001
	5	0.113	4.3	91.5	5 to 13	0.722	582.073	90	<0.0001
	6	0.078	2.9	94.5	6 to 13	0.804	390.515	72	<0.0001
	7	0.058	2.2	96.7	7 to 13	0.866	256.486	56	<0.0001
	8	0.035	1.3	98.0	8 to 13	0.916	155.655	42	<0.0001
	9	0.028	1.0	99.0	9 to 13	0.949	94.294	30	<0.0001
	10	0.017	0.6	99.7	10 to 13	0.975	45.771	20	0.001
	11	0.006	0.2	99.9	11 to 13	0.991	15.877	12	0.197
	12	0.002	0.1	100.0	12 to 13	0.997	5.562	6	0.474
	13	0.001	0.0	100.0	13	0.999	1.211	2	0.546

Reaction to Playbacks – Per-bat response in small captive groups

The per-bat response of individuals housed in small groups was significant for playbacks of normal distress calls and distorted distress calls, but not for playbacks of heterospecific distress calls (permuted paired t-test, df = 19; normal: $t = 4.5923$, $P < 0.0002$; distorted: $t = 3.0956$, $P = 0.0042$; heterospecific: $t = -0.28562$, $P = 0.782$). The per-bat response of small captive groups can be directly compared to the response of single captive individuals which did not react significantly to our playbacks (permuted paired t-test, df = 9; normal: $t = 0.16338$, $P = 0.9088$; distorted: $t = -1.2732$, $P = 0.2964$; heterospecific: $t = 0.9853$, $P = 0.4718$).

Hovering time in front of the speaker

We measured the hovering time of small captive groups and single captive individuals in front of the speaker in millisecond, using Media Player Classic (Gabest; version 1.7.17.1 from June 26st, 2018). We defined a hovering flight as the state in which the bat hovered stationary in front of the speaker without moving forward. We also filmed large free-living groups during our playbacks but could not interpret the videos in a meaningful way since too many bats were simultaneously circling the speaker and hovering in front of it.

Individuals in large free-living groups and small captive groups as well as single captive individuals occasionally hovered in front of the speaker. We did not conduct statistical tests for hovering time, since it was a rare event and our data was therefore strongly zero-inflated. Nevertheless, the duration of hovering flights was higher for individuals in small captive groups than for single captive individuals, which corresponds well with the observed response strength based on echolocation counts. However, it was not possible to measure hover duration for individuals in large free-living groups since too many bats approached the speaker simultaneously (Table S2).

Table S2: Hovering time in front of the speaker analysed through video analysis; Normal (conspecific distress call), Control 1 (distorted conspecific distress call) and Control 2 (heterospecific distress call).

Playback					Stimulus-Donor		Order (pb1-3)			Hovering time in front of the speaker (mm:ss,sss)		
Number	Group size	Sex	Date	Time	ID	Sex	Normal	Control 1	Control 2	pb1	pb2	pb3
1	3	M	18/03/2018	20:56	Gsor_33_1	M	1	3	2	00:00,000	00:00,000	00:00,000
2	3	M	13/03/2018	19:26	Gsor_69_1	F	2	3	1	00:00,000	00:15,365	00:04,134
3	3	M	14/03/2018	19:21	Gsor_28	M	2	1	3	00:00,000	00:00,000	00:00,000
4	3	M	15/03/2018	19:25	Gsor_55	F	1	2	3	00:00,522	00:00,000	00:00,000
5	3	M	20/03/2018	20:23	Gsor_41	M	3	1	2	00:00,000	00:00,000	00:02,138
6	3	M	23/03/2018	20:37	Gsor_27	F	3	1	2	00:00,000	00:02,482	00:00,000
7	3	M	24/03/2018	20:23	Gsor_56	M	3	1	2	00:00,000	00:00,000	00:00,000
8	3	M	25/03/2018	20:31	Gsor_86	F	3	2	1	00:00,000	00:01,370	00:02,991
9	3	M	26/03/2018	19:15	Gsor_33_2	M	1	2	3	00:00,000	00:04,197	00:00,000
10	3	M	27/03/2018	20:25	Gsor_69_2	F	2	1	3	00:00,000	00:00,000	00:00,000
11	1	M	31/03/2018	23:57	Gsor_55	F	2	1	3	00:02,295	00:00,000	00:00,000
12	1	M	01/04/2018	00:27	Gsor_41	M	2	1	3	00:00,000	00:01,846	00:00,000
13	1	M	31/03/2018	23:27	Gsor_27	F	3	1	2	00:00,000	00:00,000	00:00,000
14	1	M	28/03/2018	23:27	Gsor_56	M	1	3	2	00:00,000	00:00,000	00:00,000
15	1	M	28/03/2018	22:53	Gsor_86	F	1	2	3	00:00,000	00:00,000	00:00,000
16	3	F	11/03/2018	20:15	Gsor_69_2	F	2	3	1	00:00,000	00:04,187	00:01,662
17	3	F	12/03/2018	19:29	Gsor_33_2	M	2	1	3	00:13,654	00:01,421	00:00,000
18	3	F	16/03/2018	19:28	Gsor_86	F	1	2	3	00:00,000	00:00,000	00:00,000
19	3	F	17/03/2018	20:48	Gsor_56	M	3	2	1	00:00,000	00:00,000	00:00,000
20	3	F	19/03/2018	20:31	Gsor_27	F	3	1	2	00:00,000	00:00,000	00:00,000
21	3	F	21/03/2018	20:39	Gsor_41	M	3	1	2	00:00,000	00:00,000	00:03,364
22	3	F	22/03/2018	20:41	Gsor_55	F	3	2	1	00:00,000	00:00,000	00:00,000
23	3	F	29/03/2018	20:30	Gsor_28	M	1	2	3	00:03,667	00:00,000	00:00,000
24	3	F	30/03/2018	20:56	Gsor_69_1	F	2	1	3	00:00,000	00:00,000	00:00,854
25	2	F	01/04/2018	19:44	Gsor_33_1	M	2	3	1	00:00,000	00:00,000	00:00,000
26	1	F	30/03/2018	21:52	Gsor_56	M	2	1	3	00:00,000	00:00,000	00:00,000
27	1	F	29/03/2018	21:53	Gsor_41	M	1	3	2	00:00,000	00:00,000	00:00,000
28	1	F	29/03/2018	21:23	Gsor_55	F	3	2	1	00:00,000	00:00,000	00:00,000
29	1	F	22/03/2018	21:37	Gsor_28	M	1	2	3	00:00,000	00:00,000	00:00,000
30	1	F	22/03/2018	22:14	Gsor_69_1	F	2	1	3	00:00,000	00:00,000	00:00,000

Bold numbers symbolize response to conspecific distress calls.

Video S1: Presumably active mobbing of a predator by *Glossophaga soricina*. Free-living group of bats in Costa Rica is approaching, circling and hovering in front of a common boa (*Boa constrictor*) which entered their day-roost.

Playback Set-Up

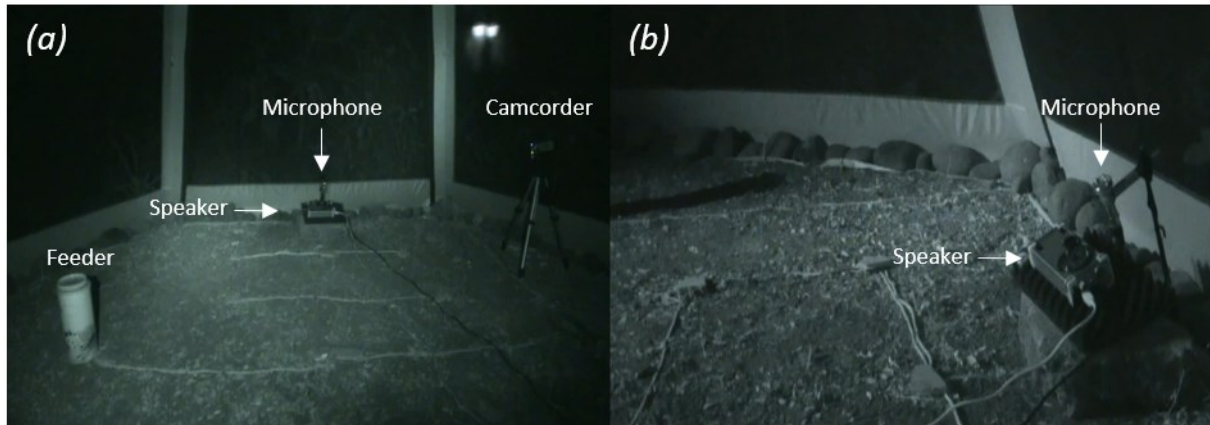


Figure S2: Playback set up: (a) view from the front camcorder (DCR-SR85, Sony, Japan), equipped with a wide angle conversion lens; two infrared emitters were positioned left and right from the camcorder; (b) the feeder was positioned on the left side view from the second camcorder; Avisoft USG Player BL Pro speaker and Avisoft CM16 microphone had the same inclination.