Bird kills at a lighted man-made structure: often on nights close to a full moon

"tower-kill data from WCTV do not support Verheijen's hypothesis . . ."

Robert L. Crawford

VERHEIJEN (1981) PRESENTED evidence that no bird kills occur at lighted, man-made structures (*e.g.*, television transmitting towers, lighthouses) on nights at or near a full moon. He believes that the bright moonlight mitigates the disorienting effects on birds of the artificial lights of those structures. Verheijen compared his findings with Stoddard's (1962) statement "So far we cannot see that the phase of the moon has much bearing on the numbers of birds migrating, or striking the obstruction." Stoddard's work on bird kills (Stoddard 1962, Stoddard and Norris 1967) was at the WCTV tower in Leon County, Florida, where his practice of daily searches for dead birds under the tower is continued by other workers (Crawford 1981a).

To test Verheijen's hypothesis, I chose from the WCTV tower-kill data (on file at Tall Timbers Research Station) each night 1956—1980 (25 years) for which 10 or more birds were recorded (N = 683 nights, N birds = 33,439). I took moon data from *The American Ephemeris and Nautical Almanac* (U.S. Nautical Almanac Office, U. S. Naval Obs., Washington, D. C.); which provides for each night a lunar value, the "fraction illuminated." A full moon's value is 1.00 whereas a new moon's is 0.00.

The data show that many bird kills were on nights near or at a full moon (Fig. 1); a regression test (Sokal and Rohlf 1969) showed that the numbers of birds killed were not dependent on moon-phase. The moon-phase mean was 45.15 (Standard Deviation = 32 79), the r-value was 0.043, the F-value was 1.265, with $P > 0.2$. The frequency distribution of bird-kill nights with regard to moon phase (Table 1) is non-random by a Chi-squared test ($P < 0.0005$) Two clumps are apparent: one at the new moon (where Verheijen's data vec-

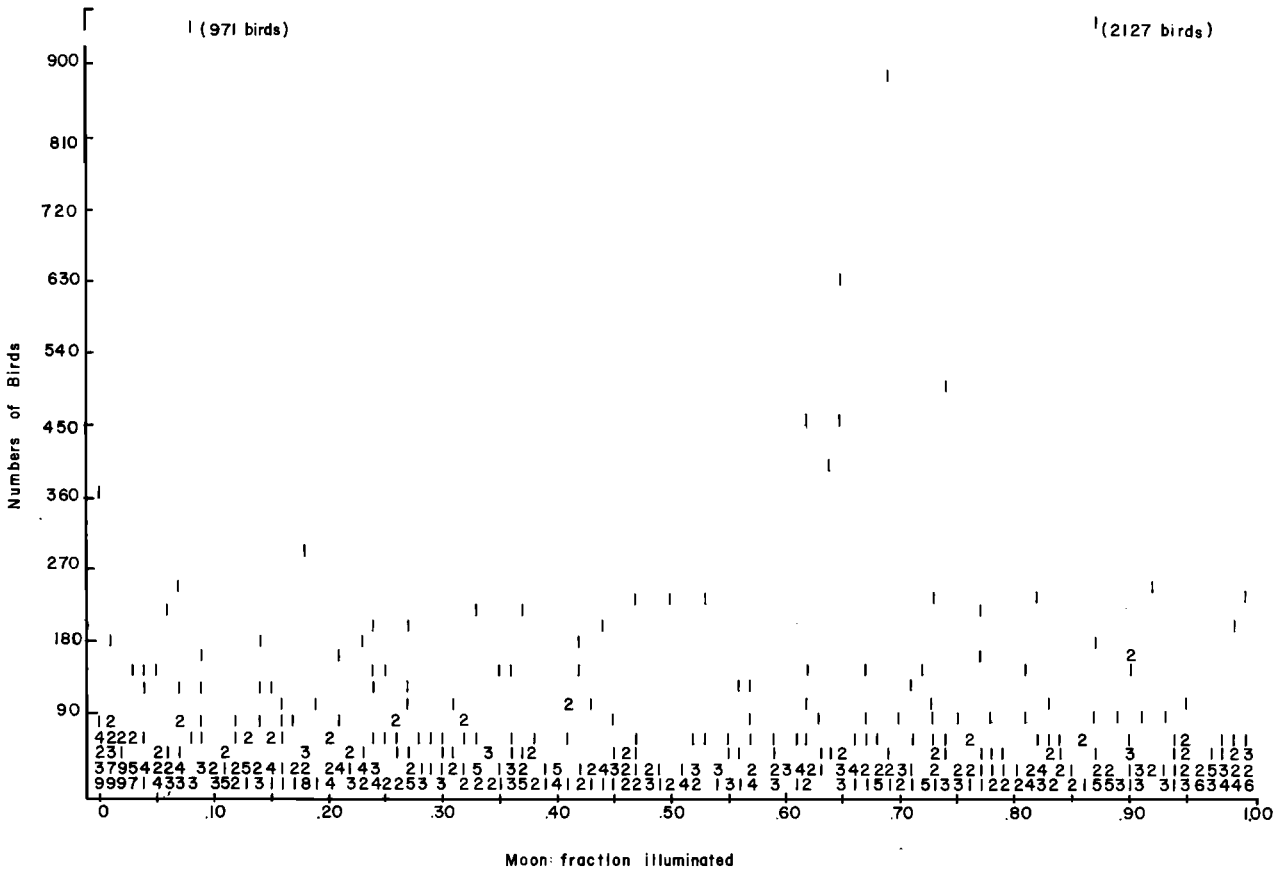

Figure 1. *Bird kills and moon phase at the WCTV tower 1956—1980.*

Table 1. Bird kills and moon phase at the WCTV tower: 1956-1980

Moon (fraction illuminated)	*Number of nights*
0.00–0.05	105
0.06–0.10	36
0.11–0.15	38
0.16–0.20	33
0.21–0.25	35
0.26–0.30	31
0.31–0.35	27
0.36–0.40	31
0.41–0.45	25
0.46–0.50	22
0.51–0.55	22
0.56–0.60	22
0.61–0.65	29
0.66–0.70	31
0.71–0.75	31
0.76–0.80	23
0.81–0.85	30
0.86–0.90	34
0.91–0.95	29
0.96–1.00	49
Total	683

tored) and another at the *full* moon. Nights very close to the full moon (values 0.97—1.00, N = 41) accounted for 1379 birds (mean = 33.6, SD = 44.5).

Verheijen's conclusion that no bird kills occur at the time of the full moon is not supported by the WCTV data. Stoddard (*ibid*, pp. 9–13) also listed 56 dates of kills at the WCTV tower and 7 (12.5%) were on nights at or near a full moon: April 25–26, 1956 (lunar values = 1.00 and 0.99), April 3–6, 1958 (0.98, 1.00, 0.99, 0.95), and October 6, 1957 (0.92).

Weather at the tower site and the magnitude of bird migration are the significant factors determining tower kills (Crawford 1981b). The disorienting effects of the tower lights during conditions of drizzle, fog, or even nearly invisible air moisture can cause the birds to beome more susceptible to disaster (Stoddard 1962, Avery *et al.* 1976). There is some evidence of a slight suppression of migration volume on nights near a full moon (Nisbet and Drury 1968) but few studies of migration take this variable into account (Richardson 1978). The moon phase may therefore influence tower kills indirectly by suppressing the volume of migration on some nights, but the tower-kill data from WCTV do not support Verheijen's hypothesis of a direct interaction among moonlight, tower lights, and avian orientation systems.

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Polynesian Tattler, near Lancaster, Los Angeles Co., Calif., July 23, 1981. The lack of barring on the underparts, the fineness of the barring on the breast, and the shape of the supercilium are all evident in the picture. First North American record south of Alaska. Photo/Herbert Clarke.