

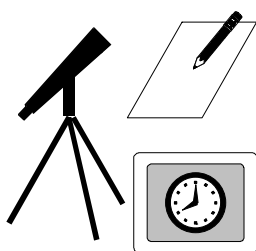
Instructions to count nocturnal bird migration by watching the full moon

Background

About 2/3 of migrating birds fly at night. Normally they fly at heights where they are not recognized by us and only on some nights we can hear calls of different species passing 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. It is obvious that the number of birds counted in a given time interval is proportional to the intensity of bird migration. Hence, numbers are not directly proportional to the intensity, because they depend on the height distribution of the birds, the visibility according to distance and the position of the moon. Comparisons with tracking radar and passive infrared showed that with a good telescope (20 to 30 times) small passerines can be seen up to 2 km. According to the position of the moon, nocturnal bird migration can be recorded by moonwatching under good conditions up to 1500 m above ground. With this method, intensity and flight directions can be recorded simultaneously. The aim of these instructions is to standardize the moonwatching method, to obtain comparable results.

Method

Site: In principle, any site can be used for observations, if the moon is visible for the whole observation period. The geographical longitude and latitude, the altitude above sea level, and some general information about the site have to be recorded on the **transcript sheet A**.



Equipment: Telescopes with a magnification of 20 to 30 (30-is optimal) are well suited for the observations. Stronger magnifications cause a very large disk of moon and therefore many birds at the edge of the moon will be overlooked. Absolutely indispensable is a stable tripod, which allows to follow the path of the moon (manually).

In addition a clock is needed to write down the time of the begin and end of the observation period (in minutes), as well as something to write on and the **two protocol sheets A and B** (enclosed to these instructions). It exists also an electronical version of the protocol sheets (LUNA_E.xls).

Staff: For a conscientious data recording **2 persons** are needed which can 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 within a time period of ± 3 days around full moon, where a correction for the change in the size of the disk of the moon is not necessary. If more observation sites are included in a study, counts should be performed simultaneously, if possible. Observations should take place when the elevation of the moon is **at least at 15° above** the horizon (better 20°), otherwise, estimations of directions and migratory intensity get very inaccurate.

We highly recommend to watch **only for 10 minutes** at a time to prevent the eyes to become very tired. Shorter observation intervals are possible but anyhow, the **exact duration** (in minutes) must be recorded on the protocol. Regular pauses of at least 5 min (for people watching alone) must be kept to maintain the necessary concentration over a observation period of a few hours. The pure observation time within one hour should be at least 30 minutes (3x10 min.).

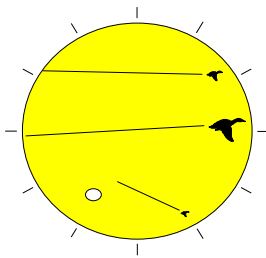
ATTENTION: **Observation time at the mainland: 20:00 – 2:20.** On islands the observation period is different: 20:00 – 21:30 (Start) or some hours later when migrants started on the mainland reach the island (depend on the distance between island and mainland).

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), the date, start and end of the whole observation period, information on the weather, and magnification of the telescope used. On the lower half, begin and end (hour+minute) of each single observation interval must be recorded according to the following numbering. This interval number is used on sheet **B** to relate the single observation of a bird to the proper observation interval. Remarks about the short weather phenomena or interruptions can be recorded here too. **Attention! It is also absolutely necessary to write down the begin and end of observation intervals where no birds have been observed.** This is an important information..

On **sheet B** all the information are recorded which belong to the observation of the bird(s) passing the disk of the moon. While the moonwatcher is constantly watching the disk of the moon, his colleague records for each observed bird the according number of the time interval (from sheet A), the actual time (not absolutely necessary if single observation intervals do not exceed 10 min.), the direction and silhouette size of the bird given by the moonwatcher.

To avoid confusion with other nights, date and site should also be recorded on the top of sheet **B** and clipped together with sheet **A**.



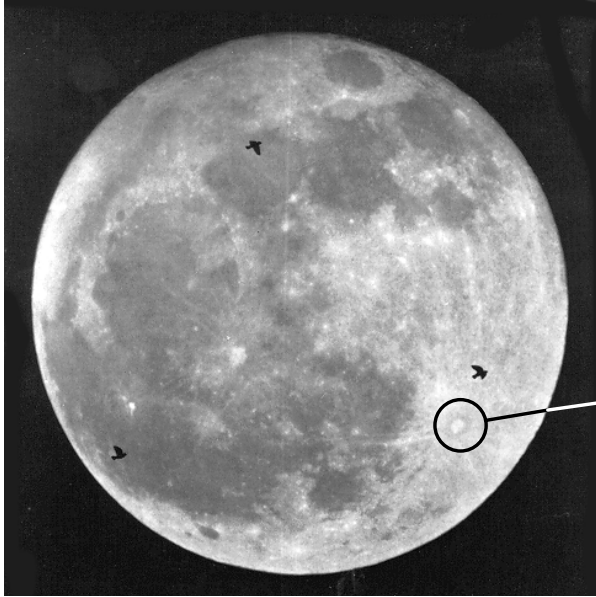
the disk.

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 e.g. 9-3 (from left to right), or 10-2 (also from left to right) etc.. It is permissible to estimate the point of entrance backwards, because often small birds (far away) are detected just when they are already inside

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(s. figure). It is just a rough classification, since experience showed 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.

Clouds and visibility: Data should be given according to sheet A. Short-term phenomena can be recorded as remarks.

An important principle: Give all the required information as exact as possible and complete, corrections later are mostly very difficult and time consuming and often not possible (e.g. an information with only the point of entrance is almost 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 give this information 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 reflexions on your own iris. There should be no confusion after having seen some real birds passing by.

Important points for the observations:

For each flight direction the entrance and exit has to be written down, otherwise the data has to be rejected.

The silhouette size has to be given in full numbers (1, 2, 3) and not as a comparison to the crater (<, > =).

Please carry out the observation only during the fixed data.