

FEMALE SPRUCE GROUSE ACTIVITIES DURING LAYING AND INCUBATION

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PUBLISHED notes on activity patterns in female grouse during laying and incubation are few and generally anecdotal in approach. Most were recorded incidental to investigations of other aspects of grouse biology (Zwickel and Lance 1965, Schladweiler 1968). Schladweiler (1968) speculated that the food requirements of female Ruffed Grouse (*Bonasa umbellus*) during incubation are such that they select "an abundant, readily available, and highly nutritious food source." This they find in the new leaves of aspen (*Populus tremuloides*), which he suggests may be an important component of this species nesting habitat. Conceivably the location of this food source could also influence patterns of activity in nesting grouse.

The opportunity to document activity patterns in two female Spruce Grouse (*Canachites canadensis franklinii*) arose with the discovery of eight nests on an area where we were studying other aspects of this species biology (McCourt 1969, Keppie MS). These observations were made in 1968 and 1971 in forests of lodgepole pine (*Pinus contorta*) about 30 feet tall near the R. B. Miller Biological Station (50° 39' N, 114° 39' W) in southwestern Alberta.

We found two nests in 1968, the first, that of female 704G, on 8 June, and we subsequently visited it one or more times daily until 15 June. At each visit we recorded the time of day, presence of the hen, and any behavioral patterns seen. Between 1 and 8 July we watched this female for a total of 51.5 hours from a blind about 25 yards from the nest and recorded all activity seen. The eggs hatched 8 July.

We found a second female, 716G, incubating a three-egg clutch under the cover of juniper (*Juniperus communis*), on 10 July. We watched her throughout the daylight hours of 11 July; her eggs hatched on 12 July.

We found six nests in 1971 and visited each from 4 to 11 times during incubation. At each visit we noted the presence or absence of the hen on the nest.

Hen 704G nested at the base of a lodgepole pine and produced a 5-egg clutch over a period of 7 days (Table 1), or an average of one egg every 1.4 days. This is similar to the rate recorded for Blue Grouse (*Dendragapus obscurus*) from the same area, 1.75 days per egg (Boag 1958: 31); and Ruffed Grouse, 1.5 days per egg (Bump et al. 1947: 286).

TABLE 1
 ACTIVITIES OF A YEARLING FEMALE SPRUCE GROUSE (704G)
 DURING LAYING AND EARLY INCUBATION

Date	Time (hours)	Visits to nest site			Number of eggs in nest
		Female seen		Female not seen	
		On nest	Near nest		
8 June	13:15	x			1
	14:00			x	1
9	10:10			x	1
10	14:00			x	2
11	13:05		x		2
	17:00	x			—
	19:00			x	3
12	12:45			x	3
	19:15			x	3
13	11:00	x			—
	12:00	x			—
	16:30		x		4
14	11:40		x		4
	17:00	x			—
	19:10	x			—
	20:05	x			—
	21:00	x			5
15	11:00	x			5
17	11:30	x			5

Until incubation started the nest was extremely simple, consisting of little more than a hollow scraped in the litter of the forest floor, but then it took on a more elaborate architecture. The bowl was composed of an orderly arrangement of fallen leaves, pine needles, and grass. Usually the female covered the eggs with litter upon leaving the nest.

On three occasions the female was seen near the nest. On two of these she was alone and within 50 yards of the nest, on the third she was accompanied by an adult male to which she exhibited no apparent response to either the "tail-swishing" or "squatting" displays (MacDonald 1968). During this period she showed no aggressive reaction toward us after being flushed from the nest.

Table 1 suggests that the time spent on the nest increased as the clutch near completion. The incubation period was 23.5 days from the time the last egg was laid at 21:00 14 June and all had hatched by 08:00 8 July. This incubation period was similar to that reported for Ruffed Grouse (Bump et al. 1947), shorter by 2.5 days than that of Blue Grouse (Zwicker and Lance 1965), and longer by 2.5 days than that of

TABLE 2
ACTIVITIES OF FEMALE YEARLING AND ADULT SPRUCE GROUSE
DURING THE INCUBATION PERIOD

Year and female	Observations		During the period of incubation			
	Days prior to hatch	Time of day (hours)	% of time on nest	No. times off nest	Mean time off nest (min)	Mean time between feeding sessions (min)
1968						
Yearling (704G)	7	09:00-21:35	93	4	12	157
	6	04:20-21:28	93	5	15	203
	5	03:40-08:30	93	2	11	249
	4	Nest checked 6 times between 10:00 and 21:30. Female on nest 5 times and off nest 1.				
	3	03:55-16:31	91	4	12	236
	2	09:00-12:43	93	1	16	—
	1	Nest checked 5 times between 09:30 and 21:30. Female on nest 4 times and off 1.				
	0	08:00	Female brooding five chicks in nest.			
	0	09:00	Female brooding five chicks short distance from nest.			
Yearling (716G)	2	19:00	Nest found—female incubating 3 eggs.			
	1	05:30-18:00 }	93	2	25	240
	1	19:00-21:30 }				
	0	08:00	Female brooding 3 chicks in nest.			
1971						
Yearling	14-0	Nest checked 11 times between 08:55 and 18:00. Female on nest 10 times and off nest 1.				
Adult	16-0	Nest checked 5 times between 08:35 and 18:15. Female on nest 5 times.				
Yearling	21-1	Nest checked 6 times between 09:00 and 18:55. Female on nest 6 times.				
Yearling	21-1	Nest checked 8 times between 08:30 and 19:45. Female on nest 8 times.				
Adult	11-1	Nest checked 4 times between 09:30 and 12:00. Female on nest 4 times.				
Yearling	6-1	Nest checked 4 times between 14:05 and 19:50. Female on nest 4 times.				

Spruce Grouse in captivity (Pendergast and Boag 1971a). Such variation manifested both inter- and intraspecifically may reflect individual differences in attentiveness. This in turn may be related to the proximity, quality, and quantity of food. The penned Spruce Grouse Pendergast and Boag (1971a) studied had ready access to an ever-present high quality diet. Thus the incubating female needed to spend little time or energy in meeting her daily food requirements and consequently may have shortened the incubation period by spending proportionately more time incubating. By contrast hen 704G fed consistently on new leaders of white spruce (*Picea glauca*) in groves 30 and 200 yards from the nest. This food must have a lower nutrient content than the artificial diet (Pendergast and Boag 1971b) and was certainly less easily acquired. Thus the hen had to feed more often and for longer periods, spending relatively more time off the nest.

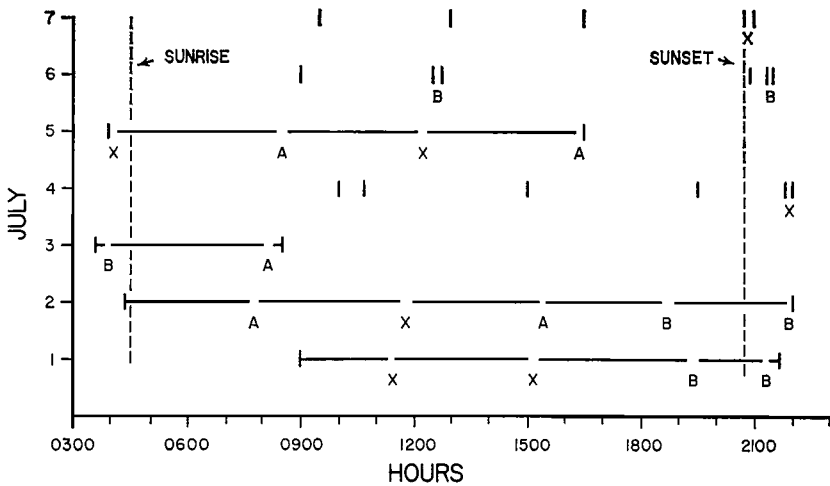


Figure 1. Activities of female 704G during the 7 days preceding hatching. Short vertical lines indicate our approach to and departure from the nest site. Horizontal lines indicate periods when bird was incubating. Spaces in horizontal lines indicate time female spent away from nest feeding. Symbols opposite spaces show location of female while away from nest feeding: A, grove of spruce 30 yards west; B, grove of spruce 200 yards southeast; X, location unknown.

The feeding schedules for both females watched in 1968 were amazingly constant during the latter stages of incubation (Table 2). During the daylight hours of observation, the proportion of time spent incubating remained about 93%. This high proportion was substantiated by the sample of visits made at various times throughout the day to the six nests found in 1971. We visited these nests 38 times; on 37 (97%) the hen was on the nest. The mean times between feeding and the mean times spent feeding also showed little variation. The difference between the two hens in mean time spent feeding, if significant, may reflect differences in general availability of food. Hen 704G fed on new spruce leaders that were concentrated on individual trees, bulky and readily picked; hen 716G, by inspection of crop contents through an incision made in the crop immediately after she returned to the nest, was feeding on pine needles and the leaves of *Vaccinium caespitosum*. Certainly both latter items were less bulky than spruce leaders, and in the case of *Vaccinium*, possibly less available. This would force hen 716G to spend more time feeding, hence more time away from the nest.

Observations from the blind showed that hen 704G fed six times daily (Figure 1) on a relatively rigid schedule. She apparently fed alternately in two nearby spruce groves, with the first feeding occurring

before sunrise and the last after sunset. She usually walked a few paces from the nest and then flew off through the pine to the feeding sites. She fed very rapidly and was highly selective, taking only new sprouting leaders. She was seen to deposit large "clocker droppings," characteristic of incubating females, while feeding in the trees. She returned at treetop height, dropped to the ground a short distance from the nest, and walked to it.

Both hens reacted aggressively when forced from the nest during incubation. They erected their feathers, particularly in the neck region, and uttered throaty clucking sounds. Hen 716G, when first flushed off her nest 2 days before the eggs hatched, also gave a distraction display in which the wings were held out and down and the tail raised and partially spread.

The activity patterns the two female Spruce Grouse exhibited during laying and incubation lend support to Schladweiler's (1968) suggestion that characteristics of the surrounding vegetation may be important to the nesting of some grouse species. If the diet of incubating hens is composed primarily of a single item, then the availability, quality, and quantity of this item could conceivably influence the distribution and success of nesting birds. These birds apparently need to acquire food quickly and in large enough quantities during incubation to remain on the nest for what appears to be a rather large and constant percentage of time.

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