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REACTIONS OF MALE BLUE GROUSE TO INTRUSIONS BY AN OBSERVER

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Reactions of birds to observers have been studied frequently in recent years, primarily in terms of effects of disturbance on nesting success or on activities of the birds, and/or in terms of development in birds of tolerance of human activities (e.g., Bart 1977, Stalmaster and Newman 1978, papers in Rodgers and Burger 1981). Such studies sometimes also consider possible influences of such effects on conclusions reached in demographic studies, but reactions to observers are not usually used to measure some other behavioral parameter. Recently, however, several observers (e.g., Mossop 1971, Willie 1971, Hemus 1972, Donaldson 1973, Bergerud and Hemus 1975) have used reactions of Blue Grouse (*Dendragapus obscurus*) to observers as a measure of aggression in different populations. The underlying assumption in these studies has been that reactions towards human observers may be equated to the levels of aggression that the same birds would show towards conspecifics of the same sex.

I studied the social behavior of male Blue Grouse during the summers of 1971 to 1974 on the Comox Burn study area of Vancouver Island, British Columbia, as part of a long-term population study by J. F. Bendell, F. C. Zwickel, and their students and associates (see Zwickel 1972). These studies involved both observational and experimental approaches, with approximately 20 males as principal subjects each year. Most birds (33 of 36 studied over the 4-year period) were color-banded by Zwickel and his assistants (McNicholl 1978). In experimental situations, I studied the subject from a hidden place whenever possible, but if deliberate approach was necessary to confirm a bird's identity, I also recorded the reactions of the bird to me. In addition, I routinely noted reactions of any Blue Grouse encountered accidentally.

In this paper, these reactions are documented and used to test the assumption that reactions towards an observer are comparable to those towards intruding male grouse. I also examine the data on specific individuals over time to see whether individuals habituate to the same intruding observer or are consistently "wild" or "tame."

STUDY AREA AND METHODS

The Comox Burn study area is situated approximately 19 km northwest of Courtenay, B. C. on the east slope of Vancouver Island. This 485 ha site was logged between 1947 and 1961, and burned in a wildfire in 1962. The dominant tree during my study was planted Douglas Fir (*Pseudotsuga menziesii*), with most of the area open to dense in vegetation in the terminology of Bendell and Elliott (1967) in 1971 and gradually progressing towards denser growth each year. Further details on the study area in general can be found in various papers cited by Zwickel

TABLE 1. Tameness scores used for reactions of male Blue Grouse to a human observer.

Behavior of bird after initial encounter	Score
Flushed or ran out of sight without resumption of previous activities.	1
Crouched for extended period; did not resume previous activity within 30 min; sometimes flushed after prolonged Crouch.	2
Flushed or ran a short distance and resumed Hooting.	3
Continued previous activity in view of observer or resumed such activity after 5 min or less.	4
Hooted to and Displayed towards and/or approached observer.	5

(1972), and details of individual territories of grouse studied by me are given in McNicholl (1978).

Since most grouse on the study area were already color-banded, I was able to avoid disturbing the birds by capturing and handling them. Whenever I had to approach a bird in order to read its band combinations, I approached as slowly and quietly as possible and only as close as necessary to confirm the band combination. On each encounter, I noted which posture(s) the bird assumed, whether or not it continued to call (Hoot), whether or not a bird which stopped calling resumed in a new site or within 5 min while still within my sight at its original site, whether or not the bird ran and/or flushed, and any other behavioral details observed. As the terminology on postures in this species varies, I have discussed and compared them elsewhere (McNicholl 1978). Those of particular relevance to this paper are summarized briefly as follows:

Neutral—The stance is neither horizontally nor vertically exaggerated; no display features, including the crest, are obvious.

Crouch (and variants)—The bird is typically flattened against the ground with neck withdrawn and no display features visible.

Alert (and variants)—Typical Alert is illustrated by Bendell and Elliott (1967: Fig. 5a), in which the body is held as in Neutral, the tail is usually up but not fanned, the crest is usually up, the neck is slightly stretched, and other display features are not obvious.

Full Display (and variants)—In typical Full Display, the crest is down, cervical apteria ("air sacs" of early authors) and surrounding rosette of white feathers are conspicuous, the combs are flared and colored, and the tail is raised and fanned. The typical posture was named Crouching by Brooks (1926), Feather Spread by Stirling and Bendell (1970), and Display Walking by Hjorth (1970). Variants include Full Courting Display of Bendell and Elliott (1967) and Upright cum Tail-Tilting and Oblique cum Multiple Hoot Canto of Hjorth (1970).

Aggressive postures—In these postures, all assumed by territorial males in response to dummy "intruding" males which were subsequently

TABLE 2. Reactions of 89 Blue Grouse to an observer on 474 encounters. For descriptions of postures and display components, see text.

Behavior	No. occurrences	% of encounters
Neutral	24	5.1
Crouch or variant	144	30.4
Alert or variant	220	46.4
Flush	187	39.5
Full Display or variant	109	23.0
Remain Hooting[1]	67	14.1
Resume Hooting[1]	103	21.7
White Shoulder-spot	11	2.3
Aggressive postures	3	0.6
Growl	34	7.2
Loud landing	32	6.8

[1] Remain Hooting refers to birds which did not cease to Hoot while I was within sight of them. Most (62) softened the Hooting at least briefly. Resume Hooting is used in the case of birds which ran or flushed a short distance and resumed Hooting almost immediately *or* resumed Hooting at the original spot encountered within sight of me within 5 min, but does not include those which resumed Hooting in the original spot shortly after my departure from their sight.

attacked by the territory holder or to live intruder males which fled, the feathers were pressed tightly to the sides of the body, the crest was down, and the combs were flared and colored. In the most common, the tail was down (Standing Tall of Stirling and Bendell 1970), but the tail was raised in other variants (e.g., the bird illustrated by Hjorth 1970: Fig. 52A), and the white shoulder-spot was visible in three variations.

White shoulder-spot—This is a group of white feathers on the undersurface of the leading edge of the wing, visible only if the wings are extended slightly forward and twisted slightly while held at the sides of the body (see Lumsden 1970). The white shoulder-spot occurs in variants of Alert, Full Display, and Aggressive postures (McNicholl 1978).

Sounds—Hooting is a term commonly used for the "song" of this grouse (Multiple Hoot Canto of Hjorth 1970). Growling refers to one or more call(s) given as a series of short stacatto phrases, and of which sonograms are illustrated by Hjorth (1970) and Stirling and Bendell (1970). "Loud landing" refers to a mechanical sound just prior to landing.

To test the possibility that male Blue Grouse would habituate to a human observer, I developed a "tameness score" based on features that indicated most wariness through most tameness (Table 1). Myre and Ursin (1979) similarly used a scoring system for recording responses of captive Willow Ptarmigan (*Lagopus lagopus*) to observers. My score is based primarily on behavior after the initial encounter, and thus is be-

TABLE 3. Tameness scores for individual male Blue Grouse.

	Frequency of each tameness score															P[1]	
	1972					1973					1974						
No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1972 vs. 1973	1973 vs. 1974
1	3	0	0	0	0	5	1	4	0	1	0	0	2	1	0	0.0005***	0.0005***
2	2	2	3	0	0	3	5	5	0	0	1	3	5	0	0	0.4	0.004**
3	0	0	3	3	2	0	0	5	2	2	0	0	1	3	2	0.3	0.15
4	1	2	0	0	0	0	3	0	0	0	1	2	1	0	0	0.05*	0.57
5	0	0	0	0	9	0	0	1	0	9	0	0	0	3	6	0.53	0.53
6	0	0	1	2	0	0	0	1	4	2	0	0	3	6	1	0.5	0.35
7	3	5	0	0	0	3	0	2	0	0	0	5	3	0	0	0.3	0.001***
8	—	—	—	—	—	1	2	5	0	0	0	1	4	0	0	—	0.62
9	1	0	6	0	0	4	2	1	0	0	2	2	6	0	0	0.12	0.13
10	0	0	5	4	3	0	1	7	5	0	0	1	7	3	0	0.35[2]	0.52
11	0	0	1	2	4	0	0	5	0	1	—	—	—	—	—	0.04	—
12	0	1	1	1	1	1	1	3	1	0	—	—	—	—	—	0.5	—
13	—	—	—	—	—	0	0	0	2	2	0	0	3	5	0	—	0.25
14	—	—	—	—	—	5	2	0	0	0	5	2	3	0	0	—	0.39
15	1	4	1	0	0	0	2	5	0	0	1	1	8	5	0	0.37	0.52
16	—	—	—	—	—	4	2	1	0	0	1	2	0	0	0	—	0.42
17	0	0	1	1	0	0	0	2	0	0	0	0	7	2	0	0.5	0.7
18	—	—	—	—	—	—	—	—	—	—	0	3	7	0	0	—	—
19	—	—	—	—	—	0	1	1	0	0	1	1	7	0	0	—	0.82

[1] Probability of values being the same between years. Statistically significant differences are indicated by asterisks (* = $P \leq .05$, ** = $P \leq .01$, *** = $P \leq .001$).

[2] By χ^2 (others by Fisher Exact Probability Test).

havior exhibited towards me once the bird was able to see me clearly. This classification attempts to avoid effects of the element of surprise.

RESULTS

Reactions on 474 encounters with 89 individuals towards me were recorded. There was considerable variation in behavior among individual birds and in some cases within an individual. Several reactions usually took place on each encounter. For example, a bird that originally crouched might have subsequently remained crouched, flushed, adopted some sort of Alert posture, assumed a variant of Full Display, or resumed Hooting.

On nearly 50% of the encounters some form of Alert posture was adopted, with crouches and flushing also frequent (Table 2). On the other hand, Aggressive postures, white shoulder-spots, loud landings, and Growls seldom occurred. Moreover, these less common responses were apparently characteristic of certain birds (McNicholl 1979). Most of the observations of Full Display were by particular "tame" individuals, which also often ignored me when I was present. One such individual was so tame that it frequently remained Hooting on one end of a log when I sat down at the far end.

Only the 19 birds on which 10 or more scores were given were included in statistical analyses. Of those, only 3 birds became tamer over time as tested by the Median Test (Table 3), using the Fisher Exact Probability Test, or Chi Square test for 2 independent samples (one case only) (Siegel 1956). Nevertheless, my impression was that most birds became tamer with time, but these changes were too subtle to be demonstrated in the tameness scale. Only one bird (2688) became less tame between years (1972 vs. 1973).

DISCUSSION

Most reactions towards me were either predator avoidance (Crouch, flush, Alert), or some form of "compromise" posture (Andrew 1956) between tendencies of staying to continue a previous activity and fleeing (Table 2). Aggression was a rare response, and there are few known cases of aggression towards humans by Blue Grouse (Fisher 1977). For this reason, I doubt that reactions to observers can be used as a reliable measure of agonistic behavior by male Blue Grouse, as has been done by some workers (see introduction). I found a "standard approach" to birds with which I was very familiar as individuals, and which Hooted in regular, predictable places to be extremely difficult, and I doubt that such a standard approach is realistic in comparing populations. Reactions to observers by an individual can also vary according to the bird's activity, as exemplified by a bird that Blackford (1963) found to be consistently wary on the ground but, "indifferent" when in a tree. In addition, I do not believe distance of observer prior to flushing or time prior to flushing are valid measures of tameness. Wilder birds tended to flush at great distance, or Crouch until the observer was very close, and then flushed. Of the 5 birds in Table 2 whose tameness score was most frequently 1 (i.e., "wildest"), one always flushed at 15 to 20 m, another flushed at 20 m or more on all but 2 occasions when he crouched until I was 1.5 m away, 2 regularly crouched until I was within 1–2 m, and the other regularly flushed from a crouch at 2 m and on landing always flushed immediately again. Tamer birds flushed, if at all, at distances between these extremes. Of the 5 birds in Table 2 whose tameness score was most often 3 (i.e., intermediate), all flushed or ran off at distances between 3 and 15 m, never flushing at more than 15 m, and never remaining crouched at close approach. The 5 "tamest" birds (most scores of 5) almost never flushed (one did once, one twice, the others never). Several observers have described incidents of encounters with tame male Blue Grouse (e.g., Edson 1925, Skinner 1927, Harthill 1935), and my study area contained several such individuals, but others, often on territories adjacent to tame birds, were consistently very wild (see McNicholl 1979).

The possibility that Blue Grouse may habituate to repeated intrusions by the same observer is suggested by an observation of Blackford (1958) that the displays of a particular male became less intense and the comb color less red as the bird became less wary. My data support this pos-

sibility (Table 3), but are inconclusive, and further investigation on this point is required.

SUMMARY

Reactions of 89 male Blue Grouse towards a single observer on 474 encounters are summarized. Most responses were some form of predator avoidance, with aggressive reactions very rare. Individual variation was marked. In birds encountered frequently, some suggestion of habituation was found, but this was not demonstrated conclusively. The marked individual variation, lack of aggressive responses towards a human observer, and difficulty in standardizing an approach to a particular bird suggest that the use of reactions to observers as a measure of aggressive levels in comparing populations is not reliable.

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