

## APPENDIX P.7

### Avian Acoustical Study Report

# **2008 Acoustic Study of Avian Night Migration on Big Galloo Island**

## **Prepared for:**

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## Summary

A single acoustic station was operated on Big Galloo Island, NY during the spring and fall migration periods of 2008. The study documented avian flight calls from the lower stratum of the atmosphere (< 700 m) for 10 hours a night beginning around sunset. 28 nights from the spring period and 20 nights from the fall period are presented in this report.

The data revealed flight calls of two cryptic species that are difficult to detect in diurnal surveys, and which were not detected in other avian surveys on Big Galloo in 2008: Common Moorhen and Least Bittern.

The vast majority of flight calls detected were from night migrating songbirds. Analysis of their flight calls indicated a typical species composition and seasonal timing as have been detected from other acoustic stations from in Upstate NY.

Over 4000 warbler and sparrow calls were logged during the 20-night fall study period. Over 5000 such calls were documented at two similar acoustic stations on the mainland (Cape Vincent Peninsula & Maple Ridge wind project) during the same period. This data is suggestive, but not conclusive, that songbird migration over Big Galloo in fall migration is of somewhat lower density than over the mainland.

The trend of night-to-night variations in flight calling detected at the acoustic station on Big Galloo was positively correlated with that documented on the Cape Vincent Peninsula but was poorly correlated to the nightly flight calling pattern at Maple Ridge.

The data from the Old Bird acoustic study suggests that there is gull activity over Big Galloo all night long during the breeding season, and that it increases substantially toward dusk and dawn. This data along with the altitude and passage rate data from the diurnal movement study (Old Bird, Inc. 2008c) indicates that gulls would make a substantial contribution to the passage rate and flight altitude of targets documented in the Stantec spring radar study.

## Introduction

Old Bird, Inc. contributed an acoustic study of nocturnal bird migration to the Bird and Bat Workplan for the Hounsfield wind energy project (Old Bird, Inc. 2007). Such studies document the night flight calls of birds during their nocturnal migrations or local night flights. The method is currently the only way to obtain detailed species information of the bird species actively flying in airspace at night.

The primary purpose of this study was to provide additional information that might be useful for the avian risk assessment for the project. The audio recordings proved useful in documenting the presence of cryptic species that are difficult to detect during diurnal surveys. In addition, acoustic data was used as an independent index of nocturnal flight activity for comparison with the nocturnal radar study data, and to provide an index for comparison with nocturnal migration on the mainland. Acoustic data also documented gull and tern calling during the night to document their flight activity over the island.

## Methods

A single audio recording station was operated during spring and fall migration 2008 on the east-central portion of the island (Fig. 1). The recording stations consisted of a



**Fig. 1. Locations of acoustic recording stations on Big Galloo Island in 2008. The blue circle is the site of the spring migration station. The red circle is the site of the fall migration station. Diameter of circles indicates the approximate lateral range of sensitivity for detecting small songbird (e.g., warbler & sparrow) night flight calls.**

skyward-facing microphone with a Knowles EK3029c element (see design at [www.oldbird.org/mike\\_home.htm](http://www.oldbird.org/mike_home.htm)), audio cable, preamplifier, and laptop computer. Each microphone was angled approximately 10 degrees from the vertical toward the west in order to help dispel rainwater. The station sampled calling in the lower stratum of the atmosphere. Estimated vertical range of bird call detection for this system is roughly 300 m for most warbler and sparrow calls and at least 600 m for thrushes (Evans 2000). Precise range is not critical as the data gathered is used for relative comparison. For example, comparison of a station's own night-to-night calling totals or with data from other similar acoustic stations.

The audio recordings were programmed to begin automatically around sunset and operate for at least 10 hours (all times in this report are Eastern Daylight Time). In spring, recording began on the night of April 14 and continued through June 1. In fall, recording began on the night of August 7 and continued through October 7. The station was unmanned and only checked periodically. The fall station site was moved from the spring site in order to reduce ambient insect noise.

Birdcalls were extracted with software developed by Old Bird, Inc. (<http://www.oldbird.org/analysis.htm>). The *Tseep* program was used to extract calls in the 6-10kHz range, which includes most of the vocal warbler (*parulidae*) and sparrow (*emberizidae*) species that migrate over the region. The *Thrush* program was used to extract calls in the 2.8-5 kHz range, which includes all the thrush (*turdidae*) species that migrate over the region plus a wide range of other species. Once the call extraction software was run, bird calls were manually separated from false detections and classified into species categories using Old Bird's software, *GlassOfFire*. The reference guide to flight call identification by Evans and O'Brien (2002) was used for species identifications. Warbler and sparrow calls were totaled for each evening. Thrush calls were also totaled for each evening.

## Results

20 nights of data for the spring study period and 28 for fall study period are presented in this report. The nights are not consecutive because some nights were missed due to power supply problems or because of frog or insect noise contamination.

In the 48 nights analyzed during spring and fall migration, two species were detected that were not documented during other avian surveys in 2008. A Common Moorhen was detected vocalizing in low flight at about 11PM on the night of May 16<sup>th</sup> and a Least Bittern was detected vocalizing at about 1AM on the morning of May 17<sup>th</sup>. In addition, flight calls of Virginia Rail (late May), Black-crowned Night Heron (numerous), Upland Sandpiper and Common Nighthawk (late May) are noteworthy.

Detections of small passerine flight calls indicated a typical species composition and temporal progression as other acoustic stations have shown in Upstate NY. Figs. 2 & 3 show the quantity of warbler and sparrow flight calls compared with that of thrushes

detected in the spring and fall data.<sup>1</sup> So, for example in Fig. 2 one can see that the primary thrush flight activity, which is composed of migratory *Catharus* thrush species, occurred in the latter half of May. This is a typical pattern for Upstate New York. The night with the greatest calling for both species groups was May 14-15.

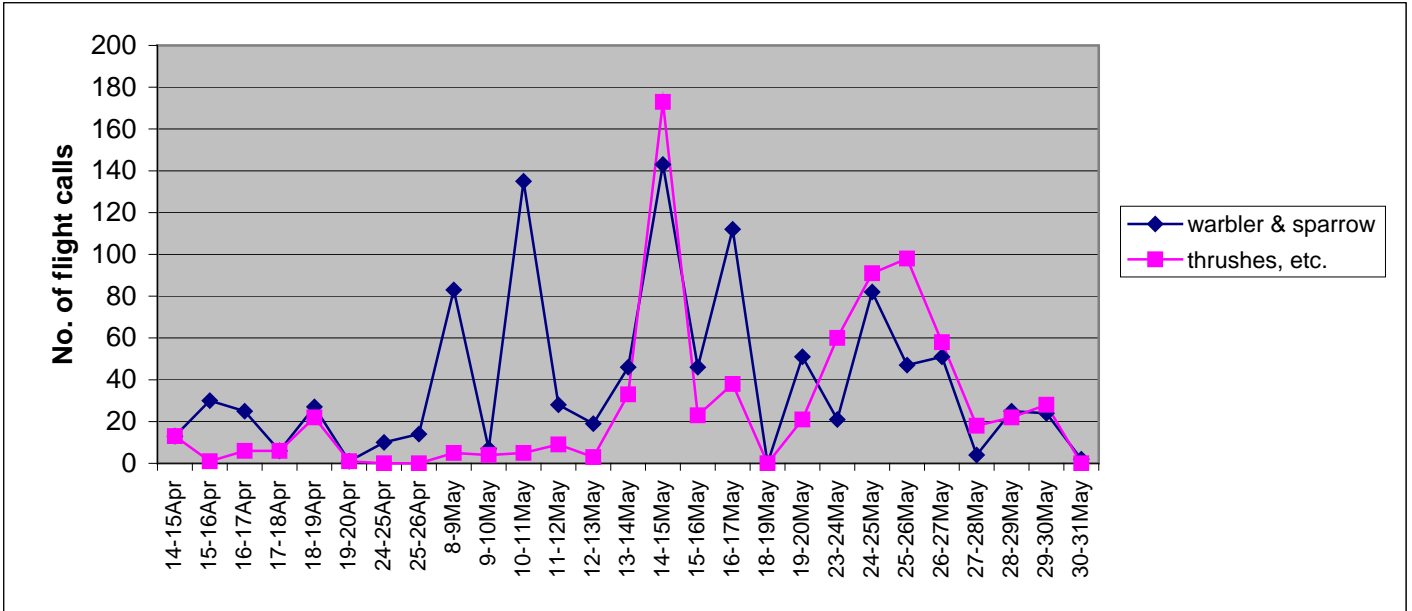


Fig. 2. Nightly totals of warbler and sparrow flight calls and thrush flight calls from the spring 2008 acoustic data.

Fig. 2 and Fig. 3 show that night migrations of these species groups are episodic events often separate by multiple nights of little migration activity. For example, Fig. 3 shows that in the continuous nightly sampling of 12 nights between Sep 19-30 there were only two large flight nights indicated for these species (Sep 21-20; Sep 28-29).

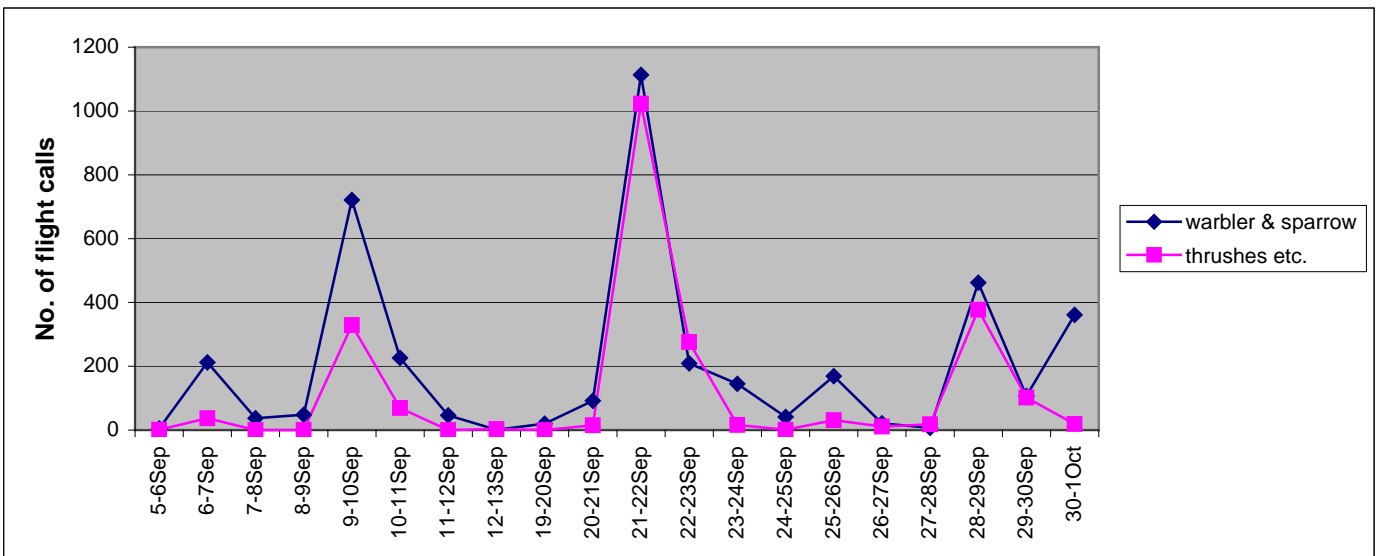
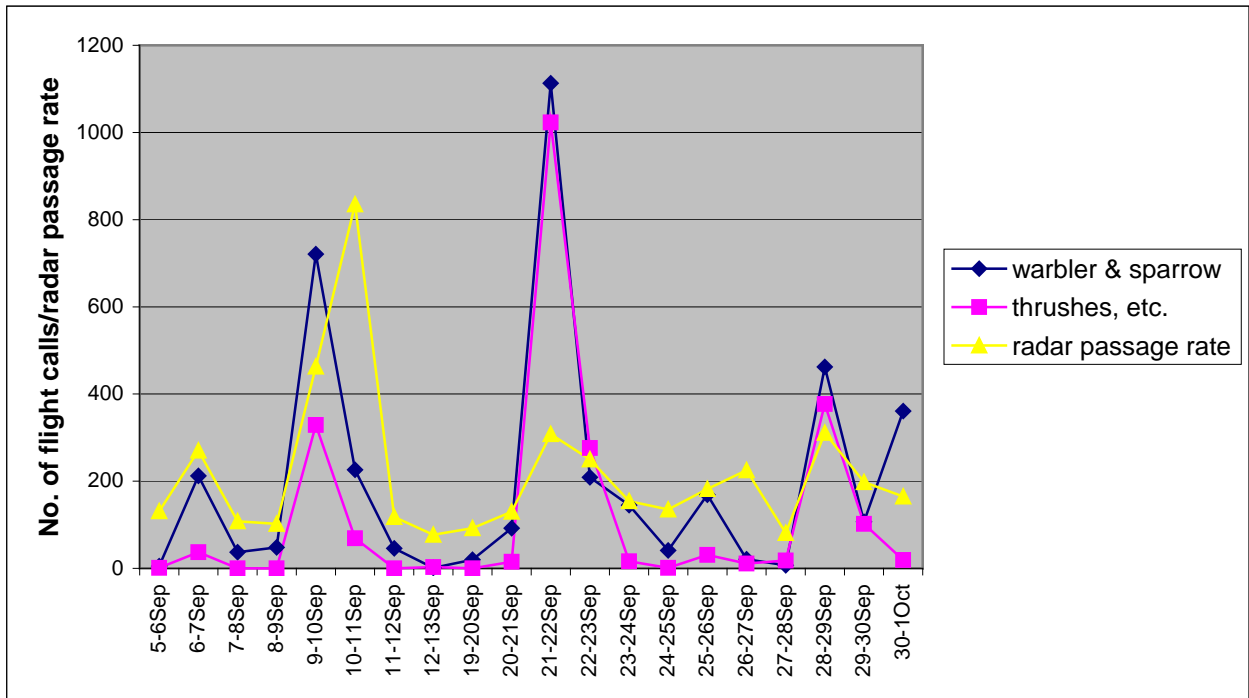


Fig. 3. Nightly totals of warbler and sparrow flight calls and thrush flight calls from the fall 2008 acoustic data.

<sup>1</sup> Note that the thrush data is predominantly species of *Catharus* thrushes, but species other than thrushes are included in this category.

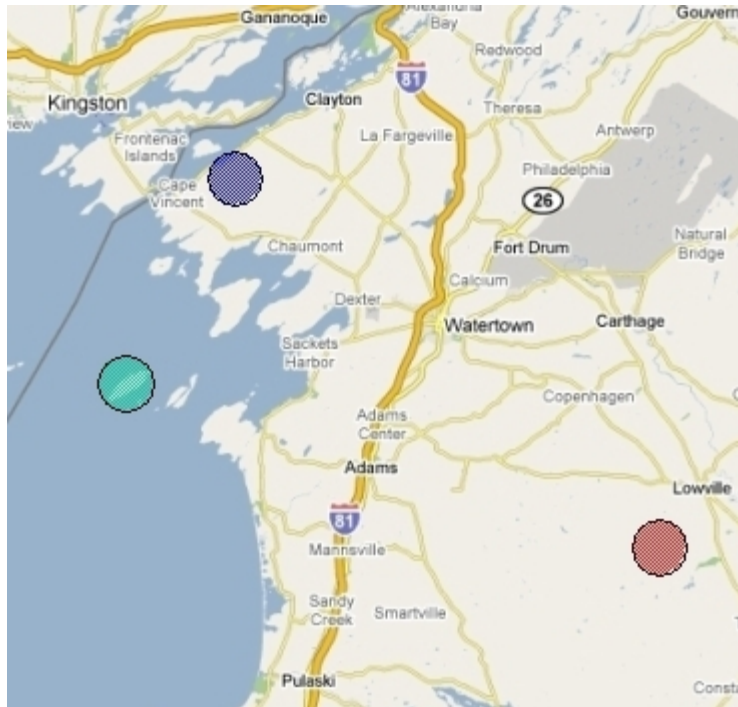
The spring flight call data did not correspond well with the nightly target passage rate data reported in the Stantec radar study on Big Galloo (Stantec 2008a). The fall flight call data showed better correlation with the Stantec study (Stantec 2008b) but there were discordant nights that stand out (see Fig. 4). For example, the highest number of flight calls documented was on the night of Sep 21-22. The radar passage rate for that night indicated a jump in activity but not as high as one might expect. Also, the night of September 10-11 shows the highest radar passage rate in this period but the acoustic data does not correspond.



**Fig. 4. Fall nightly Big Galloo calling totals along with Stantec’s nightly radar passage rate data in targets/km/hour.**

Table 1 shows nightly warbler and sparrow flight call totals from the Big Galloo acoustic station compared to two acoustic stations that were operating simultaneously on the mainland. One was on the Cape Vincent Peninsula and the other was within the Maple Ridge wind project. Fig. 5 shows their approximate locations with respect to one another. For the 20-night period shown in Table 1 when all three stations operated, the Cape Vincent station had the most calling with 5151. The Maple Ridge station had 5010 and the Big Galloo station had 4043, about 20% fewer than the other two.

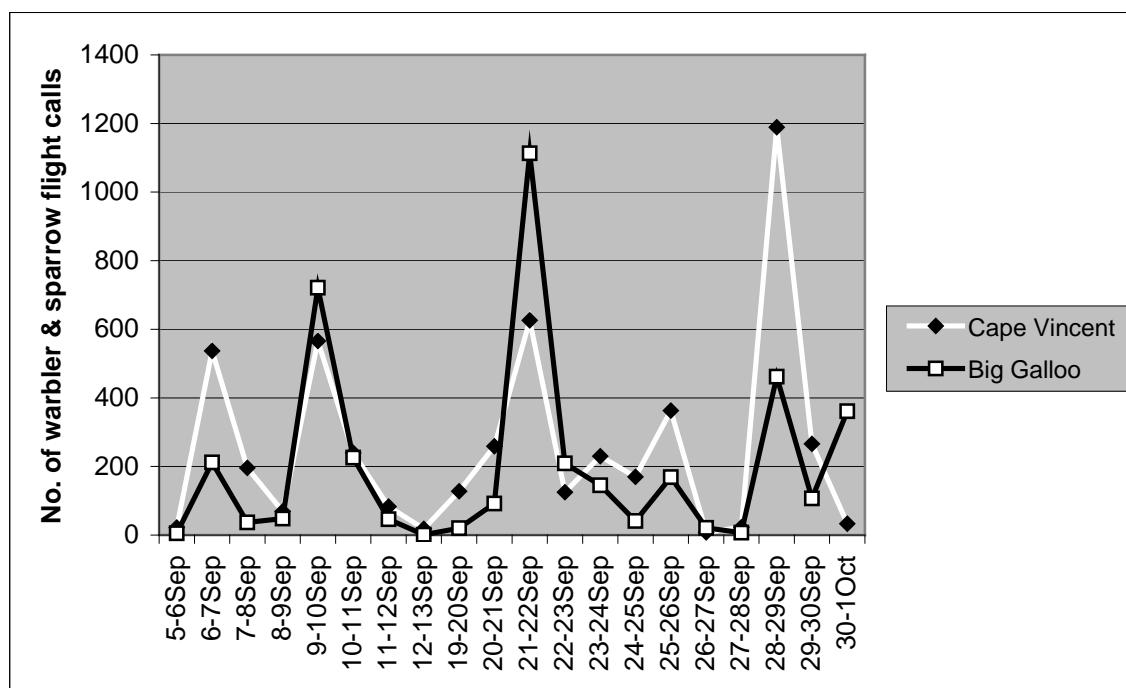
While the Cape Vincent station logged more calling than Big Galloo, their night-to-night variations in calling volume were positively correlated (Spearman’s Rank Coefficient 0.75). Fig. 6 shows a graph of the night-to-night variation in calling between Cape Vincent and Big Galloo where this correlation can be seen. The variations in the nightly call totals from the Maple Ridge acoustic station did not show good correlation with either of the other two stations.



**Fig. 6. Locations of acoustic monitoring stations in fall 2008. Green circle is the Big Galloo acoustic station, the blue circle is the Cape Vincent station, and the red circle is Maple Ridge station.**

**TABLE 1. Warbler & sparrow flight call totals for three acoustic stations in northern NY in fall 2008. CV is Cape Vincent, BG is Big Galloo, and MR is Maple Ridge.**

DATE	CV	BG	MR
5-6Sep	22	5	527
6-7Sep	537	212	314
7-8Sep	196	37	436
8-9Sep	69	48	343
9-10Sep	566	721	506
10-11Sep	240	226	230
11-12Sep	83	46	105
12-13Sep	18	1	15
19-20Sep	128	20	105
20-21Sep	259	92	277
21-22Sep	626	1113	626
22-23Sep	125	209	132
23-24Sep	230	145	154
24-25Sep	170	41	420
25-26Sep	363	169	265
26-27Sep	8	21	72
27-28Sep	23	7	168
28-29Sep	1189	462	104
29-30Sep	266	107	170
30-1Oct	33	361	41
<b>TOTALS</b>	<b>5151</b>	<b>4043</b>	<b>5010</b>



**Fig. 6. Fall nightly call totals from an acoustic station on Big Galloo Island and another on the Cape Vincent Peninsula.**

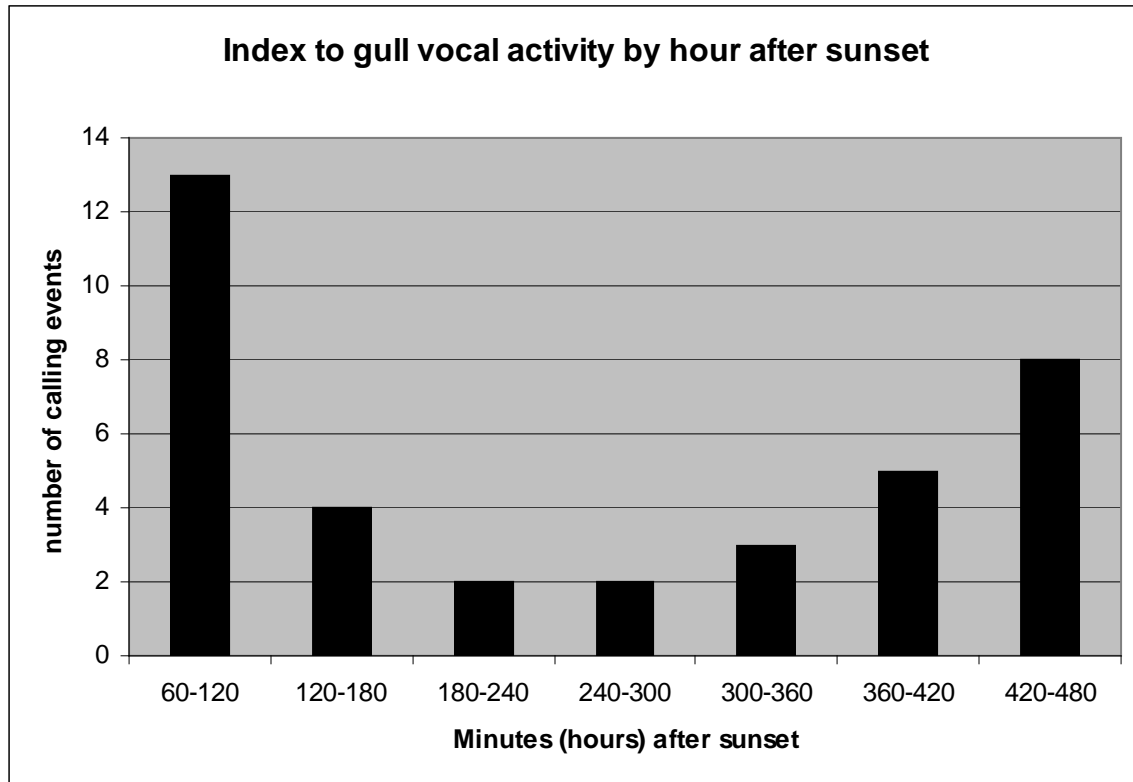
Perhaps the greatest utility of this acoustic monitoring study for the pre-construction avian risk assessment for the Hounsfield wind energy project was the acoustic data on gull vocalizations. Fig. 7 shows gull vocal activity detected from the acoustic station during the spring study period. The acoustic station picked up the weak continuous din of bird vocalizations from Little Galloo during calm-wind nights and it also documented loud transient calls of gulls flying over its location. It is the latter activity that is shown in Fig. 7.

Typically, a vocally-active individual gull (or group of gulls) flying over would call and be detected calling more than once by the acoustic monitoring station. A gull acoustic incident (as shown in Fig. 7) is one or more such proximal gull calls that are separated by other gull calls by at least 2 minutes (before & after a calling series). A gull calling incident therefore may represent one or multiple gulls and multiple calls. During the day, many gulls were seen passing over Big Galloo without vocalizing. This silent flight behavior likely occurs during the night as well. Fig. 7 is only a vocal activity index and it is unknown to what extent it also reflects the passage of gulls that do not vocalize.

37 such gull acoustic incidences were logged in 216 hours of monitoring during the second through eighth hour after sunset in the 27 spring study nights (nights of April 14-April 19; May 8-19; May 23-31). The first hour after sunset (0-60) along with the ninth hour (480-540) and tenth hour (540-600) are not shown in Fig. 7 because those hours contained many vocalizing birds in the dusk and dawn bird choruses and gull calls were more difficult to document with automatic bird call detection software. However, gull vocalizations were present in those hours and from the diurnal movement study (Old Bird

2008c) it is known that gulls were frequently crossing the island in the first and tenth hours after sunset.

Caspian Tern vocalizations were only noted on two occasions during this same 216-hour period.



**Fig. 7.** Shows the number of incidents of acoustic gull detections per hour (shown in minutes) after sunset. The data is cumulative for 27 nights of acoustic recording (nights of April 14-April 19; May 8-19; May 23-31). These were the only nights when acoustic data was successfully acquired on Big Galloo in spring 2008.

## Discussion

With regard to the cryptic species detected in this acoustic study, Common Moorhen flight calls are not typically detected in their night migrations over Upstate NY. Their flight calls at night in NY are more often detected on or near their breeding ground or in the vicinity of a water body where they are staging during migration. This species was not seen during the 2008 breeding bird survey on the island (Old Bird, Inc. 2008b) and there are only a few locations where it might breed on the island (which were all thoroughly surveyed). It seems likely that this was a migrant flying over the island at low-altitude, calling to perhaps seek a response from others of its species. The 11PM time of the call does not suggest the bird had been residing on the island but rather that it had taken flight from somewhere along the south shore of Lake Ontario earlier in the evening.

The Least Bittern is listed as a NY threatened bird, but flight calls of this species have been regularly documented in small numbers in acoustic studies all across Upstate NY.

This Big Galloo record does not carry with it any significant implications for impact to this species relative to other wind project sites in Upstate NY.

In general, the rates of small passerine flight calling detected on Big Galloo in spring and fall 2008 are comparable to those detected in other studies in Upstate NY in other years. The simultaneous fall data from the mainland is notably larger (20%) but there are numerous variables that affect flight calling besides bird migration density. It is interesting that the comparative radar study data discussed in the avian risk assessment for the Hounsfield wind project (Old Bird Inc. 2008e) also indicated a trend toward higher target passage rates (presumably small passerines) on the mainland. Theoretically, this should be expected because there are no small landbirds taking off for night migration from Lake Ontario to contribute to the nocturnal bird flight over Big Galloo. This gap in numbers due to Lake Ontario would be expected to be greater in spring than fall because of the greater length of water involved in spring (i.e., distance of Big Galloo to Rochester, NY versus Big Galloo to Kingston, ON). However, there was no acoustic data from the mainland in spring 2008 with which to compare with the spring acoustic data gathered on Big Galloo. Also, not well studied is the proclivity for some small passerines (e.g., Nashville Warbler) to course around the lake instead of flying over it, especially in specific weather conditions. Theoretically, any such behavior would also contribute to there being less small passerine migration over Big Galloo versus the mainland, and hence less flight calling over Big Galloo.

The calling comparison between the mainland acoustic stations shows good correlation between the two closest stations, Big Galloo and Cape Vincent, which are about 28 km apart and in line with the overall southwesterly directional trend of fall migration. In other words, there is a stronger likelihood that that same birds might pass over both these stations. The Maple Ridge station was over 70 km east-southeast of the Big Galloo and, therefore perhaps more likely to have a unique migration density pattern, and less likely to have the same birds passing over as either Big Galloo or Cape Vincent.

While there may often be general correlation between acoustic and radar data, for example on nights when there is no migration occurring, there are many reasons why such correlation should not be expected. The reason why the spring radar data showed poor correlation with the acoustic data is likely due to the fact that the spring radar data included significant transit of gulls, which does not vocalize much in flight (Evans, pers. obs. made during Diurnal Movement Study – Old Bird, Inc. 2008c). In the cases where specific nights in fall migration showed poor radar and acoustic correlation (e.g., Sep 10-11; Sep 21-22), there are several potential reasons for the lack of correlation. For example, not all bird species vocalize regularly in their night migrations. Some night migration events may contain higher proportions of these non-vocal species than other nights. Similarly, some nights may have higher proportions of migratory bats, which would be detected by radar but not by the avian acoustic monitoring system. The comparative acoustic and radar data are presented in this report for the reader's reference as potentially indicative of one of the events mentioned above.

The data from the Old Bird acoustic study suggests that there is gull activity over the island all night long, but that it increases substantially toward dusk and dawn. This data along with the altitude and passage rate data from the Diurnal Movement Study (Old

Bird, Inc. 2008c) indicates that gulls make a substantial contribution to the passage rate and flight altitude of targets documented in the Stantec spring radar study. Stantec could not quantify this gull contribution because their radar system does not enable reliable separation of species groups such as gulls and small passerines. The crepuscular gull passage rates documented from points 4 & 5 in the Diurnal Movement Study (i.e., gulls that would have been in range of the radar) show that gulls could have contributed hundreds of targets per hour to the radar data at dawn and dusk.

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