

Monday's Solar Eclipse

During Monday, 21 August, a total solar eclipse passed across the United States from the northwest to the southeast. People in Oregon, Idaho, and Wyoming had clear skies for viewing it. Elsewhere, clouds or clear sky were varied. I had previously been in the totality zone in Jordan, Montana in 1979 and got some pictures. I was in Changsha, China just south of the totality zone in 2009 and used a projection technique to safely show the event to our classes of Chinese teachers of English. Sample photos from those years are below.

This time I declined to travel to the totality swath, to Wyoming or Nebraska. Those are very rural areas that had few roads or facilities (lodging, gas stations, restaurants, etc.) for large numbers of people. As predicted, many people traveled from populated areas to view the total eclipse. Highways were jammed with vehicles, traveling at about half of the normal speeds. I saw an estimate a couple days later that Wyoming, which has slightly more than a half million residents, had more than a million visitors that day, tripling the number of people in that state for a day.

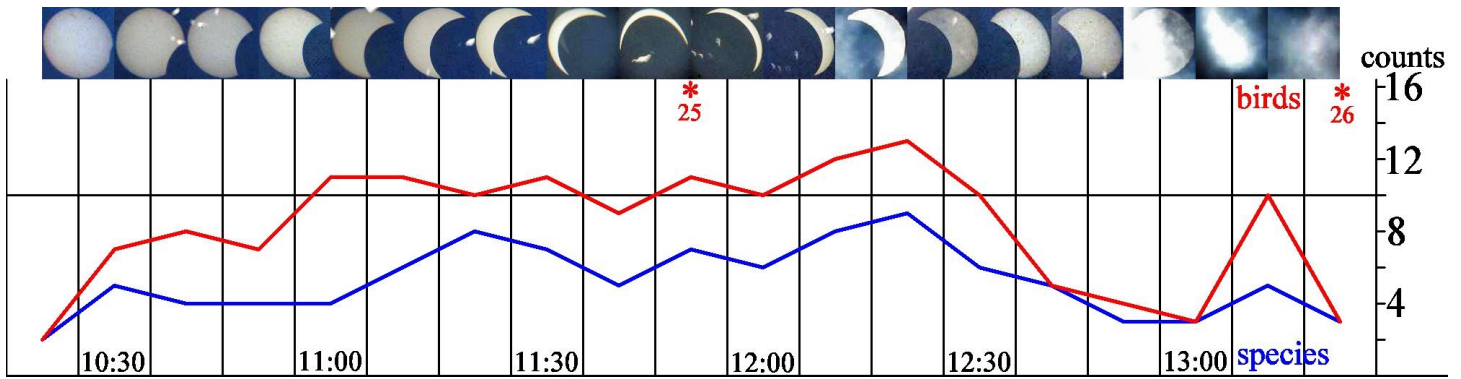
Cornell University, host to the eBird web site (<http://ebird.org/content/ebird/>) for bird watching information, put out a request for extra observations from anyone in the larger zone experiencing even a partial eclipse. It said, in part, "Past solar eclipses have featured accounts of strange bird behavior: unusual song, lack of song, roosting behavior, frantic flight, and more. For this eclipse, we want to see what information we can add through your eBird checklists. If you're going to be in area that is eclipsed on 21 Aug, please go eBirding! Submit complete checklists that are stationary, and between 5-10 minutes in duration. If you're going to be in the totality zone, please submit a 3-minute checklist for the actual totality. We currently don't have any plans for analyzing these data, but as long as you collect it, anyone can analyze it!" So I decided to help the effort with 10-minute lists from a place near my home. Our area experienced about 93 percent totality in the late morning. Normally in late morning on relatively hot August days there are few birds to observe, compared to the few hours after sunrise.

To monitor the eclipse progress I set up a simple projection system on a small mound with a good view of a variety of habitats: grassland, pond, canal, trees, shrubs. There was no wind to disturb my apparatus.



A tripod held 16X binoculars aimed at the sun, with the orientation adjusted about every 5 to 10 minutes as the sun moved across the sky. A piece of brown cardboard was cut to fit over the main lens end of the binoculars, to create a shadow beyond. One of the binocular lenses was blocked to prevent having two images of the sun. A chair held another sheet of cardboard with a white surface. The resulting image of the sun was many centimeters across, as shown in the left image. The shadow from the first sheet of cardboard never fully covered the white sheet, so the edge of the shadow appeared in some of the photos, as in the right image.

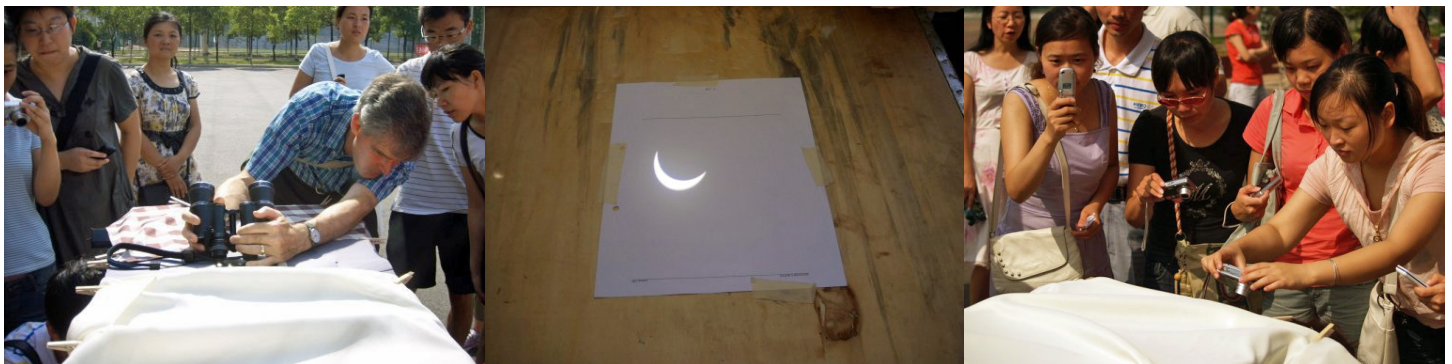
The holes in the cardboard were not perfect and so some sunlight reached the white cardboard by escaping along the sides of the binoculars rather than through the lenses. That created some bright artifacts visible in most images. (Notice the tiny crescent images in the lower right of the right image.) The center image shows the pond beyond the equipment. Using my digital camera with a zoom lens, I photographed the sun image every 10 minutes starting at 10:25 AM. At the end of the eclipse period some clouds covered the sun. I recorded the number of birds of each species during the 10 minutes between the photographs of the sun image.



Along the top is the series of sun image photos, including artifacts and clouds at the end. The graph shows the 10-minute counts of the number of different species (blue) and the total numbers of birds of any species (red). Near the center of the eclipse there was a brief overpass of a flock of about 15 Redwing Blackbirds. So as to not greatly affect the graph, I counted the flock as 1 bird, and the bird total as 11 rather than 25. Similarly, at the very end of the observations there was a flock of about 24 Bushtits. I reduced the total bird count to 3 rather than 26. The count of 10 birds just before the ending could be reduced to 6 (and the species from 5 to 4) by omitting 4 Mallard ducks that were in a different part of the canal that I had not been watching during the rest of the eclipse period.

At both ends of the observation period there were only a few birds detectable, as expected for that time of day. The numbers of species and of individual birds appear to be greater during the darker portions of the eclipse. I could feel the air temperature cooling during the dark parts of the eclipse, as if evening was approaching. Yet the coming of evening does not usually bring out more activity in these bird species. I do not yet know if my bird behavior observations were noticed elsewhere.

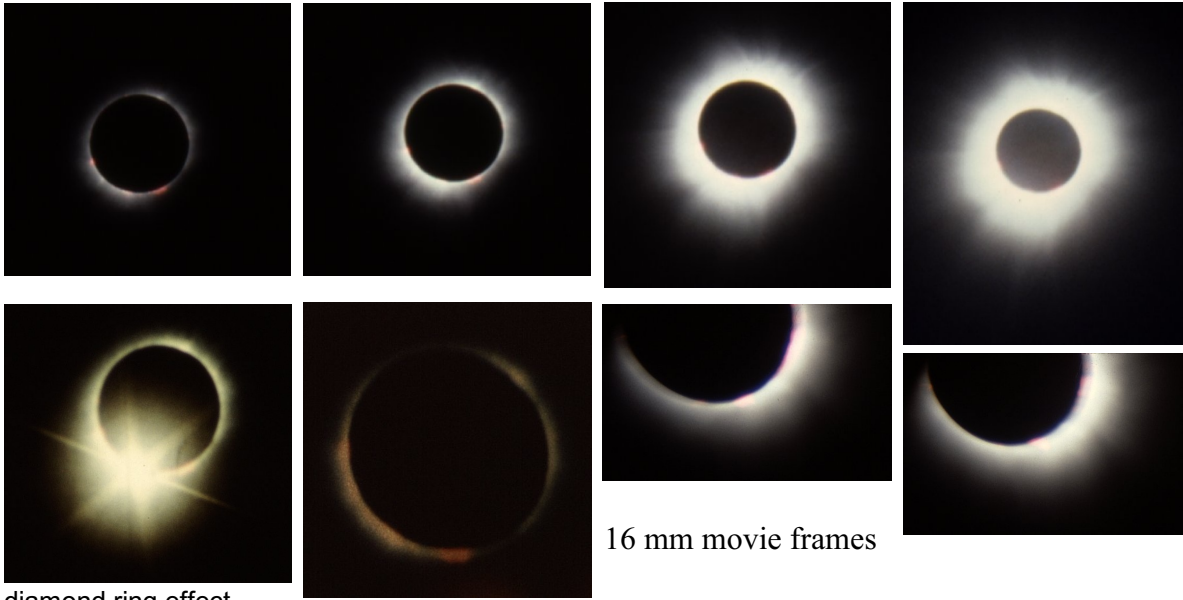
I did notice what I regard as unusual for three birds in flight. During the 10:50 period I saw a tiny Broad-tailed Hummingbird attacking a larger Barn Swallow. During the 11:30 period I saw a Barn Swallow attacking a much larger Belted Kingfisher. Perhaps it was irritability. These species are not enemies and have entirely different food supplies. The Hummingbird drinks nectar from flowers. The Swallow catches flying insects. The Kingfisher dives into water to capture fish and frogs.



In 2009 we covered a glass-top table except for a small hole through which 7X binoculars could project the sun image to a white paper on a shadowed lower board. The teachers in Changsha loved taking photos of the eclipse progress.

In 1979 I had a time-lapse 16 mm movie camera and my 35 mm slide film camera aimed through 16X binoculars mounted on an “equatorial mount” to track the motion of the sun. In practice, the weight of the apparatus was too great for the tracking equipment and the sun drifted within the field of view. Manual adjustments were occasionally needed. During totality the 35 mm camera exposure used a series of

progressively longer exposures. Later a few special frames from the 16 mm movie were rephotographed to 35 mm slide film. One of those images happened to capture the “diamond ring” effect. Some exposures showed the red prominences of the sun edge. Longer exposures showed progressively more of the corona.



35 mm views
through 16X
binoculars

16 mm movie frames

diamond ring effect

- - Dr. Ed Holroyd, 24 August 2017