

Instructions for observing nocturnal bird migration by moon-watching

BACKGROUND

In North America and Europe, research has demonstrated that the majority of migrating birds fly at night. The predominant theories explaining why some passerines migrate by night in North America and Europe—to avoid predation, to take advantage of greater atmospheric stability and celestial navigation clues, and to use cooler temperatures to dissipate body heat – could be applied to any other migration system. Consequently, we predict that a large proportion of South American migrants also fly at night.

Normally, nocturnal migrants fly at heights where they are not visible to us. However, by watching the disk of the full moon with a telescope in spring or autumn, from time to time you can see birds crossing the disk of the moon. The number of birds counted in a given time interval is proportional to the intensity of bird migration. However, numbers are not directly proportional to intensity; observations are influenced by the height distribution of the birds and the visibility according to distance and the position of the moon. With good visibility and a telescope of 20-30x magnification, nocturnally migrating birds can be recorded at altitudes up to 1500m. With the methods outlined below, intensity and flight directions can be recorded simultaneously.

Normally, one cannot distinguish different species of birds by moonwatching. However, many nocturnal migrants give “flight calls” (short, distinctive, repeated vocalizations) while they are flying. In North America, many nocturnal migrants can be identified to genus or species by their flight calls. You will be provided with a CD or cassette tape with the known flight notes of Nearctic-Neotropical migrants (species that move between North and South America, and may be observed during the moonwatch). It may be possible to identify some migrants by their vocalizations during your observations.

METHOD

Site: In principle, any site can be used for observations, if the moon is visible for the whole observation period. In general, sites greater than 1000m in altitude should be avoided. Also, neighboring sites should be at least 50 kilometers apart.

Equipment: Telescopes with a magnification of 20 to 30 power (30x is optimal) are well suited for observations. Stronger magnifications cause the disk of the moon to appear very large and therefore birds at the edge of the moon are often overlooked. A stable tripod which allows you to follow the path of the moon manually is absolutely indispensable.

A clock or watch is needed to write down the beginning and ending times of the observation periods (in minutes). Also, you will need two

or more copies each of the **two protocol sheets, A and B** and a clip board (preferably with a cover to protect the data sheets).

Staff: Data recording is much easier and more accurate with **2 or 3 people** are needed to alternate between watching and data recording. Single observers should record their comments on a tape, or work with a stop-watch to interrupt observation time while writing down the observations.

Period of observation: Observations should take place on clear or only slightly overcast nights within 3 days before or after a full moon, when the maximum number of birds could potentially be observed. During the fall of 2004, observations should occur between March 4-10, April 2-8, and May 2-8. Counts should be performed on each night when the moon is visible and at an elevation of at least at 15-20° above the horizon (if the moon is very close to the horizon, estimations of directions and migratory intensity become very inaccurate).

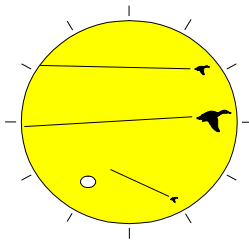
You should try to make observations each night **either** for 200 minutes **or** until 50 birds are seen, whichever comes first.

We highly recommend that each person watch **only for 10 minutes** at a time to prevent visual fatigue. Shorter observation intervals are possible but the **exact duration** (in minutes) must be recorded on the protocol. Regular pauses of at least 5 min (for people watching alone) must be made in order to maintain the necessary concentration over a observation period of a few hours. There should be at least 30 minutes (three 10-min. intervals) of actual moonwatching in each hour of observation.

Data recording: There are two different sheets prepared to record the observation data. Make some copies of the sheets before you start to use them. All the information belonging to the specific observation night must be recorded on sheet **A**. These are: information on the site (geographical longitude and latitude, altitude), the date, start and end of the whole observation period, information on the weather, and magnification of the telescope used. On the lower half, beginning and ending times (hour and minute) of each single observation interval must be recorded. This interval number is used on sheet **B** to relate the single observation of a bird to the proper observation interval. Remarks about the weather, bird vocalizations, or interruptions can be recorded here, too. **Also, it is absolutely necessary to write down the beginning and ending times of observation intervals where NO birds have been observed.** This is very important information.

On **sheet B**, record all of your observations of birds passing the disk of the moon. While the moonwatcher is constantly watching the disk of the moon, his or her colleague should record for each observed bird the corresponding number of the time interval (from sheet A), the actual time (not absolutely necessary if single observation intervals do not exceed 10 min.), "in" and "out" directions and the silhouette size of the bird given by the moonwatcher.

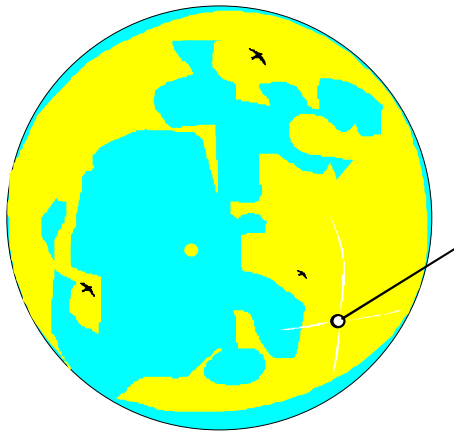
Determination of direction: The direction of the bird is given by the point of entrance and the point of exit on the disk of the moon. Point of entrance and exit are given according to the face of a clock. 12 o'clock is at the top of the telescope, 3 o'clock to the right, 6 o'clock at the bottom and 9 o'clock to the left. The direction given by the moonwatcher should be point of entrance to point of exit. For example, in the figure to the left, the tracks (from top to bottom) would be 9-3 (from left to right), or 10-2 (also from left to right) and 9-5 (left to lower right). It is permissible to estimate the point of entrance backwards, because often small birds (far away) are detected just when they are already inside the disk.



Determination of the size: The silhouette size of the observed bird is classified in relation to the size of the most conspicuous crater ("Tycho") on the lower part of the moon (see figure below). This is just a rough classification; research in the European Alps has shown that normally 80 to 90% of the birds are within the size classes of 1 to 4.

- 1 very small, just a point, hardly recognisable as a bird, much smaller than the crater
- 2 ca. 1/4 of the size of the crater - recognisable as a bird
- 3 ca. 1/2 of the size of the crater
- 4 ca. the size of the crater
- 5 ca. double of the size of the crater
- 6 ca. 4 times the size of the crater
- 7 very large, mostly fast shadow (out of focus), half of the disk of the moon or more.

It is important that for each bird **direction and size** is recorded. We know that it is just a rough estimate, but it is still much better than nothing.



The diameter of the crater ("Tycho") serves as a reference for the classification of the silhouette size of the bird.

The position of the crater turns during the night around the center of the moon, but the distance from the border of the disk keeps constant.

Extra: If you hear flight notes while you are moonwatching, record this in the "remarks" column of protocol sheet A, and try to describe or identify the calls by comparing them to your CD/tape.

An important principle: Give all the required information as exactly as possible at the time of observation; later corrections are mostly very difficult and time consuming and often not possible (e.g. an observation with only the point of entrance is useless). Avoid ambiguities. What you cannot decide on the spot can not be done later at the office desk.

Those doing moonwatching for the first time should write "new observer" on sheet A as a remark. In addition, newcomers must pay attention to the fine points which regularly seem to move over the disk of the moon. Do not count them as birds, because these are almost exclusively reflections of your own iris. There should be no confusion after having seen some real birds passing by.

Data entry:

Before entering nightly observations, you need to register your moonwatching location on the project website (<http://biology.swarthmore.edu/moonwatch.htm>) by filling out the "Site Description" form. Only complete this form **one** time. Then, after each night of observation, you should submit your data electronically by filling out the "Observations" form on the website. Complete this form once for **each night** of observation. People who like to do their own evaluations can request formulas to calculate proper directions and migratory intensities. All persons taking part in the moon-watching project will get copies of the analysis of their own observations as well as the general results.

Protocol adapted from: "Instructions to count nocturnal bird migration by watching the full moon." Swiss Ornithological Institute (1996).