

THE INFLUENCE OF WIND AND TIME ON CALLING RATE OF THE COMMON POORWILL (*PHALAELOPTILUS NUTTALLII*): CONSIDERATIONS FOR INVENTORY

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Abstract -- I collected data on the timing of vocalizations by Common Poorwills at two Okanagan Valley sites during six June 1995 nights to determine whether or not call rates during the twilight period differed from those during the post-twilight period. My results showed that poorwills called more frequently after twilight, in contrast with previous findings in California and locally of greatest vocal activity by this species during crepuscular periods. Detection of poorwill calls decreased significantly when winds were above 6.4 km. per hour (strong breeze). From these findings, I suggest that inventory protocol for Common Poorwills should include recommendations that surveys begin one-half hour before the darkest part of the night (Nautical Twilight) and that surveys not be conducted on windy nights.

Key words: Common Poorwill, diurnal vocalization patterns, inventory protocol, Okanagan Valley, *Phalaenoptilus nuttallii*, wind effects.

The Common Poorwill (*Phalaenoptilus nuttallii*) is a cryptic, nocturnal insectivorous bird that is considered a rare or uncommon resident of high rolling prairies, semi-arid flats and rocky foothills in North America (Csada and Brigham 1992a). In Canada, its known breeding range is restricted to the arid southern interior north to Riske Creek in British Columbia and the Cypress Hills of Alberta and Saskatchewan, areas that continue to undergo habitat alteration from agriculture, urbanization and logging. In spite of scant information on population trends of poorwills in Canada (Csada and Brigham 1992b), this species was "downlisted" in British Columbia from a "red list" of candidate species for legal designation as "endangered" or "threatened" to a "yellow list" of species of regional concern by the British Columbia Ministry of Environment in 1995 (British Columbia Wildlife Branch and Habitat Protection Branch 1995).

Recent interest in determining the status and population trends of poorwills and the desire for standard, effective inventory methodologies led to the development of a preliminary manual for sampling goatsucker populations in British Columbia (Bender and Brigham 1995). This inventory manual recommends that surveying for poorwills should begin at civil twilight (when the sun is about 6° below the horizon) and end at nautical twilight (when the sun is 12° below the horizon) at points 400 to 500 m. apart. Detection of the distinctive "poor-will" call, uttered primarily by territorial males, is used to provide an index of the relative abundance of the birds and to estimate the population in the area censused. Brigham and Barclay (1992) recommend recording moonlight conditions, temperature, wind speed and cloud cover so that their effects on calling activity can be considered.

Although few direct observations of foraging poorwills have been published (Bent 1940; Cannings *et al.* 1987; Brigham and Barclay 1992), these birds apparently usually

catch flying insects during brief sallies from a low perch or the ground. Radio-telemetry studies (Brigham and Barclay 1992) demonstrated that poorwills in the Okanagan begin feeding approximately 30 minutes after sunset and continue as long as there is sufficient light. The duration of feeding after nautical twilight depends on the amount of moonlight (Brigham and Barclay 1992). Since both sexes incubate eggs and share in brooding, and incubation shifts occur throughout the night (Csada and Brigham 1992a), energy constraints on both sexes should be similar.

Calling by poorwills likely functions as song, repelling other males and attracting potential mates (Csada and Brigham 1992a). From an energetic perspective, during courtship, incubation and brood-rearing, male poorwills could theoretically face a choice between spending time foraging during optimal conditions of visibility, and spending energy calling to defend their territories. However, diurnal calling patterns tend to coincide at least generally with temporal patterns of foraging (Brauner 1952; Brigham and Barclay 1992).

In this study, I collected data on calling rates by male poorwills during the period between civil twilight and nautical twilight and during the darker part of the night. I also collected data on the effect of windspeed on calling rates of poorwills.

MATERIALS AND METHODS

Study Site

The study was conducted in the Okanagan Valley near Oliver, British Columbia (49°14'40"N, 119°35'20"W, where poorwills are fairly common (Campbell *et al.* 1990). Data were collected simultaneously at two sites (Suzi Mine and Geology Camp) located about 1 km. apart nightly from 22-28

June 1995, except on 25 and 26 June, when data were collected at only one (Geology Camp) site. During these nights, the moon was not above the horizon, and therefore could not affect calling or foraging rates.

Data Collection and Analysis

At each site, one or two observer(s) from a "Bats and Nocturnal Birds" course recorded the following data during each ten-minute sampling period between 21:00 and 00:30:

- 1) Number of individual poorwills calling, based on directions of calls.
- 2) Total number of poorwill calls.
- 3) Windspeed on the scale: 0 = 0 km./hour (still), 1 = 1.6-4.8 km./hour (light breeze), 2 = 4.8-6/4 km./hour (moderate breeze), 2.5 = 6.4-11.2 km./hour (strong breeze), and 3 = greater than 11.2 km./hour (windy). Windspeeds were estimated by using the Beaufort scale (Longstreth 1953).

We excluded those 10-minute periods before which poorwills were heard calling from analysis, but included those from all periods after the first poorwill called. For each 10-minute period, calls per bird were calculated by dividing the total number of calls counted by the number of birds heard calling. Time periods were classified as either twilight (when the sun is 12° or less below the horizon, between 21:30 and 23:00 as calculated for the Oliver area by the Dominion Astronomical Observatory, Victoria) or after nautical twilight (between 23:00 and 00:30).

A two-way analysis of variance (ANOVA) (e.g., Zar 1974) was used on the entire data set to test the effects of wind and time on the number of calls per poorwill. As the number of observation periods at higher windspeeds (2.5 or 3) was very small (13), and higher windspeeds generally reduce observers' abilities to hear birds (e.g. Robbins 1981), I eliminated these data from the data set and calculated a second two-way ANOVA to assess the effects of time and windspeed on calls per poorwill at windspeeds of less than 2.5.

RESULTS

Over the six nights, data were collected from a total of 105 10-minute observation periods. The mean number of calls per bird was 70.9 ± 4.9 during twilight, whereas the mean number of calls per bird after twilight was 110.8 ± 9.0 .

When all categories of windspeed were included, fewer calls per bird were detected at windspeeds of 2.5 and 3 than at other windspeeds ($p < 0.01$; $F = 3.6$; d.f.=4: Table 1), confirming an impression I had earlier from experience in the Chilcotin area of British Columbia that strong winds reduced observer ability to detect poorwill calls. When all wind speeds were included, calls detected per bird did not differ at different times of night ($p > 0.05$; $F = 2.3$; d.f.=1: Table 2).

When data for windspeeds 2.5 and 3 were removed from the analysis, and the effects of the remaining three wind speeds and time of night were reanalysed (Table 3), no effect of wind on calling rate was indicated ($p > 0.05$). However, the mean calling rate was greater after twilight (116.0 calls per bird per 10-minute period ± 10 ; $n = 97$), than during twilight (72.7 calls per bird per 10-minute period ± 5 ; $n = 100$) ($p < 0.01$). Therefore, amount of calling differed significantly at different times of the night during the six-day observation period. This analysis showed no significant interaction effect between windspeed and time of night.

TABLE 1

MEAN NUMBER OF CALLS PER BIRD AT VARIOUS WIND SPEED CATEGORIES

Wind Speed Category ¹	n ²	Mean No. of Calls/Bird	S.E. ³
0	94	107.9	8.82
1	56	76.7	8.19
2	47	87.0	10.83
2.5	7	17.6	9.22
3	6	57.3	21.91

¹ See Data Collection section of text for definitions.

² n = sample size.

³ S.E. = standard error.

TABLE 2

COMPARISON OF WIND AND TIME ON POORWILL CALLING RATE, USING ALL DATA

Factor	DF ¹	F-Ratio ²	P ³
Wind	4	3.6	0.008
Time	1	2.3	0.133
Wind*Time	4	0.9	0.452

¹ DF = degrees of freedom

² F = a test statistic

³ P = Probability

TABLE 3

EFFECTS OF WIND AND TIME ON POORWILL CALLING RATE, USING WINDSPEED CATEGORIES 0, 1, AND 2 ONLY

Factor	DF ¹	F-Ratio ²	P ³
Wind	2	2.7	0.071
Time	1	10.6	0.001
Wind*Time	2	1.5	0.216

¹ DF = degrees of freedom

² F = a test statistic

³ P = Probability

DISCUSSION

My data indicated that overall calling by poorwills at two sites in the Okanagan over the six-day period in the third week of June was significantly greater after twilight than during twilight. These data contrast with previous observations of Brauner (1952) in California and of Brigham and Barclay (1992) locally, whose "impression was that the vast majority of vocal behaviour occurred in crepuscular periods."

Our data also contrast with the general pattern of maximum vocalization during crepuscular periods in other sallying caprimulgids (e.g. Wynne-Edwards 1930; Mengel and Jenkinson 1971; Mills 1986). Further studies are needed during different times of the breeding cycle and incorporating the pre-dawn calling period to see whether my findings were unique to a specific time and/or area or apply over a broader area and/or season. Our observations were undertaken during the incubation period of this species in the Okanagan (Cannings *et al.* 1987), when calling may be less than during courtship and territorial establishment, and may also differ from calling patterns during brood-rearing and after fledging. Since females at least occasionally call (Brauner 1952; Csada and Brigham 1992a), and both sexes incubate (Csada and Brigham 1992a), with periods when the eggs are left uncovered (Csada and Brigham 1992a), the apparent increase in number of calls during post-twilight in this study could represent periods when both birds are off the nest. Further studies of incubation patterns are needed to rule out or verify this and other possibilities.

In contrast to Bender's (1994) recommendation that inventories should begin one-half hour after sunset or civil twilight, my data suggest that point counts to inventory poorwill populations should begin one-half hour before nautical twilight and continue into the post-twilight period. In practice, this may involve dividing point count surveys for Caprimulgidae (Common Nighthawk, *Chordeiles minor*, and Common Poorwill) into separate surveys, where their breeding ranges overlap. Further observations during May and early July are needed to confirm or refute these recommendations on timing of surveys.

My results confirm the importance of excluding observations for calling poorwills during windy periods. Bender and Brigham (1995) recommend that inventory of both poorwills and Common Nighthawks not take place on nights with wind greater than about 8 km. per hour. I concur that wind seems to either decrease hearing of calls, or that poorwill calling rate decreases during winds of 6.4 km. per hour or greater.

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