THE EFFECT OF A TOTAL ECLIPSE OF THE SUN ON BIRD CALLS

ANTHONY MENDOZA, 6557 Shadow Run Drive, Tucson, Arizona 85704; anthony_mendoza@hotmail.com

I report on the effects of a total solar eclipse on calling birds at Market Lake Wildlife Management Area just north of Roberts, Idaho, on 21 August 2017. Market Marsh Wildlife Management Area (43.780° N, 112.194° W) was established in 1956 to restore the natural marshes around Market Lake, and consists of a system of levees separating marsh and open water. It covers 2052 hectares and is managed by the Idaho Department of Fish and Game. On 21 August 2017, the partial eclipse at this site started at 10:15 Mountain Daylight Time, totality started at 11:32 and ended at 11:34, and the partial eclipse ended at 12:57 www.timeanddate.com/eclipse/map/2017-august-21#). The National Weather Service measured the high for the day in nearby Idaho Falls at 28° C (http://w2.weather.gov/climate/index.php?wfo=pih), and the temperature dropped 7.2° C just before and during totality (local measurement).

Starting 90 minutes before totality, I conducted 1-minute auditory surveys ("samples") estimating the total number of individual bird vocalizations heard (all species combined) every 10 minutes (Table 1). At 30 minutes before totality, I increased the samples to one every 5 minutes. I also noted bird behavior during each sample. The species I tracked were the Canada Goose (*Branta canadensis*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Sandhill Crane (*Antigone canadensis*), Greater Yellowlegs (*Tringa melanoleuca*), Ring-billed Gull (*Larus delawarensis*), White-faced Ibis (*Plegadis chihi*), Northern Harrier (*Circus hudsonius*), Marsh Wren (*Cistothorus*

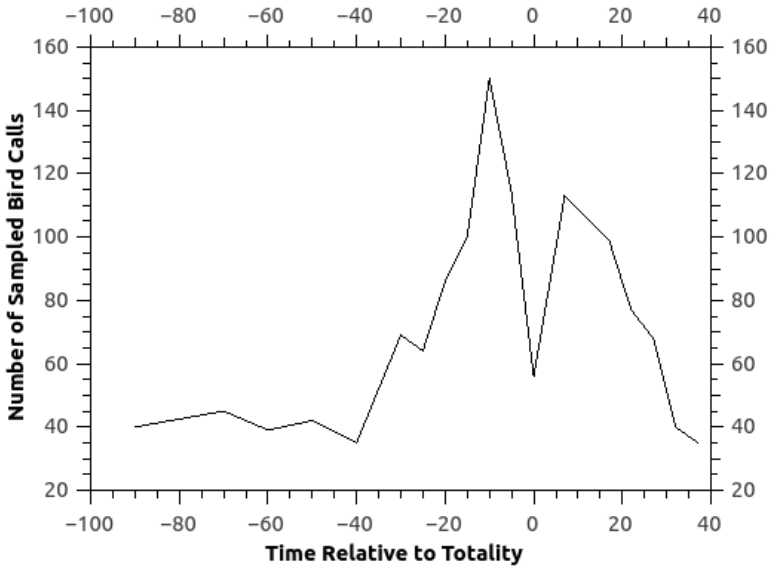

Figure 1. Number of bird calls by 1-minute interval relative to time of totality of the eclipse of the sun at Market Lake, Idaho, 21 August 2017.

Table 1 Bird Vocalizations and Behavior Noted at Market Lake, Idaho, during the Total Solar Eclipse on 21 August 2017

Time relative to totality (min)	Number of calls (per 1-min sample)	Species calling	Behavioral and other notes
–90	40	Duck, Sandhill Crane, Marsh Wren	
–80	110	Duck, Marsh Wren	Canada Goose flock flies over (omitted from Figure 1)
–70	45	Duck, Marsh Wren, Yellow-headed Blackbird	
–60	39	Canada Goose, duck, Marsh Wren	
–50	42	Duck, Sora, Marsh Wren, Yellow-headed Blackbird	Northern Harrier activity seems to have increased; Sora calling seems to have increased
–40	35	Canada Goose, Sora, Marsh Wren, Northern Harrier	
–30	69	Duck, Sora, Marsh Wren, Yellow-headed Blackbird	Increased movement of birds
–25	64	Duck, Virginia Rail, Sora, Marsh Wren Yellow-headed Blackbird	Ducks moving in and landing; sky noticeably darkening (as at dusk); White-faced Ibis arriving and roosting
–20	86	Sora, Yellow-headed Blackbird, Marsh Wren	Greatly increased Marsh Wren activity; ducks still coming in to land; swallow (Hirundinidae) activity increased
–15	100+	Duck, Virginia Rail, Sora, Greater Yellowlegs, Marsh Wren, Yellow-headed Blackbird; other calls not identified	
–10	150[a]	All above species noted	
–5	114	All above species noted, plus White-faced Ibis	Marsh Wren calling decreased; Greater Yellowlegs stopped feeding; bird call noise level noticeably reduced.
0	56	Duck; other calls not identified	Marsh Wren less noisy
7	113[a]	All above species noted, plus Ring-billed Gull	Marsh Wren very noisy; Ring-billed Gull in huge cloud making much noise (omitted from Figure 1)
12	106	Sora, Virginia Rail, Ring-billed Gull, Marsh Wren, Yellow-headed Blackbird	Birds seem to be calming down from peak.
17	99	Virginia Rail, Sora, Ring-billed Gull, Marsh Wren	Bird calls noticeably down.
22	77	Duck, Marsh Wren	
27	68	Duck, Marsh Wren	
32	40	Duck, Ring-billed Gull, Marsh Wren (far down from peak)	Bird activity back to pre-eclipse baseline (seemed same as ~1 hour before totality)
37	35	Canada Goose, Greater Yellowlegs, Marsh Wren (calls greatly reduced from peak)	

[a]Count probably low; the number of birds calling made a totally accurate count impossible.

palustris), Yellow-headed Blackbird (*Xanthocephalus xanthocepahlus*), and Common Yellowthroat (*Geothlypis trichas*). Several species of waterfowl were also seen, including the Blue-winged Teal (*Spatula discors*), Cinnamon Teal (*S. cyanoptera*), Mallard (*Anas platyrhynchos*), and Northern Pintail (*A. acuta*), but I did not distinguish their vocalizations during the eclipse (noting them simply as "duck").

Bird calls increased just before and after totality, building from a point near 40 minutes before totality (Figure 1). The Marsh Wren seemed particularly sensitive to the observed changes in sunlight. Just before and during the darkness of totality, the number of birds calling dropped dramatically. At no time during the eclipse, however, did the number of calls fall below the baseline observed before or after the eclipse. In other words, the birds at Market Lake did not actually go silent during totality, but the contrast between the maximum just before and after totality, and the dramatic drop in calls during totality, produced the subjective feeling of silence. This could account for the often-reported effect of birds going silent during totality. For example, during a total eclipse in a Maine forest, Kellogg (1963) reported that bird calls didn't actually stop, but just dropped to a low level during totality. Similarly, in coastal Maine, Mousley (1933) reported Herring Gulls (*Larus argentatus*) "calling much as they do toward nightfall" 5 minutes before totality, and plovers, sandpipers and turnstones starting to call just prior to totality.

Conway (2011) noted "the half hour between sunset and complete darkness is often the time when detection probability (of marsh birds) is highest," which corresponds with the increase in bird calls starting ~40 minutes prior to totality, when both light and temperature were dropping (mimicking the effects of approaching dusk). The drop in bird calls I observed after totality, however, occurred much more rapidly than that after dawn, when calls remain at an elevated level for up to three hours after sunrise (Conway 2011).

I thank Larry Norris (National Park Service and the University of Arizona, retired) for his field help and help editing the first draft. Thanks to the Idaho Fish and Game for its support at Market Lake.

LITERATURE CITED

Conway, C. 2011. Standardized North American marsh bird monitoring protocol. Waterbirds 34:319–346; doi 10.1675/063.034.0307.

Kellogg, P. P., and Hutchinson, C. H. 1964. The solar eclipse and bird song. Living Bird 3:390.

Mousley, H. 1933. Bird actions during the total eclipse of the sun, August 31, 1932. Auk 50:125–126; doi 10.2307/4076610.

Accepted 28 October 2017