ELECTRONIC SUPPLEMENTARY MATERIAL

SUBMITTED FOR: RESEARCH ARTICLES IN *PROC. R. SOC. B*

TITLE:

TOO RISKY TO SETTLE: AVIAN COMMUNITY STRUCTURE CHANGES IN RESPONSE TO PERCEIVED PREDATION RISK ON ADULTS AND OFFSPRING

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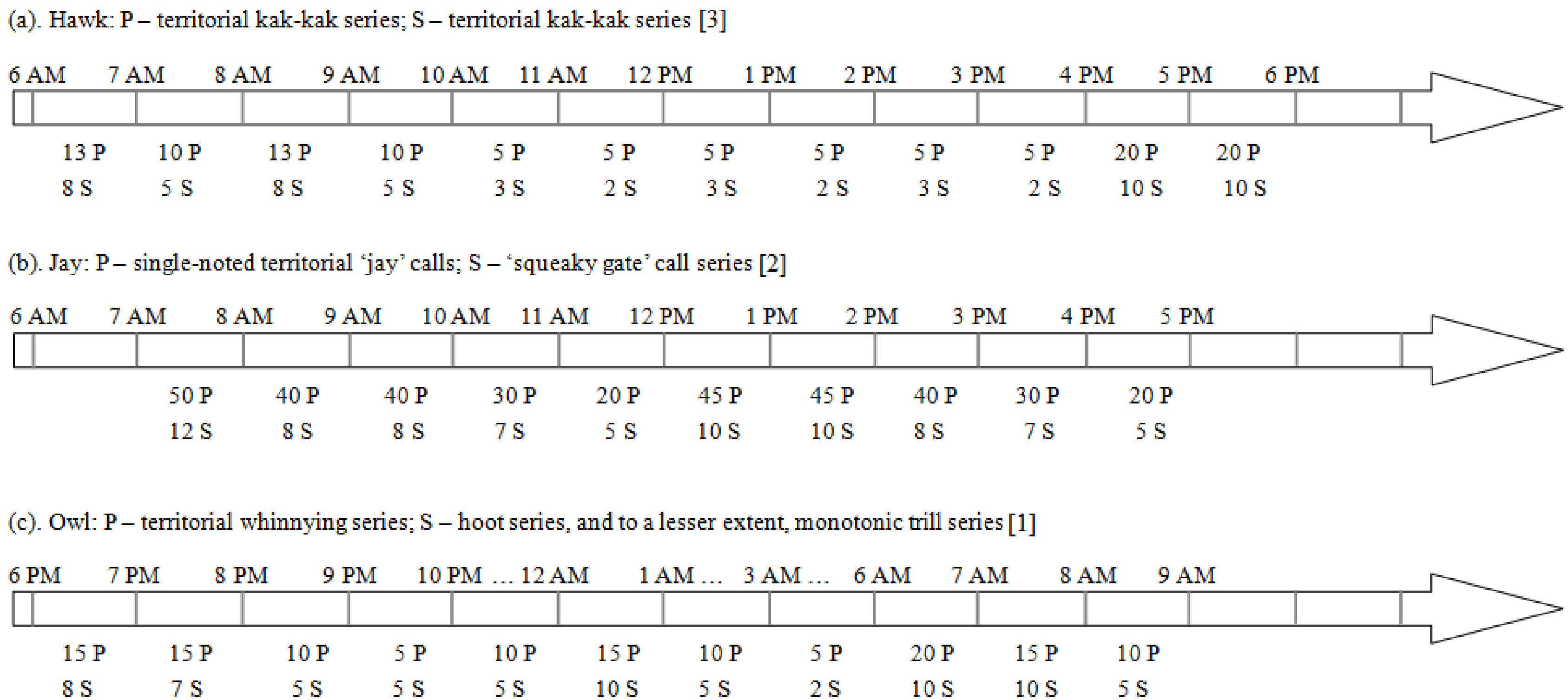
S1 - Electronic Supplementary Material 1

Details on playback scheme

Playback scheme

We obtained predator vocalization recordings from various sources including museums, audio libraries, and other online databases. Whenever possible, we used recordings taken from near Southeastern United States, but some recordings from other parts of the United States were also used due to inadequate number of recordings from local regions. We processed the recordings to remove noise and augment volume using program Audacity (version 1.3 Beta), and then compiled them into unique playback files to be burnt onto CD for each plot, using vocalizations from no more than three individual birds for each playback file. Each playback file consisted mainly of a ‘primary’ vocalization type (i.e. the most frequent vocalization used by the species, such as territorial calls), supplemented by a lesser amount of a ‘secondary’ vocalization type (i.e. vocalization that is less frequently used but that still advertises the presence and/or activity of the species; however, in the case of the Cooper’s hawk, we still used territorial calls for its relative lack of variability of vocalization repertoire) [1-3]. With the help of programmable timers, we created playback schemes whereby vocalizations were played in bouts throughout the day (or night for the Eastern screech-owl) at rates similar to the natural vocalization behaviour of the species as suggested by original recordings. Playback schemes are displayed below along time axes, showing numbers of primary vocalizations (P) and secondary vocalizations (S) during each one-hour interval. It should be noted that as we used two playback stations on each plot that played the same playback files, the actual playback amount was twice the amount provided by a playback file. The two playback stations on each plot followed the same playback scheme, except that one station lagged five minutes behind the other.

Figure S1. Illustration of playback scheme.



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S2 - ELECTRONIC SUPPLEMENTARY MATERIAL 2

BIRD COMMUNITY SURVEY DATA

Table S1. List of the eighteen focal prey species and their common and Latin names.

Species *	Plot	Treatment †	Survey1	Survey2	Survey3	Survey4	Survey5
BASP	1	H	1	0	0	0	0
	2	J	1	0	0	1	0
	3	C	1	1	1	0	1
	4	J	0	0	0	0	0
	5	J	0	0	0	0	0
	6	O	0	0	0	0	0
	7	C	0	0	0	0	0
	8	C	1	1	0	1	0
	9	H	0	0	NA	NA	NA
	10	O	2	2	NA	NA	NA
	11	J	0	0	0	NA	NA
	12	C	5	5	0	1	2
	13	H	3	2	3	3	4
	14	J	1	0	0	0	0
	15	H	1	2	4	4	2
	16	J	2	1	2	1	2
	17	C	1	0	0	0	0
	18	O	0	0	0	2	3
	19	O	0	0	0	0	0
	20	H	0	0	0	0	0
	21	O	0	0	0	0	0
	22	O	2	0	0	0	0
	23	C	2	0	NA	NA	NA
	24	H	0	2	0	NA	NA
BGGN	1	H	1	0	1	2	0
	2	J	0	0	0	0	0
	3	C	0	4	1	1	0
	4	J	1	1	0	0	0
	5	J	0	0	0	0	0
	6	O	0	0	1	0	0
	7	C	1	1	1	2	0
	8	C	3	0	0	0	1
	9	H	0	1	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	1	1	NA	NA
	12	C	0	0	0	0	0
	13	H	0	0	0	1	1
	14	J	0	0	0	0	0

	15	H	1	0	0	0	1
	16	J	0	0	0	0	1
	17	C	1	2	0	0	0
	18	O	0	0	1	0	0
	19	O	0	0	0	0	2
	20	H	0	2	1	2	0
	21	O	0	1	1	1	0
	22	O	2	0	0	0	1
	23	C	3	0	NA	NA	NA
	24	H	0	0	0	NA	NA
BHCO	1	H	0	0	0	0	0
	2	J	0	0	0	0	0
	3	C	0	2	1	2	0
	4	J	1	4	1	0	0
	5	J	0	0	0	0	0
	6	O	0	0	0	0	0
	7	C	1	1	1	0	0
	8	C	3	0	0	0	0
	9	H	0	0	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	1	0	NA	NA
	12	C	0	0	0	0	0
	13	H	0	0	0	0	0
	14	J	0	0	0	0	0
	15	H	0	1	0	0	0
	16	J	0	0	0	0	0
	17	C	0	0	0	1	0
	18	O	0	0	0	0	0
	19	O	1	1	1	1	0
	20	H	0	0	0	0	0
	21	O	0	0	0	0	0
	22	O	0	0	0	0	0
	23	C	0	1	NA	NA	NA
	24	H	0	0	0	NA	NA
BRTH	1	H	0	0	0	0	0
	2	J	0	0	0	0	0
	3	C	0	0	1	0	0
	4	J	0	1	0	0	0
	5	J	0	1	1	0	0
	6	O	0	0	1	0	0
	7	C	0	0	0	0	0
	8	C	0	0	0	0	0
	9	H	0	1	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	0	0	NA	NA

	12	C	0	0	0	0	0
	13	H	0	0	0	0	0
	14	J	0	0	0	0	0
	15	H	0	0	0	0	0
	16	J	0	2	0	1	0
	17	C	0	0	0	0	0
	18	O	0	0	0	0	0
	19	O	0	0	0	0	0
	20	H	0	0	0	2	0
	21	O	0	0	0	0	0
	22	O	0	0	0	1	0
	23	C	0	0	NA	NA	NA
	24	H	0	0	0	NA	NA
DOWO	1	H	0	0	2	0	1
	2	J	0	0	2	0	2
	3	C	0	1	1	1	1
	4	J	0	0	1	0	5
	5	J	1	0	1	3	0
	6	O	0	0	1	3	0
	7	C	1	1	1	2	1
	8	C	2	1	0	1	0
	9	H	0	0	NA	NA	NA
	10	O	0	1	NA	NA	NA
	11	J	2	0	0	NA	NA
	12	C	0	0	0	0	3
	13	H	0	1	0	0	0
	14	J	0	0	0	0	2
	15	H	0	0	0	0	0
	16	J	0	0	1	1	0
	17	C	1	0	0	0	1
	18	O	1	0	1	1	0
	19	O	0	1	0	0	2
	20	H	0	0	0	1	0
	21	O	0	1	1	2	0
	22	O	1	0	0	1	2
	23	C	0	1	NA	NA	NA
	24	H	0	0	0	NA	NA
EABL	1	H	0	2	2	0	3
	2	J	0	0	1	0	4
	3	C	0	1	0	1	0
	4	J	0	0	0	0	0
	5	J	0	1	0	0	0
	6	O	0	1	0	0	0
	7	C	0	1	1	0	0
	8	C	0	2	4	2	0

	9	H	2	2	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	1	1	NA	NA
	12	C	0	0	2	1	1
	13	H	0	1	0	0	0
	14	J	0	0	0	1	0
	15	H	1	1	2	1	2
	16	J	0	0	0	0	2
	17	C	0	1	0	0	1
	18	O	1	0	0	1	0
	19	O	0	1	3	0	1
	20	H	0	0	1	0	4
	21	O	0	0	0	0	0
	22	O	0	0	0	0	0
	23	C	0	0	NA	NA	NA
	24	H	0	0	1	NA	NA
EATO	1	H	0	0	0	0	0
	2	J	0	0	1	0	0
	3	C	0	2	0	1	2
	4	J	0	0	0	0	0
	5	J	0	0	0	0	1
	6	O	0	0	0	0	0
	7	C	0	0	0	0	1
	8	C	0	0	0	0	0
	9	H	1	2	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	0	0	NA	NA
	12	C	0	0	0	0	0
	13	H	0	0	0	0	0
	14	J	0	0	0	0	0
	15	H	0	0	0	0	1
	16	J	0	0	0	1	1
	17	C	0	0	0	0	0
	18	O	0	0	0	0	0
	19	O	0	0	0	0	1
	20	H	0	0	0	0	0
	21	O	0	0	0	0	0
	22	O	0	0	0	0	0
	23	C	0	0	NA	NA	NA
	24	H	0	0	0	NA	NA
GCFL	1	H	2	1	4	0	0
	2	J	4	3	0	1	1
	3	C	1	2	6	2	0
	4	J	5	2	2	2	0
	5	J	2	4	2	4	0

	6	O	4	3	5	4	0
	7	C	3	3	2	2	0
	8	C	3	0	3	0	0
	9	H	3	3	NA	NA	NA
	10	O	5	3	NA	NA	NA
	11	J	4	1	4	NA	NA
	12	C	3	3	5	0	0
	13	H	1	5	4	0	0
	14	J	3	4	8	4	0
	15	H	1	2	4	2	0
	16	J	2	3	1	6	0
	17	C	2	3	2	1	1
	18	O	5	2	2	3	0
	19	O	3	5	3	3	0
	20	H	4	3	1	0	1
	21	O	3	1	3	2	0
	22	O	3	2	4	5	0
	23	C	4	3	NA	NA	NA
	24	H	0	0	1	NA	NA
MODO	1	H	0	0	0	1	2
	2	J	3	0	4	1	0
	3	C	2	2	1	0	0
	4	J	0	2	0	3	3
	5	J	2	1	0	0	0
	6	O	1	0	0	1	2
	7	C	1	1	2	0	3
	8	C	1	0	0	0	0
	9	H	0	0	NA	NA	NA
	10	O	0	1	NA	NA	NA
	11	J	2	0	0	NA	NA
	12	C	1	0	0	0	0
	13	H	0	1	0	0	0
	14	J	2	0	2	1	3
	15	H	0	0	0	0	0
	16	J	1	0	0	0	1
	17	C	0	0	0	2	1
	18	O	1	3	1	2	0
	19	O	0	1	0	0	0
	20	H	0	0	1	0	4
	21	O	0	1	6	0	1
	22	O	2	2	1	1	0
	23	C	0	1	NA	NA	NA
	24	H	0	3	0	NA	NA
NOCA	1	H	0	0	0	0	0
	2	J	0	0	0	0	0

	3	C	0	0	0	0	0
	4	J	0	0	0	0	0
	5	J	0	0	0	1	0
	6	O	0	0	2	0	0
	7	C	2	0	1	0	1
	8	C	0	0	0	0	0
	9	H	0	0	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	0	0	NA	NA
	12	C	0	0	0	0	0
	13	H	0	0	0	0	0
	14	J	0	0	0	0	0
	15	H	0	0	0	0	0
	16	J	0	0	0	0	0
	17	C	0	0	0	1	0
	18	O	0	0	0	0	0
	19	O	0	0	0	0	0
	20	H	0	0	0	0	0
	21	O	0	0	0	0	0
	22	O	1	1	0	2	5
	23	C	0	0	NA	NA	NA
	24	H	0	0	1	NA	NA
NOMO	1	H	0	1	3	0	0
	2	J	1	0	0	0	0
	3	C	0	0	0	0	0
	4	J	0	0	0	0	0
	5	J	0	0	3	0	0
	6	O	0	1	0	0	0
	7	C	0	0	0	1	0
	8	C	0	1	0	0	2
	9	H	0	1	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	0	0	0	NA	NA
	12	C	0	0	1	1	0
	13	H	0	0	0	0	0
	14	J	0	0	0	0	0
	15	H	0	0	2	0	0
	16	J	0	0	1	0	0
	17	C	0	0	0	0	0
	18	O	0	1	1	0	0
	19	O	0	2	0	1	0
	20	H	0	0	1	0	0
	21	O	0	0	0	0	0
	22	O	0	0	0	0	0
	23	C	0	0	NA	NA	NA

	24	H	0	0	0	NA	NA
PIWA	1	H	1	2	7	3	1
	2	J	6	6	4	4	3
	3	C	5	3	5	12	1
	4	J	6	3	3	4	0
	5	J	8	7	6	4	1
	6	O	3	2	5	6	4
	7	C	7	5	6	5	0
	8	C	4	6	4	4	0
	9	H	5	6	NA	NA	NA
	10	O	6	5	NA	NA	NA
	11	J	3	13	3	NA	NA
	12	C	4	3	1	2	2
	13	H	4	5	6	0	1
	14	J	0	1	1	2	2
	15	H	6	8	7	4	0
	16	J	3	7	2	4	2
	17	C	6	5	1	4	1
	18	O	2	0	4	4	0
	19	O	2	1	0	1	0
	20	H	5	2	4	3	0
	21	O	2	3	5	0	0
	22	O	1	2	1	1	0
	23	C	6	5	NA	NA	NA
	24	H	0	5	4	NA	NA
PIWO	1	H	0	0	0	0	0
	2	J	0	0	0	0	0
	3	C	0	2	1	1	1
	4	J	0	0	0	0	0
	5	J	0	0	0	0	0
	6	O	0	0	0	0	0
	7	C	1	0	0	0	2
	8	C	0	0	0	0	0
	9	H	0	0	NA	NA	NA
	10	O	1	0	NA	NA	NA
	11	J	0	0	2	NA	NA
	12	C	0	0	0	0	0
	13	H	0	0	0	0	0
	14	J	0	0	2	0	0
	15	H	0	0	0	0	0
	16	J	0	0	0	2	0
	17	C	0	2	0	0	1
	18	O	0	1	0	0	0
	19	O	2	0	1	0	0
	20	H	0	0	0	0	0

	21	O	0	0	0	0	0
	22	O	0	0	0	0	0
	23	C	0	1	NA	NA	NA
	24	H	0	0	0	NA	NA
RBWO	1	H	0	1	1	3	3
	2	J	1	1	0	3	1
	3	C	0	2	1	2	1
	4	J	3	3	3	2	4
	5	J	1	1	2	3	1
	6	O	0	2	5	2	3
	7	C	3	3	2	0	2
	8	C	2	0	1	0	0
	9	H	3	1	NA	NA	NA
	10	O	2	2	NA	NA	NA
	11	J	1	3	3	NA	NA
	12	C	1	1	0	1	1
	13	H	0	0	2	1	1
	14	J	3	5	2	1	3
	15	H	0	0	0	2	1
	16	J	0	1	0	2	1
	17	C	3	4	1	1	4
	18	O	2	1	1	2	0
	19	O	1	3	2	1	1
	20	H	1	3	2	2	2
	21	O	1	0	1	0	2
	22	O	2	0	1	2	1
	23	C	1	2	NA	NA	NA
	24	H	0	1	0	NA	NA
RHWO	1	H	1	1	1	1	1
	2	J	6	1	0	0	0
	3	C	0	1	0	0	0
	4	J	2	0	0	1	1
	5	J	5	2	2	0	1
	6	O	0	1	1	1	1
	7	C	0	0	0	0	0
	8	C	1	0	0	0	0
	9	H	0	1	NA	NA	NA
	10	O	3	1	NA	NA	NA
	11	J	1	0	0	NA	NA
	12	C	3	1	1	0	1
	13	H	1	1	0	0	2
	14	J	1	1	1	0	0
	15	H	1	2	0	1	2
	16	J	1	1	0	1	1
	17	C	2	2	1	1	1

	18	O	3	1	3	2	3
	19	O	3	1	1	0	0
	20	H	5	1	0	0	1
	21	O	0	2	3	1	0
	22	O	0	0	0	0	0
	23	C	0	0	NA	NA	NA
	24	H	0	1	1	NA	NA
SUTA	1	H	0	0	0	1	0
	2	J	0	1	1	0	1
	3	C	1	3	0	1	2
	4	J	4	1	0	0	0
	5	J	1	0	0	1	1
	6	O	0	0	0	0	0
	7	C	2	1	2	0	1
	8	C	2	2	2	1	0
	9	H	2	1	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	2	0	1	NA	NA
	12	C	3	1	1	0	0
	13	H	2	2	0	0	0
	14	J	2	0	1	1	2
	15	H	3	1	2	0	0
	16	J	2	0	5	1	0
	17	C	3	2	3	1	3
	18	O	0	0	0	1	0
	19	O	1	0	0	1	3
	20	H	0	2	0	1	0
	21	O	0	1	2	0	1
	22	O	1	2	0	2	1
	23	C	1	0	NA	NA	NA
	24	H	0	1	0	NA	NA
TUTI	1	H	2	0	7	0	5
	2	J	0	7	2	3	6
	3	C	2	2	1	6	5
	4	J	3	2	3	2	7
	5	J	2	0	3	2	1
	6	O	0	5	5	2	1
	7	C	1	3	0	3	5
	8	C	1	2	0	9	0
	9	H	2	1	NA	NA	NA
	10	O	0	2	NA	NA	NA
	11	J	2	5	0	NA	NA
	12	C	2	1	2	1	0
	13	H	1	1	3	0	0
	14	J	1	2	2	1	4

	15	H	4	2	1	4	0
	16	J	2	1	0	0	1
	17	C	1	4	1	3	8
	18	O	1	1	2	2	2
	19	O	4	5	7	4	2
	20	H	1	2	5	4	3
	21	O	2	2	0	5	1
	22	O	5	2	2	4	9
	23	C	1	3	NA	NA	NA
	24	H	0	7	1	NA	NA
YTVI	1	H	2	1	0	0	0
	2	J	0	0	0	0	0
	3	C	1	2	0	0	0
	4	J	0	0	2	1	0
	5	J	0	0	0	0	0
	6	O	0	0	1	0	0
	7	C	2	1	0	2	0
	8	C	0	2	1	2	1
	9	H	1	1	NA	NA	NA
	10	O	0	0	NA	NA	NA
	11	J	1	1	0	NA	NA
	12	C	1	1	0	0	0
	13	H	0	0	0	0	0
	14	J	2	1	3	0	0
	15	H	1	0	0	0	0
	16	J	0	0	0	0	0
	17	C	1	0	0	0	0
	18	O	0	0	0	0	0
	19	O	1	0	0	0	0
	20	H	0	2	0	0	0
	21	O	1	2	0	0	0
	22	O	0	1	0	0	0
	23	C	0	0	NA	NA	NA
	24	H	0	1	0	NA	NA

(Notes: *: Species names are presented in four-letter codes. See electronic supplementary material S3 for the list of codes.

†: Playback treatments: C – Control; H – Hawk; J – Jay; O – Owl.)

S3 - ELECTRONIC SUPPLEMENTARY MATERIAL 3

FOCAL SPECIES

Table S2. List of the eighteen focal prey species and their common and Latin names.

Species Code	**Common Name**	**Latin Name**
BASP	Bachman’s Sparrow	*Peucaea aestivalis*
BGGN	Blue-gray Gnatcatcher	*Polioptila caerulea*
BHCO	Brown-headed Cowbird	*Molothrus ater*
BRTH	Brown Thrasher	*Toxostoma rufum*
DOWO	Downy Woodpecker	*Picoides pubescens*
EABL	Eastern Bluebird	*Sialia sialis*
EATO	Eastern Towhee	*Pipilo erythrophthalmus*
GCFL	Great Crested Flycatcher	*Myiarchus crinitus*
MODO	Mourning Dove	*Zenaida macroura*
NOCA	Northern Cardinal	*Cardinalis cardinalis*
NOMO	Northern Mockingbird	*Mimus polyglottos*
PIWA	Pine Warbler	*Dendroica pinus*
PIWO	Pileated Woodpecker	*Dryocopus pileatus*
RBWO	Red-bellied Woodpecker	*Melanerpes carolinus*
RHWO	Red-headed Woodpecker	*Melanerpes erythrocephalus*
SUTA	Summer Tanager	*Piranga rubra*

TUTI	Tufted Titmouse	*Baeolophus bicolor*
YTVI	Yellow-throated Vireo	*Vireo flavifrons*

(Note: We included as focal species only species that had at least ten total detections across five surveys on all plots combined. We also removed non-prey species that had enough detections, namely the American Crow *Corvus brachyrhyncos* and Blue Jay *Cyanocitta cristata*.)

DETAILS ON DATA AND DATA SOURCES FOR SPECIES FUNCTIONAL TRAITS

Table S3. Key life-history and natural-history trait data for all eighteen focal prey species. Pearson correlation coefficient between annual fecundity and adult survival rate: 0.44.

Species	**Clutch Size**	**Broods /Year***	**Egg Length (mm)**	**Egg Width (mm)**	**Annual Fecundity†**	**Adult Survival‡**	**Body Mass (g)**	**Reference§**
BASP	3.90	2.0	19.80	15.60	0.9173	0.4200¶	21.00	[1,2]
BGGN	4.40	1.5	14.60	11.38	1.0660	0.5100	6.00	[1,3,4]
BHCO**	-	-	21.45	16.42	3.0008	0.4500	42.75	[5,6]
BRTH	3.72	1.5	26.90	19.70	0.4340	0.7130	68.80	[7,8]
DOWO	4.81	1.0	19.43	15.24	0.4541	0.6000	24.50	[1,8,9]
EABL	4.41	2.0	20.88	16.50	0.8426	0.4500	30.00	[1,10]
EATO	2.40	2.0	22.60	17.50	0.4054	0.4510	41.50	[1,8,11]
GCFL	5.00	1.0	22.60	17.20	0.5115	0.4600	33.50	[8,12]
MODO	2.00	6.0	28.00	22.00	3.1160	0.4300	127.00	[13]
NOCA	3.12	2.5	24.88	18.58	0.7631	0.5320	45.00	[1,8,14]

NOMO	3.40	3.0	24.40	18.60	0.8929	0.3160	49.00	[1,8,15]
PIWA	3.50	2.5	18.10	13.50	1.0959	0.4700	13.50	[4,16]
PIWO	3.60	1.0	32.90	24.72	0.1421	0.6500	280.50	[1,17]
RBWO	4.25	1.5	25.20	19.00	0.4044	0.6600	73.50	[1,4,18,19]
RHWO	4.65	1.5	25.14	19.17	0.4494	0.6200	73.50	[1,20]
SUTA	3.20	1.5	23.55	17.20	0.5714	0.4400	30.00	[4,21]
TUTI	5.85	1.5	18.40	14.10	0.7479	0.5000	22.00	[1,8,22]
YTVI	3.60	1.0	20.80	14.80	0.4670	0.5700	18.00	[8,23]

(Notes: *: We classified brood number per breeding season to the nearest 0.5 broods following [1].

†: Due to incomplete published data on egg mass, we used egg volume to calculate egg mass assuming an average egg density of 1.005 g/cm^3 [24]. Annual fecundity was then calculated using Equations S1 to S3 [1,24,25]:

$$\text{Egg volume (mm}^3\text{)} = 0.51 \cdot \text{length (mm)} \cdot \text{width}^2\ \text{(mm}^2\text{)} \quad \text{(Equation S1)}$$

$$\text{Egg mass (g)} = 1.005 \cdot \text{egg volume (mm}^3\text{)} \cdot 10^{-3} \quad \text{(Equation S2)}$$

$$\text{Fecundity} = (\text{egg mass} \cdot \text{clutch size} \cdot \text{brood number per season}) / \text{female body mass} \quad \text{(Equation S3)}$$

‡: We used adult survival rate estimates from (close to) Southeastern United States whenever available. Otherwise, available estimates from other regions were used.

§: Whenever available, we used data from within or near southeastern United States. When data from different sources conflicted, we preferentially used data that have more support (e.g. based on larger sample sizes, closer to estimates from most sources, etc.).

¶: We were unable to find an annual survival rate estimate for BASP (Bachman's sparrow), but instead only found a monthly survival rate estimate (during the breeding season). Adult survival rate here was approximated by exponentiating monthly survival rate 12 times.

**: BHCO (brown-headed Cowbird) is a nest parasite. Instead of having regular clutches and nesting attempts, its female continues to lay eggs in the nests of other birds throughout the breeding season. Clutch size and brood number per year therefore do not apply to this species, and annual fecundity is calculated based on total number of eggs a female lays per breeding season on average, obtained directly from the literature.)

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S5 - Electronic Supplementary Material 5

Specification of N-mixture abundance models and occurrence models

Table S4. Definition of symbols used in N-mixture models and occurrence models

Model Type	Symbol	Definition
N-mixture Abundance Models	$\lambda_{TRT.t}$	Mean plot-level abundance of focal species for treatment TRT at time t
	$N_{i.t}$	Abundance of focal species on plot i at time t (each plot can be classified into one of four TRT types)
	$p_{TRT.t}$	Detection probability of individuals of focal species; it is a function of treatment TRT and other time effects
	$y_{i.t}$	Observed abundance of focal species on plot i at time t
	$\gamma_{TRT.t}$	Mean plot-level recruitment rate (through immigration) of individuals of focal species for treatment TRT at time t (specific for Open models)
	$\omega_{TRT.t}$	Mean plot-level survival rate (through avoiding emigration or predation) of individuals of focal species for treatment TRT at time t (specific for Open models)
	κ_{TRT}	Dependence coefficient between mean plot-level abundances of focal species in the second primary period and that in the first primary period (specific for Robust models)

Occurrence Models	$\phi_{TRT.t}$	Mean plot-level occurrence probability of focal species for treatment TRT at time t
	$Y_{i.t}$	True occurrence state of focal species on plot i at time t (each plot can be classified into one of four TRT types)
	p_{TRT}'	Detection probability of focal species for treatment TRT across the breeding season*
	$y_{i.t}'$	Observed occurrence state of focal species on plot i at time t
	$\gamma_{TRT.t}'$	Mean plot-level recruitment rate (through immigration) of focal species for treatment TRT at time t (specific for Open models)
	$\varepsilon_{TRT.t}$	Mean plot-level extinction rate (through emigration or predation) of focal species for treatment TRT at time t (specific for Open models)
	κ_{TRT}'	Dependence coefficient between mean plot-level occurrence of focal species in the second primary period and that in the first primary period (specific for Robust models)

Basic model structure of N-mixture models and occurrence models

For abundance models, the basic N-mixture model structure is:

$\log(\lambda_{TRT.1}) \sim \alpha_0 + \alpha_1 \cdot$ TRT-Hawk $+ \alpha_2 \cdot$ TRT-Jay $+ \alpha_3 \cdot$ TRT-Owl ……..…… (Equation S4)

$\text{logit}(p_{TRT}) \sim \beta_0 + \beta_1 \cdot$ TRT-Hawk $+ \beta_2 \cdot$ TRT-Jay $+ \beta_3 \cdot$ TRT-Owl $+ \beta_4 \cdot$ Time of day $+ \beta_5 \cdot$ Julian date $+ \beta_6 \cdot$ Julian date^2 …..………………………………. (Equation S5)

$N_{i.t} \sim \text{Poisson}(\lambda_{TRT.t})$ …………………………….… (Equation S6; $\lambda_{TRT.t}$ will be defined below)

$y_{i.t} \sim \text{Binomial}(N_{i.t}, p_{TRT})$ ……………………………………………………… (Equation S7)

For occurrence models, the basic model structure is:

$\text{logit}(\phi_{TRT.1}) \sim \alpha_0' + \alpha_1' \cdot$ TRT-Hawk $+ \alpha_2' \cdot$ TRT-Jay $+ \alpha_3' \cdot$ TRT-Owl …….. (Equation S8)

$\text{logit}(p_{TRT}') \sim \beta_0' + \beta_1' \cdot$ TRT-Hawk $+ \beta_2' \cdot$ TRT-Jay $+ \beta_3' \cdot$ TRT-Owl $+ \beta_4' \cdot$ Time of day $+ \beta_5' \cdot$ Julian date $+ \beta_6' \cdot$ Julian date^2 ……………………………..(Equation S9)

$Y_{i.t} \sim \text{Bernoulli}(\phi_{TRT.t})$ ……………………...…..(Equation S10; $\phi_{TRT.t}$ will be defined below)

$y_{i.t} \sim \text{Bernoulli}(Y_{i.t}, p_{TRT}')$ …………………...………………..……………… (Equation S11)

It should be noted that treatment effects on λ, ϕ, p and p' are represented as relative effects as compared to those of Control, with individual predator treatment types coded as dummy variables. We therefore have:

$\alpha_0 = \log(\lambda_{Control.1})$

$\beta_0 = \text{logit}(p_{Control})$

$\alpha_0' = \text{logit}(\phi_{Control.1})$

$\beta_0' = \text{logit}(p_{Control}')$

The other coefficients represent the effect of playback treatment on model parameters when compared with Control. If λ, ϕ, p and p' are considered to be independent of treatment effects, then these equations simplify to:

$\log(\lambda_{TRT.1}) = \alpha_0$

$\text{logit}(\phi_{TRT.1}) = \alpha_0'$

$\text{logit}(p_{TRT}) = \beta_0 + \beta_4 \bullet \text{Time of day} + \beta_5 \bullet \text{Julian date} + \beta_6 \bullet \text{Julian date}^2$

$\text{logit}(p_{TRT}') = \beta_0' + \beta_4' \bullet \text{Time of day} + \beta_5' \bullet \text{Julian date} + \beta_6' \bullet \text{Julian date}^2$

Closed-population abundance and occurrence models

For each species, assuming population to be closed throughout the breeding season, we have:

$\lambda_{TRT.t} = \lambda_{TRT.1}$

$\phi_{TRT\text{-}t} = \phi_{TRT.1}$

$N_{i.t}$ and $Y_{i.t}$ remain constant, denoted as N_i and $Y_{i.}$ Observed abundance counts and occurrence patterns as repeated observation of the same closed populations can therefore be defined based on the above equations, and allow the estimation of equation parameters (i.e. model parameters) through maximum likelihood estimation (MLE) [1-3]. For each species, we ran four models for abundance data and four models for occurrence data, allowing λ, ϕ, p and p' to be either dependent on treatments, or independent from treatments. We ran all models in 'unmarked' package in R (version 0.9-4) [4], using functions 'pcount' and 'occu'. We used a K value (integer upper index of integration for N-mixture [2,4]) of 100 for all abundance models of all species.

Robust-design abundance and occurrence models

For Robust Design models, we divided the primary survey periods at the end of the 3rd survey, for the reason that it was around the end of the first nesting attempt for most species [5]. For each species, assuming population closure within primary periods (Surveys 1 through 3 as the first primary period, and Surveys 4 through 5 as the second primary period), we have two abundance measures ($\lambda_{TRT.1}$, $\lambda_{TRT.2}$) and two occurrence pattern measures ($\phi_{TRT.1}$, $\phi_{TRT.2}$) for each plot. As a correlated relationship is expected of populations between the two primary periods, we use a single coefficient to define this correlation structure:

$$\log(\lambda_{TRT.2}) = \kappa_{TRT} + \log(\lambda_{TRT.1}) \quad \text{(Equation S12)}$$

$$\text{logit}(\phi_{TRT.2}) = \kappa_{TRT}' + \text{logit}(\phi_{TRT.1}) \quad \text{(Equation S13)}$$

where κ and κ' are taken to be constants, regardless of the treatment:

$$\log(\kappa) \sim \delta_0 \quad \text{(Equation S14)}$$

$$\log(\kappa') \sim \delta_0' \quad \text{(Equation S15)}$$

Observed abundance counts and occurrence patterns as repeated observation of the same closed populations within each primary period can therefore be defined based on the above equations, and allow the estimation of equation parameters (i.e. model parameters) through MLE [2,6,7]. For each species, we ran eight models for abundance data and eight models for occurrence data, allowing λ, ϕ, p, p', κ and κ' to be either dependent on treatments, or independent from treatments. We ran all models using our own R code. We used a K value of 100 for all abundance models of all species [2].

Open-population abundance and occurrence models

For each species, population is assumed to be open, i.e. allowing population abundance and occurrence patterns to change in between surveys. However, a dependence structure of populations between adjacent surveys is assumed, defined by $\gamma_{TRT.t}$, $\omega_{TRT.t}$, $\gamma_{TRT.t}'$, and $\varepsilon_{TRT.t}$. Dependence structures for plot-level abundance and occurrence pattern are defined according to

MacKenzie et al. (2003) and Dail and Madsen (2011) [7,8]. Observed abundance counts and occurrence patterns as repeated observation of the open populations can therefore be defined based on equations and allow the estimation of equation parameters (i.e. model parameters) through MLE [7,8]. For each species, we ran four models for abundance data and four models for occurrence data, allowing λ, ϕ, p, p' to be either dependent on treatments, or independent from treatments, with γ and ω taken as constants, regardless of treatment. We ran all models in 'unmarked' package in R (version 0.9-4) [4], using functions 'pcountOpen' and 'colext'. We used a K value of 80 and a constant dynamics structure for all abundance models of all species [4,8].

Estimation of plot-level abundance (aka 'best unbiased predictor' of Ni.t) based on N-mixture models

For each species, we estimated the true plot-level abundance based on the best-performing N-mixture abundance model. If the model indicating a treatment effect on abundance was among the best-performing models, we used it (or the one with lower AIC if there were more than one models) to obtain species response estimates, in the form of the log ratio between the mean plot-level abundance of treatment over that of Control. Otherwise, the species response in abundance would be zero. Estimation of $N_{i.t}$ used the classical integration as outlined in Royle and Dorazio 2008 (p. 138) [3]. We used the mode rather than the mean for abundance estimates; therefore, abundance estimates all took the form of integers.

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BEST-PERFORMING N-MIXTURE ABUNDANCE AND OCCURRENCE MODELS FOR EACH FOCAL SPECIES

Table S5. Best-performing N-mixture and occurrence models (i.e., ΔAIC ≤ 2.0) selected for the thirteen focal species that fitted N-mixture models and the one other focal species that fitted occurrence models.

Species	**Model Category**	**Model Structure**	**ΔAIC**	**Model weight***	**Treatment Effect (over Control)**			
					Treatment	**Mean**	**SE**	**p-value**
BASP	Robust design	λ(TRT).p(·)	0.00	0.6409	Owl – λ	-0.9411	0.5318	0.0768
		λ(·).p(TRT)	1.71	0.2723	**Owl – p**	**-1.4954**	**0.7293**	**0.0403**
BGGN	Robust design	ϕ(TRT).p(·)	0.00	0.6958	**-**	**-**	**-**	**-**
BHCO	Closed	λ(TRT).p(·)	0.00	0.5954	**Hawk – λ**	**-2.1129**	**1.0604**	**0.0463**
					Owl – λ	-2.0078	1.0576	0.0576
		λ(·).p(TRT)	1.42	0.2930	Hawk –p	-2.5118	1.4973	0.0934
					Owl – p	4.6206	2.7442	0.0922
BRTH	Closed	λ-p(·)	0.00	1.0000	-	-	-	-
EABL	Closed	λ(·).p(TRT)	0.00	0.9476	Owl – p	-0.9194	0.5020	0.0670
EATO	Closed	λ(·).p(TRT)	0.00	0.6644	Owl – p	-3.5656	1.9559	0.0683

		λ-p(·)	1.60	0.2982	-	-	-	-
MODO	Robust design	λ(TRT).p(·)	0.00	0.3850	Jay – λ	0.5664	0.3369	0.0928
		λ(·).p(TRT)	0.09	0.3686	-	-	-	-
		λ-p(·)	1.25	0.2058	-	-	-	-
NOCA	Robust design	λ(·).p(TRT)	0.00	0.5553	-	-	-	-
		λ(TRT).p(·)	0.55	0.4229	-	-	-	-
PIWA	Robust design	λ(TRT).p(·)	0.00	0.5983	**Owl – λ**	**-0.7088**	**0.2088**	**0.0007**
		λ(·).p(TRT)	0.86	0.3882	**Owl – p**	**-0.9065**	**0.2847**	**0.0015**
PIWO	Robust design	λ-p(·)	0.00	1.0000	-	-	-	-
RBWO	Robust design	λ-p(·)	0.00	0.7815	-	-	-	-
RHWO	Robust design	λ(TRT)-p(·)	1.50	0.2902	Hawk – λ	0.7272	0.4080	0.0747
					Jay – λ	0.7131	0.3943	0.0705
		λ-p(·)	0.00	0.6147	-	-	-	-
SUTA	Robust design	λ(TRT).p(·)	0.00	0.4314	**Hawk – λ**	**-0.7239**	**0.3534**	**0.0405**
					Owl – λ	**-0.8182**	**0.3316**	**0.0136**
		λ(·).p(TRT)	0.48	0.3400	Hawk – p	-0.8093	0.4145	0.0509

					Owl – p	**-0.9316**	**0.3953**	**0.0184**
		λ-p(·)	1.64	0.1900	-	-	-	-
YTVI	Robust design	λ(·).p(TRT)	0.00	0.3697	Hawk – λ	-1.1572	0.6775	0.0876
					Owl – λ	**-1.3437**	**0.6527**	**0.0395**
		λ-p(·)	0.56	0.2792	-	-	-	-

(Notes: Accepted models within two AIC units from the top model were included, resulting in more than one best-performing models for some species. The table additionally lists effects of individual treatments that had a $P < 0.1$ (Wald test). Significant results of individual treatment effect Wald test ($P < 0.05$) are highlighted in bold. Full name and Latin names of species are provided in the electronic supplementary material, S2.

*: Model weight refers to the weight of each model of all the models that converged and were considered to make biological sense.)

S7 - Electronic Supplementary Material 7

Unexpected responses of focal species to predation risk treatment

Table S6. List of species with unexpected responses (in terms of abundance and/or detection probability) to increased perception of predation risk, based on results in Table S4 (electronic supplementary material, S5).

Species	**Hawk**	**Jay**	**Owl**
BASP	√	√	NA
BGGN	√	√	√
BHCO	NA	√	†
BRTH	√	√	√
EABL	√	-*	NA
EATO	√	√	NA
MODO	√	†	-
NOCA	√	√	√
PIWA	√	√	NA
PIWO	√	-	-
RBWO	√	-	-
RHWO	†	‡	-
SUTA	NA	√	NA
YTVI	NA	√	NA

(Notes: NA: Species that did not display unexpected response.

-: Species that should not be vulnerable to the predation risk in question and that indeed did not exhibit a response.

√: Species that did not respond to perceived predation risk to which they should be vulnerable;

†: Species that responded positively to perceived predation risk to which they should be vulnerable;

‡: Species that responded positively to perceived predation risk to which they should not be vulnerable.

*: EABL was initially thought to not be sensitive to Jay because of the safety of the nest boxes. However, detailed study on its reproduction (Hua et al. in review) suggested strong sensitivity of the species to Jay treatment, probably because the natural cavities EABL uses for nesting under natural situations do not provide sufficient protection from nest predation by the blue jay.)

S8 - Electronic Supplementary Material 8

Effect of treatment on raw counts of plot-level species richness

Figure S2. Effects of playback treatment on the number of focal species on each plot as tallied from field surveys (all eighteen focal species considered). Effects are presented as the log of treatment-level species richness ratio between treatment and Control. This translates into a 17.72% ($\beta = -0.195$, SE = 0.059, $P < 0.001$), 13.06% ($\beta = -0.140$, SE = 0.052, $P < 0.01$) and 15.71% ($\beta = -0.171$, SE = 0.064, $P < 0.01$) reduction in species richness by Hawk, Jay, and Owl treatments, respectively. Graph shows mean ± 1.96 • SE. Double asterisk and triple asterisk indicate a statistical difference from zero at $P < 0.01$ and $P < 0.001$ levels, respectively.