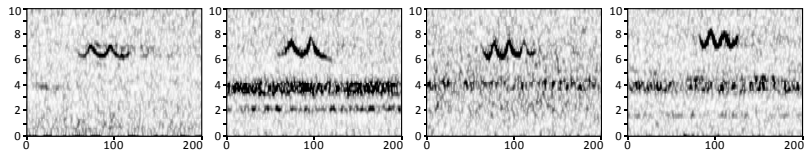
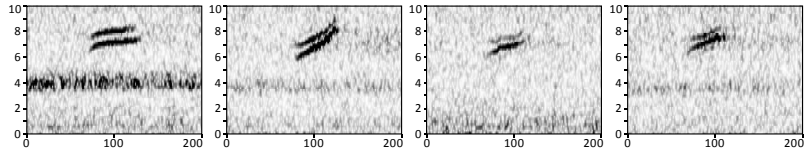
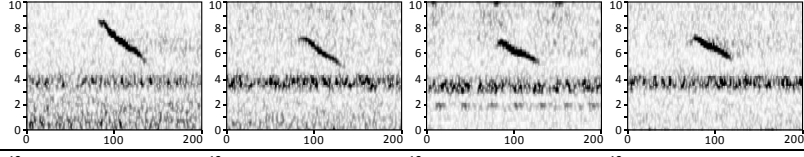
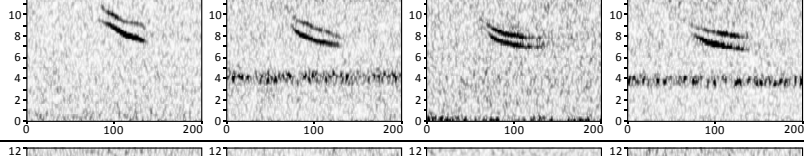
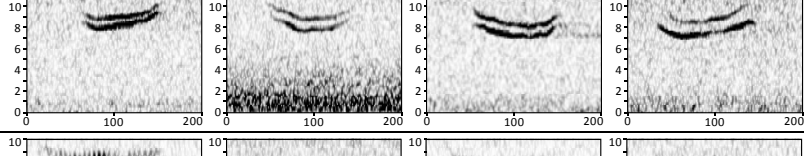
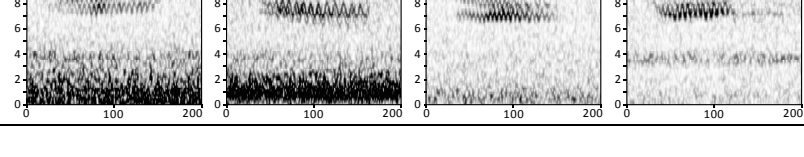
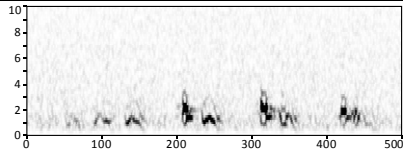
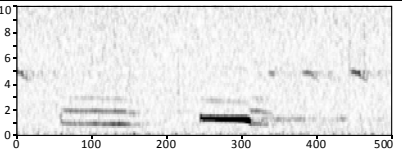
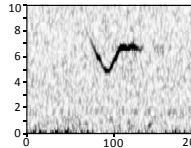
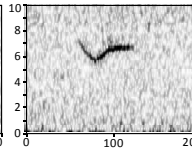
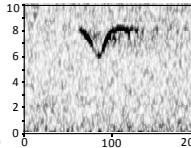
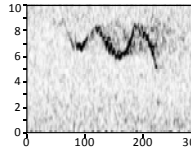
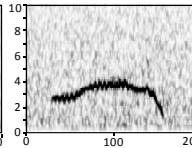
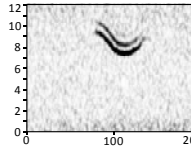
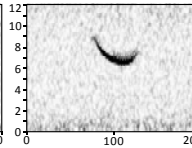
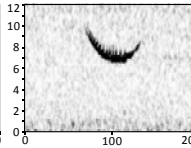
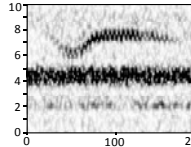
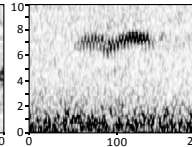
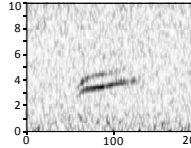
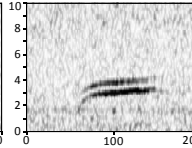
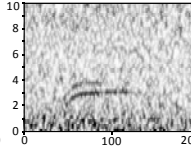
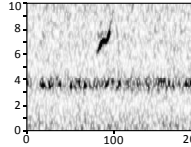
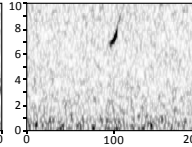
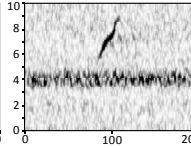
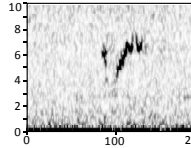
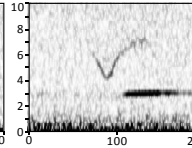


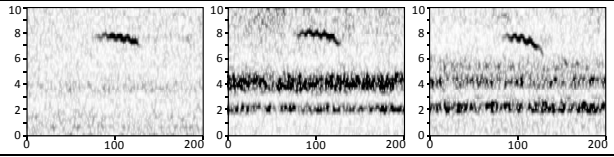
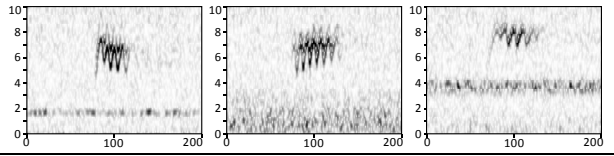
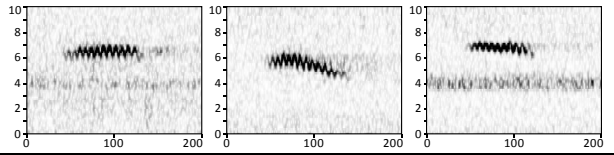
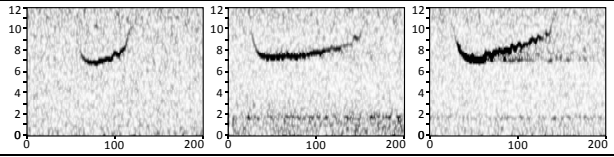
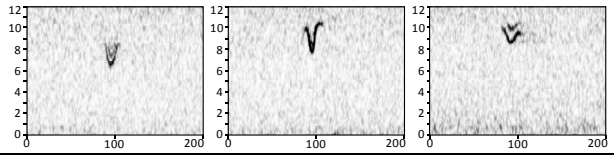
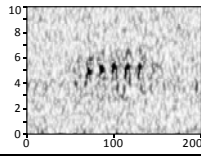
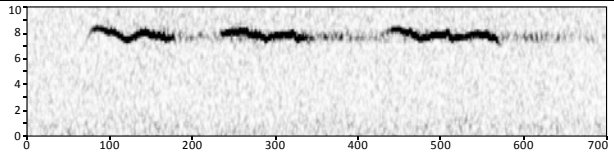
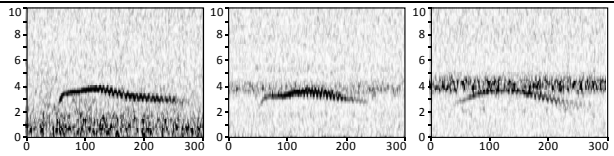
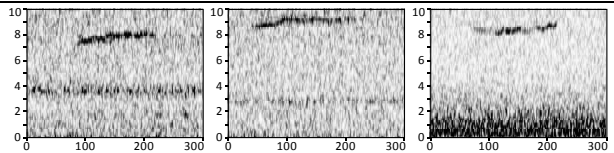
## Appendix for “Acoustic Monitoring of Nocturnally Migrating Birds Accurately Predicts the Timing and Magnitude of Migration Through the Great Lakes”

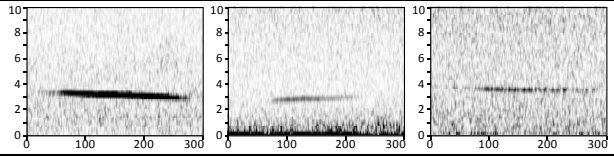
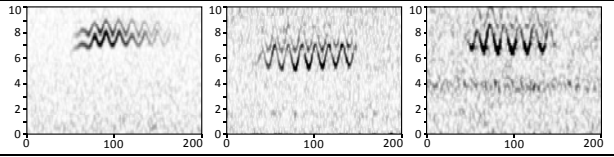
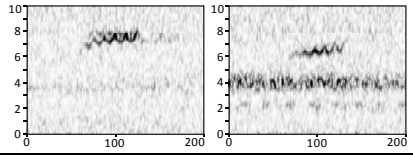
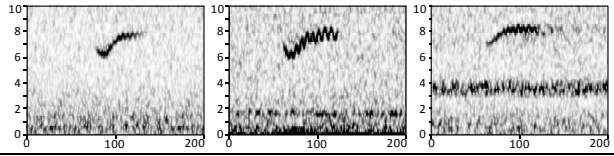
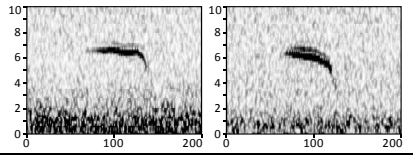
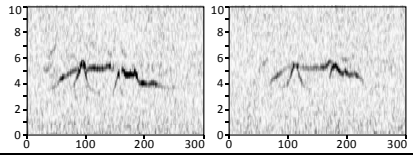
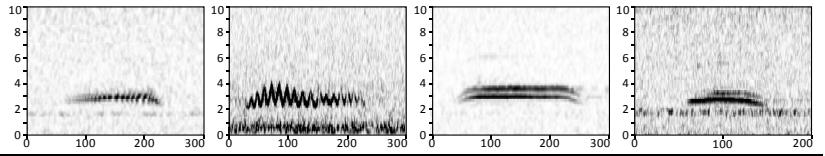
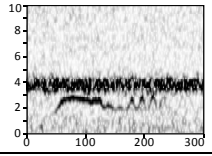
Claire E. Sanders and Daniel J. Mennill

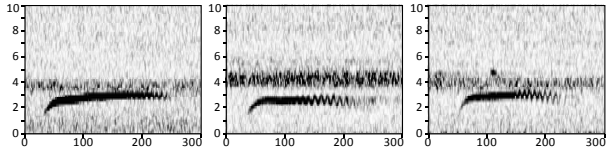
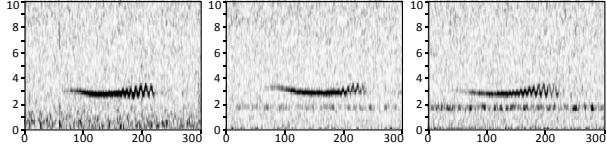
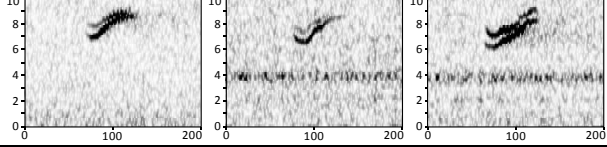
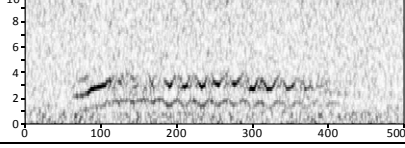
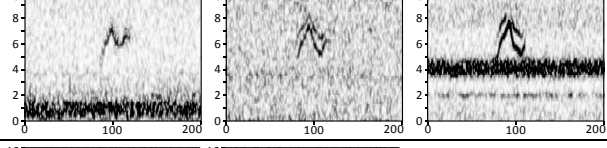
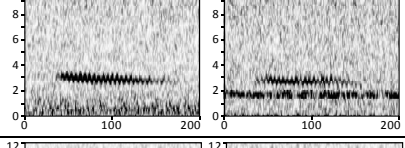
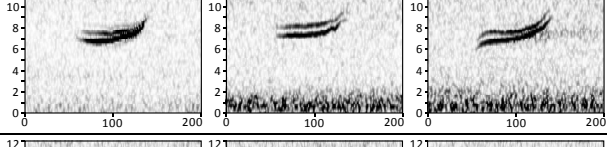
**Appendix 1.** Species classification chart used to assign night flight calls to bioacoustic categories (either multi-species or single-species categories). We constructed this chart using information from the CD-ROM “Flight calls of Migratory Birds: Eastern North American Landbirds” (Evans and O’Brien 2002) and information in Evans and Rosenberg (2000). For each bioacoustic category we indicate the species thought to produce that call, a description of the sound as it appears on a spectrogram, our broad categorization of whether it is “high” (above 5 kHz) or “low” (below 5 kHz), the typical length of the call, the total number of detections in our dataset from recordings in spring and fall of 2012, and one or more sound spectrograms. Spectrograms were generated in Syrinx-PC (J. Burt, Seattle, WA) with settings 256 FFT size, Blackman window; for all spectrograms the x-axis is in milliseconds and the y-axis is in kHz (with a maximum of either 10 or 12 kHz). Note that many spectrograms include a dark horizontal band of insect noise.

Bioacoustic category	Species	Description of sound	High or low	Typical length (ms)	Number acoustic detections	Examples from our recordings
<b>Zeep</b>	Bay-breasted Warbler, Blackburnian Warbler, Blackpoll Warbler, Cerulean Warbler, Connecticut Warbler, Louisiana Waterthrush, Magnolia Warbler, Worm-eating Warbler, Yellow Warbler	Short, wave-like frequency undulations with 2-6 peaks	High	60	4135	
<b>Up</b>	Tennessee Warbler, Nashville Warbler, Black-throated Green Warbler, Orange-crowned Warbler, Mourning Warbler, Yellow-rumped Warbler, Vesper Sparrow, White-crowned Sparrow, Ovenbird	Short up-sweep, sometimes with a pronounced harmonic and small, rapid frequency undulations	High	30-50	8465	
<b>Single Down-sweep</b>	Northern Parula, Pine Warbler	Short down-sweep	High	50	833	
<b>Double Down-sweep</b>	Savannah Sparrow, Field Sparrow	Longer down-sweep with pronounced harmonic	High	100	4919	
<b>FOSP/ SOSP</b>	Fox Sparrow, Song Sparrow	Long shallow “U” shape often with one harmonic	High	120	1690	
<b>LISP/ SWSP</b>	Swamp Sparrow, Lincoln's Sparrow	Long, flat tremolo with tight harmonic	High	150	163	

<b>Cuckoo</b>	Black-billed Cuckoo, Yellow-billed Cuckoo	Low "clack" or low "kow" with harmonic(s) given repeatedly; recalls daytime calls	Low	110	66			
<b>AMBI</b>	American Bittern	Low block of noise	Low	160	0	<i>None detected</i>		
<b>AMPI</b>	American Pipit	Lightning-bolt shaped down-sweep	Mid	70	0	<i>None detected</i>		
<b>AMRE</b>	American Redstart	Short "V" shape with a tail at the end, often with small, rapid frequency undulations in tail	High	75	663			
<b>AMRO</b>	American Robin	Type 1: Deeply-modulated tremolo with 2-4 peaks; Type 2: Low hump with many small, rapid frequency modulations	1: High 2: Low	1:200 2:200	57			
<b>ATSP</b>	American Tree Sparrow	Backwards "J" with down-sweep taller than up-sweep, sometimes with harmonic	High	50	360			
<b>BAWW</b>	Black and White Warbler	Shallow "V" shape that levels off at end; composed of very rapid frequency undulations creating a blurred appearance	High	75	42			
<b>BLGR</b>	Blue Grosbeak	Long "zeep" with six to eight peaks, with a harmonic	High	110	0	<i>None detected</i>		
<b>BITH</b>	Bicknell's Thrush	Pronounced up-sweep to declining frequency undulations	Low	200	0	<i>None detected</i>		
<b>BOBO</b>	Bobolink	Up-sweep with one or more harmonics	Low	90	75			
<b>BTBW</b>	Black-throated Blue Warbler	Very short up-sweep with a subtle inflection point in the middle	High	30	160			
<b>CAWA</b>	Canada Warbler	Distinctive wavy "V" with a short down-sweep and a broader up-sweep with several frequency undulations	High	40	27			

<b>CMWA</b>	Cape May Warbler	Gentle down-sweep consisting of slow frequency undulations with 3-5 peaks	High	50	146	
<b>COYE</b>	Common Yellowthroat	Longer "zeep" with broad frequency undulations with 3-7 peaks (usually 5 or 6)	High	60	249	
<b>CSWA</b>	Chestnut-sided Warbler	Long flat tremolo (can have slight up or down sweep)	High	75	263	
<b>CHSP</b>	Chipping Sparrow	Long "U" with Frequency undulations on the upsweep	High	90	2353	
<b>DEJU</b>	Dark-eyed Junco	Tiny, high "V" shape, often given repeatedly	High	20	157	
<b>DICK</b>	Dickcissel	Series of 7-10 inverted "V" shapes in quick succession	Mid	120	1	
<b>GCKI</b>	Golden-crowned Kinglet	Series of usually 3 notes, each with subtle frequency undulations with 1 to 3 peaks	High	150	187	
<b>GCTH</b>	Gray-cheeked Thrush	Begins with significant upsweep to slight, declining, rapid tremolo	Low	200	388	
<b>GRSP</b>	Grasshopper Sparrow	High, flat, long tone with subtle frequency undulations	High	150	40	

<b>HETH</b>	Hermit Thrush	Long, low, flat tone	Low	300	312	
<b>HOWA</b>	Hooded Warbler	Flat or slightly dipped tremolo with six to eight peaks	High	50	10	<i>Poor quality spectrogram</i>
<b>INBU</b>	Indigo Bunting	Long “zeep” with 8-10 peaks, usually with a harmonic	High	100	199	
<b>NOWA</b>	Northern Waterthrush	Slightly upswept tremolo usually with tight harmonic	High	75	85	
<b>OVEN</b>	Ovenbird	Checkmark shape (sometimes without short down-slope at start) made of rapid frequency undulations	High	70	420	
<b>PAWA</b>	Palm Warbler	Short, flat note with down-sweep at end, often with tight harmonic	High	60	428	
<b>PISI</b>	Pine Siskin	Distinctive series of notes with low double peak; may represent a “two voice” call	Mid	200	27	
<b>RBGR</b>	Rose-breasted Grosbeak	Low tremolo or low note with harmonic	Low	200	83	
<b>RCKI</b>	Ruby-crowned Kinglet	Short harmonic stack with wide frequency range	Mid	25	0	<i>None detected</i>
<b>RHWO</b>	Red-headed Woodpecker	Long harmonic stack with some modulation	Low	250	0	<i>None detected</i>
<b>SCTA</b>	Scarlet Tanager	Slightly curved tone terminating with frequency undulations	Low	150	23	

<b>SWTH</b>	Swainson's Thrush	Rapid upsweep levels off at a flat section with tremolo growing increasingly modulated at end	Low	200	9286	
<b>VEER</b>	Veery	Very slight down-sweep or flat note with tremolo growing increasingly modulated at end	Low	200	790	
<b>VESP</b>	Vesper Sparrow	Shallow checkmark with moderate tremolo and harmonic	High	85	52	
<b>VIRA</b>	Virginia Rail	Long, low frequency undulations with harmonic	Low	200	20	
<b>WIWA</b>	Wilson's Warbler	"N" shape with long initial up-sweep and short terminal up-sweep; usually with a harmonic	High	45	51	
<b>WOTH</b>	Wood Thrush	Long flat note with rapid frequency undulations	Low	200	119	
<b>WCSP</b>	White-crowned Sparrow	Gentle upsweep with harmonic	High	60	636	
<b>WTSP</b>	White-throated Sparrow	Slight down-sweep followed by 3 - 5 frequency undulations, with tight harmonic	High	140	7437	