RADAR MONITORING OF BIRD AND BAT MOVEMENT PATTERNS ON MONHEGAN ISLAND, MAINE AND ITS COASTAL WATERS

FINAL REPORT

Submitted to
University of Maine
DeepC Wind Consortium

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4 November 2013

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1.0 INTRODUCTION

As the demand for renewable sources of energy continues to increase in the United States, so too will the need for a better understanding of how these rapidly growing sectors impact wildlife populations. For example, the use of wind resources to produce energy commercially in the U.S. started in the early 1980's and has grown exponentially as an industry. By the end of 2009, 36 states had operational, utility-scale wind facilities, with the U.S. containing approximately 20% of wind capacity worldwide (AWEA 2012). The construction of wind power facilities expanded at an even greater pace in subsequent years, with more than double the wind-power capacity installed in the first quarter of 2011 than in the first quarter of 2010 (AWEA 2012). The average height and size of wind turbines have also increased over time (Wiser and Bolinger 2008). These developments have led to concern about potential negative impacts of wind power development on wildlife and their habitats, particularly migratory birds and bats, and have prompted calls for the development of standard guidelines for identifying, assessing, and monitoring those potential impacts (USFWS 2012).

Over the last two decades, construction of tall structures (e.g., digital television towers, wind turbines, cellular phone towers) that penetrate the lower strata of the atmosphere (i.e., up to 1000 feet) has increased at a rapid rate (Shire et al. 2000, National Research Council 2007). Demands for improved communications capabilities and alternative energy have spurred this growth, not only in the number of tall structures, but also their overall height.

Several studies have documented significant bird mortality at tall communication towers (Crawford, 1981, Kemper 1996) and the USFWS estimates that between four and five million birds may be killed each year from colliding with tall structures (Manville 2000). Studies conducted at wind power projects in different regions, sited in different habitat types and with varying configurations, indicate that the potential for collision incidents between aerial vertebrate biota (i.e., birds, bats) and wind turbines exists (e.g., Orloff and Flannery 1992, Johnson et al. 2002, Kerns and Kerlinger 2004, Fiedler et al. 2007, *cf* citations in Arnett et al. 2008) to varying degrees, but most frequently involves nocturnally migrating passerines and bats (Kunz et al. 2007). Other structures that penetrate the air space used by aerial vertebrates, such as buildings and power lines also are known to cause mortality during episodic migration events (*cf* citations in Erickson et al. 2005 regarding bird mortality).

Indices of bird and bat flight dynamics (e.g., movement magnitude, altitude of flight, direction) are critical for evaluating the potential risk that tall structures (e.g., wind turbines, communication towers, buildings, bridges) pose to aerial vertebrate biota. Regulatory agencies, natural resource managers and developers require this information to compare relative risk of tall structures, especially when they are proposed for areas known to support high densities of birds or bats. Additionally, stakeholders require information about other locations so that comparisons among sites can be made and characteristics of the specific site slated for development can be evaluated in a relevant context.

As with any large structures on the landscape, whether terrestrial or marine, wind turbines can be hazardous to flying organisms (see review in Kuvlesky et al. 2007). Negative impacts to bats, for example, have been documented in several post-construction studies in the United States (Johnson et al. 2002, Arnett et al. 2008, Piorkowksi et al. 2012) and Europe (Rydell et al. 2010). Bat mortality at wind farms can be caused by collision with moving or stationary blades (Johnson et al. 2002, Cryan and Barclay 2009), or barotraumas (i.e., rapid decompression) near moving blades (Baerwald et al. 2008). In some cases, bats may be attracted to wind turbines (Horn et al. 2008). Large raptors also appear to be susceptible to injury or death by wind turbines (Hunt 2002, Hoover and Morrison 2005, Smallwood and Thelander 2008) and there is also concern about the potential for adverse effects on migratory songbird and shorebird populations (Johnson et al. 2002, Kerlinger et al. 2010). Less is known about the extent of mortality on these groups at wind power developments, but comparisons are difficult to make because of incomplete development of mortality inference methods (Kuvlesky et al. 2007, Smallwood 2007). Although Erickson et al. (2005) suggested that passerine mortality is low at wind power facilities, other studies that collision risk may be at especially high for this group (Osborn et al. 2000, Mabee et al. 2006).

In 2010, New Jersey Audubon (NJA), in collaboration with the University of Maine's DeepC Consortium, undertook a one-year project to assess flight dynamics and movement patterns of aerial vertebrates in the vicinity of Monhegan Island. Radar technology provides information about movement patterns in aerial vertebrates that otherwise could not be acquired. In particular, precise estimates of movement rates, flight altitude and flight direction at night can only be generated using remote sensing technology such as radar. The intent of this work was to provide information that could be used to support decisions regarding possible development of wind resources in the Gulf of Maine. The scientific information presented in this report provides essential biological data that can inform development of resource management policy, and support review processes by federal agencies such as the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers and responsible state agencies in Maine.

1.1 SCOPE OF REPORT

The following report describes the radar study conducted by NJA on Monhegan Island, Lincoln County Maine. Radar technology can provide important information about movement patterns of aerial vertebrates that otherwise could not be acquired conventional techniques (e.g., monitoring of high flying and distant individuals, monitoring at night, accurate estimates of flight altitude). We also present results of data analyses and discussion of these results in the context of collision risk and the findings of other relevant studies. However, several caveats should be considered when evaluating results of this or other similar studies. Because our sampling was limited to a single year, caution should be exercised when extending our results to longer time frames. Interannual variability in temporal patterns of avian migration is well documented (*cf* citations in Alerstam 1990, Berthold 1996). Similarly, we advise caution before applying inferences from this study to other areas or physiographic regions. Our radars were configured to sample relatively small volumes of space compared to the extent migration and other types of bird and bat movement (e.g., post-breeding dispersal, post-fledging dispersal) that likely occurs in Gulf of Maine, and more specifically, the offshore waters in the vicinity of Monhegan Island.

Our inability to distinguish between birds and bats during radar monitoring, or distinguish among species in each of these taxa, also is important to note. Flight behavior (e.g., migration phenology, altitude) of several avian taxa (e.g., passerines) overlap with those reported for bats (Larkin 1991, Bruderer and Boldt 2001, Kunz and Fenton 2003). Consequently, we could not determine the relative contribution of birds or bats in spatial or temporal patterns we observed. Future studies focused on flight dynamics and behavior of migrating birds and bats in the region must include tasks that provide this type of information. Furthermore, that we experienced some detections that were attributable to large-bodied, fast-flying insects (e.g., dragonflies [Order Odonata], moths (Order Lepidoptera]) is important to note. Although we attempted to remove insect contamination through image-processing steps, our inability to remove it completely is certain. To reflect our uncertainty about the identity of aerial vertebrates in our radar data, we refer to entities detected by the radars as "targets," throughout this report. This is a widely used term in radar parlance for any object detected by radar.

Additionally, we use the term "target" rather than "individual" or "flock" because the number of birds or bats represented as single entities by the radar was unknown. Some studies report the ability to distinguish small, medium, large and flock-like targets by evaluating the relative strength or amount of radar return energy. This approach is problematic because inherent physical properties of radar affect the amount of energy reflected by a detected object, the basis by which target size would be evaluated. Distance between target and radar, a target's orientation relative to the radar and the location of a target in the radar beam (i.e., central versus peripheral) are among several characteristics that affect the amount of energy a target reflects. These characteristics influence target detection simultaneously, so can seriously confound target size classifications. Given these difficulties, we classified all detections as single targets. Thus, indices of movement magnitude we report are likely underestimates of the total number of inidividuals passing through the study site and the number that we recorded in any altitudinal strata.

1.2 GOALS AND OBJECTIVES

The goal of this study was to provide an improved understanding of bird and possibly bat movement patterns on Monehgan Island, Maine and its nearshore waters. Specifically, our objectives were to (1) estimate diel and seasonal movement patterns of aerial vertebrates (i.e., birds, bats) traversing Monhegan Island and its coastal waters, (2) estimate altitudinal distributions of bird/bat movements and determine what proportions occur at altitudes deemed a "risk" for collisions with wind turbines (3) determine flight directions of bird/bat "targets" in the study area and (4) investigate how meteorological conditions, both local and meso-scale, affect flight dynamics and behavior.

2.0 METHODS AND STATISTICAL APPROACHES

2.1 RADAR EQUIPMENT AND CONFIGURATION

We used a dual mobile marine radar system to collect data on bird and bat flight dynamics and behavior. This system consisted of two 25 kW Furuno X-band marine radars (frequency = 9410

GHz, wavelength = 3 cm, model # FAR2127BB, Furuno Electric Company, Nishinomiya, Japan) mounted on a trailer 12' long x 6' wide x 8' high (Fig. 1). The radars and all computer equipment connected to them were powered with a single Generac 5853 Quietpact RV generator. The generator was hooked up a series of eight, #100 propane tanks that insured uninterrupted operation.

Typically, our radars are fitted with standard 6.5' open array antennas (Fig. 1, upper), which produce a fan-shaped electromagnetic beam 1.23° wide x 20° high. The antennas rotate simultaneously to monitor various bird/bat flight dynamics and behavior patterns.

In our system, one radar unit operates with a standard 6.5' open array antenna rotating in the vertical plane (i.e., "vertically-oriented radar", Fig. 1). This is accomplished by mounting the radar to the side of the 12' long trailer so that the antenna-turning unit rotates perpendicular to the ground (Fig. 1). The antenna sweeps from horizon to horizon, describing a 180° arc above radar level (arl), 20^{o} wide (Fig. 2). Data collected with the radar antenna in this orientation were used to generate target (i.e., birds, bats) movement estimates and to quantify altitudinal distributions of targets (see Fig. 3 for data image example). The trailer was positioned so that the vertically-oriented radar antenna swept an arc from approximately NW to SE to maximize the unobstructed area sampled and the number of targets detected as aerial vertebrate biota move South to North to North to South during spring and fall migration periods, respectively.

The second radar unit, mounted on the top of the trailer (Fig. 1) operated with a parabolic dish antenna rotating in the horizontal plane (i.e., "horizontally-oriented radar"), describing a 360° arc every 2.5 seconds (Fig. 4). Data collected with the radar in this orientation provided information on flight direction (see Fig. 5 for data image example). We used a parabolic dish for the horizontally-oriented radar rather than an open array antenna, as we do normally, because we experienced persistent and often extensive backscatter of electromagnetic energy from ocean wave action, which dramatically affected the quality of data collected (Fig. 6, upper). On some days, this backscatter was extreme and it occluded the radar's entire view of the sample area over the ocean (Fig. 6, upper). This problem was exacerbated at this site because it was approximately 18 m above sea level.

Although our radars are equipped with the ability to suppress "sea clutter," this finction also attenuates signal strength for all radar reflectors and this is particularly problematic when attempting to detect small targets like birds or bats that reflect relatively small amount of energy. This parabolic dish antenna produces a 4°, conical-shaped electromagnetic beam and our mounting allowed it to be elevated in 2.5° increments above the scanning horizon. With the antenna elevated at 5° above the scanning horizon, we were able to eliminate detection of most ocean-generated, backscattered energy (Fig. 6, lower).

Our radars can be set for detection ranges of 0.125 - 96 nautical miles (nm); however, ranges of ≤ 3 nautical miles are generally the upper limit for detecting bird and bats, depending on their size. For the vertically-oriented radar, we set the range to 1.0 nm (approximately 1900 m) to ensure detection of small passerines that typically migrate at night. We set the horizontally-oriented radar's range to 1.5 nm (approximately 2750 m). Pulse lengths (i.e., rate that electromagnetic energy is transmitted) for our radars can be set from 0.07 - 1.2 μsec. For both

radars, we used a 0.15 μsec pulse length. Short pulse lengths provide better target resolution and more accurate location and distance estimates. Similarly, short detection ranges result in improved resolution of small passerine or bat-sized targets.
The radars we use feature color-coded target representation that indicates return signal strength or "reflectivity." The radar processor unit assigns targets to one of 28 reflectivity categories and its graphics processor unit converts these into 28 distinct color bins. Given our particular settings for the radar units, targets were presented on the viewing monitor as ellipses in shades of green, yellow or red, with green representing the lowest reflectivity values and red representing the highest. This allowed us to discriminate and remove weak reflectors from images that could have been insects or atmospheric particulates. In our analyses, we chose to use only targets with color values associated with the red spectrum (i.e., greatest reflectivity values). This meant that our target passage estimates were conservative, as some of the weaker reflectors in the yellow spectrum and possibly the higher green spectrum values were likely birds or bats. The radar units also are equipped with an integrated global positioning system (GPS) and target-tracking feature that allowed us to determine each target's coordinates and quantify target flight directions.

Each radar's processor unit was connected directly to a computer equipped with a PCI frame grabber circuit board. Using proprietary scheduling software developed by NJAS, we can automatically capture radar image data as bitmap files for any interval and for any duration. During this study we collected data images for five consecutive radar antenna sweeps (i.e., every 2.5 seconds), every 10 minutes, or a maximum of 30 images/hr. We chose 10-minute intervals because we believe this minimized the possibility of double counting targets in consecutive samples. With the radar's range set to 1 nm, a target moving 20 miles/hr would cross the widest part of our sample space (i.e., two nautical miles) in approximately six minutes.

2.2 DATA COLLECTION TIME FRAME AND STUDY SITE

Our radar system collected data from the southern end of Monhegan Island, Lincoln County, ME (Fig. 7, upper) 43°45.494' N, 69° 19.284' W, approximately 18 m above sea level). The island is approximately 41 km SSW of Rockland, Maine and approximately 19 km SSW of Port Clyde, the nearest mainland port and from where the Monhegan ferry runs. The island is approximately 2.5 km long, 1.0 km wide and is oriented NE-SW relative to geographic North. We selected our data collection site because it had the widest, unobstructed view in the direction of the proposed test turbine project site (Fig. 7, lower). The location provided a view of the ocean surface from approximately 170-280° (i.e., S – NW or 110° of arc) for the horizontally-oriented radar. The radar's view of the ocean surface from 0° – 170° (i.e., N – S, or 170° of arc) and from 280° – 0° (i.e., W – NS, or 80° of arc) was occluded by the island itself. However, the radar was able to monitor areas above the ocean surface where the surface itself was occluded. Additionally, several regions of the horizontally-oriented radar's sweep were occluded by trees in close proximity to the radar (Fig. 8).

2.3 DATA PROCESSING AND ANALYSIS

During the study period, we collected data on 361 days from 15 July 2010 – 14 July 2011. To the extent possible, data were collected 24 hours/day on all days during the study period. This resulted in approximately 8664 hours of data/radar during the diurnal (i.e., sunrise to sunset, and nocturnal (i.e., sunset to sunrise the following morning) data collection periods (Table 1). In total, we reviewed approximately 260,000 images/radar for each data collection period (i.e., diurnal, nocturnal). For details of data collection during each season and data collection period (i.e., diurnal, nocturnal), see Appendices 1-10.

We conducted image reviews to determine occurrences of bird/bat movement episodes and identify precipitation events, insect contamination or any other unwanted radar energy propagation. Precipitation and insects typically have distinct characteristics that allow trained observers to distinguish them from bird and bat targets. Data images with precipitation, insect contamination or any other unwanted propagation were removed from subsequent data analyses either using data processing software developed by NJAS or by manually removing images from data sets before analyses. In extreme cases (e.g., continuous rain), we removed entire days or nights of data from analysis when the number of images with contamination was > 50% of the total images collected.

2.3.1 *Vertically-oriented radar*

Using image-processing software developed by NJAS, we extracted target information from data images collected with the vertically-oriented radar. The integrated image processing software performs the following tasks:

- Identifies the sample area and creates a template (Fig. 9) to remove stationary radar reflectors (i.e., ground clutter, sea clutter, main bang).
- Removes targets with low signal strength likely to be insects (i.e., based on color value).
- Smooths the data and locates and marks the centroid of each discrete target that remains
- Exports a text file that includes information on every target's signal strength and its position (i.e., the distance of its centroid) in the *X*- and *Y*-planes relative to the radar's position
- Outputs a bitmap image showing the transformed data with marked targets (Fig. 10). This last feature allows us to review the data processing output to identify possible spurious targets and remove them from subsequent data analysis steps.

Using an analysis software program developed by NJAS staff, we summarized target counts, movement rates and altitudinal distribution (i.e., target position in the *Y*-plane relative to radar's position) for 10 min and hourly intervals. The software's output includes the total number of targets recorded in each image and the mean number of targets recorded in each five-image sample. Our analysis software also quantifies the number of targets recorded in discrete altitudinal bins (e.g., 25 m). We configured the software to assign targets to one of 76, 25 m (i.e., 1900 m or approximately 1 nm) altitudinal bins. The software also has a threshold feature that allowed us to filter out data with unusually high target counts, typically an indication of precipitation or insect contamination.

The results of analyses in this report are based on the average for each five-image sampling bout, which occurred at 10-minute intervals. These values are summed for the entire night's data collection (sum of the sample averages) to generate hourly, daily and nightly movement estimates. We believe using the sum of the sample averages is a more accurate assessment for the number of targets crossing through the study area because it minimizes the effect of enumerating the same targets multiple times during a single sampling bout. Analyses to quantify variation in target counts in successive images in a sampling bout indicated that coefficients of variation (CV) were very low (< 2%).

For analysis purposes, we divided the year into five seasons. Specifically, we divided the Fall season into "Early" (15 Jul – 30 Sep) and "Late" (1 Oct – 15 Dec) segments because the southbound migration period is considerably protracted, with distinctly different taxa migrating throughout the period. For example, birds migrating nocturnally during August and September are generally long-distance migrants, mostly passerines and shorebirds (Family Charadriidae). In October and November nocturnally migrating birds are typically short and medium distance migrants, including passerines, some shorebirds, waterfowl and owls. Furthermore, most southbound bat migration activity occurs during July – September so is not a major component of nocturnal activity during the latter part of our Fall/Late sampling period. Other season designations were: Winter (16 Dec – 15 Mar), Spring (16 Mar – 31 May) and Summer (1 Jun – 14 July). We acknowledge that these designations are arbitrary in the sense that the behavior of aerial vertebrates across a broad range of taxa results from responses to endogenous and exogenous stimuli that do not necessarily adhere to rigid temporal bounds. However, we believe our season designations approximate major periods of the annual cycle that signal distinct sets of behaviors (e.g., migration, breeding) in many birds and bat species.

Prior to statistical analyses, we evaluated response and predictor variables to determine if they met assumptions of parametric tests we proposed to use. If assumptions were not met, we transformed data or used non-parametric tests. Based on these assessments, we used the log transformation to normalize the response variable representing number of targets recorded (TR, i.e., putative birds and bats), hourly rates of targets recorded (TR/hr) and targets recorded within two altitudinal strata, 0-25 m above radar level (arl, TR25), 26-50 m arl, which are likely most relevant to the height of the proposed test turbine (TR50). We used arcsine transformations to normalize variables representing proportions of targets recorded in each altitudinal stratum (i.e., PROP25, PROP50).

We used General Linear Model procedures (GLM, Zar 2009) to investigate the effects of SEASON (i.e., Fall/Early: 15 Jul – 30 Sep 2010, Fall/Late: 1 Oct – 15 Dec 2010, Winter: 16 Dec 2010 – 15 Mar 2011, Spring: 16 Mar – 31 May 2011, Summer: 1 June – 14 July 2011) and PERIOD (Day: sunrise to sunset the same day, Night: sunset to sunrise the following morning) and the interaction between the two factors on number of targets recorded (TR, sum of 10-minute sample means) and movement rates (i.e., targets recorded/nautical mile/hour, TR/hr). The same statistical approach was used to investigate the effect of these factors on the proportion and number of targets recorded in the three altitudinal strata of interest. When GLM procedures suggested significant affects of predictor variables (i.e., Season, Period, Season*Period interaction) on response variables, we used Bonferonni procedures to make *post hoc* pairwise comparisons. We used Kolmogorov-Smirnoff (K-S) two-sample tests (Corder and Foreman

2009) to compare temporal patterns in targets recorded during DAY and NIGHT periods, altitudinal distributions among seasons and between Day and Night periods.

2.3.2 *Horizontally-oriented radar*

We used NJAS-developed software to calculate target directions from images collected with the horizontally radar. To calculate a target's direction of movement, the program uses the end point of a target's trail and the target position (Fig. 11). For Day and Night periods, we analyzed one image/hour of data collected. Targets for each hour were compiled and we used circular statistical analysis to generate mean vectors (directional tendency, Mardia and Jupp 2000), vector lengths (*r*, strength of directional tendency, Mardia and Jupp 2000) and test statistical significance (i.e., Rayleigh's *Z* test, Zar 2009). We calculated second-order mean vectors (i.e., mean of mean vectors) for each season (i.e., Day and Night separately) and tested for statistical significance using Hotelling T^2 test (Mardia and Jupp 2000).

2.4 WEATHER PATTERNS AND BIRD/BAT FLIGHT DYNAMICS

2.4.1 *Local weather conditions*

For all analyses, we used local climatological data collected at the Knox County Regional Airport, Rockland, ME (44.060° N, 69.085° W) and purchased from the National Weather Service's National Climatic Data Center web site (http://www.ncdc.noaa.gov/oa/ncdc.html). We selected this station because of its proximity to our study site (approximately38.5 km SW) and the consistency and completeness of the data available during the study period. We used weather data recorded at or as close to sunset as data were available for Night period analyses. Similarly, for Day period analyses, we used weather data recorded at or as close to sunrise as data were available. That weather conditions at the time of departure can strongly influence migratory behavior, particularly for nocturnally migrating birds, has been well documented (e.g., Able 1973, Åkesson and Hedenström 2000, Erni et al. 2002 and Richardson 1978). For Day period analyses, we also considered weather condition variables at sunset from the preceding day, enabling us to evaluate whether departure conditions from the preceding night were better predictors of movement patterns. Similarly, for the Night periods, we considered weather variables at sunrise on the same day to investigate whether these provided any support for movement patterns we recorded.

We used regression tree analyses (RT) and random forest (RF) procedures (see description below) to investigate relationships between several weather variables at both sunset and sunrise, Julian date, and six bird/bat flight dynamics response variables: TR, TR/hr, PROP25, PROP50 (used in previously described analyses), plus the sum of 10-minute sample means within the two altitudinal strata (TR25 and TR50). Wind and ceiling conditions, as well as time of year and location (i.e. over water vs. land), can influence the altitude at which birds fly (Åkesson 1993, Gauthreaux 1991, Larkin 1980). With multiple factors influencing the altitudinal distribution of birds, it is important to consider the total target abundance, not just the proportion of individuals flying at low altitudes. This accounted for scenarios where proportions within a single altitudinal range might be low but the total number of targets recorded could be high. We assessed the performance of both Julian date and its quadratic form in each model. The results were identical so Julian date is presented for ease of interpretation.

We used nine weather variables in this analysis: cloud cover (%), ceiling (m), visibility (m), barometric pressure (mb), precipitation (mm), dry bulb temperature (°C), dry bulb dew point temperature (°C), wind speed (m/s), and tailwind/headwind vector (THV) (Table 2). Given the difficulty using circular data (i.e., wind directions) in linear statistical analyses (Mardia and Jupp 2000), we calculated headwind/tailwind vectors (THV, vectors parallel to the assumed direction of migration) using an equation proposed by Piersma and Jukema (1990):

$$THV = W \cos\alpha + \sqrt{\{A^2 - (W \sin \alpha)^2\}} - A,$$

where W is the wind velocity, A is the bird's air velocity, and α is the difference between wind direction and the assumed directional goal of movement ± 180° (see Appendix 11 for diagram and derivation of equation). Using wind vectors effectively resolves the circular variable, wind azimuth, into its rectangular components (i.e., cosine and sine), and incorporates wind speed. Thus, this conversion provides a way to examine the entire affect of wind on movement patterns. This particular wind vector equation assesses wind conditions relative to the assumed axis of movement.

We used actual mean vectors of movement derived from data collected with the horizontally-oriented radar for each season and period, when available, as the assumed directional goal of movement in the calculations of THV. The strength or weakness of tailwinds, headwinds and crosswinds (i.e., SWV) is known to affect migration behavior in birds (Liechti 2006). In our analyses, we also considered the "expected" seasonally appropriate migration directions of "north" (i.e., 360°) in spring and "south" (i.e., 180°) in fall (i.e., Fall/Early and Fall/Late periods). However, because seasonally appropriate movement directions for summer and winter are not well defined, we did not include THV calculations for "expected" migration goal. For the summer period, we used the mean vectors of movement collected from the radar to calculate THV. Because the mean vector for the winter period was not statistically significantly THV could not be calculated, thus we used wind speed alone.

2.4.1.1 Regression Tree and Random Forest analyses

Regression Tree (RT) analyses are well suited for explaining variation in a single response variable by multiple predictor variables. They are easily interpreted, can deal with missing values, non-linearities, higher order interactions, and cope well with large complex data sets (Elith, et al. 2008, De'ath and Fabricius 2000, and Prasad et al. 2006), making them ideal for exploring the relationships between our different weather variables and radar target measures. RT analysis assume no relationship between the predictor and response variables and as a result, provide a set of decision rules that are practical in making management recommendations (Prasad et al. 2006). Regression trees use binary splits to make recursive partitions in the data where the between groups sums-of-squares in maximized and residual sum-of-squares is minimized.

We addressed two main weaknesses of RT (i.e., instability given different variations of test data and over-fitting) by computing Random Forest (RF) models on each of the 60 datasets we analyzed (i.e., six response variables for each five seasons during two periods). RF analyses are more robust and by running multiple permutations (i.e., computing many trees and averaging across them), they can lower bias and provide better models for prediction. RF analyses use a bootstrap training technique that combines multiple tree predictors, where each tree is built from a random selection of the available independent variables (Breiman 2001). Withheld data, termed out-of-bag samples, are then used to validate each individual tree. The number of individual trees built in the forest analysis is individually assigned. In our analyses, we used 1000 trees.

To avoid over-fitting, trees were also pruned using the minimum cross-validation prediction error term (Maindonald and Braun 2007). Cross-validated error was calculated as the residuals sum-of-squares (SSE)/total sums-of-squares (SST). We obtained R^2 values for RTs using the equation,

$$1 - cross\ validated\ error$$

We used the equation

$$1 - Mean\ square\ error\ (mse)/Var(y)$$

to calculate a 'pseudo R^2' for the RF models, where the mean square error (mse) is Sum of Squares (residuals)/n (Breiman and Cutler 2012). R^2 for RF analyses is considered 'pseudo' since it is calculated from the out-of-bag samples.

Because RT analyses are not subject to the same assumptions as linear regression techniques, they are invariant to variable transformations (Elith et al. 2008). However, variables that are closely correlated can increase each other's predictive importance erroneously. To evaluate this possibility, we conducted a Spearman (non-parametric) rank correlation analysis (Zar 2009), prior to building RT models, to identify weather variables in each grouping that might be correlated. Although some variables had correlation coefficients ≥ 0.8 (i.e., positive or negative), pruned regression trees were best explained by one to three splits, none of which had strongly correlated variables as the top predictors, making it unnecessary to remove variables from models.

2.4.2 *Synoptic weather conditions*

We used NWS surface weather maps (Fig. 12) generated at 0000 Greewich Mean Time (GMT, 2000 Eastern Standard Time) and 1200 GMT to determine the position of synoptic weather systems (i.e., meso scale atmospheric condition) relative to Monehgan Island. The position of the reference location, in this case, Monhegan Island, was then plotted on a generalized synoptic weather map (Fig. 13, after Richardson 1976, Lank 1983). For statistical purposes, we defined five regions on the synoptic map based on geostrophic wind patterns (Table 3). For each Season/Period combination we used one-way Likelihood Ratio χ^2 tests (Zar 2009) to test the null hypothesis that the proportion of TR across the five synoptic weather conditions was not significantly different (i.e., equal proportions). We used the same statistical approach to test null hypotheses for TR/hr, TR25 and TR50.

Additionally, we used Fisher's Exact test (Zar 2009) to test the null hypothesis that the distribution of TR across the five synoptic weather conditions was not significantly different from the proportional occurrence of the five synoptic conditions. We used this statistical approach rather than a two-way Likelihood Ratio χ^2 test because on several occasions, one or more of the synoptic weather classes had fewer than five occurrences during a given season or that migration events occurred fewer than five times under a particular synoptic condition. Under these circumstances, Fisher's Exact test can perform better than a two-way Likelihood Ratio χ^2 test (Mehta et al. 1984). If we failed to reject the null hypothesis, then we might infer that bird and bats preferentially "used" particular synoptic conditions disproportionate to their occurrence. Again, we used the same statistical approach to test null hypotheses for TR/hr, TR25 and TR500 for each SEASON/PERIOD combination.

2.4.3 *Effect of wind condition on flight direction*

We investigated relationships between vectors of bird/bat movement for each Season/Period combination and wind directions using circular-circular correlation coefficients (Fisher 1993, Mardia and Jupp 2000). This method is analogous to the Pearson product-moment correlation commonly used for linear data. As with Pearson’s correlation, this coefficient ranges from -1 to +1, with the former indicating a perfect negative correlation, the latter a perfect positive correlation, and 0 indicating no correlation. The significance of the correlation is tested using the jackknife method described in Zar (2009). We used circular-linear correlation coefficients (Fisher 1993, Mardia and Jupp 2000) to examine relationships between vectors of bird/bat movement and tailwind/headwind vectors (THV). The circular-linear correlation coefficient ranges from 0 – 1, so there is no index for negative correlations. The calculation of significance for correlations followed Mardia and Jupp (2000), using their approximation of the *F* distribution. Finally, we used Watson-Williams *F*-tests (Fisher 1993, Mardia and Jupp 2000) to compare SEASON/PERIOD specific mean wind vectors with corresponding mean vectors of corresponding bird/bat movement. This test determines if mean angles of two or more samples differ significantly by comparing the lengths of the mean vectors for each sample with that for the pooled data of the samples. The resulting *F* statistic is the same as Fisher’s variance ratio statistic, which is commonly used in linear statistics

2.5 STATISTICAL ANALYSIS

Prior to statistical analyses, we evaluated response and predictor variables to determine if they met assumptions of parametric tests we proposed to use. If assumptions were not met, we transformed data or used non-parametric tests. Based on these assessments, we used the log transformation to normalize the response variable representing number of targets recorded (TR), hourly rates of targets recorded (TR/hr) and targets recorded within two altitudinal strata (TR25, TR50. We used arcsine transformations to normalize variables represented as proportions (e.g., proportion of targets recorded in various altitudinal strata). Although we present results of statistical analyses that used transformed variables, we present summary statistics (e.g., means, standard errors) for response variables in their untransformed state in textual, tabular and graphical accounts, unless otherwise indicated. RT analyses were performed on untransformed variables.

All standard statistical analyses were performed using SAS® 9.2 (SAS Institute, Inc. 2004) and SYSTAT® 11.0 (SYSTAT Software, Inc. 2004). Statistical tests involving directional data (i.e., flight direction, circular-circular comparisons, circular-circular and circular-linear correlations) were performed using Orianna 4.01© (Kovach Computing Services 2012). We considered results of all statistical tests significant at $\alpha \leq 0.05$. Regression tree and random forest analyses were performed using RStudio© Version 0.97.248 (R Development Team, 2008) and the SPM Salford Predictive Modeler® Software Suite 6.6 (Salford Systems, 2011).

3.0 RESULTS

3.1 TARGET PASSAGE AND PASSAGE RATES

During the one-year study, we recorded 119,524 targets on 301 days during the nocturnal data collection period (i.e., Night, sunset to sunrise the following morning). On 59 additional nights that had contamination (e.g., precipitation, insects) on > 50% of the data images, we recorded 2,525 targets. During the diurnal data collection period (i.e., Day, sunrise to sunset the same day), we recorded 47,839 targets on 306 days and an additional 1,374 targets on days that had contamination on > 50% of the data images.

Targets recorded (i.e., TR) and target passage rates (TR/hr) during each Day and Night data collection varied widely among seasons across the entire study period (Fig. 14) and within seasons (Tables 4-13, Figs. 15-19, see Appendix 12 for summary statistics from each Season/Period and Appendices 13-22 for tabular presentations of data across all Season/Periods and altitudinal strata). This likely resulted from seasonal movement and occupancy patterns throughout the year and how these were modified by weather conditions. Kolmogorov Smirnov (K-S) two-sample tests suggested that cumulative frequency distributions of TR for Day and Night data collection periods, which characterize changes in target movements across seasons, were not significantly different for Fall/Early (maximum difference = 0.13, $n = 151$, $P = 0.58$), Spring (maximum difference = 0.1597, $n = 123$, $P = 0.43$) and Summer (maximum difference = 0.1637, $n = 73$, $P = 0.66$) seasons (Fig. 20). However, cumulative frequency distributions were significantly different between Day and Night periods during Fall/Late (maximum difference = 0.2462, $n = 125$, $P = 0.01$) and Winter (maximum difference = 0. 5048, $n = 135$, $P < 0.0001$) (Fig. 20). These patterns of significant difference were similar for TR/hr.

We found statistically significant Period effect on TR (log-transformed, $F_{1, 606} = 17.88$, $P < 0.0001$) with the Night being significantly greater than Day. TR differences among Seasons were also significant ($F_{4, 602} = 93.08$, $P < 0.0001$), with Fall/Early being significantly greater than all other seasons (all *P*s, < 0.0001) and Winter significantly smaller than all other seasons (all *P*s, < 0.0001). Fall/Late and Spring were not statistically different from each other, but both were significantly smaller than Summer.

We also found a statistically significant Season*Period interaction ($F_{4, 602} = 5.79$, $P = 0.0001$). Between-period (i.e., Night vs Day) *post hoc* comparisons for each season suggested that TR was significantly greater at Night compared with Day during Fall/Early (Night: mean = 789.29 ± SE 109.00, Day: mean = 338.46 ± SE 49.83), Fall/Late (Night: mean = 482.05 ± SE 103.89, Day: mean = 91.11 ± SE 24.36) and Spring (Night: mean = 300.10 ± SE 51.98, Day: mean = 109.73 ± SE 20.96) (all Ps < 0.003). TR was not significantly different between Night and Day periods during Summer (Night: mean = 133.58 ± SE 18.25, Day: mean = 195.21 ± SE 25.34) or Winter (Night: mean = 97.51 ± SE 54.75, Day: mean = 29.12 ± SE 5.87) (all Ps > 0.05).

Among-season *post hoc* comparisons for the Night data collection period suggested that Fall/Early was significantly greater (all Ps < 0.0001) than all other seasons, and that Winter was significantly smaller (all Ps < 0.0001) (Fig. 21, upper). Mean TR for Fall/Late, Spring and Summer during the Night data collection period was not significantly different from each other (all Ps > 0.05) (Fig. 21, upper). Mean TR for Fall/Early also was significantly greater during the Day data collection period than all other seasons (all Ps < 0.0001) except Summer, while Winter again was significantly smaller (all Ps < 0.0001) (Fig. 21, upper). Although Fall/Late and Spring were not statistically different from each other, they were both significantly smaller than Summer (all Ps < 0.0001) (Fig. 21, upper).

We found statistically significant Period ($F_{1,\,606} = 22.23$, $P < 0.0001$) and Season ($F_{4,\,602} = 90.26$, $P < 0.0001$) effects on TR/hr (log-transformed). Similar to results for TR, TR/hr was significantly greater during the Night data collection period than during the Day, Fall/Early was significantly greater than all other seasons (all Ps, < 0.0001), Winter significantly smaller than all other seasons (all Ps, < 0.0001) and Fall/Late and Spring not statistically different from each other, but both were significantly smaller than Summer.

We also found a statistically significant Season*Period interaction for TR/hr ($F_{4,\,602} = 9.23$, $P < 0.0001$). Again, *post hoc* comparisons suggested that TR/hr was significantly greater during Night vs Day collection periods for Fall/Early (Night: mean = 78.57 ± SE 10.45, Day: mean = 27.31 ± SE 4.02), Fall/Late (Night: mean = 38.90 ± SE 8.03, Day: mean = 9.18 ± SE 2.13) and Spring (Night: mean = 34.15 ± SE 5.95, Day: mean = 8.52 ± SE 1.616) (all Ps < 0.003) but not statistically different for Summer (Night: mean = 16.39 ± SE 2.03, Day: mean = 14.99 ± SE 2.21) or Winter (Night: mean = 7.55 ± SE 3.81, Day: mean = 3.73 ± SE 0.82) (all Ps > 0.05).

Among-season *post hoc* comparisons for the Night data collection period suggested that results for TR/hr were similar to TR. That is, Fall/Early was significantly greater (all Ps < 0.0001) than all other seasons, Winter was significantly smaller (all Ps < 0.0001) and mean TR/hr for Fall/Late, Spring and Summer was not significantly different from each other (all Ps > 0.05) (Fig. 21, lower). Again, among-season *post hoc* comparisons for TR/hr, Day period, suggested that Fall/Early was significantly greater (all Ps < 0.0001) than all other seasons (all Ps < 0.0001) except Summer, while Winter was significantly smaller than all seasons (all Ps < 0.0001), except Spring (Fig. 21, lower). TR/hr during Fall/Late was not statistically different from Spring or Summer, but Spring and Summer were significantly different from each other ($P < 0.05$) (Fig. 21, lower).

TR also varied with time relative to sunrise and sunset. During the Day period, TR showed a distinct peak 7-10 hours after sunrise (Fig. 22), except in Fall/Early when the pattern was bimodal, with peaks at sunrise and again 7-8 hours later (Fig. 22). Peak TR during the Night period occurred 2-4 hours after sunset, except in Summer (Fig. 23). K-S two-sample tests suggested that cumulative frequency distributions, which characterized hourly changes in target detections, were not significantly different among seasons for Day (Fig. 24 upper, all Ps > 0.35) or Night (Fig. 24 lower, all Ps > 0.70) data collection periods except between Winter and Summer (maximum difference = 0.0.59, $P < 0.04$, Fig. 24, lower)

3.2 TARGET ALTITUDE

The distribution of targets recorded across all altitudinal strata (i.e., 74, 25 m strata, equivalent to one nautical mile) also varied between seasons and periods (Tables 4-13, Figs. 25, 26, Appendix 12 for summary statistics from each Season/Period, Appendices 13-22 for tabular presentations of data). For the Day data collection period, the proportion of targets we recorded generally increased with altitude to peak between 300 and 500 m then decreased asymptotically as altitude increased during the Fall/Early and Summer seasons, while during the other seasons, the proportion of targets we recorded were highest at or below 300 m and declined steadily as altitude increased (Fig. 27)

The pattern was similar for the Night data collection period (Fig. 28), although the proportion of targets recorded in Winter appeared to decline more rapidly than during other seasons (Fig. 28). Cumulative frequency distributions used to characterize changes in altitudinal distributions were not significantly different among any seasons (K-S multi-sample tests, all Ps > 0.4, Fig. 29), except in the case of Winter, which had significantly different altitudinal distributions than all other seasons during both Day and Night periods (K-S multi-sample tests, all Ps < 0.05, Fig. 29).

Our data also suggest extensive variation in PROP25 and PROP50 (i.e., the proportion of targets recorded at ≤ 25 m, 26-50 m arl), and similarly, TR25 and TR50 (i.e., targets recorded in the same strata) during Day and Night periods (Tables 4-13, Figs. 25, 26, Appendix 12 for summary statistics from each Season/Period, Appendices 13-22 for tabular presentations of data). K-S two-sample tests suggested that Day and Night cumulative frequency distributions characterizing seasonal changes in TR25 were significantly different in Fall/Late, Winter and Spring (all Ps < 0.04, Fig. 30). However, for TR50, differences between Day and Night frequency distributions were only significant for the Winter season ($P < 0.0001$, Fig. 31).

3.2.1 *0-25 meter stratum*

We found that PROP25 (i.e., arcsine transformed) was significantly greater ($F_{1, 606} = 28.64$, $P < 0.0001$) during the Day than at Night. Our data also suggested a significant season effect ($F_{4, 602} = 25.99$, $P < 0.0001$). PROP25 in Fall/Late was significantly greater (all Ps < 0.0001) than all other seasons except Spring ($P > 0.05$), which was also significantly greater than Fall/Early and Summer (all Ps < 0.0001). PROP25 during Fall/Early and Summer was significantly lower than all other seasons (all Ps < 0.0003), but not statistically different than each other ($P > 0.12$). The Season*Period interaction was not significant ($F_{4, 602} = 1.36$, $P = 0.24$).

Our data suggest that Season had a significant effect on TR25 ($F_{4, 602} = 48.33$, $P < 0.0001$) but that Period did not ($F_{1, 606} = 0.59$, $P = 0.44$). TR25 was significantly greater during Fall/Early than all other seasons (all *P*s < 0.004) and significantly lower during Winter (all *P*s < 0.0001). Fall/Late, Spring and Summer were not statistically different from each other (all *P*s > 0.28). Although we found a significant Season*Period interaction ($F_{4, 602} = 5.27$, $P = 0.0004$) few significant differences were apparent between distinct Season/Period combinations. Between-period (i.e., Night vs Day) *post hoc* comparisons for each season suggested that TR25 was not significantly different during any season (all *Ps* > 0.05).

Among-season *post hoc* comparisons for the Night data collection period suggested that TR25 in Fall/Early was significantly greater than Summer and Winter (all *P*s ≤ 0.007, Fig. 32, upper), but not Fall/Late or Spring (all *P*s > 0.05, Fig. 32, upper) and that in Winter it was significantly smaller than all other seasons (all *P*s < 0.0001, Fig. 32, upper). Mean TR25 for Fall/Late, Spring and Summer were not significantly different from each other (all *P*s > 0.05, Fig. 32, upper). Mean TR25 for Winter also was significantly lower during the Day data collection period than all other seasons (all *P*s < 0.0001, Fig. 32, upper), while Fall/Early, Fall/Late, Spring and Summer were not statistically different from each other (all *P*s > 0.05, Fig. 32, upper).

3.2.2 *26-50 meter stratum*

PROP50 was significantly greater ($F_{1, 606} = 7.56$, $P < 0.006$) during the Day than at Night and our data suggested a significant season effect ($F_{4, 602} = 25.28$, $P < 0.0001$). PROP50 in Fall/Late was significantly greater (all *P*s ≤ 0.0009) than all other seasons except Winter ($P > 0.05$), which was not statistically different than Spring ($P > 0.05$). Fall/Early and Summer were significantly lower than the other seasons ($P \leq 0.0001$) but not statistically different from each other ($P > 0.05$). Similar to PROP25, our data suggested that the Season*Period interaction was not significant ($F_{4, 602} = 1.05$, $P = 0.38$).

Period had a significant effect on TR50 ($F_{1, 606} = 7.96$, $P < 0.005$), targets recorded at Night greater than during the Day. We also found a significant Season effect on TR50 ($F_{4, 602} = 49.79$, $P < 0.0001$). Fall/Early was significantly greater than all other seasons (all *P*s ≤ 0.0004), while Winter was significantly lower (all *P*s < 0.0001). Fall/Late, Spring and Summer were not statistically different from each other (all Ps > 0.05).

Our data also suggested a significant Season*Period interaction ($F_{4, 602} = 2.71$, $P = 0.02$). Between-period *post hoc* comparisons for each season suggested that TR50 was significantly greater at Night compared with Day during the Fall/Early, Fall/Late and Spring seasons (all *P*s < 0.04, Fig. 32, lower). During the Night data collection period, mean TR50 was significantly greater during Fall/Early than all other seasons (all *P*s ≤ 0.05, Fig. 32), and significantly less during Winter (all *P*s < 0.0001, Fig. 32, lower) and Summer (all *P*s < 0.03, Fig. 32, lower). Fall/Late and Spring were not statistically different from each other. During the Day data collection period, TR50 was significantly greater during Fall/Early than all other seasons (all *P*s < 0.05, Fig. 32, lower), except Fall/Late, and significantly less during Winter (all *P*s < 0.0001, Fig. 32, lower). Fall/Late, Spring and Summer were not statistically different from each other (all *P*s > 0.18, Fig. 32, lower).

3.3 RELATIONSHIPS BETWEEN TARGET ALTITUDE AND MOVEMENT MAGNITUDE

3.3.1 *Day*

During the Day data collection period (e.g., Fall/Early-Night, Summer-Day), we found a negative relationship between PROP25 (arcsin-transformed) and TR (log-transformed targets recorded, all altitudinal strata combined). That is, as TR increased, PROP25 decreased (Fig. 33). However, these relationships were statistically significant only for the Fall/Late, Spring and Summer seasons (all Ps ≤ 0.05, Fig. 33). Correlation coefficients (i.e., r) for significant relationships ranged from 0.31 – 0.48. Relationships between PROP50 (arcsin-transformed) and TR were also negative except during Winter, which was not statistically significant) (Fig. 33). For all other season, the relationships were significant (all Ps ≤ 0.05, Fig. 33) with correlation coefficients ranging from 0.30 – 0.47.

3.3.2 *Night*

Negative relationships between PROP25 and TR also prevailed for the Night data collection period, and all were statistically significant for all seasons (all Ps ≤ 0.03, Fig. 34) except for Winter. Correlation coefficients for significant relationships ranged from 0.31 – 0.38. Relationships between PROP50 and TR for Fall/Early, Fall/Late and Spring were negative and significant (all Ps ≤ 0.008, Fig. 34) with correlation coefficients ranging from 0.34 – 0.45. For Summer, the relationship was also negative but not significant and was positive and not statistically significant for Winter.

3.4 TARGET FLIGHT DIRECTION

3.4.1 *Fall/Early*

Flight directions recorded during Fall/Early were oriented significantly to the NE (mean vector = 29°, vector length $r = 0.15$, $P < 0.05$, Fig. 35A, see Appendix 23 for complete target direction data) during the Day data collection period. However, during the Night period the mean vector was not significant (mean vector = 82°, vector length $r = 0.09$, $P = 0.32$, Fig. 35C, see Appendix 24 for complete target direction data). We were surprised at the random nature of second-order mean vectors during Fall/Early-Night period, a time when we would expect significant movement directionality associated with southbound passage of nocturnal migrants, primarily passerines and shorebirds. Visual inspection of the data suggested that the first-order mean vectors for this period might be bi-directional and that the second-order mean vector might not accurately reflect the directional bias in the data. A statistical test we conducted to determine the degree to which data for this period was bi-directional was significant (bi-directional axis vector = 40°/220°, vector length (r) = 0.38, Rayleigh's $Z_{76} = 11.15$, $P < 0.0001$, Fig. 35D). This result may indicate significant reverse migration during the early stages of southbound passage through the Gulf of Maine. Given this, we conducted bi-directionality analyses for all Season-Period data.

3.4.2 *Fall/Late*

Fall/Late flight directions for the Day period were not significant (mean vector = 220°, vector length $r = 0.10$, $P = 0.33$, Fig. 36A) as was the bi-directionality vector (Fig. 36B, see Appendix 25 for complete target direction data). During the Night period, the mean vector was significantly oriented to the SW, which is typically considered the seasonally appropriate direction (mean vector = 224°, vector length $r = 0.33$, $P < 0.0001$, Fig. 36C, see Appendix 26 for complete target direction data). The bi-directionality analysis, although significant, was weak compared to the unidirectional results (Fig. 36D).

3.4.3 *Winter*

Mean vectors for Winter flight directions were not statistically significant for either Day or Night periods (Fig. 37 A, C, see Appendices 27 and 28 for complete target direction data), as this season is not considered an important time for migratory movements. Results of analyses for bi-directionality were similarly not significant (Fig. 37, B, D). Given that directed migration is not prevalent during the Winter season, the lack of significantly oriented flight patterns is not surprising.

3.4.4 *Spring*

Although the mean vector for flight direction during Day data collection period in Spring was not significant (mean vector = 17°, vector length $r = 0.16$, $P = 0.06$, Fig. 38A, see Appendix 29 for complete target direction data) the bi-directional vector was (41° – 221°, vector length $r = 0.38$, $P = 0.0001$, Fig. 38B). During the Night period, the second-order flight direction vector was significant (mean vector = 57°, vector length $r = 0.29$, $P = 0.003$). However, the bi-directional vector was also significant and showed less variability (46° – 226°, vector length $r = 0.47$, $P < 0.0001$, Fig. 38D, see Appendix 30 for complete target direction data). These results from the suggest that some reverse migration may be taking place during the Spring.

3.4.5 *Summer*

The mean vector for flight direction during the Day and Night data collection periods were statistically significant (Day: mean vector = 350°, vector length $r = 0.22$, $P = 0.004$, Fig. 39A, Night: mean vector = 56°, vector length $r = 0.32$, $P = 0.004$, Fig. 39C). Bi-directional vectors were not significant for either Day or Night periods (Fig. 39 B, D, see Appendices 31 and 32 for complete target direction data). Significant directionality, especially toward the north, is interesting as Summer, as we define it (i.e., June – early July), is not considered an important time for migration. These directed movements could represent travel to foraging areas by birds that either breed near Monhegan Island or by migrants from the Southern Hemisphere that spend the non breeding period (i.e., austral winter) in the Gulf of Maine

3.5 EFFECTS OF ENVIRONMENTAL CONDITIONS ON TARGET PASSAGE, ALTITUDE AND FLIGHT DIRECTION

As expected, environmental variables (i.e., meteorological conditions, date within season) were more effective at explaining variation in our movement pattern response variables (e.g., targets recorded, targets recorded in different altitudinal strata) during the migration seasons, Fall/Early, Fall/Late and Spring, compared to Winter and Summer, seasons not typically considered important for migration. In fact, of the six regression trees (RT) that were not validated through our random forest (RF) analyses, five occurred in either Winter (3) or Summer (2). Given this, we provide more detail about relationships between environmental variables and movement pattern responses for the migration seasons and provide figures to illuminate the RT models. We provide less detail about results from the RT and RF analyses for Winter and Summer, most of which are provided in two tables.

3.5.1 *Date and local meteorological conditions*

3.5.1.1 Fall/Early

THV-Expected (THV-Ex) at sunset (SS), that is Tailwind/Headwind vectors derived from assumed seasonally appropriate orientation of targets, (e.g., north, or toward 360° in spring, south, or toward 180° in fall), was the primary node splitting factor in both the Day and Night periods for 8 of the 12 response variables.

Specifically, for data collected during Day data collection period, TR, TR/hr (Fig. 40), and TR25 (Fig. 41) were approximately four times greater when THV-Ex at sunrise (SR) was > 1.79 (i.e., increasing tailwind conditions) with R^2 values ranging from 0.01 – 0.20. THV-Ex was also the primary node splitter for TR50 and PROP50 (Fig. 42), however, the former was not supported by RF analysis results and the latter had no explanatory power ($R^2 = 0$). Ceiling appeared to be the variable with the greatest influence on PROP25 (Fig. 41), but the model had no explanatory power ($R^2 = 0$).

Results for the Night period were similar. when THV-Ex conditions at sunset was > 1.10 (i.e., increasing tailwind conditions)TR, TR/hr (Fig. 40), and TR25 (Fig. 41) were approximately four times greater. THV-31° (i.e., THV derived from the flight orientation of targets recorded during the Fall/Early season) at SS was also a secondary node for the TR model. Each of these models explained 14% of the variation (i.e., R^2) in their respective movement response variables. Similarly, TR50 was four times greater when THV-31° at SS was > 1.29 (Fig 42). Julian day was a secondary node splitter and together these variables explained 0.14% of the variation in TR50. Barometric pressure (BP) at SS was the primary node splitter for PROP25 and PROP50. Values for these two responses were greatest when BP values were > 1017 mb and BP explained 14% of the variation in these movement response variables (Figs. 41, 42).

3.5.1.2 Fall/Late

For the Day period, Julian Day was the primary node splitter for TR, TR/hr (Fig. 43) and TR25 (Fig. 44). Magnitude of TR was more than six times greater on or before day 286 (13 Oct, Fig. 43) approximately five times greater for TR/hr (Fig. 43) and more than double for TR25 before day 290 (17 Oct, Fig, 44). However, R^2 values for these models were 0.06, 0.10 and 0, respectively, suggesting that Julian Day was not effective capturing variation in the response variables. BP was the primary node splitter for PROP 25 (Fig. 44) and PROP50 (Fig. 45). When BP was ≤ 1002 mb (i.e., decreasing pressure) proportion of targets in the 0 – 25 m and 26 – 50 m strata were double that on days when BP was > 1002 mb (increasing pressure). However, only the model for PROP50 had any explanatory power ($R^2 = 0.19$). TEMP was the only node splitter for TR50 (Fig. 45) and when it was > 12.5° C, targets recorded in this stratum were three times greater. However, this model explained only 9% of the variation in TR50.

For the Night period, Julian Day was the primary node splitter for TR and TR/hr, with the values 7-8 times greater on or before day 306 (2 Nov) (Fig. 43). THV-Ex at sunrise (SR) was a secondary node splitter for both response variables (Fig. 43). The magnitude of the response was approximately four times greater when THV-Ex was > 0.81 (i.e., increasing tailwind conditions). Julian Day/THV-Ex models were effective at capturing 31% of the variability in TR and TR/hr. Julian Day (≥ 306) was also the primary node splitter for TR25 (Fig. 44) and TR50 (Fig. 45). Secondary node splitters for these two response variables were Julian Day (< 296) and THV-Ex, respectively. However, these models only explained 3% and 9% of the variation in TR25 and TR50, respectively. Ceiling was the primary node splitter for PROP25 and PROP50, respectively. Proportions were approximately four times greater when Ceiling height was ≤ 564 m. Temperature (TEMP) was a secondary node splitter in the model for PROP25. These models explained 21% and 13% of the variation in PROP25 and PROP50, respectively.

3.5.1.3 Winter

BP (SS) was the primary node splitter for all response variable models for the Day period. However, only three models, TR25, PROP25 and PROP50 were validated by RF analyses (Table 14). Of these, only the model for PROP50 had any explanatory power ($R^2 = 0.22$). The proportion of targets detected in this stratum was three times greater when BP was < 1008 mb (Table 14).

For the Night period, BP at sunset was the primary node splitter for TR, TR/hr and TR50 models, dew point (DP) for PROP25 and PROP50 models and Julian day for the TR25 model (Table 14). However, none of these models explained any variation in their respective response variables ($R^2 = 0$).

3.5.1.4 Spring

For the Day collection period, dew point (DP) at sunset (SS) was the primary node splitter for TR and TR/hr, with values were 5-7 times greater when DP was ≥ 4.5° C (Fig. 46). Although

DP explained 21% of the variation in TR, it was not effective at doing the same for TR/hr ($R^2 = 0$). Julian day was the primary node splitter for TR25 and PROP 25 (Fig. 47), however, it was only effective in capturing variation for the latter ($R^2 = 0.16$). The RT model for PROP50 (Fig. 48) included the primary node splitter BP (SS) and two secondary factors, THV-57° (SR) and Julian day. Together, these captured 5% of the variation in PROP50. The model for TR50 was not validated by the RF analysis.

Julian day was the primary node splitter for TR, TR/hr (Fig. 46), TR25 (Fig. 47) and TR50 during the Night data collection period (Fig. 48) and values for these response variables were 3-4 times greater after day 112 (30 Apr), or day 132 (12 May), in the case of TR50 (Fig. 48). For TR, THV-Ex (SS) and BP (SS) were secondary node splitters, however, these variables together with Julian day only captured 8% of the variation (Fig. 46). Similarly, THV-Ex (SS) and BP (SS) were secondary node splitters for TR25 (Fig. 47) and TR50 (Fig. 48), respectively. However, these models (i.e., including Julian day) only had R^2 values of 0.02 and 0. THV-57° (SR) was the primary node splitter for PROP25 (Fig. 47) and PROP50 (Fig. 48). Additionally, TEMP (SS) was a secondary splitter for PROP25 (Fig. 47). Again, however, these models had no utility explaining variation in these responses ($R^2 = 0$).

3.5.1.5 Summer

During the Day period, RT models for TR and TR25 were not validated by RF analyses. Julian day was the primary splitting factor for TR/hr and TEMP (SR) for TR50. Primary node splitters for PROP25 and PROP50 were BP (SS) and % cloud cover (CC), respectively. Again, none of these models had any power to explain variation in the respective responses (all R^2s = 0) (Table 15).

Julian day was the primary node splitter for TR and TR/hr during the Night data collection period, with values for these responses more than double on or after day 186 (5 Jul). For TR25 and TR50, TEMP (SR) was the primary node splitter and for PROP25 and PROP50, THV-56°(SR) and BP (SS), respectively. However, none of these models had any explanatory power (all R^2s = 0) (Table 15).

3.5.2 *Synoptic weather conditions*

3.5.2.1 Fall/Early

Day period results from the one-way Likelihood Ratio χ^2 tests suggested that proportions for TR across the five synoptic conditions were not equal ($P < 0.0001$). The proportion of targets recorded under condition "2" (59%), which typically produces westerly or northwesterly winds after passage of a cold front (Table 3, Fig. 13) was greater than under all other conditions combined. In contrast, the proportion was smallest under condition "4", generally associated with precipitation in close proximity to a cold front boundary (Table 3, Fig. 13). Proportions for TR/hr, TR25 and TR50 across the five synoptic conditions also were not equal (all $Ps < 0.0001$), with distribution patterns similar to TR.

Differences between the proportions of across synoptic conditions and the proportional occurrence of those conditions was significant only for TR and TR/hr (all $Ps < 0.05$). For both response variables, synoptic condition "2"occurred on 42% of the days but accounted for 59% of the targets we recorded (Fig. 49). Furthermore, synoptic conditions "1", which typically produce southerly winds ahead of a cold front or in proximity to a warm front (Table 10, Fig. 15) occurred on 39% of the days during the Fall/Early season but only 22% of the targets we recorded occurred on those days (Fig. 49).

Results for the Night period suggested that proportions for all response variables were not equal across the five synoptic conditions (all $Ps < 0.0001$). Regardless of which response we considered, nights that we classified as condition "2" had the greatest proportion of targets (59 - 70%) we recorded during the Fall/Early season. Conversely, the lowest proportions of targets recorded were under conditions "4" or "5" (i.e., calm weather at the center of a high pressure system or in poorly organized areas near a stationary front, Table 10, Fig. 15).

The proportions of targets we recorded were significantly different from the proportional occurrence of the five synoptic conditions for all response variables (all Ps < 0.0003). Condition "2" occurred on 35% of the nights but accounted for 58 – 71% of targets we recorded during the Fall/Early season (Fig. 50). In contrast, condition "1" occurred on 48% of the nights but only accounted for 19 – 22% of the targets recorded (Fig. 50)

3.5.2.2 Fall/Late

During the Day period Proportions for TR across the five synoptic conditions were not equal ($P < 0.0001$) as was the case for the other response variables (all $Ps < 0.0001$). The greatest proportion of targets recorded across all altitudinal strata and at the two lowest strata we considered, occurred under condition "2" (52 – 56%). The lowest proportions were recorded on days classified as condition "4" for TR and TR/hr. Days classified as condition "3", which northeasterly winds after passage of a cold front or in areas N – W of low pressure (Table 10, Fig. 15), had the lowest proportion for TR25, while days with condition "5" produced the lowest for TR50.

The proportions of targets we recorded were significantly different from the proportional occurrence of the five synoptic conditions for TR ($P < 0.002$) and TR/hr ($P < 0.02$) but not for TR25 or TR50 (Ps > 0.40). Significance differences in the proportional distribution of targets recorded under the five synoptic conditions and the proportional occurrence of those conditions were related predominantly to conditions "1" and "3". Specifically, condition "1" occurred on 20% of the days during the Fall/Late season but only accounted for ~9% of TR or TR/hr (Fig. 51). Days classified as condition "3" produced ~24% of TR and TR/hr but occurred only 7% of the time (Fig. 51).

Similar to the Day period, proportions across the five synoptic conditions for TR, TR/hr, TR25 and TR50 were statistically different (all $Ps < 0.0001$) during the Night period. For all response variables, the greatest proportions (55 – 72%) were associated with condition "2". Along with condition "3", conditions that produce winds with northerly components accounted for 75 – 90% of the targets we recorded across all altitudinal strata and at the two lowest strata we considered.

Regardless of response variable during the Night period, the proportions of targets we recorded under the five synoptic conditions were significantly different from the proportional occurrence of those conditions, although the strength of these differences was much greater for TR and TR/hr (*Ps* < 0.0008) than for TR25 and TR50 (*Ps* < 0.02). For TR and TR/hr, ~70% of the targets were recorded when condition "2" was prevalent around sunset, although these conditions were only apparent ~50% of the time during this season (Fig. 52). Alternatively, we recorded only 4% of all targets under condition "1", while this condition was recorded 20% of the time (Fig. 52). For TR25 and TR50, significant differences were most attributable to condition "3", which account for 25% of targets recorded although this condition occurred only 13% of the time (Fig. 52). Additionally, we recorded only 7% of all targets in the 0-25 m and 26-50 m strata under condition "1", while this condition was recorded 20% of the time (Fig. 52).

3.5.2.3 Winter

Regardless of response variable, proportions across the five synoptic conditions were statistically different (all *Ps* < 0.0001) during the Day period. For TR and TR/hr, conditions "1" and "2" accounted for ~23% and 38% of the targets we recorded, respectively, while only 5% was recorded under condition "4". This relationship was even more pronounced for TR25 and TR50. For the former, conditions "1" and "2" accounted for ~28% and 57% of targets we recorded, respectively, while for the latter, they accounted for 46% and 35%, respectively.

Differences between the proportions of targets recorded across synoptic conditions and the proportional occurrence of those conditions was significant for all response variables (all *Ps* < 0.01), except TR25 (*P* > 0.76). For TR and TR/hr, 16% of targets we recorded occurred under condition "3" and 17% under condition "5", while these conditions were apparent for only 5% and 11%, respectively (Fig. 53). Conversely, 38% of the targets recorded under condition "2", which occurred 59% of the time (Fig. 53). For TR50, condition "1" accounted for 46% of targets recorded, but this condition occurred only 24% of the time (Fig. 53). Thirty-five percent of all targets recorded in this stratum were done so under condition "2" even though this condition occurred 59% of the time (Fig. 53).

For the Night period, proportions across the five synoptic conditions were statistically different for each response variable (all *Ps* < 0.0001). For TR and TR/hr, proportions of targets recorded were greatest under condition "3" (58% and 43%) respectively, followed by condition "2" (38% and 42%, respectively). Proportions of targets recorded in the 0-25 m and 26-50 m strata were greatest under condition "2" (59% and 67%, respectively). The fewest targets we recorded were under condition "5" (~4 – 8%), regardless of response variable. That we did not classify any night with condition "4" is important to note.

Proportions of targets recorded across synoptic conditions during the Night period were significantly different than proportional occurrence of those conditions was significant for all response variables except TR25. However, significance was much stronger for TR and TR/hr

(*P*s << 0.0001) than for TR50 ($P < 0.02$). For TR and TR/hr, target proportions were greatest (51% and 43%, respectively) when condition "3" was apparent even though this condition occurred only 5% of the time (Fig. 54). In contrast, conditions "1" and "3" occurred on 81% of the nights (25% and 56%, respectively), but accounted for only 53% of the targets recorded (11% and 42%, respectively, Fig. 54). Condition "2" accounted for 67% of all targets recorded in the 26-50 m stratum (TR50), but this condition occurred on 56% of the nights (Fig. 54). Conversely, condition "1" occurred on 25% of the nights but only accounted for 15% of the targets recorded (Fig. 54).

3.5.2.4 Spring

For each response variable, the proportion of targets was significantly different across synoptic conditions (all *P*s < 0.0001) during the Day period. Proportions were greatest under condition "1" for TR, TR/hr and TR50 (43%, 45 % and 53%, respectively) and smallest under conditions "3" and "4" (~6% for each condition). For TR25, the greatest proportion of targets recorded occurred under conditions "1" (44%) and "2" (41%) and smallest under conditions "4" and "5" (4% for each condition).

Differences between the proportions of targets recorded across synoptic conditions and the proportional occurrence of those conditions was significant for TR ($P < 0.05$), TR/hr ($P < 0.03$) and TR50 ($P < 0.01$), but not TR25 ($P > 0.20$). For TR and TR/hr, proportions were 43% and 45%, respectively, under condition "1", although this condition only occurred 30% of the time (Fig. 55). Under condition "2", target proportions were ~30% despite their occurring 53% of the time (Fig. 55). Relationships were similar for TR50, although more pronounced (Fig. 55).

Similar to the Day period, target proportions across the five synoptic conditions for TR, TR/hr, TR25 and TR50 were statistically different (all $Ps < 0.0001$) during the Night period. In all cases, proportions were greatest under condition "1" (55% – 67%) and smallest under condition "4" (2% – 4%). That this condition occurred only once during Spring – Night is important to consider.

Proportions of targets recorded across synoptic conditions were significantly different than proportional occurrence of those conditions was significant for all response variables (all *P*s ≤ 0.003), although the strength of these differences were greater for TR25 and TR50 (*P*s < 0.0007). For TR and TR/hr, 55% of the targets we recorded occurred when condition "1" was prevalent while this condition occurred 48% of the time (Fig. 56). Similarly, 12% of targets recorded occurred under condition "5" while this condition occurred only 2% of the time (Fig. 56). In contrast, we recorded 17% of targets under condition "2" despite it occurring 36% of the time (Fig. 56). The proportional differences were similar for TR25 and TR50, although more pronounced. Target proportion in each case was ~66% for condition "1" and 13% for condition "2" while 48% and 36%, respectively, occurred during Spring – Night (Fig. 56).

3.5.2.5 Summer

Proportions across the five synoptic conditions were statistically different for each response variable (all *Ps* < 0.0001) during the Day period. Regardless of response variable, the proportion of targets we recorded was greatest under condition "2" (~46%). The remaining target proportions were split nearly equally among conditions "1", "3" and "5" (~18% for each condition) for TR and TR/hr. For TR25 and TR50, the smallest proportion occurred under condition "3". That we did not classify any night with condition "4" is important to note.

The proportions of targets we recorded were not significantly different from the proportional occurrence of the five synoptic conditions for TR, TR/hr or TR25 (all Ps > 0.14). For TR50, the significant difference ($P < 0.02$) appeared to be related to conditions "2" and "3". Under condition "2", target proportion was 57% while the condition occurred 47% of the time (Fig. 57). Only 2% of the targets we recorded occurred under condition "3" although the condition occurred 15% of the time (Fig. 57).

As with all other Season – Periods, target proportions across synoptic conditions were not equal for all response variables during the Night period. Regardless of which response variable we considered, proportions were greatest under conditions "1" and "2" (~38% – 45 % for each condition) and smallest under condition "5" (~2% – 4%).

During the Night period, target proportions we recorded were not significantly different from the proportional occurrence of the five synoptic conditions for any of the response variables we considered (Fig. 58).

3.5.3 *Effects of wind on flight direction*

For all Season/Period combinations we found significant and positive correlations (all Ps < 0.05, Table 31) between wind and target directions (i.e., for a given Season/Period combination). Similarly, we found significant correlations between THVs and all target directions for all Season/Period combinations (all Ps < 0.05, Table 32). Interestingly, however, we found significant differences for Season/Period-specific wind vectors (Fig. 52) and corresponding target vectors (all Ps ≤ 0.01, Table 32), except for Summer/Day ($P = 0.90$).

4.0 DISCUSSION

In the following "Discussion" sections, we compare our results to those reported in other marine radar studies conducted primarily to assess potential impacts of wind power development. However, caution should be used when interpreting differences between this and some other studies because of inherent differences in equipment, data collection procedures and analytical approaches. Several of the studies cited in this section used a single 12 kW X-band radar with the antenna rotating parallel to the ground (i.e., what we refer to in this report as "horizontally-oriented"). Data collected with the radar in this orientation are used to estimate target movement rates and flight direction. Many practitioners then periodically rotate this unit 90^{o} so that the antenna spins perpendicular to the ground (i.e., what we refer to in this report as "vertically-oriented"). Data collected with the radar in this orientation are used to estimate target altitudes. In this study, we used two 25 kW X-band radars operating simultaneously as described in the "Methods" section.

Several of the studies we cite for comparison use manual methods to estimate the number, altitude and flight direction of targets detected by their radar. These methods may be subject to observer biases, especially because most of these studies are conducted at night and for many consecutive hours. Additionally, these studies do not archive the image data produced by their radars. In these cases, investigators are unable to conduct quality control assessments of their data analyses. In contrast, we used automated image data collection and algorithm-based data processing and target quantification, which allows for standardized assessment of target movement indices (i.e., magnitude, altitude and direction), data quality control and improved precision of estimates.

Our radars were more powerful (i.e., 25 kW versus 12 kW) than used in some studies. Greater peak power output typically results in improved ability to resolve small targets at greater distances (Desholm et al. 2006). Importantly, we used the data collected with the "vertically-oriented" radar to estimate target movement indices as well as flight altitude. Given the inherent properties of the radar systems used in several of these studies, we believe that data collected with the vertically-oriented radar provide the best estimates of target movement.

Our radar system, data collection approach and data processing are more similar to those employed by Geo-Marine, Incorporated (GMI). GMI (2004) conducted marine radar studies for the Nantucket Sound environmental impact assessment and completed a radar study in New Jersey nearshore and offshore waters (GMI 2010) conducted during spring and fall 2008 and 2009. We will most often reference the latter study, a study we conducted in 2005 in coastal Cape May County, NJ and a study we conducted in 2009 on Block Island, Washington County, RI. Given that these studies monitored bird and bat movement patterns in coastal regions, the results are most relevant to our study on Monhegan Island and the Gulf of Maine. However, these studies were conducted and results presented with reference to potential impacts to aerial vertebrate fauna from commercial scale wind turbines. In contrast, our data were analyzed and presented in the context of a 1/3 scale test wind turbine.

4.1 MOVEMENT MAGNITUDE

In this section, we discuss our findings regarding movement magnitude (number of targets recorded or TR) and rate of movement (TR/hr). Although using target movement rates as an index of migration magnitude allows for comparisons among studies, they can be misleading. This is especially true when differences in data collection methods (e.g., hours of radar operation) are not fully explored. Furthermore, target movement rates as a measure of migration magnitude can obfuscate what is likely the more important metric for assessing collision risk, that is, the total number of birds and bats exposed to the tall structure in question.

4.1.1 *Effects of season and period on movement magnitude*

Generally, TR and TR/hr ranged 2-3 orders of magnitude within a single Season/Period and coefficients of variation were > 95%. These results indicate that seasonal bird/bat movements, especially during migration periods (i.e., both diurnal and nocturnal), were temporally episodic. Given that we were monitoring the entire spectrum of bird and bat fauna in the air space occurring above and around Monhegan Island and that the phenology of movement varies widely within and among taxa (i.e., age, sex, species), this was not surprising. TR and TR/hr were markedly greater during the nocturnal compared to the diurnal period, regardless of season. The majority of waterfowl, long-legged wading birds (e.g., herons, egrets), shorebirds and passerines are known to migrate at night (Alerstam 1990). This result is important, as birds appear to be better able to avoid wind turbines during the day than at night (Desholm and Kahlert 2005). Furthermore, indices of movement magnitude were highest during nocturnal periods during the early fall season. Southbound bird and bat migration, which for some species begins in mid-July, typically includes large numbers of juveniles, which could explain some of the seasonal differences we observed (Ralph 1981). Inexperienced individuals making their first migration could be more susceptible to entities that obstruct their flight path as they may be less capacity to avoid these obstructions or find alternate pathways.

Generally, our results for target passage and passage rates were consistent with respect to Period and Season. We detected significantly more targets during nocturnal compared with diurnal periods across most seasons. Not surprisingly, targets recorded at our Monhegan study site were greater during the Fall/Early season, when the nocturnal migration of passerines and shorebirds is at its peak. Our indices of avian movement was lowest in Winter when there is a dearth of avian activity in and around the coastal waters of Maine.

The preponderance of target detections also may have been related post-breeding dispersal in birds, which for some species can occur in late July at temperate and northern latitudes (Alerstam 1990), or in part to greater bat activity during the post breeding dispersal period (i.e., August and September) compared to other times of year (Arnett et al. 2008, Horn et al. 2008). Seasonal differences in movement indices generated from marine radar data have been reported widely in terrestrial (*cf* studies listed in Kerns et al. 2007, Table 7, p. 31) and coastal studies (Mizrahi et al. 2009, GMI 2010, Mizrahi et al. 2010). Whether spring or fall exhibits greater numbers of migrants depends primarily on the location under consideration and how it corresponds spatially to migration flyways and breeding areas.

The number of targets (TR) and target movement rates (TR/hr) we recorded at our Monhegan Island study site for nocturnal migration during spring and fall were generally similar to those reported for Block Island (Mizrahi et al. 2010) and coastal NJ (GMI 2010). Although the latter study did not specifically report mean movement magnitude or movement rates (i.e., referred to as adjusted migration traffic rate, AMTR) by season or period, and results of statistical tests to explore differences between seasons and periods (i.e., diurnal, nocturnal) were not available in the printed report, Season/Period peak values of movement rates appeared to be similar. Additionally, graphical representations of their data suggest that the range movement rates they observed were similar to ones we report for Monhegan Island.

In contrast, TR and TR/hr we recorded during nocturnal periods on Monhegan Island were less than half of that reported in a spring and fall nocturnal migration study conducted in 2005 along the coast of Cape May, NJ (Mizrahi et al. 2009). The Cape May Peninsula is a geographic feature that tends to concentrate migrating birds, especially in fall. Furthermore, birds from several migration flyways (e.g., Atlantic, Delaware River Valley, Hudson River Valley) are often vectored to the Cape May Peninsula by prevailing winds in fall. Prior to spring migration, the mouth of Delaware Bay and the waters around the Cape May Peninsula serve as a staging area for several sea duck species (e.g., Surf Scoter, Black Scoter) that amass in 10s of thousands. Furthermore the Delaware Bay and the southern coast of New Jersey is a major spring staging area for shorebirds migrating north to the breeding grounds.

TR/hr from our Monehegan Island study were also lower than those we recorded during a study in the mid-Atlantic Appalachian Mountain region (Mizrahi et al. 2008) and from several terrestrial studies conducted in the northeast (e.g., Plissner et al. 2006, Mabee et al. 2005, Cooper et al. 2004a, 2004b) and the northwest U.S. (Mabee and Cooper 2004). This might suggest that overland migration is greater in magnitude than that occurring in the Gulf of Maine and the Monhegan Island vicinity. However, except for Mizrahi et al. (2008), the terrestrial studies we cite for comparison conducted radar observations for shorter periods during a given season compared to our Monhegan Island study. Our review of relevant literature suggested that most impact-assessment studies using marine radar focus on what is the assumed peak of movement for a given season. For example, two different studies conducted in northern New York during fall migration covered only two month periods in September and October (Mabee et al. 2005) or from mid August through mid October (Kerns et al. 2007), while a study from western New York was conducted for only 30 days in September and October (Cooper et al. 2004b). Doing so results in a greater migration passage rate than if studies were conducted across the entire migration season as we did in the Monhegan Island study.

Additionally, many of the studies we reviewed began their radar observations approximately one hour after sunset and continued for approximately six hours (Cooper et al. 2004a, 2004b, Mabee et al. 2005, 2006, Plissner et al. 2006), far less than the average number of hours/night we made. Nightly data collection in these studies appeared to focus on what is the assumed nightly peak of movement. Again, this would tend to result in greater migration passage rates than if data were collected throughout the entire nocturnal or diurnal period. Although some studies did conduct radar observations from sunset to sunrise the next morning (e.g., Kerns et al. 2007), we are unaware of any studies that made radar observations during both diurnal and nocturnal periods except those conducted by GMI (2004, 2010) and Mizrahi et al. (2010) at Block Island.

Differences in diel and seasonal radar observation periods are noteworthy and must be accounted for when comparing target movement and movement rate estimates among studies. Estimates that include significant sampling during non-peak periods of movement, as in our study, likely are lower than reported in studies with markedly fewer hours of observation focused on peak migration periods. Additionally, extending sampling periods provides insight into times of day and during a season when bird and bats are most vulnerable (i.e., migration periods, take off and landing, Richardson 2000). We believe that broader temporal coverage is essential to a comprehensive understanding of bird and bat movement patterns and how tall structures might affect flight behavior and potential risk of collision.

4.1.2 *Diel patterns of movement magnitude*

Our monitoring during the diurnal period suggests that sizable numbers of targets were airborne just before sunset in Fall/Late and Winter. Movements during this period could have been birds flying to roosting areas. We also detected a rapid increase in movement just after sunrise in Fall/Early and Spring. This could have been related to birds moving from roosting areas to begin foraging or the morning flight of nocturnally migrating passerines reorienting after a night of migration (Wiedner et al. 1992). Unfortunately, we found little information about temporal patterns of movement in diurnal migrants from other radar studies.

Temporal patterns in nightly movements we observed were distinct, predictable and generally consistent with those reported for nocturnal landbird migration (Gauthreaux 1971, Åkesson et al. 1996). That is, migrants ascend rapidly within the first hour after sunset; numbers increased markedly and peaked approximately 2-4 hours after sunset, and then declined gradually until the following morning. Åkesson et al. (1996) suggest that various bird species make nocturnal migration ascents at different times relative to sunset and civil twilight, which could result in the 2-3 hour interval to reach peak numbers that we observed. Horn et al. (2008) and Reynolds (2006) suggest that bats in West Virginia and New York, respectively, exhibit similar within-night activity patterns as reported for birds, but whether this behavior is widespread is unclear because data are lacking.

4.1.3 *Environmental factors affecting variation in movement magnitude*

4.1.3.1 Date and local weather conditions

Correlations between bird activity, particularly during migration, and environmental conditions (e.g., weather, season, date within season) is well documented (Lack 1960, Nisbet and Drury 1968, Able 1973, Richardson 1978, 1990b, Erni et al. 2002, Schaub et al. 2004, Liechti 2006, Mizrahi 2008, 2010). However, specific relationships between environmental and meteorological conditions and large movements of birds and bats are still often unclear. The intent in our analytical approach to illuminating these relationships was to provide more predictive power than similar studies. Furthermore, our purpose was to provide results that could be applied easily to decision-making about the wind energy development or to mitigate possible negative effects of this on aerial vertebrates. Given the complexity of avian and bat migratory systems and ecological studies of this scale, independent variables were reasonably successful at explaining variation in the magnitude of target passage and passage rates for the spring and fall migration periods. This was especially the case during both the early and late fall migration seasons.

Consistent with other studies that have identified wind as a principal driver for the timing and magnitude in migrating birds (Nisbet and Drury 1968, Alerstam 1978, 1979, Richardson 1978, 1990a, 1990b, Pyle et al. 1993, Butler et al. 1997, Bruderer and Liechti, Liechti and Bruderer 1998, Weber et al. 1998, Åkesson and Hedenström 2000, Williams et al. 2001, Erni et al. 2002). Wind conditions, especially those producing tailwinds that would facilitate movement to the south, proved most explanatory during the Fall/Early season for both Day and Night periods. Movements under tailwind conditions were consistently four times greater when they were increasing. This would help individuals conserve energy as they moved toward their wintering grounds and this may confer some fitness advantage. Carryover effects from one part of the annual cycle to another can have profound influence on fitness (Baker et al. 2004, Norris and Marra 2007). This could put a premium on selecting wind conditions that would vector an individual towards its goal using the least amount of energy (i.e., tailwinds blowing from the appropriate direction).

That Julian Day was the principal determinant explaining variation in magnitude of the response variables during the Fall/Late was not surprising given the intrinsic relationship between date within season and the abundance of migratory individuals (i.e. later in the season, there are fewer individuals available to be sampled). Diurnal movements decreased dramatically by mid-October, while nocturnal migration activity remained high throughout October, dramatically decreasing only after 1 November. The differences in diurnal and nocturnal movements are evidence of migration phenology in the Gulf of Maine. In late fall, diurnal migrants, such as waterbirds and raptors, are most numerous early in the season, peaking in locations along the mid-Atlantic coast, well south of the Gulf of Maine, around the end of October. Medium to short distance boreal landbird migrants, primarily northern sparrow and finch species, migrate later in the season.

In addition to Julian Day, tailwinds appeared to play an important role in determining the magnitude of nocturnal migrants we detected during late fall. Under increasing tailwind conditions, migration magnitude increased four-fold. Additionally, models for the Fall/Late season during the Night period were among the best at explaining variation in movement magnitude.

Although our analyses identified dew point, barometric pressure, and Julian Day as probabilistic determinants of movement magnitude in Spring, their ability to explain variation in response variables was relatively weak. In fact, the only significant predictor that had any power explaining the variation in movement magnitude was dew point. This is on contrast to recent similar conducted in coastal areas of New England and the mid-Atlantic recently (Mizrahi et al. 2009, 2010). Mizrahi et al. found that models including dew point explained little daily variation in migration magnitude, while Julian Day and wind conditions were important drivers of spring movement patterns. Certainly, increasing dew point can signal a shift to more southerly winds, which we would expect birds to exploit in their attempts to move northward in spring. Movements under tailwind conditions would help them conserve energy as they move northward towards their breeding grounds. Furthermore, temperature is typically correlated with date during spring, and moisture usually accompanies these warmer air masses from the south. This provides some explanation for understanding how increasing dew point could be related to increasing movement magnitude. However, that we did not see any of these correlated weather variables as important in the best performing models along with dew point is important to note.

Of note, the Mizrahi et al. (2010) study used for comparison took place on Block Island, RI, ~ 400 km southwest of Monhegan Island. While their results do not shed light on the influence of dew point in the Gulf of Maine, they could explain some of the general differences in migratory movements between these two regions. The breeding season for many arctic and boreal breeding birds is short, thus the spring migration period tends to be more contracted (i.e., compared with fall migration), leaving individuals less time to "wait" for optimal conditions to migrate. Early arrival to the breeding grounds, though it has its trade offs, often results in better territory and mate acquisition and higher breeding success (Møller 1994, Potti 1998, Marra et al. 1998, Norris et al. 2006, Norris and Marra 2007, Smith and Moore 2005). Time constraints could become more influential as individuals get closer to their breeding grounds, causing them to be less sensitive to weather conditions. Birds have the ability to adjust air speed with respect to a headwind or tailwind conditions and this can help reduce energy costs (Pennycuick 1989 and Liechti 2006). Under the time constraints experienced in spring, this ability may allow individuals to migrate under less than optimal conditions while minimizing energetic costs.

Finding little to no relationship between weather and target activity during the summer and winter seasons was not surprising. Movements during these seasons are likely shaped by nesting behavior and the location of foraging areas, which are not normally influenced by daily changes in local weather conditions. Future studies in the Gulf of Maine might be directed at investigating movement patterns related daily foraging in explaining target movements during these seasons.

Similar to Mizrahi et al. (2010), although not significant in our study, we found Julian Day to be the most useful predictor of target magnitude in summer. Although low barometric pressure was the most consistent predictor in winter models, its explanatory power was poor except for targets detected between 26-50 meters. Changes in barometric pressure can be indicative of changing frontal systems and lowering pressure can signal southerly air masses. Perhaps southerly air masses encourage facultative movements during the winter (Newton 2012, Oppel et al. 2008). Warm air masses related to this kind of pressure change also may cue bats to make brief movements from winter hibernacula to rehydrate (Fleming and Eby 2003) and this could have resulted in the increases in target activity we recorded in the lowest altitudinal strata. However, the biological significance of the relationship between low-pressure systems and the magnitude of aerial vertebrate movement during the winter is not well documented

4.1.3.2 Synoptic weather conditions

Our results suggested that synoptic weather patterns that produced wind conditions appropriate for vectoring individuals southward toward the wintering grounds were important predictors of movement events during the Fall/Early and Fall/Late seasons, although this effect was more pronounced during the Night period. The greatest number of targets we recorded and highest movement rates were apparent after a cold front, when the western portion of a low pressure system was positioned north and east of Monhegan Island. Drury and Keith (1962) reported that these conditions were important predictors of fall bird migration in coastal Massachusetts.

Importantly, the proportion of targets (i.e., of the total targets detected) we detected under these conditions were significantly different from their overall occurrence, suggesting that aerial vertebrates respond specifically to meso scale weather conditions that are favorable for fall migration. Furthermore, results of our synoptic analyses for Fall support relationships between local weather conditions and movement magnitude we found. That is, conditions associated with the passage of cold fronts or high pressure systems west of Monhegan produce northerly winds, which that were associated with the greatest number of target detections during our study.

Synoptic weather patterns producing wind conditions appropriate for directing individuals northward toward the breeding grounds were important predictors of movement events in Spring. At temperate latitudes, this generally means southerly winds prevalent after the passage of a warm front, east of an approaching cold front or on the western side of a high pressure system (*cf* citations in Richardson 1978, 1990a, Alerstam 1990). Nearly 50% of all targets we recorded occurred when weather patterns produced prevailing southerly winds. These conditions were important predictors of spring bird migration in coastal Massachusetts (Drury and Keith 1962). Similar to Fall seasons, we detected a disproportionately greater number of targets when pressure systems produced southerly winds or calm conditions relative to the occurrence of these conditions, again suggesting that birds, and possibly bats, were selective about the conditions under which they were actively migrating.

Birds can reduce energetic costs significantly by migrating under favorable winds (i.e., tailwinds, Gauthreaux 1991, Piersma and van de Sant 1992, Liechti et al. 2000), thus large migration events are often coincidental with these conditions (Richardson 1972, 1974, Able 1973, Blokpoel and Gauthier 1974, Pyle et al. 1993, Williams et al. 1977, 2001). This may be especially important for species that rely on nutrient reserves acquired prior to or during migration to initiate nesting and egg laying (i.e., capital breeders). The energy they save by flying under conditions that facilitate movement during migration may improve success during the breeding season.

Interestingly, our data also suggest that aerial vertebrates, in this case birds, responded to a variety of conditions during the Winter, but during the Night period, appeared to respond primarily to synoptic conditions that produce easterly or northeasterly winds. Often, these conditions can be related to winter storm activity and may result in movements toward sheltered waters near shore. Unfortunately, there are few data to support our observations from the Gulf of Maine region.

Similar to our analyses of local weather conditions and their effect on movement magnitude, synoptic weather conditions were not good predictors of movement magnitude during the Summer season, regardless of Period. Given that Summer is not typically a time when birds are migrating, this result is not surprising. More likely, birds we recorded were engaged in local movements to and from foraging areas, or possibly early migrations of bats. How migrating bats respond to meso-scale weather patterns is generally unknown. If their behavior is dissimilar enough from birds, this could result in an indiscernible pattern, as we found for Summer.

4.2 MOVEMENT ALTITUDE IN THE LOWEST ALTITUDINAL STRATA

Determining flight altitudes of birds and bats is an essential element in assessing the potential effects of tall structures on aerial vertebrates. Most investigators working on environmental impact assessments of tall structures, such as wind turbines, limit their evaluation of potential risk to the altitudinal strata immediately associated with a wind turbine's rotor swept area. However, expanding the range considered as "risky" may provide improved insight into the broader extent of potential impacts.

That most assessments of potential impacts of wind energy development are for industrial-scale turbines that are approximately 150 – 200 m tall when one of the turbine blades is in the upright position is important to note. In contrast, the Monhegan Island assessment was for a 1/3 scale test turbine that would measure approximately 50 m in height with one of the turbine blades in the upright position. Given this, we focused our analyses of altitudinal distribution on two strata, 0 – 25 m and 26 – 50 m above sea level, which is considerably lower than typically considered in these kinds of assessments. Consequently, we are not aware of any data sets that would allow for direct comparisons of movements by aerial vertebrates in these altitudinal strata. However, we will refer to other studies that report results for regions below 100 m for qualitative comparison.

4.2.1 *Effects of season and period*

The highest proportion of aerial vertebrates we detected flying at low altitudes occurred during the Day period and non migratory seasons (i.e., winter, summer). Birds typically make local flights between nesting, roosting and foraging areas during these times and likely do not ascend to the altitudes typically attained by migrating birds as there is a considerable energetic cost for this (Hedenström and Alerstam1992).

However, using proportions of targets detected in various altitudinal strata allows for comparison among studies, however, they can be misleading. The total number or aerial vertebrates detected in the two lowest altitudinal strata we considered were greatest during migration periods (i.e., fall and spring). Furthermore, low altitude targets were detected in the greatest number at night. These results correspond closely to what we found with respect to overall movement magnitude. Thus the greatest number of birds and bats flying at low altitudes occurs during the movement magnitude is also greatest. In fact, regardless of migration season, aerial vertebrates we recorded were more than twice as numerous during nocturnal compared with diurnal periods.

This inverse relationship between the total number of targets recorded and the proportion in the two lowest altitudinal strata was clear from our analyses, in particular during migration seasons. That is, as the overall number of targets we recorded increased, the proportion of targets detected at or below 50 m decreased significantly.

Similar relationships were alluded to in radar studies of bird migration in New England (Nisbet 1963), the Gulf of Mexico (Able 1970) and apparent in a study conducted in the mid Atlantic Appalachian Mountain region (Mizrahi et al. 2008). They are important to consider when evaluating the risk of collision with tall structures. Although the thesis that nocturnal migrants may be at greatest risk of collision during ascent and descent has been suggested (e.g., Richardson 2000), the greatest number of individuals may be exposed to risk during the peak periods of migration, as was the case in our study.

In general, our data suggest that proportionally more birds flew at lower altitudes compared with altitudes reported in radar studies of avian movements over land (*cf* Table 7 in Kerns et al. 2007), even though we considered a much smaller range (e.g., 0 –50 m versus 0 – 100 m). Although our results were more similar to those reported in a radar study of bird movement in the North Sea (Hüppop et al. 2006) and the altitudes of birds recorded in coastal and offshore New Jersey

(Mizrahi et al. 2009, Geo-Marine 2010) and Block Island, RI (Mizrahi et al. 2010), the proportion of aerial vertebrates we detected in the coastal waters around Monhegan tended to be greater.

4.2.2 *Environmental factors affecting variation in movement altitude*

4.2.2.1 Date and local weather conditions

During migration seasons, the factors underlying the greatest number of targets recorded in the lowest altitudinal strata were nearly identical to those that were important at predicting total movement magnitude. In Fall/Early, improving tailwinds, that is wind vectors facilitated movement in a seasonally appropriate direction (e.g. southward in fall) resulted in a four-fold greater number of targets flying at low altitudes.

Birds often fly at altitudes that minimize energy costs (Bellrose 1971, Bruderer et al. 1995). Which altitudinal stratum an individual chooses appears to be primarily a response to changing wind fields (Able 1970, Alerstam 1985, Gauthreaux 1991, Bruderer et al. 1995). Headwinds and atmospheric turbulence can increase energy expenditures during flight (Bruderer 1978, Williams et al. 2001). With respect to the latter, the atmosphere is often more turbulent and turbulence extends higher into the atmosphere over land and along coastlines than over water (Kerlinger and Moore 1989). This results primarily from an absence of thermal convection and topographic relief over water. Low altitude winds can often be faster and more persistent over water compared to land (Hüppop et al. 2006), which could explain low altitude flights by birds over water when tailwinds are present. Furthermore, when wind conditions are favorable across many strata, birds may select lower altitudes to avoid lower temperatures, relative humidity and partial pressure of oxygen typical of higher altitudes. These conditions could accelerate water loss and convective heat loss, which could reduce flight efficiency (Carmi et al. 1992, Klassen 1996, Liechti et al. 2000).

Differences in flight altitude between diurnal and nocturnal migrants were reported in a radar study of bird movement in the North Sea (Hüppop et al. 2006) and time of day is often cited as an important influence on flight altitude (Lack 1960, Eastwood and Rider 1965, Able 1970 Hüppop et al. 2004). Similarly, wind fields are generally more predictable and consistent at night than during the day, which might explain differences in the flight altitudes of diurnally and nocturnally migrating birds (Kerlinger and Moore 1989).

In Fall/Late, however, date was the most consistent predictor of movement magnitude across all altitudinal strata and at the lowest altitude, with numbers in both categories waning as the migration season approached its closure. Spring movement patterns in the lowest altitudinal strata were also most affected by date, with the greatest number occurring at the beginning of May, when the greatest diversity of migrants (e.g., passerines, shorebirds, waterbirds) would be expected in the Gulf of Maine system. Again, these results were consistent with results we found for total targets recorded across all altitudes we sampled.

4.2.2.2 Synoptic weather conditions

Results from synoptic weather analyses provided insight into weather conditions that affect the vertical distribution of birds and bats in the atmosphere similar to those that affect movement magnitude. That is, synoptic conditions that had the potential to vector migrating birds and bats toward their seasonally appropriate goals in Fall and Spring migration seasons (i.e., north in spring, south in fall), also affected the magnitude of targets we detected in the two strata most relevant to the DeepC test wind turbine project (i.e., 0 – 25 m, 26 – 50 m). Importantly, the proportion of targets (i.e., of the total targets detected) we detected in these strata were significantly different from their overall occurrence under which they occurred. This suggests that aerial vertebrates respond specifically to meso scale weather conditions that are favorable to migration toward their seasonal goals. However, this was only apparent during the Night period, suggesting that diurnal migrants may be less responsive to meso-scale weather patterns.appeared to affect the proportion of targets we recorded in the strata ≤ 50 m.

During the Fall seasons, the proportion of targets we recorded ≤ 50 m was greatest when high pressure cells produced northwesterly winds. Given the prevailing direction of migration to the southwest (this study), northwesterly winds would be perpendicular to the preferred axis of movement and this can cause birds to fly at lower altitudes (Alerstam 1978, Richardson 1990a). Kerlinger (1989) also reported this behavior in raptors migrating along the Cape May Peninsula in fall. Importantly, these conditions are also associated with proportionally greater movement magnitude (this study), supporting the thesis that the greatest risk to aerial vertebrates may be when the greatest number, not the greatest proportion, of individuals are flying at low altitude. Proportions of targets detected at low altitudes were lowest when pressure cells produced northeasterly winds, which would be considered tailwinds for birds migrating to the southwest. In Cape May, New Jersey, flight altitudes are usually greatest in birds of prey when these conditions prevail in autumn (Kerlinger 1989).

Spring, presented a somewhat different picture about the influences of meso-scale weather systems on flight at low altitudes. The approach of high pressure ridges (i.e., cold fronts) or low pressure cells, rather than synoptic conditions that produce winds opposed to the direction of migration (i.e., northerly winds), resulted in the greatest proportion of targets we recorded ≤ 50 m. Increasing clouds, low ceiling and precipitation are typical elements of these meso-scale pressure systems. These synoptic conditions also produce southerly winds that would facilitate movement north to the breeding grounds. Greater numbers of birds that typically fly at low altitudes coupled with the potential for adverse weather conditions could explain the relationships we found.

Our data did not imply any specific patterns or associations with meso-scale weather patterns for Winter or Summer seasons. This is not surprising as most of the movements during these period would be birds in transit between foraging areas or foraging and roosting areas (Winter) or nesting and foraging areas (Summer). These movements often occur at low altitudes, but are not known to be greatly influenced by meso-scale weather conditions.

4.3 FLIGHT ORIENTATION

Mechanisms used by migrating birds to find their way between breeding and wintering grounds have been studied extensively (*cf* citations in Gauthreaux 1980, Alerstam 1990, Berthold 1991). "Pilotage," the use of visible features in the landscape as a guide (e.g., coastlines, rivers, mountain ranges), is often associated with diurnal migrants (Kerlinger 1989, Alerstam 1990, Berthold 1991), although some nocturnal migrants also exhibit this behavior (Bingman et al. 1982). On the other hand, "orientation," the use of an environmental cue or cues that provide directional information (e.g., celestial rotation, Earth's magnetic inclination) appears to be more prevalent in nocturnal migrants (e.g., passerines, shorebirds)(Able and Bingman1987).

Wind conditions, however, can play an important role in modifying the directional behavior of flying vertebrates (Richardson 1990b). Our results suggest that the targets we observed responded to wind conditions, both direction alone and direction and speed together (i.e., tailwind/headwind vectors). In spring, birds and bats we recorded flew primarily in a northeasterly direction. In fall, the mean vector of flight during the day was westerly and at night it was southwesterly. The nocturnal flight directions are similar to ones reported in other radar studies conducted in New England and mid-Atlantic coastal regions (Drury and Nisbet 1964, Mizrahi et al. 2008, Geo-Marine 2010).

We found that mean vectors of prevailing winds at sunrise and sunset during the spring, summer and fall were significantly different than mean vectors for flight directions recorded during all Season/Periods. Given what appears to be a consistent pattern of flight direction in aerial vertebrates in the mid-Atlantic, our results suggests that birds and bats were either selective about the wind conditions under which they flew, or that they were able to compensate for differences between wind directions and their directional goals. Clearly, these hypotheses are not mutually exclusive and could be operating in tandem to produce the behaviors we observed.

4.4 OTHER CONSIDERATIONS REGARDING RELATIONSHIPS BETWEEN WEATHER CONDITIONS AND MOVEMENT PATTERNS

Here we evaluate possible reasons or alternative explanations for our results given that in some instances they differed from our expectations, which are based on other studies that address relationships between movement patterns in aerial vertebrates and weather conditions. First and foremost, the difficulty comparing specific results among studies that could involve different suites of species and specific weather patterns is important to acknowledge. Inherently, species may respond differently to specific set of weather conditions (Nisbet and Drury 1968, Nilsson et al. 2006). For example, small birds and bats are more likely to be influenced by strong winds than larger ones. In local and regional migration systems, species composition may differ between sites. Generally, individual species cannot be identified using radar. Species composition during migration events can show marked temporal variation at the same locale or region and among locales and regions, which could affect the detection of meaningful relationships between movement patterns and weather conditions. However, given that several of the studies we cite in this report were conducted along the east coast, this explanation seems unlikely.

There are other proximate factors that influence migratory behavior that we did not consider during this study but have been investigated by others. Lunar cycles (Pyle et al. 1993), which are also linked to tidal flow, has been shown to influence migratory decisions in birds (Nolet and Drent 1998, Tulp et al. 1994), as has wind characteristics aloft (Richardson 1978, 1990a and Schaub et al. 2003). Location and quality of stopover habitat (Morris et al. 1994 and Weber et al. 1998) and an individual's energetic condition at the time of departure have also been considered important determinants of migration behavior (Berthold 1996, Jenni and Jenni-Eirmann 1998). Nisbet and Drury (1968) also showed that changes in weather conditions rather than conditions at the time when birds initiate migration was important for interpreting migration patterns, specifically in the Gulf of Maine. We did not measure overall change in weather variables over time in this study and therefore may have missed capturing variation in environmental variables that could be influencing this system. However, on a few occasions, movement patterns in our study appeared to be related to weather conditions occurring ~12 hours prior to the period we were assessing. For example, in Fall/Late, nocturnal activity was be predicted by wind conditions at sunrise. This suggests that changes in weather conditions over time may be integrated by birds and this could be instrumental in eliciting a migration response. in make migratory decisions. Large temporal and spatial scale migration patterns across a region like the Gulf of Maine are unlikely to be adequately characterized by environmental conditions at a single moment in time.

In recent years, we have improved our understanding of how meteorological conditions influence migrating bats. During fall migration, bat activity appears to increase under low wind speeds, warm temperatures, greater moon illumination, and falling barometric pressure. Conversely, they appear to decrease when winds are from the north or northeast (Baerwald and Barclay 2011, Cryan and Brown 2007, Fleming and Ebby 2003). Surprisingly, these conditions are generally the opposite of those thought to elicit migratory responses in birds during fall. Birds and bats are indistinguishable on radar. Consequently, if the above conditions influence bat migration in the Gulf of Maine and their numbers are significant, our ability to characterize weather conditions that predict overall movements patterns will be compromised. Differences between the responses in these two distinct taxa will result in greater variability in our data and less power to detect significant patterns. Recent bat acoustic studies conducted on fifteen different islands in the Gulf of Maine have documented high call rates of both resident and migratory species from April through November (Pelletier et al. 2012). The use of other techniques, such as forward-looking infrared cameras (FLIR) or mist netting, coupled with radar data, could provide insight into the relative proportion of birds and bats moving through the Gulf of Maine and could help clarify the meteorological conditions that underlie movement patterns.

5.0 CONCLUSIONS

Despite some limitations, we believe our project was successful in documenting key elements of bird and bat flight dynamics around Monhegan Island during their north and southbound migrations through the region and during the breeding season. Moreover, the results reported here will provide informational support for decisions related to wind energy development in the Gulf of Maine.

Clearly, our results suggest that the movement of aerial vertebrates through the study area was substantial. The flight altitudes of several thousand of birds and bats could have resulted in their encountering a structure 25 – 50 m tall, which is the height proposed for the test turbine in the offshore waters of Monhegan Island. That an encounter does not necessarily result in a significant interaction (i.e., collision resulting in injury or fatality) is important to note. What proportion of encounters may have resulted in a significant interaction with a 50 m tall wind turbine is beyond the scope of this study.

Seasonal changes in movement patterns are often predictable but daily variation is less so. These patterns are likely affected by interactions between an individual's physiological conditions, distance from destination (Berthold 1984), food availability and environmental factors, such as weather and date relative to intended arrival on the breeding or wintering grounds (Able 1973, Richardson 1978, 1990a). These interactions are complex and often difficult to discern. Given this, our ability to build truly predictive models to characterize daily changes in movement patterns requires data that were beyond the scope of this study. Despite this, we believe our results shed light on meteorological conditions that modify flight dynamics and behavior. Furthermore, they suggest environmental factors that could affect when birds and bats have the greatest probability of encountering a tall structure during daily or migration movements in the Gulf of Maine.

Within the northeast, the Gulf of Maine and its coastal regions are an especially important resource for millions of migrants during both spring and fall migration and serves as a nexus for many boreal breeding birds whose migration routes intersect over the Gulf of Maine (Drury and Keith 1962, Hicklin 1987, Leppold and Mulvihill 2011, Richardson 1978 and 1979). The magnitude of movement we recorded in the area around Monhegan Island during this study lends support to the Gulf of Maine's importance. Furthermore, spatial heterogeneity in movement patterns of aerial vertebrates in the Gulf region are highly likely, thus extrapolating results from this study to other potential areas of wind energy development is not recommended. Thus, to better understand the relative importance of the Monhegan Island region to aerial vertebrates using and the context of our results relative to patterns in the Gulf of Maine region requires additional studies. We believe these are critical to developing any effective strategies for large-scale wind energy development.

6.0 ACKNOWLEDGMENTS

We would like to thank DeepC Consortium and the University of Maine, especially Jeff Thaler, Damian Brady and Peter Jumars for their support and patience throughout the project. We especially thank Becky Holberton for getting NJ Audubon involved and her support of Adrienne Lepphold during the project. Additionally, we thank the Island Institute, especially Heather Deese for her support. Finally, thanks to Dori and Matt Schweier for their logistical support on Monhegan Island.

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Table 1. Total and mean hours of data collection by period (i.e., diurnal, nocturnal) and season. Diurnal periods ran from sunrise to sunset the same day and nocturnal periods ran from sunset to sunrise the following morning.

	Total hours	Mean hours	± Standard Error	N
Diurnal				
Fall-early	1059.98	13.59	0.08	78
Fall-late	748.95	10.12	0.08	74
Winter	890.67	10.01	0.04	89
Spring	1029.28	13.72	0.09	75
Summer	660.87	15.37	0.10	43
Total	4389.75	12.23	0.12	359
Nocturnal				
Fall-early	819.55	10.37	0.07	79
Fall-late	1025.82	13.86	0.08	74
Winter	1243.85	13.98	0.04	89
Spring	769.47	10.26	0.09	75
Summer	370.42	8.61	0.01	43
Total	4229.10	11.75	0.12	360

Table 2. Types of data used in analyses to investigate relationships between local weather conditions and bird/bat flight dynamics (e.g., target passage, altitude, direction) observed on Monhegan Island, ME, 15 July 2010 - 14 July 2011. Data used in analyses were derived from local climatological data sets acquired from National Climate Data Center (NCDC) for Knox County Regional Airport, Rockland, ME.

1 Cloud cover (Cloud, % of sky covered by clouds or fog, in increments of 25%).

2 Ceiling (Ceil, vertical visibility estimated in kilometers, converted to meters)

3 Horizontal visibility (Vis, estimated in kilometers, converted to meters)

4 Precipation (Precip, mm)

5 Dry bulb temperature (Temp, in degrees Celsius)

6 Dry bulb dew point temperature (Temp, in degrees Celsius)

7 Barometric pressure (Pressure, measuree in inches, converted to millibars)

8 Wind speed (Wind, measured in knots, converted to meters/second)

9 Tailwind/Headwind vector (THV, calculated wind vector along an axis parallel to assumed direction of migration goal [i.e., S ↔ N, SW ↔ NE]. Tailwinds have positive values and headwinds have negative values [see Appendix 11 for equation used in calculation]).

Table 3. Synoptic weather classifications based on geostrophic wind circulation patterns (after Richardson 1976, Lank 1983).

Class	Description
1	Southerly winds, from SE to WSW, except immediately following a cold front. Typically occurs on the east side of a cold front or south of a passing warm front
2	Northwesterly winds, from west to north. Frequently occurs after passage of a cold front, in areas NE of a high pressure system or SW of low pressure
3	Northeasterly winds, from north to southeast. Can occur after passage of a cold front, in areas SE of high pressure or N and W of low pressure
4	The center of a low pressure system and the area immediately around a cold front. Also, areas in the immediate vicinity of a cold front. Often associated with precipitation
5	Calm weather at the center of a high pressure system or in poorly organized areas south of a stationary front.

Table 4. Results of marine radar image analyses for data collected on 78 days (i.e., sunrise to sunset the same day) during the Fall/Early 2010 period (15 July - 30 September) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate days when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
07/15/10	196	450	450	1.00	1529	306	20.40	0.02	7.40	0.02	5.00	0.09	28.42
07/16/10	197	450	390	0.87	872	184	14.15	0.01	1.27	0.02	2.95	0.05	9.50
07/17/10	198	450	450	1.00	534	105	7.00	0.04	4.52	0.05	4.92	0.24	25.37
07/18/10	199	450	450	1.00	504	123	8.20	0.04	4.39	0.02	2.93	0.21	25.63
07/19/10	200	450	420	0.93	1882	375	26.79	0.04	13.75	0.03	10.76	0.11	41.84
07/20/10	201	450	415	0.92	2715	537	38.82	0.03	14.24	0.03	14.83	0.08	43.71
07/21/10	202	445	430	0.97	2354	464	32.37	0.02	9.66	0.02	11.04	0.10	44.74
07/22/10	203	445	445	1.00	657	125	8.43	0.05	6.66	0.05	5.90	0.19	23.97
07/23/10	204	445	435	0.98	730	141	9.72	0.04	5.99	0.04	5.02	0.17	24.34
07/24/10	205	70	65	0.93	209	41	18.92	0.01	0.39	0.01	0.59	0.05	2.16
07/25/10	206	445	340	0.76	290	54	4.76	0.10	5.21	0.04	2.23	0.25	13.59
07/26/10	207	445	445	1.00	419	76	5.12	0.07	5.26	0.05	3.81	0.20	15.42
07/27/10	208	440	440	1.00	580	113	7.70	0.07	8.38	0.02	2.73	0.18	20.07
07/28/10	209	380	380	1.00	518	98	7.74	0.05	4.54	0.05	4.92	0.22	21.95
07/29/10	210	445	365	0.82	366	69	5.67	0.03	2.07	0.01	0.57	0.13	8.86
07/30/10	211	380	380	1.00	1354	269	21.24	0.02	6.16	0.04	10.53	0.12	32.18
07/31/10	212	435	435	1.00	2369	471	32.48	0.03	16.10	0.02	7.16	0.12	55.87
08/01/10	213	435	435	1.00	599	113	7.79	0.08	8.87	0.06	6.60	0.21	23.58
08/02/10	214	435	435	1.00	436	87	6.00	0.03	2.59	0.03	2.59	0.16	13.57
08/03/10	215	435	375	0.86	186	32	2.56	0.07	2.24	0.06	1.89	0.33	10.49
08/04/10	216	435	420	0.97	189	33	2.36	0.01	0.35	0.04	1.22	0.29	9.60
08/05/10	217	390	295	0.76	478	96	9.76	0.01	1.00	0.01	0.80	0.05	4.42
08/06/10	218	430	415	0.97	1101	237	17.13	0.02	4.09	0.03	6.03	0.10	23.46
08/07/10	219	430	430	1.00	727	145	10.12	0.07	9.57	0.03	4.19	0.21	31.11
08/08/10	220	425	425	1.00	834	163	11.51	0.01	2.15	0.02	3.71	0.11	17.20
08/09/10	221	425	370	0.87	884	178	14.43	0.03	4.63	0.01	2.62	0.09	16.11
08/10/10	222	425	420	0.99	3266	647	46.21	0.02	13.87	0.01	8.72	0.07	47.74
08/11/10	223	425	425	1.00	3698	1028	72.56	0.03	35.86	0.03	33.36	0.12	123.15
08/12/10	224	380	380	1.00	1467	552	43.58	0.02	10.54	0.04	20.32	0.13	74.50
08/13/10	225	425	420	0.99	875	181	12.93	0.03	5.38	0.02	3.93	0.13	23.37
08/14/10	226	425	425	1.00	336	72	5.08	0.01	1.07	0.02	1.50	0.12	8.36
08/15/10	227	420	420	1.00	177	34	2.43	0.00	0.00	0.02	0.77	0.19	6.53
08/16/10	228	420	250	0.60	102	16	1.92	0.07	1.10	0.25	3.92	0.70	11.14
08/17/10	229	420	420	1.00	1432	279	19.93	0.03	8.77	0.01	3.31	0.09	26.30
08/18/10	230	415	415	1.00	3610	717	51.83	0.04	31.58	0.03	22.05	0.13	92.95
08/19/10	231	395	395	1.00	4175	830	63.04	0.01	12.33	0.02	14.91	0.09	72.96

Table 4. Continued

08/20/10	232	410	410	1.00	2430	485	35.49	0.04	18.96	0.02	10.38	0.13	61.87
08/21/10	233	410	365	0.89	1951	384	31.56	0.05	18.11	0.05	20.27	0.19	72.43
08/22/10	234	410	380	0.93	429	87	6.87	0.04	3.24	0.03	2.84	0.19	16.43
08/23/10	235	405	95	0.23	265	66	20.84	0.07	4.73	0.04	2.49	0.14	9.46
08/24/10	236	405	375	0.93	1328	264	21.12	0.04	9.94	0.03	9.14	0.12	32.40
08/25/10	237	410	125	0.30	84	14	3.36	0.24	3.33	0.18	2.50	0.46	6.50
08/26/10	238	365	350	0.96	298	55	4.71	0.04	2.40	0.05	2.58	0.13	7.20
08/27/10	239	405	405	1.00	1890	373	27.63	0.04	15.39	0.04	15.79	0.15	56.64
08/28/10	240	405	405	1.00	2908	577	42.74	0.02	11.71	0.02	9.33	0.07	42.26
08/29/10	241	405	405	1.00	938	185	13.70	0.02	4.34	0.02	2.96	0.07	13.81
08/30/10	242	400	400	1.00	3015	599	44.93	0.03	20.66	0.01	7.35	0.09	54.64
08/31/10	243	395	395	1.00	938	183	13.90	0.04	6.63	0.02	4.49	0.12	21.66
09/01/10	244	395	395	1.00	924	188	14.28	0.07	13.43	0.03	6.10	0.19	35.40
09/02/10	245	360	360	1.00	674	138	11.50	0.12	15.97	0.07	10.24	0.30	41.15
09/03/10	246	390	390	1.00	1124	295	22.69	0.11	33.86	0.08	22.31	0.24	70.86
09/04/10	247	390	330	0.85	273	54	4.91	0.14	7.52	0.09	4.95	0.37	20.18
09/05/10	248	390	390	1.00	253	49	3.77	0.04	1.74	0.04	1.74	0.26	12.78
09/06/10	249	390	390	1.00	390	72	5.54	0.01	0.92	0.03	2.03	0.09	6.46
09/07/10	250	385	380	0.99	401	75	5.92	0.04	2.81	0.08	5.99	0.20	15.15
09/08/10	251	385	335	0.87	2329	462	41.37	0.03	13.49	0.04	20.23	0.11	51.38
09/09/10	252	355	305	0.86	2364	467	45.93	0.03	13.04	0.02	11.66	0.09	42.67
09/10/10	253	385	385	1.00	2328	461	35.92	0.03	11.88	0.03	15.84	0.13	58.02
09/11/10	254	385	385	1.00	12460	2491	194.10	0.02	55.38	0.02	54.18	0.09	224.51
09/12/10	255	380	380	1.00	2442	486	38.37	0.08	38.41	0.07	36.22	0.28	138.12
09/13/10	256	380	355	0.93	870	175	14.79	0.05	9.25	0.04	7.04	0.18	32.18
09/14/10	257	380	365	0.96	1410	278	22.85	0.01	2.96	0.01	1.77	0.04	12.22
09/15/10	258	375	370	0.99	588	120	9.73	0.06	6.73	0.04	5.10	0.21	24.69
09/16/10	259	350	350	1.00	921	190	16.29	0.03	5.98	0.03	4.95	0.11	21.66
09/17/10	260	370	270	0.73	2011	651	72.33	0.04	25.25	0.03	19.75	0.12	80.61
09/18/10	261	370	370	1.00	4816	1034	83.84	0.05	53.68	0.05	50.88	0.18	189.15
09/19/10	262	370	370	1.00	678	149	12.08	0.02	2.86	0.03	3.74	0.09	12.97
09/20/10	263	365	365	1.00	11752	2416	198.58	0.01	22.61	0.01	27.96	0.04	106.08
09/21/10	264	350	350	1.00	1246	246	21.09	0.02	6.12	0.03	6.52	0.11	26.06
09/22/10	265	365	360	0.99	450	92	7.67	0.03	2.86	0.04	3.27	0.19	17.38
09/23/10	266	335	335	1.00	5172	1203	107.73	0.03	31.40	0.02	29.07	0.11	137.00
09/24/10	267	360	310	0.86	724	163	15.77	0.06	9.91	0.05	8.10	0.23	37.15
09/25/10	268	360	325	0.90	1572	691	63.78	0.11	73.85	0.10	70.77	0.35	238.69
09/26/10	269	355	340	0.96	2441	492	43.41	0.03	12.70	0.02	8.06	0.08	41.72
09/27/10	270	355	180	0.51	841	165	27.50	0.05	8.24	0.04	6.28	0.15	25.51
09/28/10	271	355	340	0.96	218	39	3.44	0.04	1.43	0.02	0.72	0.14	5.37
09/29/10	272	355	355	1.00	735	144	12.17	0.01	0.98	0.01	0.78	0.09	13.13
09/30/10	273	325	310	0.95	288	54	5.23	0.07	3.75	0.07	3.56	0.22	11.63
Totals	78 days				121623	25803			880		778		3219
Means					1559.27	330.81	26.92	0.04	11.29	0.04	9.98	0.16	41.27

Table 5. Results of marine radar image analyses for data collected on 79 nights (i.e., sunset to sunrise the next day) during the Fall/Early 2010 period (15 July - 30 September) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate nights when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
07/14/10	195	265	265	1.00	681	136	15.40	0.02	3.40	0.03	3.79	0.09	12.58
07/15/10	196	270	270	1.00	426	80	8.89	0.02	1.31	0.03	2.44	0.10	8.26
07/16/10	197	270	265	0.98	845	166	18.79	0.01	2.16	0.02	2.55	0.05	8.05
07/17/10	198	270	260	0.96	1040	205	23.65	0.03	6.31	0.02	3.94	0.09	17.54
07/18/10	199	270	270	1.00	4496	896	99.56	0.03	22.52	0.03	29.89	0.14	122.56
07/19/10	200	270	255	0.94	4373	869	102.24	0.01	8.94	0.01	6.96	0.03	30.01
07/20/10	201	270	270	1.00	3603	746	82.89	0.01	9.11	0.01	5.38	0.03	26.09
07/21/10	202	275	155	0.56	2197	446	86.32	0.01	2.44	0.00	1.22	0.02	10.76
07/22/10	203	270	270	1.00	1739	370	41.11	0.03	10.43	0.03	10.64	0.10	38.51
07/23/10	204	270	50	0.19	80	37	22.20	0.04	1.39	0.06	2.31	0.16	6.01
07/24/10	205	275	215	0.78	401	76	10.60	0.05	4.17	0.03	2.46	0.17	13.08
07/25/10	206	275	275	1.00	1419	284	30.98	0.02	5.40	0.02	5.20	0.09	24.42
07/26/10	207	275	275	1.00	813	161	17.56	0.03	4.16	0.02	3.56	0.11	17.62
07/27/10	208	280	280	1.00	1623	338	36.21	0.02	6.04	0.01	4.37	0.06	21.24
07/28/10	209	275	185	0.67	262	50	8.11	0.08	4.01	0.14	6.87	0.36	17.94
07/29/10	210	280	280	1.00	10185	2142	229.50	0.02	40.38	0.01	31.34	0.07	159.62
07/30/10	211	280	280	1.00	8926	1809	193.82	0.01	13.98	0.01	12.16	0.03	62.62
07/31/10	212	285	285	1.00	1284	256	26.95	0.04	9.37	0.03	7.18	0.14	35.69
08/01/10	213	285	285	1.00	442	99	10.42	0.04	4.26	0.06	5.60	0.22	21.73
08/02/10	214	280	225	0.80	280	57	7.60	0.06	3.26	0.03	1.83	0.21	12.01
08/03/10	215	285	255	0.89	377	72	8.47	0.00	0.19	0.01	0.95	0.07	4.77
08/04/10	216	285	285	1.00	1070	219	23.05	0.01	1.64	0.02	3.68	0.06	13.51
08/05/10	217	285	285	1.00	845	171	18.00	0.02	2.83	0.02	3.24	0.09	14.77
08/06/10	218	285	285	1.00	6131	1244	130.95	0.03	32.46	0.02	20.09	0.08	98.61
08/07/10	219	290	265	0.91	2660	533	60.34	0.01	4.81	0.01	7.01	0.05	27.65
08/08/10	220	295	285	0.97	862	169	17.79	0.01	1.37	0.01	1.57	0.06	10.39
08/09/10	221	295	250	0.85	1499	304	36.48	0.01	2.64	0.01	1.83	0.05	14.40
08/10/10	222	295	245	0.83	6997	1416	173.39	0.02	24.69	0.02	23.27	0.08	111.30
08/11/10	223	295	295	1.00	10157	2033	206.75	0.02	50.64	0.03	62.25	0.13	273.42
08/12/10	224	295	295	1.00	3226	642	65.29	0.04	27.46	0.05	34.23	0.19	122.59
08/13/10	225	295	295	1.00	783	153	15.56	0.02	3.52	0.02	3.32	0.08	12.11
08/14/10	226	295	295	1.00	385	74	7.53	0.06	4.23	0.04	3.27	0.20	14.61
08/15/10	227	300	240	0.80	164	28	3.50	0.06	1.71	0.06	1.71	0.14	3.93
08/16/10	228	300	295	0.98	545	140	14.24	0.00	0.51	0.01	1.80	0.03	4.11
08/17/10	229	300	300	1.00	3567	768	76.80	0.02	14.43	0.01	9.47	0.09	66.96
08/18/10	230	305	305	1.00	1940	490	48.20	0.04	21.72	0.03	15.91	0.14	66.18

Table 5. Continued

08/19/10	231	305	300	0.98	1242	268	26.80	0.02	5.39	0.04	10.14	0.12	32.80
08/20/10	232	310	310	1.00	11997	2493	241.26	0.02	40.52	0.02	42.81	0.07	176.63
08/21/10	233	310	245	0.79	1470	293	35.88	0.02	4.58	0.02	4.98	0.09	25.91
08/22/10	234	310	260	0.84	1284	257	29.65	0.11	29.22	0.11	29.42	0.38	96.68
08/23/10	235	315	300	0.95	2392	480	48.00	0.06	27.09	0.05	23.08	0.21	98.73
08/24/10	236	310	275	0.89	1159	234	25.53	0.09	19.99	0.07	15.95	0.24	56.13
08/25/10	237	310	35	0.11	38	8	6.86	0.24	1.89	0.11	0.84	0.42	3.37
08/26/10	238	315	300	0.95	1449	348	34.80	0.04	12.97	0.02	8.41	0.15	50.67
08/27/10	239	315	315	1.00	6521	1401	133.43	0.02	26.00	0.02	30.94	0.09	122.89
08/28/10	240	315	315	1.00	1108	224	21.33	0.02	5.26	0.02	4.65	0.09	21.23
08/29/10	241	315	315	1.00	2351	530	50.48	0.02	8.79	0.01	7.66	0.06	29.98
08/30/10	242	320	320	1.00	3554	757	70.97	0.03	20.23	0.02	17.04	0.09	65.60
08/31/10	243	320	320	1.00	2178	457	42.84	0.02	9.23	0.02	9.02	0.09	41.55
09/01/10	244	325	325	1.00	907	181	16.71	0.03	4.99	0.02	2.79	0.08	14.77
09/02/10	245	325	325	1.00	1388	283	26.12	0.03	7.14	0.03	9.38	0.10	27.73
09/03/10	246	330	60	0.18	535	106	53.00	0.20	21.40	0.18	19.22	0.69	72.91
09/04/10	247	330	330	1.00	2076	410	37.27	0.01	3.75	0.00	1.97	0.03	12.44
09/05/10	248	330	330	1.00	1979	391	35.55	0.02	7.31	0.01	3.75	0.07	26.08
09/06/10	249	330	265	0.80	1311	284	32.15	0.02	5.42	0.03	7.37	0.08	22.75
09/07/10	250	335	335	1.00	2747	620	55.52	0.03	19.18	0.05	29.34	0.13	82.83
09/08/10	251	335	305	0.91	23635	4827	474.79	0.01	49.42	0.01	50.04	0.04	215.67
09/09/10	252	335	275	0.82	14318	2885	314.73	0.01	35.66	0.01	23.17	0.05	132.78
09/10/10	253	335	335	1.00	7956	1613	144.45	0.01	20.88	0.01	14.80	0.05	82.72
09/11/10	254	335	320	0.96	9748	1984	186.00	0.03	60.04	0.03	66.35	0.13	250.54
09/12/10	255	340	340	1.00	3000	603	53.21	0.04	25.93	0.02	14.47	0.13	80.00
09/13/10	256	340	325	0.96	652	137	12.65	0.05	6.72	0.04	5.46	0.18	24.58
09/14/10	257	340	300	0.88	7411	1487	148.70	0.01	17.86	0.01	13.84	0.05	81.06
09/15/10	258	345	345	1.00	5092	1022	88.87	0.01	13.45	0.01	13.25	0.06	62.62
09/16/10	259	345	75	0.22	1274	288	115.20	0.08	21.70	0.05	14.92	0.14	39.56
09/17/10	260	345	345	1.00	22178	4451	387.04	0.02	76.26	0.02	70.44	0.08	334.36
09/18/10	261	345	345	1.00	1460	295	25.65	0.06	18.99	0.05	14.95	0.23	66.88
09/19/10	262	345	345	1.00	5006	1009	87.74	0.02	23.38	0.02	24.19	0.10	101.99
09/20/10	263	350	350	1.00	7443	1486	127.37	0.01	18.37	0.01	16.17	0.07	101.42
09/21/10	264	350	350	1.00	1454	294	25.20	0.01	2.63	0.01	3.44	0.05	15.37
09/22/10	265	355	355	1.00	6526	1308	110.54	0.01	14.83	0.01	11.83	0.05	59.53
09/23/10	266	355	235	0.66	6275	1251	159.70	0.03	32.70	0.02	26.12	0.10	122.01
09/24/10	267	355	355	1.00	7282	1468	124.06	0.01	19.96	0.02	36.29	0.08	120.96
09/25/10	268	355	350	0.99	14977	3023	259.11	0.04	116.87	0.03	85.38	0.14	419.63
09/26/10	269	365	315	0.86	6058	1241	118.19	0.09	107.55	0.06	80.10	0.27	338.62
09/27/10	270	365	215	0.59	1248	252	35.16	0.07	16.56	0.04	9.89	0.17	44.02
09/28/10	271	365	325	0.89	2302	538	49.66	0.01	6.78	0.01	3.97	0.03	17.29
09/29/10	272	365	365	1.00	2140	443	36.41	0.03	11.39	0.02	6.83	0.08	37.47
09/30/10	273	365	350	0.96	148	27	2.31	0.11	3.10	0.04	1.09	0.20	5.29
Totals	79 nights				291592	59636			1359		1229		5362
Means					3691.04	754.89	77.09	0.03	17.21	0.03	15.56	0.12	67.87

Table 6. Results of marine radar image analyses for data collected on 74 days (i.e., sunrise to sunset the same day) during the Fall/Late 2010 period (1October - 15 December) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate days when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
10/01/10	274	350	270	0.77	124	21	2.33	0.38	7.96	0.23	4.74	0.81	17.10
10/02/10	275	350	350	1.00	1058	208	17.83	0.02	3.93	0.01	2.36	0.07	15.53
10/03/10	276	345	345	1.00	2438	494	42.96	0.02	12.16	0.03	16.01	0.14	67.47
10/04/10	277	345	185	0.54	484	92	14.92	0.07	6.65	0.05	4.18	0.17	15.97
10/05/10	278	345	345	1.00	5198	1284	111.65	0.02	21.98	0.02	27.91	0.08	108.69
10/06/10	279	345	125	0.36	190	38	9.12	0.22	8.20	0.17	6.60	0.51	19.20
10/07/10	280	340	270	0.79	321	61	6.78	0.13	8.17	0.18	11.02	0.42	25.84
10/08/10	281	320	235	0.73	285	54	6.89	0.18	9.85	0.21	11.37	0.53	28.42
10/09/10	282	340	340	1.00	410	94	8.29	0.15	14.21	0.05	4.36	0.32	30.03
10/10/10	283	340	325	0.96	130	22	2.03	0.08	1.69	0.08	1.86	0.35	7.78
10/11/10	284	340	340	1.00	727	155	13.68	0.06	8.95	0.01	1.92	0.13	20.89
10/12/10	285	335	335	1.00	3171	673	60.27	0.04	23.98	0.02	15.28	0.09	62.82
10/13/10	286	335	335	1.00	1406	280	25.07	0.03	9.36	0.02	4.78	0.14	40.03
10/14/10	287	305	305	1.00	530	116	11.41	0.12	14.23	0.09	10.29	0.40	45.96
10/15/10	288	330	55	0.17	226	76	41.45	0.24	18.16	0.34	25.89	0.83	63.22
10/16/10	289	330	210	0.64	241	83	11.86	0.18	14.81	0.20	16.88	0.49	40.98
10/17/10	290	330	325	0.98	86	12	1.11	0.06	0.70	0.06	0.70	0.28	3.35
10/18/10	291	325	325	1.00	133	22	2.03	0.20	4.47	0.08	1.65	0.37	8.11
10/19/10	292	325	325	1.00	279	50	4.62	0.04	2.15	0.07	3.58	0.26	13.08
10/20/10	293	325	325	1.00	87	13	1.20	0.07	0.90	0.07	0.90	0.25	3.29
10/21/10	294	290	215	0.74	135	22	3.07	0.20	4.40	0.13	2.77	0.71	15.64
10/22/10	295	325	325	1.00	164	29	2.72	0.18	5.30	0.11	3.18	0.47	13.62
10/23/10	296	320	320	1.00	149	24	2.25	0.27	6.44	0.05	1.29	0.45	10.79
10/24/10	297	315	245	0.78	634	124	15.18	0.04	4.50	0.03	4.30	0.12	15.26
10/25/10	298	315	315	1.00	265	49	4.67	0.08	3.88	0.06	2.77	0.28	13.50
10/26/10	299	315	315	1.00	348	108	10.29	0.07	7.76	0.05	5.28	0.24	26.07
10/27/10	300	315	190	0.60	735	152	24.00	0.08	12.20	0.07	10.13	0.22	33.92
10/28/10	301	285	285	1.00	184	36	3.79	0.01	0.20	0.01	0.39	0.07	2.54
10/29/10	302	310	295	0.95	318	69	7.02	0.07	4.56	0.02	1.52	0.17	11.50
10/30/10	303	310	310	1.00	170	31	3.00	0.16	4.92	0.05	1.64	0.35	10.76
10/31/10	304	310	220	0.71	245	90	12.27	0.30	26.82	0.17	15.43	0.61	54.73
11/01/10	305	310	310	1.00	369	87	8.42	0.05	4.01	0.04	3.30	0.17	14.38
11/02/10	306	305	305	1.00	799	182	17.90	0.10	18.45	0.04	7.97	0.26	47.38
11/03/10	307	305	305	1.00	173	30	2.95	0.10	3.12	0.05	1.56	0.36	10.75
11/04/10	308	305	135	0.44	501	98	21.78	0.29	28.36	0.13	12.32	0.48	46.75
11/05/10	309	305	180	0.59	236	43	7.17	0.32	13.85	0.44	18.77	0.90	38.63

Table 6. Continued

11/06/10	310	265	265	1.00	56	33	3.74	0.27	8.84	0.16	5.30	0.50	16.50
11/07/10	311	300	235	0.78	217	41	5.23	0.11	4.53	0.31	12.85	0.64	26.07
11/08/10	312	295	185	0.63	124	22	3.57	0.15	3.19	0.09	1.95	0.47	10.29
11/09/10	313	295	115	0.39	113	20	5.22	0.25	4.96	0.21	4.25	0.67	13.45
11/10/10	314	295	295	1.00	299	60	6.10	0.05	3.01	0.05	3.21	0.28	16.86
11/11/10	315	295	295	1.00	208	38	3.86	0.13	4.75	0.05	2.01	0.30	11.33
11/12/10	316	295	295	1.00	104	17	1.73	0.04	0.65	0.08	1.31	0.20	3.43
11/13/10	317	290	290	1.00	167	31	3.21	0.07	2.23	0.07	2.04	0.26	7.98
11/14/10	318	290	290	1.00	160	27	2.79	0.09	2.36	0.04	1.01	0.27	7.26
11/15/10	319	290	270	0.93	46	6	0.67	0.13	0.78	0.17	1.04	0.67	4.04
11/16/10	320	290	225	0.78	81	13	1.73	0.05	0.64	0.14	1.77	0.33	4.33
11/17/10	321	290	105	0.36	497	97	27.71	0.33	31.81	0.43	41.96	0.93	89.78
11/18/10	322	235	235	1.00	131	24	3.06	0.27	6.60	0.19	4.58	0.59	14.11
11/19/10	323	285	285	1.00	114	20	2.11	0.35	7.02	0.07	1.40	0.42	8.42
11/20/10	324	285	265	0.93	62	9	1.02	0.16	1.45	0.05	0.44	0.39	3.48
11/21/10	325	285	285	1.00	239	44	4.63	0.08	3.50	0.09	3.87	0.38	16.57
11/22/10	326	265	110	0.42	223	43	11.73	0.25	10.61	0.22	9.45	0.65	28.15
11/23/10	327	280	260	0.93	38	4	0.46	0.05	0.21	0.11	0.42	0.21	0.84
11/24/10	328	280	280	1.00	129	24	2.57	0.16	3.72	0.09	2.05	0.39	9.30
11/25/10	329	280	280	1.00	193	36	3.86	0.11	3.92	0.07	2.42	0.24	8.77
11/26/10	330	280	75	0.27	80	15	6.00	0.69	10.31	0.18	2.63	0.86	12.94
11/27/10	331	280	240	0.86	186	34	4.25	0.13	4.39	0.11	3.66	0.27	9.32
11/28/10	332	275	275	1.00	223	44	4.80	0.13	5.92	0.06	2.57	0.29	12.63
11/29/10	333	275	275	1.00	242	47	5.13	0.08	3.88	0.01	0.58	0.20	9.32
11/30/10	334	275	275	1.00	166	30	3.27	0.18	5.42	0.05	1.63	0.38	11.39
12/01/10	335	275	275	1.00	71	23	2.51	0.08	1.94	0.01	0.32	0.13	2.92
12/02/10	336	250	250	1.00	70	10	1.20	0.20	2.00	0.09	0.86	0.41	4.14
12/03/10	337	275	275	1.00	76	13	1.42	0.04	0.51	0.12	1.54	0.45	5.82
12/04/10	338	275	155	0.56	94	17	3.29	0.69	11.76	0.21	3.62	0.90	15.37
12/05/10	339	275	100	0.36	123	25	7.50	0.33	8.13	0.11	2.64	0.48	11.99
12/06/10	340	275	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/07/10	341	270	235	0.87	171	34	4.34	0.16	5.37	0.13	4.37	0.44	14.91
12/08/10	342	115	50	0.43	60	11	6.60	0.07	0.73	0.08	0.92	0.22	2.38
12/11/10	345	40	40	1.00	21	4	3.00	0.05	0.19	0.19	0.76	0.24	0.95
12/12/10	346	270	130	0.48	149	28	6.46	0.09	2.63	0.09	2.63	0.28	7.70
12/13/10	347	270	40	0.15	23	4	3.00	0.22	0.87	0.13	0.52	0.70	2.78
12/14/10	348	270	190	0.70	230	43	6.79	0.13	5.80	0.22	9.35	0.61	26.36
12/15/10	349	270	55	0.20	102	20	10.91	0.31	6.27	0.20	3.92	0.65	12.94
Totals	74 days				28237	6033			522.20		410.75		1468.84
Means					381.58	81.53	9.70	0.15	7.06	0.11	5.55	0.39	19.85

Table 7. Results of marine radar image analyses for data collected on 74 nights (i.e., sunset to sunrise the next day) during the Fall/Late 2010 period (1October - 15 December) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate nights when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
10/01/10	274	365	150	0.41	1853	376	75.20	0.04	14.61	0.03	10.15	0.10	36.73
10/02/10	275	370	370	1.00	11571	2335	189.32	0.03	58.72	0.03	67.20	0.12	273.23
10/03/10	276	375	310	0.83	9190	1834	177.48	0.02	28.74	0.02	37.32	0.07	121.93
10/04/10	277	375	260	0.69	1372	278	32.08	0.03	9.52	0.02	6.28	0.14	38.90
10/05/10	278	375	375	1.00	6303	1263	101.04	0.02	30.06	0.02	21.44	0.07	93.78
10/06/10	279	375	205	0.55	692	152	22.24	0.21	32.07	0.14	20.87	0.39	58.65
10/07/10	280	380	370	0.97	1172	232	18.81	0.01	2.97	0.01	2.97	0.07	16.03
10/08/10	281	380	330	0.87	995	196	17.82	0.02	4.53	0.03	4.92	0.12	23.84
10/09/10	282	380	380	1.00	1880	372	29.37	0.03	10.09	0.01	5.14	0.10	38.39
10/10/10	283	380	380	1.00	647	124	9.79	0.03	3.64	0.02	2.68	0.12	15.14
10/11/10	284	380	380	1.00	14350	2876	227.05	0.04	116.64	0.04	105.22	0.17	487.42
10/12/10	285	385	385	1.00	4752	949	73.95	0.03	25.76	0.01	13.98	0.10	96.46
10/13/10	286	385	385	1.00	4693	937	73.01	0.04	41.73	0.03	26.16	0.13	120.39
10/14/10	287	390	210	0.54	1186	234	33.43	0.09	20.72	0.05	12.82	0.21	48.54
10/15/10	288	390	75	0.19	379	74	29.60	0.33	24.21	0.28	20.50	0.68	50.57
10/16/10	289	390	390	1.00	3704	735	56.54	0.02	17.46	0.01	6.95	0.06	47.43
10/17/10	290	390	390	1.00	368	72	5.54	0.04	2.54	0.06	4.50	0.15	10.57
10/18/10	291	395	395	1.00	962	190	14.43	0.03	5.53	0.03	6.32	0.15	29.23
10/19/10	292	395	385	0.97	1781	350	27.27	0.04	14.35	0.02	6.29	0.13	47.16
10/20/10	293	395	395	1.00	130	23	1.75	0.20	4.60	0.14	3.18	0.55	12.74
10/21/10	294	395	380	0.96	211	42	3.32	0.03	1.19	0.02	1.00	0.13	5.57
10/22/10	295	395	395	1.00	555	109	8.28	0.03	2.95	0.05	5.30	0.15	16.30
10/23/10	296	400	400	1.00	21366	4316	323.70	0.02	95.75	0.02	77.97	0.08	356.74
10/24/10	297	405	270	0.67	1615	330	36.67	0.16	53.33	0.11	35.55	0.43	141.81
10/25/10	298	405	265	0.65	505	100	11.32	0.25	24.55	0.13	12.87	0.53	52.87
10/26/10	299	405	280	0.69	2437	483	51.75	0.19	89.39	0.14	66.00	0.45	218.21
10/27/10	300	405	340	0.84	1327	264	23.29	0.12	31.63	0.09	24.87	0.26	68.44
10/28/10	301	405	405	1.00	11931	2383	176.52	0.04	99.67	0.03	70.90	0.14	328.16
10/29/10	302	410	410	1.00	11709	2340	171.22	0.02	37.57	0.02	38.17	0.07	162.87
10/30/10	303	410	175	0.43	172	33	5.66	0.28	9.21	0.28	9.21	0.60	19.76
10/31/10	304	410	410	1.00	6087	1218	89.12	0.02	27.81	0.02	23.61	0.09	105.05
11/01/10	305	410	405	0.99	5393	1088	80.59	0.03	33.29	0.02	22.60	0.12	134.97
11/02/10	306	415	415	1.00	4831	963	69.61	0.03	30.90	0.04	37.87	0.13	126.98
11/03/10	307	415	415	1.00	80	13	0.94	0.04	0.49	0.10	1.30	0.48	6.18
11/04/10	308	415	25	0.06	60	11	13.20	0.45	4.95	0.30	3.30	0.85	9.35
11/05/10	309	415	415	1.00	59	6	0.43	0.05	0.31	0.03	0.20	0.22	1.32

Table 7. Continued

11/06/10	310	420	420	1.00	1325	260	18.57	0.02	6.48	0.04	10.20	0.13	33.75
11/07/10	311	420	5	0.01	30	6	36.00	0.10	0.60	0.40	2.40	0.83	5.00
11/08/10	312	425	425	1.00	3308	654	46.16	0.02	16.01	0.03	18.58	0.11	70.18
11/09/10	313	425	115	0.27	348	73	19.04	0.35	25.59	0.16	11.75	0.64	46.99
11/10/10	314	425	425	1.00	2134	425	30.00	0.02	8.56	0.04	16.33	0.11	47.20
11/11/10	315	425	425	1.00	1161	231	16.31	0.03	6.96	0.03	5.97	0.11	24.47
11/12/10	316	425	425	1.00	257	47	3.32	0.05	2.19	0.05	2.38	0.23	10.97
11/13/10	317	430	430	1.00	203	38	2.65	0.10	3.93	0.03	1.12	0.20	7.67
11/14/10	318	430	430	1.00	99	16	1.12	0.03	0.48	0.03	0.48	0.09	1.45
11/15/10	319	430	295	0.69	62	9	0.92	0.02	0.15	0.06	0.58	0.40	3.63
11/16/10	320	430	260	0.60	122	22	2.54	0.39	8.48	0.21	4.69	0.75	16.59
11/17/10	321	430	405	0.94	152	29	2.15	0.04	1.14	0.10	2.86	0.34	9.92
11/18/10	322	435	435	1.00	7328	1462	100.83	0.01	14.76	0.01	14.17	0.04	58.06
11/19/10	323	435	435	1.00	683	136	9.38	0.04	5.58	0.06	7.57	0.15	20.71
11/20/10	324	435	435	1.00	106	16	1.10	0.04	0.60	0.13	2.11	0.29	4.68
11/21/10	325	435	435	1.00	170	33	2.28	0.09	2.91	0.05	1.55	0.26	8.54
11/22/10	326	440	155	0.35	85	14	2.71	0.33	4.61	0.16	2.31	0.55	7.74
11/23/10	327	440	385	0.88	130	22	1.71	0.07	1.52	0.26	5.75	0.57	12.52
11/24/10	328	440	440	1.00	115	19	1.30	0.03	0.66	0.06	1.16	0.30	5.78
11/25/10	329	440	345	0.78	84	12	1.04	0.07	0.86	0.02	0.29	0.20	2.43
11/26/10	330	440	440	1.00	75	12	0.82	0.07	0.80	0.16	1.92	0.28	3.36
11/27/10	331	440	440	1.00	148	23	1.57	0.09	2.02	0.00	0.00	0.12	2.80
11/28/10	332	445	445	1.00	124	23	1.55	0.09	2.04	0.10	2.41	0.33	7.60
11/29/10	333	445	445	1.00	107	25	1.69	0.07	1.64	0.06	1.40	0.21	5.37
11/30/10	334	445	445	1.00	62	9	0.61	0.13	1.16	0.02	0.15	0.16	1.45
12/01/10	335	445	175	0.39	707	139	23.83	0.10	13.76	0.23	31.85	0.51	70.38
12/02/10	336	445	445	1.00	46	5	0.34	0.04	0.22	0.04	0.22	0.13	0.65
12/03/10	337	445	90	0.20	229	45	15.00	0.67	30.07	0.31	13.95	0.98	44.02
12/04/10	338	445	375	0.84	36	4	0.32	0.42	1.67	0.17	0.67	0.58	2.33
12/05/10	339	445	265	0.60	262	48	5.43	0.47	22.72	0.27	13.19	0.76	36.46
12/06/10	340	445	195	0.44	188	36	5.54	0.55	19.91	0.31	11.30	0.90	32.36
12/07/10	341	450	425	0.94	67	10	0.71	0.03	0.30	0.22	2.24	0.36	3.58
12/08/10	342	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/11/10	345	450	450	1.00	107	22	1.47	0.06	1.23	0.07	1.44	0.17	3.70
12/12/10	346	450	35	0.08	340	67	57.43	0.14	9.06	0.26	17.34	0.70	46.90
12/13/10	347	450	220	0.49	606	139	18.95	0.33	45.42	0.37	51.38	0.91	126.16
12/14/10	348	450	440	0.98	268	63	4.30	0.03	2.12	0.07	4.47	0.26	16.22
12/15/10	349	450	380	0.84	214	38	3.00	0.05	1.95	0.11	4.26	0.29	10.83
Totals	74 nights				157806	31533			1279.65		1086.06		4234.19
Means					2132.51	426.12	36.80	0.11	17.29	0.10	14.68	0.30	57.22

Table 8. Results of marine radar image analyses for data collected on 89 days (i.e., sunrise to sunset the same day) during the Winter 2010-11 period (16 December - 15 March) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate days when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
12/16/10	350	265	240	0.91	178	34	4.25	0.16	5.35	0.11	3.63	0.34	11.46
12/17/10	351	265	255	0.96	94	17	2.00	0.16	2.71	0.02	0.36	0.30	5.06
12/18/10	352	265	265	1.00	108	18	2.04	0.06	1.00	0.03	0.50	0.19	3.33
12/19/10	353	265	185	0.70	66	11	1.78	0.03	0.33	0.00	0.00	0.12	1.33
12/20/10	354	265	115	0.43	256	50	13.04	0.28	14.06	0.44	21.88	0.80	40.23
12/21/10	355	265	45	0.17	347	67	44.67	0.35	23.17	0.44	29.16	0.88	59.28
12/22/10	356	265	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/23/10	357	215	150	0.70	51	8	1.60	0.08	0.63	0.31	2.51	0.57	4.55
12/24/10	358	270	270	1.00	74	13	1.44	0.09	1.23	0.05	0.70	0.22	2.81
12/25/10	359	270	270	1.00	90	14	1.56	0.02	0.31	0.03	0.47	0.13	1.87
12/26/10	360	265	265	1.00	116	20	2.26	0.04	0.86	0.06	1.21	0.18	3.62
12/27/10	361	265	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/28/10	362	265	265	1.00	27	3	0.34	0.11	0.33	0.00	0.00	0.11	0.33
12/29/10	363	169	169	1.00	48	7	1.24	0.21	1.46	0.02	0.15	0.31	2.19
12/30/10	364	200	200	1.00	62	9	1.35	0.11	1.02	0.11	1.02	0.37	3.34
12/31/10	365	270	270	1.00	52	7	0.78	0.06	0.40	0.02	0.13	0.13	0.94
01/01/11	001	270	270	1.00	38	4	0.44	0.05	0.21	0.03	0.11	0.08	0.32
01/02/11	002	270	230	0.85	49	5	0.65	0.14	0.71	0.02	0.10	0.27	1.33
01/03/11	003	270	270	1.00	72	13	1.44	0.25	3.25	0.00	0.00	0.42	5.42
01/04/11	004	270	240	0.89	95	23	2.88	0.22	5.08	0.17	3.87	0.44	10.17
01/05/11	005	275	255	0.93	159	32	3.76	0.18	5.64	0.14	4.43	0.36	11.67
01/06/11	006	180	130	0.72	134	25	5.77	0.18	4.48	0.13	3.17	0.51	12.87
01/07/11	007	255	85	0.33	35	11	3.88	0.00	0.00	0.00	0.00	0.06	0.63
01/08/11	008	260	260	1.00	70	9	1.04	0.17	1.54	0.07	0.64	0.27	2.44
01/09/11	009	260	260	1.00	94	16	1.85	0.20	3.23	0.03	0.51	0.28	4.43
01/10/11	010	270	190	0.70	71	11	1.74	0.10	1.08	0.11	1.24	0.37	4.03
01/11/11	011	275	275	1.00	127	22	2.40	0.18	3.98	0.05	1.04	0.43	9.35
01/12/11	012	175	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/13/11	013	195	195	1.00	27	5	0.77	0.19	0.93	0.04	0.19	0.30	1.48
01/14/11	014	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/16/11	016	135	135	1.00	35	5	1.11	0.09	0.43	0.11	0.57	0.29	1.43
01/17/11	017	280	280	1.00	193	35	3.75	0.19	6.71	0.08	2.72	0.44	15.23
01/18/11	018	280	50	0.18	147	29	17.40	0.52	15.19	0.12	3.55	0.67	19.33
01/19/11	019	285	85	0.30	197	39	13.76	0.10	3.96	0.13	5.15	0.25	9.70
01/20/11	020	270	220	0.81	71	11	1.50	0.03	0.31	0.08	0.93	0.31	3.41
01/21/11	021	280	15	0.05	171	33	66.00	0.19	6.18	0.16	5.40	0.68	22.58

Table 8. Continued

01/22/11	022	210	210	1.00	103	19	2.71	0.05	0.92	0.06	1.11	0.26	4.98
01/23/11	023	290	160	0.55	554	108	20.25	0.17	18.13	0.08	8.19	0.45	48.54
01/24/11	024	290	290	1.00	73	32	3.31	0.07	2.19	0.00	0.00	0.14	4.38
01/25/11	025	290	65	0.22	42	8	3.69	0.19	1.52	0.07	0.57	0.40	3.24
01/26/11	026	105	100	0.95	42	9	2.70	0.00	0.00	0.00	0.00	0.05	0.43
01/27/11	027	295	105	0.36	223	67	19.14	0.07	4.51	0.26	17.43	0.40	26.74
01/28/11	028	200	175	0.88	41	5	0.86	0.00	0.00	0.00	0.00	0.10	0.49
01/29/11	029	295	145	0.49	24	3	0.62	0.50	1.50	0.00	0.00	0.50	1.50
01/30/11	030	295	90	0.31	50	8	2.67	0.10	0.80	0.00	0.00	0.10	0.80
01/31/11	031	295	295	1.00	109	18	1.83	0.07	1.32	0.06	0.99	0.35	6.28
02/01/11	032	300	30	0.10	11	2	2.00	0.00	0.00	0.00	0.00	0.09	0.18
02/02/11	033	300	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/03/11	034	300	220	0.73	99	16	2.18	0.12	1.94	0.05	0.81	0.25	4.04
02/04/11	035	300	300	1.00	73	10	1.00	0.12	1.23	0.04	0.41	0.26	2.60
02/05/11	036	270	230	0.85	76	12	1.57	0.25	3.00	0.39	4.74	0.79	9.47
02/06/11	037	300	300	1.00	490	95	9.50	0.05	5.04	0.03	3.30	0.11	10.08
02/07/11	038	305	305	1.00	87	20	1.97	0.03	0.69	0.02	0.46	0.17	3.45
02/08/11	039	305	20	0.07	9	1	1.50	0.00	0.00	0.00	0.00	0.00	0.00
02/09/11	040	305	305	1.00	85	13	1.28	0.16	2.14	0.08	1.07	0.34	4.44
02/10/11	041	305	305	1.00	106	18	1.77	0.05	0.85	0.00	0.00	0.07	1.19
02/11/11	042	305	305	1.00	130	24	2.36	0.04	0.92	0.08	2.03	0.18	4.25
02/12/11	043	315	230	0.73	123	21	2.74	0.06	1.20	0.13	2.73	0.46	9.73
02/13/11	044	315	180	0.57	151	32	5.33	0.16	5.09	0.25	7.84	0.55	17.59
02/14/11	045	260	215	0.83	148	27	3.77	0.05	1.28	0.10	2.74	0.38	10.22
02/15/11	046	315	315	1.00	27	2	0.19	0.00	0.00	0.07	0.15	0.15	0.30
02/16/11	047	320	320	1.00	139	24	2.25	0.07	1.73	0.05	1.21	0.18	4.32
02/17/11	048	320	320	1.00	38	5	0.47	0.00	0.00	0.00	0.00	0.03	0.13
02/18/11	049	320	270	0.84	62	8	0.89	0.45	3.61	0.08	0.65	0.53	4.26
02/19/11	050	320	290	0.91	125	21	2.17	0.10	2.02	0.06	1.34	0.33	6.89
02/20/11	051	325	325	1.00	98	16	1.48	0.06	0.98	0.00	0.00	0.20	3.27
02/21/11	052	325	145	0.45	274	53	10.97	0.61	32.30	0.19	9.86	0.87	46.23
02/22/11	053	325	325	1.00	88	14	1.29	0.05	0.64	0.05	0.64	0.19	2.70
02/23/11	054	325	325	1.00	88	13	1.20	0.14	1.77	0.02	0.30	0.26	3.40
02/24/11	055	305	275	0.90	1238	244	26.62	0.02	3.74	0.01	1.58	0.05	11.04
02/25/11	056	330	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/26/11	057	330	330	1.00	79	13	1.18	0.11	1.48	0.04	0.49	0.22	2.80
02/27/11	058	330	35	0.11	33	6	5.14	0.00	0.00	0.03	0.18	0.12	0.73
02/28/11	059	335	55	0.16	29	5	2.73	0.10	0.52	0.41	2.07	0.66	3.28
03/01/11	060	335	335	1.00	95	15	1.34	0.19	2.84	0.07	1.11	0.37	5.53
03/02/11	061	335	245	0.73	260	49	6.00	0.11	5.28	0.16	7.92	0.57	27.70
03/03/11	062	335	335	1.00	89	14	1.25	0.01	0.16	0.00	0.00	0.06	0.79
03/04/11	063	325	325	1.00	121	21	1.94	0.14	2.95	0.06	1.21	0.31	6.60
03/05/11	064	340	180	0.53	475	90	15.00	0.03	3.03	0.16	14.59	0.37	33.16
03/06/11	065	340	325	0.96	76	17	1.57	0.03	0.45	0.03	0.45	0.37	6.26
03/07/11	066	345	220	0.64	469	90	12.27	0.05	4.80	0.13	11.90	0.40	35.88
03/08/11	067	345	345	1.00	151	25	2.17	0.06	1.49	0.09	2.15	0.19	4.80
03/09/11	068	345	345	1.00	93	14	1.22	0.05	0.75	0.00	0.00	0.09	1.20

Table 8. Continued

03/10/11	069	350	200	0.57	1070	291	43.65	0.00	1.09	0.01	2.99	0.03	7.61
03/11/11	070	355	85	0.24	213	41	14.47	0.45	18.48	0.28	11.55	0.82	33.49
03/12/11	071	355	355	1.00	259	46	3.89	0.03	1.24	0.02	0.71	0.12	5.68
03/13/11	072	355	135	0.38	53	7	1.56	0.11	0.79	0.06	0.40	0.45	3.17
03/14/11	073	325	325	1.00	128	22	2.03	0.07	1.55	0.09	2.06	0.23	4.98
03/15/11	074	355	355	1.00	95	12	1.01	0.03	0.38	0.00	0.00	0.34	4.04
Totals	89 days				12168	2352			264.12		225.23		721.02
Means					136.72	26.43	5.27	0.11	2.97	0.08	2.53	0.29	8.10

Table 9. Results of marine radar image analyses for data collected on 89 nights (i.e., sunset to sunrise the next day) during the Winter 2010-11 period (16 December - 15 March) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate nights when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
12/16/10	350	455	240	0.53	108	17	2.13	0.17	2.83	0.02	0.31	0.19	3.15
12/17/10	351	455	455	1.00	116	19	1.25	0.03	0.66	0.09	1.64	0.26	4.91
12/18/10	352	455	380	0.84	86	12	0.95	0.07	0.84	0.09	1.12	0.24	2.93
12/19/10	353	455	440	0.97	82	12	0.82	0.10	1.17	0.09	1.02	0.28	3.37
12/20/10	354	455	245	0.54	409	78	9.55	0.03	2.67	0.18	14.30	0.49	38.33
12/21/10	355	455	240	0.53	206	36	4.50	0.09	3.15	0.26	9.44	0.72	26.04
12/22/10	356	455	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/23/10	357	450	450	1.00	44	5	0.33	0.05	0.23	0.11	0.57	0.30	1.48
12/24/10	358	450	450	1.00	43	7	0.47	0.02	0.16	0.09	0.65	0.23	1.63
12/25/10	359	450	450	1.00	31	3	0.20	0.00	0.00	0.00	0.00	0.03	0.10
12/26/10	360	455	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/27/10	361	455	295	0.65	770	151	15.36	0.02	3.53	0.09	14.12	0.21	31.57
12/28/10	362	455	455	1.00	56	6	0.40	0.00	0.00	0.11	0.64	0.20	1.18
12/29/10	363	455	455	1.00	46	4	0.26	0.00	0.00	0.09	0.35	0.09	0.35
12/30/10	364	450	450	1.00	49	3	0.20	0.10	0.31	0.06	0.18	0.29	0.86
12/31/10	365	450	450	1.00	63	7	0.47	0.10	0.67	0.06	0.44	0.19	1.33
01/01/11	001	450	425	0.94	60	7	0.49	0.05	0.35	0.03	0.23	0.08	0.58
01/02/11	002	450	290	0.64	538	104	10.76	0.51	52.97	0.35	36.15	0.90	93.56
01/03/11	003	450	450	1.00	51	5	0.33	0.08	0.39	0.08	0.39	0.22	1.08
01/04/11	004	450	435	0.97	113	17	1.17	0.04	0.60	0.04	0.60	0.08	1.35
01/05/11	005	445	445	1.00	102	17	1.15	0.01	0.17	0.02	0.33	0.06	1.00
01/06/11	006	450	340	0.76	49	5	0.44	0.08	0.41	0.02	0.10	0.12	0.61
01/07/11	007	445	445	1.00	17696	3535	238.31	0.01	23.57	0.01	26.57	0.03	117.86
01/08/11	008	445	310	0.70	248	46	4.45	0.26	12.06	0.22	10.02	0.52	23.93
01/09/11	009	445	425	0.96	67	10	0.71	0.06	0.60	0.04	0.45	0.21	2.09
01/10/11	010	445	445	1.00	67	7	0.47	0.01	0.10	0.03	0.21	0.10	0.73
01/11/11	011	445	385	0.87	47	5	0.39	0.19	0.96	0.02	0.11	0.26	1.28
01/12/11	012	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/13/11	013	445	445	1.00	86	11	0.74	0.00	0.00	0.05	0.51	0.15	1.66
01/14/11	014	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/16/11	016	440	430	0.98	89	16	1.12	0.00	0.00	0.07	1.08	0.13	2.16
01/17/11	017	440	390	0.89	44	7	0.54	0.11	0.80	0.02	0.16	0.25	1.75
01/18/11	018	440	125	0.28	274	55	13.20	0.41	22.48	0.25	13.65	0.69	38.14
01/19/11	019	435	20	0.05	9	4	6.00	0.00	0.00	0.00	0.00	0.00	0.00
01/20/11	020	435	65	0.15	10	1	0.46	0.10	0.10	0.00	0.00	0.10	0.10
01/21/11	021	320	315	0.98	39	2	0.19	0.00	0.00	0.00	0.00	0.08	0.15

Table 9. Continued

01/22/11	022	430	145	0.34	129	27	5.59	0.03	0.84	0.02	0.42	0.09	2.30
01/23/11	023	430	430	1.00	44	5	0.35	0.02	0.11	0.00	0.00	0.14	0.68
01/24/11	024	430	320	0.74	934	183	17.16	0.10	18.81	0.03	5.68	0.45	82.88
01/25/11	025	20	20	1.00	4	0	0.00	0.00	0.00	0.00	0.00	0.25	0.00
01/26/11	026	435	135	0.31	163	29	6.44	0.15	4.27	0.15	4.27	0.37	10.85
01/27/11	027	425	370	0.87	7196	1436	116.43	0.02	23.75	0.02	21.95	0.06	80.82
01/28/11	028	425	215	0.51	24	2	0.28	0.50	1.00	0.00	0.00	0.67	1.33
01/29/11	029	425	400	0.94	32	3	0.23	0.09	0.28	0.00	0.00	0.16	0.47
01/30/11	030	425	425	1.00	109	20	1.41	0.01	0.18	0.00	0.00	0.04	0.73
01/31/11	031	425	425	1.00	56	8	0.56	0.00	0.00	0.02	0.14	0.13	1.00
02/01/11	032	420	185	0.44	74	13	2.11	0.11	1.41	0.00	0.00	0.12	1.58
02/02/11	033	420	125	0.30	360	73	17.52	0.16	11.56	0.12	8.92	0.42	30.62
02/03/11	034	420	420	1.00	92	13	0.93	0.03	0.42	0.02	0.28	0.12	1.55
02/04/11	035	420	420	1.00	56	5	0.36	0.04	0.18	0.02	0.09	0.07	0.36
02/05/11	036	420	95	0.23	176	33	10.42	0.12	3.94	0.29	9.56	0.67	22.13
02/06/11	037	420	420	1.00	46	4	0.29	0.07	0.26	0.11	0.43	0.24	0.96
02/07/11	038	415	95	0.23	129	24	7.58	0.46	10.98	0.42	10.05	0.92	22.14
02/08/11	039	415	245	0.59	572	109	13.35	0.03	2.86	0.03	2.86	0.11	12.39
02/09/11	040	415	415	1.00	103	17	1.23	0.05	0.83	0.04	0.66	0.21	3.63
02/10/11	041	415	415	1.00	102	16	1.16	0.04	0.63	0.07	1.10	0.14	2.20
02/11/11	042	410	370	0.90	90	12	0.97	0.06	0.67	0.20	2.40	0.43	5.20
02/12/11	043	405	400	0.99	103	14	1.05	0.04	0.54	0.07	0.95	0.18	2.58
02/13/11	044	405	395	0.98	103	14	1.06	0.03	0.41	0.06	0.82	0.12	1.63
02/14/11	045	405	290	0.72	981	192	19.86	0.02	3.52	0.07	12.53	0.24	46.19
02/15/11	046	405	405	1.00	125	19	1.41	0.06	1.06	0.02	0.30	0.16	3.04
02/16/11	047	400	400	1.00	167	30	2.25	0.01	0.18	0.03	0.90	0.10	2.87
02/17/11	048	400	400	1.00	51	5	0.38	0.02	0.10	0.04	0.20	0.08	0.39
02/18/11	049	400	385	0.96	63	9	0.70	0.02	0.14	0.05	0.43	0.17	1.57
02/19/11	050	400	400	1.00	80	16	1.20	0.01	0.20	0.00	0.00	0.05	0.80
02/20/11	051	395	270	0.68	87	14	1.56	0.39	5.47	0.25	3.54	0.70	9.82
02/21/11	052	395	395	1.00	38	6	0.46	0.13	0.79	0.03	0.16	0.18	1.11
02/22/11	053	395	395	1.00	67	9	0.68	0.04	0.40	0.01	0.13	0.16	1.48
02/23/11	054	390	390	1.00	59	8	0.62	0.07	0.54	0.02	0.14	0.08	0.68
02/24/11	055	390	300	0.77	108	18	1.80	0.19	3.50	0.29	5.17	0.69	12.33
02/25/11	056	390	225	0.58	267	52	6.93	0.06	2.92	0.19	9.93	0.47	24.34
02/26/11	057	390	205	0.53	41	4	0.59	0.76	3.02	0.05	0.20	0.80	3.22
02/27/11	058	390	300	0.77	116	18	1.80	0.09	1.55	0.18	3.26	0.42	7.60
02/28/11	059	385	385	1.00	73	13	1.01	0.08	1.07	0.04	0.53	0.16	2.14
03/01/11	060	385	385	1.00	594	115	8.96	0.01	0.77	0.01	1.55	0.04	4.65
03/02/11	061	385	350	0.91	46	4	0.34	0.00	0.00	0.09	0.35	0.26	1.04
03/03/11	062	385	385	1.00	31	3	0.23	0.06	0.19	0.03	0.10	0.19	0.58
03/04/11	063	380	380	1.00	57	10	0.79	0.00	0.00	0.00	0.00	0.02	0.18
03/05/11	064	380	380	1.00	43	6	0.47	0.07	0.42	0.07	0.42	0.19	1.12
03/06/11	065	380	150	0.39	114	20	4.00	0.31	6.14	0.42	8.42	0.77	15.44
03/07/11	066	375	355	0.95	85	12	1.01	0.05	0.56	0.02	0.28	0.29	3.53
03/08/11	067	375	375	1.00	43	5	0.40	0.05	0.23	0.05	0.23	0.23	1.16
03/09/11	068	375	330	0.88	73	13	1.20	0.00	0.00	0.04	0.53	0.11	1.42

Table 9. Continued

03/10/11	069	370	200	0.54	976	192	28.80	0.08	14.95	0.07	13.77	0.21	40.13
03/11/11	070	365	185	0.51	88	20	3.24	0.31	6.14	0.17	3.41	0.50	10.00
03/12/11	071	365	325	0.89	142	25	2.31	0.01	0.35	0.06	1.41	0.13	3.35
03/13/11	072	365	365	1.00	56	9	0.74	0.04	0.32	0.09	0.80	0.27	2.41
03/14/11	073	365	365	1.00	48	7	0.58	0.02	0.15	0.10	0.73	0.23	1.60
03/15/11	074	365	365	1.00	466	108	8.88	0.08	8.58	0.01	1.39	0.16	16.92
Totals	89 nights				37580	7236			278.952556		276.736837		914.399332
Means					422.25	81.30	7.05	0.09	3.13	0.08	3.11	0.25	10.27

Table 10. Results of marine radar image analyses for data collected on 75 days (i.e., sunrise to sunset the same day) during the Spring 2011 period (16 March - 31 May) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate days when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets recorded <=100 m

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
03/16/11	075	360	145	0.40	420	82	16.97	0.74	60.33	0.13	10.93	0.90	73.80
03/17/11	076	360	360	1.00	69	11	0.92	0.23	2.55	0.16	1.75	0.43	4.78
03/18/11	077	360	340	0.94	123	35	3.09	0.03	1.14	0.06	1.99	0.12	4.27
03/19/11	078	360	220	0.61	85	12	1.64	0.11	1.27	0.04	0.42	0.14	1.69
03/20/11	079	365	365	1.00	152	27	2.22	0.09	2.31	0.01	0.36	0.22	5.86
03/21/11	080	365	180	0.49	169	31	5.17	0.33	10.27	0.22	6.97	0.68	21.09
03/22/11	081	365	215	0.59	89	15	2.09	0.29	4.38	0.06	0.84	0.45	6.74
03/23/11	082	365	285	0.78	53	8	0.84	0.02	0.15	0.02	0.15	0.09	0.75
03/24/11	083	350	185	0.53	90	14	2.27	0.11	1.56	0.06	0.78	0.18	2.49
03/25/11	084	370	280	0.76	115	19	2.04	0.36	6.77	0.17	3.14	0.59	11.23
03/26/11	085	375	375	1.00	100	15	1.20	0.34	5.10	0.07	1.05	0.48	7.20
03/27/11	086	375	375	1.00	119	19	1.52	0.22	4.15	0.10	1.92	0.55	10.38
03/28/11	087	375	375	1.00	46	6	0.48	0.04	0.26	0.15	0.91	0.37	2.22
03/29/11	088	380	380	1.00	31	2	0.16	0.06	0.13	0.13	0.26	0.39	0.77
03/30/11	089	380	380	1.00	121	21	1.66	0.32	6.77	0.09	1.91	0.63	13.19
03/31/11	090	380	380	1.00	77	14	1.11	0.14	2.00	0.10	1.45	0.57	8.00
04/01/11	091	380	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/02/11	092	385	340	0.88	52	7	0.62	0.25	1.75	0.17	1.21	0.44	3.10
04/03/11	093	375	375	1.00	74	11	0.88	0.26	2.82	0.19	2.08	0.50	5.50
04/04/11	094	385	125	0.32	36	6	1.44	0.00	0.00	0.00	0.00	0.03	0.17
04/05/11	095	385	260	0.68	597	115	13.27	0.26	30.05	0.25	28.32	0.60	69.15
04/06/11	096	390	335	0.86	80	12	1.07	0.31	3.75	0.14	1.65	0.73	8.70
04/07/11	097	390	390	1.00	115	19	1.46	0.07	1.32	0.03	0.66	0.23	4.46
04/08/11	098	390	390	1.00	141	24	1.85	0.04	1.02	0.03	0.68	0.25	5.96
04/09/11	099	365	365	1.00	95	17	1.40	0.08	1.43	0.06	1.07	0.25	4.29
04/10/11	100	395	395	1.00	284	62	4.71	0.05	3.27	0.04	2.18	0.19	11.57
04/11/11	101	400	290	0.73	616	144	14.90	0.08	12.16	0.16	23.14	0.27	39.27
04/12/11	102	400	400	1.00	195	50	3.75	0.11	5.38	0.05	2.31	0.22	11.03
04/13/11	103	400	70	0.18	64	12	5.14	0.11	1.31	0.03	0.38	0.30	3.56
04/14/11	104	400	400	1.00	207	36	2.70	0.02	0.87	0.04	1.57	0.13	4.52
04/15/11	105	405	405	1.00	297	56	4.15	0.17	9.62	0.08	4.34	0.37	20.55
04/16/11	106	405	405	1.00	136	21	1.56	0.15	3.24	0.05	1.08	0.32	6.79
04/17/11	107	405	270	0.67	269	50	5.56	0.03	1.67	0.10	5.02	0.32	15.80
04/18/11	108	385	380	0.99	104	19	1.50	0.03	0.55	0.10	1.83	0.35	6.58
04/19/11	109	405	390	0.96	226	40	3.08	0.03	1.06	0.04	1.77	0.19	7.79
04/20/11	110	410	215	0.52	127	22	3.07	0.20	4.50	0.11	2.43	0.38	8.31

Table 10. Continued

04/21/11	111	410	305	0.74	325	61	6.00	0.04	2.63	0.10	5.82	0.23	14.26
04/22/11	112	410	410	1.00	235	42	3.07	0.11	4.83	0.04	1.61	0.35	14.83
04/23/11	113	410	95	0.23	194	36	11.37	0.36	12.99	0.21	7.42	0.68	24.49
04/26/11	116	120	10	0.08	322	64	192.00	0.00	0.00	0.00	0.00	0.00	0.00
04/27/11	117	420	420	1.00	2628	519	37.07	0.01	4.54	0.01	5.92	0.04	21.33
04/28/11	118	420	395	0.94	201	36	2.73	0.01	0.36	0.05	1.97	0.09	3.22
04/29/11	119	420	420	1.00	886	196	14.00	0.01	2.88	0.01	1.55	0.06	12.17
04/30/11	120	420	400	0.95	378	94	7.05	0.06	5.72	0.05	4.72	0.24	22.38
05/01/11	121	425	425	1.00	409	82	5.79	0.07	5.41	0.03	2.41	0.15	12.03
05/02/11	122	425	425	1.00	1201	238	16.80	0.03	7.33	0.01	2.97	0.10	24.37
05/03/11	123	425	425	1.00	1454	337	23.79	0.03	10.66	0.02	6.49	0.09	31.98
05/04/11	124	425	355	0.84	573	171	14.45	0.06	9.85	0.14	24.17	0.26	44.47
05/05/11	125	430	210	0.49	297	55	7.86	0.04	2.41	0.03	1.48	0.11	5.93
05/06/11	126	430	430	1.00	390	73	5.09	0.11	8.05	0.03	2.25	0.27	19.65
05/07/11	127	330	330	1.00	330	60	5.45	0.00	0.18	0.02	1.45	0.09	5.64
05/08/11	128	290	290	1.00	103	16	1.66	0.11	1.71	0.05	0.78	0.23	3.73
05/09/11	129	435	340	0.78	153	23	2.03	0.17	3.91	0.03	0.60	0.31	7.22
05/10/11	130	435	95	0.22	82	14	4.42	0.62	8.71	0.11	1.54	0.77	10.76
05/11/11	131	435	350	0.80	120	20	1.71	0.12	2.33	0.03	0.50	0.28	5.50
05/12/11	132	435	395	0.91	197	34	2.58	0.01	0.35	0.10	3.45	0.26	8.97
05/13/11	133	440	440	1.00	2320	457	31.16	0.04	17.93	0.02	10.05	0.09	43.34
05/14/11	134	440	400	0.91	2118	419	31.43	0.04	18.20	0.04	16.42	0.17	72.21
05/15/11	135	440	45	0.10	256	50	33.33	0.10	4.88	0.05	2.54	0.19	9.38
05/16/11	136	440	150	0.34	78	13	2.60	0.50	6.50	0.17	2.17	0.68	8.83
05/17/11	137	440	315	0.72	85	13	1.24	0.28	3.67	0.13	1.68	0.48	6.27
05/18/11	138	445	390	0.88	88	11	0.85	0.18	2.00	0.09	1.00	0.39	4.25
05/19/11	139	445	395	0.89	2322	460	34.94	0.05	21.20	0.03	14.46	0.13	61.61
05/20/11	140	445	305	0.69	73	12	1.18	0.05	0.66	0.01	0.16	0.12	1.48
05/21/11	141	445	390	0.88	1929	382	29.38	0.02	9.51	0.02	7.92	0.09	32.48
05/22/11	142	135	135	1.00	155	29	6.44	0.22	6.36	0.13	3.74	0.45	12.91
05/23/11	143	450	365	0.81	209	39	3.21	0.16	6.16	0.11	4.11	0.49	19.22
05/24/11	144	450	395	0.88	469	100	7.59	0.09	8.74	0.10	9.59	0.28	27.51
05/25/11	145	450	450	1.00	2047	418	27.87	0.06	23.07	0.02	9.80	0.15	64.12
05/26/11	146	450	450	1.00	792	165	11.00	0.04	5.83	0.01	2.08	0.06	9.79
05/27/11	147	455	455	1.00	1197	247	16.29	0.02	5.57	0.02	4.33	0.09	22.29
05/28/11	148	455	455	1.00	633	126	8.31	0.03	3.98	0.04	5.18	0.11	14.33
05/29/11	149	455	440	0.97	466	100	6.82	0.17	17.17	0.04	3.86	0.29	29.18
05/30/11	150	455	355	0.78	4571	930	78.59	0.02	18.72	0.01	13.84	0.06	55.34
05/31/11	151	455	445	0.98	968	190	12.81	0.06	10.99	0.03	6.28	0.16	30.42
Totals	75 days				36828	7386			480.91		312.87		1229.48
Means					491.04	98.48	11.01	0.13	6.41	0.07	4.17	0.29	16.39

Table 11. Results of marine radar image analyses for data collected on 75 nights (i.e., sunset to sunrise the next day) during the Spring 2011 period (16 March - 31 May) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate nights when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
03/16/11	075	360	345	0.96	23	3	0.26	0.00	0.00	0.00	0.00	0.04	0.13
03/17/11	076	360	325	0.90	911	182	16.80	0.07	12.39	0.08	14.58	0.22	40.76
03/18/11	077	360	275	0.76	136	24	2.62	0.29	7.06	0.15	3.53	0.50	12.00
03/19/11	078	360	360	1.00	83	13	1.08	0.04	0.47	0.02	0.31	0.19	2.51
03/20/11	079	355	355	1.00	458	88	7.44	0.03	2.50	0.02	1.34	0.08	6.72
03/21/11	080	355	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03/22/11	081	355	160	0.45	69	11	2.06	0.20	2.23	0.09	0.96	0.29	3.19
03/23/11	082	355	215	0.61	38	5	0.70	0.21	1.05	0.11	0.53	0.34	1.71
03/24/11	083	350	320	0.91	33	4	0.38	0.03	0.12	0.03	0.12	0.15	0.61
03/25/11	084	345	305	0.88	77	12	1.18	0.03	0.31	0.03	0.31	0.17	2.03
03/26/11	085	345	345	1.00	46	6	0.52	0.07	0.39	0.04	0.26	0.11	0.65
03/27/11	086	345	345	1.00	50	6	0.52	0.00	0.00	0.04	0.24	0.06	0.36
03/28/11	087	345	345	1.00	36	5	0.43	0.03	0.14	0.00	0.00	0.19	0.97
03/29/11	088	340	340	1.00	52	8	0.71	0.04	0.31	0.06	0.46	0.10	0.77
03/30/11	089	340	340	1.00	1274	255	22.50	0.05	12.01	0.05	13.41	0.23	59.05
03/31/11	090	340	10	0.03	20	4	12.00	0.00	0.00	0.00	0.00	0.00	0.00
04/01/11	091	340	160	0.47	74	12	2.25	0.49	5.84	0.24	2.92	0.73	8.76
04/02/11	092	335	335	1.00	132	22	1.97	0.08	1.83	0.04	0.83	0.21	4.67
04/03/11	093	335	335	1.00	185	32	2.87	0.03	1.04	0.06	2.08	0.16	5.19
04/04/11	094	335	275	0.82	1006	211	23.02	0.06	13.00	0.03	7.13	0.14	29.57
04/05/11	095	335	280	0.84	119	24	2.57	0.16	3.83	0.10	2.42	0.39	9.28
04/06/11	096	330	330	1.00	360	73	6.64	0.07	5.07	0.05	3.65	0.24	17.84
04/07/11	097	330	330	1.00	2270	449	40.82	0.06	25.91	0.04	19.78	0.18	81.89
04/08/11	098	330	330	1.00	2002	396	36.00	0.01	4.55	0.01	3.36	0.06	24.73
04/09/11	099	325	325	1.00	1056	210	19.38	0.04	7.76	0.03	5.57	0.14	29.43
04/10/11	100	325	160	0.49	408	81	15.19	0.23	18.86	0.22	17.87	0.47	38.32
04/11/11	101	320	300	0.94	3509	701	70.10	0.03	20.78	0.03	24.37	0.13	88.70
04/12/11	102	320	295	0.92	597	116	11.80	0.09	10.49	0.13	14.57	0.31	35.75
04/13/11	103	320	135	0.42	739	147	32.67	0.06	8.35	0.06	8.35	0.16	23.87
04/14/11	104	320	320	1.00	184	34	3.19	0.13	4.43	0.03	0.92	0.21	7.21
04/15/11	105	315	315	1.00	407	75	7.14	0.07	4.98	0.04	2.76	0.17	12.71
04/16/11	106	315	200	0.63	164	31	4.65	0.02	0.76	0.19	5.86	0.45	13.80
04/17/11	107	315	265	0.84	790	154	17.43	0.04	5.65	0.04	5.46	0.13	19.69
04/18/11	108	315	195	0.62	397	85	13.08	0.10	8.14	0.06	4.71	0.25	21.41
04/19/11	109	315	210	0.67	760	148	21.14	0.05	7.98	0.03	4.48	0.13	19.08
04/20/11	110	310	275	0.89	397	84	9.16	0.05	3.81	0.02	1.48	0.11	9.31

Table 11. Continued

04/21/11	111	310	310	1.00	102	17	1.65	0.10	1.67	0.09	1.50	0.34	5.83
04/22/11	112	310	310	1.00	829	166	16.06	0.06	10.21	0.05	8.21	0.21	35.24
04/23/11	113	90	60	0.67	71	14	7.00	0.25	3.55	0.15	2.17	0.61	8.48
04/26/11	116	300	230	0.77	4660	976	127.30	0.06	57.18	0.04	35.81	0.16	151.64
04/27/11	117	300	295	0.98	3036	615	62.54	0.01	7.50	0.01	7.50	0.05	28.36
04/28/11	118	300	285	0.95	2937	584	61.47	0.02	13.52	0.03	14.91	0.11	66.02
04/29/11	119	300	220	0.73	5836	1165	158.86	0.01	14.77	0.01	14.77	0.05	62.88
04/30/11	120	300	300	1.00	2627	521	52.10	0.03	13.29	0.02	12.69	0.11	57.71
05/01/11	121	295	295	1.00	1927	384	39.05	0.07	25.11	0.03	11.56	0.20	78.51
05/02/11	122	295	290	0.98	2387	491	50.79	0.02	12.14	0.05	26.12	0.17	81.46
05/03/11	123	295	165	0.56	2387	487	88.55	0.03	14.69	0.02	11.22	0.07	35.70
05/04/11	124	295	115	0.39	757	148	38.61	0.06	8.41	0.07	10.56	0.23	34.61
05/05/11	125	290	205	0.71	218	43	6.29	0.18	7.89	0.05	2.17	0.32	13.61
05/06/11	126	290	290	1.00	3802	762	78.83	0.02	18.04	0.03	19.64	0.12	90.59
05/07/11	127	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
05/08/11	128	285	285	1.00	1300	258	27.16	0.01	2.98	0.01	2.98	0.08	20.84
05/09/11	129	285	35	0.12	70	16	13.71	0.34	5.49	0.11	1.83	0.47	7.54
05/10/11	130	285	120	0.42	74	12	3.00	0.08	0.97	0.05	0.65	0.15	1.78
05/11/11	131	285	250	0.88	188	34	4.08	0.05	1.63	0.04	1.45	0.20	6.69
05/12/11	132	285	285	1.00	1910	434	45.68	0.10	41.35	0.05	21.36	0.27	115.43
05/13/11	133	280	280	1.00	6715	1430	153.21	0.09	135.44	0.06	83.27	0.28	395.25
05/14/11	134	280	140	0.50	472	120	25.71	0.24	28.22	0.05	5.85	0.44	52.63
05/15/11	135	280	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
05/16/11	136	280	85	0.30	134	25	8.82	0.16	4.10	0.13	3.17	0.45	11.19
05/17/11	137	275	225	0.82	126	24	3.20	0.12	2.86	0.10	2.29	0.44	10.48
05/18/11	138	275	270	0.98	102	16	1.78	0.20	3.14	0.15	2.35	0.38	6.12
05/19/11	139	275	100	0.36	245	47	14.10	0.26	12.28	0.17	7.87	0.54	25.51
05/20/11	140	275	275	1.00	10106	2155	235.09	0.03	59.28	0.03	57.36	0.12	259.30
05/21/11	141	275	265	0.96	465	94	10.64	0.11	9.91	0.05	4.65	0.28	26.48
05/22/11	142	265	220	0.83	1232	247	33.68	0.12	30.27	0.06	15.04	0.33	80.80
05/23/11	143	270	130	0.48	190	34	7.85	0.14	4.83	0.11	3.76	0.29	9.84
05/24/11	144	270	265	0.98	4819	960	108.68	0.08	77.69	0.05	50.00	0.25	240.45
05/25/11	145	270	270	1.00	1691	333	37.00	0.06	19.50	0.07	21.66	0.26	86.25
05/26/11	146	265	185	0.70	933	186	30.16	0.03	4.98	0.02	2.99	0.08	15.75
05/27/11	147	265	265	1.00	3384	676	76.53	0.03	18.58	0.02	12.98	0.07	48.94
05/28/11	148	265	265	1.00	615	122	13.81	0.04	4.36	0.03	3.17	0.11	12.89
05/29/11	149	265	220	0.83	1452	288	39.27	0.05	14.08	0.07	18.84	0.19	53.36
05/30/11	150	265	265	1.00	1223	247	27.96	0.04	11.11	0.03	6.26	0.13	31.10
05/31/11	151	265	260	0.98	2051	412	47.54	0.03	12.05	0.03	10.85	0.12	51.22
Totals	75 nights				89935	18254			915.10		694.10		2953.14
Means					1199.13	243.39	28.91	0.08	12.20	0.06	9.25	0.21	39.38

Table 12. Results of marine radar image analyses for data collected on 43 days (i.e., sunrise to sunset the same day) during the Summer 2011 period (1June - 14 July) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate days when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets recorded <=100 m for

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
06/01/11	152	455	390	0.86	1299	262	20.15	0.04	9.48	0.05	12.30	0.17	44.57
06/02/11	153	455	455	1.00	289	52	3.43	0.06	3.06	0.01	0.54	0.19	9.72
06/03/11	154	460	435	0.95	246	44	3.03	0.13	5.72	0.07	2.86	0.30	13.06
06/04/11	155	460	460	1.00	616	117	7.63	0.06	6.46	0.03	3.23	0.16	18.99
06/05/11	156	365	365	1.00	308	58	4.77	0.01	0.56	0.01	0.38	0.09	5.46
06/06/11	157	460	460	1.00	1310	257	16.76	0.05	12.56	0.05	11.97	0.20	51.20
06/07/11	158	460	430	0.93	490	92	6.42	0.04	3.76	0.06	5.07	0.14	12.77
06/08/11	159	440	440	1.00	702	135	9.20	0.04	5.58	0.02	2.88	0.09	12.50
06/09/11	160	20	20	1.00	22	5	7.50	0.27	1.36	0.00	0.00	0.41	2.05
06/10/11	161	460	460	1.00	1998	396	25.83	0.07	29.53	0.06	25.17	0.22	88.59
06/11/11	162	460	200	0.43	100	17	2.55	0.18	3.06	0.07	1.19	0.31	5.27
06/12/11	163	460	40	0.09	46	7	5.25	0.52	3.65	0.02	0.15	0.61	4.26
06/13/11	164	460	365	0.79	135	21	1.73	0.06	1.24	0.15	3.11	0.38	7.93
06/14/11	165	460	100	0.22	17	2	0.60	0.06	0.12	0.06	0.12	0.12	0.24
06/15/11	166	468	468	1.00	923	180	11.61	0.06	11.51	0.04	7.41	0.23	41.15
06/16/11	167	465	465	1.00	1895	388	25.03	0.04	15.15	0.01	4.71	0.09	36.04
06/17/11	168	465	430	0.92	590	113	7.88	0.05	5.94	0.02	2.30	0.12	13.60
06/18/11	169	465	390	0.84	356	64	4.92	0.30	19.24	0.10	6.29	0.43	27.33
06/19/11	170	465	465	1.00	1836	360	23.23	0.04	14.71	0.04	13.92	0.14	50.78
06/20/11	171	465	465	1.00	1370	269	17.35	0.04	10.21	0.03	7.26	0.13	35.54
06/21/11	172	465	465	1.00	2683	531	34.26	0.03	16.82	0.02	11.08	0.10	50.86
06/22/11	173	465	455	0.98	807	160	10.55	0.08	12.09	0.05	7.34	0.15	24.19
06/23/11	174	465	325	0.70	1407	276	25.48	0.01	2.94	0.00	0.98	0.03	8.43
06/24/11	175	460	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/25/11	176	460	330	0.72	2651	546	49.64	0.00	1.85	0.00	0.62	0.01	5.56
06/26/11	177	460	375	0.82	584	116	9.28	0.02	1.99	0.02	2.18	0.07	8.14
06/27/11	178	195	195	1.00	265	50	7.69	0.01	0.38	0.04	2.08	0.07	3.58
06/28/11	179	465	465	1.00	510	103	6.65	0.03	3.43	0.03	3.43	0.10	10.70
06/29/11	180	460	445	0.97	1278	254	17.12	0.01	3.78	0.01	1.59	0.06	14.51
06/30/11	181	460	460	1.00	261	49	3.20	0.11	5.26	0.02	0.94	0.30	14.46
07/01/11	182	460	460	1.00	530	98	6.39	0.04	3.70	0.03	3.14	0.12	11.46
07/02/11	183	460	460	1.00	1098	214	13.96	0.02	4.68	0.02	5.26	0.10	22.02
07/03/11	184	460	445	0.97	329	59	3.98	0.02	1.26	0.02	0.90	0.18	10.40
07/04/11	185	460	460	1.00	925	182	11.87	0.02	2.95	0.01	0.98	0.03	5.12
07/05/11	186	460	460	1.00	520	110	7.17	0.05	5.29	0.05	5.08	0.19	20.52
07/06/11	187	460	455	0.99	706	137	9.03	0.02	2.72	0.02	2.72	0.10	13.97

Table 12. Continued

07/07/11	188	455	455	1.00	1015	199	13.12	0.04	7.25	0.04	8.43	0.17	33.72
07/08/11	189	455	455	1.00	918	183	12.07	0.05	9.77	0.03	6.38	0.17	31.30
07/10/11	191	255	255	1.00	257	47	5.53	0.01	0.37	0.03	1.28	0.33	15.54
07/11/11	192	450	450	1.00	384	73	4.87	0.05	3.42	0.05	3.42	0.26	19.20
07/12/11	193	455	450	0.99	2303	457	30.47	0.05	22.03	0.05	24.01	0.23	105.77
07/13/11	194	420	290	0.69	3219	638	66.00	0.04	26.56	0.03	20.02	0.13	80.47
07/14/11	195	240	240	1.00	1319	318	39.75	0.03	9.40	0.03	8.68	0.11	35.20
Totals	43 days				38517	7639			310.82		231.41		1026.19
Means					895.74	177.65	13.79	0.07	7.23	0.03	5.38	0.18	23.86

Table 13. Results of marine radar image analyses for data collected on 43 nights (i.e., sunset to sunrise the next day) during the Summer 2011 period (1June - 14 July) on Monhegan Island, Lincoln County, ME with the vertically-oriented radar. "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust), Bolded dates indicate nights when the proportion of clean images were >0.50. "Total targets recorded" are the number of birds/bats recorded in all images collected. "Sum of the sample averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate. "Target rate" represents the number of targets detected per nautical mile of passage front per hour. We also present the proportion and number of targets detected within the two lowest altitudinal strata (i.e., 25 and 50 m) and targets recorded <=100 m for comparison with other studies NJAS has conducted.

Date	Julian day	Data images collected	Clean images	Proprtion clean images	Total targets recorded	Sum of the sample averages	Target passage rate	Proportion of targets recorded <=25 m	Number of targets recorded <=25 m	Proportion of targets recorded 26-50 m	Number of targets recorded 26-50 m	Proportion of targets recorded 0-100 m	Number of targets recorded 0-100 m
06/01/11	152	265	265	1	1254	250	28.301887	0.02	5.38	0.03	6.78	0.10	26.12
06/02/11	153	260	215	0.82692308	204	39	5.4418605	0.05	2.10	0.02	0.76	0.25	9.75
06/03/11	154	260	220	0.84615385	473	95	12.954545	0.09	8.64	0.05	4.82	0.26	24.90
06/04/11	155	260	260	1	263	50	5.7692308	0.12	5.89	0.07	3.61	0.27	13.31
06/05/11	156	260	260	1	531	103	11.884615	0.03	2.91	0.02	2.13	0.12	12.22
06/06/11	157	260	260	1	568	111	12.807692	0.01	1.56	0.01	1.37	0.07	7.23
06/07/11	158	260	260	1	395	77	8.8846154	0.03	2.34	0.04	3.31	0.12	9.55
06/08/11	159	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
06/09/11	160	260	170	0.65384615	313	67	11.823529	0.03	2.14	0.05	3.21	0.12	8.13
06/10/11	161	260	260	1	611	120	13.846154	0.04	4.52	0.04	4.71	0.14	16.69
06/11/11	162	260	25	0.09615385	42	7	8.4	0.02	0.17	0.00	0.00	0.07	0.50
06/12/11	163	260	135	0.51923077	117	23	5.1111111	0.04	0.98	0.04	0.98	0.13	2.95
06/13/11	164	260	105	0.40384615	140	24	6.8571429	0.06	1.37	0.19	4.46	0.34	8.06
06/14/11	165	255	25	0.09803922	13	2	2.4	0.23	0.46	0.00	0.00	0.38	0.77
06/15/11	166	255	255	1	524	110	12.941176	0.04	3.99	0.03	3.15	0.14	15.74
06/16/11	167	255	255	1	1062	214	25.176471	0.02	4.03	0.02	5.04	0.09	19.55
06/17/11	168	255	195	0.76470588	416	79	12.153846	0.04	3.23	0.03	2.47	0.11	8.93
06/18/11	169	255	255	1	253	52	6.1176471	0.02	1.23	0.01	0.41	0.10	5.34
06/19/11	170	255	255	1	508	100	11.764706	0.03	2.95	0.00	0.39	0.11	11.02
06/20/11	171	255	255	1	673	138	16.235294	0.02	2.26	0.01	2.05	0.11	14.97
06/21/11	172	255	210	0.82352941	425	85	12.142857	0.02	1.80	0.03	2.60	0.14	12.00
06/22/11	173	255	100	0.39215686	405	79	23.7	0.11	8.58	0.08	6.44	0.27	21.26
06/23/11	174	255	120	0.47058824	573	112	28	0.01	1.37	0.01	0.78	0.04	4.30
06/24/11	175	260	50	0.19230769	409	81	48.6	0.06	5.15	0.04	3.56	0.21	16.64
06/25/11	176	260	255	0.98076923	964	191	22.470588	0.04	8.52	0.04	6.74	0.17	33.29
06/26/11	177	260	250	0.96153846	1071	214	25.68	0.02	4.40	0.01	2.80	0.07	15.99
06/27/11	178	255	255	1	270	53	6.2352941	0.08	4.32	0.03	1.57	0.27	14.53
06/28/11	179	255	225	0.88235294	552	111	14.8	0.13	13.88	0.10	11.06	0.40	44.44
06/29/11	180	260	260	1	578	113	13.038462	0.04	4.89	0.02	2.35	0.17	18.96
06/30/11	181	260	260	1	645	127	14.653846	0.02	2.76	0.02	3.15	0.14	17.72
07/01/11	182	260	260	1	843	170	19.615385	0.02	3.83	0.03	4.84	0.09	16.13
07/02/11	183	260	260	1	232	46	5.3076923	0.06	2.97	0.07	3.17	0.25	11.30
07/03/11	184	255	135	0.52941176	260	54	12	0.01	0.62	0.00	0.00	0.05	2.49
07/04/11	185	255	255	1	761	150	17.647059	0.02	3.15	0.01	2.17	0.09	13.80
07/05/11	186	260	260	1	330	70	8.0769231	0.03	2.33	0.05	3.39	0.14	9.76

Table 13. Continued

07/06/11	187	255	195	0.76470588	359	74	11.384615	0.04	2.89	0.01	0.62	0.10	7.63
07/07/11	188	260	260	1	2547	527	60.807692	0.02	9.93	0.01	6.83	0.07	38.49
07/08/11	189	55	55	1	165	32	17.454545	0.15	4.85	0.17	5.43	0.56	17.84
07/10/11	191	260	255	0.98076923	670	134	15.764706	0.03	3.40	0.03	4.60	0.14	19.20
07/11/11	192	265	185	0.69811321	425	87	14.108108	0.07	5.94	0.04	3.48	0.22	19.04
07/12/11	193	265	265	1	2054	411	46.528302	0.02	9.20	0.02	9.20	0.10	42.62
07/13/11	194	135	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
07/14/11	195	250	250	1	1503	297	35.64	0.04	11.26	0.04	12.05	0.14	40.71
Totals	43 nights				24401	4879			172.20		146.50		653.86
Means					567.47	113.47	16.11	0.05	4.00	0.04	3.41	0.16	15.21

Table 14. Results from regression tree (RT) and random forests (RF) analyses for Day and Night sampling periods in Winter (16 Dec 2010 - 15 Mar 2011). Data are summarized for each of the six "Response" variables. "Predictor" variable refers to most important explanatory variable, at sunset (SS) or sunrise (SR), chosen by modeling procedures for each response variable. "Node splitting criteria" refer to threshold values for RT branching and "Mean measure at split" indicates the mean of the response variable when the response the threshold criteria was or was not met. See Methods section 2.4.1 and Table 2 for a full description of each predictor variable. Cross-validated error was calculated as the residuals sum-of-squares (SSE)/total sums-of-squares (SST). We obtained R2 values for RTs using the equation, 1-cross validated error.

Period	Response variables	Predictor variables*	Node splitting criteria	Mean measure at split		Cross-validated error	R^2
				Criteria met	Criteria not met		
Day (N=61)							
	Targets recorded (TR)	BP (SS)	≥ 1008	NA**	NA**	NA**	0
	Target passage rate (TR/hr)	BP (SS)	≥ 1008	NA**	NA**	NA**	0
	Targets recorded 0-25 m (TR25)	BP (SS)	≥ 1011	7.24 (n=33)	17.9 (n=28)	1.02	0
	Proportion targets recorded 0-25 m (PROP25)	BP (SS)	≥ 1011	0.071 (n=33)	0.141 (n=28)	1.02	0
	Targets recorded 26-50 m (TR50)	BP (SS)	≥ 1008	NA**	NA**	NA**	0
	Proportion targets recorded 26-50 m (PROP50)	BP (SS)	≥ 1008	0.048 (n=45)	0.135 (n=16)	0.78	0.22
Night (N=65)							
	Targets recorded (TR)	BP (SS)	≥ 1001	19.2 (n=51)	401 (n=14)	1.02	0
	Target passage rate (TR/hr)	BP (SS)	≥ 1001	1.7 (n=51)	30.2 (n=14)	1.02	0
	Targets recorded 0-25 m (TR25)	Julian day	≥ 28.5	5.59 (n=49)	30.2 (n=16)	1.05	0
	Proportion targets recorded 0-25 m (PROP25)	DP (SS)	< -4.5	0.054 (n=46)	30.2 (n-19)	1.29	0
	Targets recorded 26-50 m (TR50)	BP (SS)	≥ 1008	5.83 (n=40)	30.2 (n=25)	1.01	0
	Proportion targets recorded 26-50 m (PROP50)	DP (SS)	< -4.5	5.83 (n=46)	30.2 (n=19)	1.03	0

*BP: Barometric pressure (mb); DP: Wet bulb dew point (°C). See Methods section 2.4.1 and Table 2 for description of weather variables.
**NA refers to RT models that were not validated by RF analyses

Table 15. Results from regression tree (RT) and random forests (RF) analyses for Day and Night sampling periods in Summer (1Jun - 14 Jul 2011). Data are summarized for each of the six "Response" variables. "Predictor" variable refers to most important explanatory variable, at sunset (SS) or sunrise (SR), chosen by modeling procedures for each response variable. "Node splitting criteria" refer to threshold values for RT branching and "Mean measure at split" indicates the mean of the response variable when the response the threshold criteria was or was not met. See Methods section 2.4.1 and Table 2 for a full description of each predictor variable. Cross-validated error was calculated as the residuals sum-of-squares (SSE)/total sums-of-squares (SST). We obtained R2 values for RTs using the equation, *1-cross validated error.*

Period	Response variable	Predictor variable*	Node splitting criteria	Mean measure at split		Cross-validated error	R^2
				Criteria met	Criteria not met		
Day (N=36)							
	Targets recorded (TR)	THV-350° (SS)	NA**	NA**	NA**	0	0
	Target passage rate (TR/hr)	Julian day	< 188	13.3 (n=29)	64.3 (n=7)	1.06	0
	Targets recorded 0-25 m (TR25)	Julian day	NA**	NA**	NA**	0	0
	Proportion targets recorded 0-25 m (PROP25)	BP (SS)	≥ 1006	0.038 (n=29)	0.107 (n=7)	1.05	0
	Targets recorded 26-50 m (TR50)	TEMP (SR)	< 15.5	22.9 (n=28)	55.9 (n=8)	1.03	0
	Proportion targets recorded 26-50 m (PROP50)	CC (SS)	≥ 62.5	0.023 (n=15)	0.044 (n=21)	1.07	0
Night (N=31)							
	Targets recorded (TR)	Julian day	< 186	107 (n=24)	229 (n=7)	1.05	0
	Target passage rate (TR/hr)	Julian day	< 186	13.3 (n=24)	27.5 (n=7)	1.08	0
	Targets recorded 0-25 m (TR25)	TEMP (SR)	< 14.5	16.6 (n=21)	32.3 (n=10)	1.05	0
	Proportion targets recorded 0-25 m (PROP25)	THV-56° (SR)	≥ -1.04	0.031 (n=18)	0.049 (n=13)	1.04	0
	Targets recorded 26-50 m (TR50)	TEMP (SR)	< 14.5	13.4 (n=21)	28.7 (n=10)	1.00	0
	Proportion targets recorded 26-50 m (PROP50)	BP (SS)	> 1009	0.02 (n=14)	0.038 (n=17)	1.16	0

*THV: Tailwind/headwind vector; BP: Barometric pressure; TEMP: temperature (°C); CC: Cloud cover (%). See Methods section 2.4.1 and Table 2 for description of weather variables.

**NA refers to RT models that were not validated by RF analyses

Table 16. Circular-circular correlation coefficients and *P*-vaules for relationships between wind directions recorded at Knox County Regional Airport, Rockland, ME and mean vectors for target directions recorded with the horizontally-oriented radar. We restricted these analyses to migration periods because flight directions were not signficant for other seasons (i.e., Winter, summer). For Day periods, wind directions are those recorded at or as close to sunrise as data were available. We used wind directions recorded at or as close to sunset as data were available for Night periods.

Season/Period		Correlation coefficient (r)*	*P***
Fall/Early			
	Day	0.032	< 0.05
	Night	0.228	< 0.05
Fall/Late			
	Day	0.087	< 0.05
	Night	0.281	< 0.05
Spring			
	Day	0.121	< 0.05
	Night	0.194	< 0.05

* Coefficient ranges from -1 to +1, with the former indicating a perfect negative correlation, the latter a perfect positive correlation, and 0 indicating no correlation.

** The significance of the correlation is tested by using the jackknife method described in Zar (2003)

Table 17. Circular-linear correlation coefficients and *P*- vaules for relationships between Tailwind/Headwind vectors (see Table 2 for description) and mean vectors for target directions recorded with the horizontally-oriented radar. We restricted these analyses to migration periods because flight directions were not signficant for other seasons (i.e., Winter, summer).

Season/Period	Correlation coefficient (r)*	*P***
Fall/Early-Day		
THV(29)[a]	0.306	0.001
THV(180)[b]	0.206	0.05
Fall/Early-Night		
THV(31)[c]	0.392	<0.0001
THV(211)[c]		
THV(360)[b]	0.443	<0.0001
Fall/Late-Day		
THV(56)[c]	0.495	<0.0001
THV(236)[c]	0.433	<0.0002
THV(360)[b]	0.469	<0.0001
Fall/Late-Night		
THV(224)[a]	0.482	<0.0001
THV(360)[b]	0.645	<0.0001
Spring/Day		
THV(41)[c]	0.358	<0.0001
THV(221)[c]	0.291	<0.0001
THV(180)[b]	0.565	<0.0001
Spring/Night		
THV(57)[a]	0.575	<0.0001
THV(360)[b]	0.319	<0.0001

[a] Number in parentheses assumed to be the directional goal of movement (i.e., in degrees). Based on analysis of data collected with horizontally-oriented radar (see Figures 35, 36 and 38)

[b] Number in parentheses represents generalized and seasonally appropriate directional goal (e.g., spring [North-360°], fall [South-180°])

[c] Number in parentheses assumed to be the directional goal of movement (i.e., in degrees) when results indicate a significant axial or bi-directional orientation in target movements . Based on analysis of data collected with horizontally-oriented radar (see Figures 35, 36 and 38)

* Correlation coefficient ranges from 0 to 1, so there is no negative correlation.

** The calculation of the significance of the correlation follows Mardia & Jupp (2000) and is an approximation of the *F* distribution

Table 18. F statistics and *P*- vaules for comparisons between Season/Period-specific wind vectors and corresponding mean vectors of bird/bat movement. Numbers in parentheses represent sample sizes. We restricted these analyses to migration periods because flight directions were not signficant for other seasons (i.e., Winter, summer).

Season/Period		Vectors		Watson-Williams *F* statistic*	*P*
		Wind	Bird/Bat		
Fall/Early					
	Day	306°	29°	26.33	< 0.0001
	Night	192°	211°	75.64	< 0.0001
Fall/Late					
	Day	16°	220°	0.01	0.90
	Night	190°	224°	119.81	< 0.0001
Spring					
	Day	261°	41°	6.57	0.01
	Night	338°	57°	9.67	0.003

* Compares two or more samples to determine if their mean angles differ significantly by comparing the lengths of the mean vectors for each sample with that for the pooled data of the two or more samples. The resulting *F* statistic is the same as Fisher's variance ratio statistic which is commonly used in linear statistics

Figure 1. Dual radar system with vertically-oriented (open-array) and horizontally-oriented (parabolic dish) antennas that operate simultaneously. This system allows for data collection on passage (horizontal and vertical), altitude (vertical) and flight direction (horizontal).

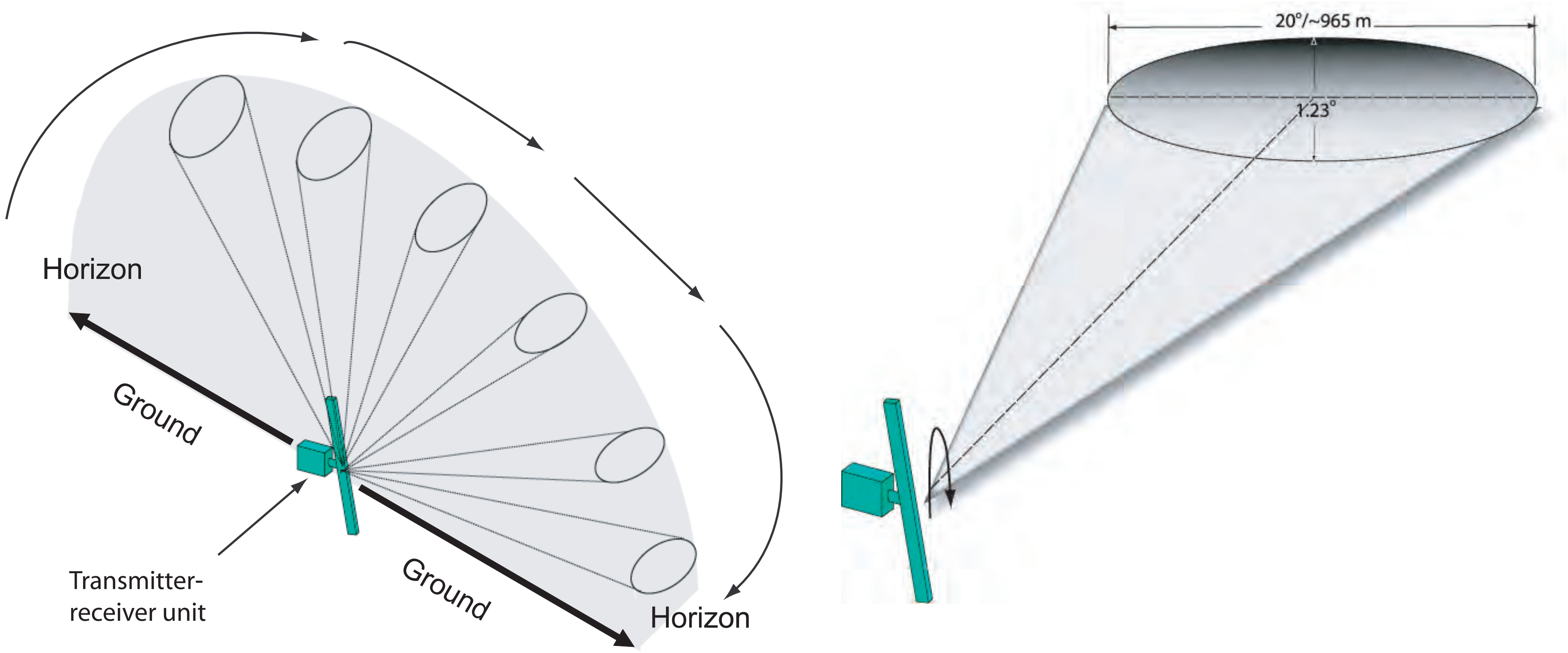
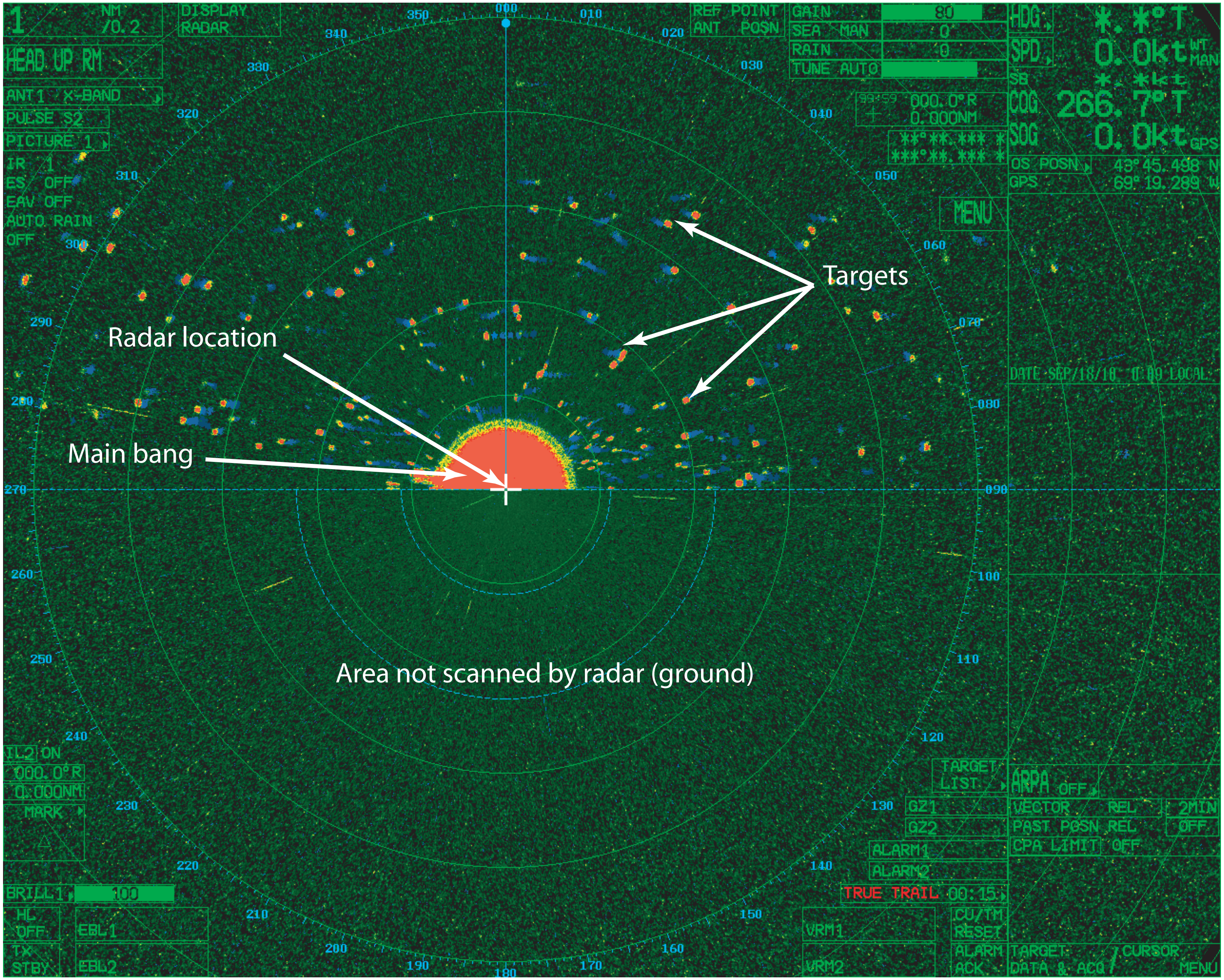


Figure 2. Graphical depiction of scanning operation of vertically-oriented radar. In this orientation, the transmitter-receiver unit is mounted perpendicular to the ground so that the radar antenna's rotation results in a 180°, horizon-to-horizon scan (radar does not transmit when antenna is oriented groundward). Data collected in "vertical" scanning mode can be used to estimate (1) target altitude and (2) target passage magnitude.



1 NM /0.2
DISPLAY RADAR
HEAD UP RM
ANT1 X-BAND
PULSE S2
PICTURE 1
IR 1
ES OFF
EAV OFF
AUTO RAIN OFF
REF POINT ANT POSN
GAIN 80
SEA MAN 0
RAIN 0
TUNE AUTO
HDG *.*°T
SPD 0.0kt WT MAN
SB *.*kt
COG 266.7°T
SOG 0.0kt GPS
99:59 000.0°R 0.000NM
°.*** *
°**. *
OS POSN GPS 43°45.498 N 69°19.289 W
DATE SEP/18/10 0:09 LOCAL
IL2 ON
000.0°R
0.000NM
BRILL1 100
HL OFF
TX STBY
ARPA OFF
VECTOR REL 2MIN
PAST POSN REL OFF
CPA LIMIT OFF
TRUE TRAIL 00:15

Figure. 3. Data image from the "vertical" radar collected on 18 September 2010 at 0009 EDT (12:09 AM). The small red ellipses with the blue tails are bird or bats flying through the radar's sample space. The height above the blue dotted line splitting the image indicates each target's altitude. The large, circular red area in the center of the image is the "main bang" an area of interference generated by an inherent to marine radars. Note that the radar in the vertical orientation does not transmit or receive electromagnetic energy when the antenna scans toward the ground so no targets are shown below the blue dotted line.

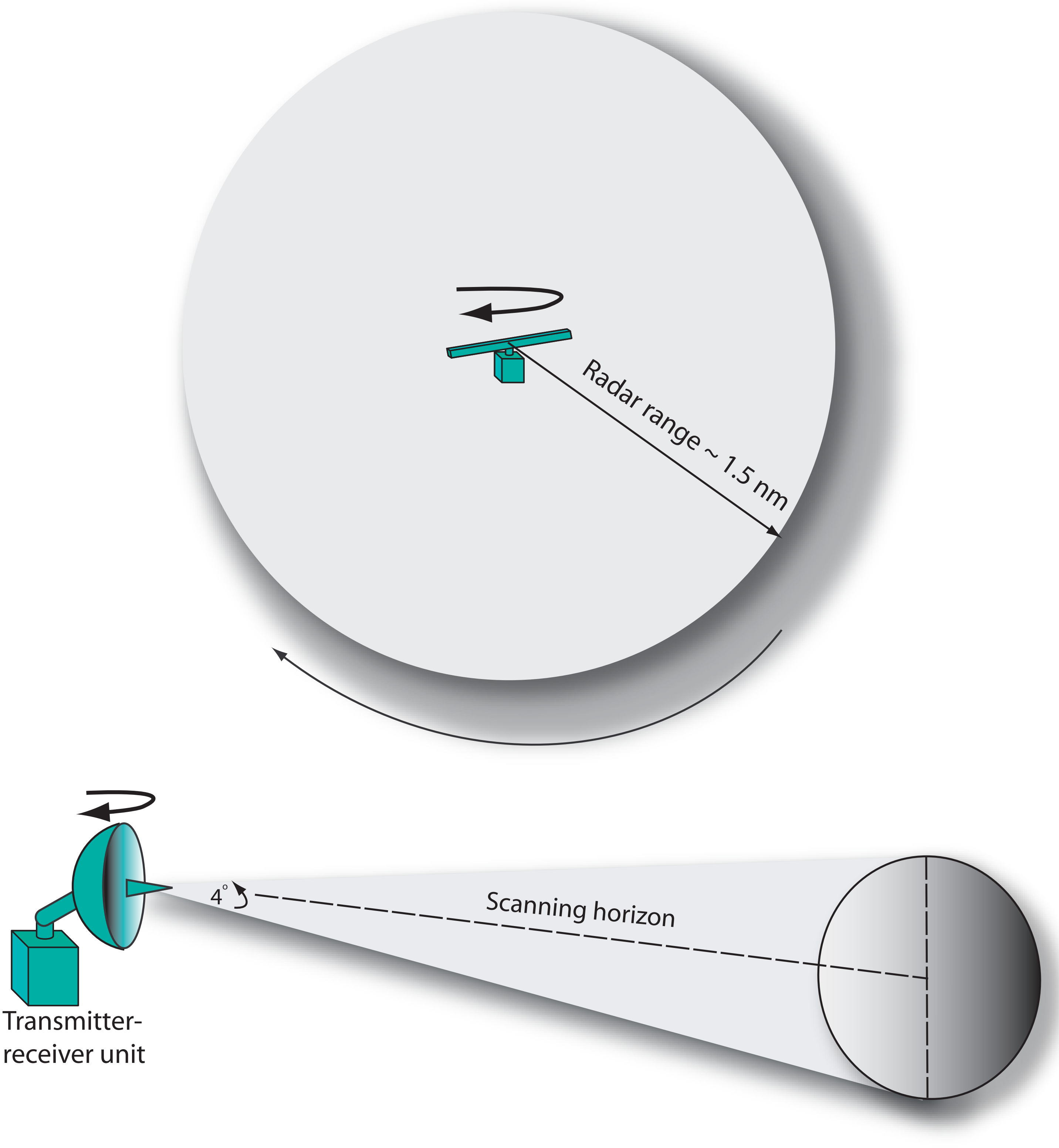


Figure 4. Graphic representation of scanning operation of horizontally-oriented radar. In this orientation, the antenna rotates in a plane parallel to the ground resulting in a 360° scan with a that samples 10° above and below the scanning horizon. The radar's range is set to 1 nautical mile (1.85 km, 6076 ft) which is the effective detection range for small passerines with our 25 kW radar.

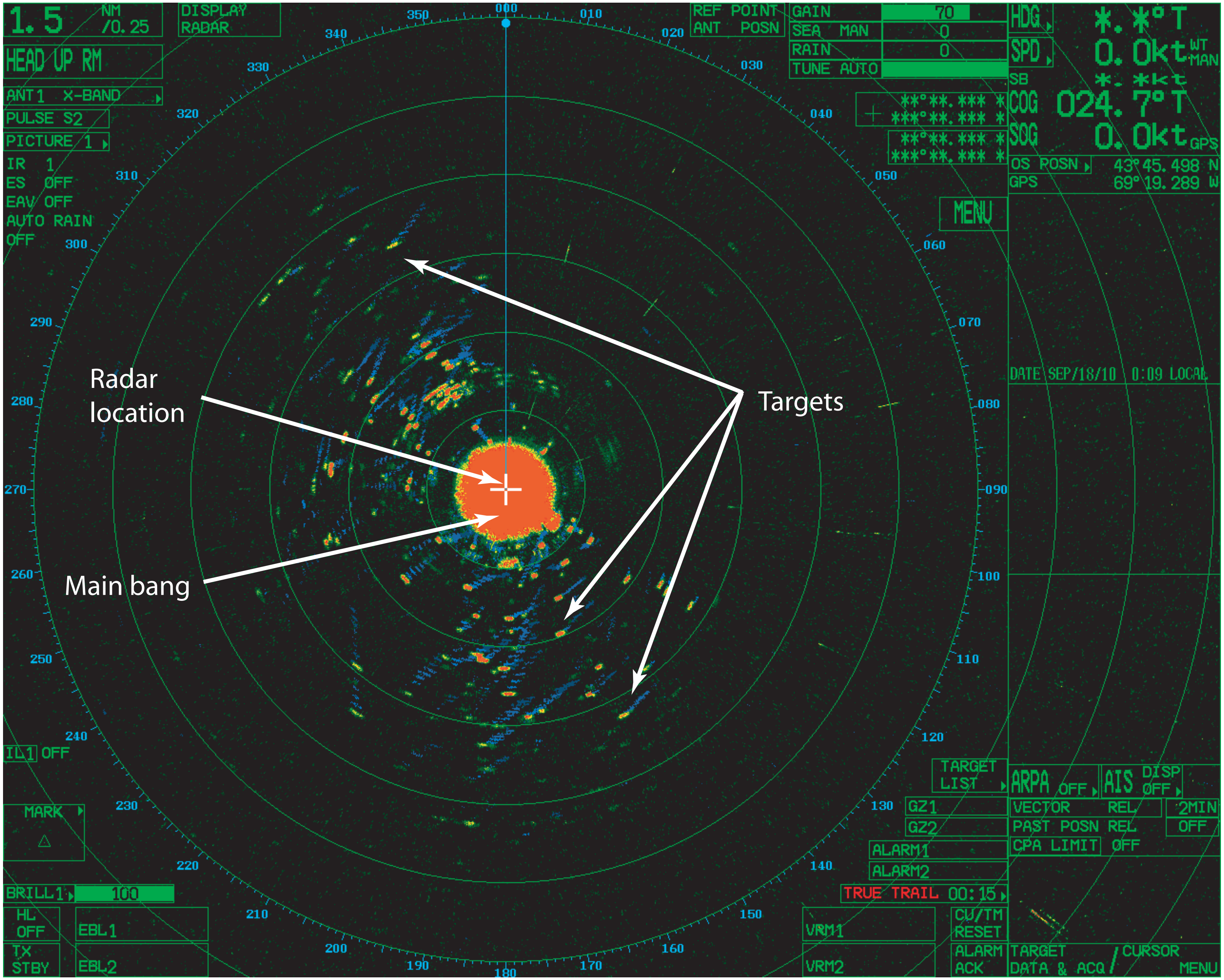


Figure 5. Data image from the "horizontally-oriented" radar collected on 18 September 2010 at 0009 EDT (12:09 AM). The small red ellipses with the blue trails are bird or bats flying through the radar's sample space. A blue trails shows the 15 second track history of its associated target, so represents its general flight direction. The large, cirucular red area in the center of the image is the "main bang," an area of interference generated by and inherent to marine radars.

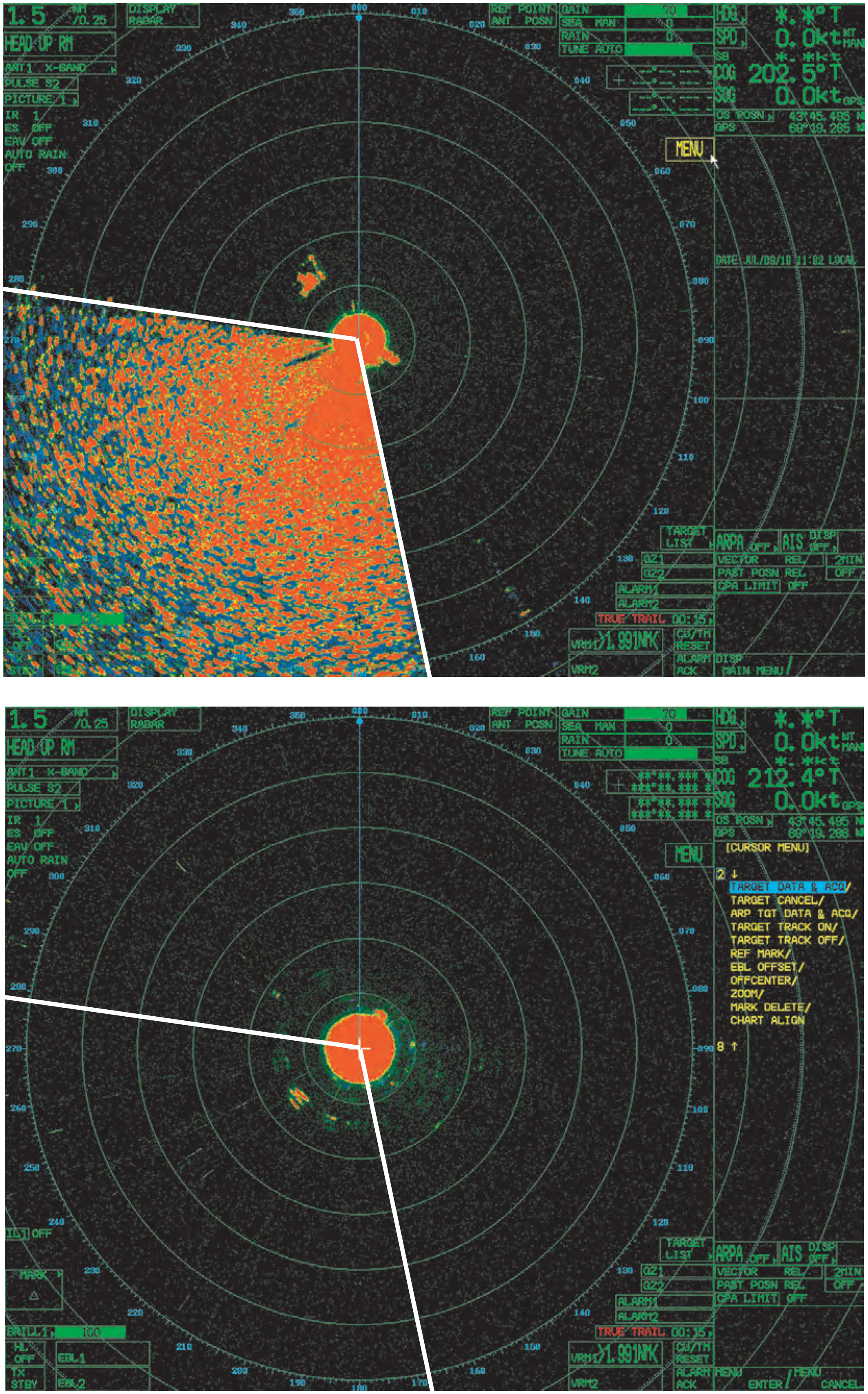


Figure 6. (Upper) Image from horizontally-oriented radar fitted with standard 6.5′ open array antenna showing extensive backscatter of radar energy from wave action along the southern coast of Monhegan Island. White lines describe the radar's view of the ocean surface. (Lower) Image from horizontally-oriented radar fitted with parabolic dish antenna that produces a 4° conical beam. Antenna raised ~5° above the scanning horizon eliminated most of the backscattered radar energy from the ocean's surface.

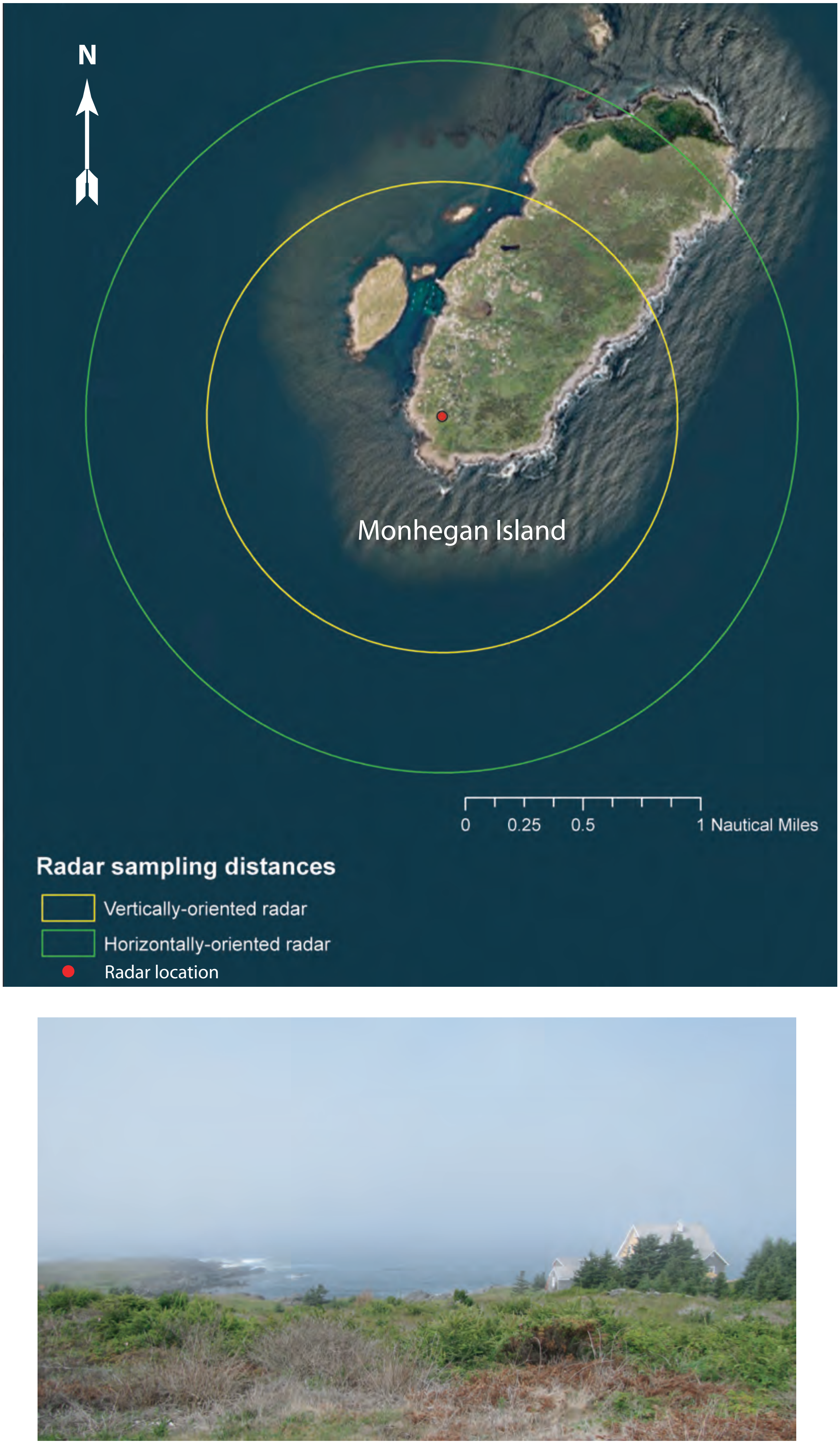


Figure 7. (Upper) Aerial photograph of Monhegan Island showing radar study site (lower). . Photo looking south from radar study site. Radar location provided ~110^{o} of unobstructed view of the ocean surface toward the S-SW.

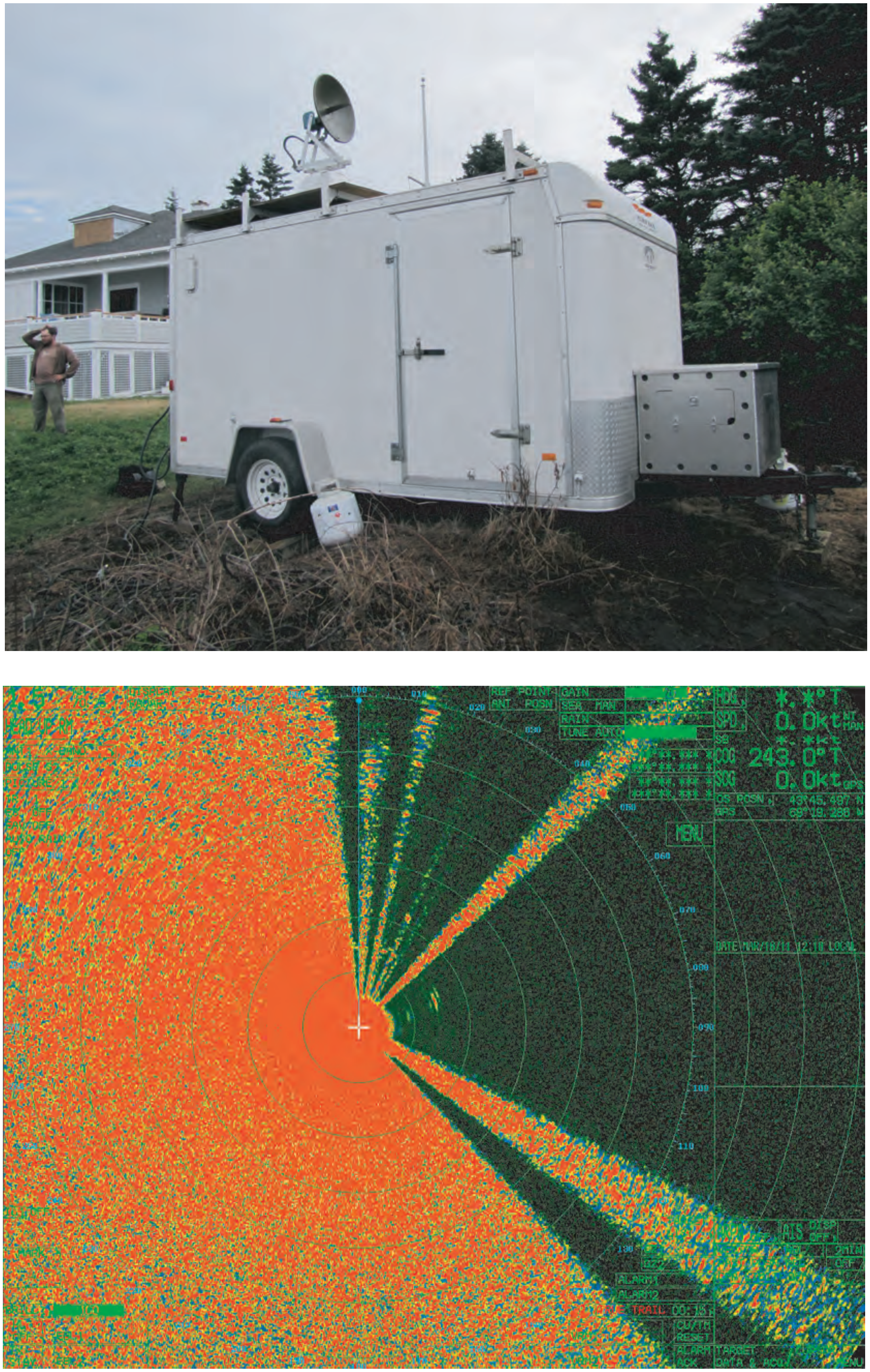


Figure 8. (Upper) Photo showing trees to the North of the radar that occludes transmitted electromagnetic energy. (Lower) Image from horizontally-orietntedradar showing areas of occlusion (i.e., areas not covered with red) caused by trees to the north, east and south-east of the radar.

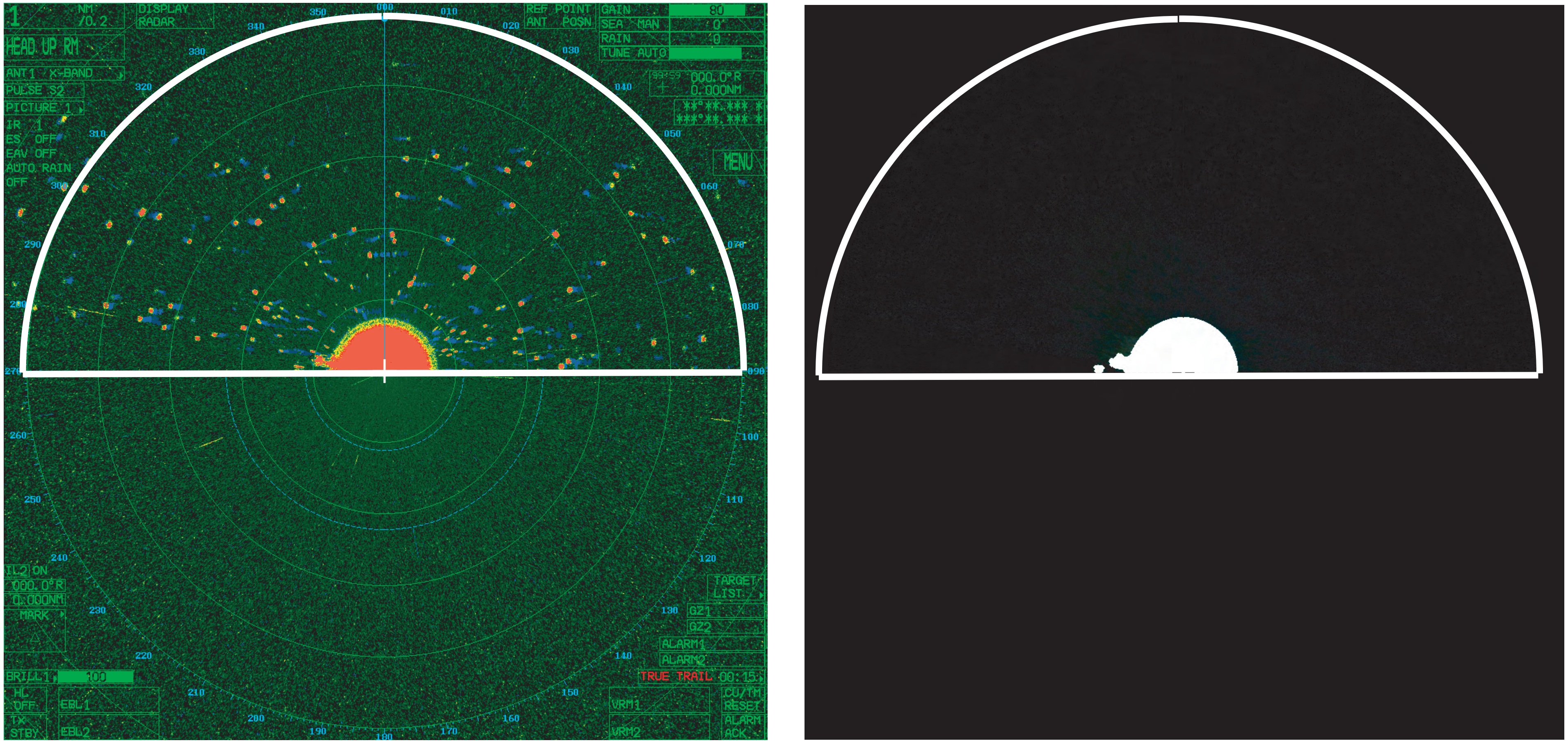


Figure 9. (Left) Data image from vertically oriented radar collected on 18 September 2010, 0009 EDT 12:09 AM). The thick white line graphicallyrepresents how NJAS's integrated image processing software defines the sample area. (Right) Template generated by NJAS's integrated image processing software for data collected on the same date as data image on the left. The template is used as a mask to remove stationary reflectors (i.e., main bang, ground clutter, see Figs. 3, 5 for reference) from data images.

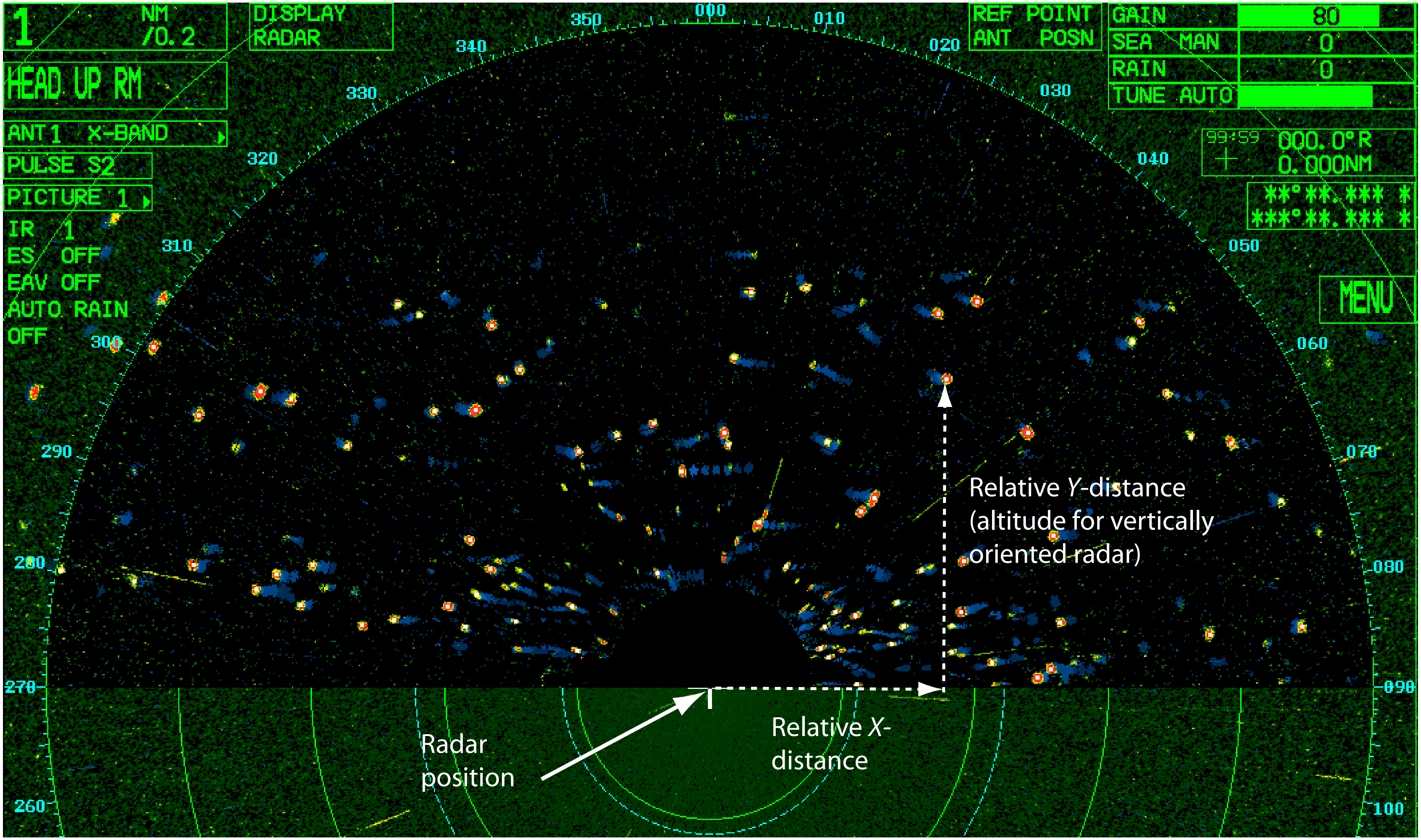
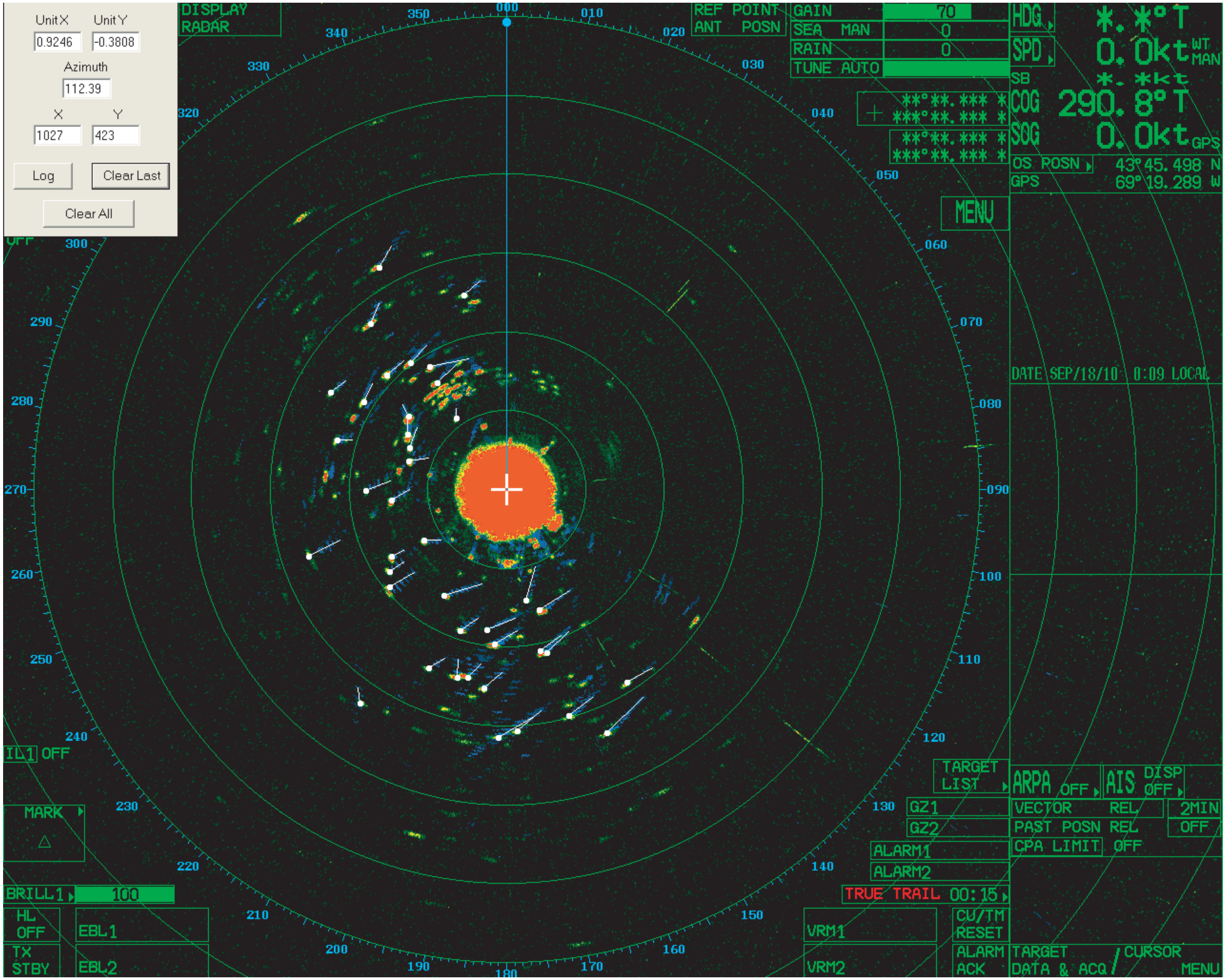


Figure 10. Data image collected on 18 September 2010 at 0009 EDT (12:09 AM), with the vertically-oriented radar. NJAS integrated imageprocessing software removes targets with low reflectivity, smooths the data and locates and marks the centroid of each discrete target that remains. In this representation, target centroids are marked with white dots. Because coordinates of the scan center (i.e., radar position, GPS) and the image's pixel dimensions are known, we can calculate a target's distance from the radar in the X-, Y-planes. This allows us to calculate any target's altitude (Y-distance, vertical radar) or X-, Y-coordinates (horizontal radar).



Unit X 0.9246
Unit Y -0.3808
Azimuth 112.39
X 1027
Y 423

DISPLAY RADAR
REF POINT ANT POSN
GAIN 70
SEA MAN 0
RAIN 0
TUNE AUTO
HDG *.*° T
SPD 0.0kt WT MAN
SB *.*kt
COG 290.8° T
SOG 0.0kt GPS
OS POSN GPS 43°45.498 N 69°19.289 W
DATE SEP/18/10 0:09 LOCAL
IL1 OFF
BRILL1 100
HL OFF
TX STBY
ARPA OFF
AIS DISP OFF
VECTOR REL 2MIN
PAST POSN REL OFF
CPA LIMIT OFF
TRUE TRAIL 00:15

Figure 11. Data image collected on 18 September 2010 at 0009 EDT (12:09 AM) with the horizontal radar. The image shows target tracks (white circles with white tails) created using NJAS software to calculate target directions. The end of a target's trail (blue dotted line, see Figs. 3 and 5 for reference) and the target (green, yellow or red ellipses) is marked (in that order) using the computer's mouse and cursor. The program outputs the position of the trail's tail and the target and from these calculates the target's direction of movement.

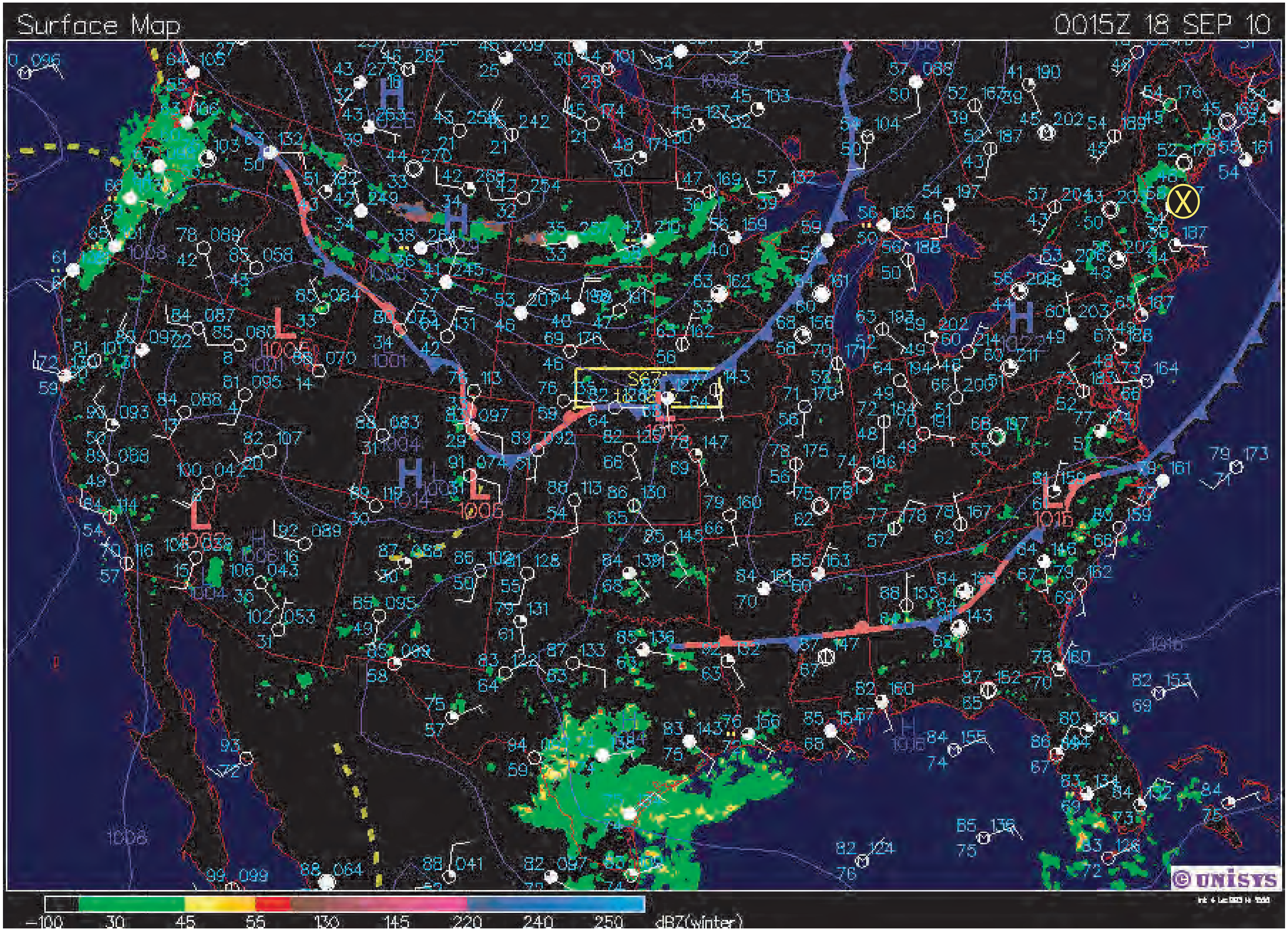


Figure 12. Surface weather map from 18 September 2010 00Z Greenwich Mean Time (Z, equivalent to 17 September, 2000 EST). Note yellow "X" within yellow circle, indicating general location of the Monhegan Island, ME study area. Surface weather maps were used to determine the position of synoptic weather systems (i.e., large scale atmospheric conditions) such as high or low pressure systems or frontal boundaries relative to the study areas.

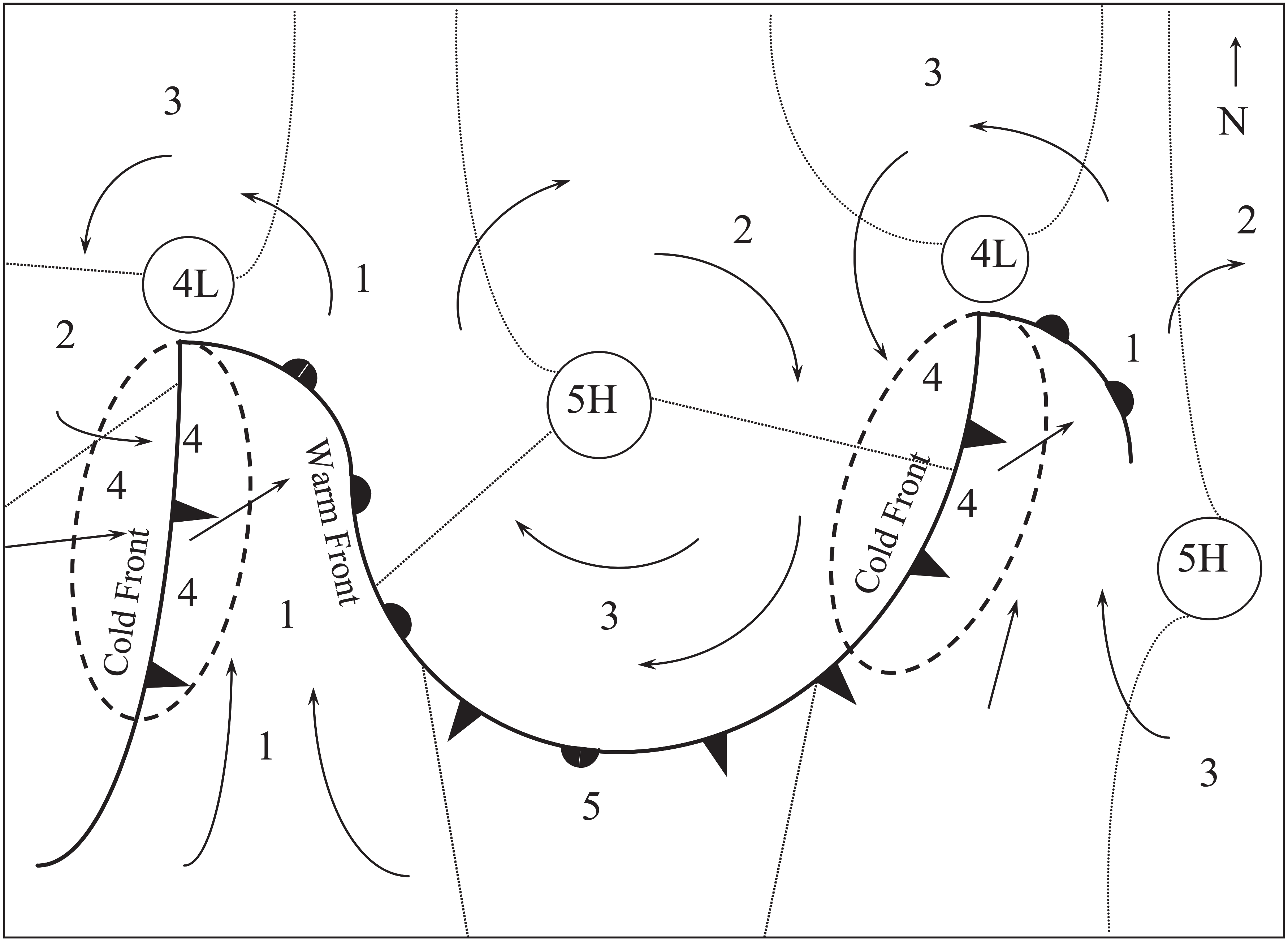


Figure 13. Generalized synoptic weather map with five synoptic regions: (1) southerly winds except after cold fronts, (2) northwesterly winds, (3) northeasterly winds, (4) the center of low pressure systems and (5) calm weather at the center of high pressure systems (after Richardson 1976, Lank 1983).

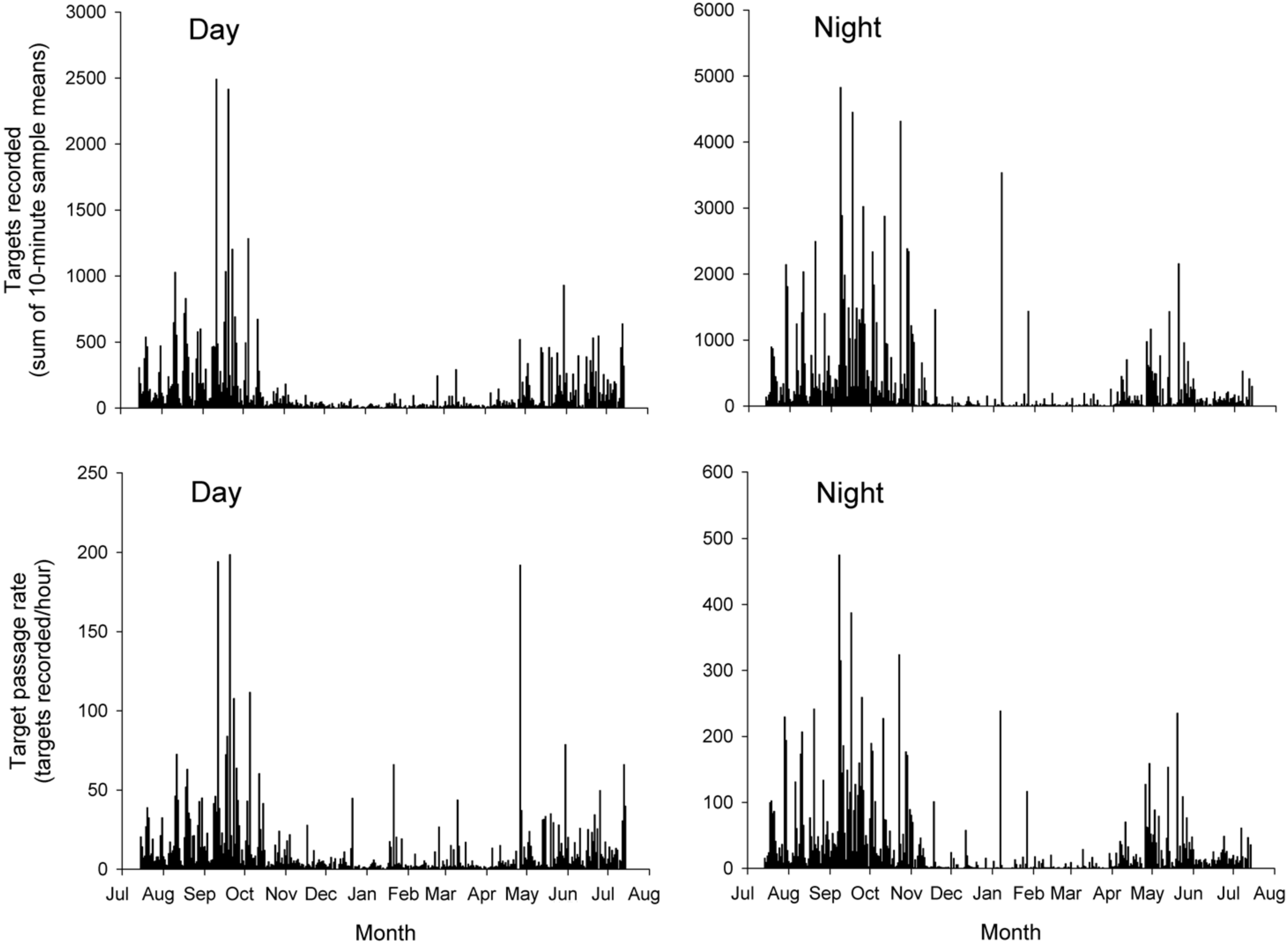


Figure 14. Seasonal temporal pattern in targets recorded and target passage rate during day (i.e. sunrise to sunset, upper panel) and night (sunset to sunrise the following morning, lower panel) for entire study period, 15 July 2010 - 14 July 2011.

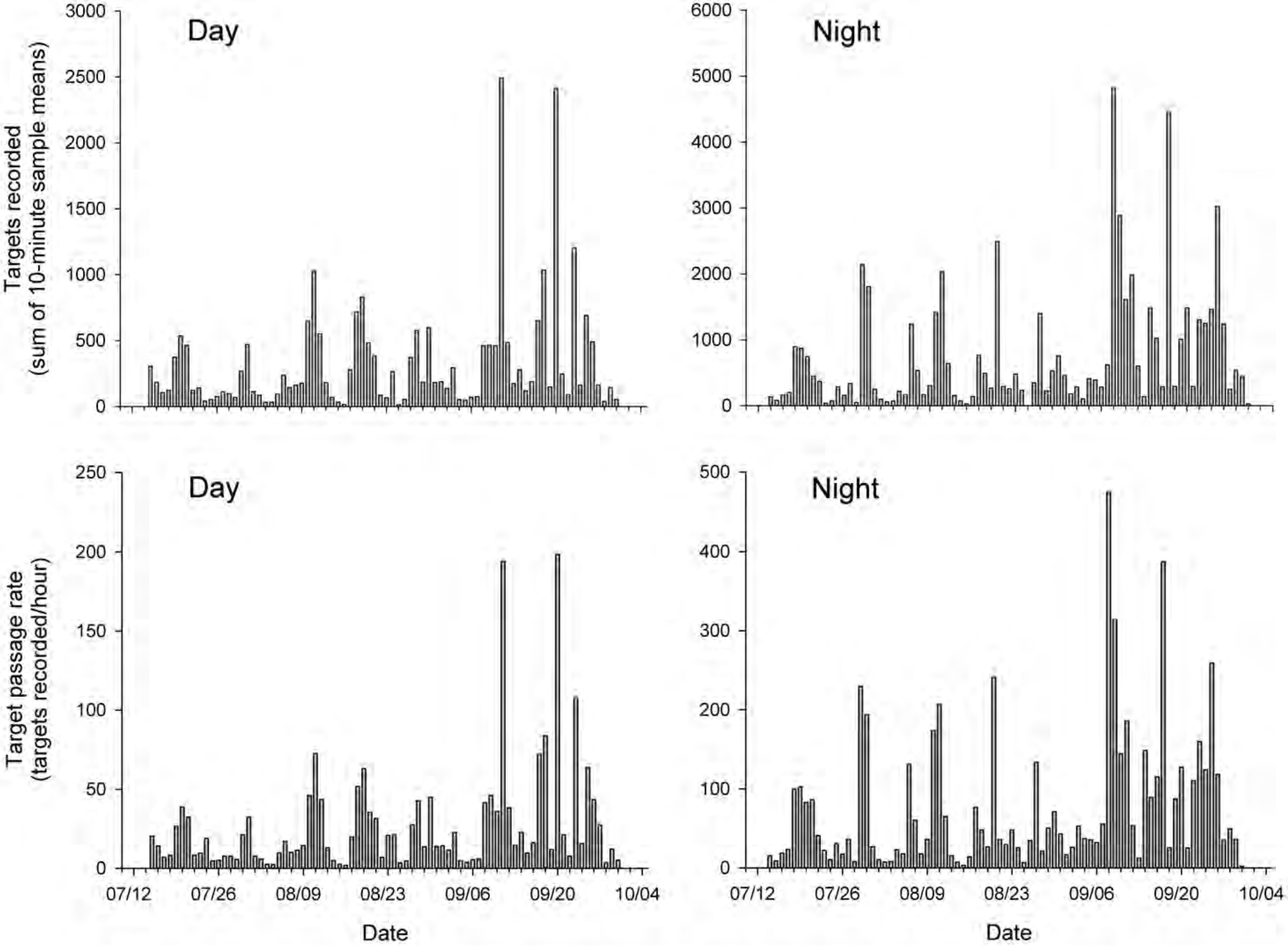


Figure 15. Temporal pattern in targets recorded (upper panels) and target passage rates (lower panels) during day (i.e. sunrise to sunset) and night (sunset to sunrise the following morning) data collection periods, Fall-early season (15 Jul - 30 Sep 2010).

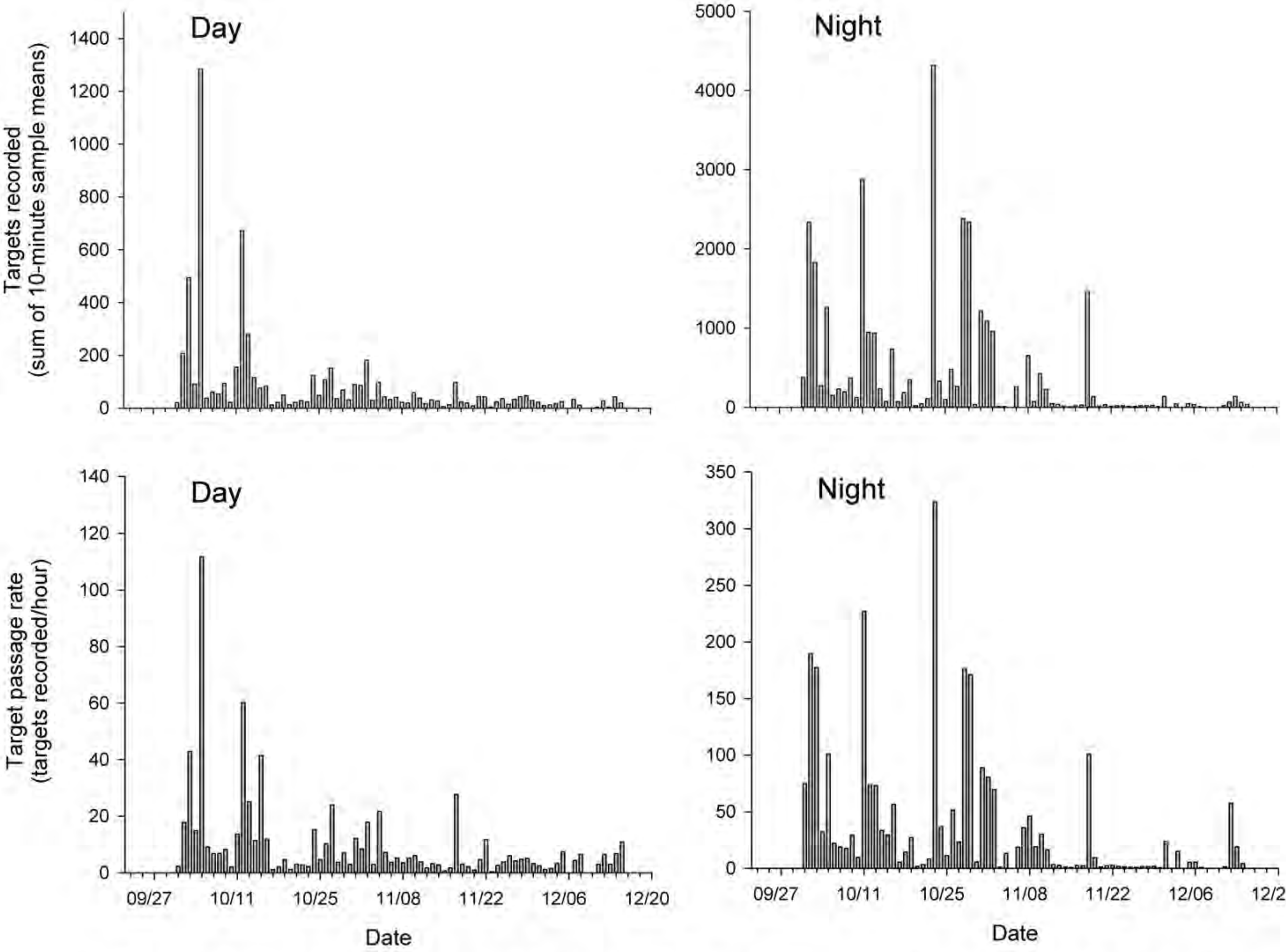


Figure 16. Temporal pattern in targets recorded (upper panels) and target passage rates (lower panels) during day (i.e. sunrise to sunset) and night (sunset to sunrise the following morning) data collection periods, Fall-late season (1 Oct - 15 Dec 2010).

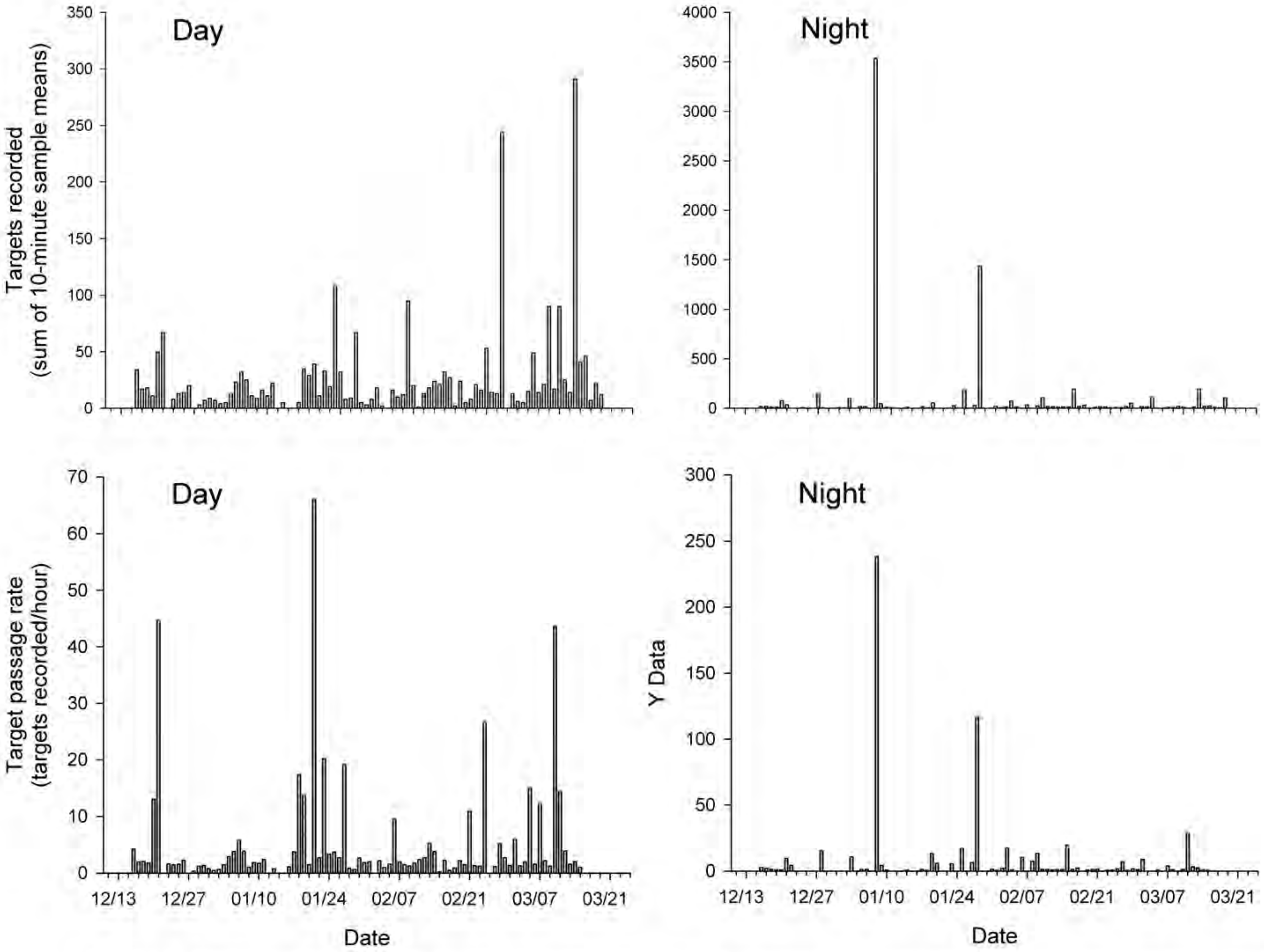


Figure 17. Temporal pattern in targets recorded (upper panels) and target passage rates (lower panels) during day (i.e. sunrise to sunset) and night (sunset to sunrise the following morning) data collection periods, Winter season (16 Dec 2010 - 15 Mar 2011).

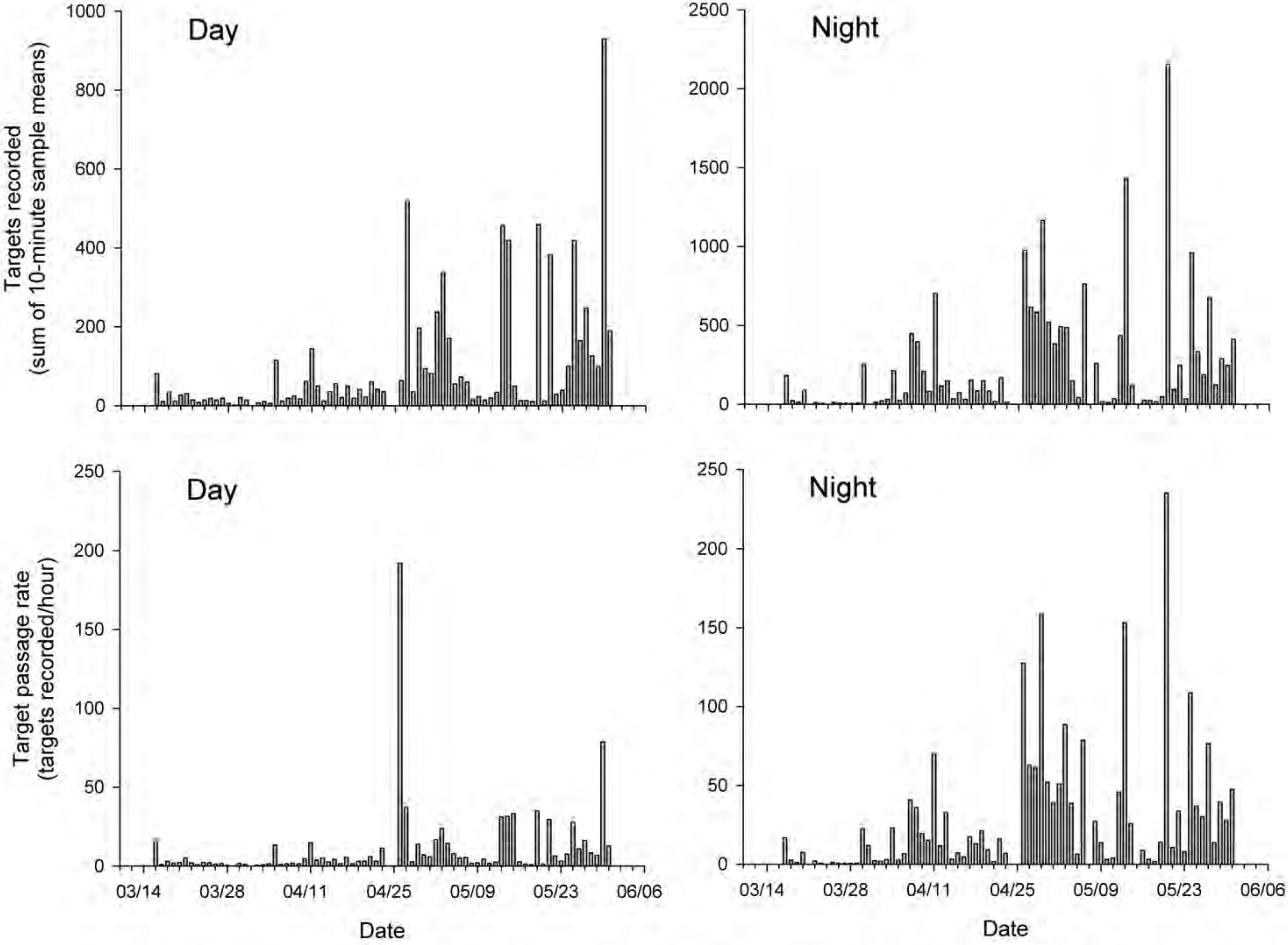


Figure 18. Temporal pattern in targets recorded (upper panels) and target passage rates (lower panels) during day (i.e. sunrise to sunset) and night (sunset to sunrise the following morning) data collection periods, Spring season (16 Mar - 31 May 2011).

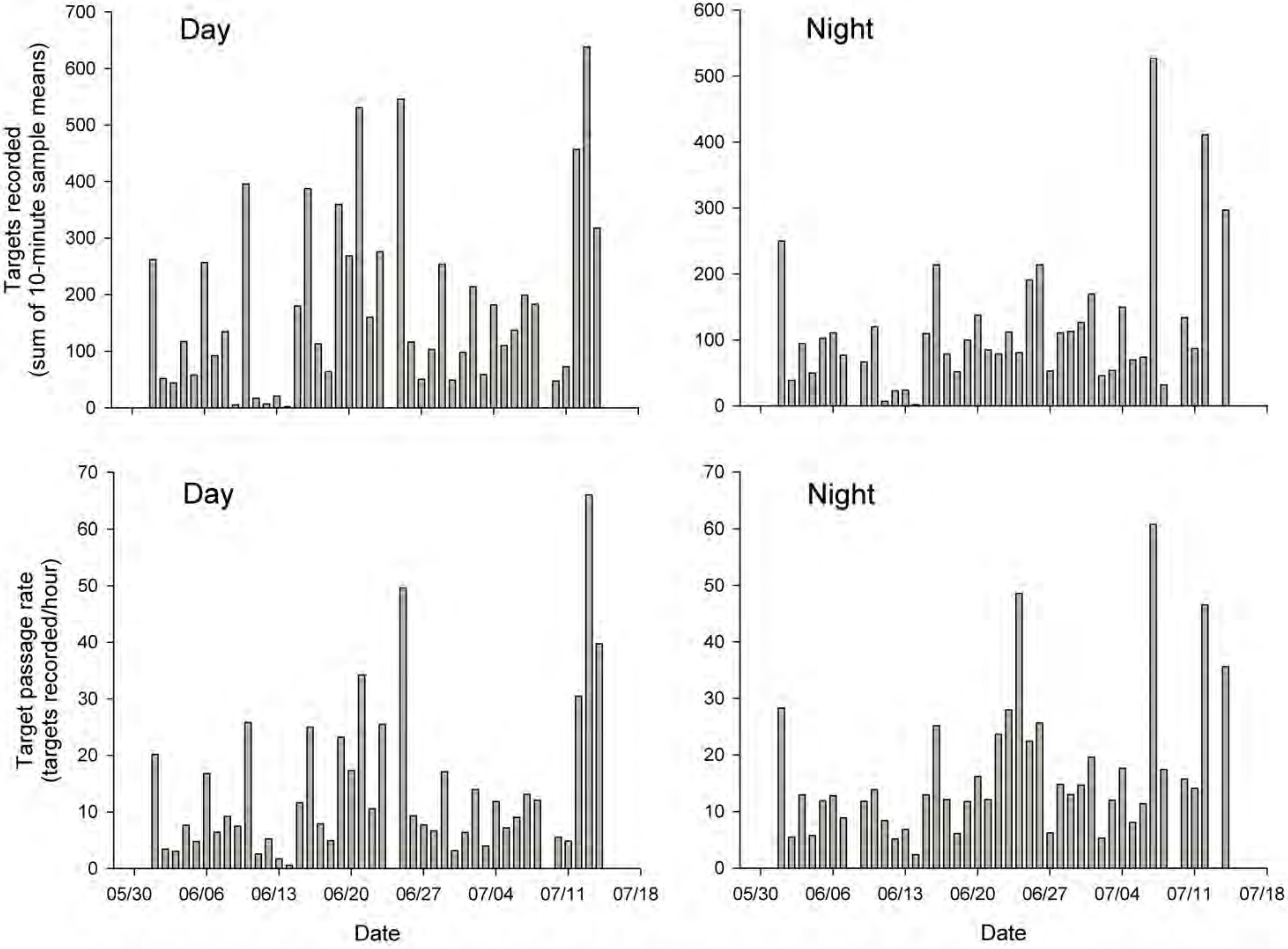


Figure 19. Temporal pattern in targets recorded (upper panels) and target passage rates (lower panels) during day (i.e. sunrise to sunset) and night (sunset to sunrise the following morning) data collection periods, Summer season (1 Jun - 14 Jul 2011).

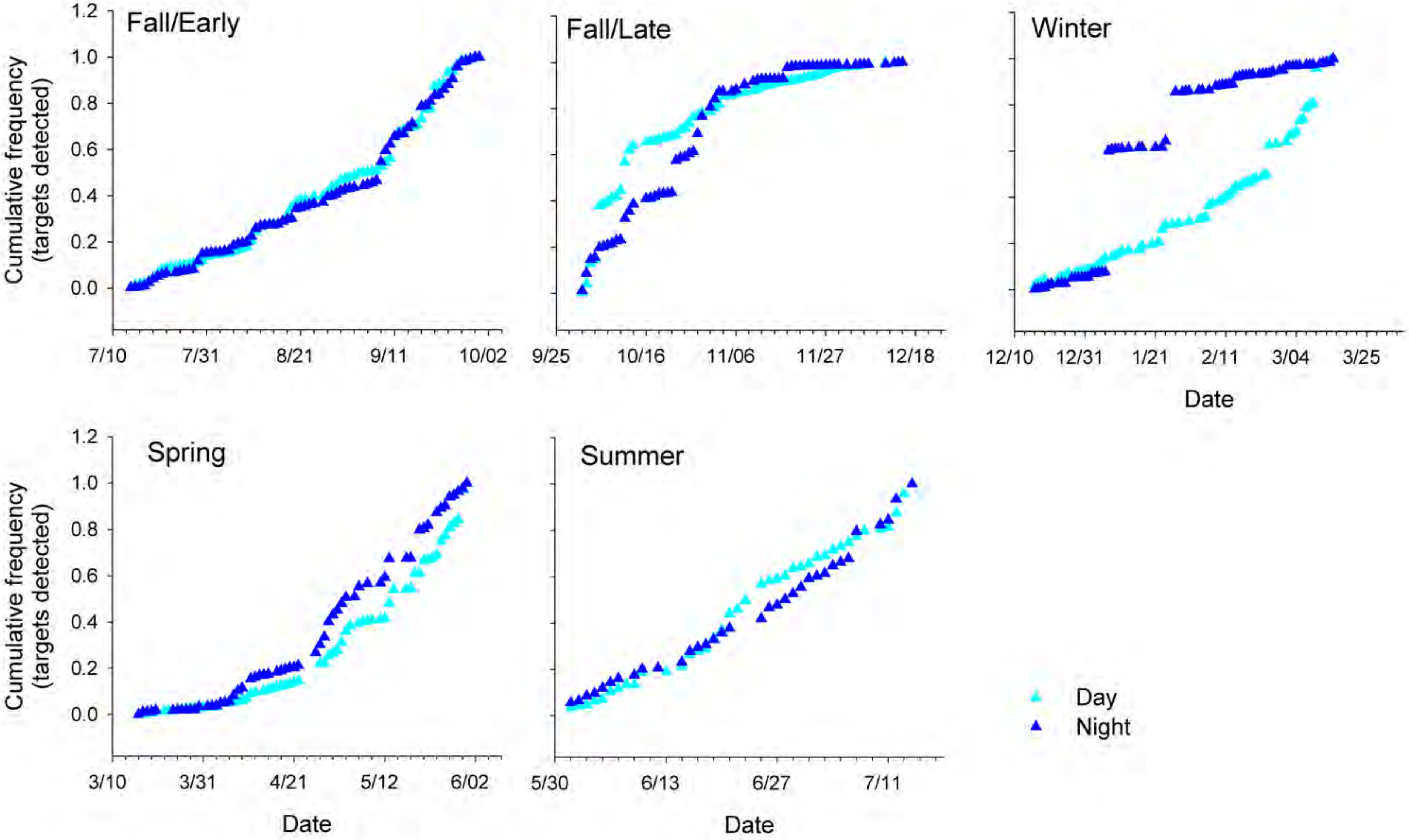


Figure 20. Cumulative frequency distributions for total targets detected (sum of 10-minute sample means) during for diurnal (Day, sunrise to sunset the same day) and nocturnal (Night, sunset to sunrise the next morning) sampling periods during all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

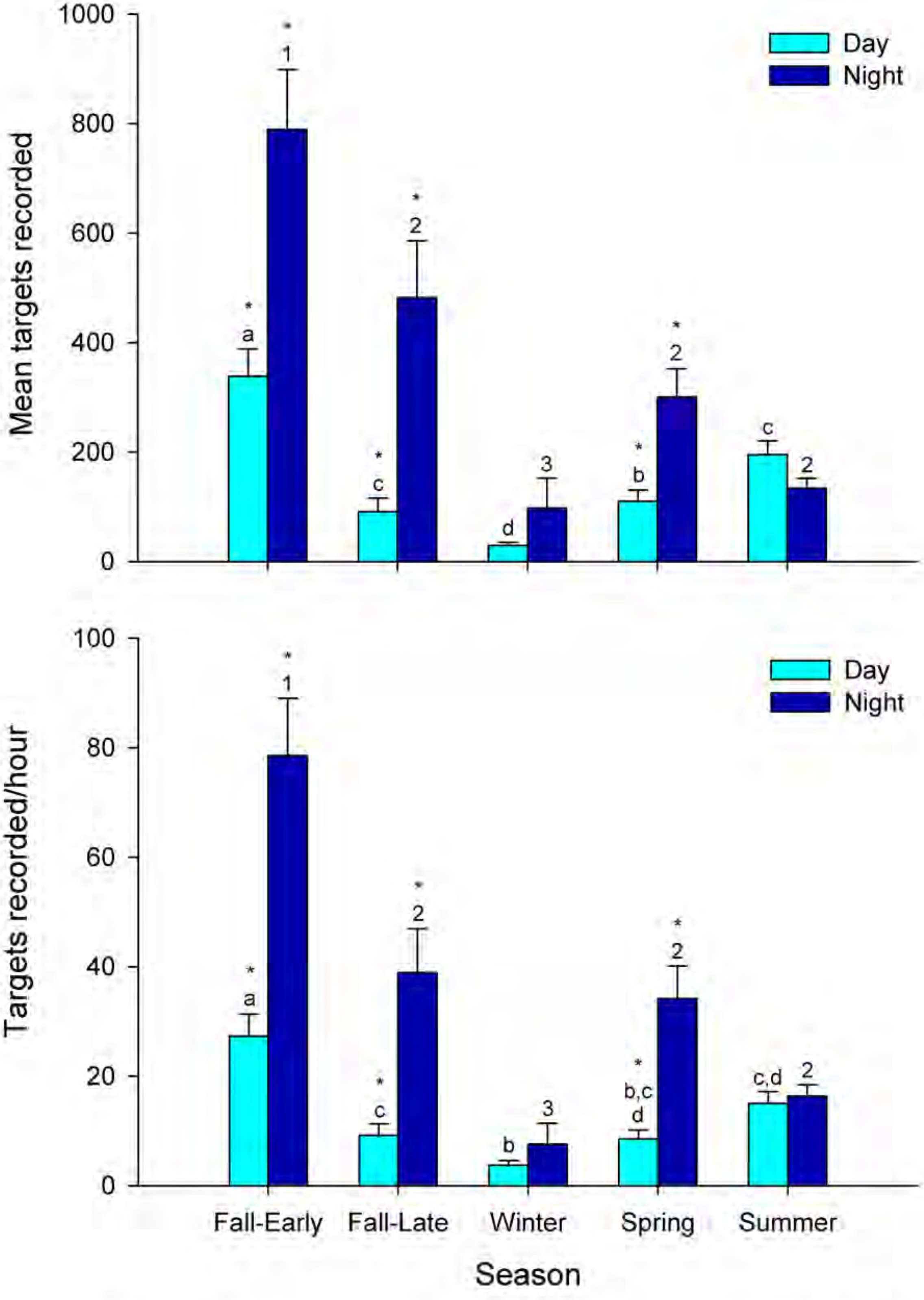


Figure 21. Comparison of mean targets (top) and target detection rate (bottom) recorded during the MRWPF radar study. Error bars represent SE of the means. Bars with asterisks indicate differences between periods for a given season (e.g., Fall/Early-Day vs Fall/Early-Night). Bars with the same letter (Day) or same number (Night) are not statistically different. Analyses used log-transformed data, and Bonferroni adjustment for multiple comparisons. Plots show untransformed data.

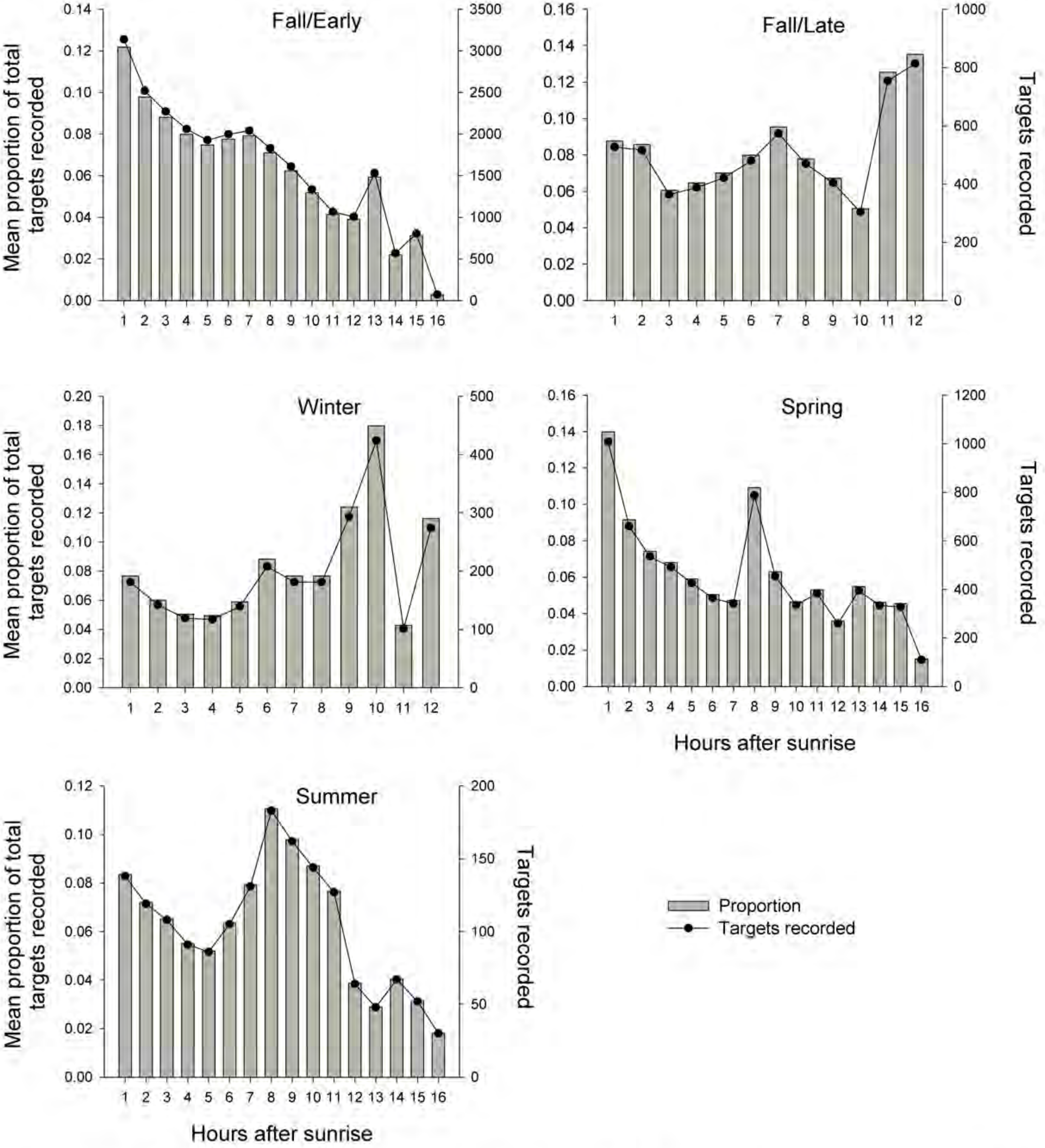


Figure 22. Proportion and total targets recorded by hour during the diurnal period (Day, sunrise to sunset the same day) for each season of data collection. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

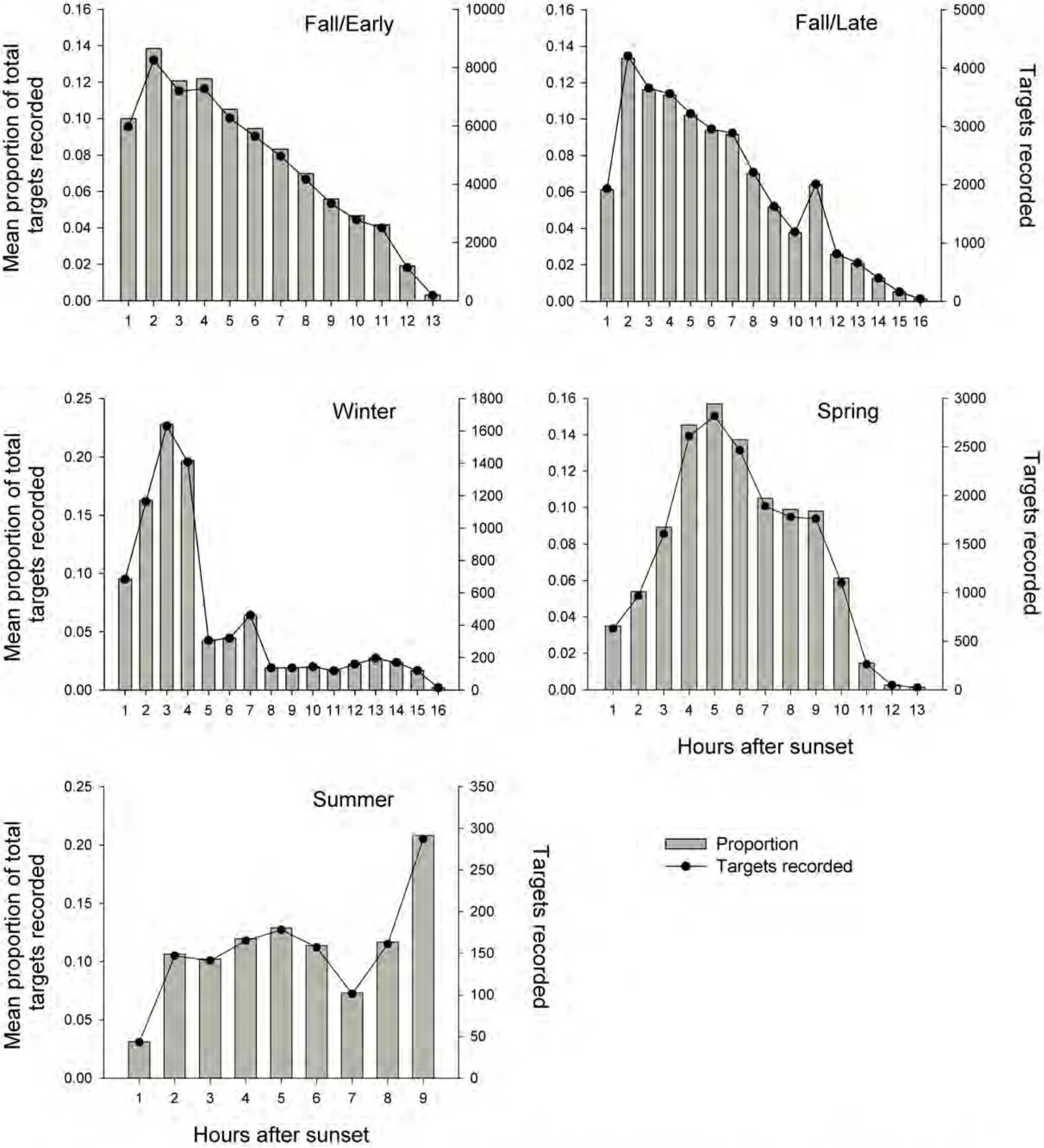
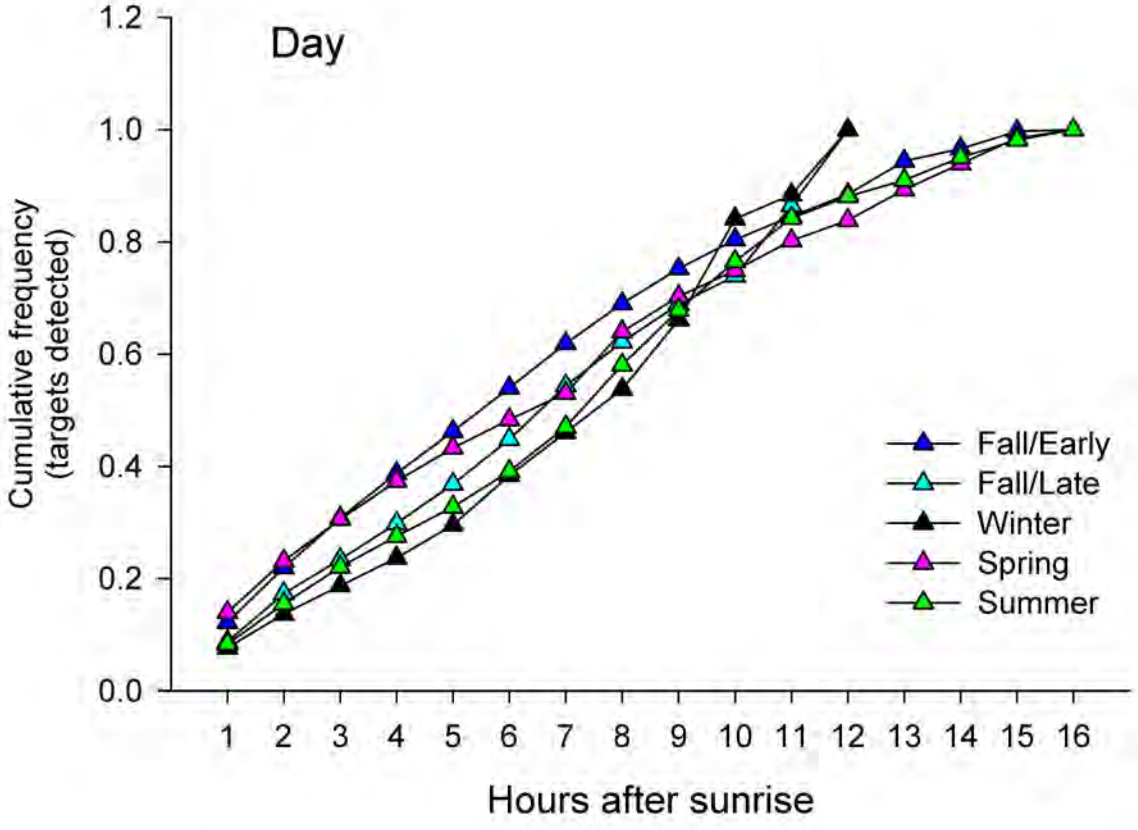


Figure 23. Proportion and total targets recorded by hour during the nocturnal period (Night, sunset to sunrise the following morning) for each season of data collection. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).



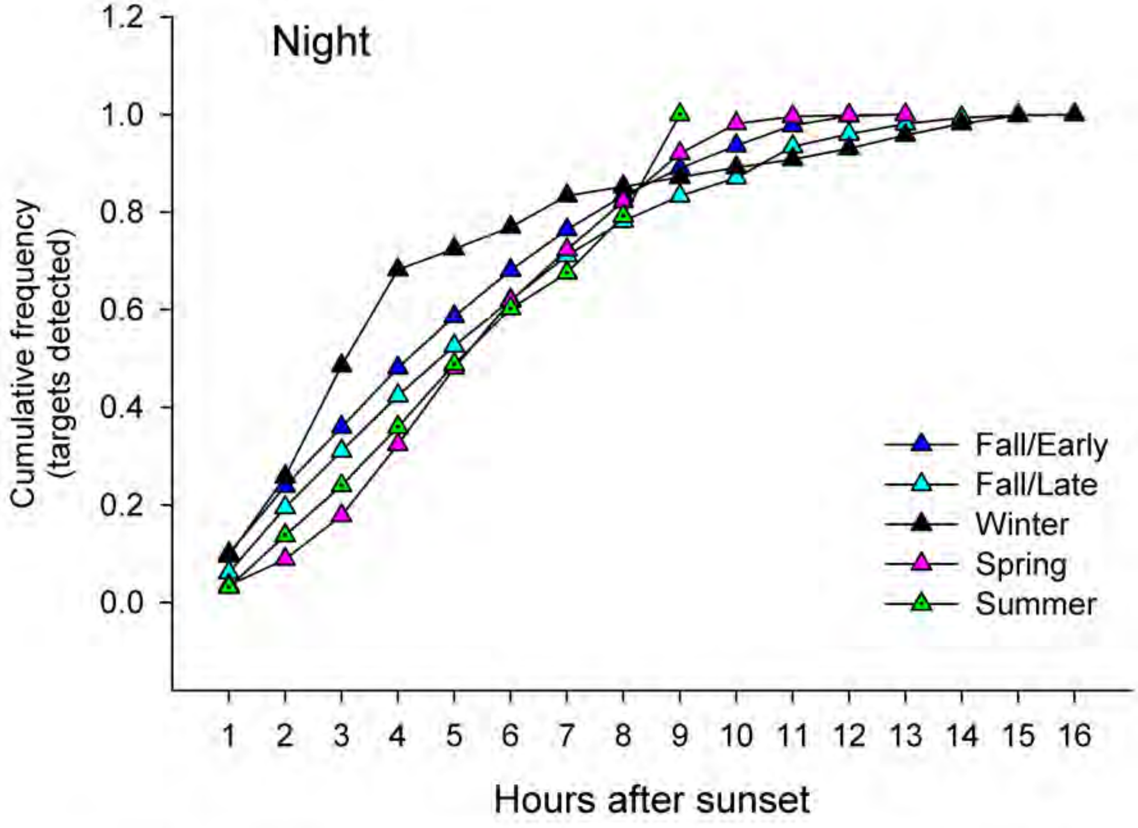


Figure 24. Hourly cumulative frequency distributions relative to sunrise (Day data collection period) 3and sunset (Night data collection period) for targets detected (i.e., sum of 10-minute sample means for each hour averaged over entire season) during Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

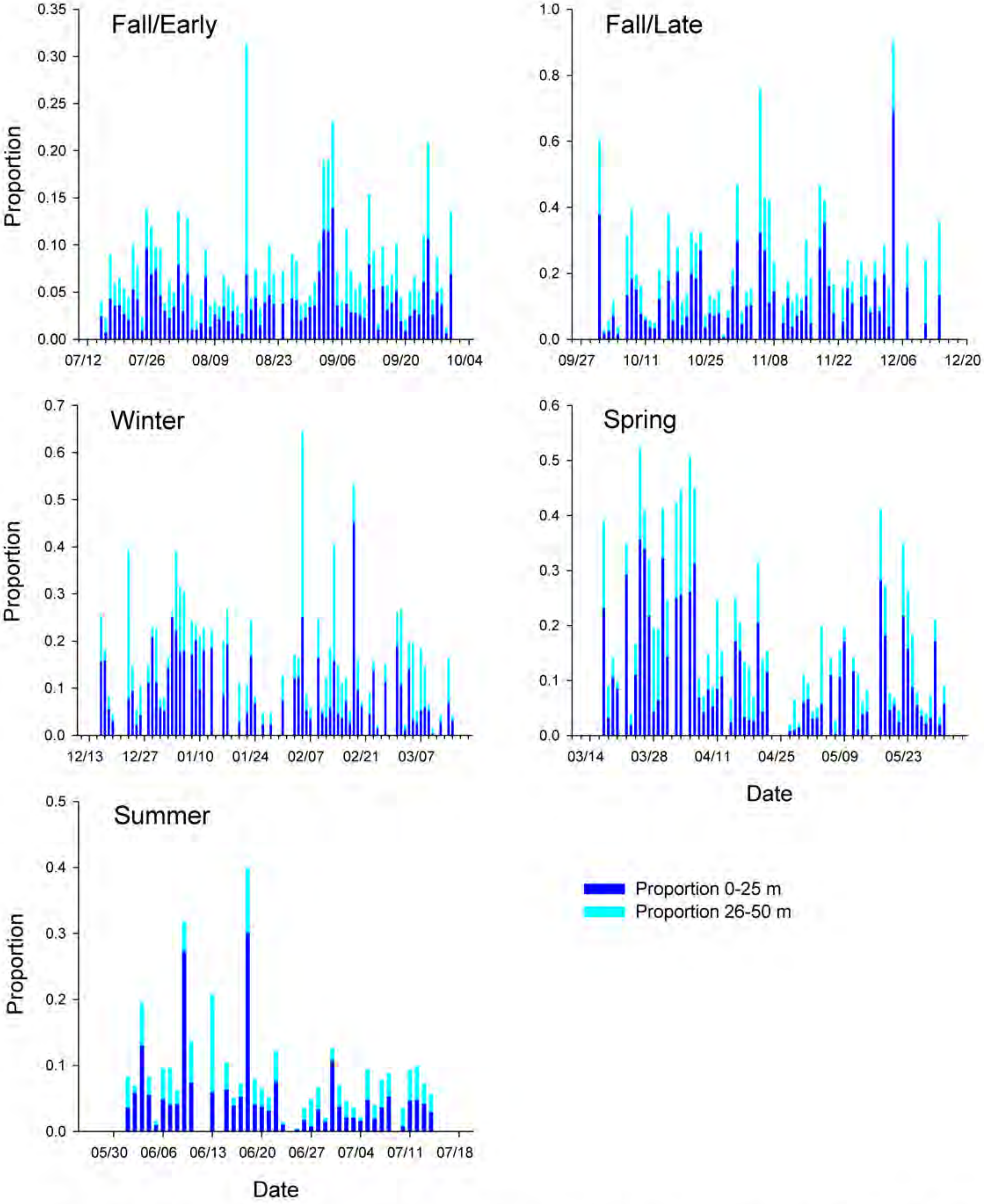


Figure 25. Seasonal temporal pattern in the proportion of targets recorded <= 25 m and 26 - 50 m during the diurnal data collection period (Day, sunrise to sunset the same day) for all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

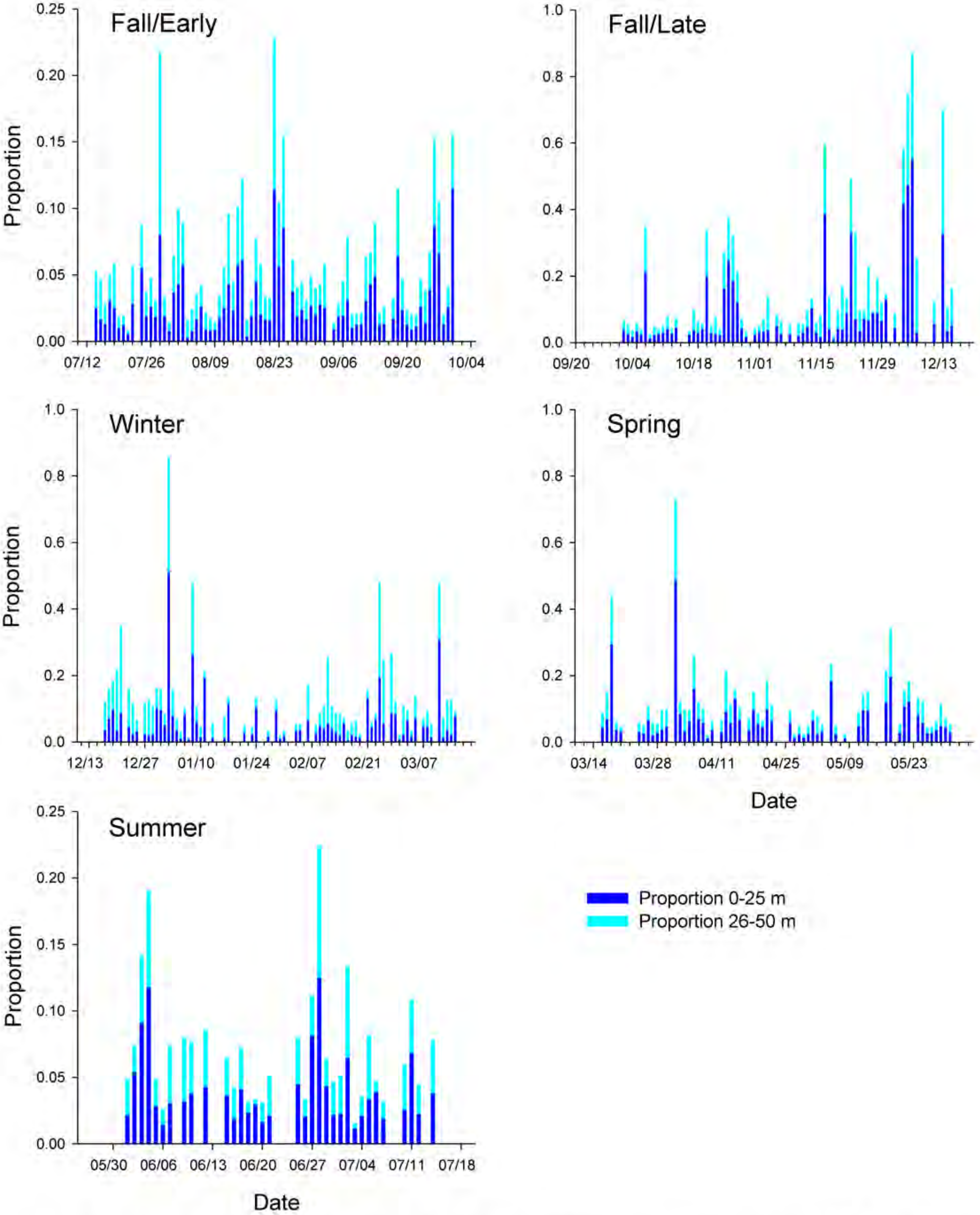


Figure 26. Seasonal temporal pattern in the proportion of targets recorded <= 25 m and 26 - 50 m during the nocturnal data collection period (Night, sunset to sunrise the next day) for all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

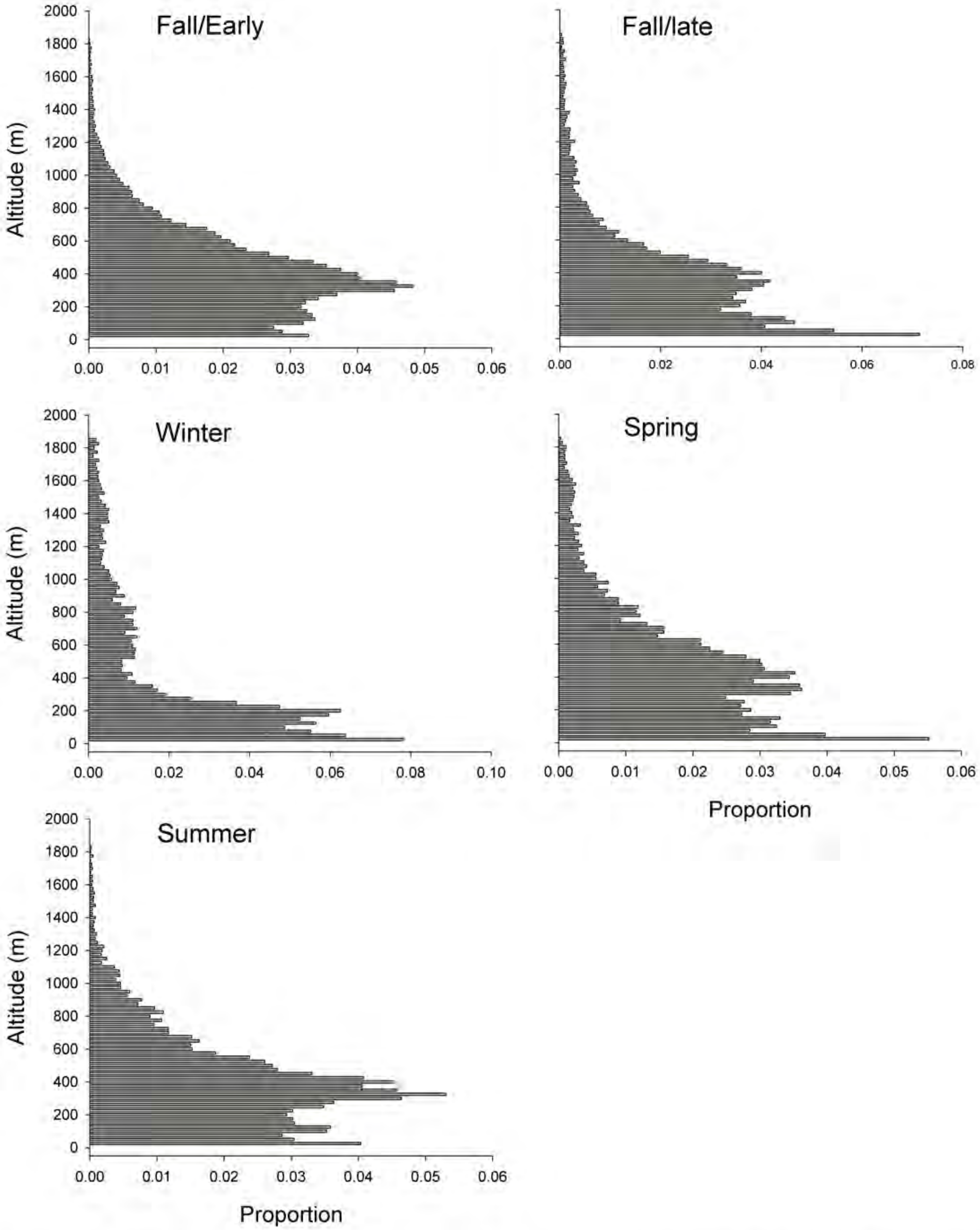


Fig. 27. Altitudinal distribution of targets recorded the diurnal data collection period (Day, sunrise-sunset the same day) during during all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

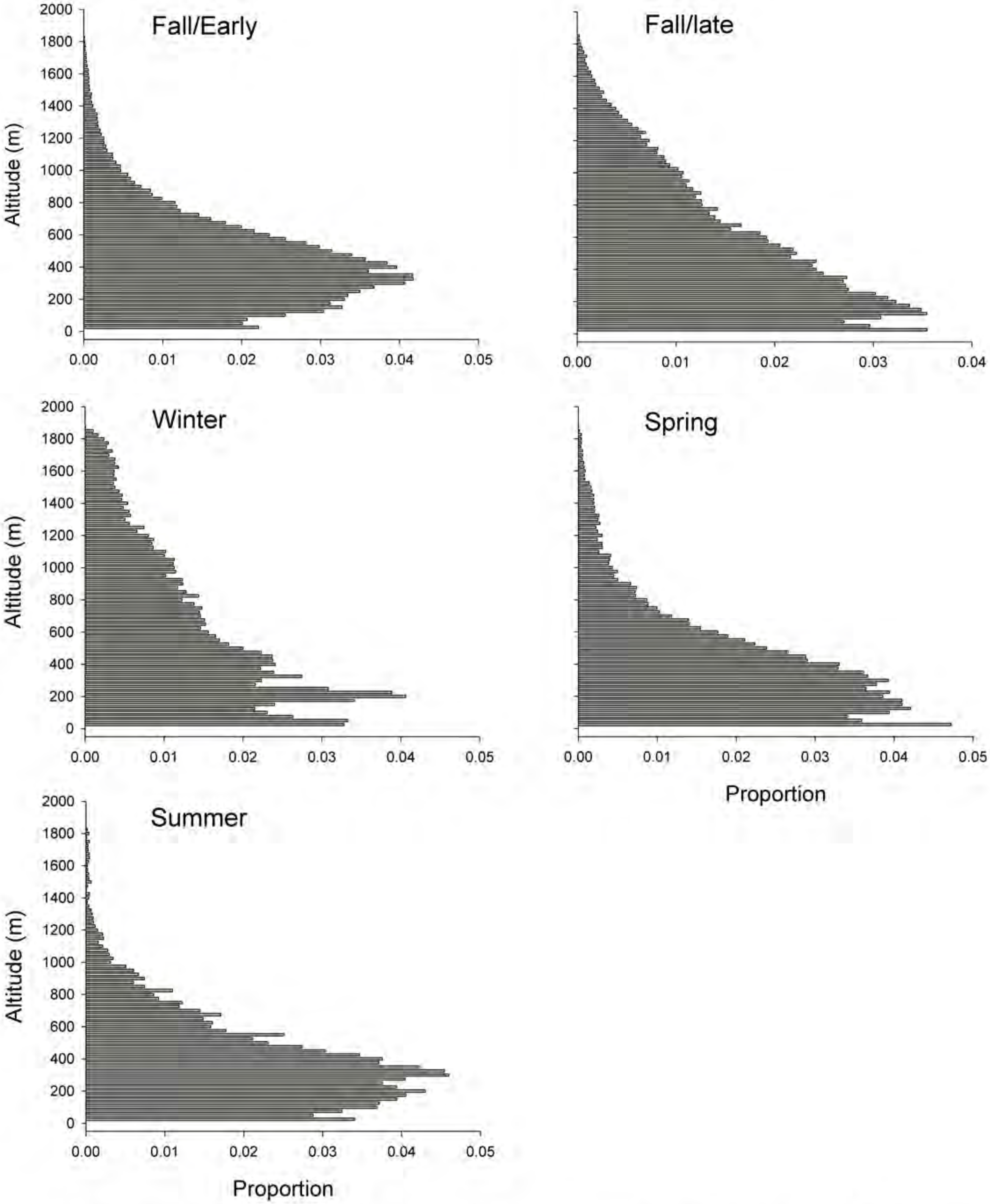


Fig. 28. Altitudinal distribution of targets recorded the nocturnal data collection period (Night, sunset to sunrise the next day) during during all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

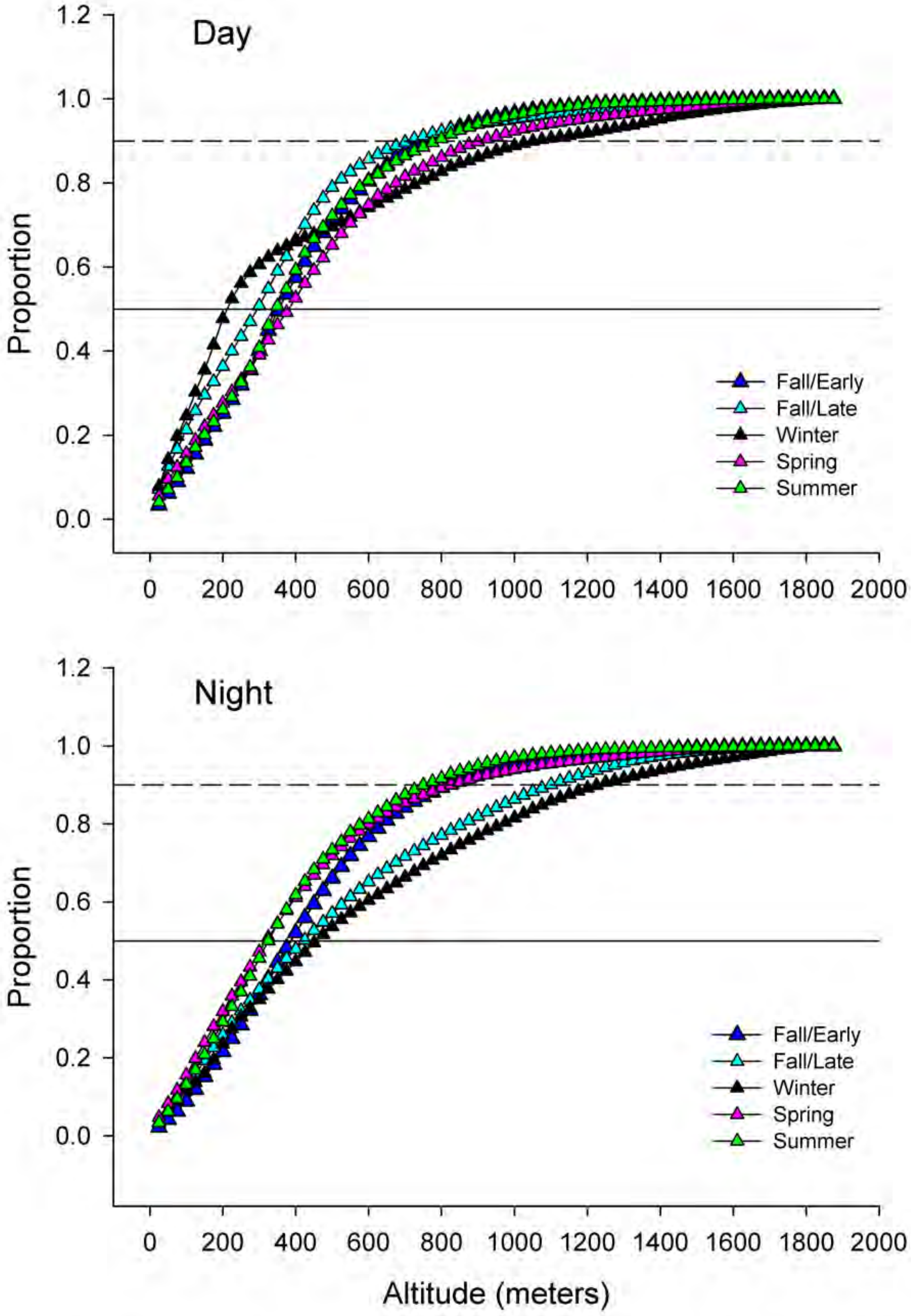


Figure 29. Cumulative frequency distributions for targets recorded in each of 75, 25 m altitudinal strata (i.e., 1875 meters = ~1.0 nautical mile, the range setting for the vertical radar) for diurnal (sunrise to sunset the same day)and nocturnal (sunset to sunrise the next day) sampling periods during all seasons. Solid and dashed reference lines represent the 50th and 90th percentiles of targets recorded, respectively.

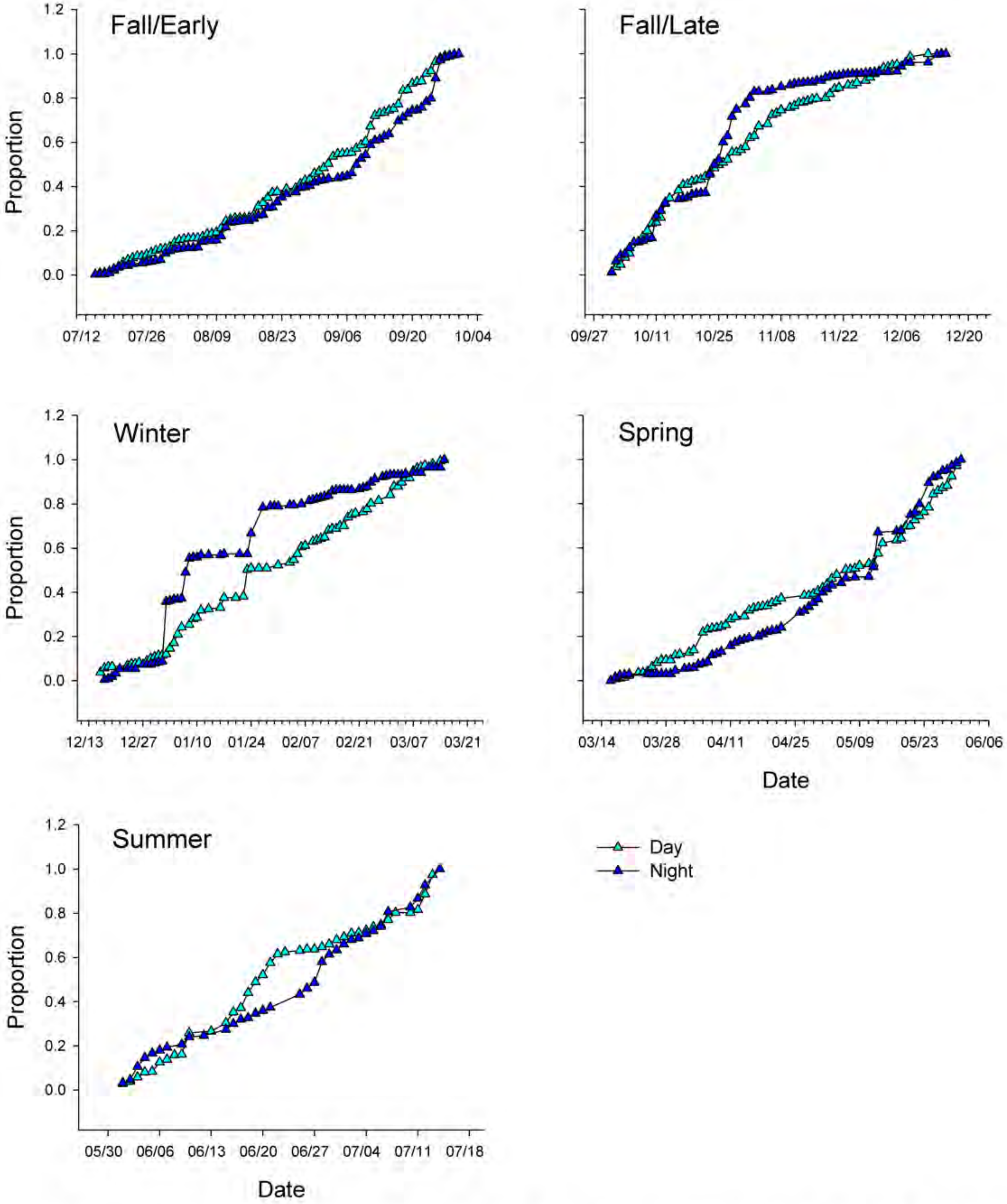


Figure 30. Cumulative frequency distributions for the number of targets recorded in the 0-25 m strata during diurnal (Day, sunrise to sunset the same day) and nocturnal (Night, sunset to sunrise the following morning) data collection periods for all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

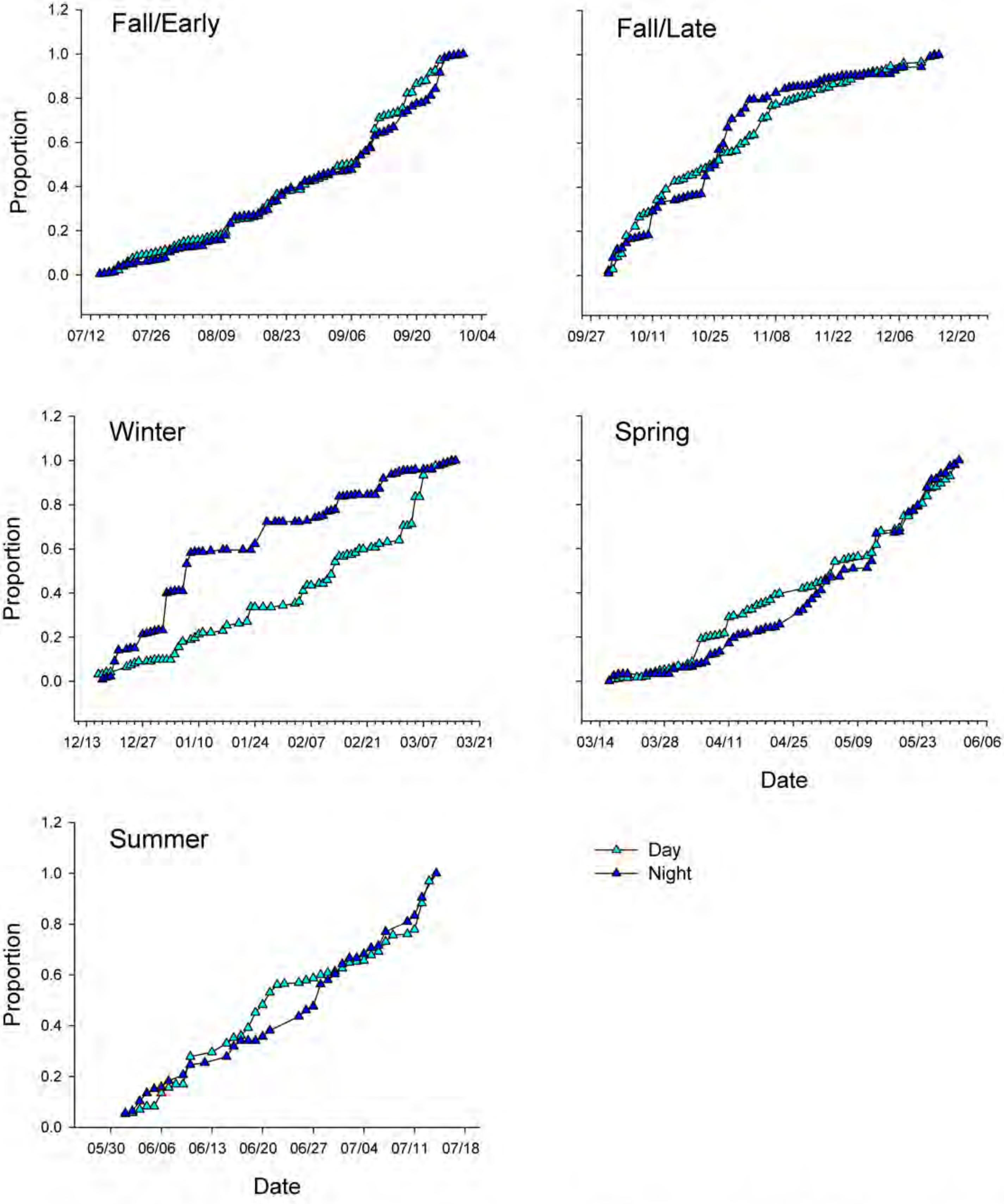


Figure 31. Cumulative frequency distributions for the number of targets recorded in the 26-50 m strata during diurnal (Day, sunrise to sunset the same day) and nocturnal (Night, sunset to sunrise the following morning) data collection periods for all seasons. Fall/Early (14 July - 30 September 2010), Fall/Late (1 October - 15 December 2011), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 31 May 2011) and Summer (1 June - 14 July 2011).

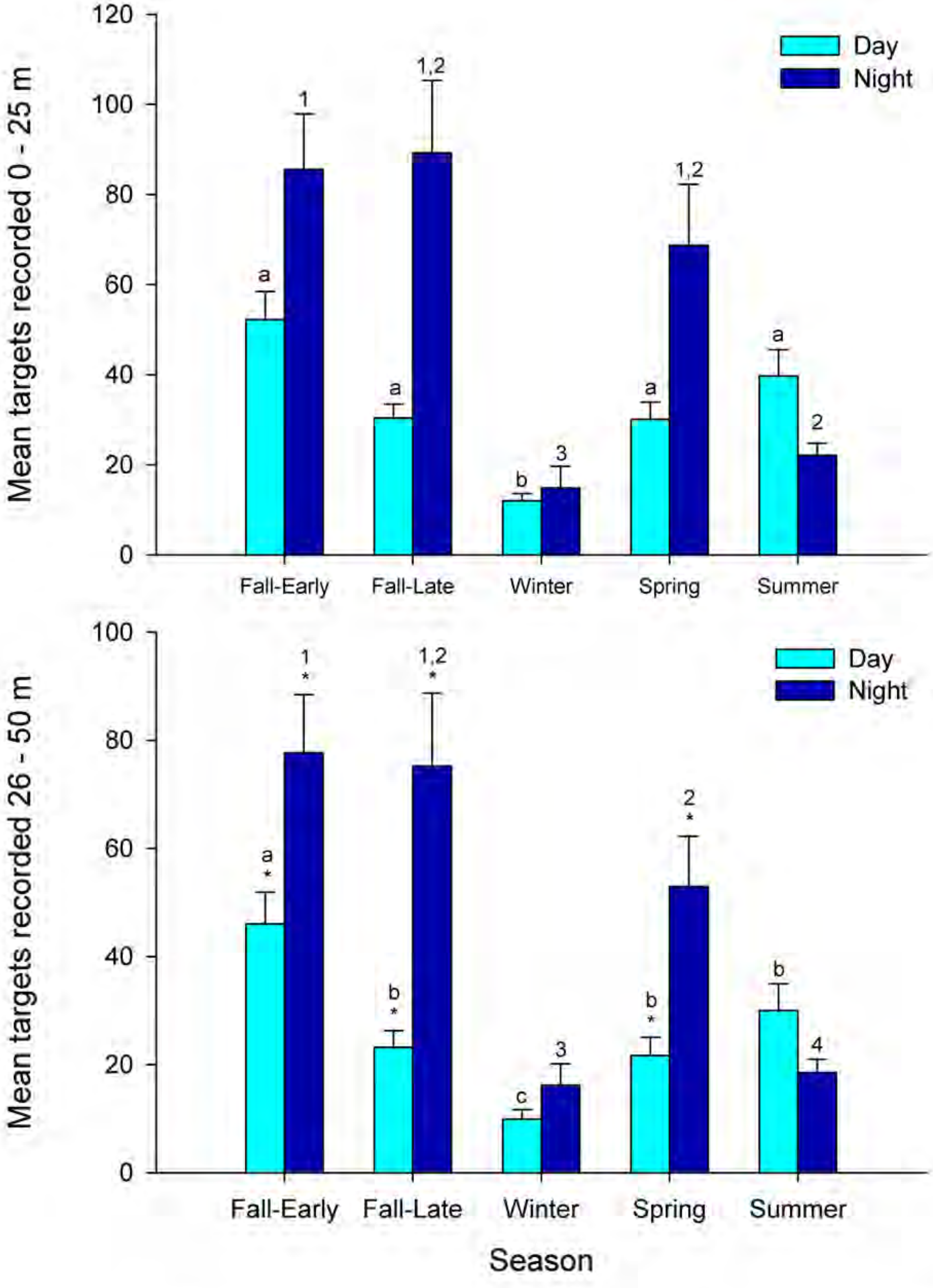


Figure 32. Comparison of mean targets 0 - 25 m (top) and 26 - 50 m (bottom) strata recorded during the MRWPF radar study. Error bars show SE of means. Bars with asterisks indicate differences between periods for a given season (e.g., Fall/Early-Day versus Fall/Early-Night). Bars with the same letter (Day) or same number (Night) are not statistically different. Analyses used log-transformed data and Bonferroni adjustment for multiple comparisons. Plots show untransformed data.

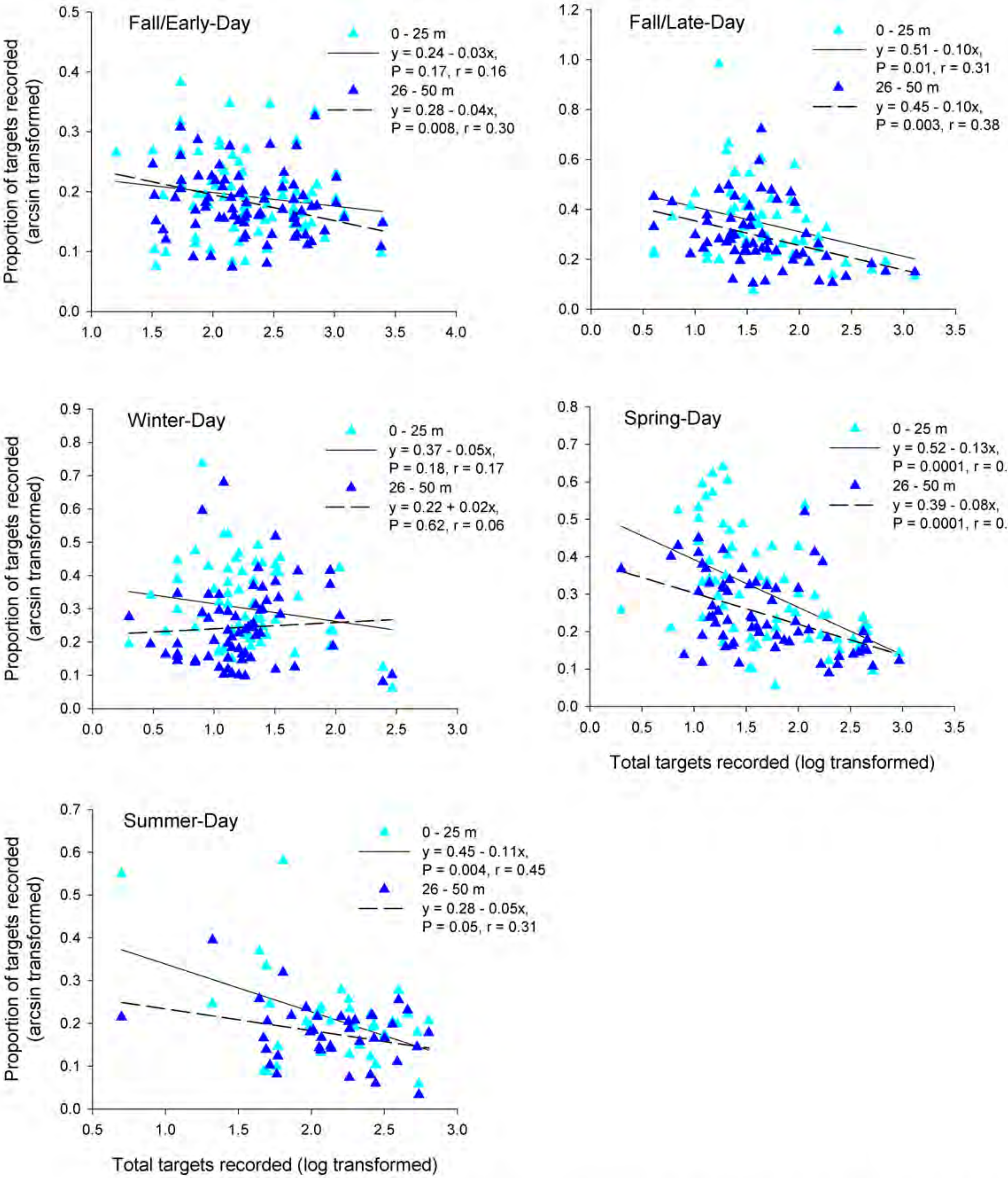


Figure 33. Correlations between the proportion of targets recorded in the two lowest altitudinal strata (i.e., 0 - 25 m, 25 - 50 m) and total targets recorded (i.e., sum of the 10-minute sample averages) during the Day data collection period in Fall/Early (15 July - 30 Sep 2010), Fall/Late (1 October - 15 December 2010), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 30 May 2011) and Summer (1 June - 14 July 2011).

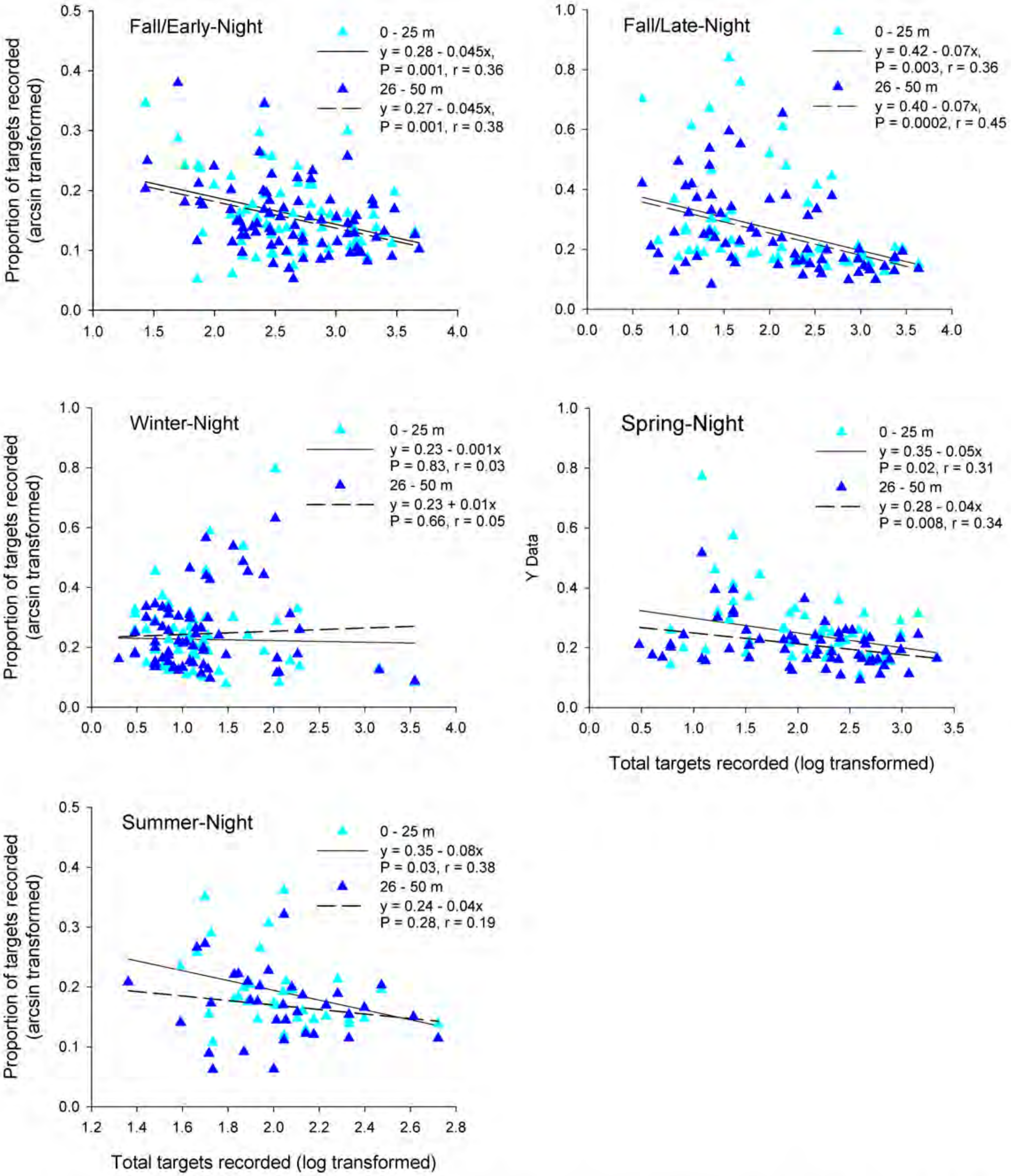
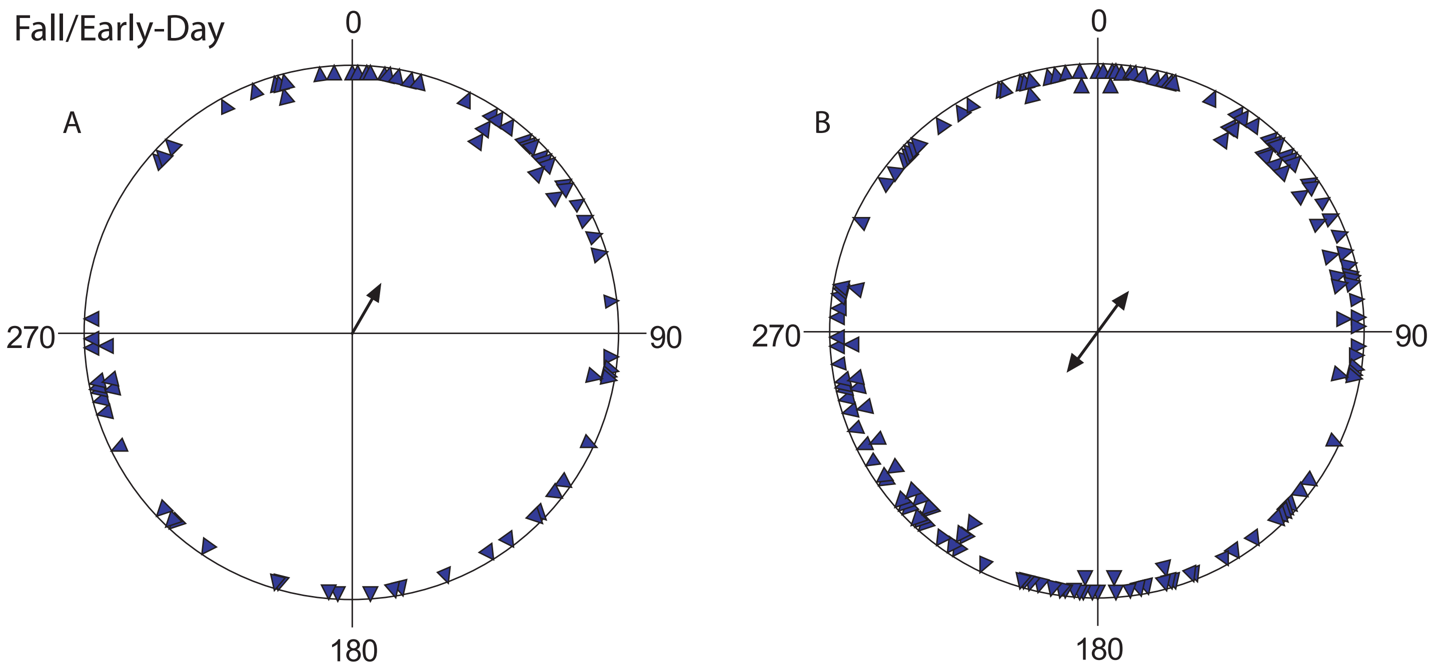
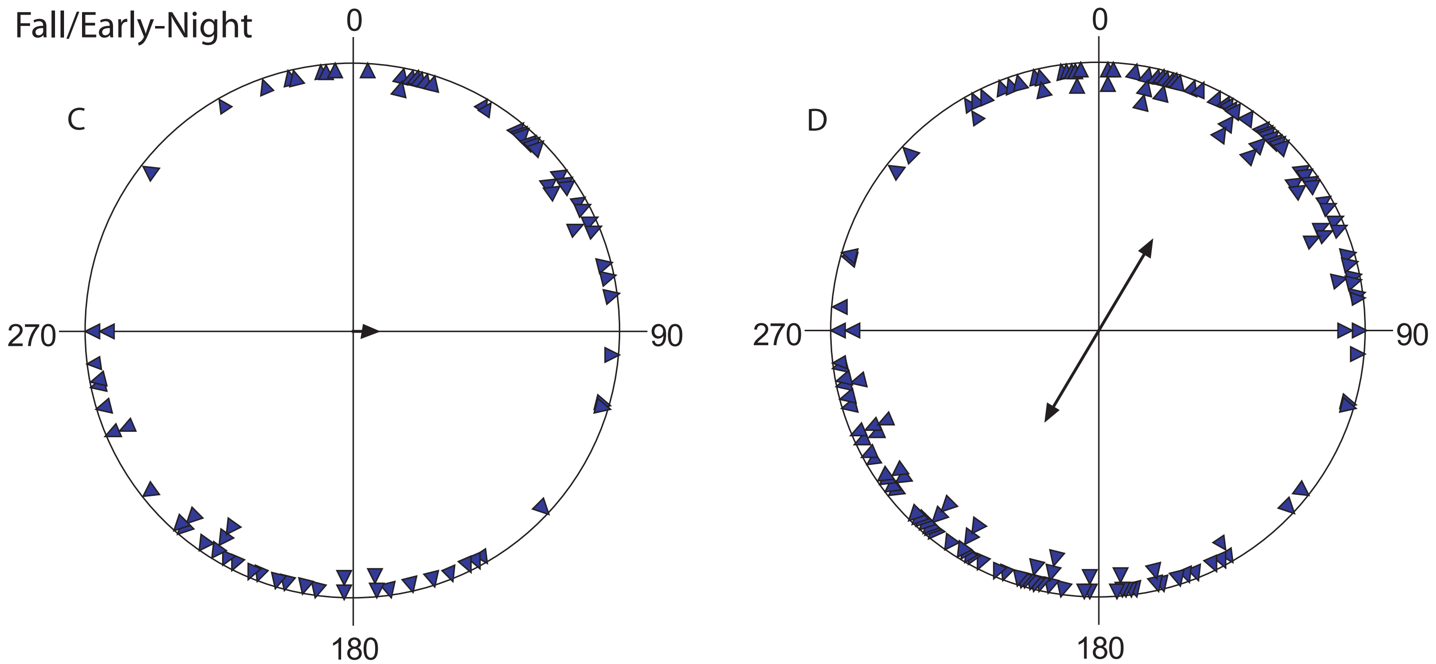


Figure 34. Correlations between the proportion of targets recorded in the two lowest altitudinal strata (i.e., 0 - 25 m, 25 - 50 m) and total targets recorded (i.e., sum of the 10-minute sample averages) during the Night data ollection period in Fall/Early (15 July - 30 Sep 2010), Fall/Late (1 October - 15 December 2010), Winter (16 December 2010 - 15 March 2011), Spring (16 March - 30 May 2011) and Summer (1 June - 14 July 2011).



2nd order Mean vector (μ) = 29°
Vector length (r) = 0.15
Hotelling's F = 3.01
$P_{77} < 0.05$

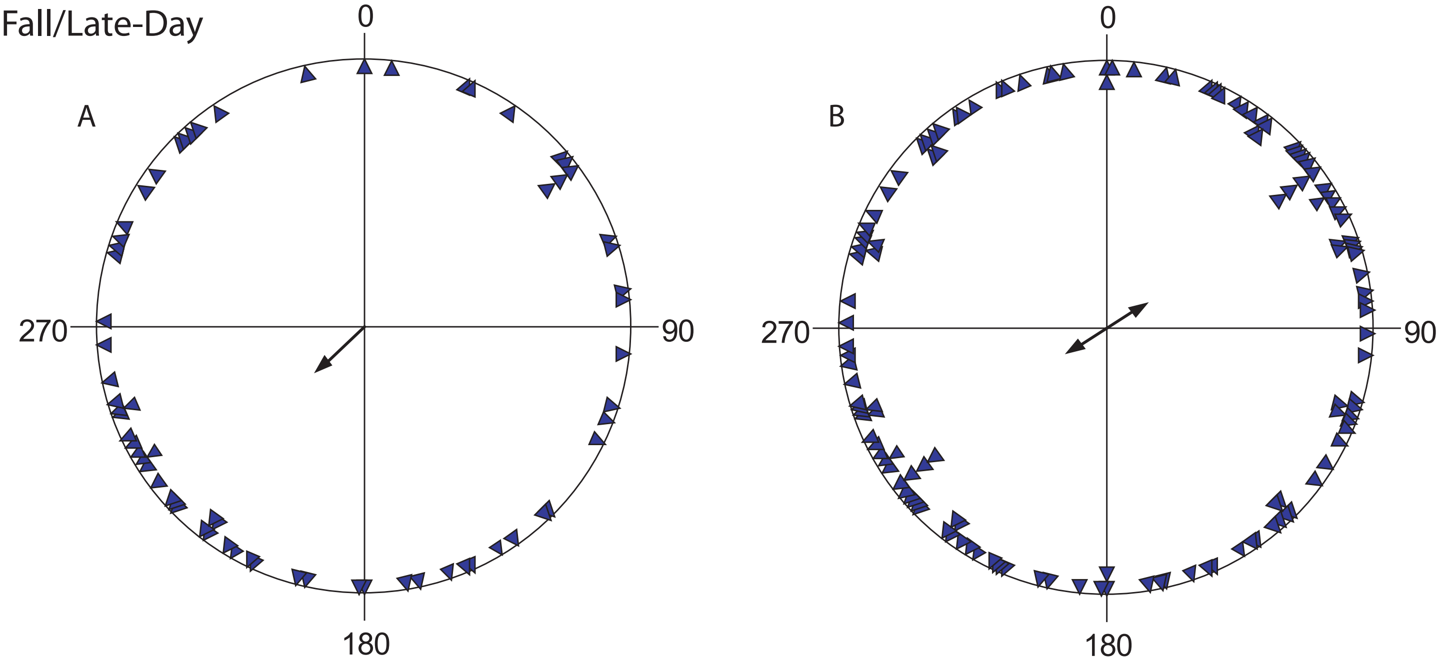
2nd order Mean vector (μ) = 37° - 217°
Vector length (r) = 0.18
Hotelling's F = 2.50
$P_{77} = 0.08$



2nd order Mean vector (μ) = 83°
Vector length (r) = 0.09
Hotelling's F = 1.16
$P_{76} = 0.32$

2nd order Mean vector (μ) = 31° - 211°
Vector length (r) = 0.38
Hotelling's F = 11.15
$P_{76} < 0.0001$

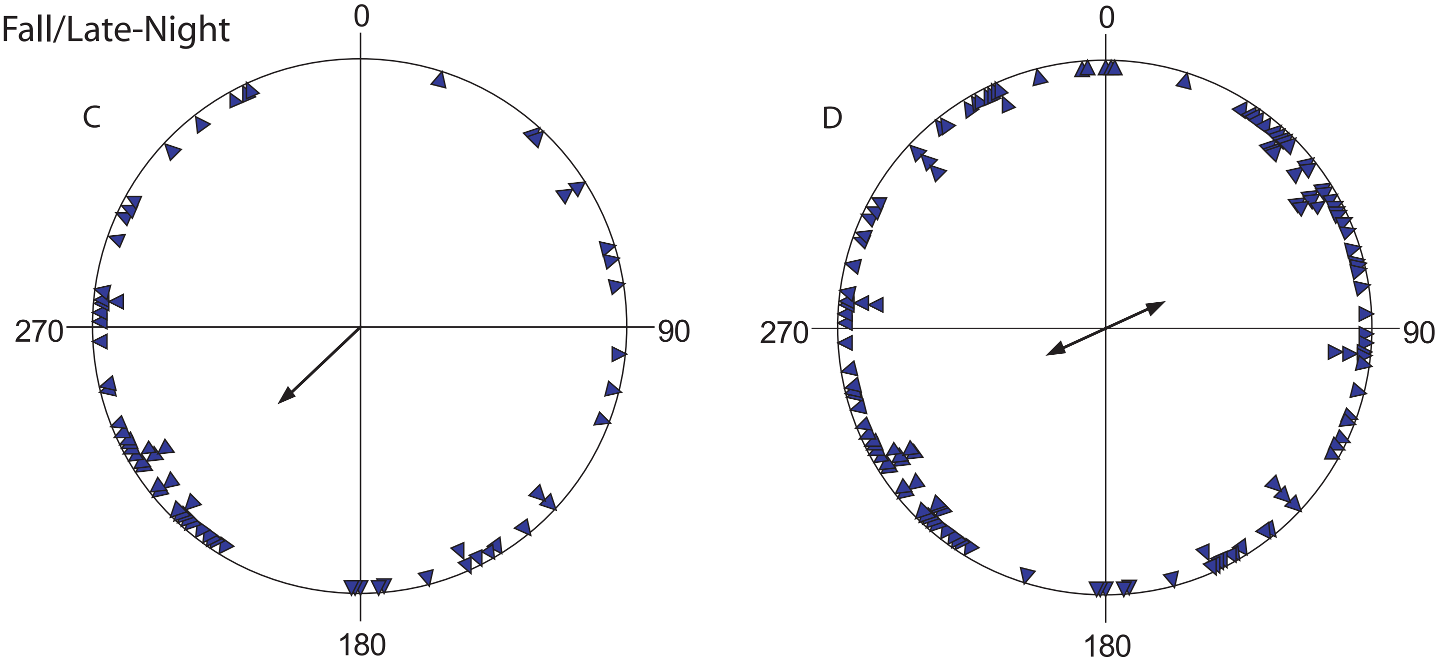
Fig. 35. Second-order mean vectors (i.e., mean of meanns) of targets recorded during Day (upper) and Night (lower) data collection periods, Fall/Early for unimodal (left) and bimodal (right) distributions. Blue triangles around the perimeter of each circle represent first-order mean vectors. Arrows point in the direction of the second-order mean vector and their length represents the vector length. Vector length is an index or circular variance with values ranging between 0 and 1. The higher the value, the lower the variance in the mean vector.



Fall/Late-Day

2nd order Mean vector (μ) = 220°
Vector length (r) = 0.10
Hotelling's F = 1.13
P_{68} = 0.33

2nd order Mean vector (μ) = 56° - 236°
Vector length (r) = 0.17
Hotelling's F = 1.97
P_{68} = 0.14

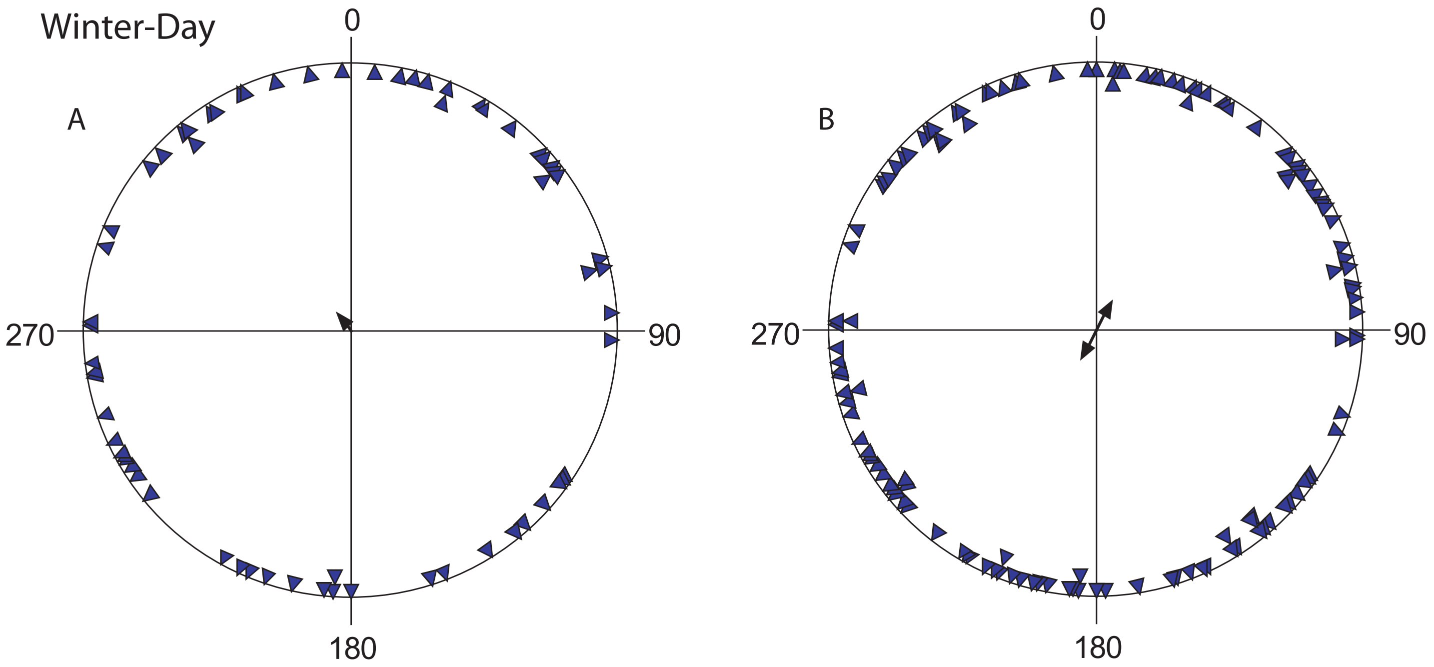


Fall/Late-Night

2nd order Mean vector (μ) = 224°
Vector length (r) = 0.33
Hotelling's F = 12.04
P_{68} < 0.0001

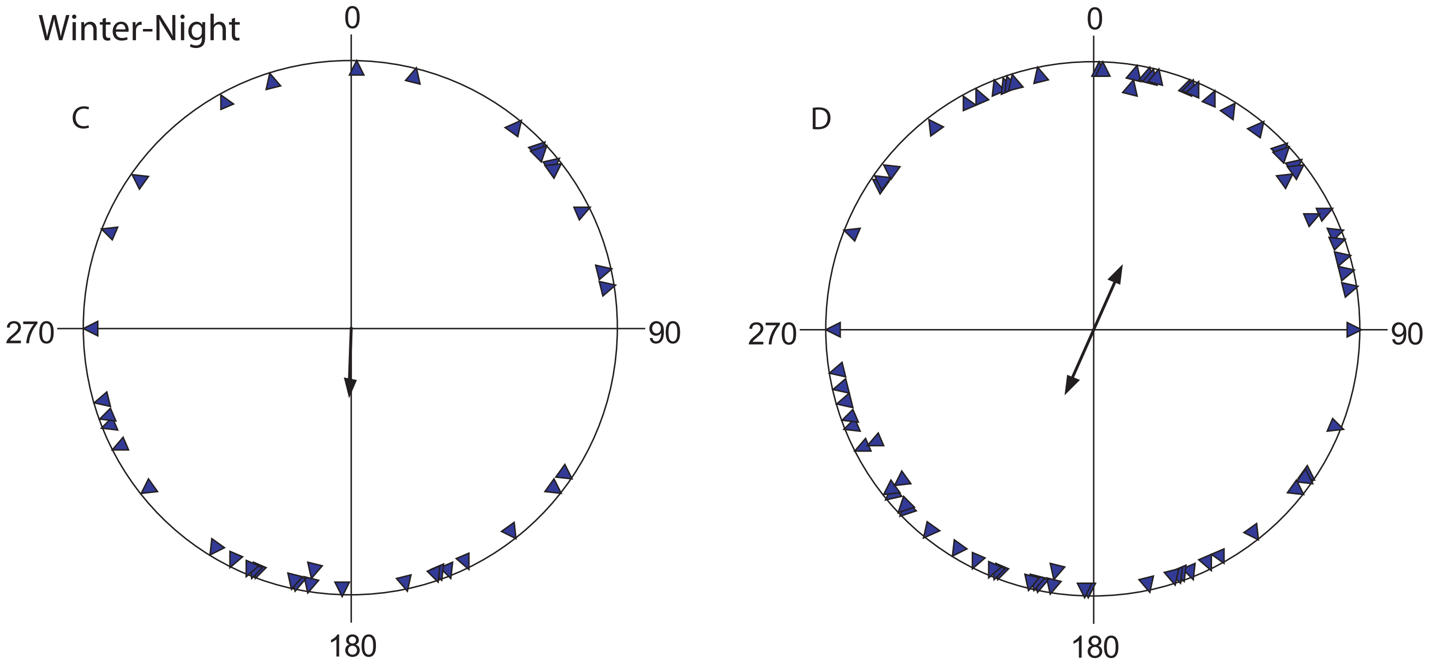
2nd order Mean vector (μ) = 65° - 245°
Vector length (r) = 0.20
Hotelling's F = 3.61
P_{68} < 0.03

Fig. 36. Second-order mean vectors (i.e., mean of meanns) of targets recorded during Day (upper) and Night (lower) data collection periods, Fall/Late for unimodal (left) and bimodal (right) distributions. Blue triangles around the perimeter of each circle represent first-order mean vectors. Arrows point in the direction of the second-order mean vector and their length represents the vector length. Vector length is an index or circular variance with values ranging between 0 and 1. The higher the value, the lower the variance in the mean vector.



2nd order Mean vector (μ) = 330°
Vector length (r) = 0.05
Hotelling's F = 0.32
P_{65} = 0.73

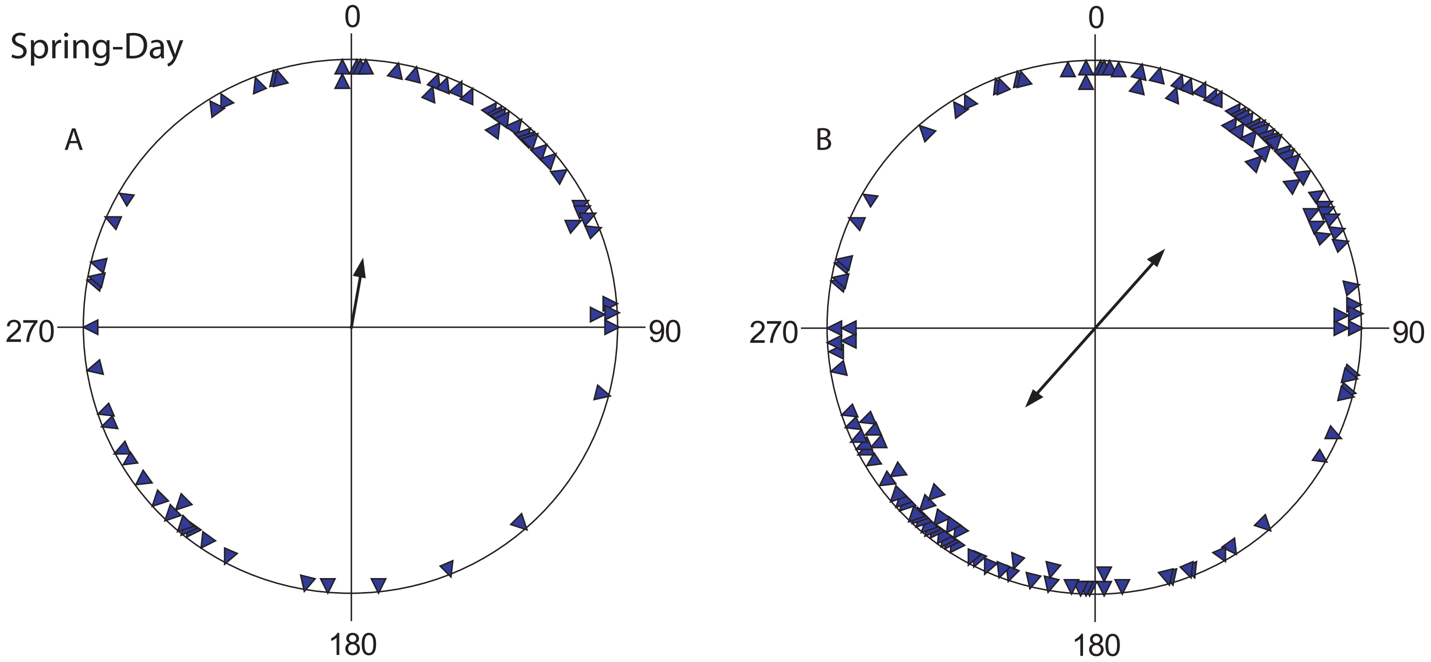
2nd order Mean vector (μ) = 29° - 209°
Vector length (r) = 0.11
Hotelling's F = 0.82
P_{65} = 0.44



2nd order Mean vector (μ) = 175°
Vector length (r) = 0.23
Hotelling's F = 2.92
P_{38} = 0.06

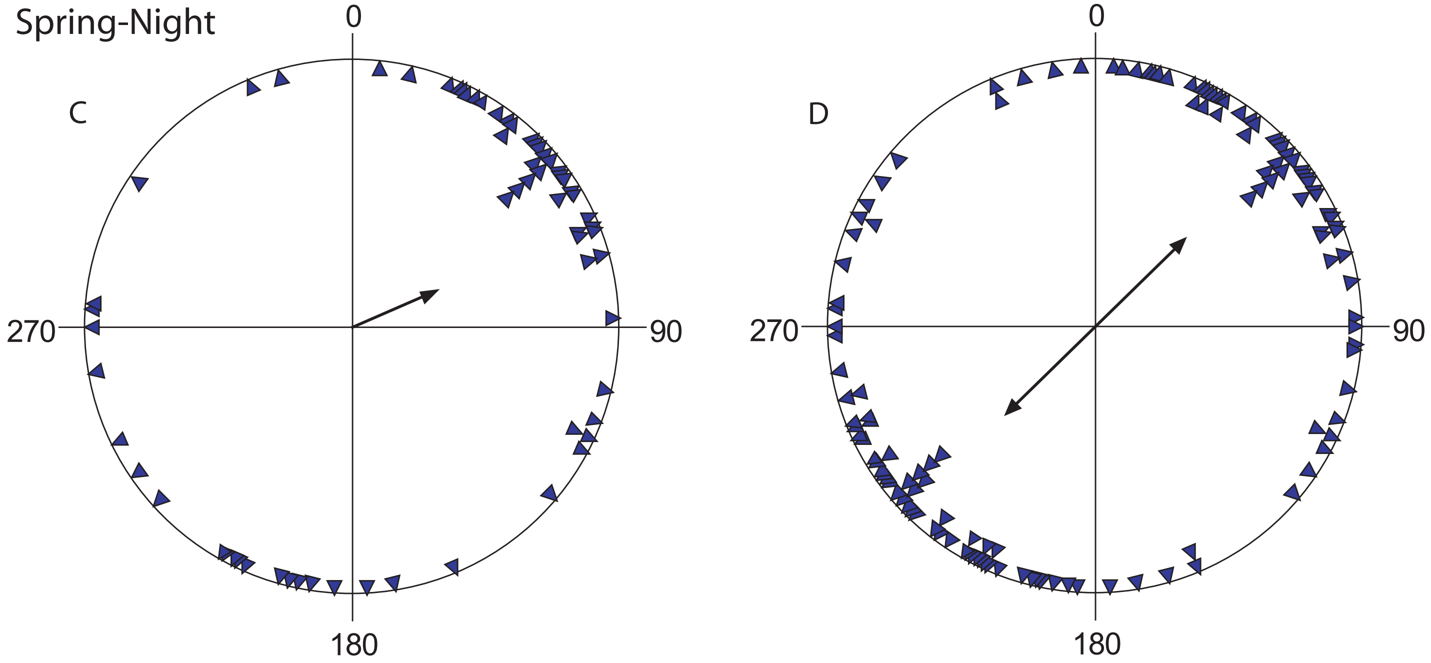
2nd order Mean vector (μ) = 24° - 204°
Vector length (r) = 0.25
Hotelling's F = 2.39
P_{38} = 0.09

Fig. 37. Second-order mean vectors (i.e., mean of meanns) of targets recorded during Day (upper) and Night (lower) data collection periods, Winter for unimodal (left) and bimodal (right) distributions. Blue triangles around the perimeter of each circle represent first-order mean vectors. Arrows point in the direction of the second-order mean vector and their length represents the vector length. Vector length is an index or circular variance with values ranging between 0 and 1. The higher the value, the lower the variance in the mean vector.



2nd order Mean vector (μ) = 17°
Vector length (r) = 0.16
Hotelling's $F = 2.92$
$P_{64} = 0.06$

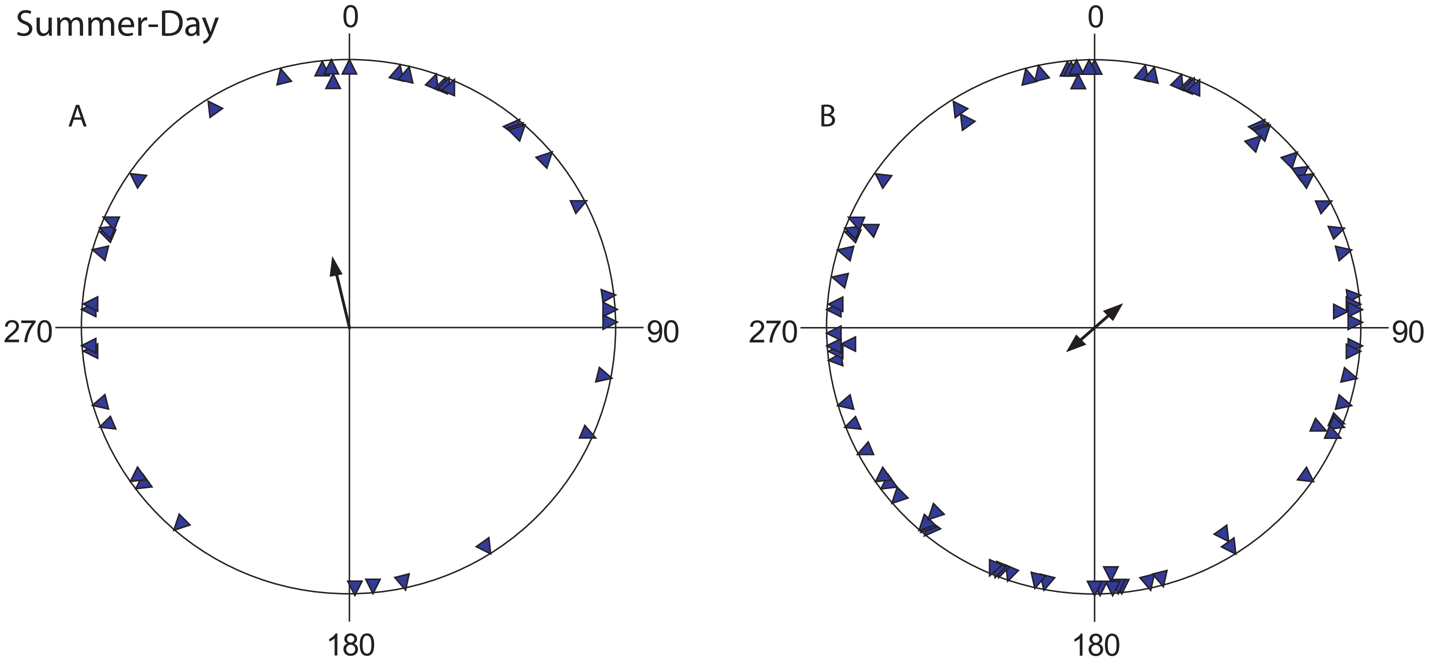
2nd order Mean vector (μ) = 41° - 221°
Vector length (r) = 0.38
Hotelling's $F = 9.17$
$P_{64} = 0.0001$



2nd order Mean vector (μ) = 57°
Vector length (r) = 0.29
Hotelling's $F = 6.39$
$P_{65} = 0.003$

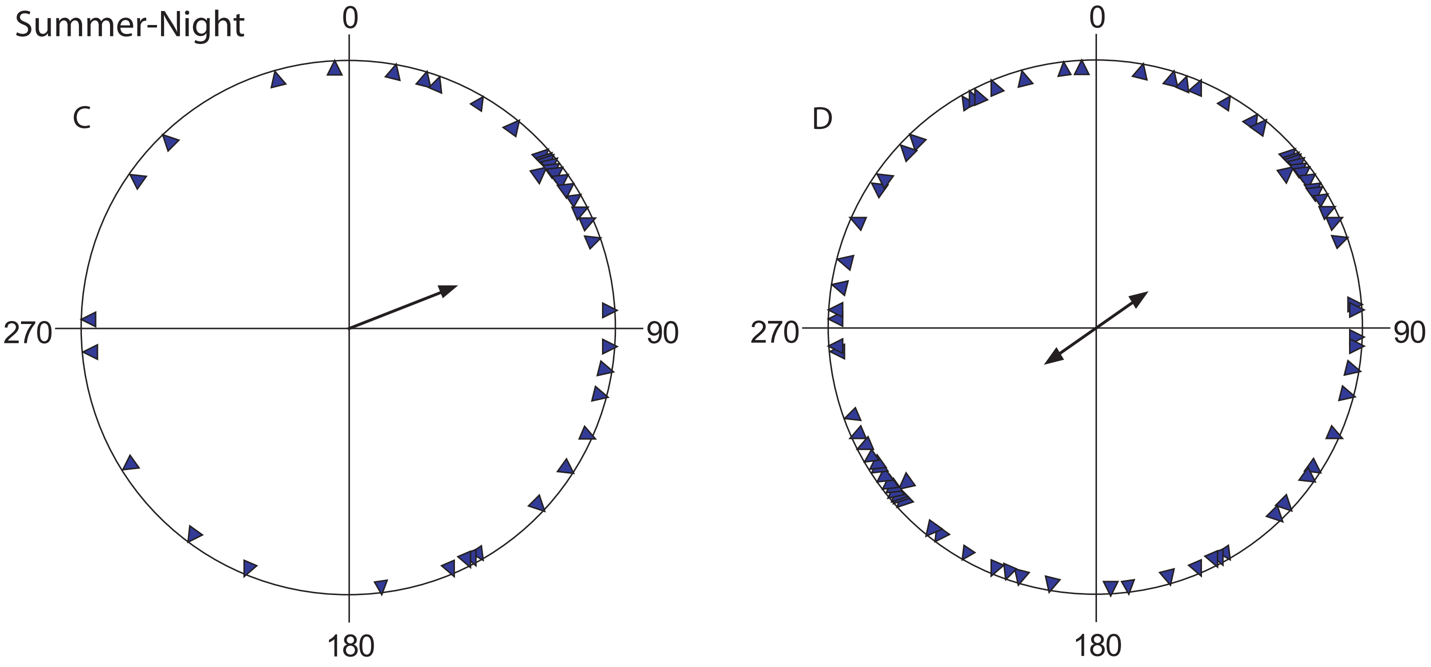
2nd order Mean vector (μ) = 46° - 226°
Vector length (r) = 0.47
Hotelling's $F = 14.03$
$P_{65} < 0.0001$

Fig. 38. Second-order mean vectors (i.e., mean of meanns) of targets recorded during Day (upper) and Night (lower) data collection periods, Spring for unimodal (left) and bimodal (right) distributions. Blue triangles around the perimeter of each circle represent first-order mean vectors. Arrows point in the direction of the second-order mean vector and their length represents the vector length. Vector length is an index or circular variance with values ranging between 0 and 1. The higher the value, the lower the variance in the mean vector.



2nd order Mean vector (μ) = 350°
Vector length (*r*) = 0.22
Hotelling's *F* = 6.44
P_{40} = 0.004

2nd order Mean vector (μ) = 50° - 230°
Vector length (*r*) = 0.12
Hotelling's *F* = 0.58
P_{40} = 0.56



2nd order Mean vector (μ) = 56°
Vector length (*r*) = 0.32
Hotelling's *F* = 6.52
P_{39} = 0.004

2nd order Mean vector (μ) = 55° - 235°
Vector length (*r*) = 0.23
Hotelling's *F* = 2.01
P_{39} = 0.13

Fig. 39. Second-order mean vectors (i.e., mean of meanns) of targets recorded during Day (upper) and Night (lower) data collection periods, Summer for unimodal (left) and bimodal (right) distributions. Blue triangles around the perimeter of each circle represent first-order mean vectors. Arrows point in the direction of the second-order mean vector and their length represents the vector length. Vector length is an index or circular variance with values ranging between 0 and 1. The higher the value, the lower the variance in the mean vector.

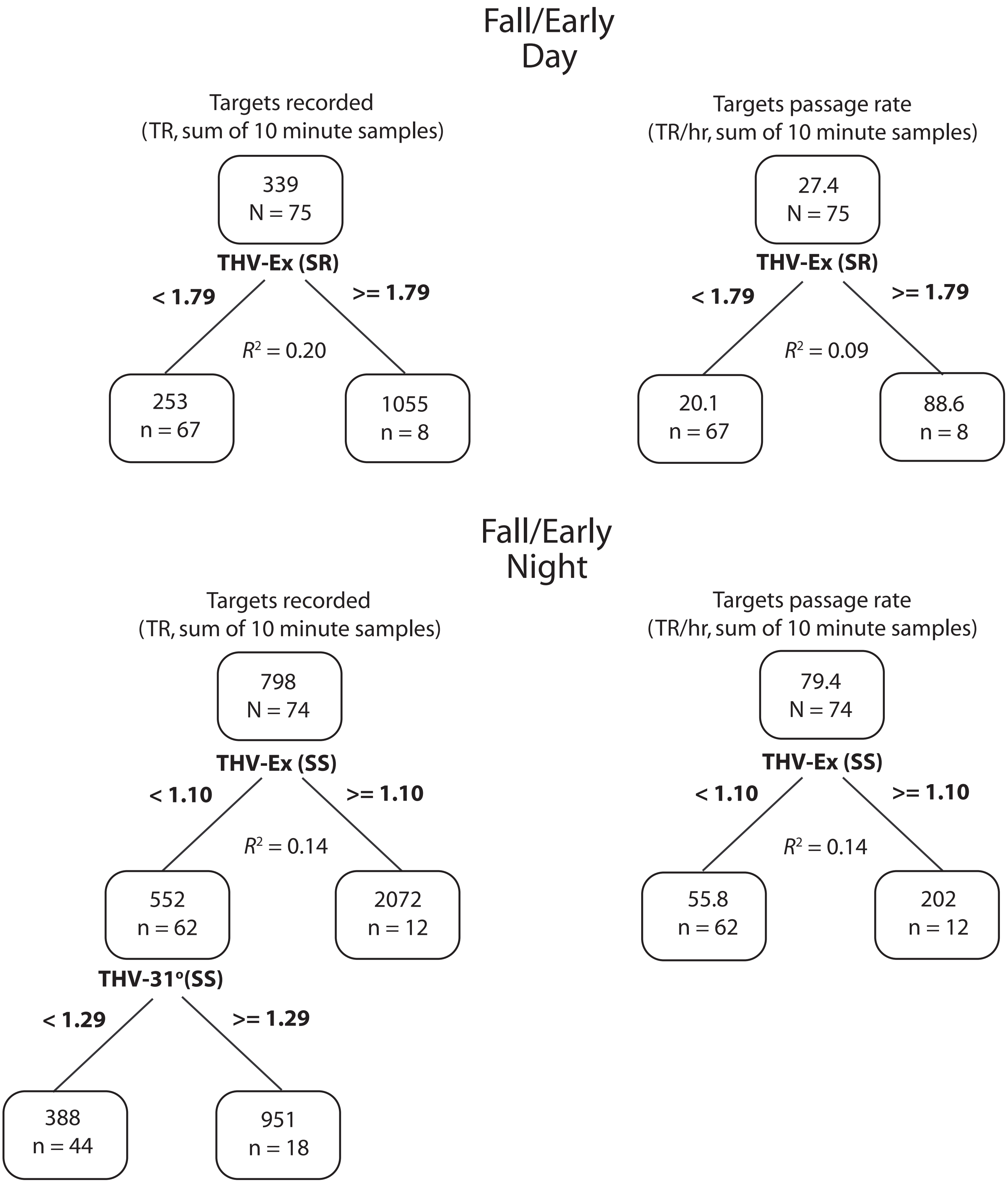


Figure 40. Regression tree (RT) models for the Fall-Early season (15 Jul – 30 Sep 2010). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

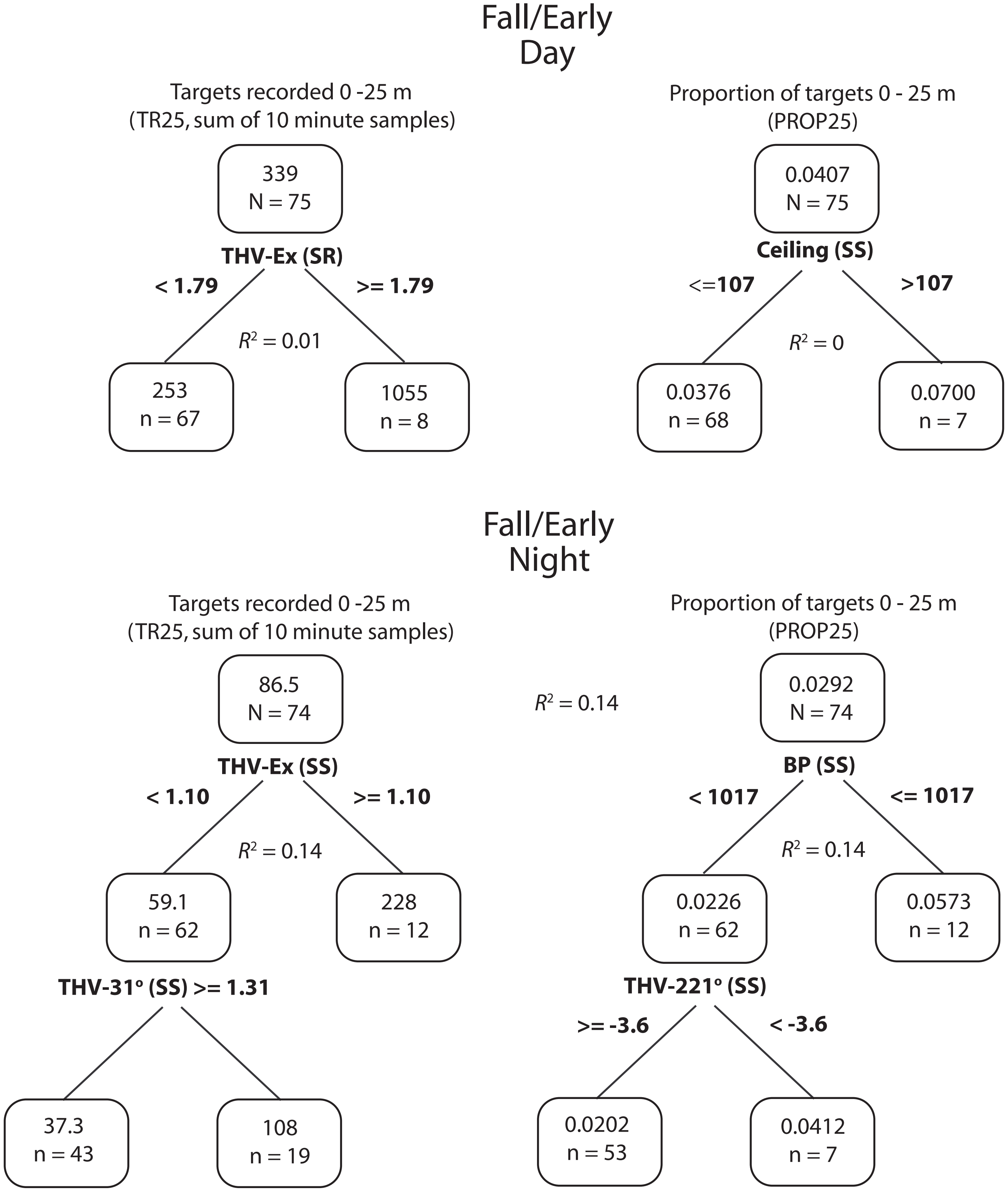


Figure 41. Regression tree (RT) models for the Fall-Early season (15 Jul – 30 Sep 2010). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

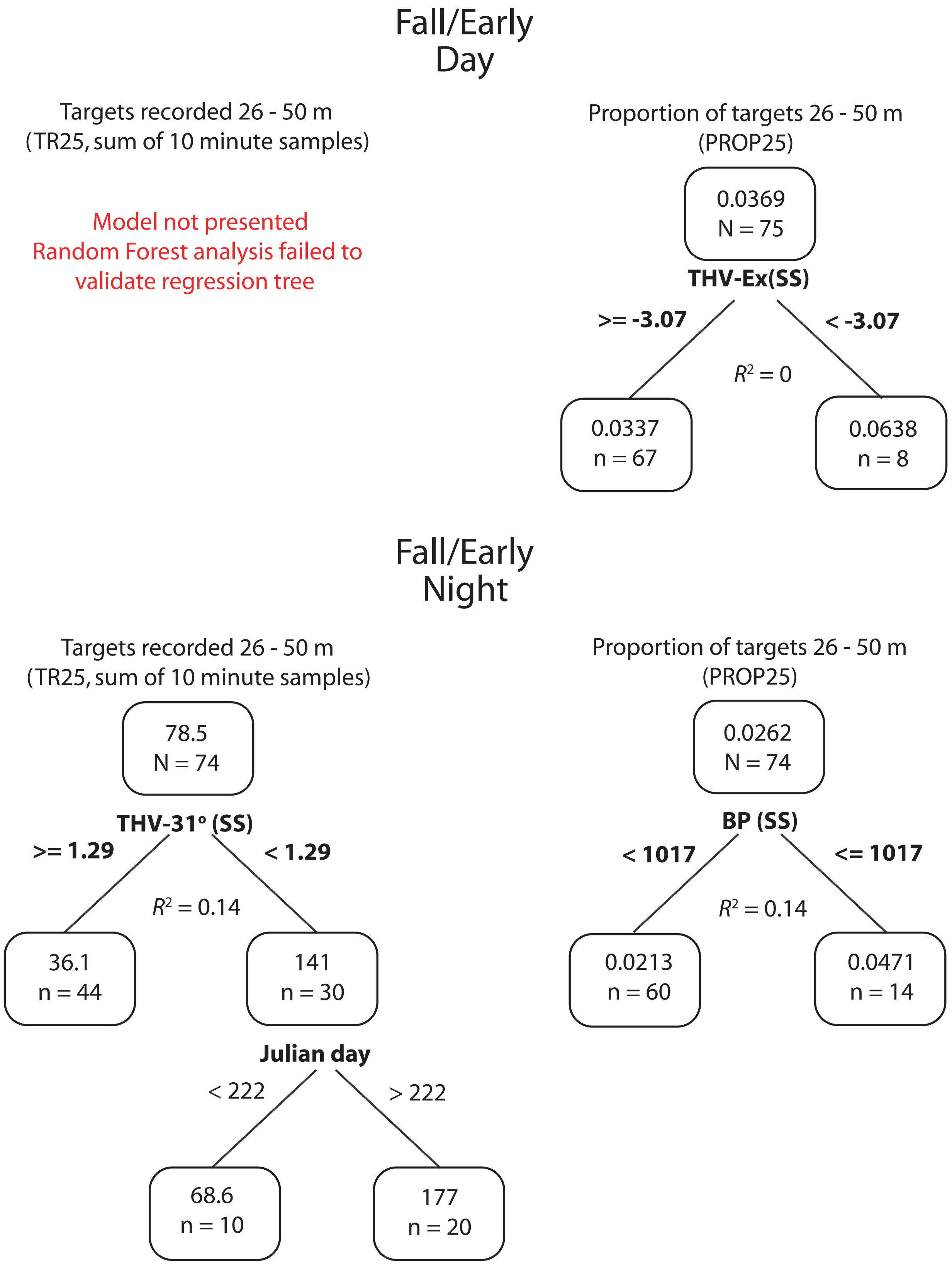


Figure 42. Regression tree (RT) models for the Fall-Early season (15 Jul – 30 Sep 2010). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

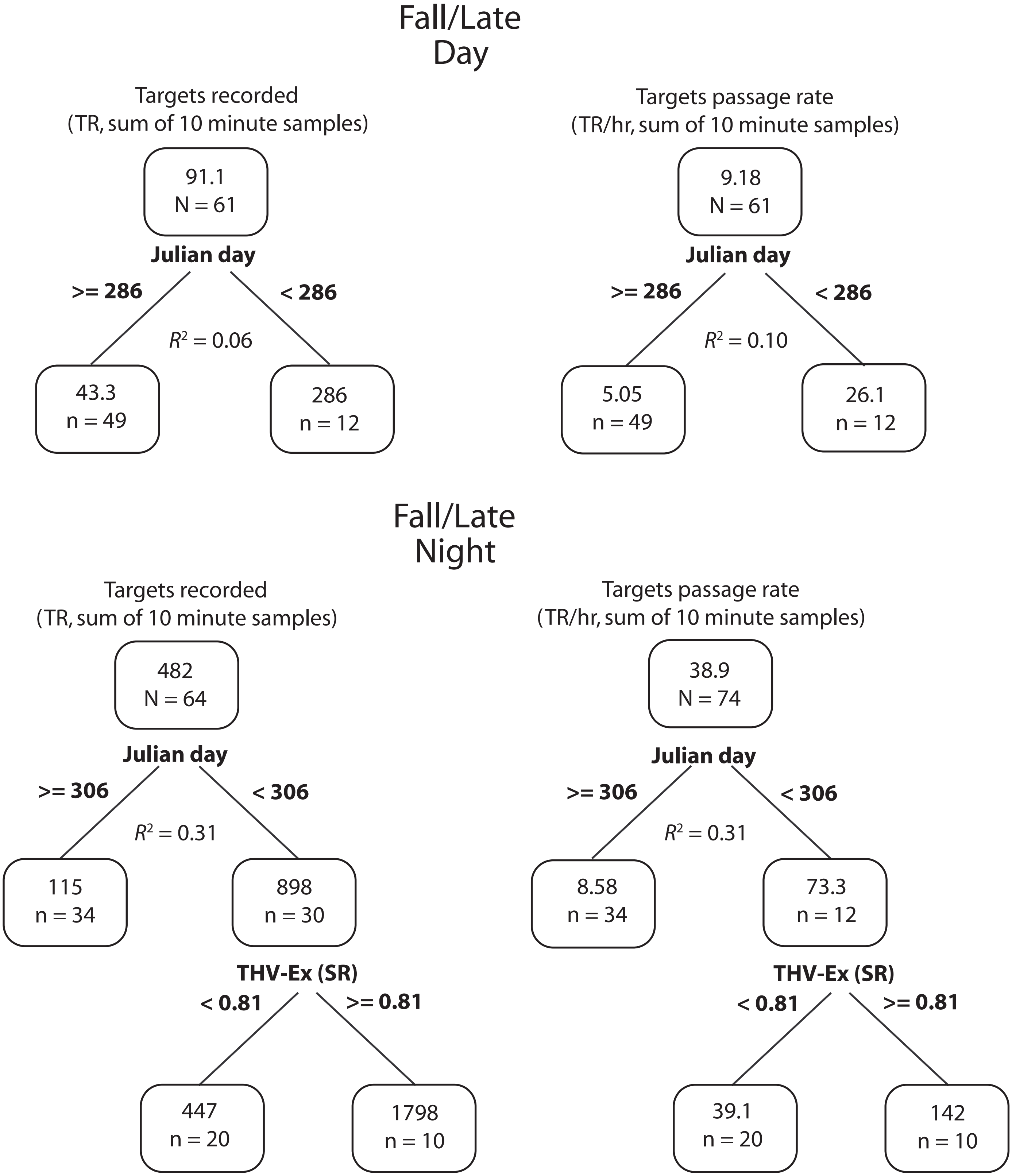


Figure 43. Regression tree (RT) models for the Fall-Late season (1 Oct – 15 Dec 2010). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

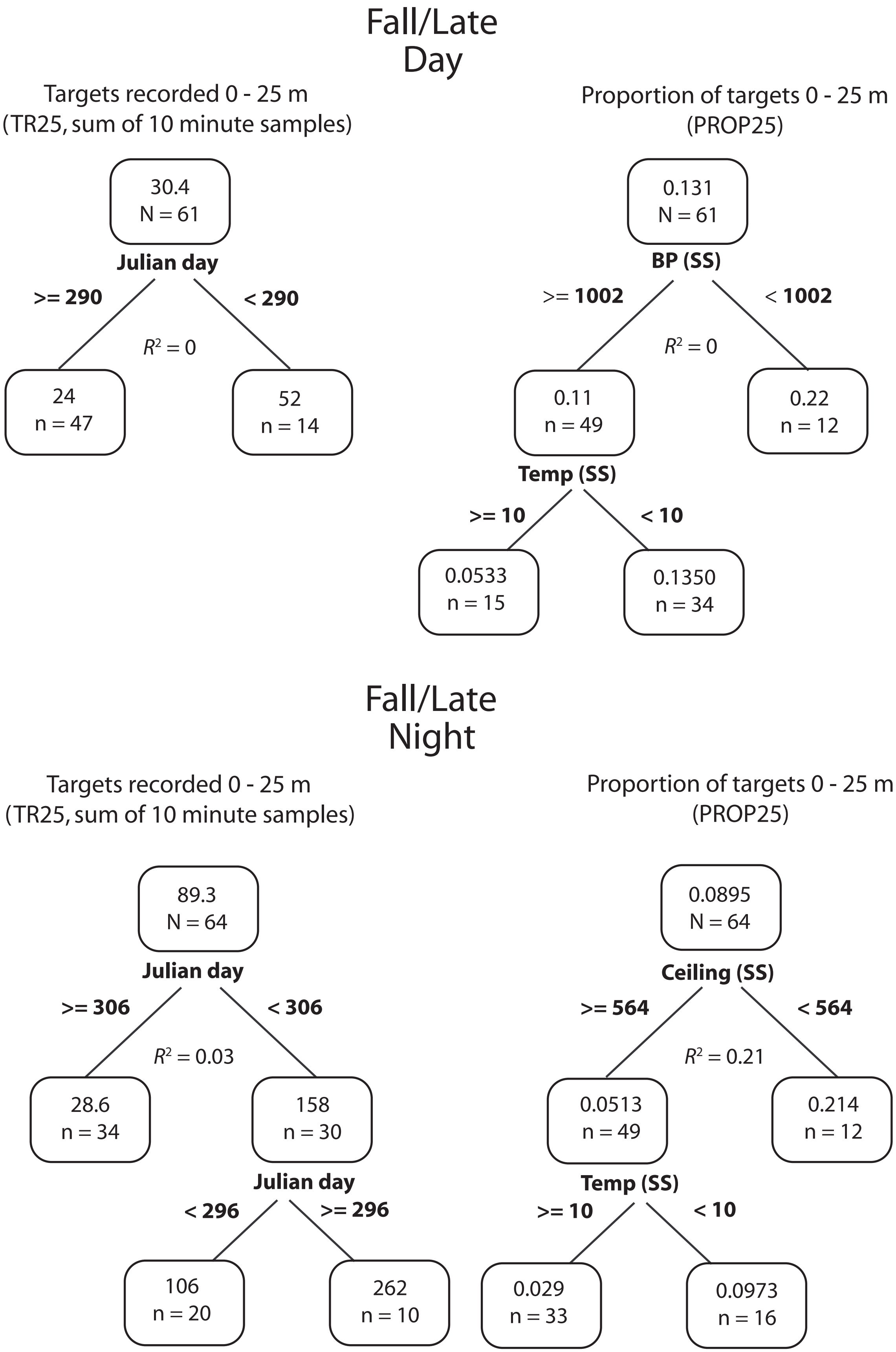


Figure 44. Regression tree (RT) models for the Fall-Late season (1 Oct – 15 Dec 2010). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

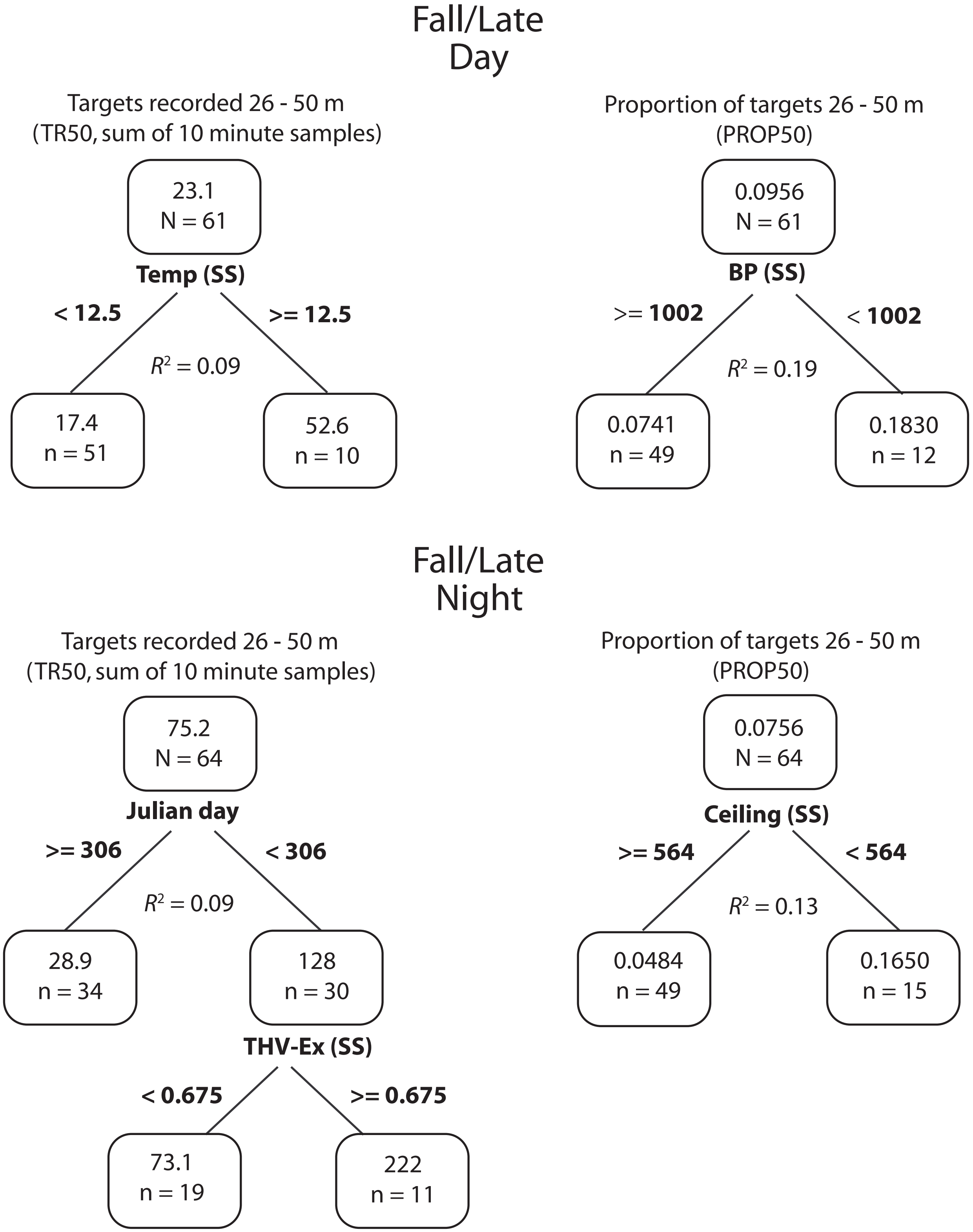


Figure 45. Regression tree (RT) models for the Fall-Late season (1 Oct – 15 Dec 2010). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

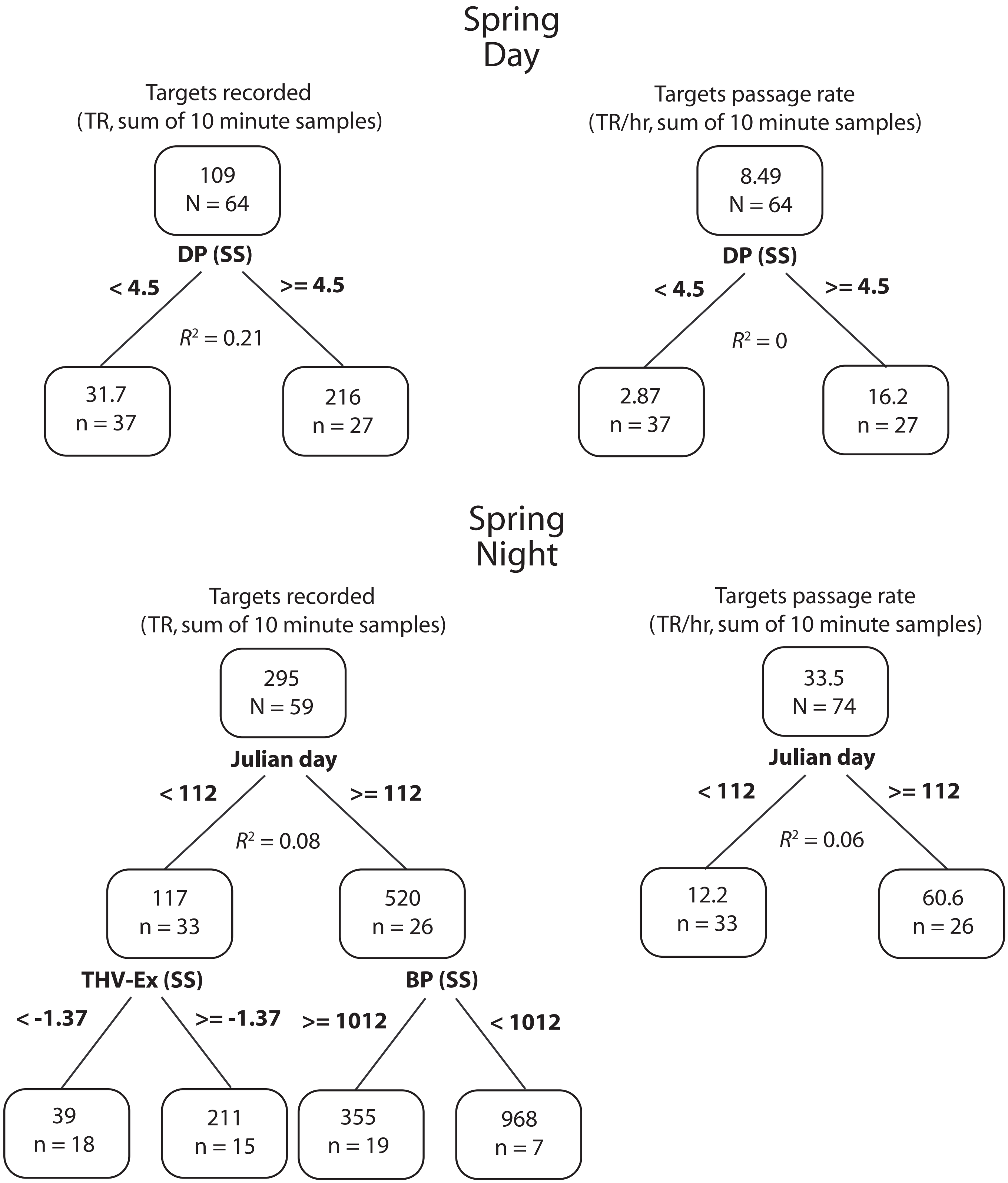


Figure 46. Regression tree (RT) models for the Spring season (16 Mar – 31 May 2011). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

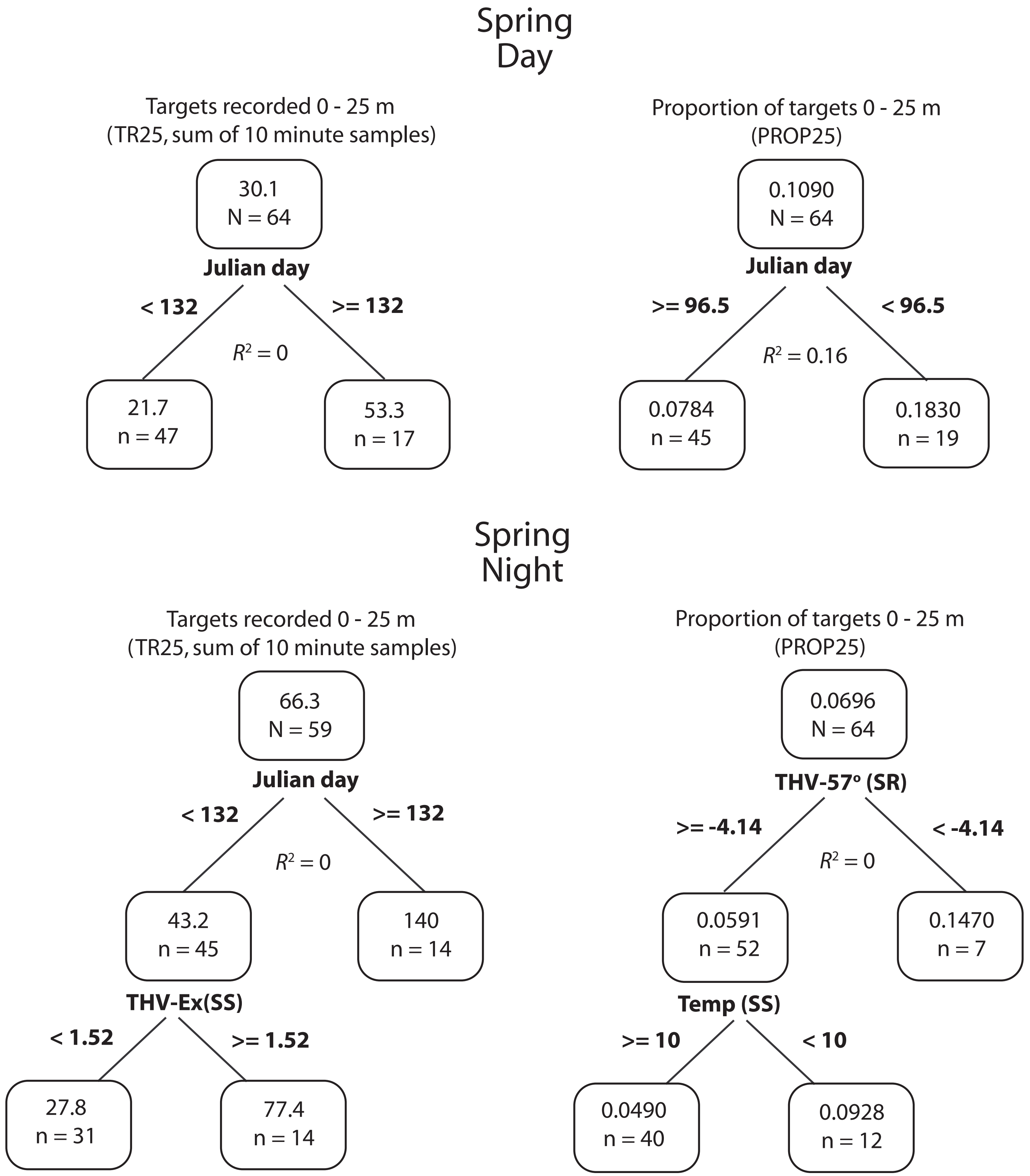


Figure 47. Regression tree (RT) models for the Spring season (16 Mar – 31 May 2011). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

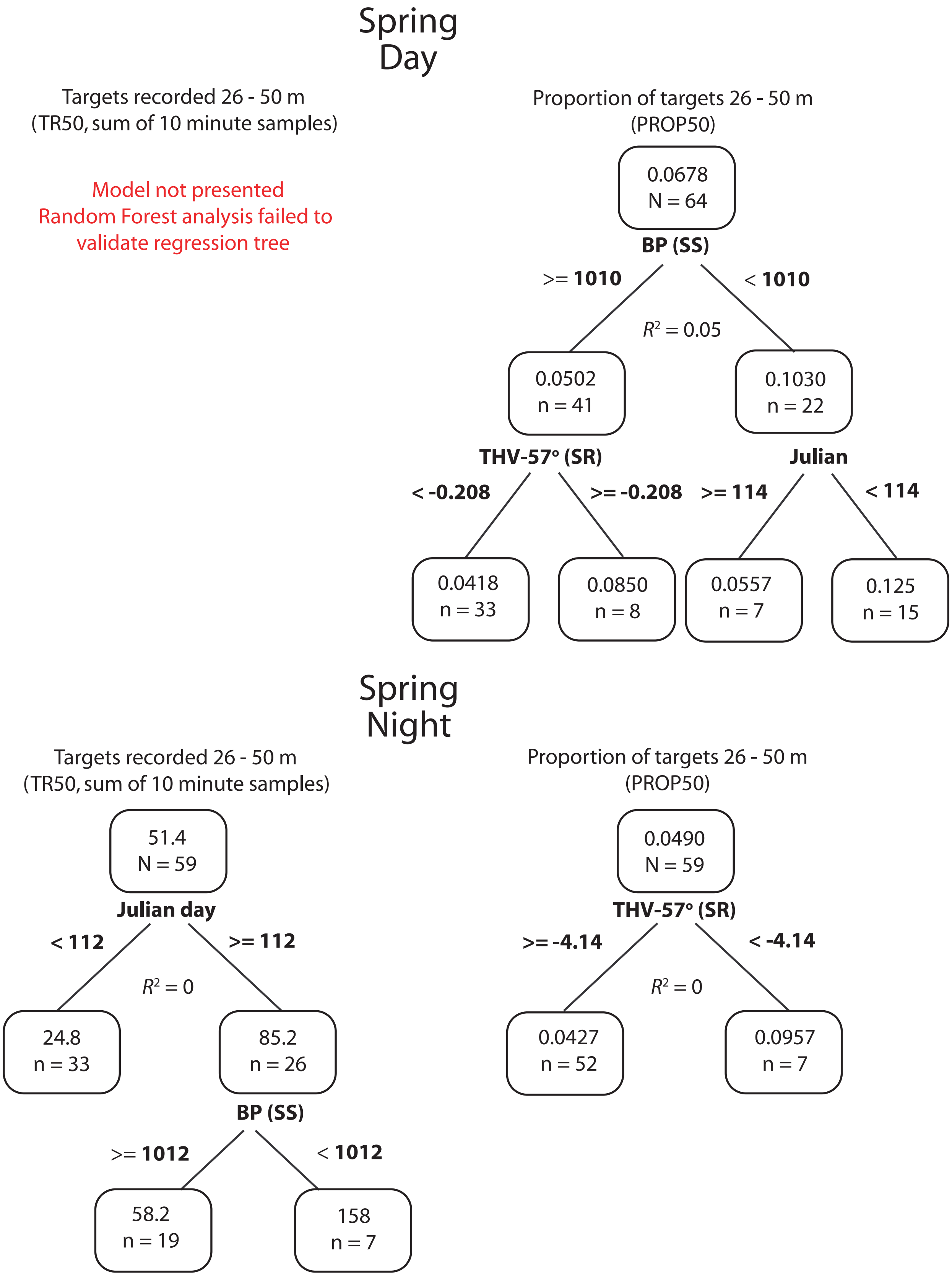


Figure 48. Regression tree (RT) models for the Spring season (16 Mar – 31 May 2011). Splits in the tree are "nodes." Independent variables that best explain variation in response variables are provided at each node along with the respective threshold values (criteria) at the split. Numbers in each box represent mean values and number of samples (N or n) for the response variable. Values in boxes after the split represent means and sample sizes for the response variable with respect to the particular threshold criteria. Trees are read from the root node at the top of the model. R^2 values represent the variation explained by the entire model. Weather condition variables and their abbreviations are given in Methods section 2.4.1 and Table 2. Abbreviations SR (sunrise) and SS (sunset) represent the time frame for the independent weather variables. Note that when SS is indicated for Day period models, this refers to weather variables from sunset on the preceding day. When SR is indicated for Night period models, this refers to weather variables from sunrise that same day.

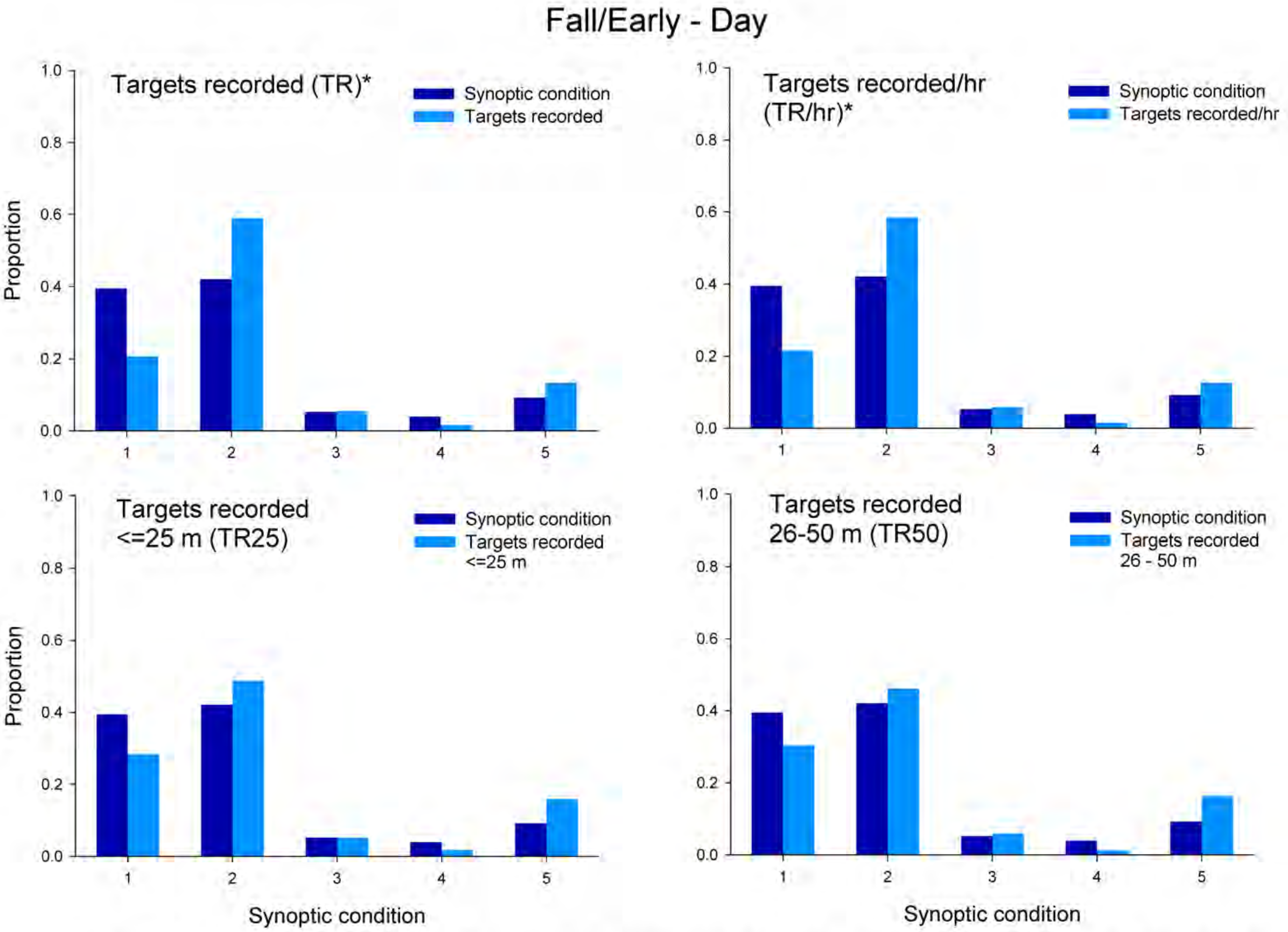


Figure 49. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the Fall/Early season (14 July - 30 September) during the diurnal data collection period (Day). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

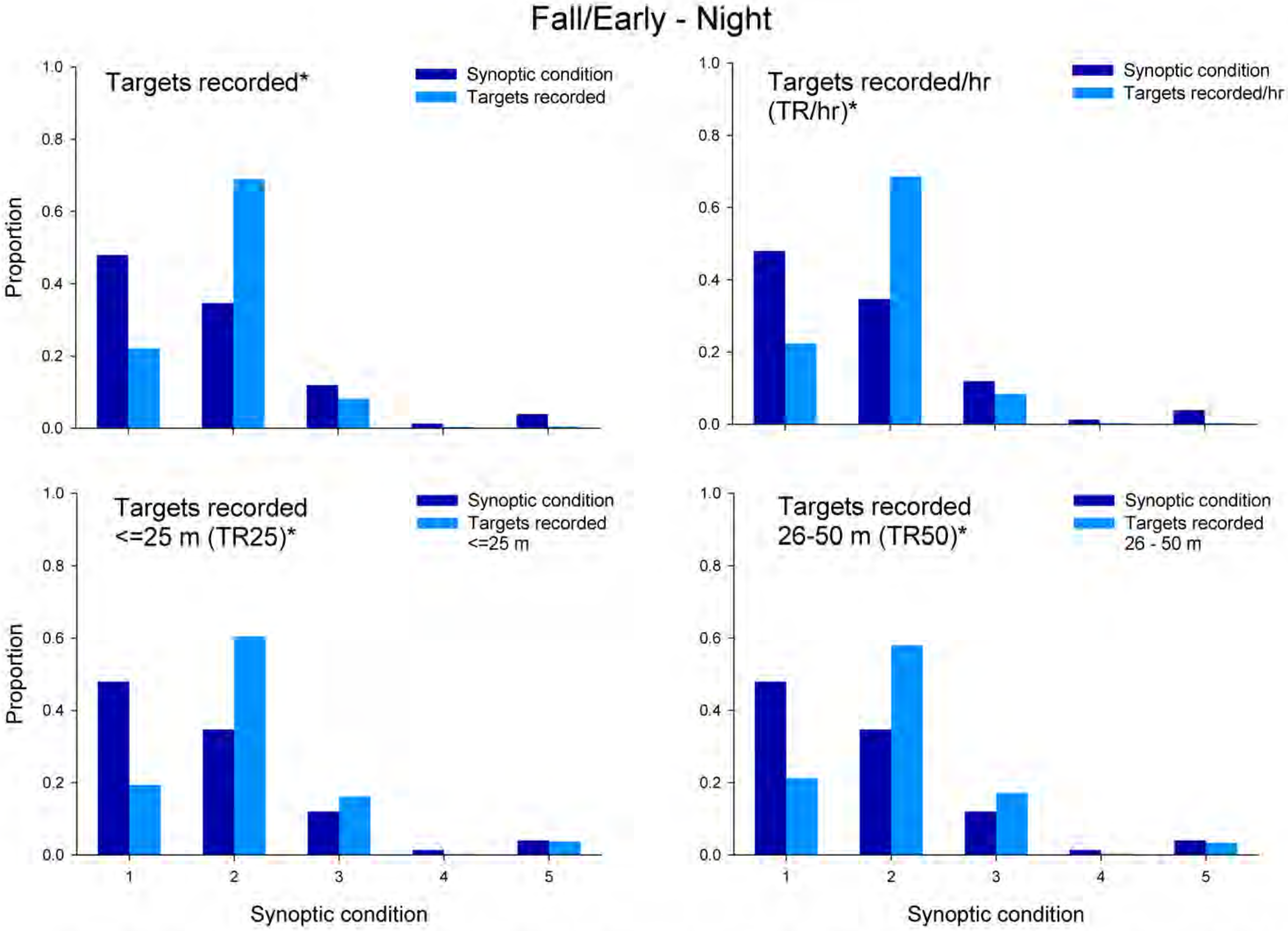


Figure 50. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the the Fall-Early season (15 July - 30 September), during the nocturnal data collection period (Night). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

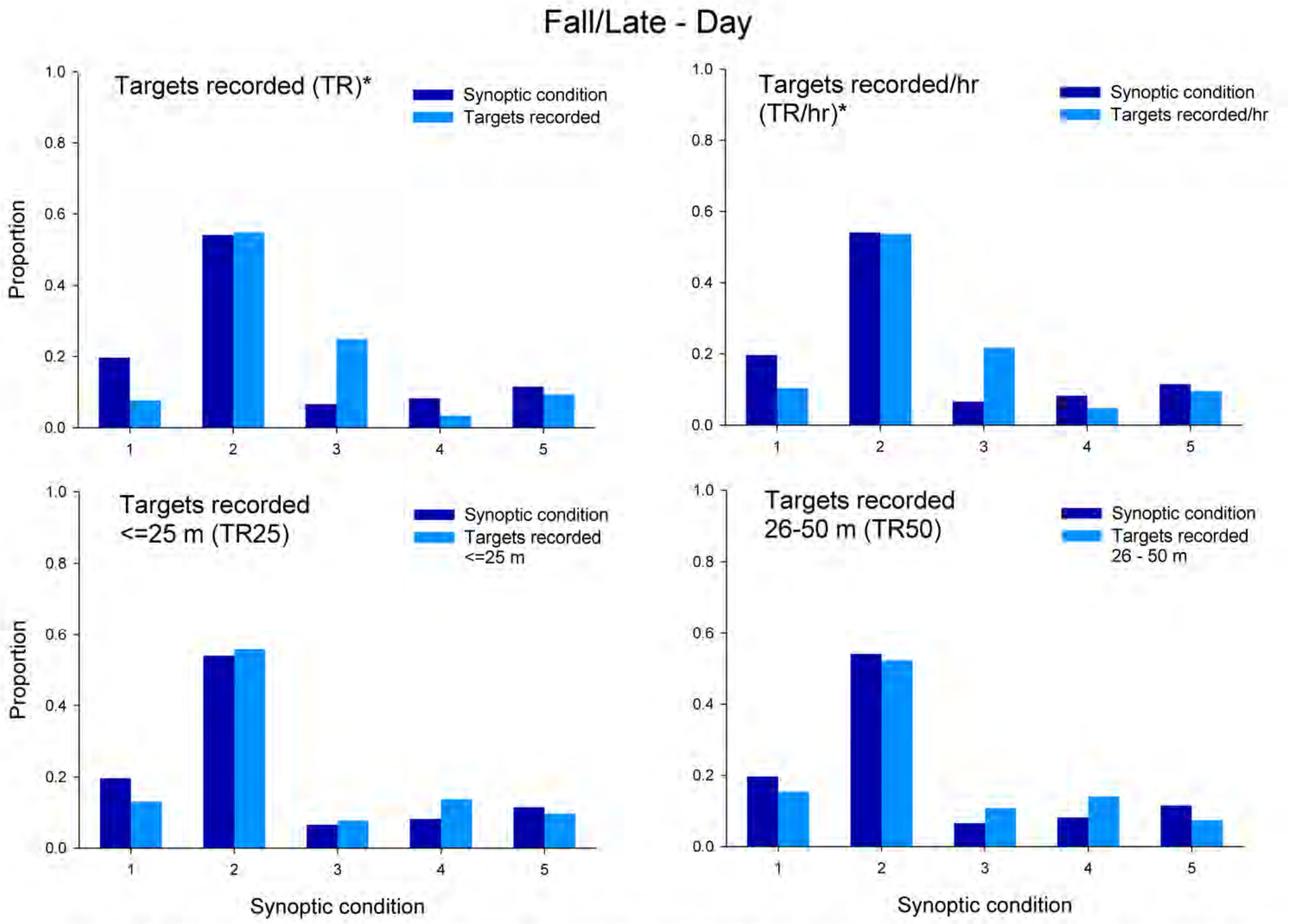


Figure 51. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the Fall/Late season (1 October - 15 December) during the diurnal data collection period (Day). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

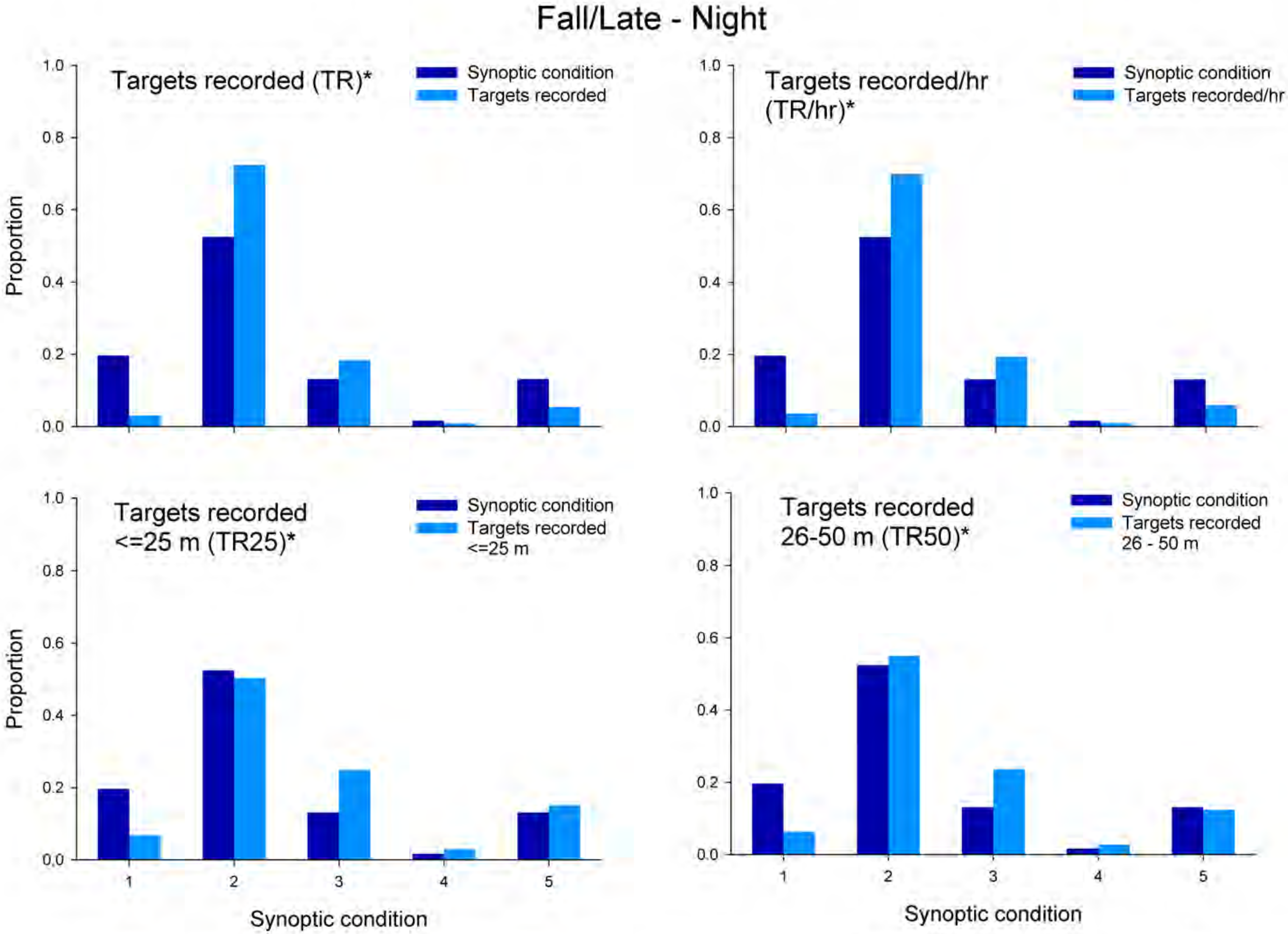


Figure 52. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the the Fall-Late season (1 October - 15 December), during the nocturnal data collection period (Night). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

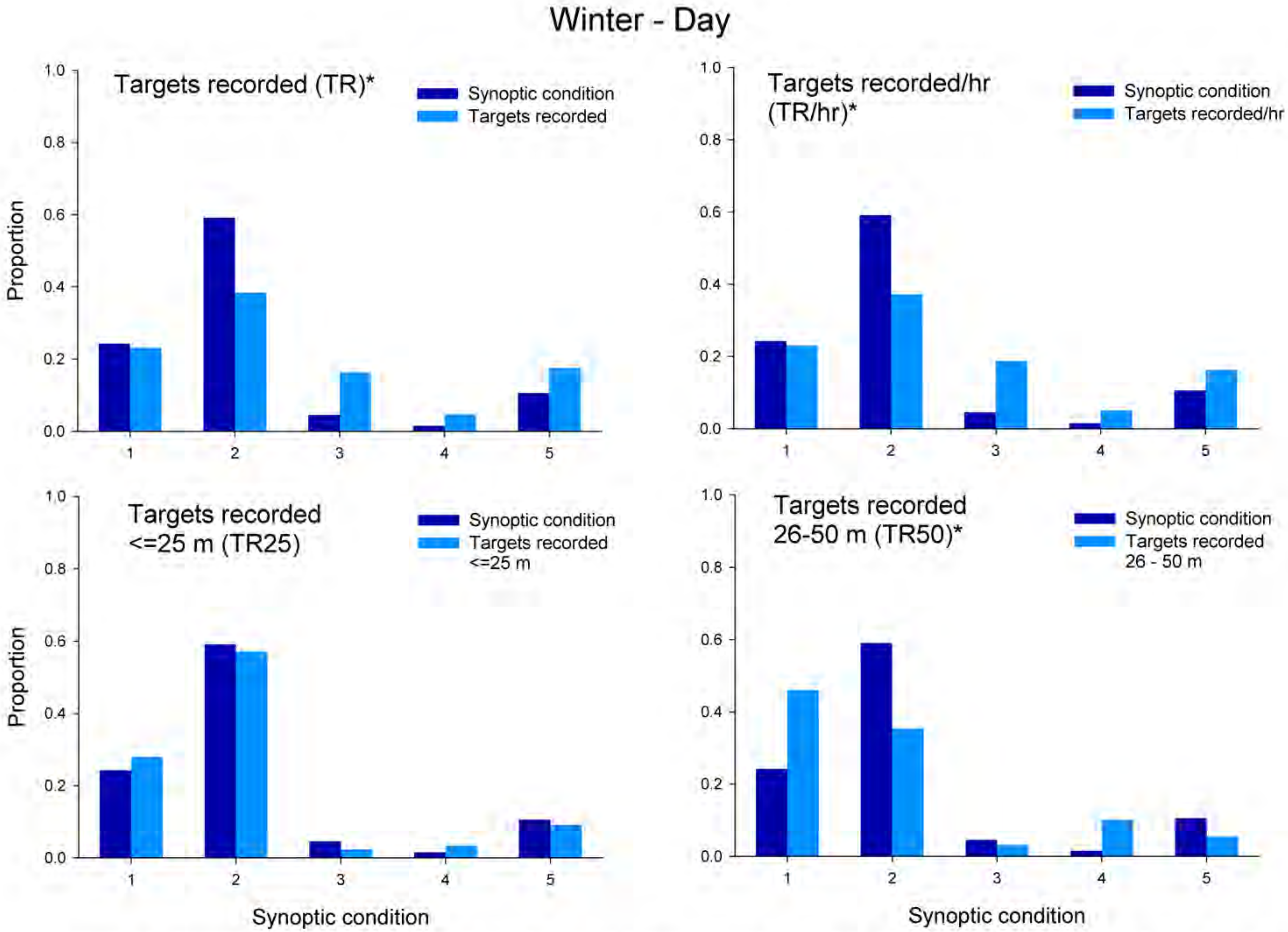


Figure 53. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for Winter season (16 December - 15 March) during the diurnal data collection period (Day). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

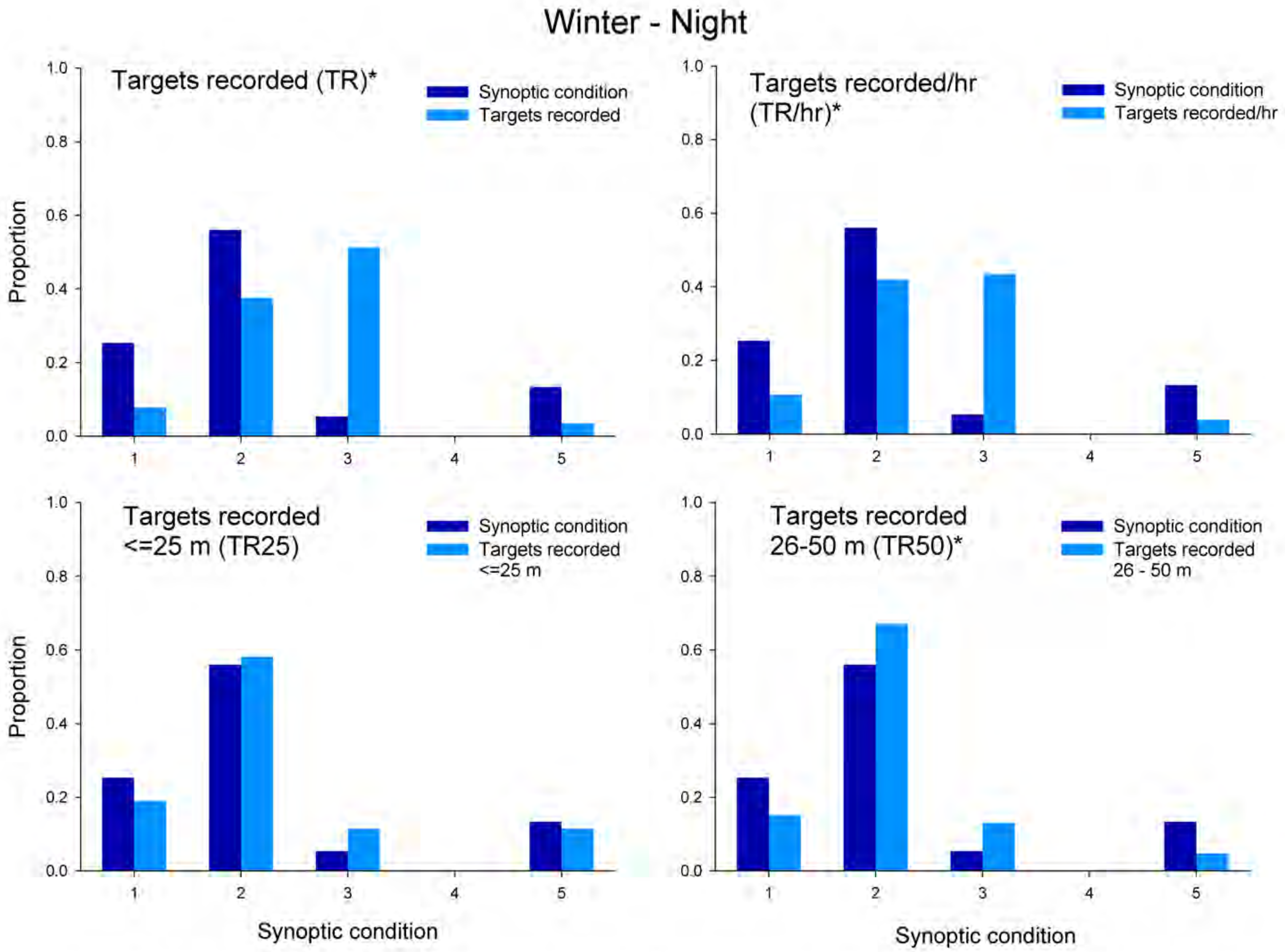


Figure 54. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the Winter season (16 December - 15 March) during the nocturnal data collection period (Night). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

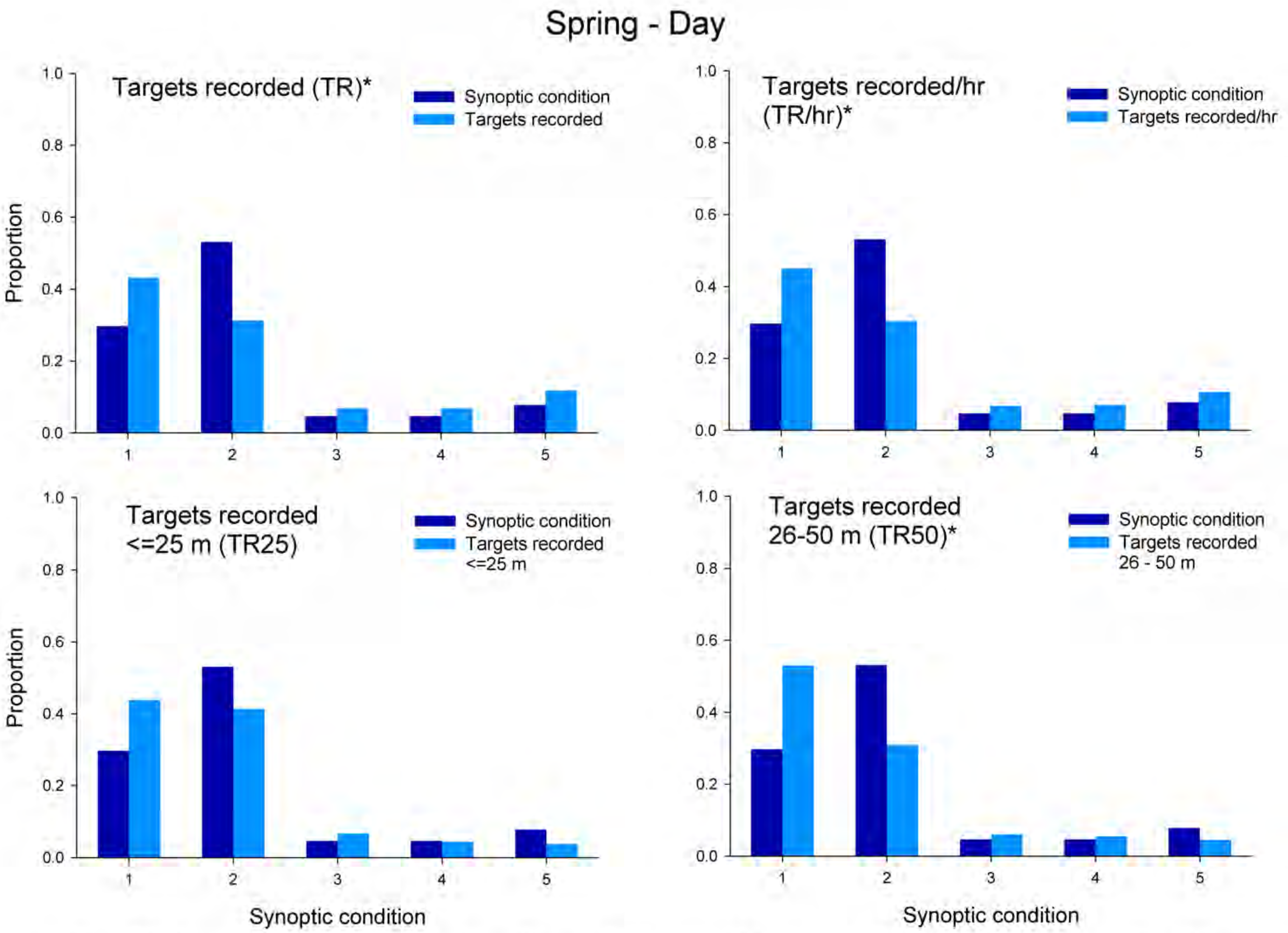


Figure 55. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for Spring season (16 March - 31 May) during the diurnal data collection period (Day). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

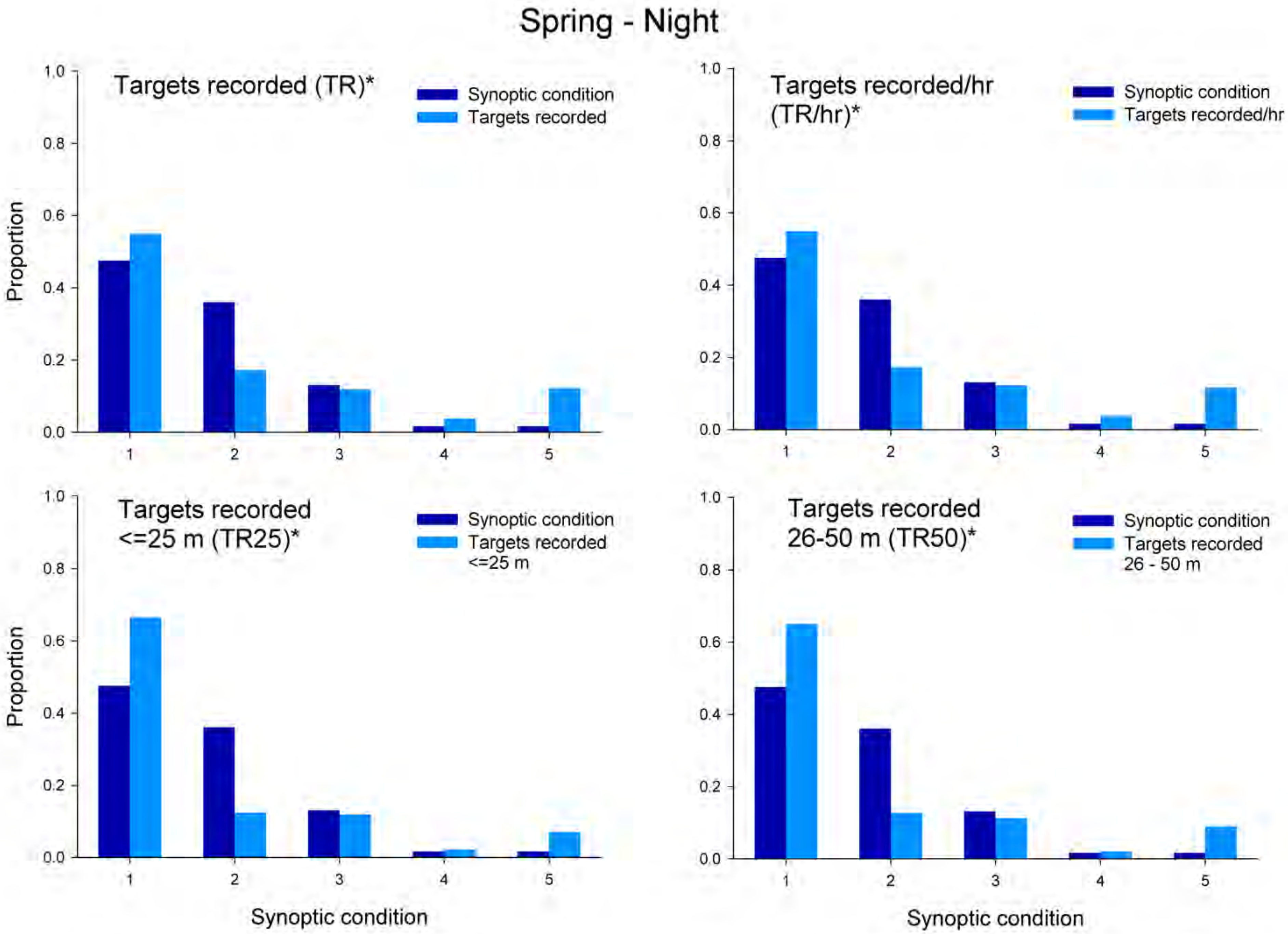


Figure 56. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the Spring season (16 March - 31 May) during the nocturnal data collection period (Night). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

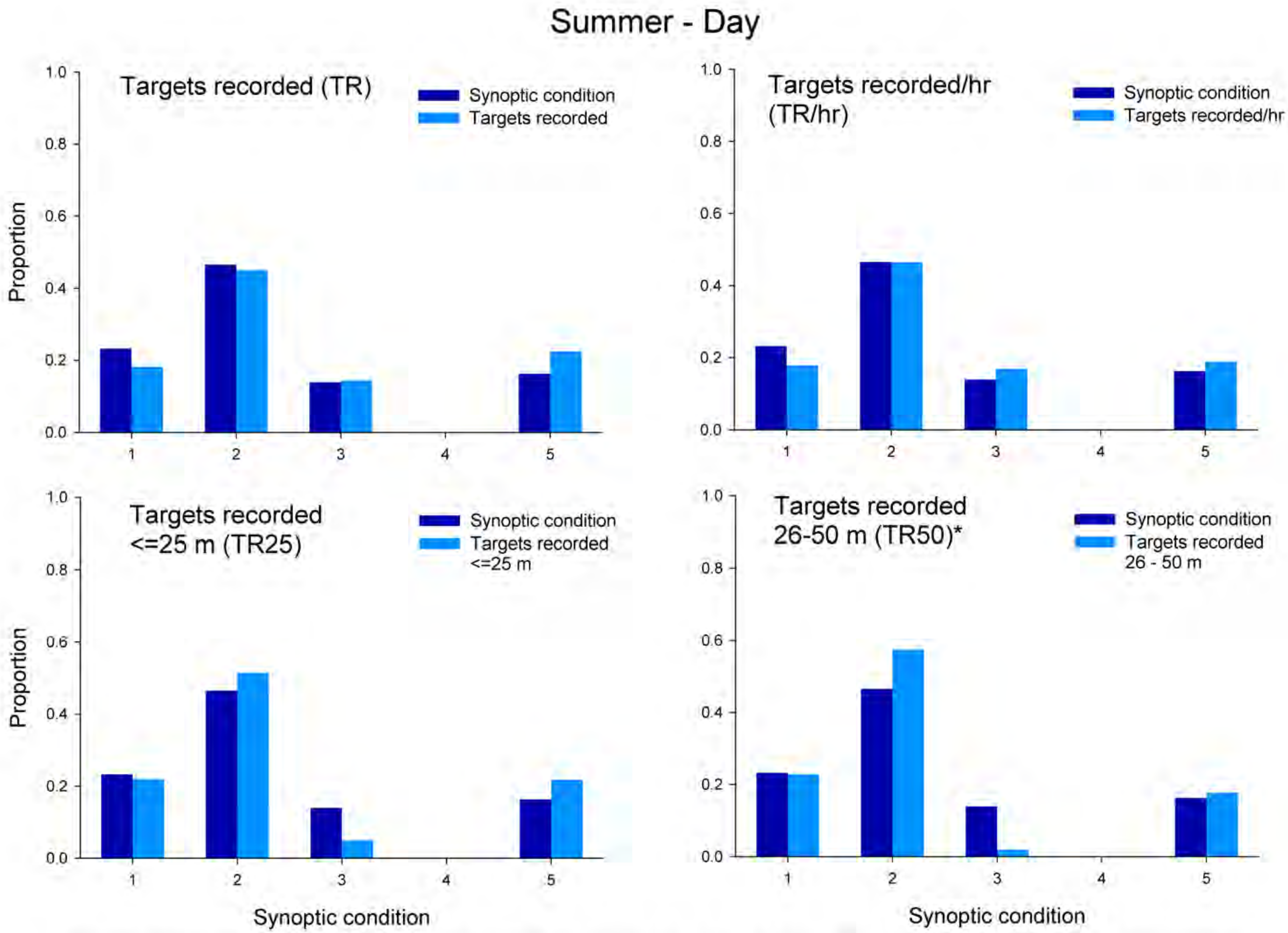


Figure 57. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for Summer season (1 June - 14 July) during the diurnal data collection period (Day). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

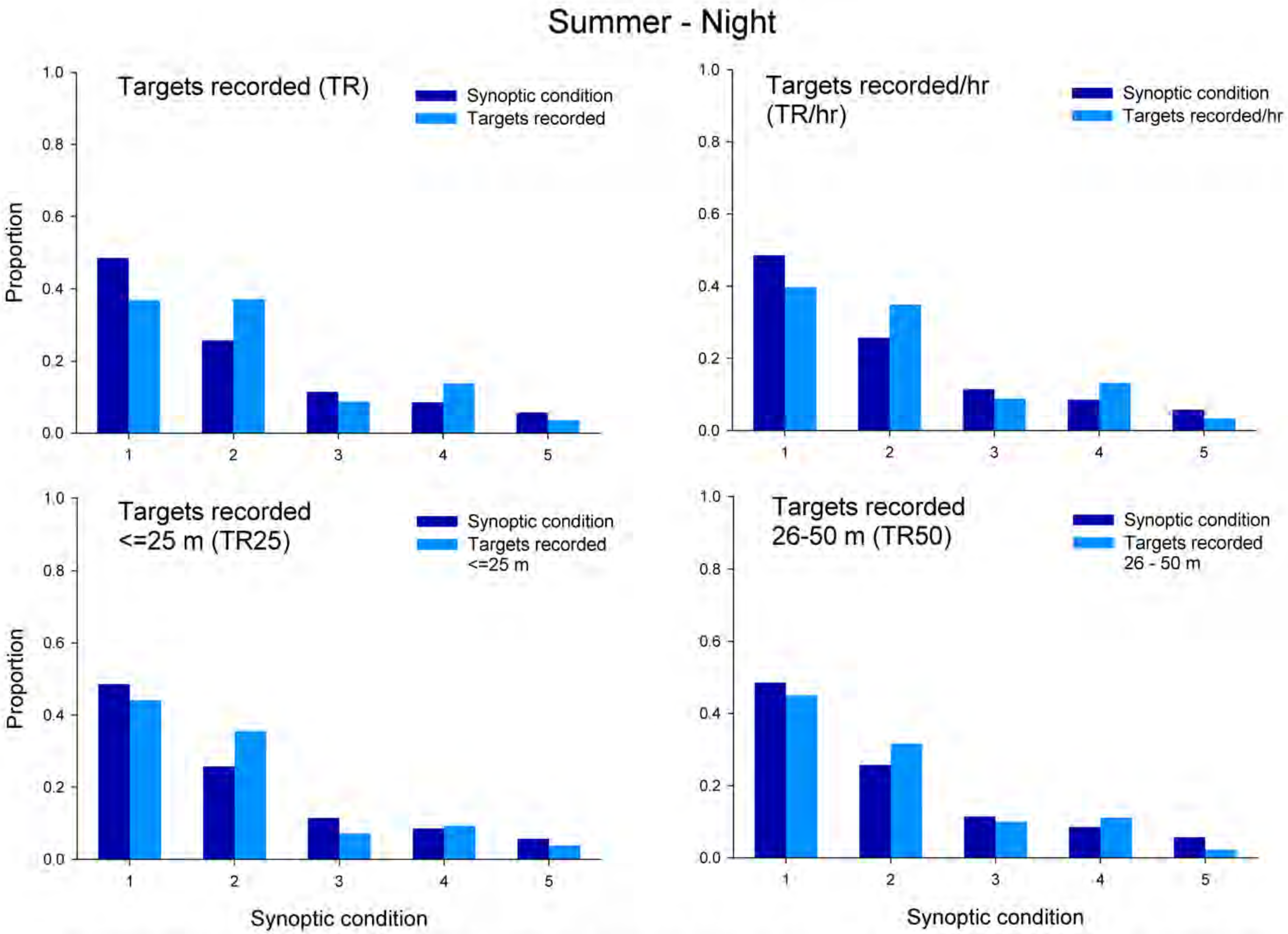


Figure 58. Proportional occurrence of synoptic conditions and response variables (i.e., TR, TR/hr, TR25, TR50) under each condition for the Summer season (1 June - 14 July) during the nocturnal data collection period (Night). Asterisk indicates that proportional occurence of synoptic conditions and response variables were significantly different.

Appendix 1. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 78 days during the Fall-early period (15 July - 30 Sep 2010) on Monhegan Island, Lincoln County, ME. Data images (30,955) were collected during 1060 hours (mean = 13.6 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
07/15/10	196	04:08	19:17	15.13	450	450	1.00
07/16/10	197	04:09	19:16	15.10	450	390	0.87
07/17/10	198	04:10	19:15	15.08	450	450	1.00
07/18/10	199	04:11	19:14	15.05	450	450	1.00
07/19/10	200	04:12	19:14	15.02	450	420	0.93
07/20/10	201	04:13	19:13	14.98	450	415	0.92
07/21/10	202	04:14	19:12	14.97	445	430	0.97
07/22/10	203	04:15	19:11	14.93	445	445	1.00
07/23/10	204	04:16	19:10	14.90	445	435	0.98
07/24/10	205	04:17	19:09	14.87	70	65	0.93
07/25/10	206	04:18	19:08	14.83	445	340	0.76
07/26/10	207	04:19	19:07	14.80	445	445	1.00
07/27/10	208	04:20	19:06	14.77	440	440	1.00
07/28/10	209	04:21	19:05	14.72	380	380	1.00
07/29/10	210	04:22	19:04	14.68	445	365	0.82
07/30/10	211	04:23	19:03	14.65	380	380	1.00
07/31/10	212	04:24	19:01	14.62	435	435	1.00
08/01/10	213	04:25	19:00	14.58	435	435	1.00
08/02/10	214	04:26	18:59	14.53	435	435	1.00
08/03/10	215	04:27	18:58	14.50	435	375	0.86
08/04/10	216	04:28	18:57	14.47	435	420	0.97
08/05/10	217	04:30	18:55	14.42	390	295	0.76
08/06/10	218	04:31	18:54	14.38	430	415	0.97
08/07/10	219	04:32	18:53	14.33	430	430	1.00
08/08/10	220	04:33	18:51	14.30	425	425	1.00
08/09/10	221	04:34	18:50	14.25	425	370	0.87
08/10/10	222	04:35	18:48	14.22	425	420	0.99
08/11/10	223	04:36	18:47	14.17	425	425	1.00
08/12/10	224	04:37	18:45	14.13	380	380	1.00
08/13/10	225	04:39	18:44	14.08	425	420	0.99
08/14/10	226	04:40	18:42	14.03	425	425	1.00
08/15/10	227	04:41	18:41	14.00	420	420	1.00
08/16/10	228	04:42	18:39	13.95	420	250	0.60
08/17/10	229	04:43	18:38	13.90	420	420	1.00
08/18/10	230	04:44	18:36	13.87	415	415	1.00
08/19/10	231	04:45	18:35	13.82	395	395	1.00
08/20/10	232	04:46	18:33	13.77	410	410	1.00
08/21/10	233	04:48	18:31	13.72	410	365	0.89
08/22/10	234	04:49	18:30	13.68	410	380	0.93
08/23/10	235	04:50	18:28	13.63	405	95	0.23
08/24/10	236	04:51	18:27	13.58	405	375	0.93
08/25/10	237	04:52	18:25	13.53	410	125	0.30
08/26/10	238	04:53	18:23	13.48	365	350	0.96
08/27/10	239	04:54	18:21	13.45	405	405	1.00
08/28/10	240	04:55	18:20	13.40	405	405	1.00
08/29/10	241	04:57	18:18	13.35	405	405	1.00
08/30/10	242	04:58	18:16	13.30	400	400	1.00
08/31/10	243	04:59	18:15	13.25	395	395	1.00
09/01/10	244	05:00	18:13	13.20	395	395	1.00
09/02/10	245	05:01	18:11	13.15	360	360	1.00
09/03/10	246	05:02	18:09	13.12	390	390	1.00
09/04/10	247	05:03	18:07	13.07	390	330	0.85
09/05/10	248	05:04	18:06	13.02	390	390	1.00
09/06/10	249	05:06	18:04	12.97	390	390	1.00
09/07/10	250	05:07	18:02	12.92	385	380	0.99

Appendix 1. Continued

09/08/10	251	05:08	18:00	12.87	385	335	0.87
09/09/10	252	05:09	17:58	12.82	355	305	0.86
09/10/10	253	05:10	17:57	12.77	385	385	1.00
09/11/10	254	05:11	17:55	12.72	385	385	1.00
09/12/10	255	05:12	17:53	12.67	380	380	1.00
09/13/10	256	05:13	17:51	12.62	380	355	0.93
09/14/10	257	05:15	17:49	12.57	380	365	0.96
09/15/10	258	05:16	17:47	12.52	375	370	0.99
09/16/10	259	05:17	17:46	12.47	350	350	1.00
09/17/10	260	05:18	17:44	12.42	370	270	0.73
09/18/10	261	05:19	17:42	12.37	370	370	1.00
09/19/10	262	05:20	17:40	12.32	370	370	1.00
09/20/10	263	05:21	17:38	12.27	365	365	1.00
09/21/10	264	05:22	17:36	12.22	350	350	1.00
09/22/10	265	05:24	17:35	12.17	365	360	0.99
09/23/10	266	05:25	17:33	12.12	335	335	1.00
09/24/10	267	05:26	17:31	12.07	360	310	0.86
09/25/10	268	05:27	17:29	12.02	360	325	0.90
09/26/10	269	05:28	17:27	11.98	355	340	0.96
09/27/10	270	05:29	17:25	11.93	355	180	0.51
09/28/10	271	05:30	17:24	11.88	355	340	0.96
09/29/10	272	05:32	17:22	11.83	355	355	1.00
09/30/10	273	05:33	17:20	11.78	325	310	0.95

Appendix 2. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 79 nights during the Fall-early period (15 Jul - 30 Sep 2010) on Monhegan Island, Lincoln County, ME. Data images (24,595) were collected during 819.6 hours (mean = 13.4 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
07/15/10	196	19:17	04:08	8.85	270	270	1.00
07/16/10	197	19:16	04:09	8.88	270	265	0.98
07/17/10	198	19:15	04:10	8.90	270	260	0.96
07/18/10	199	19:14	04:11	8.93	270	270	1.00
07/19/10	200	19:14	04:12	8.97	270	255	0.94
07/20/10	201	19:13	04:13	9.00	270	270	1.00
07/21/10	202	19:12	04:14	9.02	275	155	0.56
07/22/10	203	19:11	04:15	9.05	270	270	1.00
07/23/10	204	19:10	04:16	9.08	270	50	0.19
07/24/10	205	19:09	04:17	9.12	275	215	0.78
07/25/10	206	19:08	04:18	9.15	275	275	1.00
07/26/10	207	19:07	04:19	9.18	275	275	1.00
07/27/10	208	19:06	04:20	9.22	280	280	1.00
07/28/10	209	19:05	04:21	9.27	275	185	0.67
07/29/10	210	19:04	04:22	9.30	280	280	1.00
07/30/10	211	19:03	04:23	9.33	280	280	1.00
07/31/10	212	19:01	04:24	9.37	285	285	1.00
08/01/10	213	19:00	04:25	9.40	285	285	1.00
08/02/10	214	18:59	04:26	9.45	280	225	0.80
08/03/10	215	18:58	04:27	9.48	285	255	0.89
08/04/10	216	18:57	04:28	9.52	285	285	1.00
08/05/10	217	18:55	04:30	9.57	285	285	1.00
08/06/10	218	18:54	04:31	9.60	285	285	1.00
08/07/10	219	18:53	04:32	9.65	290	265	0.91
08/08/10	220	18:51	04:33	9.68	295	285	0.97
08/09/10	221	18:50	04:34	9.73	295	250	0.85
08/10/10	222	18:48	04:35	9.77	295	245	0.83
08/11/10	223	18:47	04:36	9.82	295	295	1.00
08/12/10	224	18:45	04:37	9.85	295	295	1.00
08/13/10	225	18:44	04:39	9.90	295	295	1.00
08/14/10	226	18:42	04:40	9.95	295	295	1.00
08/15/10	227	18:41	04:41	9.98	300	240	0.80
08/16/10	228	18:39	04:42	10.03	300	295	0.98
08/17/10	229	18:38	04:43	10.08	300	300	1.00
08/18/10	230	18:36	04:44	10.12	305	305	1.00
08/19/10	231	18:35	04:45	10.17	305	300	0.98
08/20/10	232	18:33	04:46	10.22	310	310	1.00
08/21/10	233	18:31	04:48	10.27	310	245	0.79
08/22/10	234	18:30	04:49	10.30	310	260	0.84
08/23/10	235	18:28	04:50	10.35	315	300	0.95
08/24/10	236	18:27	04:51	10.40	310	275	0.89
08/25/10	237	18:25	04:52	10.45	310	35	0.11
08/26/10	238	18:23	04:53	10.50	315	300	0.95
08/27/10	239	18:21	04:54	10.53	315	315	1.00
08/28/10	240	18:20	04:55	10.58	315	315	1.00
08/29/10	241	18:18	04:57	10.63	315	315	1.00
08/30/10	242	18:16	04:58	10.68	320	320	1.00
08/31/10	243	18:15	04:59	10.73	320	320	1.00
09/01/10	244	18:13	05:00	10.78	325	325	1.00
09/02/10	245	18:11	05:01	10.83	325	325	1.00
09/03/10	246	18:09	05:02	10.87	330	60	0.18
09/04/10	247	18:07	05:03	10.92	330	330	1.00
09/05/10	248	18:06	05:04	10.97	330	330	1.00

Appendix 2. Continued

09/06/10	249	18:04	05:06	11.02	330	265	0.80
09/07/10	250	18:02	05:07	11.07	335	335	1.00
09/08/10	251	18:00	05:08	11.12	335	305	0.91
09/09/10	252	17:58	05:09	11.17	335	275	0.82
09/10/10	253	17:57	05:10	11.22	335	335	1.00
09/11/10	254	17:55	05:11	11.27	335	320	0.96
09/12/10	255	17:53	05:12	11.32	340	340	1.00
09/13/10	256	17:51	05:13	11.37	340	325	0.96
09/14/10	257	17:49	05:15	11.42	340	300	0.88
09/15/10	258	17:47	05:16	11.47	345	345	1.00
09/16/10	259	17:46	05:17	11.52	345	75	0.22
09/17/10	260	17:44	05:18	11.57	345	345	1.00
09/18/10	261	17:42	05:19	11.62	345	345	1.00
09/19/10	262	17:40	05:20	11.67	345	345	1.00
09/20/10	263	17:38	05:21	11.72	350	350	1.00
09/21/10	264	17:36	05:22	11.77	350	350	1.00
09/22/10	265	17:35	05:24	11.82	355	355	1.00
09/23/10	266	17:33	05:25	11.87	355	235	0.66
09/24/10	267	17:31	05:26	11.92	355	355	1.00
09/25/10	268	17:29	05:27	11.97	355	350	0.99
09/26/10	269	17:27	05:28	12.00	365	315	0.86
09/27/10	270	17:25	05:29	12.05	365	215	0.59
09/28/10	271	17:24	05:30	12.10	365	325	0.89
09/29/10	272	17:22	05:32	12.15	365	365	1.00
09/30/10	273	17:20	05:33	12.20	365	350	0.96

Appendix 3. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 74 days during the Fall-late period (1Oct - 15 Dec 2010) on Monhegan Island, Lincoln County, ME. Data images (21,840) were collected during 749 hours (mean = 10.1 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
10/01/10	274	05:34	17:18	11.73	350	270	0.77
10/02/10	275	05:35	17:16	11.68	350	350	1.00
10/03/10	276	05:36	17:15	11.63	345	345	1.00
10/04/10	277	05:37	17:13	11.58	345	185	0.54
10/05/10	278	05:39	17:11	11.53	345	345	1.00
10/06/10	279	05:40	17:09	11.48	345	125	0.36
10/07/10	280	05:41	17:07	11.43	340	270	0.79
10/08/10	281	05:42	17:06	11.38	320	235	0.73
10/09/10	282	05:43	17:04	11.33	340	340	1.00
10/10/10	283	05:45	17:02	11.28	340	325	0.96
10/11/10	284	05:46	17:00	11.23	340	340	1.00
10/12/10	285	05:47	16:59	11.18	335	335	1.00
10/13/10	286	05:48	16:57	11.13	335	335	1.00
10/14/10	287	05:50	16:55	11.08	305	305	1.00
10/15/10	288	05:51	16:54	11.03	330	55	0.17
10/16/10	289	05:52	16:52	11.00	330	210	0.64
10/17/10	290	05:53	16:50	10.95	330	325	0.98
10/18/10	291	05:54	16:49	10.90	325	325	1.00
10/19/10	292	05:56	16:47	10.85	325	325	1.00
10/20/10	293	05:57	16:46	10.80	325	325	1.00
10/21/10	294	05:58	16:44	10.75	290	215	0.74
10/22/10	295	06:00	16:42	10.70	325	325	1.00
10/23/10	296	06:01	16:41	10.67	320	320	1.00
10/24/10	297	06:02	16:39	10.62	315	245	0.78
10/25/10	298	06:03	16:38	10.57	315	315	1.00
10/26/10	299	06:05	16:36	10.52	315	315	1.00
10/27/10	300	06:06	16:35	10.47	315	190	0.60
10/28/10	301	06:07	16:33	10.43	285	285	1.00
10/29/10	302	06:08	16:32	10.38	310	295	0.95
10/30/10	303	06:10	16:31	10.33	310	310	1.00
10/31/10	304	06:11	16:29	10.30	310	220	0.71
11/01/10	305	06:12	16:28	10.25	310	310	1.00
11/02/10	306	06:14	16:26	10.20	305	305	1.00
11/03/10	307	06:15	16:25	10.17	305	305	1.00
11/04/10	308	06:16	16:24	10.12	305	135	0.44
11/05/10	309	06:18	16:23	10.07	305	180	0.59
11/06/10	310	06:19	16:21	10.03	265	265	1.00
11/07/10	311	06:20	16:20	9.98	300	235	0.78
11/08/10	312	06:22	16:19	9.95	295	185	0.63
11/09/10	313	06:23	16:18	9.90	295	115	0.39
11/10/10	314	06:24	16:17	9.87	295	295	1.00
11/11/10	315	06:26	16:16	9.83	295	295	1.00
11/12/10	316	06:27	16:15	9.78	295	295	1.00
11/13/10	317	06:28	16:14	9.75	290	290	1.00
11/14/10	318	06:29	16:13	9.72	290	290	1.00
11/15/10	319	06:31	16:12	9.67	290	270	0.93
11/16/10	320	06:32	16:11	9.63	290	225	0.78
11/17/10	321	06:33	16:10	9.60	290	105	0.36
11/18/10	322	06:35	16:09	9.57	235	235	1.00
11/19/10	323	06:36	16:08	9.53	285	285	1.00
11/20/10	324	06:37	16:07	9.50	285	265	0.93
11/21/10	325	06:38	16:07	9.47	285	285	1.00
11/22/10	326	06:40	16:06	9.43	265	110	0.42

Appendix 3. Continued

11/23/10	327	06:41	16:05	9.40	280	260	0.93
11/24/10	328	06:42	16:05	9.37	280	280	1.00
11/25/10	329	06:43	16:04	9.33	280	280	1.00
11/26/10	330	06:45	16:03	9.30	280	75	0.27
11/27/10	331	06:46	16:03	9.28	280	240	0.86
11/28/10	332	06:47	16:02	9.25	275	275	1.00
11/29/10	333	06:48	16:02	9.22	275	275	1.00
11/30/10	334	06:49	16:02	9.20	275	275	1.00
12/01/10	335	06:50	16:01	9.17	275	275	1.00
12/02/10	336	06:51	16:01	9.15	250	250	1.00
12/03/10	337	06:52	16:01	9.13	275	275	1.00
12/04/10	338	06:53	16:00	9.10	275	155	0.56
12/05/10	339	06:55	16:00	9.08	275	100	0.36
12/06/10	340	06:56	16:00	9.07	275	0	0.00
12/07/10	341	06:56	16:00	9.05	270	235	0.87
12/08/10	342	06:57	16:00	9.03	115	50	0.43
12/11/10	345	07:00	16:00	8.98	40	40	1.00
12/12/10	346	07:01	16:00	8.97	270	130	0.48
12/13/10	347	07:02	16:00	8.97	270	40	0.15
12/14/10	348	07:03	16:00	8.95	270	190	0.70
12/15/10	349	07:03	16:01	8.95	270	55	0.20

Appendix 4. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 74 nights during the Fall-late period (1Oct - 15 Dec 2010) on Monhegan Island, Lincoln County, ME. Data images (24,760) were collected during 1025.8 hours (mean = 13.9 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
10/01/10	274	17:18	05:34	12.25	365	150	0.41
10/02/10	275	17:16	05:35	12.30	370	370	1.00
10/03/10	276	17:15	05:36	12.35	375	310	0.83
10/04/10	277	17:13	05:37	12.40	375	260	0.69
10/05/10	278	17:11	05:39	12.45	375	375	1.00
10/06/10	279	17:09	05:40	12.50	375	205	0.55
10/07/10	280	17:07	05:41	12.55	380	370	0.97
10/08/10	281	17:06	05:42	12.60	380	330	0.87
10/09/10	282	17:04	05:43	12.65	380	380	1.00
10/10/10	283	17:02	05:45	12.70	380	380	1.00
10/11/10	284	17:00	05:46	12.75	380	380	1.00
10/12/10	285	16:59	05:47	12.80	385	385	1.00
10/13/10	286	16:57	05:48	12.85	385	385	1.00
10/14/10	287	16:55	05:50	12.90	390	210	0.54
10/15/10	288	16:54	05:51	12.95	390	75	0.19
10/16/10	289	16:52	05:52	12.98	390	390	1.00
10/17/10	290	16:50	05:53	13.03	390	390	1.00
10/18/10	291	16:49	05:54	13.08	395	395	1.00
10/19/10	292	16:47	05:56	13.13	395	385	0.97
10/20/10	293	16:46	05:57	13.18	395	395	1.00
10/21/10	294	16:44	05:58	13.23	395	380	0.96
10/22/10	295	16:42	06:00	13.28	395	395	1.00
10/23/10	296	16:41	06:01	13.32	400	400	1.00
10/24/10	297	16:39	06:02	13.37	405	270	0.67
10/25/10	298	16:38	06:03	13.42	405	265	0.65
10/26/10	299	16:36	06:05	13.47	405	280	0.69
10/27/10	300	16:35	06:06	13.52	405	340	0.84
10/28/10	301	16:33	06:07	13.55	405	405	1.00
10/29/10	302	16:32	06:08	13.60	410	410	1.00
10/30/10	303	16:31	06:10	13.65	410	175	0.43
10/31/10	304	16:29	06:11	13.68	410	410	1.00
11/01/10	305	16:28	06:12	13.73	410	405	0.99
11/02/10	306	16:26	06:14	13.78	415	415	1.00
11/03/10	307	16:25	06:15	13.82	415	415	1.00
11/04/10	308	16:24	06:16	13.87	415	25	0.06
11/05/10	309	16:23	06:18	13.92	415	415	1.00
11/06/10	310	16:21	06:19	13.95	420	420	1.00
11/07/10	311	16:20	06:20	14.00	420	5	0.01
11/08/10	312	16:19	06:22	14.03	425	425	1.00
11/09/10	313	16:18	06:23	14.08	425	115	0.27
11/10/10	314	16:17	06:24	14.12	425	425	1.00
11/11/10	315	16:16	06:26	14.15	425	425	1.00
11/12/10	316	16:15	06:27	14.20	425	425	1.00
11/13/10	317	16:14	06:28	14.23	430	430	1.00
11/14/10	318	16:13	06:29	14.27	430	430	1.00
11/15/10	319	16:12	06:31	14.32	430	295	0.69
11/16/10	320	16:11	06:32	14.35	430	260	0.60
11/17/10	321	16:10	06:33	14.38	430	405	0.94
11/18/10	322	16:09	06:35	14.42	435	435	1.00
11/19/10	323	16:08	06:36	14.45	435	435	1.00
11/20/10	324	16:07	06:37	14.48	435	435	1.00
11/21/10	325	16:07	06:38	14.52	435	435	1.00
11/22/10	326	16:06	06:40	14.55	440	155	0.35

Appendix 4. Continued

11/23/10	327	16:05	06:41	14.58	440	385	0.88
11/24/10	328	16:05	06:42	14.62	440	440	1.00
11/25/10	329	16:04	06:43	14.65	440	345	0.78
11/26/10	330	16:03	06:45	14.68	440	440	1.00
11/27/10	331	16:03	06:46	14.70	440	440	1.00
11/28/10	332	16:02	06:47	14.73	445	445	1.00
11/29/10	333	16:02	06:48	14.77	445	445	1.00
11/30/10	334	16:02	06:49	14.78	445	445	1.00
12/01/10	335	16:01	06:50	14.82	445	175	0.39
12/02/10	336	16:01	06:51	14.83	445	445	1.00
12/03/10	337	16:01	06:52	14.85	445	90	0.20
12/04/10	338	16:00	06:53	14.88	445	375	0.84
12/05/10	339	16:00	06:55	14.90	445	265	0.60
12/06/10	340	16:00	06:56	14.92	445	195	0.44
12/07/10	341	16:00	06:56	14.93	450	425	0.94
12/08/10	342	16:00	06:57	14.95	0	0	0.00
12/11/10	345	16:00	07:00	15.00	450	450	1.00
12/12/10	346	16:00	07:01	15.02	450	35	0.08
12/13/10	347	16:00	07:02	15.02	450	220	0.49
12/14/10	348	16:00	07:03	15.03	450	440	0.98
12/15/10	349	16:01	07:03	15.03	450	380	0.84

Appendix 5. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 89 days during the Winter period (16 Dec 2010 - 15 Mar 2011) on Monhegan Island, Lincoln County, ME. Data images (25,214) were collected during 890.7 hours (mean = 10.0 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
12/16/10	350	07:04	16:01	8.93	265	240	0.91
12/17/10	351	07:05	16:01	8.93	265	255	0.96
12/18/10	352	07:05	16:01	8.93	265	265	1.00
12/19/10	353	07:06	16:02	8.92	265	185	0.70
12/20/10	354	07:07	16:02	8.92	265	115	0.43
12/21/10	355	07:07	16:03	8.92	265	45	0.17
12/22/10	356	07:08	16:03	8.92	265	0	0.00
12/23/10	357	07:08	16:04	8.92	215	150	0.70
12/24/10	358	07:08	16:04	8.92	270	270	1.00
12/25/10	359	07:09	16:05	8.93	270	270	1.00
12/26/10	360	07:09	16:06	8.93	265	265	1.00
12/27/10	361	07:09	16:06	8.93	265	0	0.00
12/28/10	362	07:10	16:07	8.95	265	265	1.00
12/29/10	363	07:10	16:08	8.95	169	169	1.00
12/30/10	364	07:10	16:09	8.97	200	200	1.00
12/31/10	365	07:10	16:10	8.98	270	270	1.00
01/01/11	001	07:10	16:10	9.00	270	270	1.00
01/02/11	002	07:10	16:11	9.00	270	230	0.85
01/03/11	003	07:10	16:12	9.02	270	270	1.00
01/04/11	004	07:10	16:13	9.03	270	240	0.89
01/05/11	005	07:10	16:14	9.05	275	255	0.93
01/06/11	006	07:10	16:15	9.08	180	130	0.72
01/07/11	007	07:10	16:16	9.10	255	85	0.33
01/08/11	008	07:10	16:17	9.12	260	260	1.00
01/09/11	009	07:10	16:18	9.13	260	260	1.00
01/10/11	010	07:09	16:19	9.17	270	190	0.70
01/11/11	011	07:09	16:21	9.18	275	275	1.00
01/12/11	012	07:09	16:22	9.22	175	0	0.00
01/13/11	013	07:08	16:23	9.23	195	195	1.00
01/14/11	014	07:08	16:24	9.27	0	0	0.00
01/16/11	016	07:07	16:27	9.32	135	135	1.00
01/17/11	017	07:06	16:28	9.35	280	280	1.00
01/18/11	018	07:06	16:29	9.38	280	50	0.18
01/19/11	019	07:05	16:30	9.42	285	85	0.30
01/20/11	020	07:04	16:32	9.45	270	220	0.81
01/21/11	021	07:04	16:33	9.48	280	15	0.05
01/22/11	022	07:03	16:34	9.52	210	210	1.00
01/23/11	023	07:02	16:35	9.55	290	160	0.55
01/24/11	024	07:01	16:37	9.58	290	290	1.00
01/25/11	025	07:00	16:38	9.62	290	65	0.22
01/26/11	026	07:00	16:39	9.65	105	100	0.95
01/27/11	027	06:59	16:41	9.70	295	105	0.36
01/28/11	028	06:58	16:42	9.73	200	175	0.88
01/29/11	029	06:57	16:44	9.77	295	145	0.49
01/30/11	030	06:56	16:45	9.82	295	90	0.31
01/31/11	031	06:55	16:46	9.85	295	295	1.00
02/01/11	032	06:54	16:48	9.90	300	30	0.10
02/02/11	033	06:52	16:49	9.93	300	0	0.00
02/03/11	034	06:51	16:50	9.98	300	220	0.73
02/04/11	035	06:50	16:52	10.02	300	300	1.00
02/05/11	036	06:49	16:53	10.07	270	230	0.85
02/06/11	037	06:48	16:55	10.10	300	300	1.00
02/07/11	038	06:46	16:56	10.15	305	305	1.00

Appendix 5. Continued

02/08/11	039	06:45	16:57	10.20	305	20	0.07
02/09/11	040	06:44	16:59	10.23	305	305	1.00
02/10/11	041	06:43	17:00	10.28	305	305	1.00
02/11/11	042	06:41	17:01	10.33	305	305	1.00
02/12/11	043	06:40	17:03	10.37	315	230	0.73
02/13/11	044	06:38	17:04	10.42	315	180	0.57
02/14/11	045	06:37	17:05	10.47	260	215	0.83
02/15/11	046	06:36	17:07	10.52	315	315	1.00
02/16/11	047	06:34	17:08	10.55	320	320	1.00
02/17/11	048	06:33	17:09	10.60	320	320	1.00
02/18/11	049	06:31	17:11	10.65	320	270	0.84
02/19/11	050	06:30	17:12	10.70	320	290	0.91
02/20/11	051	06:28	17:14	10.75	325	325	1.00
02/21/11	052	06:27	17:15	10.80	325	145	0.45
02/22/11	053	06:25	17:16	10.85	325	325	1.00
02/23/11	054	06:23	17:17	10.90	325	325	1.00
02/24/11	055	06:22	17:19	10.93	305	275	0.90
02/25/11	056	06:20	17:20	10.98	330	0	0.00
02/26/11	057	06:19	17:21	11.03	330	330	1.00
02/27/11	058	06:17	17:23	11.08	330	35	0.11
02/28/11	059	06:15	17:24	11.13	335	55	0.16
03/01/11	060	06:14	17:25	11.18	335	335	1.00
03/02/11	061	06:12	17:27	11.23	335	245	0.73
03/03/11	062	06:10	17:28	11.28	335	335	1.00
03/04/11	063	06:09	17:29	11.33	325	325	1.00
03/05/11	064	06:07	17:30	11.38	340	180	0.53
03/06/11	065	06:05	17:32	11.43	340	325	0.96
03/07/11	066	06:03	17:33	11.48	345	220	0.64
03/08/11	067	06:02	17:34	11.53	345	345	1.00
03/09/11	068	06:00	17:36	11.58	345	345	1.00
03/10/11	069	05:58	17:37	11.63	350	200	0.57
03/11/11	070	05:56	17:38	11.68	355	85	0.24
03/12/11	071	05:55	17:39	11.73	355	355	1.00
03/13/11	072	05:53	17:41	11.78	355	135	0.38
03/14/11	073	05:51	17:42	11.83	325	325	1.00
03/15/11	074	05:49	17:43	11.88	355	355	1.00

Appendix 6. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 89 nights during the Winter period (16 Dec 2010 - 15 Mar 2011) on Monhegan Island, Lincoln County, ME. Data images (28,565) were collected during 1243.9 hours (mean = 14.0 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
12/16/10	350	16:01	07:04	15.05	455	240	0.53
12/17/10	351	16:01	07:05	15.05	455	455	1.00
12/18/10	352	16:01	07:05	15.05	455	380	0.84
12/19/10	353	16:02	07:06	15.07	455	440	0.97
12/20/10	354	16:02	07:07	15.07	455	245	0.54
12/21/10	355	16:03	07:07	15.07	455	240	0.53
12/22/10	356	16:03	07:08	15.07	455	0	0.00
12/23/10	357	16:04	07:08	15.07	450	450	1.00
12/24/10	358	16:04	07:08	15.07	450	450	1.00
12/25/10	359	16:05	07:09	15.05	450	450	1.00
12/26/10	360	16:06	07:09	15.05	455	0	0.00
12/27/10	361	16:06	07:09	15.05	455	295	0.65
12/28/10	362	16:07	07:10	15.03	455	455	1.00
12/29/10	363	16:08	07:10	15.03	455	455	1.00
12/30/10	364	16:09	07:10	15.02	450	450	1.00
12/31/10	365	16:10	07:10	15.00	450	450	1.00
01/01/11	001	16:10	07:10	14.98	450	425	0.94
01/02/11	002	16:11	07:10	14.98	450	290	0.64
01/03/11	003	16:12	07:10	14.97	450	450	1.00
01/04/11	004	16:13	07:10	14.95	450	435	0.97
01/05/11	005	16:14	07:10	14.93	445	445	1.00
01/06/11	006	16:15	07:10	14.90	450	340	0.76
01/07/11	007	16:16	07:10	14.88	445	445	1.00
01/08/11	008	16:17	07:10	14.87	445	310	0.70
01/09/11	009	16:18	07:10	14.85	445	425	0.96
01/10/11	010	16:19	07:09	14.82	445	445	1.00
01/11/11	011	16:21	07:09	14.80	445	385	0.87
01/12/11	012	16:22	07:09	14.77	0	0	0.00
01/13/11	013	16:23	07:08	14.75	445	445	1.00
01/14/11	014	16:24	07:08	14.72	0	0	0.00
01/16/11	016	16:27	07:07	14.67	440	430	0.98
01/17/11	017	16:28	07:06	14.63	440	390	0.89
01/18/11	018	16:29	07:06	14.60	440	125	0.28
01/19/11	019	16:30	07:05	14.57	435	20	0.05
01/20/11	020	16:32	07:04	14.53	435	65	0.15
01/21/11	021	16:33	07:04	14.50	320	315	0.98
01/22/11	022	16:34	07:03	14.47	430	145	0.34
01/23/11	023	16:35	07:02	14.43	430	430	1.00
01/24/11	024	16:37	07:01	14.40	430	320	0.74
01/25/11	025	16:38	07:00	14.37	20	20	1.00
01/26/11	026	16:39	07:00	14.33	435	135	0.31
01/27/11	027	16:41	06:59	14.28	425	370	0.87
01/28/11	028	16:42	06:58	14.25	425	215	0.51
01/29/11	029	16:44	06:57	14.22	425	400	0.94
01/30/11	030	16:45	06:56	14.17	425	425	1.00
01/31/11	031	16:46	06:55	14.13	425	425	1.00
02/01/11	032	16:48	06:54	14.08	420	185	0.44
02/02/11	033	16:49	06:52	14.05	420	125	0.30
02/03/11	034	16:50	06:51	14.00	420	420	1.00
02/04/11	035	16:52	06:50	13.97	420	420	1.00
02/05/11	036	16:53	06:49	13.92	420	95	0.23
02/06/11	037	16:55	06:48	13.88	420	420	1.00
02/07/11	038	16:56	06:46	13.83	415	95	0.23

Appendix 6. Continued

02/08/11	039	16:57	06:45	13.78	415	245	0.59
02/09/11	040	16:59	06:44	13.75	415	415	1.00
02/10/11	041	17:00	06:43	13.70	415	415	1.00
02/11/11	042	17:01	06:41	13.65	410	370	0.90
02/12/11	043	17:03	06:40	13.62	405	400	0.99
02/13/11	044	17:04	06:38	13.57	405	395	0.98
02/14/11	045	17:05	06:37	13.52	405	290	0.72
02/15/11	046	17:07	06:36	13.47	405	405	1.00
02/16/11	047	17:08	06:34	13.43	400	400	1.00
02/17/11	048	17:09	06:33	13.38	400	400	1.00
02/18/11	049	17:11	06:31	13.33	400	385	0.96
02/19/11	050	17:12	06:30	13.28	400	400	1.00
02/20/11	051	17:14	06:28	13.23	395	270	0.68
02/21/11	052	17:15	06:27	13.18	395	395	1.00
02/22/11	053	17:16	06:25	13.13	395	395	1.00
02/23/11	054	17:17	06:23	13.08	390	390	1.00
02/24/11	055	17:19	06:22	13.05	390	300	0.77
02/25/11	056	17:20	06:20	13.00	390	225	0.58
02/26/11	057	17:21	06:19	12.95	390	205	0.53
02/27/11	058	17:23	06:17	12.90	390	300	0.77
02/28/11	059	17:24	06:15	12.85	385	385	1.00
03/01/11	060	17:25	06:14	12.80	385	385	1.00
03/02/11	061	17:27	06:12	12.75	385	350	0.91
03/03/11	062	17:28	06:10	12.70	385	385	1.00
03/04/11	063	17:29	06:09	12.65	380	380	1.00
03/05/11	064	17:30	06:07	12.60	380	380	1.00
03/06/11	065	17:32	06:05	12.55	380	150	0.39
03/07/11	066	17:33	06:03	12.50	375	355	0.95
03/08/11	067	17:34	06:02	12.45	375	375	1.00
03/09/11	068	17:36	06:00	12.40	375	330	0.88
03/10/11	069	17:37	05:58	12.35	370	200	0.54
03/11/11	070	17:38	05:56	12.30	365	185	0.51
03/12/11	071	17:39	05:55	12.25	365	325	0.89
03/13/11	072	17:41	05:53	12.20	365	365	1.00
03/14/11	073	17:42	05:51	12.15	365	365	1.00
03/15/11	074	17:43	05:49	12.10	365	365	1.00

Appendix 7. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 75 days during the Spring period (16 Mar - 31 May 2011) on Monhegan Island, Lincoln County, ME. Data images (29,880) were collected during 1029.3 hours (mean = 13.7 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
03/16/11	075	05:47	17:44	11.93	360	145	0.40
03/17/11	076	05:46	17:45	11.98	360	360	1.00
03/18/11	077	05:44	17:47	12.03	360	340	0.94
03/19/11	078	05:42	17:48	12.08	360	220	0.61
03/20/11	079	05:40	17:49	12.13	365	365	1.00
03/21/11	080	05:38	17:50	12.18	365	180	0.49
03/22/11	081	05:37	17:52	12.23	365	215	0.59
03/23/11	082	05:35	17:53	12.28	365	285	0.78
03/24/11	083	05:33	17:54	12.33	350	185	0.53
03/25/11	084	05:31	17:55	12.38	370	280	0.76
03/26/11	085	05:29	17:56	12.43	375	375	1.00
03/27/11	086	05:28	17:58	12.48	375	375	1.00
03/28/11	087	05:26	17:59	12.53	375	375	1.00
03/29/11	088	05:24	18:00	12.58	380	380	1.00
03/30/11	089	05:22	18:01	12.63	380	380	1.00
03/31/11	090	05:20	18:02	12.68	380	380	1.00
04/01/11	091	05:19	18:04	12.73	380	0	0.00
04/02/11	092	05:17	18:05	12.78	385	340	0.88
04/03/11	093	05:15	18:06	12.83	375	375	1.00
04/04/11	094	05:13	18:07	12.88	385	125	0.32
04/05/11	095	05:11	18:08	12.93	385	260	0.68
04/06/11	096	05:10	18:10	12.98	390	335	0.86
04/07/11	097	05:08	18:11	13.03	390	390	1.00
04/08/11	098	05:06	18:12	13.08	390	390	1.00
04/09/11	099	05:04	18:13	13.13	365	365	1.00
04/10/11	100	05:03	18:14	13.18	395	395	1.00
04/11/11	101	05:01	18:16	13.23	400	290	0.73
04/12/11	102	04:59	18:17	13.28	400	400	1.00
04/13/11	103	04:58	18:18	13.33	400	70	0.18
04/14/11	104	04:56	18:19	13.38	400	400	1.00
04/15/11	105	04:54	18:20	13.43	405	405	1.00
04/16/11	106	04:52	18:22	13.48	405	405	1.00
04/17/11	107	04:51	18:23	13.52	405	270	0.67
04/18/11	108	04:49	18:24	13.57	385	380	0.99
04/19/11	109	04:48	18:25	13.62	405	390	0.96
04/20/11	110	04:46	18:26	13.67	410	215	0.52
04/21/11	111	04:44	18:28	13.72	410	305	0.74
04/22/11	112	04:43	18:29	13.77	410	410	1.00
04/23/11	113	04:41	18:30	13.80	410	95	0.23
04/26/11	116	04:36	18:34	13.95	120	10	0.08
04/27/11	117	04:35	18:35	13.98	420	420	1.00
04/28/11	118	04:33	18:36	14.03	420	395	0.94
04/29/11	119	04:32	18:37	14.08	420	420	1.00
04/30/11	120	04:31	18:38	14.12	420	400	0.95
05/01/11	121	04:29	18:39	14.17	425	425	1.00
05/02/11	122	04:28	18:41	14.20	425	425	1.00
05/03/11	123	04:26	18:42	14.25	425	425	1.00
05/04/11	124	04:25	18:43	14.30	425	355	0.84
05/05/11	125	04:24	18:44	14.33	430	210	0.49
05/06/11	126	04:22	18:45	14.38	430	430	1.00
05/07/11	127	04:21	18:46	14.42	330	330	1.00
05/08/11	128	04:20	18:48	14.45	290	290	1.00
05/09/11	129	04:18	18:49	14.50	435	340	0.78

Appendix 7. Continued

05/10/11	130	04:17	18:50	14.53	435	95	0.22
05/11/11	131	04:16	18:51	14.58	435	350	0.80
05/12/11	132	04:15	18:52	14.62	435	395	0.91
05/13/11	133	04:14	18:53	14.65	440	440	1.00
05/14/11	134	04:13	18:54	14.68	440	400	0.91
05/15/11	135	04:11	18:55	14.73	440	45	0.10
05/16/11	136	04:10	18:57	14.77	440	150	0.34
05/17/11	137	04:09	18:58	14.80	440	315	0.72
05/18/11	138	04:08	18:59	14.83	445	390	0.88
05/19/11	139	04:07	19:00	14.87	445	395	0.89
05/20/11	140	04:06	19:01	14.90	445	305	0.69
05/21/11	141	04:06	19:02	14.93	445	390	0.88
05/22/11	142	04:05	19:03	14.97	135	135	1.00
05/23/11	143	04:04	19:04	15.00	450	365	0.81
05/24/11	144	04:03	19:05	15.02	450	395	0.88
05/25/11	145	04:02	19:06	15.05	450	450	1.00
05/26/11	146	04:01	19:07	15.08	450	450	1.00
05/27/11	147	04:01	19:08	15.10	455	455	1.00
05/28/11	148	04:00	19:09	15.13	455	455	1.00
05/29/11	149	03:59	19:09	15.17	455	440	0.97
05/30/11	150	03:59	19:10	15.18	455	355	0.78
05/31/11	151	03:58	19:11	15.20	455	445	0.98

Appendix 8. Data collection dates, start/end times, sunset/sunrise times and survey hour for marine radar study conducted on 75 nights during the Spring period (16 Mar - 31 May 2011) on Monhegan Island, Lincoln County, ME. Data images (18,805) were collected during 769.5 hours (mean = 10.3 hours/day). "Clean images" refers to data images that ar free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days th had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
03/16/11	075	17:44	05:47	12.05	360	345	0.96
03/17/11	076	17:45	05:46	12.00	360	325	0.90
03/18/11	077	17:47	05:44	11.95	360	275	0.76
03/19/11	078	17:48	05:42	11.90	360	360	1.00
03/20/11	079	17:49	05:40	11.85	355	355	1.00
03/21/11	080	17:50	05:38	11.80	355	0	0.00
03/22/11	081	17:52	05:37	11.75	355	160	0.45
03/23/11	082	17:53	05:35	11.70	355	215	0.61
03/24/11	083	17:54	05:33	11.65	350	320	0.91
03/25/11	084	17:55	05:31	11.60	345	305	0.88
03/26/11	085	17:56	05:29	11.55	345	345	1.00
03/27/11	086	17:58	05:28	11.50	345	345	1.00
03/28/11	087	17:59	05:26	11.45	345	345	1.00
03/29/11	088	18:00	05:24	11.40	340	340	1.00
03/30/11	089	18:01	05:22	11.35	340	340	1.00
03/31/11	090	18:02	05:20	11.30	340	10	0.03
04/01/11	091	18:04	05:19	11.25	340	160	0.47
04/02/11	092	18:05	05:17	11.20	335	335	1.00
04/03/11	093	18:06	05:15	11.15	335	335	1.00
04/04/11	094	18:07	05:13	11.10	335	275	0.82
04/05/11	095	18:08	05:11	11.05	335	280	0.84
04/06/11	096	18:10	05:10	11.00	330	330	1.00
04/07/11	097	18:11	05:08	10.95	330	330	1.00
04/08/11	098	18:12	05:06	10.90	330	330	1.00
04/09/11	099	18:13	05:04	10.85	325	325	1.00
04/10/11	100	18:14	05:03	10.80	325	160	0.49
04/11/11	101	18:16	05:01	10.75	320	300	0.94
04/12/11	102	18:17	04:59	10.70	320	295	0.92
04/13/11	103	18:18	04:58	10.65	320	135	0.42
04/14/11	104	18:19	04:56	10.60	320	320	1.00
04/15/11	105	18:20	04:54	10.55	315	315	1.00
04/16/11	106	18:22	04:52	10.50	315	200	0.63
04/17/11	107	18:23	04:51	10.47	315	265	0.84
04/18/11	108	18:24	04:49	10.42	315	195	0.62
04/19/11	109	18:25	04:48	10.37	315	210	0.67
04/20/11	110	18:26	04:46	10.32	310	275	0.89
04/21/11	111	18:28	04:44	10.27	310	310	1.00
04/22/11	112	18:29	04:43	10.22	310	310	1.00
04/23/11	113	18:30	04:41	10.18	90	60	0.67
04/26/11	116	18:34	04:36	10.03	300	230	0.77
04/27/11	117	18:35	04:35	10.00	300	295	0.98
04/28/11	118	18:36	04:33	9.95	300	285	0.95
04/29/11	119	18:37	04:32	9.90	300	220	0.73
04/30/11	120	18:38	04:31	9.87	300	300	1.00
05/01/11	121	18:39	04:29	9.82	295	295	1.00
05/02/11	122	18:41	04:28	9.78	295	290	0.98
05/03/11	123	18:42	04:26	9.73	295	165	0.56
05/04/11	124	18:43	04:25	9.68	295	115	0.39
05/05/11	125	18:44	04:24	9.65	290	205	0.71
05/06/11	126	18:45	04:22	9.60	290	290	1.00
05/07/11	127	18:46	04:21	9.57	0	0	0.00
05/08/11	128	18:48	04:20	9.53	285	285	1.00
05/09/11	129	18:49	04:18	9.48	285	35	0.12

Appendix 8. Continued

05/10/11	130	18:50	04:17	9.45	285	120	0.42
05/11/11	131	18:51	04:16	9.40	285	250	0.88
05/12/11	132	18:52	04:15	9.37	285	285	1.00
05/13/11	133	18:53	04:14	9.33	280	280	1.00
05/14/11	134	18:54	04:13	9.30	280	140	0.50
05/15/11	135	18:55	04:11	9.25	280	0	0.00
05/16/11	136	18:57	04:10	9.22	280	85	0.30
05/17/11	137	18:58	04:09	9.18	275	225	0.82
05/18/11	138	18:59	04:08	9.15	275	270	0.98
05/19/11	139	19:00	04:07	9.12	275	100	0.36
05/20/11	140	19:01	04:06	9.08	275	275	1.00
05/21/11	141	19:02	04:06	9.05	275	265	0.96
05/22/11	142	19:03	04:05	9.02	265	220	0.83
05/23/11	143	19:04	04:04	8.98	270	130	0.48
05/24/11	144	19:05	04:03	8.97	270	265	0.98
05/25/11	145	19:06	04:02	8.93	270	270	1.00
05/26/11	146	19:07	04:01	8.90	265	185	0.70
05/27/11	147	19:08	04:01	8.88	265	265	1.00
05/28/11	148	19:09	04:00	8.85	265	265	1.00
05/29/11	149	19:09	03:59	8.82	265	220	0.83
05/30/11	150	19:10	03:59	8.80	265	265	1.00
05/31/11	151	19:11	03:58	8.78	265	260	0.98

Appendix 9. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 43 days during the Spring period (1 Jun - 14 Jul 2011) on Monhegan Island, Lincoln County, ME. Data images (18,513) were collected during 660.9 hours (mean = 15.8 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

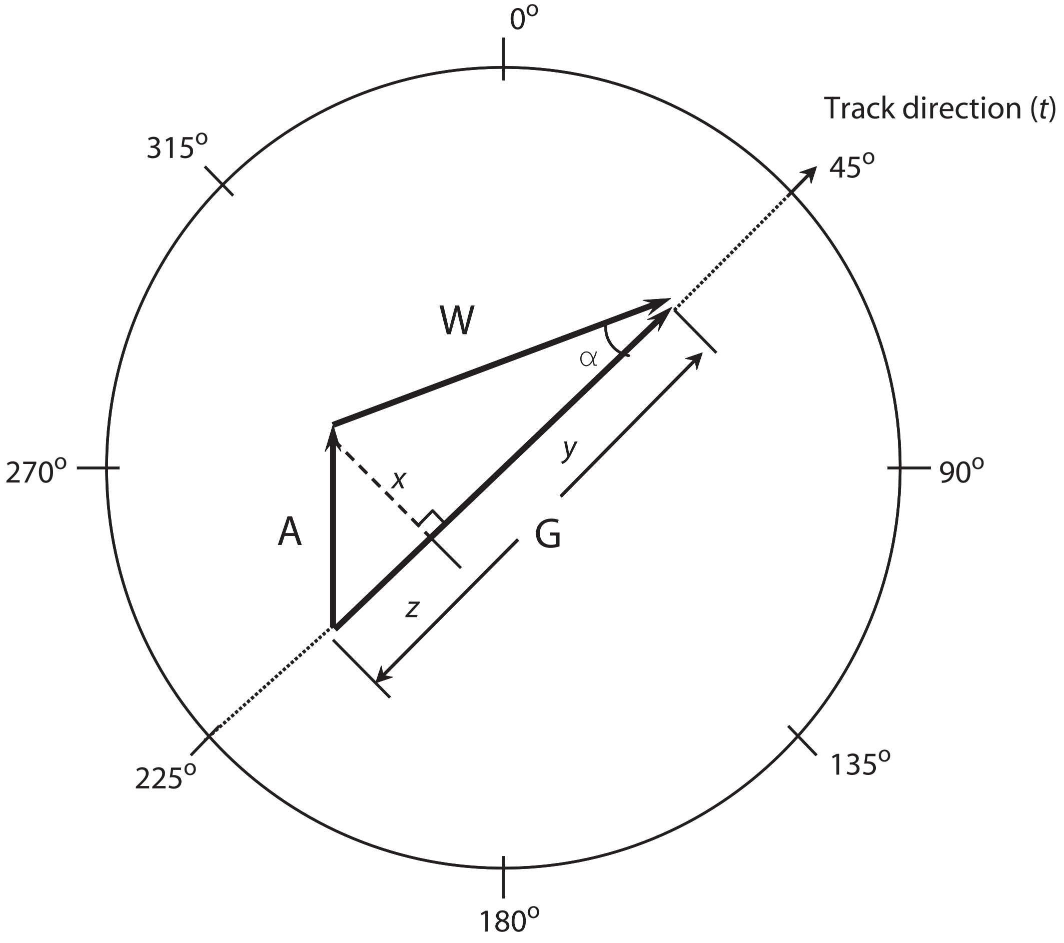
Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
06/01/11	152	03:58	19:12	15.23	455	390	0.86
06/02/11	153	03:57	19:13	15.25	455	455	1.00
06/03/11	154	03:57	19:14	15.27	460	435	0.95
06/04/11	155	03:56	19:14	15.30	460	460	1.00
06/05/11	156	03:56	19:15	15.32	365	365	1.00
06/06/11	157	03:55	19:16	15.33	460	460	1.00
06/07/11	158	03:55	19:16	15.35	460	430	0.93
06/08/11	159	03:55	19:17	15.37	440	440	1.00
06/09/11	160	03:55	19:18	15.38	20	20	1.00
06/10/11	161	03:54	19:18	15.38	460	460	1.00
06/11/11	162	03:54	19:19	15.40	460	200	0.43
06/12/11	163	03:54	19:19	15.42	460	40	0.09
06/13/11	164	03:54	19:20	15.42	460	365	0.79
06/14/11	165	03:54	19:20	15.43	460	100	0.22
06/15/11	166	03:54	19:21	15.43	468	468	1.00
06/16/11	167	03:54	19:21	15.45	465	465	1.00
06/17/11	168	03:54	19:21	15.45	465	430	0.92
06/18/11	169	03:54	19:22	15.45	465	390	0.84
06/19/11	170	03:54	19:22	15.45	465	465	1.00
06/20/11	171	03:54	19:22	15.47	465	465	1.00
06/21/11	172	03:55	19:23	15.47	465	465	1.00
06/22/11	173	03:55	19:23	15.47	465	455	0.98
06/23/11	174	03:55	19:23	15.45	465	325	0.70
06/24/11	175	03:55	19:23	15.45	460	0	0.00
06/25/11	176	03:56	19:23	15.45	460	330	0.72
06/26/11	177	03:56	19:23	15.45	460	375	0.82
06/27/11	178	03:56	19:23	15.43	195	195	1.00
06/28/11	179	03:57	19:23	15.43	465	465	1.00
06/29/11	180	03:57	19:23	15.42	460	445	0.97
06/30/11	181	03:58	19:23	15.42	460	460	1.00
07/01/11	182	03:58	19:23	15.40	460	460	1.00
07/02/11	183	03:59	19:23	15.38	460	460	1.00
07/03/11	184	03:59	19:22	15.38	460	445	0.97
07/04/11	185	04:00	19:22	15.37	460	460	1.00
07/05/11	186	04:01	19:22	15.35	460	460	1.00
07/06/11	187	04:01	19:22	15.33	460	455	0.99
07/07/11	188	04:02	19:21	15.32	455	455	1.00
07/08/11	189	04:03	19:21	15.30	455	455	1.00
07/10/11	191	04:04	19:20	15.25	255	255	1.00
07/11/11	192	04:05	19:19	15.23	450	450	1.00
07/12/11	193	04:06	19:19	15.22	455	450	0.99
07/13/11	194	04:06	19:18	15.18	420	290	0.69
07/14/11	195	04:07	19:18	15.17	240	240	1.00

Appendix 10. Data collection dates, start/end times, sunset/sunrise times and survey hours for marine radar study conducted on 43 nights during the Spring period (1 Jun - 14 Jul 2011) on Monhegan Island, Lincoln County, ME. Data images (8,550) were collected during 370.4 hours (mean = 8.6 hours/day). "Clean images" refers to data images that are free from insect or abiotic contamination (e.g., rain, dust). Bolded dates represent days that had <0.50 clean images, so were not incldued in statistical analyses. Start and end times are given in Eastern Standard Time.

Date	Julian day	Start Time	End Time	Total data collection hours	Total images collected	Clean images	Proportion clean images
06/01/11	152	19:12	03:58	8.75	265	265	1.00
06/02/11	153	19:13	03:57	8.73	260	215	0.83
06/03/11	154	19:14	03:57	8.72	260	220	0.85
06/04/11	155	19:14	03:56	8.68	260	260	1.00
06/05/11	156	19:15	03:56	8.67	260	260	1.00
06/06/11	157	19:16	03:55	8.65	260	260	1.00
06/07/11	158	19:16	03:55	8.63	260	260	1.00
06/08/11	159	19:17	03:55	8.62	0	0	0.00
06/09/11	160	19:18	03:55	8.60	260	170	0.65
06/10/11	161	19:18	03:54	8.60	260	260	1.00
06/11/11	162	19:19	03:54	8.58	260	25	0.10
06/12/11	163	19:19	03:54	8.57	260	135	0.52
06/13/11	164	19:20	03:54	8.57	260	105	0.40
06/14/11	165	19:20	03:54	8.55	255	25	0.10
06/15/11	166	19:21	03:54	8.55	255	255	1.00
06/16/11	167	19:21	03:54	8.53	255	255	1.00
06/17/11	168	19:21	03:54	8.53	255	195	0.76
06/18/11	169	19:22	03:54	8.53	255	255	1.00
06/19/11	170	19:22	03:54	8.53	255	255	1.00
06/20/11	171	19:22	03:54	8.52	255	255	1.00
06/21/11	172	19:23	03:55	8.52	255	210	0.82
06/22/11	173	19:23	03:55	8.52	255	100	0.39
06/23/11	174	19:23	03:55	8.53	255	120	0.47
06/24/11	175	19:23	03:55	8.53	260	50	0.19
06/25/11	176	19:23	03:56	8.53	260	255	0.98
06/26/11	177	19:23	03:56	8.53	260	250	0.96
06/27/11	178	19:23	03:56	8.55	255	255	1.00
06/28/11	179	19:23	03:57	8.55	255	225	0.88
06/29/11	180	19:23	03:57	8.57	260	260	1.00
06/30/11	181	19:23	03:58	8.57	260	260	1.00
07/01/11	182	19:23	03:58	8.58	260	260	1.00
07/02/11	183	19:23	03:59	8.60	260	260	1.00
07/03/11	184	19:22	03:59	8.60	255	135	0.53
07/04/11	185	19:22	04:00	8.62	255	255	1.00
07/05/11	186	19:22	04:01	8.63	260	260	1.00
07/06/11	187	19:22	04:01	8.65	255	195	0.76
07/07/11	188	19:21	04:02	8.67	260	260	1.00
07/08/11	189	19:21	04:03	8.68	55	55	1.00
07/10/11	191	19:20	04:04	8.73	260	255	0.98
07/11/11	192	19:19	04:05	8.75	265	185	0.70
07/12/11	193	19:19	04:06	8.77	265	265	1.00
07/13/11	194	19:18	04:06	8.80	135	0	0.00
07/14/11	195	19:18	04:07	8.82	250	250	1.00

Appendix 11

Wind Vector Schematic



A schematic representation used to calculate head or tailwind vectors (THV) for birds flying in a fixed track direction (t) and with a constant air speed (after Piersma and Jukema 1990). If α is the angular difference between t and the wind direction (w), then $\alpha = w \pm 180^{o} - t$. If W is wind velocity, A is the bird's air velocity, and G is its ground velocity, then the 'wind effect,' ΔW (THV) = G - A. If birds try to remain on course then the heading of G is always along t. Following the schematic and rules of trigonometry, THV can be calculated as follows: $\sin\alpha = x/W$, therefore $x = W\sin\alpha$. Also, $z = \sqrt{(A^2 - x^2)}$, and so $z = \sqrt{\{A^2 - (W\sin\alpha)^2\}}$. Additionally, $\cos\alpha = y/W$, and therefore $y = W\cos\alpha$. Because $G = y + z$, it follows that:

$$G = W\cos\alpha + \sqrt{\{A^2 - (W\sin\alpha)^2\}}.$$

Similarly, because $\Delta W(\text{THV}) = G - A$, it follows that:

$$\Delta W = W\cos\alpha + \sqrt{\{A^2 - (W\sin\alpha)^2\}} - A.$$

Appendix 12. Summary statistics for each Season/Period of data collection. Data collected during radar study conducted on Monhegan Island, Lincoiln County, ME to monitor bird and bat movement patterns and flight dynamics.

Season-Period	Variable	N	Mean	Standard error	Standard deviation	Lower95%	Upper95%	Minimum	Maximum
Fall/Early-Day									
	Targets recorded (TR)	76	338.46	49.83	434.45	239.18	437.74	16.00	2491.00
	Log-transformedTR	76	2.29	0.05	0.45	2.19	2.40	1.20	3.40
	Targets recorded/hr (TR/hr)	76	27.31	4.02	35.06	19.30	35.33	1.92	198.58
	Log-transformed TR/hr	76	1.20	0.05	0.45	1.10	1.31	0.28	2.30
	Targets recorded ≤ 25 m (TR25)	76	52.28	6.21	54.12	39.91	64.64	1.00	277.00
	Log-transformed TR25	76	1.49	0.06	0.49	1.38	1.61	0.00	2.44
	Proportion of targets recorded ≤ 25 m (PROP25)	76	0.04	0.00	0.03	0.03	0.05	0.01	0.14
	Arcsine-transformed PROP25	76	0.19	0.01	0.07	0.18	0.21	0.08	0.38
	Targets recorded > 25 m or≤ 50 m (TR50)	76	45.97	5.86	51.12	34.29	57.65	3.00	271.00
	Log-transformed TR50	76	1.45	0.05	0.44	1.35	1.55	0.48	2.43
	Proportion of targets recorded > 25 m or≤ 50 m (PROP50)	76	0.04	0.00	0.03	0.03	0.04	0.01	0.25
	Arcsinetransformed PROP50	76	0.18	0.01	0.07	0.17	0.20	0.07	0.52
	Targets recorded ≤ 100 m (TR100)	76	50.92	5.66	49.39	39.64	62.21	2.00	292.00
	Log-transformed TR100	76	1.55	0.04	0.37	1.47	1.64	0.30	2.47
	Proportion of targets recorded ≤ 100 m (PROP100)	76	0.05	0.00	0.03	0.04	0.05	0.01	0.21
	Arcsine-transformed PROP100	76	0.20	0.01	0.07	0.19	0.22	0.10	0.47
Fall/Early-Night									
	Targets recorded (TR)	75	789.29	109.00	943.99	891125.32	1006.49	27.00	4827.00
	Log-transformedTR	75	2.63	0.06	0.51	0.26	2.75	1.43	3.68
	Targets recorded/hr (TR/hr)	75	78.57	10.45	90.46	8182.99	99.38	2.31	474.79
	Log-transformed TR/hr	75	1.65	0.06	0.49	0.24	1.76	0.36	2.68
	Targets recorded ≤ 25 m (TR25)	75	85.59	12.33	106.77	11400.87	110.15	1.00	579.00
	Log-transformed TR25	75	1.66	0.06	0.52	0.27	1.78	0.00	2.76
	Proportion of targets recorded ≤ 25 m (PROP25)	75	0.03	0.00	0.02	0.00	0.03	0.00	0.11
	Arcsine-transformed PROP25	75	0.16	0.01	0.06	0.00	0.17	0.05	0.35
	Targets recorded > 25 m or≤ 50 m (TR50)	75	77.68	10.75	93.12	8670.46	99.10	5.00	423.00
	Log-transformed TR50	75	1.63	0.06	0.48	0.23	1.74	0.70	2.63
	Proportion of targets recorded > 25 m or≤ 50 m (PROP50)	75	0.03	0.00	0.02	0.00	0.03	0.00	0.14
	Arcsinetransformed PROP50	75	0.15	0.01	0.06	0.00	0.17	0.05	0.38
	Targets recorded ≤ 100 m (TR100)	75	98.72	14.24	123.35	15216.39	127.10	1.00	608.00
	Log-transformed TR100	75	1.69	0.06	0.56	0.31	1.82	0.00	2.78
	Proportion of targets recorded ≤ 100 m (PROP100)	75	0.03	0.00	0.02	0.00	0.03	0.00	0.07
	Arcsine-transformed PROP100	75	0.16	0.01	0.05	0.00	0.17	0.06	0.27

Appendix 12. Continued

Fall/Late-Day									
	Targets recorded (TR)	61	91.11	24.36	190.27	42.39	139.84	4.00	1284.00
	Log-transformedTR	61	1.62	0.06	0.49	1.49	1.74	0.60	3.11
	Targets recorded/hr (TR/hr)	61	9.18	2.13	16.64	4.92	13.44	0.46	111.65
	Log-transformed TR/hr	61	0.67	0.06	0.45	0.56	0.79	-0.34	2.05
	Targets recorded ≤ 25 m (TR25)	61	30.39	3.07	24.01	24.25	36.54	1.00	113.00
	Log-transformed TR25	61	1.31	0.06	0.45	1.20	1.43	0.00	2.05
	Proportion of targets recorded ≤ 25 m (PROP25)	61	0.13	0.01	0.11	0.10	0.16	0.01	0.69
	Arcsine-transformed PROP25	61	0.35	0.02	0.15	0.31	0.39	0.07	0.98
	Targets recorded > 25 m or≤ 50 m (TR50)	61	23.15	3.11	24.33	16.92	29.38	1.00	113.00
	Log-transformed TR50	61	1.17	0.05	0.42	1.06	1.28	0.00	2.05
	Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	61	0.10	0.01	0.08	0.07	0.12	0.01	0.44
	Arcsinetransformed PROP50	61	0.29	0.02	0.13	0.26	0.32	0.10	0.72
	Targets recorded ≤ 100 m (TR100)	61	19.89	3.05	23.79	13.79	25.98	1.00	121.00
	Log-transformed TR100	61	1.08	0.06	0.47	0.96	1.20	0.00	2.08
	Proportion of targets recorded ≤ 100 m (PROP100)	61	0.07	0.01	0.05	0.06	0.08	0.01	0.24
	Arcsine-transformed PROP100	61	0.26	0.01	0.09	0.23	0.28	0.07	0.51
Fall/Late-Night									
	Targets recorded (TR)	64	482.05	103.89	831.12	274.44	689.65	4.00	4316.00
	Log-transformedTR	64	2.05	0.10	0.81	1.84	2.25	0.60	3.64
	Targets recorded/hr (TR/hr)	64	38.90	8.03	64.21	22.86	54.94	0.32	323.70
	Log-transformed TR/hr	64	0.97	0.10	0.83	0.76	1.17	-0.49	2.51
	Targets recorded ≤ 25 m (TR25)	64	89.27	16.09	128.70	57.12	121.41	1.00	582.00
	Log-transformed TR25	64	1.50	0.09	0.69	1.32	1.67	0.00	2.76
	Proportion of targets recorded ≤ 25 m (PROP25)	64	0.09	0.01	0.12	0.06	0.12	0.01	0.55
	Arcsine-transformed PROP25	64	0.27	0.02	0.17	0.22	0.31	0.10	0.84
	Targets recorded > 25 m or≤ 50 m (TR50)	64	75.22	13.51	108.09	48.22	102.22	1.00	525.00
	Log-transformed TR50	64	1.46	0.08	0.66	1.30	1.63	0.00	2.72
	Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	64	0.08	0.01	0.08	0.06	0.10	0.01	0.37
	Arcsinetransformed PROP50	64	0.25	0.02	0.13	0.22	0.28	0.08	0.65
	Targets recorded ≤ 100 m (TR100)	64	73.97	16.12	128.97	41.75	106.18	1.00	673.00
	Log-transformed TR100	64	1.31	0.10	0.78	1.12	1.50	0.00	2.83
	Proportion of targets recorded ≤ 100 m (PROP100)	64	0.05	0.01	0.04	0.04	0.06	0.00	0.26
	Arcsine-transformed PROP100	64	0.20	0.01	0.09	0.18	0.22	0.05	0.54

Appendix 12. Continued

Winter-Day								
Targets recorded (TR)	66	29.12	5.87	47.68	17.40	40.84	2.00	291.00
Log-transformedTR	66	1.23	0.05	0.40	1.13	1.33	0.30	2.46
Targets recorded/hr (TR/hr)	66	3.73	0.82	6.68	2.08	5.37	0.19	43.65
Log-transformed TR/hr	66	0.31	0.05	0.42	0.21	0.41	-0.72	1.64
Targets recorded ≤ 25 m (TR25)	66	11.97	1.65	13.41	8.67	15.27	1.00	93.00
Log-transformed TR25	66	0.88	0.05	0.44	0.77	0.98	0.00	1.97
Proportion of targets recorded ≤ 25 m (PROP25)	66	0.10	0.01	0.08	0.08	0.12	0.00	0.45
Arcsine-transformed PROP25	66	0.30	0.02	0.13	0.27	0.33	0.06	0.74
Targets recorded > 25 m or≤ 50 m (TR50)	66	9.89	1.75	14.23	6.40	13.39	1.00	77.00
Log-transformed TR50	66	0.68	0.07	0.53	0.54	0.81	0.00	1.89
Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	66	0.07	0.01	0.07	0.05	0.09	0.01	0.39
Arcsinetransformed PROP50	66	0.24	0.01	0.12	0.21	0.27	0.08	0.68
Targets recorded ≤ 100 m (TR100)	66	7.55	1.24	10.08	5.07	10.02	1.00	63.00
Log-transformed TR100	66	0.62	0.06	0.46	0.51	0.74	0.00	1.80
Proportion of targets recorded ≤ 100 m (PROP100)	66	0.06	0.01	0.05	0.04	0.07	0.01	0.29
Arcsine-transformed PROP100	66	0.22	0.01	0.09	0.20	0.24	0.08	0.57
Winter-Night								
Targets recorded (TR)	69	97.51	54.75	454.77	-11.74	206.75	2.00	3535.00
Log-transformedTR	69	1.17	0.07	0.60	1.03	1.32	0.30	3.55
Targets recorded/hr (TR/hr)	69	7.55	3.81	31.63	-0.05	15.15	0.19	238.31
Log-transformed TR/hr	69	0.08	0.08	0.63	-0.08	0.23	-0.72	2.38
Targets recorded ≤ 25 m (TR25)	69	14.86	4.76	39.54	5.36	24.35	1.00	274.00
Log-transformed TR25	69	0.62	0.07	0.59	0.48	0.76	0.00	2.44
Proportion of targets recorded ≤ 25 m (PROP25)	69	0.06	0.01	0.08	0.04	0.08	0.01	0.51
Arcsine-transformed PROP25	69	0.23	0.02	0.12	0.20	0.26	0.08	0.79
Targets recorded > 25 m or≤ 50 m (TR50)	69	16.16	3.97	33.00	8.23	24.09	1.00	187.00
Log-transformed TR50	69	0.70	0.07	0.61	0.55	0.84	0.00	2.27
Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	69	0.07	0.01	0.07	0.05	0.09	0.01	0.35
Arcsinetransformed PROP50	69	0.24	0.01	0.12	0.22	0.27	0.09	0.63
Targets recorded ≤ 100 m (TR100)	69	11.72	4.18	34.69	3.39	20.06	1.00	204.00
Log-transformed TR100	69	0.51	0.07	0.56	0.37	0.64	0.00	2.31
Proportion of targets recorded ≤ 100 m (PROP100)	69	0.04	0.00	0.03	0.03	0.05	0.01	0.22
Arcsine-transformed PROP100	69	0.19	0.01	0.07	0.17	0.21	0.09	0.49

Appendix 12. Continued

Spring-Day									
	Targets recorded (TR)	64	109.73	20.96	167.65	67.86	151.61	2.00	930.00
	Log-transformedTR	64	1.66	0.07	0.58	1.51	1.80	0.30	2.97
	Targets recorded/hr (TR/hr)	64	8.52	1.62	12.93	5.29	11.75	0.16	78.59
	Log-transformed TR/hr	64	0.59	0.07	0.55	0.45	0.72	-0.80	1.90
	Targets recorded ≤ 25 m (TR25)	64	30.09	3.85	30.77	22.41	37.78	1.00	156.00
	Log-transformed TR25	64	1.25	0.06	0.50	1.12	1.38	0.00	2.19
	Proportion of targets recorded ≤ 25 m (PROP25)	64	0.11	0.01	0.10	0.09	0.13	0.00	0.36
	Arcsine-transformed PROP25	64	0.31	0.02	0.15	0.27	0.35	0.06	0.64
	Targets recorded > 25 m or≤ 50 m (TR50)	64	21.67	3.33	26.63	15.02	28.32	1.00	147.00
	Log-transformed TR50	64	1.11	0.06	0.45	0.99	1.22	0.00	2.17
	Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	64	0.07	0.01	0.05	0.06	0.08	0.01	0.25
	Arcsinetransformed PROP50	64	0.25	0.01	0.10	0.22	0.27	0.09	0.52
	Targets recorded ≤ 100 m (TR100)	64	17.81	2.43	19.41	12.96	22.66	1.00	91.00
	Log-transformed TR100	64	0.97	0.07	0.56	0.83	1.11	0.00	1.96
	Proportion of targets recorded ≤ 100 m (PROP100)	64	0.05	0.01	0.04	0.04	0.06	0.00	0.19
	Arcsine-transformed PROP100	64	0.21	0.01	0.09	0.19	0.24	0.04	0.45
Spring-Night									
	Targets recorded (TR)	59	300.10	51.98	399.27	196.05	404.15	3.00	2155.00
	Log-transformedTR	59	2.04	0.09	0.73	1.85	2.23	0.48	3.33
	Targets recorded/hr (TR/hr)	59	34.15	5.95	45.69	22.24	46.05	0.26	235.09
	Log-transformed TR/hr	59	1.08	0.10	0.76	0.89	1.28	-0.58	2.37
	Targets recorded ≤ 25 m (TR25)	59	68.73	13.56	104.13	41.59	95.87	1.00	636.00
	Log-transformed TR25	59	1.48	0.08	0.65	1.31	1.64	0.00	2.80
	Proportion of targets recorded ≤ 25 m (PROP25)	59	0.07	0.01	0.08	0.05	0.09	0.01	0.49
	Arcsine-transformed PROP25	59	0.25	0.01	0.12	0.22	0.28	0.11	0.77
	Targets recorded > 25 m or≤ 50 m (TR50)	59	52.93	9.30	71.43	34.32	71.55	1.00	391.00
	Log-transformed TR50	59	1.36	0.08	0.63	1.20	1.53	0.00	2.59
	Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	59	0.05	0.01	0.04	0.04	0.06	0.01	0.24
	Arcsinetransformed PROP50	59	0.21	0.01	0.08	0.19	0.23	0.09	0.52
	Targets recorded ≤ 100 m (TR100)	59	57.88	11.41	87.66	35.04	80.72	1.00	446.00
	Log-transformed TR100	59	1.34	0.09	0.69	1.16	1.52	0.00	2.65
	Proportion of targets recorded ≤ 100 m (PROP100)	59	0.04	0.00	0.03	0.04	0.05	0.01	0.13
	Arcsine-transformed PROP100	59	0.20	0.01	0.06	0.19	0.22	0.10	0.37

Appendix 12. Continued

Summer-Day									
	Targets recorded (TR)	39	195.21	25.34	158.27	143.90	246.51	5.00	638.00
	Log-transformedTR	39	2.13	0.07	0.43	1.99	2.27	0.70	2.80
	Targets recorded/hr (TR/hr)	39	14.99	2.21	13.79	10.52	19.46	1.73	66.00
	Log-transformed TR/hr	39	1.03	0.06	0.36	0.91	1.15	0.24	1.82
	Targets recorded ≤ 25 m (TR25)	39	39.69	5.89	36.75	27.78	51.61	2.00	149.00
	Log-transformed TR25	39	1.40	0.07	0.47	1.25	1.55	0.30	2.17
	Proportion of targets recorded ≤ 25 m (PROP25)	39	0.05	0.01	0.06	0.03	0.07	0.00	0.30
	Arcsine-transformed PROP25	39	0.21	0.02	0.11	0.18	0.25	0.06	0.58
	Targets recorded > 25 m or≤ 50 m (TR50)	39	29.97	4.97	31.03	19.92	40.03	1.00	127.00
	Log-transformed TR50	39	1.25	0.08	0.49	1.09	1.41	0.00	2.10
	Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	39	0.04	0.00	0.03	0.03	0.04	0.00	0.15
	Arcsinetransformed PROP50	39	0.18	0.01	0.07	0.15	0.20	0.03	0.40
	Targets recorded ≤ 100 m (TR100)	39	34.72	5.46	34.07	23.67	45.76	1.00	180.00
	Log-transformed TR100	39	1.34	0.07	0.47	1.19	1.49	0.00	2.26
	Proportion of targets recorded ≤ 100 m (PROP100)	39	0.04	0.01	0.04	0.03	0.06	0.00	0.21
	Arcsine-transformed PROP100	39	0.20	0.01	0.08	0.17	0.22	0.05	0.48
Summer-Night									
	Targets recorded (TR)	34	133.59	18.25	106.41	96.46	170.72	23.00	527.00
	Log-transformedTR	34	2.03	0.05	0.29	1.92	2.13	1.36	2.72
	Targets recorded/hr (TR/hr)	34	16.39	2.03	11.85	12.25	20.52	5.11	60.81
	Log-transformed TR/hr	34	1.13	0.04	0.26	1.04	1.22	0.71	1.78
	Targets recorded ≤ 25 m (TR25)	34	22.12	2.67	15.56	16.69	27.55	3.00	69.00
	Log-transformed TR25	34	1.25	0.05	0.30	1.14	1.35	0.48	1.84
	Proportion of targets recorded ≤ 25 m (PROP25)	34	0.04	0.00	0.03	0.03	0.05	0.01	0.13
	Arcsine-transformed PROP25	34	0.19	0.01	0.06	0.17	0.21	0.11	0.36
	Targets recorded > 25 m or≤ 50 m (TR50)	34	18.53	2.47	14.38	13.51	23.55	1.00	61.00
	Log-transformed TR50	34	1.12	0.07	0.41	0.97	1.26	0.00	1.79
	Proportion of targets recorded > 25 m or ≤ 50 m (PROP50)	34	0.03	0.00	0.02	0.02	0.04	0.00	0.10
	Arcsinetransformed PROP50	34	0.17	0.01	0.06	0.15	0.19	0.06	0.32
	Targets recorded ≤ 100 m (TR100)	34	23.88	2.64	15.37	18.52	29.25	3.00	68.00
	Log-transformed TR100	34	1.29	0.05	0.29	1.19	1.39	0.48	1.83
	Proportion of targets recorded ≤ 100 m (PROP100)	34	0.04	0.00	0.02	0.03	0.05	0.02	0.08
	Arcsine-transformed PROP100	34	0.20	0.01	0.04	0.18	0.21	0.13	0.28

Appendix 13. Results of marine radar image analyses for data collected on 78 days (i.e., sunrise to sunset the same day) during the Fall-early season (15 Jul - 30 Sep 2010). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																					
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
07/15/10	1529	306	37	25	35	45	63	28	42	51	57	37	32	49	70	72	48	43	49	58	31	23	39	34	29	46	58	31	31	25	16	32	38	25	20	32	10	17	12	27	7	10
07/16/10	872	184	6	14	14	11	10	13	21	28	25	30	27	43	60	39	54	29	33	40	32	29	21	40	31	25	17	8	31	21	15	15	10	3	7	4	6	1	6	5	7	1
07/17/10	534	105	23	25	37	44	35	19	29	11	5	13	16	15	7	9	11	15	6	10	2	4	3	4	6	0	13	6	23	6	3	8	15	2	18	11	10	18	11	4	3	0
07/18/10	504	123	18	12	28	47	28	14	17	14	7	13	2	13	26	23	10	11	20	10	18	10	15	4	13	5	2	8	8	5	5	9	3	3	14	10	12	4	1	1	4	0
07/19/10	1882	375	69	54	43	44	52	66	73	70	89	86	84	91	125	122	74	79	59	42	58	43	36	23	25	41	12	25	41	16	22	32	9	23	26	28	19	3	13	11	3	14
07/20/10	2715	537	72	75	39	35	77	96	111	96	98	115	110	128	148	154	123	125	99	95	71	84	46	33	36	30	24	33	32	15	32	22	32	43	36	55	36	25	28	11	32	19
07/21/10	2354	464	49	56	53	69	73	70	48	61	93	98	85	76	97	95	64	82	100	77	75	82	66	91	44	38	39	59	54	50	22	16	21	40	22	21	31	23	24	20	35	15
07/22/10	657	125	35	31	31	29	15	24	32	9	16	18	32	28	29	16	29	27	30	15	7	9	22	14	3	3	8	5	11	2	10	3	7	2	9	6	7	6	2	10	6	0
07/23/10	730	141	31	26	26	43	40	33	13	26	35	27	25	26	45	35	29	21	19	14	33	18	17	14	17	11	8	13	5	4	2	5	11	6	1	6	2	2	5	0	2	3
07/24/10	209	41	2	3	4	2	4	3	1	0	3	18	0	13	16	15	15	11	9	7	0	7	8	2	3	0	6	5	0	1	4	0	1	0	1	0	0	2	0	7	1	10
07/25/10	290	54	28	12	22	11	10	8	5	8	11	10	9	5	13	9	2	4	15	1	6	6	12	6	3	0	1	10	1	11	5	3	4	9	4	3	4	10	2	0	0	0
07/26/10	419	76	29	21	12	23	16	22	16	9	5	7	7	1	12	12	10	23	22	10	2	3	11	14	9	6	15	9	4	14	2	1	0	0	2	6	4	9	1	1	0	0
07/27/10	580	113	43	14	16	30	26	14	19	21	28	39	16	13	11	29	25	14	24	27	14	12	13	11	3	13	5	6	9	6	8	16	2	1	0	3	3	5	1	3	0	3
07/28/10	518	98	24	26	34	32	28	24	29	16	11	15	17	8	20	20	13	17	10	19	14	6	3	5	19	6	10	4	6	1	5	8	9	7	4	5	9	8	0	2	3	1
07/29/10	366	69	11	3	13	20	11	16	4	5	6	4	18	20	18	15	14	16	20	7	2	13	13	12	1	4	7	4	8	11	12	5	6	13	3	0	0	0	5	3	0	0
07/30/10	1354	269	31	53	25	53	48	35	49	67	82	66	73	63	47	53	35	46	43	66	52	33	30	18	27	23	20	9	25	16	17	14	21	14	9	20	14	4	5	4	2	2
07/31/10	2369	471	81	36	60	104	101	122	146	109	157	107	151	138	147	136	148	117	96	97	58	43	29	15	9	12	12	13	8	8	16	4	2	22	10	2	4	1	1	13	3	5
08/01/10	599	113	47	35	26	17	31	26	17	9	13	5	12	14	16	6	13	8	10	9	13	1	16	18	12	14	11	20	9	16	16	21	12	8	7	13	8	4	16	7	16	0
08/02/10	436	87	13	13	12	30	14	10	5	5	7	7	7	3	14	10	8	11	0	12	12	6	2	6	8	8	4	8	21	14	22	17	26	21	11	7	13	12	9	8	4	4
08/03/10	186	32	13	11	11	26	17	14	4	4	4	8	2	2	1	2	0	3	7	6	0	0	4	2	1	0	0	1	2	2	2	3	2	0	0	0	1	3	0	1	0	2
08/04/10	189	33	2	7	16	30	13	11	10	5	4	3	1	10	5	6	7	8	6	0	1	1	0	3	3	0	1	0	5	0	1	2	2	1	0	0	1	0	0	0	0	2
08/05/10	478	96	5	4	4	9	4	2	4	3	9	0	0	11	16	19	6	15	12	26	21	14	11	4	10	18	10	16	22	13	7	14	12	9	18	6	4	19	10	15	2	16
08/06/10	1101	237	19	28	34	28	35	44	40	37	32	62	46	34	53	62	39	33	26	33	37	30	29	25	33	25	13	22	6	21	17	4	3	7	11	8	6	3	0	9	10	1
08/07/10	727	145	48	21	35	52	52	29	16	16	25	26	21	25	8	15	17	9	7	7	12	14	8	11	6	27	8	10	14	7	16	10	5	6	14	6	0	7	8	9	0	5
08/08/10	834	163	11	19	33	25	15	13	18	14	12	6	24	29	29	35	37	39	24	26	10	16	13	17	10	21	26	25	18	25	13	10	12	7	17	15	7	15	12	24	13	11
08/09/10	884	178	23	13	10	34	7	0	4	14	12	6	12	14	2	2	4	10	5	4	15	9	14	5	15	11	20	33	39	34	35	36	43	39	39	35	38	40	44	27	23	11
08/10/10	3266	647	70	44	58	69	106	102	82	96	71	83	56	78	88	58	78	68	64	109	92	72	79	158	95	120	158	169	169	126	96	79	85	66	36	22	21	28	40	18	12	18
08/11/10	3698	1028	129	120	83	111	116	107	125	103	122	112	121	203	191	136	136	198	192	183	157	127	117	109	65	53	52	30	35	31	25	21	24	36	19	13	11	27	24	20	9	11
08/12/10	1467	552	28	54	53	63	36	58	71	54	50	48	63	69	80	51	57	55	39	46	52	59	43	38	19	21	28	30	18	7	13	31	9	7	8	13	18	19	3	2	8	6
08/13/10	875	181	26	19	37	31	23	33	27	38	19	33	23	34	37	48	38	39	14	16	14	38	15	11	10	20	24	28	15	17	10	9	18	14	9	11	7	6	24	3	4	1
08/14/10	336	72	5	7	12	15	8	4	11	13	7	12	17	13	10	5	15	18	26	2	10	4	8	5	1	2	7	10	0	1	2	0	10	1	1	0	2	8	8	3	2	8
08/15/10	177	34	0	4	11	19	12	5	8	2	1	6	2	7	4	1	4	5	10	5	1	4	3	7	0	0	4	8	1	0	1	2	5	6	0	0	7	4	2	0	0	3
08/16/10	102	16	7	25	18	21	20	4	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/17/10	1432	279	45	17	35	38	29	37	16	39	27	25	28	31	39	23	37	28	34	67	32	52	26	23	62	36	32	63	26	36	35	18	31	32	13	24	36	42	55	37	22	36
08/18/10	3610	717	159	111	110	88	227	222	164	125	114	115	128	116	140	144	117	96	106	94	99	91	120	90	129	106	100	72	51	66	44	42	15	16	12	20	14	29	13	11	7	11
08/19/10	4175	830	62	75	102	128	88	129	139	186	152	141	157	319	300	289	187	142	115	108	126	128	97	109	90	39	82	61	89	61	47	30	62	49	47	44	26	13	26	3	24	7
08/20/10	2430	485	95	52	80	83	85	118	113	97	115	114	118	156	104	90	82	94	101	98	72	106	69	45	27	20	31	25	19	20	22	28	10	13	5	7	14	5	11	12	6	3
08/21/10	1951	384	92	103	87	86	86	95	68	62	102	78	100	99	98	83	64	84	65	66	72	59	51	35	32	27	9	23	13	17	15	12	11	2	0	4	3	0	0	5	5	9
08/22/10	429	87	16	14	35	16	13	8	27	10	6	11	2	7	20	11	16	3	7	0	4	5	1	9	2	0	8	3	7	3	0	4	2	4	1	2	3	1	1	8	8	11
08/23/10	265	66	19	10	5	4	3	4	1	3	3	6	7	5	9	6	4	6	11	9	1	2	8	4	11	10	10	5	12	7	9	4	5	1	3	2	3	3	0	1	3	4
08/24/10	1328	264	50	46	45	22	26	30	46	24	32	33	46	61	89	94	78	83	104	91	55	47	18	18	32	20	25	9	13	12	11	5	7	7	2	5	3	7	2	3	0	2
08/25/10	84	14	20	15	3	1	4	1	1	0	0	2	0	1	4	2	0	0	0	1	0	0	2	1	1	1	0	2	3	0	0	1	0	0	0	0	0	0	2	0	1	2
08/26/10	298	55	13	14	5	7	21	22	8	5	7	16	11	13	27	9	11	6	12	1	0	13	4	10	2	12	7	5	9	1	0	4	1	0	1	2	4	1	1	4	0	0
08/27/10	1890	373	78	80	57	72	98	47	71	69	60	46	48	62	72	47	66	82	71	72	57	30	34	27	36	47	44	61	74	32	28	34	32	16	23	13	9	2	6	5	8	11
08/28/10	2908	577	59	47	46	61	69	73	48	25	33	59	31	51	36	35	54	20	60	70	99	153	126	165	208	216	238	170	163	119	77	79	35	28	27	21	27	13	13	5	4	6
08/29/10	938	185	22	15	10	23	13	28	12	15	34	32	33	33	36	38	37	70	45	58	48	37	35	37	30	23	25	13	11	14	9	2	13	20	4	8	4	0	4	0	0	2
08/30/10	3015	599	104	37	61	73	90	86	70	73	64	60	114	134	136	158	130	151	134	135	141	134	124	92	65	81	69	57	63	23	28	43	33	22	7	47	13	19	14	17	15	30
08/31/10	938	183	34	23	34	20	33	32	34	23	18	19	17	40	47	49	36	32	29	30	33	28	37	21	21	38	22	18	20	16	9	11	6	1	13	6	3	9	15	4	8	3
09/01/10	924	188	66	30	31	47	38	34	38	18	17	17	26	39	34	27	33	34	14	25	30	10	27	13	11	16	40	15	10	15	20	16	32	5	8	10	4	12	5	5	2	2
09/02/10	674	138	78	50	38	35	34	38	24	15	18	18	11	17	13	20	16	5	8	23	29	16	5	7	12	4	8	7	1	8	11	1	8	0	11	1	2	2	6	6	8	4

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
9	7	20	14	16	3	7	0	5	2	0	0	0	0	0	2	4	0	1	0	1	0	0	1	0	0	2	0	1	0	0	0	0	0	0
3	0	3	0	1	5	5	8	0	0	4	1	5	0	0	0	1	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1	5	1	0	3	0	3	1	3	1	3	0	0	1	1	0	0	0	0	0	0	0	1	4	0	0	4	0	0	0	1	1	0	0	0
1	1	0	0	10	0	2	1	3	3	2	3	8	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1	12	7	5	1	0	0	0	5	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	16	19	17	7	14	9	5	6	7	2	5	0	0	0	4	2	0	0	0	0	0	0	0	0	1	6	0	0	0	0	0	0	0	0
30	22	14	8	2	6	5	5	6	4	10	6	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
6	3	1	9	1	0	0	1	9	0	0	1	0	2	3	10	10	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	1	4	1	3	5	2	0	3	0	1	0	1	0	0	1	1	1	0	1	1	2	0	0	1	0	0	0	0	0	0	0
14	5	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	5	2	1	2	0	7	8	6	3	2	3	1	0	0	0	2	0	0	0	0	0	3	1	0	0	1	0	0	0	0	1	0	0	0
0	3	2	2	5	2	6	0	5	0	0	0	0	3	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
2	1	4	1	0	1	0	0	1	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0
0	0	5	4	0	0	0	0	0	0	0	0	1	1	0	0	0	0	5	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0
2	1	0	4	4	5	0	0	3	7	2	1	0	0	0	1	0	0	1	5	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0
0	1	6	0	5	2	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0
5	1	0	1	4	1	6	1	0	0	0	1	3	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
0	0	0	0	3	0	0	0	2	1	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0
0	3	0	2	0	3	1	3	2	0	3	0	1	3	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	2	3	2	0	0	1	0	1	1	0	0	3	4	0	1	0	1	0	0	0
6	12	8	7	4	5	1	2	0	2	0	1	1	0	2	0	0	0	0	0	0	5	0	0	0	1	0	0	0	1	0	0	0	0	0
3	4	13	0	12	15	12	1	4	4	0	2	4	1	1	7	6	4	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
11	6	8	5	8	10	5	2	1	10	1	8	0	0	0	0	0	0	6	6	5	0	2	0	0	0	0	0	0	0	0	0	0	1	0
11	17	12	9	3	8	9	1	5	1	2	1	1	1	2	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0
3	5	6	2	5	6	3	0	5	1	0	4	3	1	4	2	0	2	0	2	5	2	7	4	4	3	2	0	1	3	16	0	2	0	0
24	15	18	18	10	10	1	5	0	2	1	6	3	2	1	3	1	2	0	0	0	0	0	0	0	1	0	0	1	0	0	1	2	0	0
9	8	11	18	7	11	9	4	7	11	7	19	12	5	8	5	7	5	4	0	6	3	1	3	1	1	0	1	2	7	2	0	0	0	0
9	1	1	1	2	7	3	0	2	1	0	0	2	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
9	2	3	3	1	0	3	6	0	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	4	5	8	2	0	1	4	0	0	0	1	0	0	0	0	0	1	0	1	0	0	5	1	0	0	0	1	0	1	2	0	0	1	0
1	1	0	0	3	2	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	5	5	1	4	8	3	8	3	5	0	5	0	1	0	1	1	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0
7	4	2	2	5	9	9	3	4	4	5	1	1	7	6	1	0	0	1	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
14	8	12	12	13	5	1	3	0	3	5	0	2	3	0	4	1	0	0	0	0	0	0	2	3	2	0	2	0	0	1	0	0	0	0
3	3	6	4	4	5	4	4	1	1	5	1	1	0	0	0	1	2	5	1	0	0	1	2	3	2	4	0	0	0	0	2	0	0	0
0	0	4	0	2	3	3	1	1	1	0	1	1	2	0	0	0	0	0	0	3	0	1	0	0	1	1	0	1	0	2	0	0	1	0
4	3	14	3	5	5	3	7	9	1	4	2	2	0	2	1	0	0	1	2	3	3	3	5	2	6	4	8	5	2	6	2	3	0	0
0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	0	2	4	7	7	5	9	1	1
0	0	2	5	0	0	3	0	0	0	3	3	1	1	1	0	1	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	1	0	5	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
0	0	0	1	0	2	0	0	0	0	0	0	1	0	1	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
13	8	7	10	0	3	4	3	2	1	0	1	0	0	0	5	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	8	5	4	2	0	0	3	0	2	0	0	0	1	7	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
0	2	1	6	6	0	1	4	5	2	0	1	0	0	1	0	4	4	1	0	2	0	0	0	1	1	0	0	1	1	0	0	1	0	0
6	4	10	8	4	4	0	2	4	3	0	2	4	0	1	1	1	2	0	0	2	1	5	1	0	0	0	0	0	1	1	0	1	0	0
12	4	1	1	1	0	1	3	2	1	0	0	5	0	0	0	0	4	1	5	0	3	0	0	1	0	1	0	0	0	0	0	0	0	0
2	10	2	0	2	6	2	7	2	4	2	0	0	0	0	0	0	2	3	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
0	5	2	10	1	9	4	3	0	1	1	0	0	3	0	0	0	0	0	0	2	2	2	6	0	0	0	0	0	0	3	2	0	0	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
09/03/10	1124	295	129	85	31	25	13	10	10	8	15	5	4	16	16	23	16	21	26	25	17	11	13	15	20	8	21	18	28	11	40	24	14	14	30	27	20	21	43	19	21	29
09/04/10	273	54	38	25	21	18	14	11	11	5	12	13	7	11	5	14	5	1	1	4	4	5	2	0	1	6	4	0	0	0	3	0	0	3	1	4	0	4	0	0	5	0
09/05/10	253	49	9	9	18	30	10	6	8	6	2	3	13	9	4	5	5	5	5	10	5	0	2	3	1	3	9	4	5	5	1	0	1	3	0	2	0	2	2	0	4	1
09/06/10	390	72	5	11	7	12	13	12	10	16	6	15	15	17	14	25	17	5	22	5	11	9	6	9	7	2	3	16	1	13	1	0	0	13	9	7	9	6	1	8	4	0
09/07/10	401	75	15	32	20	14	8	20	17	15	10	8	1	7	10	10	6	6	8	18	15	20	9	6	9	1	3	11	8	2	9	8	8	10	13	4	2	2	5	1	4	6
09/08/10	2329	462	68	102	38	51	67	99	76	60	37	70	66	59	64	77	76	88	41	49	60	45	50	45	43	90	32	100	30	56	67	52	49	46	36	36	40	55	14	26	29	9
09/09/10	2364	467	66	59	36	55	92	69	84	80	78	101	110	95	101	121	100	87	87	71	85	78	61	68	65	96	67	47	35	30	44	29	19	18	10	20	9	19	10	4	4	7
09/10/10	2328	461	60	80	81	72	101	119	85	99	90	118	91	66	95	102	85	72	72	69	55	72	73	69	52	71	38	39	17	6	24	14	12	14	3	14	9	5	8	10	18	15
09/11/10	12460	2491	277	271	283	292	321	374	473	551	562	651	807	910	915	800	683	628	608	475	398	292	240	203	206	140	116	103	96	65	59	42	46	36	50	46	23	41	36	31	49	43
09/12/10	2442	486	193	182	168	151	144	123	113	97	84	91	77	67	83	81	53	74	38	48	63	53	60	45	38	28	41	31	29	28	36	16	17	17	17	10	7	1	3	9	2	7
09/13/10	870	175	46	35	56	23	35	42	39	33	35	30	13	41	46	24	21	20	27	28	21	16	24	15	23	7	10	3	2	7	9	7	25	6	16	9	8	8	2	0	8	7
09/14/10	1410	278	15	9	17	21	11	14	9	7	6	15	7	19	19	31	25	35	40	64	46	75	54	62	55	80	92	68	80	83	39	35	50	40	22	28	33	11	8	4	12	10
09/15/10	588	120	33	25	41	22	36	33	11	21	15	26	41	24	25	28	24	25	17	14	19	13	6	9	6	8	2	0	0	2	2	1	5	6	1	1	2	1	0	6	0	4
09/16/10	921	190	29	24	21	31	25	22	28	22	22	12	33	33	55	46	58	56	48	41	43	44	32	14	33	19	15	5	9	7	17	8	3	0	2	3	1	7	7	12	3	0
09/17/10	2011	651	78	61	46	64	67	76	84	97	83	69	69	84	71	77	88	85	66	80	87	57	54	33	55	38	38	28	34	43	15	21	11	17	8	6	12	0	8	2	3	0
09/18/10	4816	1034	250	237	173	221	237	220	220	201	199	230	195	302	250	224	187	162	171	148	145	103	87	76	74	81	42	37	57	29	16	18	27	34	25	7	19	12	5	17	4	4
09/19/10	678	149	13	17	11	18	14	14	14	4	9	7	20	23	18	29	40	28	15	18	28	24	27	20	26	17	28	34	21	29	12	14	9	9	9	0	2	1	3	4	5	2
09/20/10	11752	2416	110	136	126	144	244	228	221	266	314	309	378	594	680	612	566	590	657	605	635	558	487	427	342	347	281	307	265	226	174	145	140	146	121	75	58	51	28	41	25	27
09/21/10	1246	246	31	33	35	33	36	57	53	51	52	78	84	88	79	93	89	49	40	47	25	22	27	21	29	15	1	13	9	14	1	4	3	6	0	0	1	2	4	0	0	0
09/22/10	450	92	14	16	27	28	20	28	16	24	17	11	15	11	16	18	4	4	11	14	23	15	21	16	9	8	1	1	10	7	1	1	1	6	6	0	5	1	3	4	2	1
09/23/10	5172	1203	135	125	151	178	213	202	204	253	225	223	270	325	366	378	370	350	234	197	186	122	135	55	50	33	27	10	24	20	13	22	12	6	7	5	8	6	8	8	1	2
09/24/10	724	163	44	36	20	65	39	17	19	12	13	7	14	13	14	21	26	20	16	19	29	29	17	16	17	20	28	21	28	27	14	7	8	7	7	4	5	0	6	4	1	1
09/25/10	1572	691	168	161	103	111	113	81	52	24	32	37	30	60	48	35	29	64	53	28	36	46	37	32	10	28	26	33	21	4	3	5	4	5	12	8	4	6	6	2	4	0
09/26/10	2441	492	63	40	32	72	46	55	65	53	59	63	98	134	173	172	119	190	152	113	118	94	126	64	49	31	33	38	31	4	20	31	15	18	9	6	5	4	8	1	2	4
09/27/10	841	165	42	32	18	38	30	20	30	9	5	14	12	25	23	32	32	31	29	29	8	32	29	16	32	27	23	32	23	26	14	8	4	7	5	6	6	12	15	3	13	3
09/28/10	218	39	8	4	11	7	3	2	0	3	1	3	8	3	3	14	5	6	17	9	21	4	10	4	7	6	14	7	9	5	3	2	1	1	1	1	3	1	0	1	2	1
09/29/10	735	144	5	4	17	41	31	11	8	14	8	15	18	19	12	17	22	19	34	39	41	35	42	27	29	48	22	17	14	21	17	13	26	2	14	6	9	3	0	0	0	0
09/30/10	288	54	20	19	11	12	4	3	4	1	7	13	5	11	16	13	11	8	13	11	2	3	2	13	20	4	6	2	0	13	7	2	0	5	1	0	2	3	0	6	2	1

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
39	20	15	15	15	12	19	16	6	2	2	1	2	4	0	3	2	2	0	0	1	3	0	0	0	0	1	0	0	1	0	1	0	0	0
0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
3	4	6	0	4	2	0	4	0	5	1	0	0	2	1	0	0	3	1	0	0	0	5	0	0	0	0	0	1	0	0	0	0	1	0
3	0	1	2	1	2	1	1	0	0	0	2	1	0	0	1	0	1	0	0	8	2	0	0	0	0	0	0	1	0	0	1	0	0	0
3	1	2	1	0	4	2	3	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
28	18	6	8	3	17	4	12	1	1	0	4	3	4	2	5	0	2	2	8	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
8	3	1	0	0	1	1	3	1	0	2	2	2	0	3	7	2	5	2	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
6	2	4	3	10	7	5	17	3	5	7	7	7	0	8	6	0	0	6	1	3	6	3	4	0	2	4	4	0	1	0	2	0	0	0
27	31	28	13	21	5	1	8	12	2	7	7	5	7	10	15	5	1	5	1	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0
3	8	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
3	10	3	0	1	0	0	0	0	0	0	0	0	0	0	1	4	3	3	5	2	3	2	0	0	0	1	1	0	0	0	0	0	1	0
10	8	5	5	1	9	1	2	2	1	1	0	0	0	5	1	0	5	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0
2	1	0	5	4	2	2	1	1	0	0	0	0	1	0	0	2	1	1	0	0	0	0	2	3	2	3	0	0	0	0	0	0	0	0
0	0	1	0	0	1	0	1	2	1	0	2	0	3	3	0	0	5	2	3	1	3	1	0	0	0	0	0	0	1	0	1	0	0	0
0	2	7	9	18	5	21	6	3	2	2	2	4	8	0	0	1	1	0	0	0	0	3	1	0	0	1	0	0	0	0	0	0	0	0
19	1	5	3	0	6	0	2	2	13	4	2	0	0	3	0	2	1	0	0	4	0	0	0	0	0	0	0	1	1	1	0	0	0	0
2	6	0	5	2	0	6	0	5	5	0	0	1	0	1	0	0	0	1	1	0	1	1	2	1	0	0	1	0	0	1	0	0	0	0
4	15	5	1	6	3	4	0	3	0	2	1	2	2	0	1	4	0	2	0	0	1	5	2	0	1	1	0	0	0	0	0	0	1	0
2	5	3	0	0	1	0	3	2	1	0	0	0	0	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3	3	0	2	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0
0	2	0	2	1	1	1	0	1	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	1	1	0	2	0	0	0	0	0	0	0	0	1	0	0	0
4	4	4	0	1	0	0	1	0	2	2	3	1	0	0	0	1	0	1	2	0	1	0	1	0	1	2	0	0	0	0	0	0	0	0
12	4	0	0	1	7	10	6	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
6	1	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	4	1	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0

Appendix 14. Results of marine radar image analyses for data collected on 79 nights (i.e., sunset to sunrise the next day) during the Fall-early season (15 Jul - 30 Sep 2010). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975
07/14/10	681	136	17	19	14	13	17	9	7	9	13	15	18	8	24	24	18	42	23	28	21	41	29	31	10	25	24	22	19	23	5	16	9	7	5	21	3	5	0	5	7
07/15/10	426	80	7	13	4	20	12	12	9	10	12	13	22	3	15	15	8	29	25	15	15	12	9	12	3	1	19	17	16	8	7	1	13	17	3	4	0	8	0	5	0
07/16/10	845	166	11	13	10	7	25	21	23	20	26	30	44	44	36	36	29	40	32	38	22	21	25	21	4	14	18	17	21	6	19	15	19	29	18	5	8	14	14	10	5
07/17/10	1040	205	32	20	15	22	26	19	15	18	13	30	21	17	32	35	19	32	25	40	35	41	38	24	34	39	38	43	25	25	18	34	29	19	29	22	15	23	18	12	11
07/18/10	4496	896	113	150	101	251	286	277	218	221	195	223	199	202	190	151	122	130	102	107	84	108	92	70	90	75	43	71	50	56	60	33	35	37	43	32	35	24	47	32	25
07/19/10	4373	869	45	35	29	42	37	95	57	62	70	133	140	246	316	342	338	394	320	328	283	248	197	119	121	46	64	48	35	29	16	21	22	18	7	13	7	4	6	7	7
07/20/10	3603	746	44	26	17	39	85	72	71	83	73	103	101	140	139	158	111	125	129	166	165	142	142	136	136	112	117	131	99	86	62	67	82	81	37	29	41	50	33	34	24
07/21/10	2197	446	12	6	10	25	42	67	55	69	93	94	114	178	106	132	106	161	164	95	102	70	79	62	58	57	31	38	37	32	22	11	5	7	9	14	2	1	8	3	0
07/22/10	1739	370	49	50	32	50	43	101	82	62	56	53	48	49	67	70	65	60	47	49	47	57	47	63	58	46	58	36	30	28	27	25	21	16	12	8	17	15	13	6	5
07/23/10	80	37	3	5	3	2	1	1	7	2	1	0	5	1	3	3	3	0	6	5	0	3	1	2	4	0	1	3	0	0	5	1	4	3	0	0	0	0	0	0	0
07/24/10	401	76	22	13	18	16	17	20	6	7	11	5	10	11	19	10	23	21	16	25	8	22	15	13	14	15	2	5	4	6	6	5	0	0	0	0	0	0	0	5	4
07/25/10	1419	284	27	26	26	43	50	52	52	64	59	48	40	78	83	69	47	47	64	45	35	30	39	41	32	21	41	37	27	36	32	12	17	22	6	7	12	1	8	4	3
07/26/10	813	161	21	18	15	35	30	32	20	32	15	20	14	11	26	19	36	24	25	23	17	18	23	22	27	29	19	19	8	17	10	13	4	7	33	10	16	9	12	14	2
07/27/10	1623	338	29	21	27	25	24	25	30	24	25	15	16	46	53	63	38	89	78	71	57	40	84	67	84	64	57	49	42	46	33	21	14	46	24	23	16	13	12	14	18
07/28/10	262	50	21	36	28	9	3	8	14	12	5	4	5	3	6	4	0	10	0	6	5	7	2	7	4	2	2	7	9	5	0	10	0	4	0	3	7	2	6	0	0
07/29/10	10185	2142	192	149	169	249	310	347	348	381	369	437	357	455	498	525	507	530	489	465	445	385	338	313	280	211	227	186	162	130	127	68	79	68	50	51	58	29	35	24	37
07/30/10	8926	1809	69	60	55	125	156	257	242	295	352	422	502	561	582	578	464	490	434	381	394	331	304	304	199	180	191	166	101	88	100	88	64	65	64	30	37	19	15	26	22
07/31/10	1284	256	47	36	41	55	54	49	48	27	32	38	56	64	54	52	62	54	69	75	61	30	23	37	40	47	24	12	20	13	11	6	3	2	1	4	0	3	0	7	2
08/01/10	442	99	19	25	22	31	14	9	6	4	7	16	16	19	15	6	4	15	14	9	11	16	12	17	18	9	5	1	12	4	6	5	7	2	10	2	10	2	10	1	4
08/02/10	280	57	16	9	17	17	9	1	4	18	10	13	11	7	4	3	10	8	5	9	5	1	7	3	4	26	21	4	1	6	1	5	7	0	0	1	0	3	0	0	3
08/03/10	377	72	1	5	12	7	15	21	14	11	13	7	7	25	22	8	3	9	3	7	7	6	13	16	6	6	10	25	15	4	2	8	16	10	4	1	6	13	3	0	3
08/04/10	1070	219	8	18	24	16	17	18	13	13	8	10	24	26	29	34	24	40	53	30	44	20	53	43	57	46	47	29	48	17	38	13	28	31	14	14	31	17	4	15	6
08/05/10	845	171	14	16	19	24	18	26	6	38	19	16	19	25	43	51	35	33	44	33	27	36	21	48	18	31	8	25	15	17	9	7	11	20	10	16	7	6	5	2	5
08/06/10	6131	1244	160	99	98	129	200	251	256	251	193	197	236	256	237	187	202	196	237	241	237	165	188	168	163	166	147	113	134	132	103	86	78	59	76	57	50	55	38	35	49
08/07/10	2660	533	24	35	40	39	31	36	31	27	39	60	27	40	37	50	43	50	73	52	26	39	55	36	31	64	48	71	56	65	86	63	112	75	98	81	100	78	97	63	89
08/08/10	862	169	7	8	10	28	14	17	14	15	16	19	18	48	32	39	46	58	62	27	38	32	34	20	27	23	14	27	22	11	8	8	14	5	17	14	6	2	8	8	11
08/09/10	1499	304	13	9	25	24	24	26	34	18	26	34	55	59	54	42	27	62	47	72	48	64	62	68	62	51	52	41	35	55	46	25	24	14	28	5	13	11	9	18	15
08/10/10	6997	1416	122	115	125	188	279	341	288	274	360	379	425	365	436	356	312	283	227	210	210	166	151	117	102	123	122	70	105	84	56	76	64	47	49	47	28	30	33	28	35
08/11/10	10157	2033	253	311	368	434	428	391	351	407	426	393	387	442	339	397	290	266	300	235	218	230	251	211	226	200	179	163	191	144	190	115	136	112	110	91	63	61	56	56	57
08/12/10	3226	642	138	172	155	151	156	143	128	120	120	108	88	107	99	104	126	150	84	115	100	81	79	75	84	61	47	64	44	35	42	41	29	25	27	25	7	9	8	9	6
08/13/10	783	153	18	17	13	14	26	30	22	44	32	25	36	34	47	34	27	18	39	23	16	19	26	17	19	11	9	13	12	10	21	14	15	10	4	6	7	13	4	5	2
08/14/10	385	74	22	17	30	7	11	9	8	20	9	11	22	11	15	15	17	11	6	3	3	11	9	11	2	10	1	1	14	5	4	4	10	2	6	6	7	8	5	2	2
08/15/10	164	28	10	10	3	0	4	4	6	0	1	2	2	9	8	1	8	6	7	3	9	9	11	3	2	2	4	0	2	4	1	3	3	5	0	0	0	4	1	0	2
08/16/10	545	140	2	7	1	6	18	14	14	11	7	5	14	6	5	19	26	17	23	25	24	22	25	30	18	12	21	29	13	7	20	7	6	5	1	7	14	6	6	4	1
08/17/10	3567	768	67	44	78	122	131	124	132	146	200	197	193	245	224	183	156	149	100	103	104	55	86	71	53	69	65	49	27	33	46	39	23	29	22	20	26	15	5	7	16
08/18/10	1940	490	86	63	52	61	64	67	51	62	71	66	76	74	81	86	74	69	57	73	89	52	61	73	34	42	40	31	17	23	20	18	26	23	22	9	16	3	2	4	4
08/19/10	1242	268	25	47	31	49	37	53	46	67	45	74	71	73	45	55	45	23	36	20	10	21	18	17	19	28	21	40	27	7	21	25	6	4	6	11	10	16	8	4	3
08/20/10	11997	2493	195	206	199	250	362	367	416	435	483	530	534	581	588	577	492	507	502	407	377	307	313	273	228	185	189	213	213	146	140	124	147	128	94	88	105	70	94	40	86
08/21/10	1470	293	23	25	41	41	26	26	29	38	50	61	49	65	67	72	42	68	73	45	42	62	36	30	33	40	42	37	15	27	20	24	21	24	22	20	13	20	9	4	14
08/22/10	1284	257	146	147	114	76	108	75	69	77	63	46	51	43	17	17	4	19	18	19	7	18	8	11	9	6	6	4	6	5	1	0	2	2	0	4	6	1	0	1	1
08/23/10	2392	480	135	115	138	104	131	105	108	82	79	93	98	106	105	94	60	49	37	48	54	61	43	50	42	68	26	52	36	28	41	33	36	29	21	9	17	8	10	7	0
08/24/10	1159	234	99	79	52	48	61	43	55	31	40	35	29	29	15	39	60	32	38	27	38	26	38	14	11	8	16	8	13	4	0	4	3	6	2	1	4	5	7	3	0
08/25/10	38	8	9	4	3	0	0	0	0	0	0	0	0	2	0	0	1	0	1	1	5	3	1	2	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/26/10	1449	348	54	35	42	80	66	35	36	52	64	72	44	53	60	50	39	38	42	39	47	21	33	52	21	23	33	35	33	31	19	16	20	18	17	20	7	5	4	11	12
08/27/10	6521	1401	121	144	137	170	214	214	185	192	203	237	195	263	262	301	248	286	321	284	263	258	211	200	209	203	165	117	74	80	72	83	86	53	54	60	25	44	39	38	26
08/28/10	1108	224	26	23	28	28	50	31	15	35	49	43	30	45	40	47	35	29	14	28	25	12	34	25	27	23	19	18	9	4	19	19	21	22	3	6	14	19	3	11	14
08/29/10	2351	530	39	34	26	34	61	82	61	73	75	62	60	77	87	69	77	55	61	65	49	55	51	45	25	46	23	32	47	43	29	42	25	20	28	23	25	31	26	22	26
08/30/10	3554	757	95	80	56	77	129	99	137	99	134	85	94	127	109	68	91	107	71	71	57	75	70	90	76	62	73	53	57	67	65	39	40	43	43	37	36	23	38	57	33
08/31/10	2178	457	44	43	57	54	94	89	75	93	62	62	62	31	44	62	25	47	58	42	63	60	47	47	47	47	54	53	58	44	30	16	15	18	17	11	27	24	25	33	23
09/01/10	907	181	25	14	24	11	30	24	11	13	18	25	35	17	24	31	16	30	41	17	49	31	22	37	23	32	11	23	13	28	22	17	10	13	10	3	15	15	22	6	9

Total targets by altitudinal strata (25 meter bins)

1000	1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
1	1	10	2	0	7	1	0	1	2	2	0	0	0	1	3	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	2	0	1	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	5	9	6	0	4	4	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	4	6	0	1	2	4	1	1	0	0	1	2	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
16	25	18	13	8	1	11	3	5	2	1	3	1	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
1	0	6	2	5	1	5	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
25	22	17	7	7	12	6	2	3	1	3	1	0	1	0	1	2	0	2	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
4	3	4	5	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
8	13	2	7	2	0	3	4	4	2	9	1	1	1	0	0	0	3	0	0	4	4	0	0	3	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
5	5	0	0	1	0	2	1	2	4	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	5	1	0	2	2	2	0	0	0	0	0
3	0	2	4	5	2	4	1	3	1	3	3	5	4	5	4	0	0	5	0	0	0	3	2	1	0	0	1	0	7	0	0	0	0	0	0
6	12	9	3	3	3	11	6	3	16	2	7	0	0	1	3	5	2	1	1	1	1	0	1	0	0	0	1	0	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0
3	25	9	10	12	3	6	3	0	4	0	0	0	3	2	2	5	5	4	0	0	0	2	0	0	0	0	0	4	3	0	0	0	0	0	0
16	6	18	19	12	15	6	3	2	6	4	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	5	0	6	0	0	2	0	0	0	2	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	0	2	0	0	0	0	0	0	0
0	0	5	0	2	8	1	1	0	3	0	0	0	3	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	1	1	0	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	2	0	0	1	0	0	0	4	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	4	3	1	2	12	0	0	2	1	1	2	0	0	6	6	0	3	1	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	2	1	0	3	0	0	3	2	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	5	1	0	0	0
21	26	19	20	22	13	15	6	25	4	1	0	0	5	7	9	3	0	0	0	1	0	1	0	0	0	0	0	3	3	2	0	0	0	0	0
66	67	53	38	49	29	23	21	17	21	18	15	20	8	6	8	3	3	6	4	2	2	1	0	1	0	3	3	1	2	2	0	0	1	0	0
1	1	2	6	6	5	2	1	3	0	1	0	0	1	0	2	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
18	12	5	1	2	12	6	3	6	5	1	2	5	5	3	3	1	4	0	0	1	0	4	0	1	0	0	1	0	0	0	0	0	1	0	0
29	22	20	16	10	7	10	5	5	5	7	1	0	3	1	3	5	0	0	3	1	2	6	0	2	0	0	2	2	0	1	1	0	0	0	0
46	39	43	26	53	30	54	45	42	24	33	18	39	38	16	21	14	19	3	20	12	12	0	5	8	6	3	5	5	0	0	0	0	0	0	0
0	4	1	7	2	1	4	5	2	3	0	1	5	2	1	5	2	1	0	0	0	4	0	1	2	2	0	5	3	1	0	0	0	0	0	0
2	2	3	4	3	2	0	1	1	2	3	2	0	0	0	0	0	0	4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	6	3	0	0	0	0	0	1	0	0	2	1	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	6	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	4	6	3	4	1	1	7	3	0	2	4	0	0	0	1	0	1	0	0	1	0	0	1	0	1	0	2	2	1	0	0	0	0	0	0
14	16	11	9	3	5	5	9	2	2	5	9	3	3	6	0	0	0	0	0	0	0	0	2	4	3	0	0	0	2	0	0	0	0	0	0
9	10	10	7	5	4	10	10	1	1	8	0	0	5	0	0	6	0	0	6	2	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0
0	6	0	4	5	8	11	6	1	5	3	2	0	4	9	2	5	1	1	0	0	3	0	0	1	0	1	0	0	0	0	0	0	0	0	0
72	79	49	47	77	28	48	49	32	33	25	10	44	27	27	17	18	12	12	16	15	14	14	9	4	14	5	1	2	1	4	0	0	1	0	0
14	6	3	1	4	2	5	0	2	1	1	1	2	0	0	0	0	0	1	0	2	2	0	5	2	4	2	1	1	1	2	1	2	4	2	0
0	0	0	0	3	7	3	1	1	2	0	0	0	4	1	0	2	0	1	1	2	1	2	1	2	5	6	5	3	4	2	5	7	6	0	0
10	5	2	2	2	0	0	2	3	2	0	0	0	0	0	2	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
5	3	5	14	7	4	6	5	16	7	3	0	2	8	1	0	2	6	6	5	6	2	4	2	4	0	1	6	4	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	3	2	0	2	3	5	24	4	0	3	5	0	0	2	5	5	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	1	0
21	22	17	7	7	24	13	8	0	7	2	5	8	9	1	9	3	8	2	6	2	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
12	14	4	2	8	14	13	11	4	8	8	8	8	3	0	6	1	1	2	4	0	1	3	6	2	0	3	6	6	2	0	2	0	3	0	0
20	32	19	31	17	23	10	18	19	17	22	24	31	16	26	23	5	21	6	14	16	15	15	15	25	9	20	9	4	5	4	3	6	0	0	0
20	28	35	37	44	36	49	27	17	22	19	16	37	39	51	29	22	19	7	6	31	10	14	6	6	21	11	5	12	3	1	5	4	2	0	0
41	5	13	10	25	15	7	10	19	14	9	17	4	7	14	17	22	18	6	6	6	7	11	9	2	7	14	5	9	16	2	8	0	0	0	0
2	0	12	16	4	8	1	1	6	5	0	3	3	1	12	4	6	0	0	2	0	1	0	0	0	0	0	0	0	2	0	0	0	0	1	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975
09/02/10	1388	283	35	46	29	26	30	37	25	28	42	28	35	36	61	50	28	28	63	36	44	63	50	34	51	50	27	20	7	30	36	23	31	32	39	18	19	14	6	11	16
09/03/10	535	106	108	97	80	83	61	58	22	6	2	0	0	0	0	0	0	0	0	2	0	0	0	0	1	3	1	0	0	0	10	0	0	0	0	0	0	0	0	0	0
09/04/10	2076	410	19	10	17	17	23	19	28	18	40	61	48	94	91	75	54	66	85	87	75	74	79	83	59	88	76	35	52	51	56	37	45	49	28	32	22	17	42	31	26
09/05/10	1979	391	37	19	38	38	31	30	32	30	44	28	40	55	67	78	58	60	63	67	46	49	50	64	56	53	49	52	39	49	42	42	40	37	29	48	27	33	23	37	28
09/06/10	1311	284	25	34	21	25	22	24	20	29	28	21	33	37	53	28	44	59	44	32	58	33	57	52	58	30	26	24	26	25	29	23	22	18	25	13	25	13	28	11	8
09/07/10	2747	620	85	130	73	79	96	89	55	67	75	56	62	48	71	83	78	89	89	102	73	74	53	92	64	77	49	70	76	75	68	72	75	51	23	41	33	34	21	23	29
09/08/10	23635	4827	242	245	256	313	511	624	630	891	875	859	1095	1132	1211	1168	957	1181	1093	976	1000	871	879	774	750	610	559	575	528	400	360	258	256	230	230	144	173	163	115	80	64
09/09/10	14318	2885	177	115	153	214	316	345	327	392	433	468	525	544	653	652	613	726	712	656	602	469	425	418	403	353	321	252	281	242	214	186	160	176	149	146	151	132	72	113	94
09/10/10	7956	1613	103	73	94	138	199	200	184	267	265	299	292	315	299	289	293	272	324	261	272	280	230	204	165	167	109	147	131	104	140	105	124	93	127	95	67	92	106	62	58
09/11/10	9748	1984	295	326	315	295	273	357	278	298	250	295	244	274	283	341	287	282	306	354	336	353	309	302	263	218	240	249	249	207	164	125	103	113	74	65	51	43	36	39	52
09/12/10	3000	603	129	72	83	114	82	113	146	81	82	123	141	147	187	159	161	158	204	111	118	108	82	61	57	29	30	27	23	10	9	12	6	14	3	11	12	20	7	19	4
09/13/10	652	137	32	26	30	29	26	25	28	19	13	29	31	40	24	25	27	33	19	13	19	1	10	23	17	11	5	1	8	3	6	7	8	14	6	4	1	1	0	3	7
09/14/10	7411	1487	89	69	81	165	206	222	257	248	224	256	325	375	367	391	296	344	298	309	287	272	209	207	174	150	167	119	161	132	85	94	91	101	82	70	83	68	61	54	42
09/15/10	5092	1022	67	66	79	100	134	181	147	183	128	175	145	151	147	114	92	133	112	147	107	113	87	100	79	105	121	141	97	126	119	103	81	96	97	112	100	94	74	59	59
09/16/10	1274	288	96	66	6	7	22	9	10	8	28	16	39	56	75	76	80	86	69	51	57	52	29	45	30	25	36	33	23	17	22	6	10	14	6	9	5	3	2	4	11
09/17/10	22178	4451	380	351	377	558	586	633	658	623	633	628	705	777	768	835	756	779	755	738	662	687	676	585	639	622	599	520	424	425	370	355	326	333	272	251	276	205	163	184	129
09/18/10	1460	295	94	74	81	82	80	93	57	54	51	82	63	55	58	88	48	28	35	45	42	44	30	29	7	14	19	5	25	7	4	4	12	10	1	1	1	4	0	6	0
09/19/10	5006	1009	116	120	144	126	212	196	213	251	230	226	259	299	282	273	239	232	165	188	164	143	113	98	80	75	52	59	61	41	26	23	21	38	23	18	30	15	11	12	27
09/20/10	7443	1486	92	81	94	241	209	251	286	236	248	178	192	122	126	183	181	171	207	180	186	205	220	223	205	164	164	192	145	143	117	115	136	142	122	146	120	85	86	86	95
09/21/10	1454	294	13	17	21	25	27	34	48	87	96	141	149	149	150	80	57	43	32	34	30	26	23	18	25	17	7	6	6	8	13	14	1	5	3	13	5	7	0	0	5
09/22/10	6526	1308	74	59	69	95	113	122	123	132	104	126	131	216	180	179	184	221	221	182	165	172	191	202	179	182	205	189	115	196	202	175	147	180	132	138	138	107	77	83	85
09/23/10	6275	1251	164	131	153	164	154	182	150	149	185	195	223	232	232	287	257	341	327	314	323	285	251	239	191	149	145	90	96	77	42	51	24	50	39	32	13	16	29	18	13
09/24/10	7282	1468	99	180	185	136	151	211	274	214	208	150	166	240	223	237	197	264	287	337	341	329	357	353	356	321	305	252	195	159	102	99	61	73	53	40	31	22	15	17	10
09/25/10	14977	3023	579	423	469	608	808	791	703	654	655	618	620	645	717	697	537	622	583	513	420	412	353	365	271	259	232	202	179	145	144	81	71	81	64	48	50	48	44	38	19
09/26/10	6058	1241	525	391	345	392	376	412	398	373	369	353	309	227	206	177	124	117	108	69	85	95	61	66	64	76	41	28	29	23	31	14	44	23	9	18	6	5	8	7	1
09/27/10	1248	252	82	49	63	24	34	15	10	9	14	12	10	37	43	52	42	56	55	48	52	67	55	82	61	64	30	31	34	30	8	19	1	10	4	2	9	8	4	8	3
09/28/10	2302	538	29	17	19	9	8	13	6	11	17	35	37	29	67	57	88	85	126	124	102	144	144	148	155	122	120	105	105	85	53	42	48	39	34	19	16	4	9	2	2
09/29/10	2140	443	55	33	51	42	43	25	35	64	40	35	67	73	89	92	88	73	87	64	115	94	88	62	81	92	64	45	37	62	54	36	31	38	34	22	17	15	19	16	10
09/30/10	148	27	17	6	4	2	0	0	3	3	2	0	2	1	2	6	1	9	5	8	8	6	9	3	5	6	4	9	2	3	1	3	2	2	1	0	1	3	3	2	0

Total targets by altitudinal strata (25 meter bins)

1000	1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
18	11	11	7	8	2	3	0	6	6	1	0	3	1	0	1	5	0	6	0	1	5	3	1	0	2	0	0	0	2	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	20	18	21	11	8	9	14	6	7	4	3	1	4	1	5	3	1	0	5	0	0	0	0	0	0	0	2	0	0	1	2	0	0	0	0
24	17	21	32	7	21	24	14	23	7	9	3	3	7	10	1	5	6	4	1	3	6	7	1	5	1	1	0	7	0	1	0	0	0	0	0
28	12	12	12	18	1	6	12	4	0	0	2	0	2	4	0	2	5	0	1	0	2	0	0	1	0	0	1	1	0	0	1	0	0	1	0
23	17	18	11	4	4	3	4	7	5	8	4	4	2	1	8	7	2	0	1	4	3	2	0	0	0	0	0	0	0	2	2	1	0	0	0
48	57	41	29	35	33	22	19	25	7	9	5	2	8	4	2	0	0	0	0	1	4	1	0	1	1	1	1	0	1	0	0	0	0	0	0
77	79	75	56	52	53	21	37	41	25	25	30	16	30	29	26	28	21	21	28	25	25	20	29	14	18	11	14	5	4	1	1	1	0	0	0
77	69	70	66	73	63	24	48	49	57	61	51	43	26	26	17	13	13	21	12	10	2	5	2	7	0	1	5	0	0	0	0	0	0	0	0
71	44	57	73	68	52	34	44	20	38	42	28	28	41	22	39	11	15	2	26	4	3	9	4	12	1	7	1	0	0	1	6	0	1	0	0
0	6	1	5	8	2	2	1	1	4	0	3	2	3	0	0	1	0	4	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3	5	2	4	3	2	2	2	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
21	9	20	13	24	17	11	5	3	12	7	4	3	2	4	1	1	1	10	0	0	1	1	0	6	1	0	0	0	0	0	0	0	3	0	0
57	33	45	57	38	30	42	25	39	19	24	18	31	33	23	15	14	12	20	22	11	12	17	13	16	17	8	4	5	6	6	1	3	3	2	0
4	3	1	1	2	0	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	2	2	2	6	1	2	2	0
135	167	146	137	133	84	98	85	88	85	104	101	63	61	95	67	44	44	48	24	22	14	23	25	11	18	1	1	0	2	2	1	4	2	0	0
1	0	5	1	0	1	0	0	4	1	1	0	0	0	0	1	3	0	0	1	3	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0
6	14	0	4	8	11	6	7	3	1	0	7	4	2	3	0	3	2	4	10	1	4	1	0	0	0	0	0	0	2	0	1	0	1	0	0
62	89	81	64	42	35	51	31	66	32	44	38	31	28	36	30	20	32	45	35	11	27	8	28	21	26	10	7	3	9	7	10	6	2	1	0
2	0	2	0	2	2	0	0	0	1	0	1	3	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0
79	90	42	44	52	46	44	48	51	50	52	38	31	15	16	6	6	1	2	2	2	1	0	3	0	3	2	2	0	0	2	2	1	0	2	0
16	24	14	12	13	20	15	27	7	24	9	16	4	7	10	4	16	2	1	10	4	2	0	3	0	0	0	0	0	0	0	0	2	0	0	0
4	2	1	4	1	1	3	0	1	1	0	3	0	0	2	2	2	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0
20	33	12	22	20	15	8	16	8	4	0	5	2	3	3	1	0	0	2	3	4	6	3	2	1	1	6	4	0	0	0	0	5	0	0	0
4	1	8	0	4	5	4	2	10	8	0	2	3	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	4	0	0	1	1	3	4	0	3	0	2	1	2	1	0	2	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0
12	4	10	0	1	3	2	1	0	0	4	0	1	4	2	0	0	1	2	1	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0
0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Appendix 15. Results of marine radar image analyses for data collected on 74 days (i.e., sunrise to sunset the same day) during the Fall-late season (1 Oct - 15 Dec 2010). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
10/01/10	124	21	47	28	9	17	1	0	0	3	0	0	0	0	0	0	0	0	6	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	2	0	0	1	0	0	0	0
10/02/10	1058	208	20	12	32	15	30	8	27	24	27	30	29	36	38	43	52	59	64	65	61	54	58	36	50	36	22	16	18	11	3	19	5	4	13	1	1	0	0	0	3	0
10/03/10	2438	494	60	79	86	108	101	75	70	94	109	142	116	117	154	126	114	203	146	117	67	72	65	25	25	16	17	27	2	8	9	12	9	2	11	11	3	8	7	3	0	6
10/04/10	484	92	35	22	15	12	14	17	9	23	28	21	46	28	16	33	10	20	13	18	21	26	3	12	16	12	4	0	6	1	2	0	0	0	0	0	0	0	0	0	0	0
10/05/10	5198	1284	89	113	117	121	144	125	111	100	143	161	128	153	197	163	188	166	186	194	199	180	178	164	142	103	117	133	115	93	134	75	85	75	56	50	60	48	27	48	30	36
10/06/10	190	38	41	33	10	12	4	6	2	1	0	0	0	3	5	12	2	0	5	4	3	13	8	5	6	5	0	0	0	3	2	3	1	0	0	0	0	0	0	1	0	0
10/07/10	321	61	43	58	26	9	5	4	6	9	3	1	4	3	1	4	4	5	14	8	6	6	5	3	8	6	14	7	5	3	9	5	6	9	2	1	1	1	0	0	0	0
10/08/10	285	54	52	60	21	17	6	2	4	5	5	3	7	3	3	10	14	9	6	0	3	4	3	2	6	0	5	4	1	3	1	4	0	0	2	0	0	0	2	3	0	0
10/09/10	410	94	62	19	19	31	22	19	12	15	14	12	15	13	14	12	19	16	10	16	10	3	4	6	0	3	1	6	3	4	2	0	0	0	4	1	0	0	0	0	2	3
10/10/10	130	22	10	11	16	9	7	11	4	6	2	3	1	5	7	7	1	0	0	4	0	4	0	0	3	1	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0
10/11/10	727	155	42	9	19	28	41	27	24	29	31	15	34	41	38	39	33	30	46	32	30	33	14	14	19	13	14	7	5	1	3	0	5	5	0	0	0	0	0	0	0	0
10/12/10	3171	673	113	72	44	67	86	93	86	98	104	115	148	218	224	297	223	217	203	166	155	107	71	66	56	36	26	21	5	17	0	6	6	4	0	2	0	0	0	1	0	0
10/13/10	1406	280	47	24	41	89	67	60	39	56	86	57	91	131	116	97	46	83	67	61	38	35	15	16	13	10	0	6	1	0	5	0	1	0	0	0	0	0	1	1	0	0
10/14/10	530	116	65	47	38	60	15	28	21	22	28	24	7	6	25	29	5	21	15	10	4	4	0	4	6	4	1	2	2	4	5	1	5	0	0	0	0	0	2	1	3	1
10/15/10	226	76	54	77	34	23	17	6	5	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/16/10	241	83	43	49	20	7	20	14	11	12	11	12	8	6	0	3	6	0	2	4	1	1	0	0	0	3	1	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0
10/17/10	86	12	5	5	4	10	2	6	2	1	5	0	0	0	3	1	5	2	0	0	2	1	0	0	0	3	0	0	2	0	0	0	0	5	0	1	1	1	2	0	1	1
10/18/10	133	22	27	10	1	11	0	1	2	4	3	3	4	1	1	0	5	2	2	3	11	10	2	1	2	3	2	5	3	1	1	0	1	2	0	0	0	0	0	0	0	0
10/19/10	279	50	12	20	18	23	16	10	11	9	8	13	9	5	9	15	13	2	7	7	7	3	8	3	3	6	5	6	8	2	4	2	1	0	0	4	0	0	0	0	0	0
10/20/10	87	13	6	6	2	8	9	9	2	4	2	0	0	7	6	1	0	2	2	2	7	2	0	0	0	2	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10/21/10	135	22	27	17	20	32	13	2	3	1	1	1	2	1	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	4	0
10/22/10	164	29	30	18	20	9	6	12	5	4	4	1	4	3	0	2	3	6	2	0	3	5	0	2	5	1	0	0	3	0	3	1	0	0	0	0	0	1	2	0	0	0
10/23/10	149	24	40	8	6	13	6	11	10	6	3	1	2	0	10	5	1	4	6	2	4	2	0	0	0	0	0	0	2	1	1	0	1	1	0	0	0	0	0	0	0	1
10/24/10	634	124	23	22	21	12	16	18	14	18	12	11	25	14	25	21	15	32	30	32	23	16	19	8	18	22	4	7	8	6	2	6	2	13	9	5	5	0	6	5	6	9
10/25/10	265	49	21	15	25	12	20	2	5	5	6	12	6	6	4	5	9	10	11	15	8	10	7	5	9	2	4	0	1	0	4	2	0	0	5	0	0	1	0	2	1	0
10/26/10	348	108	25	17	19	23	23	32	8	3	13	10	4	18	21	18	11	20	9	14	5	8	4	9	8	5	0	4	1	5	4	1	1	0	0	0	0	0	0	0	0	0
10/27/10	735	152	59	49	36	20	24	21	26	20	27	22	27	30	29	25	19	23	18	29	26	20	23	21	23	11	14	10	10	5	13	12	2	7	6	3	6	2	2	3	1	8
10/28/10	184	36	1	2	2	8	1	2	3	6	10	6	7	6	9	12	11	6	6	13	10	11	1	4	1	0	3	2	5	7	0	1	8	1	6	0	0	0	2	0	1	0
10/29/10	318	69	21	7	14	11	8	15	8	14	12	7	4	7	10	21	7	5	3	3	15	1	3	1	0	4	3	8	3	1	0	0	0	0	4	3	0	1	5	4	1	6
10/30/10	170	31	27	9	7	16	16	7	4	2	3	2	2	3	3	3	5	11	5	2	9	3	2	6	1	7	1	0	2	0	0	0	0	2	0	0	0	0	1	4	1	0
10/31/10	245	90	73	42	12	22	18	4	16	3	4	4	2	1	1	4	4	6	1	0	0	0	2	2	4	1	0	1	2	0	0	1	1	1	0	1	1	0	0	0	0	0
11/01/10	369	87	17	14	16	14	19	12	14	16	29	24	7	10	4	9	5	4	1	1	6	5	1	8	2	8	5	10	5	6	6	5	10	4	9	10	4	2	2	5	8	6
11/02/10	799	182	81	35	35	57	75	70	57	70	44	37	39	33	8	18	22	19	12	9	8	7	8	16	5	3	7	0	0	4	0	0	0	0	0	0	0	0	1	4	0	0
11/03/10	173	30	18	9	19	16	25	15	6	14	9	5	10	4	4	2	0	1	1	0	3	0	1	0	0	1	0	0	0	3	2	2	0	0	0	1	0	0	0	0	0	0
11/04/10	501	98	145	63	17	14	50	53	30	36	10	8	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11/05/10	236	43	76	103	24	9	6	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	1	0	2	0	0	0	0	0	0	1	0
11/06/10	56	33	15	9	0	4	5	1	2	4	0	6	0	0	0	1	0	1	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/07/10	217	41	24	68	26	20	10	7	3	15	12	5	7	1	1	0	0	0	2	0	0	2	0	1	2	4	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
11/08/10	124	22	18	11	21	8	6	10	5	10	3	5	1	0	8	2	1	5	1	1	2	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0
11/09/10	113	20	28	24	11	13	6	1	5	1	4	0	1	2	2	2	0	2	2	2	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
11/10/10	299	60	15	16	21	32	31	18	7	21	8	7	6	0	5	9	10	7	6	8	2	1	5	1	0	8	3	4	1	7	4	2	1	0	0	0	0	3	0	6	1	0
11/11/10	208	38	26	11	9	16	13	23	16	14	18	6	3	1	0	1	4	2	0	0	4	4	1	4	0	2	0	0	0	2	2	2	1	0	0	0	0	0	0	0	0	1
11/12/10	104	17	4	8	2	7	3	12	9	2	0	3	2	2	4	0	0	0	5	0	2	1	1	1	4	6	1	6	5	0	0	1	0	0	1	4	2	0	1	0	1	0
11/13/10	167	31	12	11	3	17	5	19	5	5	4	6	15	9	0	7	2	4	9	3	2	7	2	5	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
11/14/10	160	27	14	6	14	9	12	7	14	17	9	16	11	5	5	0	2	0	1	2	0	5	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
11/15/10	46	6	6	8	7	10	4	3	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/16/10	81	13	4	11	5	7	4	2	4	3	4	1	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
11/17/10	497	97	163	215	47	35	5	2	3	5	4	1	0	4	3	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11/18/10	131	24	36	25	6	10	2	10	4	11	2	1	0	0	4	0	5	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/19/10	114	20	40	8	0	0	5	5	1	1	2	11	12	2	0	3	0	2	3	1	0	0	0	0	0	2	0	0	0	4	0	0	0	2	2	0	1	3	0	0	0	0

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
6	4	3	0	2	0	0	9	0	0	0	0	0	0	1	0	1	0	0	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	3	2	0	1	0	1	0	0	0	2	2	0	0	2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
56	30	44	45	21	31	25	28	18	17	13	5	14	7	15	5	2	7	5	7	5	6	6	3	5	2	1	8	5	3	1	5	6	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	2	0	0	1	0	0	1	0	0	0	0	0	2	5	0	2	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	7	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	3	1	0	0	0	0	0	0	0	0	0	0	0	5	2	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	3	0	0	1	0	2	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1	0	1	1	0	0	1	0	0	0	3	0	0	0	0	4	1	0	0	2	0	0	0	0	2	1	0	0
0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0	3	0	0	5	1	0	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	3	0	4	1	0	0	0	0	0	0	0	0	0	0
0	0	0	1	3	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3	2	1	0	0	0
0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	0	0	0	2	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	13	4	1	3	5	1	7	3	5	19	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	4	1	1	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	1	2	0	0	0	0	1	0
7	6	13	8	3	1	2	1	1	2	1	0	1	0	2	0	0	0	0	0	0	5	0	2	2	0	1	2	5	2	0	2	4	5	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	1	3	1	0	1	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
0	0	6	0	0	0	5	0	2	5	1	0	0	1	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	0	0	0	0	3	2	0	2	0	0	2	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	10	7	12	6	18	8	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	4	1	0	2	1	1	2	0	0	0	0	6	3	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0
1	0	1	0	0	0	0	3	0	0	0	0	0	0	0	3	2	1	1	2	2	0	0	0	1	2	1	0	0	0	0	0	2	0	0
1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1	3	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0
1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	3	0	1	0	1	1	0	0	1	0	0	0	0	0	0	1	9	5	3	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	2	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
11/20/10	62	9	10	3	3	8	3	1	1	2	5	2	2	3	2	1	1	0	0	0	0	1	0	0	1	1	0	2	4	0	0	0	1	0	0	0	0	2	0	0	0	0
11/21/10	239	44	19	21	26	24	26	23	6	14	9	11	12	11	4	7	7	1	3	3	0	0	0	0	0	0	1	2	1	1	1	1	1	0	1	0	0	1	0	0	0	0
11/22/10	223	43	55	49	21	21	31	5	12	7	7	2	3	0	0	0	1	0	0	3	1	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/23/10	38	4	2	4	2	0	1	3	1	5	2	1	3	0	0	1	0	2	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	1
11/24/10	129	24	20	11	7	12	11	6	7	2	4	5	5	1	0	1	3	0	1	2	0	1	0	0	0	0	2	3	4	0	0	0	0	0	0	0	0	0	0	2	1	0
11/25/10	193	36	21	13	2	11	21	15	14	14	11	10	3	14	4	8	4	2	0	3	4	0	0	0	0	0	0	0	0	1	1	2	2	3	0	0	2	0	0	0	0	0
11/26/10	80	15	55	14	0	0	1	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/27/10	186	34	24	20	6	1	0	3	7	8	2	1	4	2	0	2	10	3	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
11/28/10	223	44	30	13	9	12	14	13	16	9	13	7	13	6	6	2	9	8	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	0	3	7	2	0	1	0	0	0
11/29/10	242	47	20	3	12	13	30	16	28	23	19	11	6	14	10	2	4	7	0	6	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11/30/10	166	30	30	9	10	14	27	12	10	2	7	1	5	5	4	5	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
12/01/10	71	23	6	1	1	1	17	13	8	6	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	2	0	0	0
12/02/10	70	10	14	6	3	6	2	2	5	6	6	5	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1
12/03/10	76	13	3	9	9	13	11	2	0	8	4	5	0	0	0	0	0	0	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
12/04/10	94	17	65	20	0	0	0	2	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
12/05/10	123	25	40	13	6	0	3	6	2	2	0	4	3	3	0	0	1	1	0	0	0	0	1	0	2	3	0	2	1	3	1	4	0	1	0	2	1	0	0	1	0	1
12/06/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/07/10	171	34	27	22	13	13	17	9	6	4	14	4	8	5	3	3	0	5	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0
12/08/10	60	11	4	5	0	4	4	0	1	2	4	6	1	2	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
12/11/10	21	4	1	4	0	0	0	3	3	0	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
12/12/10	149	28	14	14	7	6	1	9	18	17	28	13	2	0	4	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0
12/13/10	23	4	5	3	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/14/10	230	43	31	50	35	25	17	12	23	22	1	6	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/15/10	102	20	32	20	7	7	2	3	9	3	9	2	0	0	1	0	1	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	2	5	1	0	1	4	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0
1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	1	0	0	0
0	0	1	0	0	1	0	1	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	3	3	4	3	6	6	6	1	0	2	7	6	5	4	0	1	3	0	4	0	0	1	3	2	8	0	2	4	1	0	0	0
1	0	4	1	0	2	1	5	0	2	1	0	1	0	0	0	1	0	2	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0
0	0	0	1	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	3	0	2	0	0	2	0	0
0	0	0	2	2	0	0	1	5	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	1	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1	2	0	1	0	0	0
0	1	0	0	1	0	1	0	0	0	0	0	0	1	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	1	0	1	1	1	0	0	1	0	0	1	2	0	3	0	1	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	1	2	2	0	0	0	0	1	0	1	2	0	0
1	1	1	0	1	3	0	0	2	2	1	1	0	1	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	1	0	0
0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 16. Results of marine radar image analyses for data collected on 74 nights (i.e., sunset to sunrise the next day) during the Fall-late season (1 Oct - 15 Dec 2010). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
10/01/10	1853	376	72	50	24	35	17	35	24	15	14	17	11	43	48	67	47	56	51	55	75	98	87	72	71	66	76	57	58	58	39	36	47	39	29	29	36	46	24	18	20	16
10/02/10	11571	2335	291	333	310	420	571	595	488	517	468	475	428	481	413	460	461	429	368	367	319	358	314	277	269	239	189	196	173	142	101	123	126	119	91	92	46	40	63	91	25	54
10/03/10	9190	1834	144	187	148	132	139	121	157	152	142	136	157	188	273	298	300	421	457	498	505	630	585	517	468	416	389	238	235	183	146	111	84	47	66	56	58	72	15	35	40	48
10/04/10	1372	278	47	31	62	52	80	56	57	57	40	53	46	43	56	50	34	51	42	52	30	27	35	43	38	52	23	16	26	15	8	2	4	10	11	6	2	8	10	5	9	2
10/05/10	6303	1263	150	107	113	98	118	97	149	114	97	114	122	143	143	150	189	178	201	211	194	175	143	190	158	159	133	139	164	105	115	120	137	95	127	151	173	122	172	145	127	127
10/06/10	692	152	146	95	24	2	3	5	5	3	4	9	10	16	17	30	9	18	10	19	18	20	15	9	24	18	17	12	20	20	19	8	8	7	3	5	6	4	0	9	9	0
10/07/10	1172	232	15	15	26	25	6	24	21	13	15	15	18	16	17	27	36	38	31	49	32	29	32	34	26	36	31	24	48	39	18	39	40	40	19	22	34	11	14	11	5	21
10/08/10	995	196	23	25	31	42	28	22	27	25	21	24	17	36	21	26	22	29	34	54	22	35	28	24	29	36	26	31	32	9	27	6	24	4	8	11	26	11	18	10	6	2
10/09/10	1880	372	51	26	55	62	88	71	49	43	63	46	54	46	39	52	53	57	39	45	54	54	48	56	52	29	43	49	27	39	34	20	37	26	20	24	31	24	18	13	16	10
10/10/10	647	124	19	14	19	27	19	25	28	18	21	17	14	7	10	22	25	28	20	23	15	16	12	39	15	21	10	8	9	4	15	5	16	8	9	1	5	8	3	15	0	6
10/11/10	14350	2876	582	525	652	673	809	895	847	803	790	764	656	639	618	587	442	438	366	406	259	232	236	200	158	154	147	85	133	106	98	74	99	76	78	70	88	72	58	44	33	49
10/12/10	4752	949	129	70	115	169	140	155	118	128	126	101	121	118	123	111	131	93	88	125	82	132	93	121	116	105	100	121	74	69	84	93	84	82	88	96	80	74	49	87	49	37
10/13/10	4693	937	209	131	117	146	139	120	116	89	56	102	75	70	83	92	102	92	83	101	106	104	123	110	84	125	103	107	92	76	110	111	106	70	46	53	91	95	72	54	53	38
10/14/10	1186	234	105	65	45	31	22	18	17	35	34	38	40	26	22	25	22	14	22	11	24	14	27	37	52	23	23	16	26	48	23	28	16	16	8	8	10	10	9	17	9	21
10/15/10	379	74	124	105	25	5	5	11	9	6	3	8	3	6	7	12	7	8	1	6	3	0	1	3	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/16/10	3704	735	88	35	46	70	103	93	76	68	103	56	47	66	64	46	47	42	48	60	49	51	64	45	55	49	63	50	50	28	41	37	67	72	84	66	59	65	58	89	70	81
10/17/10	368	72	13	23	5	13	15	14	26	17	17	10	19	11	10	14	3	7	11	6	2	2	5	17	13	12	6	6	5	8	3	5	8	6	0	0	2	0	2	0	0	0
10/18/10	962	190	28	32	37	51	39	40	41	52	33	49	44	38	30	44	32	12	30	12	15	23	32	13	13	9	4	5	15	20	16	6	12	10	3	4	13	3	3	2	12	13
10/19/10	1781	350	73	32	57	78	72	64	55	79	77	59	73	52	43	55	53	51	58	38	34	31	6	24	10	25	45	24	20	52	37	39	33	34	32	21	18	15	22	28	11	12
10/20/10	130	23	26	18	16	12	3	8	4	3	8	3	2	0	0	5	0	6	0	0	0	0	0	1	3	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	4	0
10/21/10	211	42	6	5	16	1	7	16	6	7	13	3	3	8	16	15	9	5	7	5	2	4	6	8	2	4	5	1	3	2	6	2	0	0	0	0	1	2	3	1	0	0
10/22/10	555	109	15	27	15	26	32	20	32	25	44	29	23	24	16	28	15	10	24	12	14	8	8	7	1	3	5	10	5	8	2	1	6	8	8	2	3	4	2	3	0	2
10/23/10	21366	4316	474	386	372	534	618	665	575	616	578	534	490	453	419	452	377	319	258	293	262	284	308	242	291	266	306	289	284	268	241	255	314	312	349	246	361	372	327	301	356	347
10/24/10	1615	330	261	174	147	112	139	139	93	78	60	50	51	50	46	50	30	35	22	14	7	7	6	8	3	5	8	5	0	0	0	6	2	1	1	0	0	0	0	0	1	1
10/25/10	505	100	124	65	41	37	44	30	19	12	8	24	14	11	4	9	0	3	2	1	1	0	9	4	2	14	1	0	0	0	0	0	0	7	0	4	0	0	2	0	2	0
10/26/10	2437	483	451	333	179	138	129	135	98	111	46	50	78	58	85	58	57	48	56	36	45	22	54	24	16	19	20	8	8	11	14	14	5	2	0	1	4	4	0	0	0	2
10/27/10	1327	264	159	125	41	19	33	22	30	22	36	34	37	47	24	26	39	55	32	43	54	36	27	32	32	39	11	14	23	33	27	35	12	24	14	13	8	12	5	11	1	7
10/28/10	11931	2383	499	355	388	401	523	508	508	517	518	547	493	435	424	467	339	314	317	286	223	254	198	169	178	206	255	161	233	184	152	176	221	180	139	144	87	89	99	114	81	68
10/29/10	11709	2340	188	191	178	258	340	290	301	305	295	259	209	200	187	146	179	165	146	136	143	142	151	146	169	179	182	145	191	166	201	177	195	208	237	217	213	256	308	258	260	294
10/30/10	172	33	48	48	6	1	5	2	6	1	1	3	0	0	0	4	4	3	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
10/31/10	6087	1218	139	118	104	164	259	233	279	173	217	173	167	153	135	113	76	128	186	117	115	118	108	136	132	129	124	94	117	147	110	102	104	104	115	67	84	98	76	60	44	104
11/01/10	5393	1088	165	112	197	195	225	195	136	155	110	118	96	92	77	84	95	76	65	92	90	68	113	98	101	90	89	61	78	68	96	96	90	86	78	112	86	63	68	95	104	61
11/02/10	4831	963	155	190	129	163	172	190	176	129	167	132	82	88	115	93	98	90	115	85	107	82	98	98	77	77	82	89	104	47	84	72	83	61	83	94	75	71	73	53	96	69
11/03/10	80	13	3	8	6	21	1	3	4	3	5	0	0	0	2	4	1	2	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0
11/04/10	60	11	27	18	3	3	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
11/05/10	59	6	3	2	2	6	4	0	5	0	1	2	0	0	1	2	4	5	2	0	3	0	0	0	0	2	0	3	1	5	0	0	0	0	0	0	1	0	0	0	0	0
11/06/10	1325	260	33	52	37	50	32	38	38	38	43	29	36	41	43	56	23	24	40	53	51	40	52	35	35	34	49	17	31	21	31	25	13	15	15	10	32	2	12	20	15	6
11/07/10	30	6	3	12	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
11/08/10	3308	654	81	94	80	100	123	96	131	84	101	127	115	160	146	140	150	119	139	133	117	119	120	102	92	63	56	74	48	55	41	29	17	32	8	27	21	19	5	8	1	10
11/09/10	348	73	122	56	26	20	19	9	20	9	6	6	5	4	4	1	1	4	0	3	1	1	1	0	1	3	1	2	0	2	1	1	0	1	0	1	2	0	0	0	0	1
11/10/10	2134	425	43	82	44	68	57	72	65	77	78	43	42	24	26	16	17	10	6	27	28	24	14	5	6	29	19	12	19	15	28	34	22	39	20	18	42	38	41	45	80	50
11/11/10	1161	231	35	30	26	32	20	19	12	10	16	29	8	11	22	27	32	27	13	19	36	39	33	36	33	22	51	33	22	18	19	26	26	24	20	12	29	23	14	13	7	5
11/12/10	257	47	12	13	16	19	4	9	30	12	4	4	8	9	5	1	6	2	5	0	7	0	8	3	1	4	1	10	5	1	4	1	0	2	1	2	5	0	1	0	2	2
11/13/10	203	38	21	6	6	8	9	6	6	10	6	4	4	7	10	4	1	3	3	1	5	2	0	10	4	0	0	3	3	6	0	2	6	0	4	1	4	4	0	1	1	0
11/14/10	99	16	3	3	0	3	12	8	6	11	8	7	0	0	2	0	2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	3	1	0	0	0	5
11/15/10	62	9	1	4	7	13	5	6	3	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	1	4	0	2	0	0	0
11/16/10	122	22	47	26	9	10	4	6	2	7	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0
11/17/10	152	29	6	15	21	10	17	8	16	5	8	2	2	1	1	1	2	2	0	2	1	1	6	6	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0	1	1
11/18/10	7328	1462	74	71	60	86	124	95	148	162	157	215	236	227	273	238	256	206	239	231	191	184	204	188	178	202	175	197	174	174	133	131	139	88	117	150	81	81	54	62	66	75
11/19/10	683	136	28	38	23	15	9	14	16	14	10	15	6	12	18	12	12	31	31	22	28	14	13	19	12	24	22	11	24	10	35	14	8	4	8	10	5	4	6	12	12	4

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
7	6	8	10	1	8	3	3	3	1	0	1	0	1	5	3	0	2	0	2	1	1	0	0	2	1	2	2	2	0	0	0	0	0	0
50	18	25	18	11	16	3	9	13	11	14	5	4	3	0	7	5	3	6	7	3	7	6	0	0	0	4	0	0	0	1	0	0	0	0
13	29	18	6	23	6	15	11	17	20	5	7	0	8	3	0	4	3	3	1	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0
5	7	1	0	4	6	4	5	1	0	2	0	0	0	0	0	0	5	3	9	6	1	5	1	2	1	2	3	4	1	1	2	0	0	0
95	86	62	64	51	43	57	51	33	27	28	8	7	12	2	4	0	3	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	4	4	3	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	12	16	13	3	8	7	6	6	6	8	8	10	3	7	8	1	2	3	11	4	1	0	1	0	0	0	4	1	0	1	0	0	0	0
10	4	5	3	4	2	4	3	4	1	2	0	0	1	0	9	2	5	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
24	19	21	19	14	14	9	9	9	4	6	10	9	4	2	8	2	2	5	8	0	1	0	4	6	2	3	0	0	0	1	0	1	0	1
4	6	2	0	2	5	2	3	5	2	2	0	0	0	1	1	2	3	0	2	3	0	0	1	5	0	0	0	0	0	0	0	0	0	0
57	13	21	25	23	12	14	21	11	11	10	0	2	4	4	5	2	3	0	12	2	2	7	10	2	5	6	9	3	5	3	1	4	0	0
39	52	74	53	64	52	28	26	29	21	22	24	14	15	33	20	11	14	16	15	5	7	4	0	10	7	6	3	3	4	0	0	0	4	0
52	36	50	23	40	39	43	29	13	35	20	20	10	23	24	21	42	27	13	17	34	26	26	16	20	21	23	11	35	9	19	13	7	4	0
10	10	8	11	3	8	16	6	9	8	10	3	6	10	5	0	2	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	3	4	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
116	68	89	53	56	61	52	78	61	87	59	62	65	52	47	36	37	35	27	11	13	18	20	14	10	6	9	8	2	0	1	0	0	0	0
1	0	1	3	4	4	0	0	0	0	0	1	0	1	1	3	3	0	3	2	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0
2	4	0	9	5	4	5	4	4	1	0	2	1	2	2	4	3	0	3	0	0	3	5	1	4	2	2	0	0	0	0	0	0	0	0
15	19	13	14	0	7	6	3	5	4	3	1	5	7	5	6	3	0	8	6	2	0	3	0	3	0	0	0	0	0	0	1	0	0	0
0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
3	5	9	0	0	0	0	0	0	1	3	1	2	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
359	323	302	348	310	367	275	375	305	305	360	311	292	260	219	241	203	144	135	154	144	102	110	96	77	53	32	43	51	37	14	7	7	11	0
0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	4	0	0	0	1	0	1	0	0	0	0	0	0	3	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2	0	5	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0	0	0
4	0	0	0	3	3	0	0	0	0	0	4	1	0	2	1	1	0	0	7	1	0	1	0	1	0	3	1	0	0	0	0	0	0	0
62	61	43	48	37	31	33	13	19	30	20	9	14	7	15	11	0	5	4	8	4	3	0	0	0	2	1	0	0	0	1	0	0	0	0
266	236	192	238	216	206	185	150	187	199	144	122	134	119	89	79	86	87	53	68	39	35	41	36	26	14	13	3	5	20	7	1	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	6	6	16	4	1
60	78	65	78	47	60	44	41	43	22	42	40	21	19	34	15	25	17	19	10	11	13	9	4	1	5	4	4	15	7	6	5	0	1	0
74	77	96	78	83	77	65	87	32	97	41	54	58	27	47	33	21	16	22	17	12	19	10	15	9	16	7	16	4	1	1	3	2	0	0
57	69	54	47	48	69	51	34	30	34	21	32	24	9	8	3	2	12	13	1	14	16	1	2	10	13	0	2	4	1	4	1	0	1	0
2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	1	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
2	6	4	11	2	2	6	2	0	1	1	5	5	0	0	0	0	0	0	1	1	2	0	1	1	0	0	0	0	0	0	0	0	5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	2	4	5	8	4	11	33	9	6	3	9	5	0	0	1	4	7	0	0	0	3	0	0	1	0	0	0	0	1	0	0	0	1	0
0	0	1	0	0	1	0	0	1	1	0	1	0	1	0	0	1	2	2	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
45	55	56	49	46	43	48	40	30	33	24	22	19	32	40	17	21	15	8	12	9	11	8	2	7	0	4	2	1	3	2	5	0	0	0
12	17	20	14	25	15	4	2	9	20	6	6	4	4	7	15	2	8	2	6	8	2	1	5	4	7	3	1	1	1	1	0	0	0	0
2	4	1	2	3	1	0	0	1	5	3	0	0	2	4	0	0	0	0	1	0	1	2	1	0	2	1	1	0	0	0	1	0	0	0
1	0	5	0	1	1	0	3	2	2	0	1	0	3	0	6	1	0	1	2	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0
0	0	2	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0	1	1	1	0	0	0	0	1	3	4	2	1	0	0	0
0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0
0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	1	0	1	0	1	0	1	2	0	1	0	1	0	0	0	0	0	0
71	91	83	77	78	70	76	55	83	49	73	73	61	51	33	28	32	29	21	12	21	1	1	1	0	0	0	0	3	2	4	6	0	1	0
7	6	7	4	3	0	1	5	3	4	1	0	2	6	0	1	2	0	1	1	0	1	1	0	0	0	0	0	1	0	0	1	0	0	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
11/20/10	106	16	4	14	7	6	0	2	8	10	11	11	2	0	2	2	1	0	1	1	0	1	2	0	0	1	0	1	5	2	0	0	0	0	0	0	0	0	3	1	1	1
11/21/10	170	33	15	8	2	19	22	1	23	4	20	9	1	0	5	3	4	2	0	5	0	3	1	3	1	0	0	0	0	0	6	0	2	0	0	0	1	0	0	0	0	0
11/22/10	85	14	28	14	1	4	0	1	1	2	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/23/10	130	22	9	34	23	8	4	7	6	7	3	5	0	2	0	1	3	0	0	0	0	0	3	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1
11/24/10	115	19	4	7	13	11	2	8	2	7	3	8	5	1	0	5	6	2	1	0	0	1	0	0	0	5	0	1	0	0	0	0	0	1	0	0	0	0	1	4	0	0
11/25/10	84	12	6	2	8	1	1	2	11	7	5	5	2	4	2	0	4	0	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
11/26/10	75	12	5	12	4	0	0	0	7	10	6	1	0	1	1	0	0	1	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	2	0	0	1	0	0	0	0	0
11/27/10	148	23	13	0	3	2	1	3	7	7	20	22	13	10	9	3	0	0	3	0	2	0	0	0	0	0	7	0	1	3	1	2	0	0	2	0	2	0	0	0	1	0
11/28/10	124	23	11	13	8	9	11	13	1	5	0	2	1	0	1	0	0	3	0	1	0	0	0	0	0	0	1	1	0	0	1	3	4	5	0	0	5	0	0	1	1	1
11/29/10	107	25	7	6	4	6	4	7	5	10	3	5	14	1	0	0	0	5	2	0	0	1	1	1	1	1	0	0	4	1	2	4	0	0	0	0	0	0	0	0	0	0
11/30/10	62	9	8	1	0	1	0	1	4	5	6	3	0	1	1	5	0	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0
12/01/10	707	139	70	162	100	26	33	47	72	89	74	21	4	0	0	0	0	0	0	1	0	0	2	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/02/10	46	5	2	2	0	2	0	0	2	3	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	7	2	1	0	5	1
12/03/10	229	45	153	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12/04/10	36	4	15	6	0	0	0	0	0	0	1	3	3	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	1	0	0	0	0	0
12/05/10	262	48	124	72	3	0	0	0	0	0	6	5	6	18	6	10	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
12/06/10	188	36	104	59	6	0	2	1	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/07/10	67	10	2	15	7	0	0	5	0	1	10	0	0	2	0	0	0	1	1	0	5	5	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	2	0	1	1	0
12/08/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/11/10	107	22	6	7	0	5	1	4	14	6	2	0	2	2	3	2	2	0	0	0	0	0	1	0	1	0	3	1	1	1	0	1	0	0	3	1	2	2	1	8	0	1
12/12/10	340	67	46	88	72	32	15	29	23	14	6	7	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
12/13/10	606	139	198	224	108	20	8	7	12	10	4	1	2	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
12/14/10	268	63	9	19	20	21	20	18	27	33	42	26	2	0	1	0	5	0	0	1	2	0	1	2	1	1	0	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0
12/15/10	214	38	11	24	8	18	9	10	13	19	26	9	3	4	6	6	2	1	2	3	0	1	0	1	1	1	2	1	0	0	0	2	1	1	3	3	0	2	0	0	0	0

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	2	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
2	1	1	0	2	1	2	4	3	1	4	2	1	1	0	0	0	0	0	0	1	0	0	0	2	1	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	1	0	1	0	0
0	0	1	0	1	1	0	0	2	0	2	0	2	0	0	2	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0
0	4	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0
5	2	1	0	0	0	2	2	0	0	1	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	1	0	0	0	0
2	0	0	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	1	1	0	0
3	0	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	2	1	1	4	0	1	0	0	0	0	0	0
0	0	0	0	2	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	1	1	1	0	0	0	0	0	0	0	0	0
2	1	3	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	0	0	0	0	1	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	2	1	0	1	0	1	1	1	0	0	0	2	2	0	1	0	2	0	1	0	0	0	0	2	0	0	1	0	1	1	0	0
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
0	4	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0	0	0
0	0	0	1	2	0	1	2	1	1	0	1	0	0	1	1	1	1	0	0	2	0	0	1	0	0	0	1	0	1	1	1	1	0	0

Appendix 17. Results of marine radar image analyses for data collected on 89 days (i.e., sunrise to sunset the same day) during the Winter season (16 Dec 2010 - 15 Mar 2011). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
12/16/10	178	34	28	19	5	8	3	7	14	8	19	7	14	4	0	2	1	4	0	0	0	1	2	1	0	0	0	0	1	2	0	0	3	4	4	3	0	0	1	0	0	2
12/17/10	94	17	15	2	7	4	4	3	15	4	2	6	5	7	6	8	0	1	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
12/18/10	108	18	6	3	6	5	7	6	10	17	10	11	7	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
12/19/10	66	11	2	0	4	2	7	0	3	0	5	7	13	5	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0
12/20/10	256	50	72	112	17	5	5	1	0	7	7	3	1	1	4	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
12/21/10	347	67	120	151	31	5	2	1	1	1	4	4	4	3	5	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
12/22/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/23/10	51	8	4	16	8	1	1	3	0	0	2	0	0	2	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	4	2	1	0	0	0	0	0	0	0	0	0	0
12/24/10	74	13	7	4	4	1	4	13	10	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	3	0	0	1	0	2	3	3	0	2	3	2	0	0	1	0	0
12/25/10	90	14	2	3	1	6	5	8	5	16	7	5	11	6	5	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
12/26/10	116	20	5	7	7	2	2	10	8	11	1	1	5	3	1	5	3	1	2	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	2	0	0	0	0	1	0	1
12/27/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/28/10	27	3	3	0	0	0	4	7	0	1	0	3	2	1	2	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/29/10	48	7	10	1	3	1	1	1	1	7	3	4	1	0	1	0	1	1	1	0	1	1	1	0	0	0	1	0	0	1	0	1	0	1	1	0	1	1	1	0	0	0
12/30/10	62	9	7	7	6	3	4	0	0	1	8	6	2	2	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	0
12/31/10	52	7	3	1	1	2	2	3	5	6	1	2	4	1	3	0	1	2	0	0	1	0	0	1	0	0	1	0	0	1	0	2	1	0	0	0	0	0	0	1	0	0
01/01/11	38	4	2	1	0	0	7	6	1	1	2	0	1	0	2	0	3	0	0	0	0	0	1	0	2	0	0	1	0	0	0	0	0	2	0	1	0	0	0	0	0	1
01/02/11	49	5	7	1	5	0	3	1	4	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	2	2	0	0	1	0	0	0	0
01/03/11	72	13	18	0	5	7	6	3	1	1	0	3	3	3	3	0	0	1	0	1	1	0	1	0	0	0	1	1	1	2	0	0	0	0	0	0	1	0	1	0	0	0
01/04/11	95	23	21	16	4	1	1	1	2	7	6	5	4	0	0	5	2	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0
01/05/11	159	32	28	22	3	5	12	8	8	11	5	1	3	4	0	0	0	3	1	1	1	0	5	0	0	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0
01/06/11	134	25	24	17	22	6	5	9	1	5	8	10	4	0	3	4	8	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
01/07/11	35	11	0	0	0	2	2	0	3	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	3	4
01/08/11	70	9	12	5	2	0	1	7	3	1	2	0	1	2	2	1	4	0	1	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	1	0	2	0	1
01/09/11	94	16	19	3	0	4	3	1	8	4	5	2	0	0	1	6	2	0	1	2	0	0	0	2	2	3	3	2	0	0	1	4	3	1	0	1	1	1	0	0	0	0
01/10/11	71	11	7	8	6	5	2	1	4	2	7	4	0	0	1	2	4	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
01/11/11	127	22	23	6	3	22	1	14	0	4	3	3	0	5	2	2	8	2	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	3	1	3	3
01/12/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/13/11	27	5	5	1	0	2	3	0	0	6	0	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0
01/14/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/16/11	35	5	3	4	3	0	4	2	0	3	2	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
01/17/11	193	35	37	15	12	20	16	17	11	17	12	4	2	0	4	6	2	1	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/18/11	147	29	77	18	3	0	1	5	2	3	3	0	1	0	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
01/19/11	197	39	20	26	2	1	1	4	2	7	2	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	9	5	2	3	7	5	13	6	5
01/20/11	71	11	2	6	8	6	2	5	4	4	3	6	2	0	0	1	0	0	0	0	0	0	0	1	0	0	1	3	0	0	0	0	0	0	0	0	1	1	1	0	2	0
01/21/11	171	33	32	28	27	30	18	7	10	8	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/22/11	103	19	5	6	5	11	10	12	6	15	6	1	3	10	2	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0
01/23/11	554	108	93	42	51	63	61	42	39	53	39	3	2	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	4	4
01/24/11	73	32	5	0	3	2	3	1	2	0	1	6	5	3	0	0	2	0	1	1	0	2	1	1	3	1	3	2	1	1	1	1	0	0	1	0	1	1	0	2	2	0
01/25/11	42	8	8	3	3	3	2	4	0	8	3	0	0	0	0	3	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/26/11	42	9	0	0	0	2	0	0	5	6	3	1	0	6	1	4	9	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/27/11	223	67	15	58	10	6	13	8	7	15	13	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	4	0	0	1	0	0	1	0	0	1	3	3	1	7	3
01/28/11	41	5	0	0	1	3	0	0	0	0	5	1	1	0	2	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	3	3	2	2	1	0	0	0	1
01/29/11	24	3	12	0	0	0	1	0	0	0	0	0	1	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
01/30/11	50	8	5	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	2	0	3	1	0	0	0	1	0
01/31/11	109	18	8	6	12	12	7	4	6	14	10	5	2	0	0	3	0	1	6	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
02/01/11	11	2	0	0	1	0	1	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/02/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/03/11	99	16	12	5	4	4	6	19	10	1	3	14	2	1	4	5	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
02/04/11	73	10	9	3	3	4	8	7	3	3	7	5	0	2	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	0	0	0	1

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
1	4	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	1	0	1	0	2	0	1	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2	0	0	0	0	1	0
2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	7	1	0
0	2	0	0	0	0	0	0	1	0	1	2	0	0	1	0	1	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1	0	0	0	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2	1	0	1	1	1	0	2	0	0	1	0	2	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	2	1	4	3	5	3	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	2	0	1	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	1	2	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0
0	1	0	0	2	0	0	0	0	2	0	0	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0	0	0	0
0	1	0	0	0	0	0	0	3	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	0	3	0	3	0	0	0	0	1	0	0	0	1	1	0	0
0	3	0	0	1	0	1	1	2	2	3	2	1	6	3	0	0	1	1	0	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0
0	0	2	1	0	2	0	1	1	0	0	1	0	0	1	0	2	1	0	0	0	0	1	1	1	0	0	1	0	2	0	0	0	0	0
2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	0	2	2	0	2	0	0	1	0
0	1	1	0	1	0	1	0	1	0	0	1	0	0	1	0	0	2	0	0	1	0	0	0	0	1	1	1	0	0	0	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	1	0	0	1	0	0	0	1	0	1	0	1	0	1	0	0	0	0
0	0	3	1	0	1	1	0	0	0	0	2	0	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0
0	0	0	0	3	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	1	0	1	0	2	3	2	3	2	4	1	2	0	0
7	6	4	1	1	4	3	0	2	3	0	0	1	0	3	4	2	5	2	5	2	2	3	1	1	0	4	2	0	1	0	0	0	0	0
0	0	0	0	0	0	1	0	0	4	2	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	1	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0
3	7	4	1	3	0	1	0	1	0	0	0	0	2	0	7	1	4	1	1	0	2	4	3	1	2	0	0	0	0	0	0	0	0	0
0	0	1	1	1	2	1	0	1	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	3	2	4	5	3	2	0	2	3	1	2	2	0	3	2	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1	0	1	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3	1	2	0	5	2	1	2	3	3	1	2	0	0
0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	2	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	2	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
02/05/11	76	12	19	30	10	1	1	0	1	2	2	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
02/06/11	490	95	26	17	6	3	15	4	9	17	25	26	29	33	29	23	8	13	15	17	7	7	7	10	18	11	5	8	7	13	13	8	5	11	4	1	4	0	0	2	5	3
02/07/11	87	20	3	2	2	8	16	12	4	12	6	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0
02/08/11	9	1	0	0	0	0	0	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
02/09/11	85	13	14	7	6	2	2	6	7	8	4	3	1	1	0	2	0	0	0	1	0	0	0	0	1	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
02/10/11	106	18	5	0	0	2	9	17	8	10	4	4	1	3	6	3	2	2	1	0	0	0	0	1	1	2	0	0	0	0	2	1	1	0	0	0	1	0	0	1	1	0
02/11/11	130	24	5	11	3	4	2	10	19	16	6	5	8	0	4	1	5	1	0	1	3	0	2	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0
02/12/11	123	21	7	16	19	15	2	2	5	3	7	3	7	0	1	0	0	3	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0
02/13/11	151	32	24	37	17	5	7	6	5	4	0	1	1	0	0	0	0	0	0	0	1	4	0	0	0	0	0	2	6	5	2	1	0	0	0	1	0	1	1	3	0	0
02/14/11	148	27	7	15	20	14	9	1	12	19	13	5	0	0	0	0	1	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0
02/15/11	27	2	0	2	2	0	2	0	0	0	0	2	2	1	1	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	2	1	0	2	0	0	0
02/16/11	139	24	10	7	1	7	4	7	8	7	6	17	5	0	3	0	3	2	0	2	2	0	6	5	2	1	2	1	2	0	0	0	1	3	0	2	0	1	0	0	1	0
02/17/11	38	5	0	0	1	0	5	2	2	2	0	0	4	2	0	1	1	0	4	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0
02/18/11	62	8	28	5	0	0	7	2	1	0	0	4	1	0	2	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0
02/19/11	125	21	12	8	18	3	6	2	4	7	8	14	6	2	0	1	0	0	0	0	1	2	3	0	2	1	2	0	1	0	1	0	0	0	0	2	0	0	0	0	0	2
02/20/11	98	16	6	0	5	9	5	1	4	4	6	3	1	0	0	0	0	1	0	0	2	0	2	0	0	0	0	2	1	0	1	3	1	1	1	1	1	3	2	0	2	0
02/21/11	274	53	167	51	10	11	9	9	3	5	5	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/22/11	88	14	4	4	2	7	8	5	8	12	5	2	1	2	4	1	0	1	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	3	1
02/23/11	88	13	12	2	5	4	0	1	5	4	3	4	3	4	1	1	0	1	2	1	0	0	0	2	0	0	1	1	0	1	0	0	0	0	0	0	0	1	0	1	1	1
02/24/11	1238	244	19	8	9	20	21	19	28	23	21	21	17	26	23	30	19	16	18	27	36	32	22	32	36	32	20	37	21	44	34	36	24	32	33	15	17	19	13	21	11	4
02/25/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/26/11	79	13	9	3	2	3	9	8	2	7	9	13	2	3	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
02/27/11	33	6	0	1	0	3	4	1	5	6	9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/28/11	29	5	3	12	2	2	0	2	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/01/11	95	15	18	7	8	2	6	5	11	4	5	7	3	0	0	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
03/02/11	260	49	28	42	55	22	27	22	18	19	10	4	1	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0
03/03/11	89	14	1	0	2	2	3	9	19	23	5	2	3	1	1	3	1	1	1	0	0	0	0	1	1	2	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
03/04/11	121	21	17	7	10	4	13	14	7	4	5	1	0	2	0	2	6	1	4	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	1
03/05/11	475	90	16	77	66	16	42	29	82	72	38	20	3	1	0	0	0	0	3	1	1	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	1
03/06/11	76	17	2	2	8	16	14	0	1	0	3	4	6	0	0	2	0	0	0	2	0	0	0	0	0	3	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0
03/07/11	469	90	25	62	64	36	51	40	55	51	31	19	7	5	6	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0
03/08/11	151	25	9	13	3	4	7	6	15	7	5	18	10	16	9	1	4	5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
03/09/11	93	14	5	0	1	2	16	13	4	2	0	3	12	3	6	0	4	1	0	0	0	0	0	0	0	0	0	0	1	2	0	2	2	1	0	0	0	0	0	1	0	1
03/10/11	1070	291	4	11	3	10	19	19	32	43	42	19	1	9	12	4	3	8	20	4	13	22	40	36	34	38	50	51	31	38	43	33	26	41	48	36	18	46	34	33	26	30
03/11/11	213	41	96	60	14	4	2	0	6	9	12	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	1	0	1	0
03/12/11	259	46	7	4	1	20	16	26	14	9	13	3	9	5	0	9	5	9	5	1	5	2	10	12	6	3	9	4	6	5	3	5	1	1	4	3	0	0	0	1	2	0
03/13/11	53	7	6	3	12	3	11	0	4	4	1	3	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
03/14/11	128	22	9	12	1	7	8	12	6	3	5	9	10	2	6	5	4	2	4	1	1	1	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
03/15/11	95	12	3	0	1	28	11	8	14	4	3	2	2	0	0	0	0	4	3	0	1	7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	3	0	1	0	0	2	1	0	1	1	1	3	1	2	1	0	0	3	2	0	0	0	0	1	1	0	0	0	0	0	0	0
0	0	1	2	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	1	1	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	2	1	0	1	0	1	0	1	0	0	1	2	2	0	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
0	0	1	0	1	2	0	4	1	1	2	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
0	0	0	0	1	0	1	1	0	3	0	0	1	1	0	1	4	0	2	0	0	1	0	0	2	0	1	0	0	0	0	0	0	0	0
0	1	0	0	0	2	0	3	1	1	0	0	0	2	0	1	1	2	0	1	0	0	0	1	0	0	0	0	0	1	1	1	3	2	0
0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	2	1	6	0	1	1	0
2	0	1	0	0	0	0	0	0	0	0	1	0	0	2	1	1	2	0	0	1	0	0	0	1	0	2	0	0	1	1	1	9	0	0
0	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	3	0	0	0	5	2	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
2	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	2	0	0	0	1	0	0	1	0	0	0	2	1	0	0	0	0	0	0	1	2	1	0	1	0	0	0	0	1	2	0
1	2	2	1	0	0	3	0	2	0	3	0	0	1	0	2	0	0	2	0	2	1	0	1	2	0	0	0	1	0	0	0	0	4	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	2	0	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0
0	2	1	1	2	0	2	0	0	0	2	0	1	1	4	1	1	0	0	3	1	0	0	0	0	0	3	0	1	0	0	0	0	0	0
13	6	10	11	5	8	14	4	15	12	14	17	7	16	18	17	17	19	10	10	10	16	7	10	4	6	3	2	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	1	0	0	0	3	3	0	1	0	0	2	0	1	0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	1	0	0	1	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0
0	0	1	1	2	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0
0	0	0	1	0	2	0	0	0	1	0	0	0	1	0	1	2	0	1	1	1	0	0	0	1	0	0	1	1	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	1	0	1	0	0	1	1	0	0	0	1	0
15	7	3	0	1	2	0	0	0	0	0	0	7	0	0	0	0	0	0	2	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	1	1	0	1	0	0	0	1	1	0	3	1	1	1	1	0	0	1	0	2	0	0	0	1	0	1	0	0	2	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	1	0	0	0	0	0	0	2	2	0	2	1	0	1	0	0	1	0	0	1	0	0	1	0	1	1	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Appendix 18. Results of marine radar image analyses for data collected on 89 nights (i.e., sunset to sunrise the next day) during the Winter season (16 Dec 2010 - 15 Mar 2011). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
12/16/10	108	17	18	2	0	0	0	2	3	3	6	1	2	1	2	4	1	1	2	3	2	1	0	2	0	1	0	0	1	1	4	3	1	3	3	2	3	4	1	1	0	2
12/17/10	116	19	4	10	13	3	6	9	12	10	0	0	0	0	1	2	0	0	3	6	6	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	1	1	2	2
12/18/10	86	12	6	8	7	0	6	1	7	2	0	7	3	6	3	0	1	1	0	0	2	3	0	0	1	0	0	0	1	0	1	1	0	0	1	2	0	3	1	1	1	2
12/19/10	82	12	8	7	2	6	2	8	1	4	5	2	4	5	0	0	0	0	0	0	5	0	0	2	1	1	1	1	0	2	1	0	0	0	0	0	1	0	0	0	0	0
12/20/10	409	78	14	75	95	17	9	12	16	37	52	24	3	0	0	0	0	4	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12/21/10	206	36	18	54	67	10	2	4	5	10	15	11	5	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/22/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/23/10	44	5	2	5	6	0	0	1	0	5	1	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	1	1	0	0	4	0
12/24/10	43	7	1	4	5	0	0	0	0	3	6	3	4	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
12/25/10	31	3	0	0	0	1	0	6	2	3	1	0	1	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2	0
12/26/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/27/10	770	151	18	72	50	21	20	89	215	155	89	31	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/28/10	56	6	0	6	3	2	0	4	0	2	3	7	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0	0	1	2	1	0	0	1	0
12/29/10	46	4	0	4	0	0	1	8	4	1	0	4	5	2	1	1	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0
12/30/10	49	3	5	3	2	4	2	1	0	0	2	6	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	1	1	0	3	0	0
12/31/10	63	7	6	4	0	2	0	4	1	1	1	5	2	1	2	0	1	0	1	1	0	0	0	1	1	1	2	2	0	0	0	0	0	1	0	0	0	0	0	0	1	0
01/01/11	60	7	3	2	0	0	2	2	5	5	11	3	0	1	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	1
01/02/11	538	104	274	187	16	7	3	3	6	4	5	3	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	2	2	5	1
01/03/11	51	5	4	4	3	0	0	3	1	6	5	1	1	1	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	1	0	0	0	1	0	0	0	0
01/04/11	113	17	4	4	0	1	0	1	0	3	4	6	0	2	0	1	1	0	1	1	1	1	0	0	1	1	1	2	0	2	1	0	2	0	0	4	2	0	3	0	3	0
01/05/11	102	17	1	2	2	1	8	4	6	10	14	4	1	3	0	2	1	0	2	6	2	0	1	1	0	1	1	2	0	0	0	1	1	0	1	1	1	0	0	0	1	1
01/06/11	49	5	4	1	1	0	1	0	2	2	6	1	3	0	0	2	0	0	0	1	0	0	0	0	1	0	0	1	5	0	0	0	0	0	0	1	0	0	0	0	0	2
01/07/11	17696	3535	118	133	149	190	168	203	256	296	292	306	315	350	499	424	448	429	477	446	455	420	380	388	370	356	334	366	301	305	329	313	285	262	320	287	264	305	288	277	301	302
01/08/11	248	46	65	54	5	5	5	5	4	21	19	7	4	3	12	9	1	3	2	4	5	1	3	0	0	2	0	0	0	0	1	0	1	0	3	0	0	0	0	0	1	0
01/09/11	67	10	4	3	1	6	3	8	0	0	2	5	3	0	0	2	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/10/11	67	7	1	2	2	2	1	1	2	6	9	4	1	2	0	1	0	0	0	0	0	0	1	0	0	2	0	0	1	0	1	1	0	2	1	0	0	2	1	0	0	0
01/11/11	47	5	9	1	0	2	1	1	6	4	0	1	0	0	2	3	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
01/12/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/13/11	86	11	0	4	4	5	1	4	3	4	12	5	1	2	2	1	2	1	0	2	0	1	0	2	3	0	0	4	4	1	0	3	1	3	0	1	0	0	0	0	0	0
01/14/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/16/11	89	16	0	6	2	4	2	4	8	9	1	9	3	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	2	1	3	0	0	0	1	1	0	0	0
01/17/11	44	7	5	1	2	3	1	3	0	0	2	2	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01/18/11	274	55	112	68	10	0	1	2	2	7	6	5	0	0	0	0	0	0	0	1	0	1	2	0	4	8	6	3	2	2	0	1	1	0	0	0	0	0	1	0	0	0
01/19/11	9	4	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/20/11	10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3	1	0	0	0	0	0	0
01/21/11	39	2	0	0	3	0	2	0	0	5	4	3	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	1	0
01/22/11	129	27	4	2	3	2	1	0	7	1	1	1	1	2	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	0	2	2	5	7	10	5	4	5	5	3	4
01/23/11	44	5	1	0	3	2	1	1	0	4	1	0	4	3	0	1	0	1	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1
01/24/11	934	183	96	29	94	204	183	105	54	64	61	10	0	3	1	1	0	0	0	1	1	1	1	0	1	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
01/25/11	4	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01/26/11	163	29	24	24	7	6	7	4	6	7	11	7	0	1	1	0	2	0	0	4	7	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/27/11	7196	1436	119	110	85	91	115	124	150	205	183	221	248	288	340	299	251	321	286	291	240	199	206	160	160	138	122	135	177	161	131	174	177	122	158	120	106	94	122	61	61	68
01/28/11	24	2	12	0	3	1	1	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/29/11	32	3	3	0	1	1	1	0	0	1	1	2	0	0	0	0	1	1	1	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
01/30/11	109	20	1	0	3	0	4	6	16	20	12	11	0	1	0	1	0	0	1	0	2	0	0	1	0	0	1	0	0	1	1	2	1	0	0	1	0	2	0	0	0	1
01/31/11	56	8	0	1	5	1	2	2	1	3	2	1	2	2	1	0	0	0	0	0	4	0	0	0	0	0	0	2	0	0	0	0	0	0	1	5	0	0	0	0	1	0
02/01/11	74	13	8	0	0	1	5	5	10	9	12	6	0	0	0	1	2	2	1	2	1	1	2	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0
02/02/11	360	73	57	44	8	42	38	31	25	31	32	10	2	11	7	5	2	3	3	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
02/03/11	92	13	3	2	2	4	3	10	6	7	9	3	2	1	0	0	0	2	0	0	0	0	0	0	2	3	1	2	1	0	0	1	0	1	0	0	1	1	0	2	0	1
02/04/11	56	5	2	1	1	0	8	3	3	1	4	1	0	0	0	2	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	1	0	2	1	1	1	1	2	0	0	1

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	1	0	0	0	0	2	1	0	3	1	2	4	4	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	0	1	1	1	0	1	0	0	0	0	1	0	0	1	1	1	0	0	2	0	0	1	0	1	1	1	1	1	1	0	0	1	2	0
0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	2	1	2	0	1	0
0	1	1	0	1	0	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	6	4	6	9	10	2
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	1	2	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	1	2	0	0	0	1	0	0	0	3	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0
0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
1	0	0	0	0	2	1	0	7	1	0	2	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0
0	1	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	0	1	0	0	0
0	0	0	1	1	0	0	1	1	0	1	0	1	1	1	0	1	2	1	1	0	1	1	0	2	1	0	1	0	1	0	1	1	0	0
0	1	0	0	0	1	0	2	0	1	0	2	0	0	1	0	0	1	0	0	0	1	0	1	0	2	0	2	1	0	0	1	0	1	0
0	0	2	1	0	0	2	0	0	2	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	1	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	1	2	1	0	1	1	0	0	0
0	1	1	1	4	1	2	4	0	2	0	1	1	0	1	0	2	4	4	2	3	1	7	3	5	3	1	1	1	0	1	1	1	1	0
3	2	1	0	1	2	0	0	0	1	2	0	0	0	0	0	0	1	1	0	1	1	0	0	1	0	0	0	0	1	1	0	1	0	0
2	1	0	2	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	2	0	0	1	1	0	0	1	0	0	0	0
314	289	277	289	247	240	255	223	189	201	147	136	164	144	134	156	126	134	118	102	97	106	101	97	120	95	98	73	87	62	72	45	32	18	1
1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	1	0	1	1	0	0	1	0	1	1	0	3	1	1	3	2	0	1	0	0	1	0	2	0	2	1	0	0	0
3	0	2	0	2	1	0	1	1	0	2	2	0	0	2	1	0	2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	1	0	1	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	2	0	0	1	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	1	1	1	1	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	3	0	0	1	0	1	0	1	1	2	2	1	0	0	3	0	0	2	1	3	0	0	1	0	1	1	2	0	0	0	0	0	0
1	1	0	1	1	1	0	0	0	1	1	0	1	0	2	1	1	0	0	1	2	0	0	0	0	1	1	1	1	0	0	0	1	0	0
0	1	0	3	5	2	7	3	0	2	1	0	1	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1	1	2	0	1	0	0	0	0	0
3	1	7	4	4	2	6	4	6	2	0	0	0	0	0	2	0	1	1	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0
0	2	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	2	1	2	0	0	1	1	0	0	0
0	1	0	0	0	1	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0	1	3	0	1	2	0	1	0	1	0
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	2	5	5	0	0	1	1	1	4	2	1	4	1	5	2	1	2	0	0
42	74	42	46	31	31	15	32	17	16	9	8	4	1	1	1	1	1	2	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
1	1	0	1	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	1	0	0	0
2	1	1	1	2	1	0	1	0	0	1	1	1	3	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	0	1	0	0	0	0
0	2	0	1	0	0	2	2	0	0	2	1	1	1	0	1	1	0	1	0	0	0	0	2	1	0	0	1	1	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	1	2	0	0	1	1	2	0	1	0	1	1	0	1	0	0	1	0	0	1	1	0	1	0	1	1	0	0	2	0	1	1	0
0	0	0	1	0	0	2	0	0	0	1	0	1	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																					
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
02/05/11	176	33	21	51	40	6	2	6	9	17	17	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
02/06/11	46	4	3	5	0	3	0	0	7	2	2	1	0	0	1	0	0	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
02/07/11	129	24	59	54	5	1	2	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/08/11	572	109	15	15	21	14	37	44	74	96	102	84	6	0	1	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	1	1	0	2	2	0	0	0	0	0
02/09/11	103	17	5	4	5	8	2	1	4	8	4	4	5	2	0	4	7	6	2	2	2	0	0	0	2	0	0	1	1	0	0	1	1	1	1	1	1	2	2	0	0	0
02/10/11	102	16	4	7	2	1	3	1	11	5	8	11	6	1	0	1	0	0	0	0	2	3	0	1	0	0	0	1	0	2	2	0	0	1	1	3	0	1	1	2	0	0
02/11/11	90	12	5	18	14	2	4	7	1	7	3	1	0	0	2	4	0	0	0	0	0	0	0	0	1	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
02/12/11	103	14	4	7	2	6	1	2	1	3	9	10	1	0	4	3	6	0	1	0	2	4	1	0	0	0	0	0	0	0	2	0	0	1	0	2	0	1	0	1	1	0
02/13/11	103	14	3	6	2	1	2	2	20	10	10	3	1	4	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	0	2	0	0
02/14/11	981	192	18	64	104	50	46	42	146	146	201	118	13	2	0	0	1	0	0	3	1	0	2	0	0	0	0	0	3	0	0	0	0	0	1	0	0	3	0	0	1	1
02/15/11	125	19	7	2	8	3	0	4	4	2	3	0	2	5	2	2	2	3	2	4	1	2	1	0	0	6	1	0	6	0	1	2	4	3	0	4	1	0	0	1	1	2
02/16/11	167	30	1	5	5	5	6	10	3	10	14	7	9	7	6	6	5	2	1	0	6	13	1	7	1	1	1	3	4	0	1	0	0	0	0	2	4	0	0	1	1	0
02/17/11	51	5	1	2	1	0	1	0	0	5	4	1	0	0	2	0	0	1	0	0	0	1	0	0	1	0	1	1	0	1	1	1	0	0	1	0	2	1	0	0	1	0
02/18/11	63	9	1	3	5	2	0	1	1	6	4	3	3	0	0	0	2	2	0	2	0	1	0	0	1	0	0	0	2	0	1	0	0	0	3	0	0	0	1	1	3	0
02/19/11	80	16	1	0	1	2	4	1	2	1	0	7	4	1	2	2	5	1	0	2	1	0	0	0	0	0	1	1	2	0	0	0	0	0	1	0	0	0	0	2	1	0
02/20/11	87	14	34	22	0	5	0	1	0	3	1	0	0	2	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0
02/21/11	38	6	5	1	1	0	1	3	0	0	0	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	1	2	0	0
02/22/11	67	9	3	1	6	1	5	1	3	6	0	2	2	1	2	0	1	2	2	0	0	3	0	0	0	0	1	0	0	0	1	2	3	3	2	1	1	0	0	0	0	0
02/23/11	59	8	4	1	0	0	1	4	1	0	1	1	0	1	0	0	0	0	1	0	1	0	0	3	1	2	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
02/24/11	108	18	21	31	18	4	0	4	7	2	3	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0
02/25/11	267	52	15	51	35	24	14	12	17	52	29	13	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/26/11	41	4	31	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
02/27/11	116	18	10	21	11	7	2	4	8	18	15	3	0	1	0	0	0	1	1	0	0	2	1	0	0	0	0	0	0	0	2	0	0	0	0	1	2	0	1	0	0	0
02/28/11	73	13	6	3	3	0	4	2	1	6	9	9	12	5	4	1	1	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
03/01/11	594	115	4	8	5	7	5	14	15	19	15	28	18	23	23	34	25	29	22	32	22	24	22	16	21	15	35	7	14	19	6	3	1	2	1	9	7	8	9	4	3	1
03/02/11	46	4	0	4	5	3	1	3	6	5	2	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
03/03/11	31	3	2	1	1	2	2	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
03/04/11	57	10	0	0	1	0	6	4	1	0	0	0	4	0	1	2	3	0	0	0	1	1	0	0	0	1	1	0	1	0	0	0	1	2	0	1	1	2	0	0	0	0
03/05/11	43	6	3	3	0	2	1	2	0	0	0	1	0	0	1	2	0	0	0	0	2	0	1	2	5	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0
03/06/11	114	20	35	48	5	0	0	1	1	5	3	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1
03/07/11	85	12	4	2	9	10	3	2	12	5	6	6	2	3	1	0	1	0	0	0	1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1
03/08/11	43	5	2	2	1	5	0	0	1	3	4	0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	0	0	0
03/09/11	73	13	0	3	3	2	2	2	19	11	14	6	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
03/10/11	976	192	76	70	24	34	38	35	45	82	80	51	43	57	55	39	24	33	25	27	14	4	6	8	15	12	4	5	9	12	8	4	7	2	3	0	1	0	0	0	0	0
03/11/11	88	20	27	15	1	1	2	0	3	1	0	4	4	0	0	0	0	0	1	0	2	4	0	0	1	5	3	0	0	0	0	0	1	2	1	0	0	0	0	0	4	1
03/12/11	142	25	2	8	3	6	4	2	5	9	2	5	3	0	1	0	3	1	0	0	0	5	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0	1	1	0	2	3
03/13/11	56	9	2	5	4	4	5	1	4	4	5	3	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0	3	2	0	0	0	2	0	0	0
03/14/11	48	7	1	5	3	2	3	3	0	2	1	0	0	0	0	1	0	0	0	0	2	0	0	2	0	3	2	0	2	0	0	3	0	0	0	1	1	4	0	0	0	1
03/15/11	466	108	37	6	8	22	8	10	14	21	12	14	9	6	7	2	4	8	19	12	13	17	23	15	1	2	4	10	6	8	13	9	4	14	10	7	14	2	0	0	9	10

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	1	0	0	0	2	1	2	0	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0
1	0	0	1	0	1	0	0	0	0	0	1	2	4	1	2	12	5	5	4	1	3	0	1	1	1	0	2	2	2	0	1	0	0	0
0	0	0	1	1	0	0	0	0	0	0	2	0	0	1	3	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0
0	0	1	0	1	1	0	1	0	1	1	0	1	2	0	0	1	1	0	1	2	0	1	2	0	0	2	0	1	0	0	0	1	0	0
0	0	0	0	1	1	3	1	1	1	0	2	0	1	0	0	0	0	0	0	2	0	0	0	1	1	0	1	0	0	0	0	0	0	0
0	1	0	0	0	0	2	1	1	1	0	1	2	2	1	3	1	0	1	0	2	0	0	0	2	0	2	0	2	1	0	2	0	0	0
0	2	2	0	0	1	1	0	1	1	1	0	0	0	2	0	1	0	0	0	0	1	0	1	0	4	2	2	1	2	2	1	0	0	0
0	0	0	0	0	0	0	1	0	2	0	1	2	3	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0
0	0	4	3	1	1	3	1	1	0	2	0	0	1	0	3	0	1	1	0	1	0	0	1	0	1	1	1	2	2	1	1	1	0	0
1	0	3	0	0	0	0	0	0	3	1	1	0	1	0	0	0	1	0	2	0	2	0	1	0	0	1	0	1	0	0	1	0	0	0
1	2	0	0	1	1	0	0	1	0	0	0	2	0	0	2	1	0	0	0	1	0	2	0	0	3	1	0	1	0	2	0	0	0	0
0	0	4	2	0	0	1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0
1	0	0	2	0	0	2	4	1	1	0	1	1	1	0	0	1	0	1	1	1	5	3	0	0	1	1	1	0	0	3	3	0	0	0
0	0	0	0	0	2	0	1	0	0	0	0	1	2	0	0	1	0	0	0	1	0	1	0	1	1	0	0	0	1	1	0	0	0	0
1	1	0	1	1	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1	0	0	0
0	0	1	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0
1	2	2	2	1	0	0	0	0	2	1	1	0	2	1	2	0	1	0	0	0	0	0	2	0	2	4	0	2	3	0	0	1	0	0
1	0	0	0	0	1	0	0	0	1	0	0	2	0	0	0	2	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	1	0	0	1	0	2	0	1	0	0	0	1	1	0	2	0	0	1	1	0	0	1	1	0	0	1	0	1	2	0	0	0
0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
0	1	1	0	2	0	0	2	0	0	1	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
1	1	0	0	1	1	2	0	2	4	2	0	0	0	0	1	0	2	0	2	0	0	2	0	0	1	0	0	0	1	0	0	0	0	0
0	0	0	1	0	1	0	0	0	2	1	0	0	2	0	0	0	1	1	0	1	0	0	1	0	0	2	0	0	0	1	0	0	0	0
0	1	0	0	1	0	1	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	0	1	0	0	0	0	0	0	0	2	0	0	2	0	0	1	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0
0	0	0	1	0	0	0	2	0	2	0	1	1	0	1	1	1	1	1	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0
0	0	0	0	1	1	1	0	0	0	1	0	2	2	0	1	0	0	0	2	1	0	0	2	2	2	1	0	3	0	0	2	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
0	2	0	1	1	1	1	0	1	3	4	4	4	6	5	2	1	2	3	4	3	0	1	6	3	3	1	5	1	2	2	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0
5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	9	4	0	3	2	8	0	0	2	2	1	0	5	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0

Appendix 19. Results of marine radar image analyses for data collected on 75 days (i.e., sunrise to sunset the same day) during the Spring season (16 Mar - 31 May 2011). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
03/16/11	420	82	309	56	3	10	14	11	7	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
03/17/11	69	11	16	11	2	1	1	5	10	4	0	0	0	3	6	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
03/18/11	123	35	4	7	0	4	8	8	3	12	9	8	1	6	1	3	0	5	1	1	0	3	1	6	6	1	1	1	1	1	4	0	0	1	2	3	2	0	0	0	0	2
03/19/11	85	12	9	3	0	0	0	8	9	15	9	0	0	6	8	3	1	0	0	1	1	3	2	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03/20/11	152	27	13	2	3	15	21	17	22	9	6	11	11	2	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0
03/21/11	169	31	56	38	6	15	10	7	9	9	1	6	3	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/22/11	89	15	26	5	3	6	6	0	3	4	3	4	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	3	1	3	0	0
03/23/11	53	8	1	1	3	0	6	7	16	1	0	1	4	0	1	0	0	0	0	0	1	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/24/11	90	14	10	5	1	0	0	1	2	0	6	2	4	0	4	2	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
03/25/11	115	19	41	19	4	4	2	2	5	8	2	12	2	0	0	1	2	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
03/26/11	100	15	34	7	3	4	4	2	5	4	7	5	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
03/27/11	119	19	26	12	17	10	3	3	3	6	5	1	6	2	5	9	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/28/11	46	6	2	7	2	6	6	1	0	2	4	0	0	1	3	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
03/29/11	31	2	2	4	5	1	1	2	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
03/30/11	121	21	39	11	20	6	8	9	0	2	0	2	2	0	4	8	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0
03/31/11	77	14	11	8	12	13	4	1	0	1	6	1	3	0	0	0	0	0	0	0	0	0	1	1	1	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04/01/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/02/11	52	7	13	9	1	0	4	0	0	2	3	0	0	0	0	0	0	0	1	0	1	0	1	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1
04/03/11	74	11	19	14	0	4	0	6	0	3	0	0	0	0	2	0	1	5	1	0	0	1	1	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04/04/11	36	6	0	0	0	1	4	11	4	0	0	3	0	4	0	0	0	0	0	0	1	4	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/05/11	597	115	156	147	46	10	15	11	16	7	17	16	5	6	7	5	12	2	11	7	5	4	1	2	1	6	3	1	3	1	4	10	4	3	12	3	0	1	3	0	4	3
04/06/11	80	12	25	11	11	11	9	1	2	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0
04/07/11	115	19	8	4	4	11	11	7	6	0	6	4	0	5	4	4	1	6	5	0	0	2	0	1	0	0	2	1	4	3	1	0	0	2	1	0	1	0	1	0	0	1
04/08/11	141	24	6	4	6	19	12	6	11	0	1	3	4	5	8	6	4	1	2	0	3	7	0	4	1	1	1	0	0	0	0	0	0	0	0	4	0	0	1	1	1	2
04/09/11	95	17	8	6	8	2	7	10	10	6	9	5	0	0	0	0	0	2	3	3	0	1	0	2	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
04/10/11	284	62	15	10	13	15	16	29	14	11	18	9	1	5	7	9	12	11	12	5	1	2	7	1	3	4	9	5	5	2	6	0	0	0	0	5	0	4	0	1	0	1
04/11/11	616	144	52	99	16	1	4	33	35	36	69	72	26	10	8	8	11	11	5	8	22	3	19	8	7	1	1	2	1	0	0	4	6	2	2	1	1	1	0	3	0	0
04/12/11	195	50	21	9	8	5	11	8	16	7	13	5	8	9	9	10	4	6	12	1	3	3	2	0	4	6	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04/13/11	64	12	7	2	2	8	4	1	5	0	0	0	1	1	2	0	1	5	1	0	0	0	0	0	0	2	2	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0
04/14/11	207	36	5	9	5	7	2	10	21	23	14	17	11	9	1	6	1	5	2	8	0	5	4	0	1	0	0	0	1	2	3	5	0	0	4	7	0	0	0	0	1	0
04/15/11	297	56	51	23	12	23	25	22	13	14	9	16	11	6	0	8	11	14	2	0	5	3	2	0	0	0	2	1	1	3	2	2	1	0	1	1	0	1	0	3	0	0
04/16/11	136	21	21	7	3	13	10	10	11	7	2	6	3	2	4	1	2	1	1	1	0	0	8	1	0	0	0	0	0	0	1	0	0	3	3	2	2	0	0	0	0	0
04/17/11	269	50	9	27	29	20	17	36	20	19	23	3	8	1	3	1	1	3	1	1	3	2	1	3	3	10	4	2	0	1	2	0	1	0	0	2	0	1	0	1	0	0
04/18/11	104	19	3	10	7	16	12	7	1	2	2	5	4	2	2	2	0	2	0	0	0	2	0	0	1	0	2	1	0	1	0	0	1	1	1	1	1	1	3	0	0	2
04/19/11	226	40	6	10	9	19	5	23	10	13	7	9	8	6	6	3	1	6	0	0	0	0	1	4	3	0	0	1	1	1	6	3	5	0	4	12	5	9	9	0	0	0
04/20/11	127	22	26	14	8	0	0	2	4	4	3	4	0	4	2	4	0	1	0	0	0	2	7	1	1	1	3	8	2	0	3	0	0	0	0	0	1	0	0	0	1	0
04/21/11	325	61	14	31	7	24	11	18	16	25	22	9	7	8	2	2	0	1	2	7	3	5	5	3	2	0	2	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0
04/22/11	235	42	27	9	27	20	18	17	12	14	11	13	10	3	2	2	7	1	1	1	2	5	6	0	0	0	1	0	1	0	0	2	0	0	0	0	0	1	0	0	0	0
04/23/11	194	36	70	40	5	17	12	4	5	2	1	0	0	1	4	2	9	0	2	0	0	2	2	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/26/11	322	64	0	0	0	0	0	0	0	0	1	0	3	0	4	2	0	0	0	0	2	0	0	0	5	0	6	2	4	16	34	25	41	36	12	8	1	0	0	0	0	0
04/27/11	2628	519	23	30	23	32	28	36	26	22	24	17	42	57	69	71	66	71	91	119	127	112	145	117	112	147	125	71	66	76	53	37	63	71	52	31	47	34	23	22	30	10
04/28/11	201	36	2	11	2	3	3	5	0	4	5	9	7	16	13	2	8	8	3	4	4	3	2	0	0	1	7	1	7	5	7	8	7	7	7	3	1	0	1	0	4	4
04/29/11	886	196	13	7	18	17	15	17	24	14	9	10	21	20	20	22	22	8	21	13	21	15	7	20	18	23	20	17	20	35	33	15	42	47	60	26	29	27	54	7	15	12
04/30/11	378	94	23	19	17	31	13	27	6	23	15	30	24	27	6	6	9	8	18	4	13	10	8	2	2	0	7	3	0	0	1	0	0	1	0	1	0	0	1	0	0	1
05/01/11	409	82	27	12	8	13	16	19	17	26	13	14	11	11	15	24	12	14	24	21	26	21	14	8	16	2	4	2	0	0	3	1	1	1	0	0	0	0	0	0	0	0
05/02/11	1201	238	37	15	32	39	8	39	33	42	35	39	22	45	86	76	58	91	70	48	60	58	40	40	25	14	13	9	11	12	9	8	10	1	3	0	2	1	1	4	6	1
05/03/11	1454	337	46	28	25	39	42	38	20	33	15	36	28	32	42	50	44	49	47	31	52	48	44	45	56	48	39	61	53	64	38	12	18	7	16	9	11	11	6	15	36	29
05/04/11	573	171	33	81	15	20	8	6	14	9	11	8	7	12	10	13	14	17	25	15	13	21	13	6	9	13	15	9	13	11	11	2	6	8	11	8	10	5	6	8	8	2
05/05/11	297	55	13	8	6	5	2	7	1	0	2	0	1	6	8	4	2	7	8	6	4	7	14	8	9	14	10	14	24	5	6	8	11	10	6	11	9	6	4	0	5	8
05/06/11	390	73	43	12	15	35	21	28	10	11	13	14	8	10	20	8	5	13	8	3	4	5	11	7	6	4	8	7	15	4	3	1	9	9	1	0	1	5	0	1	3	1

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	2	2	0	0	0	0	0	0	0	1	2	0	0	0	0	0	1	0	0	2	0	0	1	1	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
1	0	0	2	4	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
0	0	2	2	3	1	6	0	1	1	1	0	3	3	5	4	2	0	0	0	0	2	2	2	0	0	1	2	0	1	0	0	0	0	0
0	0	1	0	0	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	1	0	1	3	1	1	0	1	0	1	0	0	1	1	0	2	1	0	1	0	0	0	0	1	1	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	2	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	3	2	1	0	0	1	0	0	1	0	1	0	0	0
0	0	0	0	1	2	0	0	1	0	2	1	1	0	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	0	0	3	0	1	0	5	2	1	0	0	0	0	0	0	0	1	1	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	1	0	0	1	0	1	1	0	1	1	0	1	1	0	1	2	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0
0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0
0	0	1	0	0	2	0	0	0	0	3	1	0	1	3	2	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0
2	0	1	0	0	2	0	2	0	1	1	0	1	3	0	0	1	0	1	3	1	0	1	0	0	1	0	0	2	0	3	0	0	2	0
0	0	1	0	0	0	0	1	0	0	0	0	1	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	2	2	0	2	0
1	1	3	0	0	0	0	0	1	2	1	1	0	0	1	0	0	1	0	0	0	1	1	0	0	1	1	0	0	0	2	0	0	0	0
1	0	0	0	1	2	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	0	0	0	0	0	1	1	0	1	1	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0
3	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0
0	1	0	0	0	0	0	1	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0
1	0	0	2	0	1	2	0	1	0	0	2	1	1	0	0	1	0	0	3	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	2	8	2	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
4	4	0	0	1	0	0	4	0	1	2	0	0	3	0	2	7	6	6	9	4	6	3	4	3	1	1	2	1	3	3	5	6	5	0
0	1	1	0	1	0	1	3	4	1	2	1	1	2	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	5	1	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	10	19	30	22	19	12	1	0	0	0	0	0	0
19	10	11	9	10	11	8	14	8	5	2	7	10	5	8	9	3	11	2	9	4	2	11	2	4	1	0	1	0	2	6	4	2	0	0
0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	0	0	1	0	2	0	2	0	0	2	0	0	2	0	0	0
10	5	3	1	0	0	0	4	0	0	0	1	2	1	0	0	0	0	2	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0
3	2	2	0	2	0	0	0	2	0	0	1	0	0	1	2	0	2	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
0	0	0	0	1	5	0	0	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
1	0	6	1	4	0	0	1	3	2	1	0	0	1	2	0	4	5	0	2	3	5	0	0	8	2	0	0	2	0	0	4	1	0	0
18	9	7	16	4	5	6	5	3	1	2	0	3	1	1	0	0	0	1	0	3	0	0	0	0	0	0	3	2	0	1	0	0	0	0
6	6	2	4	6	10	1	3	1	0	0	0	3	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0
4	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	5	4	0
0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
05/07/11	330	60	1	8	5	17	19	9	10	8	8	11	3	12	6	5	1	2	3	3	3	3	12	27	4	1	4	3	12	3	5	5	16	7	9	4	12	6	5	1	2	2
05/08/11	103	16	11	5	5	3	1	0	3	1	0	0	0	5	2	0	5	3	4	3	0	2	1	1	5	0	0	0	1	6	3	4	1	1	2	0	0	1	2	3	0	3
05/09/11	153	23	26	4	8	10	13	4	8	2	1	1	2	3	0	2	3	3	1	4	3	1	6	2	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	1
05/10/11	82	14	51	9	0	3	0	1	2	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
05/11/11	120	20	14	3	11	5	6	8	3	12	3	7	1	2	3	1	1	3	0	4	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	3	6
05/12/11	197	34	2	20	13	17	16	9	19	15	6	4	7	11	7	13	2	3	0	3	1	1	0	3	0	8	3	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
05/13/11	2320	457	91	51	40	38	76	58	64	53	52	35	54	96	86	71	84	90	85	80	69	92	57	58	63	52	49	51	55	49	18	25	30	19	31	32	22	15	22	19	19	10
05/14/11	2118	419	92	83	99	91	73	94	59	67	57	52	44	59	46	64	56	76	46	49	51	37	69	78	75	59	39	27	42	35	61	28	36	32	16	23	13	7	9	14	15	16
05/15/11	256	50	25	13	8	2	8	6	1	3	1	2	5	5	3	11	2	1	3	1	0	4	1	1	1	15	10	8	14	13	11	4	7	4	7	19	11	5	1	0	0	0
05/16/11	78	13	39	13	1	0	2	2	2	2	1	1	0	1	0	0	0	0	0	4	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	1	1	1
05/17/11	85	13	24	11	6	0	8	10	3	3	0	1	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0
05/18/11	88	11	16	8	3	7	0	1	2	2	0	0	3	5	5	2	0	2	0	1	2	2	0	2	0	0	0	0	0	0	1	0	0	1	0	1	1	1	1	0	2	0
05/19/11	2322	460	107	73	51	80	80	94	89	89	73	81	85	101	81	66	65	82	68	64	68	61	36	39	18	13	9	9	12	13	14	6	15	6	5	14	16	14	15	29	23	19
05/20/11	73	12	4	1	2	2	4	4	2	0	0	0	1	0	1	0	4	3	1	0	0	3	0	1	3	2	1	2	3	0	1	0	4	0	1	0	1	0	1	1	0	0
05/21/11	1929	382	48	40	32	44	55	33	35	45	45	63	42	80	69	44	46	51	72	55	37	50	56	36	48	36	43	25	20	29	22	32	33	28	43	41	44	20	37	26	28	21
05/22/11	155	29	34	20	8	7	10	9	5	5	13	3	7	1	15	2	1	2	0	1	0	0	1	0	0	0	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
05/23/11	209	39	33	22	9	39	38	7	7	4	0	2	2	0	7	1	2	0	3	1	0	1	1	0	4	1	2	2	0	4	0	0	2	4	0	1	0	0	0	0	0	0
05/24/11	469	100	41	45	21	22	22	16	10	11	7	13	7	10	12	11	8	7	7	6	7	7	1	5	5	10	5	11	4	15	12	4	3	24	6	4	10	5	0	4	7	2
05/25/11	2047	418	113	48	85	68	100	114	68	96	88	66	66	116	80	58	44	73	70	38	36	34	29	30	27	21	19	29	31	23	25	15	19	29	52	17	26	16	5	10	14	12
05/26/11	792	165	28	10	8	1	6	10	2	6	5	11	21	31	54	79	32	48	47	28	39	37	31	21	12	25	11	7	26	24	14	11	10	12	5	3	7	8	6	3	5	1
05/27/11	1197	247	27	21	28	32	27	26	21	35	23	23	18	30	62	95	40	67	57	27	35	41	50	47	36	47	45	15	41	19	17	15	10	18	13	13	8	8	16	4	9	4
05/28/11	633	126	20	26	18	8	25	11	20	11	19	15	21	22	30	28	21	29	31	22	16	20	16	16	7	16	20	15	14	10	10	10	17	12	13	7	1	3	6	4	0	0
05/29/11	466	100	80	18	8	30	6	23	10	13	17	13	17	14	9	13	5	5	9	8	12	13	12	10	12	4	7	5	4	8	4	3	7	7	3	6	1	7	5	7	0	6
05/30/11	4571	930	92	68	47	65	78	56	40	57	56	107	128	220	268	274	240	243	332	324	270	250	203	149	176	140	182	94	63	82	53	45	26	32	14	12	21	1	10	4	13	7
05/31/11	968	190	56	32	38	29	26	19	22	17	46	37	27	57	40	54	34	47	22	46	32	39	38	33	7	18	16	8	10	5	7	7	13	0	9	11	9	16	1	0	3	8

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	5	3	5	2	6	0	2	0	1	5	3	4	3	1	0	0	2	0	0	2	0	1	0	2	0	0	0	2	2	0	0	2	0	0
1	0	1	3	1	0	0	0	3	0	1	0	1	0	1	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
2	1	1	0	0	1	1	0	0	0	1	1	1	1	2	4	2	2	2	2	1	3	2	0	1	1	0	2	0	2	1	2	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
2	3	3	2	0	1	2	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0	1	0	1	0	0	0
13	8	10	8	11	18	12	14	1	3	9	6	26	4	9	11	8	6	6	6	13	4	20	13	6	6	0	3	0	3	0	2	0	0	0
17	7	19	13	2	0	2	4	5	4	8	3	6	2	5	1	0	0	6	1	4	0	9	4	3	0	1	0	2	0	0	1	0	0	0
2	3	1	4	3	0	2	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
1	1	1	1	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0
1	1	0	0	0	0	0	0	1	0	0	0	1	1	3	0	1	0	0	1	1	1	0	0	1	2	0	1	0	0	0	1	0	0	0
20	17	24	22	14	18	8	13	19	21	15	10	17	10	5	10	12	13	11	14	12	21	16	22	12	20	11	10	4	9	4	2	0	1	2
2	1	2	0	0	1	2	0	0	0	0	5	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	2	0	0	1	0	1	0	0
18	27	8	13	14	21	12	15	16	14	13	8	11	1	4	14	1	6	14	3	15	9	7	0	0	2	0	5	0	0	2	2	0	0	0
0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	1	0	0	0	0	0	0	0
10	3	1	3	1	1	7	1	0	0	1	0	0	0	1	0	0	1	3	0	1	0	3	1	0	0	0	0	3	0	1	0	0	0	0
12	10	5	3	2	6	10	5	6	6	6	9	7	4	5	1	5	0	11	9	0	7	1	1	3	0	0	1	1	0	0	0	1	0	0
0	2	6	0	0	0	0	0	5	0	9	4	5	1	8	0	0	0	0	5	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
6	0	5	0	0	0	4	0	1	1	3	0	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	1	1	0	1	0	0	0	0
2	0	0	1	6	0	3	2	0	2	0	0	2	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	1	0	0	0	0
1	0	3	1	0	2	1	0	1	0	0	2	0	0	0	0	0	1	0	1	0	0	0	1	0	1	6	0	1	1	0	1	0	1	0
1	0	0	4	5	3	0	8	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	2	0	1	1	0	1	0	0	1	0	0	0
1	2	2	7	2	0	1	1	2	3	3	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0

Appendix 20. Results of marine radar image analyses for data collected on 75 nights (i.e., sunset to sunrise the next day) during the Spring season (16 Mar - 31 May 2011). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
03/16/11	23	3	0	0	0	1	0	1	1	3	1	2	1	2	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03/17/11	911	182	62	73	24	45	34	36	18	36	39	55	48	36	45	34	24	33	33	15	13	20	15	12	15	8	29	17	6	5	9	5	9	5	4	4	1	7	0	0	3	5
03/18/11	136	24	40	20	6	2	0	4	12	8	2	0	1	1	4	0	5	0	5	0	0	0	1	0	5	2	1	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0
03/19/11	83	13	3	2	0	11	2	19	14	3	0	0	2	2	1	0	3	1	1	2	0	0	8	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	2	0	1
03/20/11	458	88	13	7	5	10	14	14	12	11	21	28	28	11	20	6	18	14	11	6	16	12	0	2	13	4	6	8	6	8	4	1	6	4	4	6	10	6	6	6	13	10
03/21/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/22/11	69	11	14	6	0	0	0	2	0	0	0	1	0	0	0	0	3	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03/23/11	38	5	8	4	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
03/24/11	33	4	1	1	0	3	1	0	3	0	4	3	0	1	0	0	0	0	0	2	1	4	0	0	2	0	2	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0
03/25/11	77	12	2	2	5	4	7	4	5	1	4	8	1	0	0	2	0	0	0	2	2	3	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/26/11	46	6	3	2	0	0	1	0	3	0	6	11	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	1	1	0	6	0	1	0	0	0	0	0	0	0	0
03/27/11	50	6	0	2	0	1	0	5	5	2	2	5	1	6	3	4	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0
03/28/11	36	5	1	0	3	3	3	1	5	3	3	1	1	0	1	1	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03/29/11	52	8	2	3	0	0	0	0	13	4	0	6	3	0	0	0	0	1	2	3	3	3	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	5	0	1
03/30/11	1274	255	60	67	82	86	78	74	75	76	54	57	47	61	54	46	37	35	28	3	6	23	3	7	2	2	6	8	9	0	7	5	5	7	5	7	8	7	0	2	0	6
03/31/11	20	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/01/11	74	12	36	18	0	0	0	0	3	0	8	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/02/11	132	22	11	5	5	7	2	1	9	8	8	7	11	7	2	5	10	4	0	1	0	0	0	0	0	0	5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
04/03/11	185	32	6	12	1	11	15	19	18	12	11	10	11	14	6	4	4	0	2	0	1	0	3	0	0	0	0	0	0	0	0	0	1	2	4	0	6	0	0	0	2	0
04/04/11	1006	211	62	34	23	22	26	16	7	8	17	17	11	25	16	29	20	28	22	20	22	21	13	6	23	20	17	38	28	17	42	24	24	18	13	13	23	18	13	23	17	14
04/05/11	119	24	19	12	11	4	2	2	5	4	11	8	5	1	5	1	0	0	3	1	0	0	0	0	0	0	2	1	7	4	0	0	0	3	0	0	0	0	0	0	0	0
04/06/11	360	73	25	18	10	35	9	19	18	25	11	8	10	7	3	7	7	10	10	8	18	3	5	1	7	8	1	5	2	0	7	0	5	1	5	1	1	0	1	0	0	4
04/07/11	2270	449	131	100	79	104	124	85	100	93	120	89	69	51	39	49	52	53	38	27	33	17	11	19	25	7	30	24	43	21	22	16	14	28	16	5	14	12	38	16	18	9
04/08/11	2002	396	23	17	48	37	82	63	75	50	75	62	89	87	69	110	135	90	81	82	89	67	45	53	54	34	44	44	34	33	20	19	33	17	15	11	15	10	11	6	4	9
04/09/11	1056	210	39	28	36	45	68	37	62	57	48	67	39	43	26	52	36	52	22	39	23	22	11	18	9	20	9	6	9	0	0	10	1	2	11	2	14	7	2	6	0	2
04/10/11	408	81	95	90	6	2	8	3	5	6	18	9	5	20	13	8	2	15	6	2	12	11	5	2	8	5	0	3	0	6	0	4	5	2	2	2	3	0	0	1	0	3
04/11/11	3509	701	104	122	127	91	102	126	142	128	202	196	217	214	165	142	144	130	97	83	71	40	71	67	42	50	51	56	42	48	27	32	33	21	13	20	16	13	12	15	22	18
04/12/11	597	116	54	75	25	30	47	50	33	25	6	33	28	26	22	15	10	9	7	5	4	8	6	6	9	7	1	0	5	0	2	3	1	0	3	2	4	0	5	0	1	0
04/13/11	739	147	42	42	18	18	8	13	6	9	1	2	4	2	1	13	6	2	8	18	11	17	9	7	13	27	12	8	14	27	14	31	20	24	35	57	25	28	18	15	9	15
04/14/11	184	34	24	5	4	6	12	11	11	6	15	8	8	8	4	9	0	0	3	0	0	0	1	1	3	3	0	0	4	2	1	0	1	1	1	0	1	3	2	0	0	1
04/15/11	407	75	27	15	17	10	26	18	16	14	17	7	14	13	9	23	8	7	3	8	8	2	3	2	1	1	5	10	2	1	1	9	10	2	0	1	5	1	0	0	2	3
04/16/11	164	31	4	31	32	6	0	2	8	13	6	1	3	0	0	1	0	0	0	0	0	1	2	0	0	0	3	2	1	12	4	1	2	4	6	0	1	1	1	1	0	0
04/17/11	790	154	29	28	25	19	19	21	19	14	8	33	17	22	26	9	22	23	16	20	11	4	17	35	29	26	15	7	10	21	12	11	15	21	23	23	23	19	16	7	6	17
04/18/11	397	85	38	22	21	19	12	6	16	10	11	8	17	9	13	3	5	7	7	8	5	10	9	10	4	7	1	1	13	9	1	4	6	4	5	4	11	7	0	4	2	4
04/19/11	760	148	41	23	10	24	11	24	13	11	37	25	27	53	19	17	19	20	35	42	17	30	78	47	27	22	8	6	9	10	3	2	3	0	1	0	0	0	0	0	0	0
04/20/11	397	84	18	7	4	15	11	9	0	7	3	5	7	6	1	7	6	1	8	2	7	12	1	10	7	5	9	2	1	5	8	7	11	2	9	5	6	12	9	4	10	4
04/21/11	102	17	10	9	6	10	7	9	15	3	2	2	0	0	0	3	3	1	2	2	0	0	0	1	0	0	0	0	0	0	0	0	1	3	1	2	0	0	0	0	0	0
04/22/11	829	166	51	41	41	43	48	61	30	39	46	37	52	61	40	31	37	30	27	10	12	8	7	3	6	10	0	2	1	4	9	0	0	5	3	4	3	1	4	0	0	0
04/23/11	71	14	18	11	14	0	6	3	0	1	0	0	2	1	2	0	0	1	4	1	2	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0
04/26/11	4660	976	273	171	126	154	136	117	131	116	123	106	104	150	184	144	124	126	107	113	140	102	76	71	98	75	78	57	92	78	45	55	62	65	96	70	39	31	13	24	16	26
04/27/11	3036	615	37	37	31	35	34	36	51	49	27	50	47	64	68	84	96	98	90	118	92	149	148	105	130	131	132	101	100	117	84	97	73	80	70	49	57	41	28	44	19	27
04/28/11	2937	584	68	75	64	125	99	130	128	154	108	108	133	154	98	135	91	138	105	78	115	84	74	60	63	53	40	51	49	56	39	43	22	36	25	19	17	8	12	5	2	7
04/29/11	5836	1165	74	74	86	81	90	74	103	108	94	120	156	247	275	287	299	405	358	360	319	358	310	269	237	170	133	118	126	105	84	75	42	33	21	29	24	12	18	9	8	8
04/30/11	2627	521	67	64	64	96	73	115	128	119	101	104	117	130	115	193	117	104	123	128	105	110	78	101	42	44	18	24	24	9	18	12	10	5	9	8	4	8	8	0	0	2
05/01/11	1927	384	126	58	79	131	170	130	126	94	106	63	62	63	51	48	43	42	29	44	55	33	47	64	18	41	20	28	19	18	24	15	9	11	8	14	7	5	1	1	0	5
05/02/11	2387	491	59	127	100	110	197	154	131	76	107	76	81	68	94	85	83	71	48	42	55	48	55	36	36	24	19	10	14	11	19	11	20	10	20	8	10	10	18	10	8	10
05/03/11	2387	487	72	55	19	29	20	13	22	5	21	25	36	66	87	95	110	92	110	120	120	117	119	104	127	114	116	74	71	58	53	30	27	43	14	28	11	30	14	11	21	19
05/04/11	757	148	43	54	36	44	51	40	41	24	27	22	8	22	35	18	33	16	5	19	11	11	10	10	2	5	0	1	0	9	9	1	1	2	11	5	1	4	3	12	15	7
05/05/11	218	43	40	11	9	9	17	13	6	10	8	6	3	4	10	4	7	2	4	1	2	0	2	4	12	2	0	2	0	1	2	0	0	0	1	5	1	0	0	4	0	0
05/06/11	3802	762	90	98	137	127	206	232	243	277	290	211	230	230	230	187	108	119	87	65	51	39	34	36	25	46	28	37	48	45	50	34	32	21	10	10	14	6	2	4	13	5

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0
7	6	4	1	2	0	4	0	0	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	1	3	1	1	1	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	8	2	0	1	0	4	5	0	5	3	3	0	4	8	0	1	1	0	0	1	0	1	1	1	2	0	0	2	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	5	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1	2	1	1	1	0	0	4	5	1	1	4	3	0
0	0	0	1	0	1	0	1	1	0	3	2	2	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	4	1	1	1	0	0	0	0	1	3	0	1	0	1	1	0	2	2	1	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0
0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	6	4	1	0	4	5	0	1	2	11	11	7	12	1	11	11	2	6	16	4	1	5	4	1	0	0	0	0	1	2	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6	3	7	0
0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	3	3	1	2	3	0	2	0	1	0	1	1	1	0	0	0	0
0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
11	8	12	15	8	8	10	5	13	2	8	4	2	8	9	8	3	3	3	6	1	2	4	0	0	0	0	2	1	0	0	0	0	0	0
0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
7	4	1	4	7	2	0	0	3	0	2	1	0	1	0	0	3	1	0	0	2	0	0	3	0	0	0	0	0	4	0	0	0	0	0
20	31	34	22	17	14	13	19	14	13	22	27	7	9	12	13	5	24	11	17	16	12	4	8	9	8	4	6	5	4	2	4	0	3	0
4	8	3	2	10	6	7	2	2	0	0	0	5	0	0	0	0	0	1	4	2	1	0	1	0	1	0	0	1	0	0	0	0	0	0
4	5	6	2	11	5	1	4	1	0	1	3	1	2	2	5	0	1	0	1	2	2	2	0	0	1	3	0	2	2	3	2	2	0	0
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17	19	15	4	1	12	11	9	16	7	5	2	6	3	9	3	0	3	4	4	7	7	1	0	5	4	4	3	1	2	6	4	3	0	0
0	0	5	0	0	0	4	1	2	1	1	2	0	0	4	0	1	0	0	3	1	0	0	0	0	0	1	0	2	0	1	0	0	1	0
22	9	6	5	6	13	3	7	2	4	1	4	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
2	4	0	1	0	1	0	0	0	1	4	0	0	0	1	0	5	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0
2	0	4	4	8	9	8	5	0	3	2	3	6	4	1	3	3	6	3	1	1	0	0	1	0	4	1	0	4	0	0	0	0	0	0
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0	2	2	4	6	2	0	2	1	1	4	2	5	2	0	0	0	0	0	8	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
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2	0	0	2	0	5	0	0	1	0	0	1	3	1	0	0	0	0	0	0	0	1	0	0	0	0	1	3	0	2	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	16	18	7	21	13	13	49	39	51	54	54	58	39	45	45	39	37	40	13	30	6	4	7	5	5	7	5	0	1	0	1	0	0	0
18	12	5	8	12	4	7	2	8	0	3	2	3	1	4	0	7	7	1	0	0	2	2	0	1	0	0	0	1	0	0	0	0	0	0
6	2	8	3	3	2	7	2	3	7	4	0	0	2	2	0	0	0	5	1	0	0	4	4	1	0	0	0	0	0	0	0	0	0	0
5	4	2	1	1	2	1	0	0	3	1	0	2	0	0	2	0	0	0	0	0	1	0	1	0	2	5	0	2	1	0	0	1	0	0
4	3	0	4	0	0	1	9	4	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	5	1	1	0	1	0	0	0	0	2	2	2	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0
9	8	11	9	11	19	9	30	13	12	13	13	7	3	1	1	10	1	5	3	8	1	0	1	4	2	1	0	3	1	3	4	0	0	0
9	17	11	5	7	10	0	4	0	1	0	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	11	12	6	15	9	1	2	2	1	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	4	0	2	6	3	1	0
0	0	0	0	1	1	0	2	0	0	1	0	3	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	1	5	2	1	0	0	0	6	3	3	0	2	2	0	0	5	2	0	0	0	4	0	3	1	0	0	0	0	0	0	0	0	0

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
05/07/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/08/11	1300	258	15	15	21	54	42	24	56	64	40	46	54	62	75	38	43	54	60	53	37	40	46	41	34	39	37	34	18	38	23	7	16	8	6	2	3	8	5	1	7	7
05/09/11	70	16	24	8	0	1	2	3	2	4	3	1	0	3	0	0	1	4	2	0	3	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/10/11	74	12	6	4	0	1	4	3	2	8	6	6	3	6	5	1	0	0	0	0	0	1	2	0	0	1	0	1	0	0	4	0	1	0	0	0	0	1	0	0	0	0
05/11/11	188	34	9	8	4	16	11	9	10	2	17	8	4	5	3	1	3	9	2	5	1	1	2	2	1	0	0	1	1	3	0	2	0	0	0	2	0	1	0	3	2	2
05/12/11	1910	434	182	94	100	132	173	125	114	87	106	78	54	65	58	44	37	40	35	65	33	13	15	20	17	26	6	18	14	14	3	17	8	14	5	14	20	15	0	0	1	0
05/13/11	6715	1430	636	391	383	446	490	496	443	478	376	362	343	190	149	165	136	134	88	61	65	49	35	33	15	23	23	11	13	19	11	10	12	14	1	2	12	3	14	19	20	10
05/14/11	472	120	111	23	39	34	17	17	8	8	8	12	2	5	8	9	7	11	5	0	1	8	16	13	4	11	11	5	13	4	4	9	11	4	3	0	4	1	0	3	4	2
05/15/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/16/11	134	25	22	17	10	11	5	16	5	12	4	3	1	5	0	0	0	2	0	0	5	0	1	2	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
05/17/11	126	24	15	12	14	14	2	2	2	3	4	1	3	8	2	0	2	10	5	0	0	0	1	1	3	2	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1
05/18/11	102	16	20	15	4	0	0	1	2	0	2	6	1	3	0	0	8	2	2	3	1	1	0	0	0	0	0	0	0	0	0	2	5	1	0	1	0	0	0	0	0	0
05/19/11	245	47	64	41	15	13	24	14	9	11	9	4	6	2	4	0	0	0	3	1	0	5	0	1	0	0	0	0	9	0	1	0	0	0	0	0	0	0	0	0	2	0
05/20/11	10106	2155	278	269	274	395	350	386	380	393	453	410	492	484	526	502	429	436	402	412	336	264	216	251	184	180	169	121	113	47	73	57	42	80	58	59	77	68	33	32	57	20
05/21/11	465	94	49	23	33	26	22	39	32	22	13	22	8	4	2	7	5	13	1	6	10	3	5	0	3	0	4	1	0	0	0	1	3	0	3	6	2	13	5	13	1	9
05/22/11	1232	247	151	75	87	90	68	48	52	27	7	24	14	9	14	15	11	20	9	3	4	5	15	6	9	11	7	9	1	1	19	14	6	39	15	39	36	37	34	22	35	20
05/23/11	190	34	27	21	4	3	0	3	5	2	3	0	11	8	6	8	11	13	6	7	5	0	8	6	3	4	1	5	2	2	0	2	1	0	0	1	2	0	2	2	1	1
05/24/11	4819	960	390	251	256	310	329	321	301	218	278	220	238	246	177	162	152	92	85	85	69	53	29	26	38	32	34	33	29	14	23	23	26	10	9	10	26	24	21	13	19	9
05/25/11	1691	333	99	110	129	100	89	74	79	91	98	102	65	77	60	52	48	31	9	10	12	16	7	25	26	24	19	18	4	7	6	22	13	6	7	4	9	0	0	6	13	11
05/26/11	933	186	25	15	17	22	12	12	13	17	17	13	20	24	30	44	42	27	37	35	34	27	39	16	22	21	33	38	19	20	16	24	19	14	11	10	14	16	14	14	14	9
05/27/11	3384	676	93	65	56	31	36	22	19	15	31	15	20	35	40	42	60	82	86	136	130	140	166	166	145	138	107	118	143	116	93	108	102	90	69	83	65	68	60	27	34	30
05/28/11	615	122	22	16	10	17	11	5	7	12	23	23	26	34	24	37	34	21	15	25	17	17	14	7	10	3	13	13	6	9	5	12	4	0	9	3	4	12	6	7	10	10
05/29/11	1452	288	71	95	65	38	73	116	62	61	31	33	50	57	33	37	43	56	64	41	82	22	47	35	20	31	12	16	21	20	10	10	4	8	4	16	10	7	2	9	12	2
05/30/11	1223	247	55	31	48	20	37	41	53	85	56	34	56	64	65	41	44	28	44	44	34	31	24	19	18	28	18	20	23	14	10	15	14	7	8	13	3	4	2	5	5	0
05/31/11	2051	412	60	54	54	87	94	84	108	94	100	99	104	106	122	80	81	65	52	67	32	38	17	25	34	33	25	29	17	3	1	5	5	6	7	11	11	21	3	4	11	14

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	4	5	1	0	1	0	2	0	0	0	0	0	1	2	2	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0
0	0	0	0	0	2	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
2	2	3	5	4	1	2	0	5	1	3	1	1	1	3	0	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
9	7	7	1	11	0	1	0	0	1	3	1	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
32	35	30	13	38	33	13	13	11	15	6	23	26	24	23	22	26	27	23	21	10	14	22	12	4	6	0	5	0	1	1	3	2	0	0
0	4	2	0	1	4	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	0	4	0	0	0	0	1	2	0	0
0	0	0	0	1	0	0	0	0	1	1	5	3	1	0	1	1	0	1	1	0	0	0	1	1	1	1	0	0	0	0	2	0	0	0
0	0	0	0	0	0	0	5	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	34	17	23	17	21	22	34	15	5	25	9	5	4	8	5	2	7	5	5	0	0	1	3	3	1	5	2	4	0	1	1	1	1	0
14	3	8	6	1	0	5	2	0	1	1	2	5	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	2	0
8	8	19	11	6	16	8	6	1	10	7	4	10	3	4	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0
9	25	3	7	8	2	8	5	6	4	0	4	9	3	6	11	2	6	6	2	1	3	0	3	3	0	0	1	0	0	0	0	1	0	0
1	0	4	2	7	11	2	0	6	2	7	3	12	13	7	1	7	2	7	6	0	3	0	5	0	0	1	0	0	0	2	1	0	1	0
9	10	6	2	1	1	0	1	1	3	4	4	1	2	2	7	5	2	0	2	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0
40	23	39	12	10	19	21	14	14	14	11	8	5	10	0	5	10	7	7	5	11	0	1	7	0	3	0	1	2	0	3	0	0	0	0
0	1	4	0	0	4	1	8	4	1	1	1	6	7	2	0	2	1	0	0	5	2	0	1	1	3	2	4	0	0	0	1	0	0	0
1	0	9	3	0	3	1	0	1	4	2	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2	3	7	0	3	7	0	5	0	7	0	5	4	0	0	4	6	0	0	0	0	0	2	2	2	0	0	0	1	0	0	0	1	1	0
18	7	24	19	9	9	6	16	8	9	1	5	11	2	10	9	1	6	6	2	2	1	1	1	4	0	0	1	0	0	0	0	0	0	0

Appendix 21. Results of marine radar image analyses for data collected on 43 days (i.e., sunrise to sunset the same day) during the Summer 2011 season (1 Jun - 14 Jul 2011). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																						
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000
06/01/11	1299	262	47	61	31	82	45	24	12	28	36	87	81	120	116	50	35	34	27	17	13	20	24	29	18	11	11	19	18	8	14	10	10	27	15	19	17	23	3	7	2	10
06/02/11	289	52	17	3	15	19	13	3	10	10	15	9	4	6	12	15	12	13	6	6	4	10	2	4	8	7	4	4	6	0	3	4	5	0	0	12	6	2	0	1	7	0
06/03/11	246	44	32	16	15	10	4	5	2	1	7	12	12	10	2	4	1	0	0	0	0	0	3	13	6	1	9	5	4	9	2	1	4	1	0	7	1	2	0	0	2	6
06/04/11	616	117	34	17	23	26	17	30	28	17	16	21	34	26	31	37	13	18	16	10	28	16	14	9	4	7	12	10	13	5	6	5	2	0	6	3	1	1	5	4	3	8
06/05/11	308	58	3	2	9	15	6	7	8	0	9	9	13	21	7	11	11	14	20	22	8	11	20	20	8	10	3	4	1	0	0	0	5	5	8	6	3	0	0	1	0	0
06/06/11	1310	257	64	61	79	57	67	51	58	35	58	58	41	63	78	47	48	87	51	52	26	39	46	22	25	4	1	1	8	8	0	11	3	0	3	2	4	3	1	6	1	1
06/07/11	490	92	20	27	8	13	13	4	3	7	16	23	18	35	42	45	42	30	10	13	8	9	12	16	4	1	5	4	6	4	4	2	0	5	1	3	1	0	1	1	5	1
06/08/11	702	135	29	15	9	12	8	32	17	16	21	24	33	32	30	42	47	30	31	29	26	34	35	13	16	3	16	23	9	12	11	6	3	0	0	13	1	5	0	0	0	0
06/09/11	22	5	6	0	3	0	0	0	0	0	1	2	0	0	5	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/10/11	1998	396	149	127	93	78	64	63	73	62	58	53	67	110	115	129	83	56	93	68	55	52	31	32	30	40	34	35	17	22	28	16	3	3	5	4	6	6	2	10	0	5
06/11/11	100	17	18	7	0	6	3	3	4	4	0	0	1	0	0	0	2	7	2	0	0	4	2	6	1	5	0	3	3	1	2	2	0	2	1	0	0	1	4	0	0	0
06/12/11	46	7	24	1	1	2	1	0	0	0	0	2	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	1	1	0	1	0	0	3	0	0	0	0	0	1	0	2
06/13/11	135	21	8	20	7	16	7	10	7	8	9	8	7	5	1	0	2	2	0	0	0	0	0	1	2	1	4	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1
06/14/11	17	2	1	1	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	4	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
06/15/11	923	180	59	38	42	72	74	48	49	36	36	37	43	44	68	37	32	30	18	19	6	26	7	16	14	5	7	14	1	2	3	2	4	5	5	3	0	0	2	0	0	2
06/16/11	1895	388	74	23	36	43	32	27	41	56	81	62	63	89	140	105	71	97	73	68	73	55	49	44	39	41	20	30	42	51	38	32	11	23	20	13	17	18	13	28	16	14
06/17/11	590	113	31	12	6	22	7	5	14	9	9	11	16	26	25	21	36	31	39	23	13	18	21	10	21	19	12	18	12	5	5	1	5	10	10	3	3	7	8	4	5	5
06/18/11	356	64	107	35	7	3	4	3	2	2	3	0	5	7	16	16	6	6	9	10	7	10	14	6	4	6	2	0	2	0	1	2	2	5	0	2	7	2	1	1	2	3
06/19/11	1836	360	75	71	43	70	86	81	72	68	100	115	109	137	149	86	99	102	98	50	29	55	24	5	16	19	10	8	5	10	9	3	5	0	0	2	1	0	0	3	3	0
06/20/11	1370	269	52	37	42	50	63	59	42	57	47	61	60	63	80	94	60	83	76	43	46	46	49	45	27	6	6	7	9	12	19	8	0	1	5	1	6	1	1	2	0	0
06/21/11	2683	531	85	56	43	73	111	93	95	115	85	105	115	207	207	176	162	175	141	124	74	72	51	45	27	18	32	16	22	9	22	12	16	17	19	9	0	4	10	10	0	1
06/22/11	807	160	61	37	11	13	11	28	23	28	24	34	29	34	24	43	25	52	37	31	31	37	13	21	16	5	10	7	5	18	3	7	11	8	3	4	11	13	4	1	6	3
06/23/11	1407	276	15	5	8	15	5	5	11	13	10	17	17	17	39	23	45	67	90	38	33	52	60	63	72	84	72	58	56	37	56	53	69	37	45	27	15	19	4	6	8	4
06/24/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/25/11	2651	546	9	3	8	7	6	5	10	7	9	13	17	16	34	29	22	34	55	86	82	108	102	88	87	57	83	117	113	56	61	64	105	80	128	116	87	116	99	84	58	70
06/26/11	584	116	10	11	13	7	12	7	5	7	15	13	8	24	24	21	40	21	25	29	30	20	38	20	23	25	22	11	26	5	2	1	4	8	8	9	3	7	4	0	3	0
06/27/11	265	50	2	11	1	5	14	15	10	14	19	10	8	11	21	16	11	19	9	7	8	8	6	3	4	5	8	0	2	3	2	2	1	1	0	0	0	0	0	0	0	0
06/28/11	510	103	17	17	6	13	6	9	2	2	6	7	23	11	10	12	6	18	10	6	7	7	10	20	7	21	15	19	16	20	12	16	31	11	25	15	18	14	5	8	4	9
06/29/11	1278	254	19	8	13	33	37	11	21	27	18	38	27	31	57	74	49	49	59	42	35	48	62	52	51	31	18	10	23	11	24	18	7	12	9	26	17	14	11	18	12	9
06/30/11	261	49	28	5	25	19	7	14	12	9	7	3	5	3	22	5	13	12	0	5	16	2	6	3	3	6	5	0	0	1	4	2	3	0	1	1	0	1	1	2	0	1
07/01/11	530	98	20	17	20	5	43	25	24	12	15	17	13	34	25	33	9	30	25	11	10	8	10	23	6	12	3	14	12	5	3	7	0	5	0	0	4	1	0	0	1	2
07/02/11	1098	214	24	27	34	28	28	24	35	33	26	48	52	76	84	60	71	67	61	59	51	27	29	34	6	8	7	9	4	11	8	7	0	1	16	2	1	4	17	2	0	0
07/03/11	329	59	7	5	24	22	22	14	8	8	8	14	6	17	17	16	12	9	13	9	3	4	1	5	0	4	0	11	3	9	3	4	6	10	6	3	4	6	1	0	0	0
07/04/11	925	182	15	5	2	4	2	4	6	8	13	18	13	24	51	51	46	64	66	75	41	28	18	45	22	18	24	29	30	23	12	17	16	8	27	11	11	3	7	3	12	1
07/05/11	520	110	25	24	24	24	34	19	20	17	22	34	21	17	13	26	13	29	7	16	12	14	7	9	6	2	1	12	10	2	9	1	10	5	8	1	0	0	3	2	3	4
07/06/11	706	137	14	14	23	21	27	23	21	14	20	35	18	20	25	40	38	28	8	8	17	23	23	23	17	8	17	11	25	12	9	14	19	4	3	6	3	4	3	0	3	2
07/07/11	1015	199	37	43	40	52	60	54	33	47	42	19	15	49	45	31	46	56	41	17	34	32	46	20	28	8	10	19	9	7	6	2	3	7	13	5	5	7	1	3	3	2
07/08/11	918	183	49	32	41	35	73	43	44	81	50	53	32	20	28	15	49	16	20	20	8	13	32	23	7	8	20	17	4	8	1	10	12	1	4	9	0	3	0	1	3	1
07/10/11	257	47	2	7	21	55	30	1	3	1	1	0	1	8	7	9	1	10	9	5	11	1	5	0	1	1	6	2	5	11	1	1	0	0	2	5	10	1	0	9	2	0
07/11/11	384	73	18	18	20	45	6	10	4	8	3	5	12	8	8	9	10	4	8	4	9	5	4	11	7	13	7	14	9	9	10	7	8	9	6	13	4	3	1	9	0	5
07/12/11	2303	457	111	121	121	180	134	157	118	107	54	46	86	80	89	69	98	89	93	78	65	34	59	33	22	19	28	19	20	27	19	14	16	17	8	2	0	4	4	0	6	3
07/13/11	3219	638	134	101	93	78	146	117	163	115	136	159	174	185	188	158	135	170	158	120	102	63	56	58	50	28	21	40	24	12	27	4	6	18	2	12	5	1	1	1	5	3
07/14/11	1319	318	39	36	40	31	51	40	54	40	54	56	95	94	98	94	57	87	61	48	51	33	12	29	16	23	11	8	9	7	11	0	6	1	9	1	3	1	0	1	2	0

Total targets by altitudinal strata (25 meter bins)

1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
5	10	0	4	2	3	0	6	1	0	0	1	0	0	0	0	0	1	0	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	1	3	0	1	2	0	1	2	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	8	5	2	1	0	1	1	4	0	0	0	2	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4	11	5	2	1	0	4	1	0	2	0	0	1	0	0	3	0	1	1	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1	2	0	0	0	0	1	0	0	0	0	0	0	0
2	3	2	0	2	3	5	0	6	0	2	2	1	0	1	2	1	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	2	2	0
3	0	4	1	0	0	0	1	0	1	2	0	0	0	2	2	1	0	1	2	1	1	1	0	0	0	0	0	2	0	2	0	1	0	0
0	1	1	0	0	0	0	0	1	1	0	3	0	2	0	0	0	1	0	0	1	5	1	0	0	1	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	3	1	1	0	0	1	1	0	2	1	3	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0
2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	0	0	0	3	0	0	2	0	0	1	0	0	1	2	4	0	0	0	2	0	0	0	0	0	0	0	0	0	0
5	0	1	1	4	2	2	1	1	1	0	0	1	1	0	1	2	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
2	1	1	0	5	3	3	0	1	0	0	1	3	0	0	2	0	0	1	1	1	1	0	1	1	0	1	0	0	0	0	0	3	0	0
4	2	1	0	2	1	3	0	3	1	0	3	0	0	4	0	0	0	3	1	0	0	0	0	2	0	0	4	0	0	0	2	0	0	0
0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	0	2	0	0	1	0	0	1	1	0	0	0
0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	6	7	6	1	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	2	0	0	0	0	0	0	0
0	4	4	1	3	0	1	4	0	2	0	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0
5	7	0	6	2	5	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	2	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	50	51	39	22	29	18	25	16	8	3	5	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0
1	5	1	2	0	1	2	0	2	1	0	0	0	0	1	1	0	0	0	0	0	0	2	0	2	0	1	0	1	0	0	0	0	0	0
0	0	4	3	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	6	4	7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	9	17	22	4	15	4	4	15	6	2	0	2	4	5	0	2	1	12	8	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0
3	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
2	4	2	0	0	2	0	1	0	1	2	0	0	1	1	1	1	1	0	1	0	0	2	0	2	0	1	0	0	0	1	0	0	0	0
0	2	0	0	0	11	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
2	0	6	0	3	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10	2	4	10	5	3	1	5	1	2	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	1	4	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0
8	11	10	13	2	2	4	6	3	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	3	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0
1	7	5	11	0	0	0	2	0	0	1	0	0	0	0	0	1	0	0	0	0	2	0	1	0	1	0	0	0	0	0	0	0	0	0
0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7	0	0	0	0
6	7	6	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	3	3	3	0	5	2	2	4	4	4	4	3	1	0	0	3	0	0	0	2	1	0	0	0	1	1	3	2	0	1	1	0	0	0
6	3	6	1	1	2	13	4	16	10	5	11	6	4	7	13	1	3	6	3	5	11	1	5	2	2	0	1	1	1	0	0	0	0	0
0	3	2	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Appendix 22. Results of marine radar image analyses for data collected on 43 nights (i.e., sunset to sunrise the next day) during the Summer 2011 season (1 Jun - 14 Jul 2011). "Total targets" are the number of birds/bats recorded in all images collected. "Sum of averages" refers to targets recorded averaged over the five successive images collected once every 10 minutes. These values are summed for the entire night's data collection to generate a passage estimate.

Date	Total targets	Sum of averages	Total targets by altitudinal strata (25 meter bins)																																							
			25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
06/01/11	1254	250	27	34	38	32	31	55	53	58	35	41	45	52	43	50	51	52	49	42	35	36	37	23	21	18	16	18	24	27	22	17	14	10	14	20	19	10	6	8	8	10	7
06/02/11	204	39	11	4	20	16	13	18	3	9	15	8	2	6	1	7	11	3	4	5	11	1	2	11	10	1	1	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0
06/03/11	473	95	43	24	38	19	34	19	13	9	25	26	12	29	23	11	15	12	15	5	11	7	8	8	4	1	8	5	3	2	2	0	0	5	9	1	5	1	5	1	1	2	4
06/04/11	263	50	31	19	3	17	6	9	16	6	7	8	8	13	2	9	7	17	10	11	6	9	3	6	2	0	0	0	0	2	1	2	1	1	0	2	1	2	2	1	4	2	0
06/05/11	531	103	15	11	16	21	33	34	17	27	18	9	7	14	9	19	9	23	13	11	12	15	6	5	5	6	13	13	14	5	13	15	9	14	22	5	12	5	4	6	7	4	4
06/06/11	568	111	8	7	3	19	23	25	24	22	37	31	29	30	27	18	21	21	18	14	22	14	13	6	15	14	5	15	10	11	11	6	5	8	9	1	1	8	1	0	0	1	0
06/07/11	395	77	12	17	12	8	16	22	15	16	3	9	14	10	12	14	10	4	14	8	11	12	3	7	15	5	21	12	6	12	8	5	4	1	9	4	1	2	4	2	4	5	3
06/08/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/09/11	313	67	10	15	2	11	10	14	4	7	2	7	21	15	15	15	3	16	24	11	8	10	13	15	9	10	6	6	2	1	0	0	7	2	0	3	1	2	5	6	0	0	0
06/10/11	611	120	23	24	22	16	29	19	17	22	11	24	15	21	32	24	17	12	19	21	14	16	12	16	20	19	7	2	11	10	7	9	8	4	4	10	5	4	11	9	0	3	6
06/11/11	42	7	1	0	0	2	0	0	0	0	1	1	0	1	2	3	2	2	5	4	4	11	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/12/11	117	23	5	5	2	3	3	5	8	4	6	3	2	13	8	3	4	4	6	2	1	0	1	1	0	1	0	0	0	0	0	0	0	0	12	1	2	4	5	1	0	0	0
06/13/11	140	24	8	26	2	11	11	9	3	1	1	2	6	6	6	4	3	0	2	1	0	4	10	0	1	0	0	0	2	1	2	0	1	0	0	0	1	0	0	0	0	0	0
06/14/11	13	2	3	0	1	1	0	1	2	0	0	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/15/11	524	110	19	15	19	22	20	17	35	26	25	31	31	14	23	18	20	16	11	17	7	13	9	14	0	4	2	0	5	4	5	9	0	0	5	3	7	13	15	5	4	0	1
06/16/11	1062	214	20	25	27	25	35	24	39	28	48	47	57	74	76	43	30	61	37	30	33	22	24	29	28	23	13	15	19	7	14	15	12	7	9	5	2	11	3	1	5	1	2
06/17/11	416	79	17	13	10	7	6	8	18	24	10	13	21	32	38	26	23	18	18	19	24	12	6	8	9	4	3	0	3	1	3	5	0	0	0	0	4	4	2	2	0	0	0
06/18/11	253	52	6	2	4	14	6	4	7	11	9	0	5	15	14	8	11	12	11	7	10	6	8	10	6	6	10	2	5	3	9	4	2	0	0	8	0	1	2	5	0	0	1
06/19/11	508	100	15	2	19	20	25	22	23	20	20	16	30	27	33	23	14	13	24	15	20	18	14	17	5	3	16	8	3	4	3	4	2	1	1	0	2	2	6	3	1	0	0
06/20/11	673	138	11	10	16	36	21	21	27	21	15	15	11	30	21	38	30	17	26	52	25	18	10	18	18	16	18	21	17	16	5	18	4	5	13	0	2	3	8	6	8	0	0
06/21/11	425	85	9	13	18	20	13	12	21	17	14	11	28	15	28	20	8	7	12	15	8	5	7	17	9	18	9	2	4	12	1	13	2	1	2	1	3	0	0	1	2	2	1
06/22/11	405	79	44	33	17	15	12	11	7	8	4	13	24	8	15	18	14	12	15	10	6	3	11	20	12	19	25	4	1	8	1	1	9	1	0	0	0	0	2	0	0	1	0
06/23/11	573	112	7	4	9	2	5	5	1	4	3	7	14	29	35	29	46	60	69	56	31	24	21	8	15	15	13	13	2	4	2	0	1	0	1	1	0	2	5	2	0	0	0
06/24/11	409	81	26	18	18	22	35	16	15	20	32	26	26	23	7	4	4	6	3	4	4	0	6	8	4	3	10	1	3	1	5	2	0	0	6	2	2	4	3	3	2	5	2
06/25/11	964	191	43	34	45	46	38	22	31	25	23	18	16	30	21	16	14	19	13	19	14	18	22	16	22	11	11	24	26	33	36	58	26	25	44	12	10	16	5	7	6	4	3
06/26/11	1071	214	22	14	22	22	36	34	18	76	65	52	61	78	34	55	34	53	32	10	33	39	16	27	7	10	17	14	33	20	19	6	20	8	6	3	10	13	5	13	4	4	0
06/27/11	270	53	22	8	26	18	14	11	24	6	16	3	10	4	6	5	4	1	1	3	6	3	1	1	6	2	8	8	3	1	0	2	3	0	2	3	3	4	5	1	9	0	9
06/28/11	552	111	69	55	60	37	26	17	6	8	6	3	13	11	18	30	35	10	7	10	4	10	12	6	19	7	5	0	8	2	6	5	2	0	2	0	1	8	3	8	5	1	0
06/29/11	578	113	25	12	30	30	21	35	23	52	30	24	27	19	30	30	21	31	18	25	14	6	2	6	4	8	9	2	6	1	1	5	1	0	6	4	0	5	0	6	0	0	1
06/30/11	645	127	14	16	21	39	20	43	29	27	31	40	25	36	37	33	38	35	30	22	23	17	11	9	4	6	1	2	7	9	3	1	4	0	5	0	0	0	0	3	2	0	1
07/01/11	843	170	19	24	23	14	12	27	29	36	21	32	38	42	54	52	40	42	51	37	21	24	14	29	14	28	11	17	18	20	1	5	9	17	8	3	0	0	0	1	0	0	0
07/02/11	232	46	15	16	15	11	16	6	8	9	12	7	7	11	12	12	9	13	8	2	10	3	7	0	1	1	5	0	0	1	0	0	0	1	1	0	2	0	2	0	1	1	0
07/03/11	260	54	3	0	1	8	4	1	5	6	2	9	21	10	18	7	20	18	20	17	18	1	11	3	4	1	5	2	2	2	6	0	9	6	0	0	4	6	0	0	4	3	2
07/04/11	761	150	16	11	18	25	23	30	33	36	28	34	37	30	16	24	30	20	36	12	25	22	10	29	18	22	4	12	20	9	9	8	8	16	8	17	12	7	10	4	0	1	4
07/05/11	330	70	11	16	5	14	17	14	12	13	9	22	21	16	19	29	2	6	3	10	13	0	7	7	7	1	3	10	1	7	2	4	0	0	1	0	2	2	0	4	0	0	4
07/06/11	359	74	14	3	13	7	24	9	23	6	4	1	5	3	6	12	9	9	15	17	12	9	14	23	6	7	5	9	10	5	8	7	1	0	2	4	1	3	5	1	1	3	4
07/07/11	2547	527	48	33	42	63	87	123	123	126	125	123	115	137	159	149	127	108	95	92	54	50	69	73	34	35	48	34	25	26	26	13	17	17	11	14	8	6	12	17	10	5	13
07/08/11	165	32	25	28	10	29	17	0	0	5	1	5	3	4	5	0	4	0	0	2	4	0	3	0	0	1	1	5	3	3	0	4	1	0	0	0	0	0	0	2	0	0	0
07/10/11	670	134	17	23	20	36	29	51	73	71	57	21	19	4	13	20	11	14	18	13	13	19	13	11	9	9	4	7	10	10	6	4	3	2	7	6	3	1	1	2	6	0	0
07/11/11	425	87	29	17	27	20	23	21	21	16	10	16	19	17	19	9	17	8	7	7	10	12	8	6	11	7	12	11	11	9	3	1	0	6	2	3	0	2	0	0	1	1	0
07/12/11	2054	411	46	46	53	68	79	79	75	84	110	94	79	105	95	58	93	73	63	48	48	45	55	48	40	34	37	34	68	35	28	22	23	30	18	15	7	17	20	11	22	9	9
07/13/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/14/11	1503	297	57	61	40	48	38	48	52	52	47	54	69	82	69	76	55	89	63	62	46	35	31	67	23	22	32	29	12	19	11	11	13	9	19	22	8	6	4	1	1	9	0

Total targets by altitudinal strata (25 meter bins)

1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875
9	1	2	6	2	6	1	0	3	4	1	4	1	0	0	1	1	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	0
0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	5	0	0	1	3	1	0	0	0	0	5	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	4	0	0	0	0	0	2	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	1	3	0	0	1	0	1	0	0	0
0	5	1	2	1	0	1	2	1	0	2	0	2	0	0	2	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
0	6	2	0	8	2	6	1	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	3	1	1	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	6	1	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0
4	5	1	0	4	2	4	2	2	2	4	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	1	0	0	1	0	0	2	0	1	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	1	1	5	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
2	3	6	0	2	3	1	1	2	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	3	0	2	0	2	1	0	0	1	2	0	5	1	0	2	0	2	3	0	0	1	0	0	0	1	0	0	0	0	0	0
7	10	2	1	4	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	3	6	2	8	6	0	0	1	1	0	0	1	1	0	0	0	0	0	1	0	1	1	3	0	1	0	0	1	1	2	0	0	0
3	1	4	2	5	2	2	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0
5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	0	1	2	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
1	0	1	1	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	4	1	0	3	0	0	0	0	0	1	5	1	0	1	2	1	1	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0
1	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
2	1	1	4	0	2	2	0	2	0	2	0	0	0	1	0	0	0	2	0	1	0	0	1	2	3	1	3	2	0	4	3	0	0
3	8	12	4	1	12	12	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	3	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0
0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	2	2	0	5	2	2	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	2	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Appendix 23. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Day (diurnal) data collection period, Fall/Early (15 Jul - 30 Sep 2010).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
07/15/10	38	1.07	17.58	0.36	4.95	0.006
07/16/10	47	3.73	3.79	0.90	38.22	< 1E-12
07/17/10	124	42.41	2.36	0.90	100.42	< 1E-12
07/18/10	70	68.28	4.98	0.76	40.77	< 1E-12
07/19/10	128	8.40	4.19	0.71	64.33	< 1E-12
07/20/10	82	223.05	15.02	0.29	6.96	9.51E-04
07/21/10	89	331.49	7.01	0.56	27.69	< 1E-12
07/22/10	50	134.23	6.43	0.73	26.40	3.43E-12
07/23/10	67	64.06	20.66	0.24	3.74	0.024
07/24/10	19	312.83	1.92	0.99	18.60	2.53E-08
07/25/10	16	125.39	10.61	0.76	9.14	2.06E-05
07/26/10	16	100.31	12.18	0.70	7.76	1.57E-04
07/27/10	51	83.00	5.95	0.76	29.08	< 1E-12
07/28/10	124	33.40	1.90	0.93	108.19	< 1E-12
07/29/10	23	115.90	10.46	0.68	10.74	5.35E-06
07/30/10	52	159.34	7.40	0.66	22.35	1.97E-10
07/31/10	95	259.73	5.88	0.62	36.81	< 1E-12
08/01/10	49	353.92	7.50	0.66	21.52	2.90E-10
08/02/10	26	7.24	6.35	0.85	18.86	9.12E-09
08/03/10	34	47.66	2.45	0.97	31.95	< 1E-12
08/04/10	34	37.41	4.25	0.91	28.19	4.48E-12
08/05/10	12	49.25	6.00	0.95	10.85	6.74E-07
08/06/10	63	72.19	5.37	0.75	35.84	< 1E-12
08/07/10	21	15.40	22.18	0.38	3.08	0.044
08/08/10	17	33.46	10.25	0.76	9.75	9.78E-06
08/09/10	66	49.95	2.50	0.94	58.17	< 1E-12
08/10/10	71	60.89	13.60	0.34	8.33	2.42E-04
08/11/10	95	252.94	20.40	0.20	3.86	0.021
08/12/10	66	273.06	4.25	0.83	45.65	< 1E-12
08/13/10	17	345.00	17.70	0.52	4.51	0.009
08/14/10	10	4.30	20.94	0.58	3.37	0.03
08/15/10	16	26.41	15.74	0.58	5.38	0.003
08/16/10	1	100.89	*****	1.00	1.00	0.512
08/17/10	61	0.90	12.76	0.39	9.28	9.34E-05
08/18/10	84	344.19	5.53	0.68	38.72	< 1E-12
08/19/10	102	258.80	7.33	0.51	26.41	3.40E-12
08/20/10	145	176.07	3.88	0.72	74.06	< 1E-12
08/21/10	60	224.24	17.16	0.30	5.32	0.005
08/22/10	25	313.13	7.17	0.82	16.79	3.56E-08
08/23/10	7	257.86	8.72	0.95	6.33	7.50E-05
08/24/10	80	255.71	3.46	0.86	59.67	< 1E-12
08/25/10	12	267.12	7.53	0.92	10.24	< 1E-12
08/26/10	26	56.03	8.02	0.77	15.45	6.94E-08
08/27/10	63	99.81	6.37	0.68	29.13	< 1E-12
08/28/10	53	33.48	9.18	0.55	16.20	9.21E-08
08/29/10	51	98.30	16.21	0.34	5.87	0.003
08/30/10	185	148.22	4.48	0.60	65.44	< 1E-12
08/31/10	66	128.94	8.70	0.53	18.51	9.18E-09
09/01/10	57	135.60	18.15	0.29	4.76	0.009
09/02/10	48	48.09	11.69	0.47	10.61	1.43E-05
09/04/10	8	338.45	71.59	0.31	0.76	0.483
09/05/10	4	196.55	18.92	0.92	3.36	0.022
09/06/10	8	13.33	29.57	0.50	2.01	0.135
09/07/10	36	56.17	10.39	0.58	12.28	1.61E-06
09/08/10	56	143.65	14.61	0.36	7.18	7.62E-04

Appendix 23. Continued

09/09/10	46	169.73	11.23	0.50	11.33	6.22E-06
09/10/10	101	197.82	3.60	0.82	67.31	< 1E-12
09/11/10	216	269.58	5.68	0.46	45.24	< 1E-12
09/12/10	112	259.85	3.50	0.81	73.15	< 1E-12
09/13/10	57	316.35	6.45	0.70	27.66	< 1E-12
09/14/10	14	44.76	15.41	0.63	5.60	0.002
09/15/10	173	171.92	2.72	0.82	116.28	< 1E-12
09/16/10	27	344.40	11.85	0.59	9.39	3.73E-05
09/17/10	123	227.30	3.62	0.78	74.50	< 1E-12
09/18/10	146	257.18	4.88	0.61	54.34	< 1E-12
09/19/10	55	34.48	3.97	0.88	42.19	< 1E-12
09/20/10	251	185.53	2.24	0.82	170.18	< 1E-12
09/21/10	45	183.17	7.81	0.66	19.82	1.22E-09
09/22/10	22	55.92	1.83	0.99	21.51	2.31E-09
09/23/10	175	214.71	3.95	0.67	77.34	< 1E-12
09/24/10	23	356.52	10.58	0.68	10.57	6.63E-06
09/25/10	26	95.46	10.97	0.63	10.44	9.61E-06
09/26/10	57	244.15	4.29	0.85	41.29	< 1E-12
09/27/10	17	267.72	9.75	0.78	10.28	4.44E-06
09/28/10	11	343.77	7.50	0.93	9.56	< 1E-12
09/29/10	35	43.71	3.54	0.94	30.61	< 1E-12
09/30/10	13	10.72	14.09	0.69	6.14	0.001

Appendix 24. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Night (nocturnal) data collection period, Fall/Early (15 Jul - 30 Sep 2010).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
07/14/10	34	56.47	7.34	0.75	19.24	3.46E-09
07/15/10	16	15.26	12.86	0.67	7.23	3.21E-04
07/16/10	56	67.24	5.81	0.75	31.15	< 1E-12
07/18/10	382	182.24	1.36	0.90	307.79	< 1E-12
07/19/10	88	212.43	10.18	0.41	14.50	5.07E-07
07/20/10	101	82.97	6.14	0.59	34.99	< 1E-12
07/21/10	135	182.47	3.35	0.79	84.20	< 1E-12
07/22/10	81	133.17	3.41	0.87	60.73	< 1E-12
07/23/10	21	346.99	12.14	0.64	8.51	8.44E-05
07/25/10	97	152.08	2.83	0.89	76.53	< 1E-12
07/26/10	25	106.16	3.61	0.95	22.64	7.26E-10
07/27/10	120	62.57	3.00	0.85	86.18	< 1E-12
07/28/10	7	41.12	18.82	0.79	4.35	0.008
07/29/10	335	197.99	1.44	0.90	270.71	< 1E-12
07/30/10	217	201.02	1.76	0.90	176.61	< 1E-12
07/31/10	32	308.39	11.71	0.56	9.91	2.35E-05
08/01/10	21	31.43	6.62	0.87	15.85	9.62E-08
08/02/10	20	16.49	4.91	0.93	17.27	5.05E-08
08/03/10	10	40.66	4.42	0.98	9.58	< 1E-12
08/04/10	47	53.91	2.26	0.96	43.68	< 1E-12
08/05/10	48	75.01	3.40	0.92	40.54	< 1E-12
08/06/10	207	175.98	1.82	0.90	167.90	< 1E-12
08/07/10	48	356.92	3.77	0.90	38.97	< 1E-12
08/08/10	19	30.24	4.72	0.94	16.70	8.11E-08
08/09/10	152	65.57	2.23	0.89	120.64	< 1E-12
08/10/10	261	212.18	1.96	0.86	191.72	< 1E-12
08/11/10	415	247.99	1.54	0.86	307.42	< 1E-12
08/12/10	74	263.91	9.34	0.47	16.61	6.10E-08
08/13/10	45	95.08	5.96	0.78	27.35	4.36E-12
08/14/10	22	13.87	5.78	0.89	17.57	3.23E-08
08/15/10	6	353.37	9.06	0.96	5.51	5.66E-04
08/16/10	33	44.55	3.66	0.94	28.83	2.86E-12
08/17/10	190	209.41	4.12	0.63	74.69	< 1E-12
08/18/10	141	11.64	2.84	0.84	99.24	< 1E-12
08/19/10	156	11.48	3.14	0.79	96.69	< 1E-12
08/20/10	344	212.08	1.87	0.83	236.93	< 1E-12
08/21/10	42	259.97	29.72	0.21	1.82	0.163
08/22/10	191	258.36	1.31	0.95	172.88	< 1E-12
08/23/10	110	232.84	1.51	0.96	101.90	< 1E-12
08/24/10	84	270.75	2.16	0.94	74.54	< 1E-12
08/25/10	3	175.78	29.58	0.90	2.42	0.079
08/26/10	73	172.45	8.55	0.52	19.34	3.98E-09
08/27/10	210	221.35	3.37	0.70	101.67	< 1E-12
08/28/10	40	107.58	18.50	0.34	4.52	0.01
08/29/10	62	150.09	8.08	0.58	20.49	1.27E-09
08/30/10	105	188.02	7.75	0.48	24.03	3.67E-11
08/31/10	56	167.94	6.89	0.67	25.23	1.11E-11
09/01/10	42	60.56	6.49	0.76	24.22	5.80E-11
09/02/10	70	55.68	2.63	0.93	60.41	< 1E-12
09/04/10	22	65.49	2.97	0.97	20.73	4.02E-09
09/05/10	30	78.53	3.83	0.94	26.23	2.92E-11
09/06/10	51	55.18	1.68	0.98	48.83	< 1E-12
09/07/10	105	39.06	2.28	0.92	88.84	< 1E-12
09/08/10	338	203.39	2.87	0.66	147.27	< 1E-12
09/09/10	296	195.79	2.15	0.81	193.56	< 1E-12

Appendix 24. Continued

09/10/10	125	207.98	3.37	0.80	80.43	< 1E-12
09/11/10	231	270.34	2.31	0.83	157.53	< 1E-12
09/12/10	44	253.98	5.32	0.82	29.91	< 1E-12
09/13/10	49	18.91	5.48	0.80	31.00	< 1E-12
09/14/10	169	162.28	2.41	0.86	125.18	< 1E-12
09/15/10	159	154.72	3.19	0.78	95.97	< 1E-12
09/16/10	32	43.43	25.29	0.28	2.47	0.084
09/17/10	649	222.50	1.53	0.79	403.64	< 1E-12
09/18/10	104	354.36	4.82	0.69	49.87	< 1E-12
09/19/10	212	215.22	4.46	0.57	67.96	< 1E-12
09/20/10	207	191.45	2.62	0.80	133.18	< 1E-12
09/21/10	4	53.10	*****	0.30	0.35	0.729
09/22/10	138	158.06	5.56	0.56	43.72	< 1E-12
09/23/10	123	330.41	8.12	0.43	22.50	1.69E-10
09/24/10	67	14.62	6.90	0.63	26.56	2.92E-12
09/25/10	471	221.50	2.10	0.73	248.55	< 1E-12
09/26/10	313	247.38	1.77	0.86	232.08	< 1E-12
09/27/10	33	340.58	7.54	0.75	18.43	6.35E-09
09/28/10	15	3.18	21.47	0.48	3.51	0.027
09/29/10	165	45.08	1.93	0.91	136.83	< 1E-12
09/30/10	2	347.38	4.47	1.00	2.00	0.138

Appendix 25. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Day (diurnal) data collection period, Fall/Late (1 Oct - 15 Dec 2010).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
10/01/10	2	24.93	51.84	0.62	0.78	0.527
10/02/10	49	168.37	5.25	0.81	32.23	< 1E-12
10/03/10	161	239.42	3.22	0.77	95.77	< 1E-12
10/04/10	82	237.84	1.55	0.97	77.21	< 1E-12
10/05/10	130	243.23	2.09	0.92	109.36	< 1E-12
10/06/10	9	253.46	16.84	0.76	5.19	0.003
10/07/10	5	53.18	23.67	0.69	2.35	0.091
10/08/10	7	51.24	12.93	0.90	5.61	8.81E-04
10/09/10	20	157.85	15.25	0.54	5.91	0.002
10/10/10	6	49.19	17.20	0.86	4.42	0.006
10/11/10	86	156.35	3.65	0.84	60.36	< 1E-12
10/12/10	198	239.64	2.64	0.81	128.97	< 1E-12
10/13/10	92	245.44	6.53	0.58	31.19	< 1E-12
10/14/10	53	320.44	6.02	0.74	29.21	< 1E-12
10/16/10	3	206.54	10.53	0.99	2.92	0.038
10/17/10	3	72.80	20.86	0.95	2.70	0.054
10/18/10	8	171.34	31.95	0.48	1.81	0.166
10/19/10	24	210.02	10.01	0.69	11.55	2.07E-06
10/20/10	1	23.96	*****	1.00	1.00	0.512
10/21/10	3	0.79	32.53	0.68	1.38	0.274
10/22/10	8	34.64	29.37	0.50	2.03	0.132
10/23/10	8	226.31	38.33	0.42	1.43	0.247
10/24/10	24	318.00	22.93	0.35	2.93	0.052
10/25/10	10	315.99	22.87	0.55	2.98	0.047
10/26/10	35	233.29	8.31	0.69	16.79	1.73E-08
10/28/10	5	53.05	8.91	0.97	4.71	0.002
10/29/10	14	251.66	26.05	0.43	2.59	0.073
10/30/10	6	116.72	21.68	0.68	2.77	0.056
10/31/10	18	217.75	12.63	0.65	7.69	2.03E-04
11/01/10	9	218.05	36.98	0.41	1.51	0.226
11/02/10	52	250.52	30.67	0.18	1.72	0.18
11/03/10	19	258.87	27.98	0.32	1.98	0.138
11/04/10	6	181.98	*****	0.17	0.18	0.848
11/05/10	3	306.28	*****	0.34	0.34	0.748
11/06/10	8	266.51	21.25	0.62	3.12	0.039
11/07/10	10	217.85	26.45	0.49	2.43	0.086
11/08/10	11	195.08	59.71	0.29	0.90	0.416
11/09/10	7	316.74	37.31	0.46	1.45	0.242
11/10/10	15	228.25	9.12	0.86	11.00	1.08E-06
11/11/10	19	212.28	19.37	0.45	3.91	0.018
11/12/10	12	227.84	16.31	0.64	4.96	0.005
11/13/10	11	193.32	23.84	0.51	2.87	0.053
11/14/10	18	251.07	6.21	0.90	14.56	2.75E-07
11/15/10	3	347.90	27.34	0.91	2.50	0.071
11/16/10	1	286.56	*****	1.00	1.00	0.512
11/18/10	5	111.61	22.99	0.82	3.34	0.026
11/19/10	5	218.71	25.02	0.79	3.09	0.036
11/20/10	2	53.81	3.34	1.00	2.00	0.137
11/21/10	31	241.67	22.85	0.31	2.99	0.049
11/22/10	1	84.81	*****	1.00	1.00	0.512
11/23/10	2	302.05	81.85	0.81	1.32	0.309
11/25/10	17	180.20	33.59	0.29	1.39	0.251
11/26/10	1	136.97	*****	1.00	1.00	0.512
11/27/10	9	145.24	*****	0.19	0.33	0.727
11/29/10	8	108.19	52.02	0.35	1.01	0.378

Appendix 25. Continued

11/28/10	17	293.16	*****	0.03	0.01	0.99
11/30/10	17	6.38	75.77	0.13	0.28	0.759
12/02/10	4	82.99	23.38	0.88	3.07	0.035
12/03/10	8	205.02	63.05	0.32	0.84	0.446
12/04/10	4	135.73	7.812°	0.99	3.88	0.009
12/05/10	14	161.41	29.33	0.39	2.18	0.113
12/06/10	2	70.50	20.20	0.99	1.95	0.147
12/07/10	8	288.46	19.21	0.67	3.54	0.023
12/08/10	3	149.55	39.28	0.62	1.14	0.353
12/11/10	1	326.73	*****	1.00	1.00	0.512
12/12/10	8	271.32	19.33	0.74	4.34	0.008
12/14/10	7	96.43	20.96	0.66	3.04	0.041
12/15/10	14	290.19	148.63	0.20	0.55	0.584

Appendix 26. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Night (nocturnal) data collection period, Fall/Late (1 Oct - 15 Dec 2010).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
10/01/10	40	176.87	4.06	0.90	32.72	< 1E-12
10/02/10	467	225.32	1.46	0.86	343.63	< 1E-12
10/03/10	231	243.43	1.67	0.91	189.82	< 1E-12
10/04/10	147	244.23	2.38	0.88	113.97	< 1E-12
10/05/10	213	256.07	1.44	0.94	186.12	< 1E-12
10/06/10	9	299.32	35.06	0.42	1.62	0.202
10/07/10	20	111.84	12.83	0.62	7.74	2.11E-04
10/08/10	51	148.19	5.17	0.81	33.38	< 1E-12
10/09/10	33	182.10	6.54	0.80	21.28	9.37E-10
10/10/10	32	104.34	6.49	0.81	21.06	1.18E-09
10/11/10	664	232.90	1.07	0.89	527.47	< 1E-12
10/12/10	141	238.66	3.56	0.76	80.95	< 1E-12
10/13/10	109	276.80	5.28	0.64	44.77	< 1E-12
10/14/10	113	278.84	2.37	0.91	93.15	< 1E-12
10/15/10	9	334.72	22.20	0.58	3.03	0.044
10/16/10	70	212.26	5.61	0.71	35.57	< 1E-12
10/17/10	15	150.21	34.80	0.34	1.72	0.181
10/18/10	53	214.38	8.08	0.61	19.75	2.64E-09
10/19/10	15	18.77	20.15	0.51	3.87	0.018
10/20/10	6	335.76	9.42	0.96	5.48	6.40E-04
10/21/10	6	153.10	13.90	0.91	4.92	0.002
10/22/10	10	175.55	12.92	0.83	6.89	2.16E-04
10/23/10	412	223.59	1.49	0.87	311.55	< 1E-12
10/24/10	91	295.72	8.19	0.49	21.46	4.77E-10
10/25/10	24	242.70	22.74	0.35	2.97	0.05
10/26/10	93	275.72	4.80	0.72	48.16	< 1E-12
10/27/10	74	57.92	2.41	0.94	64.92	< 1E-12
10/28/10	631	224.13	1.25	0.86	466.01	< 1E-12
10/29/10	282	222.39	1.99	0.84	199.65	< 1E-12
10/30/10	1	43.45	*****	1.00	1.00	0.512
10/31/10	199	221.82	1.79	0.91	163.88	< 1E-12
11/01/10	212	240.84	2.17	0.86	156.00	< 1E-12
11/02/10	165	246.51	1.88	0.92	138.18	< 1E-12
11/03/10	4	331.58	35.39	0.59	1.38	0.268
11/05/10	4	75.51	36.07	0.58	1.35	0.276
11/06/10	44	224.40	4.84	0.85	32.09	< 1E-12
11/08/10	128	248.11	2.02	0.92	109.18	< 1E-12
11/09/10	20	231.33	5.34	0.92	16.80	6.60E-08
11/10/10	62	238.48	2.01	0.96	57.46	< 1E-12
11/11/10	25	240.19	3.37	0.96	22.93	5.83E-10
11/12/10	13	237.84	12.99	0.77	7.62	1.29E-04
11/13/10	14	238.06	14.75	0.65	5.93	0.002
11/14/10	5	297.04	25.73	0.65	2.13	0.117
11/15/10	2	276.82	2.49	1.00	2.00	0.137
11/16/10	1	72.65	*****	1.00	1.00	0.512
11/17/10	2	141.77	28.01	0.98	1.91	0.155
11/18/10	67	133.41	2.11	0.96	61.20	< 1E-12
11/19/10	11	218.19	11.99	0.83	7.64	6.89E-05
11/20/10	11	181.84	8.50	0.91	9.18	< 1E-12
11/21/10	9	273.39	23.61	0.56	2.78	0.058
11/23/10	2	156.41	84.57	0.80	1.28	0.322
11/24/10	9	180.72	16.64	0.76	5.25	0.003
11/25/10	5	267.60	32.71	0.57	1.60	0.21
11/26/10	2	81.98°	32.82	0.97	1.87	0.162
11/27/10	11	165.96	8.26	0.92	9.27	< 1E-12

Appendix 26. Continued.

11/28/10	5	215.00	20.40	0.86	3.65	0.017
11/29/10	4	257.17	10.87	0.97	3.78	0.011
11/30/10	1	322.77	*****	1.00	1.00	0.512
12/02/10	2	216.76	0.24	1.00	2.00	0.137
12/04/10	1	57.53	*****	1.00	1.00	0.512
12/05/10	1	313.73	*****	1.00	1.00	0.512
12/07/10	2	156.68	*****	0.40	0.31	0.781
12/11/10	2	231.74	49.77	0.93	1.72	0.196
12/14/10	2	42.80	107.90	0.70	0.98	0.435
12/15/10	1	133.32	*****	1.00	1.00	0.512

Appendix 27. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Day (diurnal) data collection period, Winter (16 Dec 2010 - 15 Mar 2011.

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
12/16/10	11	320.43	*****	0.13	0.18	0.843
12/17/10	15	328.94	*****	0.03	0.02	0.985
12/18/10	9	263.76	34.07	0.43	1.68	0.189
12/19/10	9	241.65	17.64	0.67	4.09	0.012
12/20/10	6	238.04	14.70	0.89	4.80	0.003
12/23/10	1	293.81	*****	1.00	1.00	0.512
12/24/10	2	231.66	3.29	1.00	2.00	0.137
12/25/10	10	203.72	28.71	0.47	2.16	0.114
12/26/10	2	159.59	63.53	0.58	0.66	0.582
12/29/10	2	141.65	*****	0.07	0.01	0.992
12/30/10	3	245.37	62.46	0.50	0.74	0.517
01/03/11	9	126.72	101.66	0.26	0.62	0.552
01/04/11	5	124.34	*****	0.09	0.04	0.968
01/05/11	7	251.47	23.15	0.70	3.45	0.025
01/06/11	13	309.58	*****	0.15	0.28	0.766
01/07/11	11	209.64	32.15	0.41	1.86	0.156
01/08/11	7	271.57	33.86	0.48	1.64	0.199
01/09/11	4	138.39	29.24	0.65	1.71	0.188
01/10/11	1	76.43	*****	1.00	1.00	0.512
01/11/11	3	321.52	71.73	0.47	0.67	0.553
01/16/11	2	92.42	106.17	0.71	1.00	0.426
01/17/11	28	343.18	55.38	0.14	0.53	0.593
01/18/11	4	313.00	8.37	0.98	3.87	0.009
01/19/11	3	242.26	20.50	0.95	2.71	0.053
01/20/11	3	336.05	68.89	0.48	0.69	0.544
01/22/11	3	48.21	18.15	0.96	2.77	0.048
01/23/11	5	14.61	*****	0.20	0.21	0.829
01/24/11	2	180.27	94.36	0.76	1.15	0.368
01/25/11	2	199.03	*****	0.11	0.02	0.981
01/26/11	2	272.00	47.29	0.93	1.75	0.19
01/29/11	1	320.19	*****	1.00	1.00	0.512
01/30/11	1	327.72	*****	1.00	1.00	0.512
01/31/11	7	86.30	19.20	0.78	4.26	0.009
02/01/11	2	240.51	*****	0.21	0.09	0.935
02/03/11	24	22.38	131.97	0.06	0.09	0.912
02/04/11	4	52.36	*****	0.16	0.10	0.916
02/05/11	1	184.40	*****	1.00	1.00	0.512
02/06/11	1	22.83	*****	1.00	1.00	0.512
02/07/11	1	74.74	*****	1.00	1.00	0.512
02/09/11	3	17.14	*****	0.15	0.07	0.942
02/10/11	5	289.01	119.94	0.33	0.55	0.6
02/11/11	5	261.32	22.35	0.83	3.42	0.023
02/12/11	1	52.52	*****	1.00	1.00	0.512
02/13/11	5	162.99	*****	0.23	0.27	0.782
02/14/11	2	335.75	13.03	1.00	1.98	0.141
02/15/11	1	132.95	*****	1.00	1.00	0.512
02/16/11	6	76.94	24.46	0.63	2.40	0.087
02/18/11	1	351.72	*****	1.00	1.00	0.512
02/19/11	1	186.98	*****	1.00	1.00	0.512
02/20/11	2	51.65	*****	0.30	0.18	0.87
02/21/11	1	125.36	*****	1.00	1.00	0.512
02/23/11	3	236.57	31.57	0.69	1.42	0.262
02/24/11	8	30.32	113.47	0.27	0.59	0.571
02/26/11	11	38.29	*****	0.18	0.35	0.718
03/01/11	13	184.84	7.99	0.91	10.66	5.60E-07

Appendix 27. Continued

03/02/11	2	31.60	19.82	0.99	1.95	0.146
03/03/11	3	358.85	*****	0.24	0.17	0.867
03/04/11	5	148.38	51.17	0.44	0.97	0.401
03/05/11	1	5.34	*****	1.00	1.00	0.512
03/08/11	12	193.29	22.16	0.52	3.24	0.036
03/09/11	10	260.86	27.04	0.49	2.35	0.093
03/12/11	19	47.37	1.49	0.99	18.76	2.28E-08
03/13/11	1	53.90	*****	1.00	1.00	0.512
03/14/11	12	205.81	*****	0.07	0.06	0.944
03/15/11	5	11.86	26.54	0.76	2.92	0.046

Appendix 28. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Night (nocturnal) data collection period, Winter (16 Dec 2010 - 15 Mar 2011).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
12/16/10	2	254.77	46.44	0.652	0.85	0.492
12/17/10	12	189.26	15.35	0.669	5.368	0.003
12/18/10	2	212.22	28.69	0.975	1.902	0.156
12/19/10	2	243.75	62.71	0.887	1.572	0.234
12/20/10	2	207.81	74.26	0.844	1.424	0.276
12/21/10	1	192.53	*****	1	1	0.512
12/23/10	1	250.02	*****	1	1	0.512
12/25/10	6	189.73	26.03	0.705	2.979	0.044
12/27/10	1	81.12	*****	1	1	0.512
12/28/10	1	232.77	*****	1	1	0.512
12/29/10	2	202.12	53.21	0.917	1.683	0.205
12/31/10	1	331.56	*****	1	1	0.512
01/05/11	5	161.99	13.32	0.936	4.376	0.005
01/06/11	2	305.46	*****	0.107	0.023	0.982
01/07/11	105	203.81	0.66	0.993	103.552	< 1E-12
01/08/11	1	193.24	*****	1	1	0.512
01/10/11	1	270.00	*****	1	1	0.512
01/11/11	1	342.90	*****	1	1	0.512
01/19/11	3	168.07	10.39	0.987	2.922	0.038
01/22/11	1	124.05	*****	1	1	0.512
01/24/11	1	46.40	*****	1	1	0.512
01/27/11	133	154.11	0.73	0.989	130.161	< 1E-12
01/28/11	1	14.04	*****	1	1	0.512
02/01/11	1	158.55	*****	1	1	0.512
02/06/11	1	128.66	*****	1	1	0.512
02/11/11	2	51.84	18.12	0.99	1.96	0.145
02/12/11	2	201.01	1.77	1	2	0.137
02/28/11	1	142.43	*****	1	1	0.512
03/01/11	13	47.16	3.25	0.984	12.583	1.33E-06
03/02/11	6	182.70	9.30	0.956	5.489	6.15E-04
03/07/11	11	160.58	5.10	0.968	10.309	< 1E-12
03/08/11	1	248.33	*****	1	1	0.512
03/09/11	1	39.61	*****	1	1	0.512
03/10/11	41	292.12	1.24	0.99	40.22	< 1E-12
03/11/11	9	77.46	10.75	0.896	7.218	4.64E-05
03/12/11	6	63.21	14.97	0.891	4.759	0.003
03/13/11	2	1.87	12.44	0.995	1.981	0.141
03/15/11	19	52.52	4.11	0.952	17.229	5.96E-08

Appendix 29. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Day (diurnal) data collection period, Spring (16 Mar - 31 May 2011).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
03/16/11	1	50.19	*****	1.00	1.00	0.512
03/17/11	9	90.81	25.82	0.52	2.47	0.081
03/19/11	9	185.16	7.34	0.95	8.12	< 1E-12
03/20/11	2	10.83	*****	0.37	0.28	0.805
03/21/11	6	35.36	5.02	0.99	5.85	9.82E-05
03/22/11	4	219.61	46.58	0.51	1.03	0.383
03/23/11	4	65.87	37.56	0.71	2.01	0.134
03/24/11	5	87.86	26.45	0.64	2.07	0.126
03/25/11	6	43.88	23.34	0.75	3.39	0.026
03/26/11	3	105.18	*****	0.23	0.16	0.871
03/27/11	5	208.32	12.03	0.95	4.49	0.004
03/30/11	5	174.40	27.53	0.63	1.97	0.14
03/31/11	2	248.22	81.18	0.53	0.57	0.632
04/02/11	2	1.66	*****	0.17	0.06	0.957
04/03/11	3	19.69	*****	0.27	0.22	0.827
04/04/11	5	224.17	51.09	0.44	0.97	0.4
04/05/11	19	39.08	4.13	0.95	17.22	6.01E-08
04/06/11	2	139.93	47.85	0.64	0.83	0.502
04/07/11	5	214.14	30.55	0.70	2.48	0.078
04/08/11	7	224.70	93.73	0.30	0.63	0.548
04/09/11	2	65.98	64.04	0.88	1.56	0.238
04/10/11	9	36.51	19.30	0.64	3.65	0.021
04/11/11	8	24.66	2.94	0.99	7.89	< 1E-12
04/12/11	2	87.99	26.99	0.98	1.91	0.154
04/15/11	19	280.55	12.33	0.65	8.09	1.29E-04
04/16/11	4	343.45	29.48°	0.81	2.60	0.065
04/17/11	7	54.42	10.70	0.93	6.02	3.09E-04
04/18/11	4	63.63	31.00	0.79	2.49	0.076
04/19/11	3	294.19	39.27	0.62	1.14	0.352
04/20/11	4	281.13	27.57	0.83	2.75	0.054
04/21/11	16	42.26	5.60	0.93	13.73	5.30E-07
04/22/11	4	270.75	*****	0.35	0.48	0.649
04/23/11	3	62.49	38.32	0.83	2.09	0.122
04/26/11	24	251.23	2.30	0.98	23.09	5.76E-10
04/27/11	33	331.69	8.15	0.71	16.82	1.85E-08
04/29/11	17	358.29	22.73	0.41	2.90	0.053
04/30/11	10	300.78	23.01	0.54	2.95	0.048
05/01/11	19	68.23	26.17	0.34	2.25	0.104
05/02/11	53	3.52	7.39	0.65	22.53	1.65E-10
05/03/11	45	358.17	5.76	0.79	28.25	2.12E-12
05/04/11	5	44.19	*****	0.22	0.23	0.811
05/05/11	17	47.93	6.38	0.90	13.76	4.38E-07
05/06/11	11	34.62	11.52	0.85	7.87	4.05E-05
05/07/11	17	27.87	7.51	0.86	12.67	6.05E-07
05/08/11	10	284.63	11.17	0.87	7.59	4.05E-05
05/09/11	10	234.46	16.45	0.68	4.63	0.007
05/11/11	7	190.07	21.17	0.74	3.84	0.015
05/12/11	14	239.36	8.46	0.89	10.97	8.81E-07
05/13/11	26	2.71	19.84	0.39	3.85	0.02
05/14/11	32	19.32	17.25	0.40	5.06	0.006
05/16/11	1	228.58	*****	1.00	1.00	0.512
05/19/11	1	158.63	*****	1.00	1.00	0.512
05/20/11	1	220.91	*****	1.00	1.00	0.512
05/21/11	52	14.81	6.06	0.74	28.75	< 1E-12
05/22/11	4	218.83	61.27	0.45	0.79	0.482

Appendix 29. Continued

05/23/11	4	85.26	27.27	0.68	1.85	0.161
05/24/11	4	36.47	3.96	1.00	3.97	0.007
05/25/11	63	339.13	33.41	0.15	1.45	0.234
05/26/11	5	328.62	24.88	0.79	3.11	0.035
05/27/11	39	344.21	9.48	0.61	14.42	1.55E-07
05/28/11	9	242.94	16.80	0.69	4.34	0.009
05/29/11	26	33.70	2.56	0.97	24.68	1.40E-10
05/30/11	91	21.17	5.94	0.63	35.90	< 1E-12
05/31/11	65	261.47	8.40	0.55	19.46	3.55E-09

Appendix 30. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Night (nocturnal) data collection period, Spring (16 Mar - 31 May 2011).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
03/17/11	63	50.95	1.43	0.981	60.57	< 1E-12
03/18/11	9	207.16	33.33	0.439	1.733	0.179
03/19/11	1	270.00	*****	1	1	0.512
03/20/11	26	67.14	4.52	0.922	22.11	9.70E-10
03/22/11	1	177.61	*****	1	1	0.512
03/24/11	2	115.99	*****	0.219	0.096	0.928
03/25/11	1	130.31	*****	1	1	0.512
03/27/11	3	111.96	12.29	0.982	2.892	0.04
03/29/11	5	104.89	*****	0.303	0.458	0.655
03/30/11	130	59.58	1.67	0.946	116.447	< 1E-12
04/01/11	1	304.51	*****	1	1	0.512
04/02/11	12	67.69	5.9°	0.952	10.886	7.33E-07
04/03/11	11	74.33	9.00	0.904	8.98	< 1E-12
04/04/11	34	38.30	5.84	0.836	23.774	1.41E-10
04/05/11	4	74.57	8.54	0.983	3.861	0.009
04/06/11	24	88.12	14.05	0.539	6.982	6.02E-04
04/07/11	120	68.88	3.92	0.751	67.699	< 1E-12
04/08/11	39	53.59	2.65	0.959	35.871	< 1E-12
04/09/11	82	54.72	2.63	0.917	68.968	< 1E-12
04/10/11	8	22.67°	4.47	0.984	7.747	< 1E-12
04/11/11	111	46.01	1.65	0.955	101.207	< 1E-12
04/12/11	48	236.83	5.72	0.783	29.441	< 1E-12
04/13/11	1	209.05	*****	1	1	0.512
04/14/11	7	210.60	16.87	0.827	4.783	0.004
04/17/11	27	50.83	3.98	0.937	23.703	2.69E-10
04/18/11	11	26.52	34.26	0.394	1.708	0.183
04/19/11	20	118.76	21.01	0.412	3.388	0.032
04/20/11	7	65.36	17.99	0.805	4.531	0.006
04/21/11	5	157.61	38.83	0.512	1.31	0.284
04/22/11	40	45.66	6.00	0.799	25.543	2.41E-11
04/26/11	131	344.60	4.15	0.708	65.665	< 1E-12
04/27/11	84	25.15	1.44	0.974	79.674	< 1E-12
04/28/11	165	48.16	3.05	0.788	102.36	< 1E-12
04/29/11	105	171.52	5.25	0.652	44.596	< 1E-12
04/30/11	95	206.80	4.72	0.722	49.5	< 1E-12
05/01/11	106	58.95	3.59	0.809	69.388	< 1E-12
05/02/11	295	28.60	1.13	0.945	263.2	< 1E-12
05/03/11	68	337.15	4.97	0.77	40.291	< 1E-12
05/04/11	16	184.39	8.22	0.847	11.471	9.59E-07
05/05/11	15	68.78	6.00	0.936	13.129	7.62E-07
05/06/11	200	34.63	0.74	0.984	193.506	< 1E-12
05/08/11	27	196.12	56.35	0.138	0.512	0.604
05/09/11	4	194.58	4.51	0.995	3.961	0.008
05/10/11	1	192.38	*****	1	1	0.512
05/11/11	9	189.89	13.20	0.846	6.438	3.64E-04
05/12/11	72	50.25	6.05	0.673	32.589	< 1E-12
05/13/11	298	55.81	1.52	0.9	241.153	< 1E-12
05/14/11	42	30.84	9.84	0.574	13.827	3.24E-07
05/16/11	11	228.85	6.97	0.941	9.744	< 1E-12
05/17/11	15	260.19	7.85	0.892	11.932	8.77E-07
05/18/11	22	274.10	5.83	0.892	17.508	3.34E-08
05/19/11	7	244.83	13.88	0.88	5.425	0.001
05/20/11	174	44.43	2.12	0.887	136.992	< 1E-12
05/21/11	29	204.82	46.10	0.162	0.762	0.471
05/22/11	40	50.83	8.36	0.66	17.41	9.15E-09

Appendix 30. Continued

05/23/11	1	50.04	*****	1	1	0.512
05/24/11	207	58.58	2.29	0.847	148.457	< 1E-12
05/25/11	77	38.05	4.61	0.775	46.209	< 1E-12
05/26/11	27	13.84	3.34	0.955	24.636	1.32E-10
05/27/11	27	275.10	6.00	0.861	20.035	3.78E-09
05/28/11	13	6.99	12.89	0.769	7.682	1.17E-04
05/29/11	88	48.82	0.93	0.988	85.975	< 1E-12
05/30/11	47	115.88	25.24	0.231	2.505	0.081
05/31/11	67	37.68	2.38	0.944	59.683	< 1E-12

Appendix 31. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Day (diurnal) data collection period, Summer (1June - 14 July 2011).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
06/01/11	3	49.16	34.94	0.86	2.22	0.103
06/02/11	14	114.19	11.19	0.81	9.07	1.37E-05
06/03/11	13	221.87	20.38	0.53	3.70	0.022
06/04/11	29	287.22	12.49	0.55	8.77	8.31E-05
06/05/11	5	23.45	57.59	0.42	0.86	0.444
06/06/11	60	305.31	14.78	0.34	7.06	8.63E-04
06/07/11	27	328.36	13.95	0.52	7.24	4.73E-04
06/08/11	30	345.77	13.65	0.50	7.63	3.18E-04
06/09/11	3	13.62	9.77	0.99	2.93	0.037
06/10/11	51	253.61	10.83	0.49	12.23	4.87E-06
06/11/11	6	294.88	20.72	0.80	3.82	0.015
06/12/11	1	233.13	*****	1.00	1.00	0.512
06/13/11	6	291.22	38.20	0.48	1.38	0.263
06/15/11	54	175.16	18.11	0.30	4.78	0.008
06/16/11	68	0.30	6.49	0.65	29.07	< 1E-12
06/17/11	39	41.85	3.26	0.94	34.38	< 1E-12
06/18/11	20	22.85	6.07	0.89	15.97	1.04E-07
06/19/11	83	86.21	16.28	0.27	5.97	0.003
06/20/11	83	90.00	8.19	0.51	21.19	6.26E-10
06/21/11	100	148.36	20.28	0.20	3.91	0.02
06/22/11	27	266.95	7.69	0.78	16.43	3.60E-08
06/24/11	14	265.10	3.19	0.98	13.53	8.59E-07
06/25/11	13	248.67	2.12	0.99	12.82	1.29E-06
06/26/11	43	11.08	2.76	0.95	38.93	< 1E-12
06/27/11	4	101.36	30.14	0.80	2.55	0.07
06/28/11	30	292.25	12.91	0.53	8.40	1.32E-04
06/29/11	53	354.39	4.06	0.88	40.56	< 1E-12
06/30/11	31	83.59	6.97	0.79	19.39	3.98E-09
07/01/11	25	179.68	63.94	0.13	0.40	0.676
07/02/11	52	274.49	7.64	0.64	21.35	5.36E-10
07/03/11	3	21.33	3.40	1.00	2.99	0.034
07/04/11	50	19.59	4.79	0.84	35.09	< 1E-12
07/05/11	134	39.87	5.10	0.61	49.76	< 1E-12
07/06/11	36	356.61	65.82	0.10	0.38	0.689
07/07/11	63	168.76	16.96	0.29	5.45	0.004
07/08/11	47	275.29	7.04	0.70	23.09	1.01E-10
07/11/11	8	40.80	11.87	0.89	6.37	2.55E-04
07/12/11	60	356.67	10.93	0.45	12.28	4.66E-06
07/13/11	52	235.51	13.69	0.39	8.05	3.18E-04
07/14/11	8	62.36	33.69	0.46	1.68	0.189

Appendix 32. Mean vectors, vector lengths and results of first-order circular statistics for data collected with horizontally-oriented radar on Monhegan Island, Lincoln County, ME, and its nearshore waters during the Night (nocturnal) data collection period, Summer (1Jun - 14 Jul 2011).

Date	N	Mean vector (μ, in degress)	Standard error mean vector (μ, in degress)	Mean vector length (r)	Rayleigh's Z	*P*
06/01/11	50	60.37	2.85	0.94	44.191	< 1E-12
06/02/11	21	123.17	7.54	0.831	14.512	1.84E-07
06/03/11	45	150.46	55.51	0.108	0.529	0.591
06/04/11	22	53.54	11.33	0.657	9.495	2.51E-05
06/05/11	45	86.38	5.21	0.828	30.828	< 1E-12
06/06/11	14	57.04	8.13	0.893	11.174	8.96E-07
06/07/11	14	10.15	15.75	0.623	5.432	0.003
06/09/11	17	203.50	24.54	0.385	2.516	0.079
06/10/11	31	133.93	32.10	0.224	1.552	0.213
06/11/11	2	344.70	54.82	0.912	1.665	0.21
06/12/11	3	173.63	32.27	0.88	2.324	0.09
06/13/11	18	238.18	11.36	0.701	8.852	4.20E-05
06/15/11	30	63.37	1.93	0.983	28.999	3.13E-12
06/16/11	64	51.28	3.08	0.912	53.176	< 1E-12
06/17/11	25	17.25	1.69	0.989	24.462	1.82E-10
06/18/11	13	55.60	12.89	0.769	7.678	1.17E-04
06/19/11	32	153.74	6.27	0.823	21.673	7.68E-10
06/20/11	25	114.06	11.85	0.607	9.213	4.25E-05
06/21/11	36	94.37	16.10	0.401	5.796	0.003
06/22/11	17	305.34	5.42	0.927	14.601	3.19E-07
06/23/11	11	272.07	6.72	0.945	9.828	< 1E-12
06/24/11	47	265.80	1.98	0.972	44.441	< 1E-12
06/25/11	31	66.04	9.51	0.659	13.461	3.41E-07
06/26/11	43	50.30	8.56	0.632	17.179	1.05E-08
06/27/11	16	52.65	7.06	0.885	12.538	7.10E-07
06/28/11	42	357.21	7.16	0.718	21.648	3.81E-10
06/29/11	18	99.64	29.32	0.317	1.811	0.164
06/30/11	34	157.18	6.77	0.784	20.921	1.11E-09
07/01/11	31	105.47	12.44	0.537	8.928	7.29E-05
07/02/11	21	30.89	2.58	0.979	20.123	6.96E-09
07/03/11	6	39.00	16.19	0.873	4.574	0.005
07/04/11	19	20.30	14.36	0.582	6.441	0.001
07/05/11	72	48.06	2.76	0.92	60.938	< 1E-12
07/06/11	17	70.04	4.21	0.955	15.51	2.11E-07
07/07/11	112	217.20	4.89	0.669	50.161	< 1E-12
07/08/11	14	316.89	4.99	0.959	12.863	9.99E-07
07/11/11	22	49.97	1.90	0.988	21.476	2.36E-09
07/12/11	52	152.53	6.26	0.73	27.719	< 1E-12
07/14/11	26	51.89	15.38	0.484	6.084	0.002