

1989

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Fred C. Zwickel

David A. Boag

James F. Bendell

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Recommended Citation

Zwickel, Fred C.; Boag, David A.; and Bendell, James F. (1989) "Longevity in Blue Grouse," *North American Bird Bander*. Vol. 14 : Iss. 1 , Article 1.

Available at: <https://digitalcommons.usf.edu/nabb/vol14/iss1/1>

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Longevity in Blue Grouse

Fred C. Zwickel and David A. Boag
Department of Zoology
University of Alberta
Edmonton, Alberta T6G 2E9 Canada

James F. Bendell
Faculty of Forestry
University of Toronto
Toronto, Ontario M5S 1A1 Canada

Despite widespread banding of grouse, published longevity records for most species are limited. Johnsgard (1983) summarized some of the data available but did not include a maximum longevity record for Blue Grouse, *Dendragapus obscurus*. However, he suggested from published mortality rates that, among the Tetraoninae, Blue Grouse and White-tailed Ptarmigan, *Lagopus leucurus*, might be long-lived.

We know of only two published records of longevity for Blue Grouse, both from Vancouver Island, British Columbia. One was for a male banded as an adult (#2836) and was ≥ 11 years of age when shot (Balph 1979). The other (#3974) was banded as a juvenile, sex unknown, and was either 10 or 11 years of age when shot (Walters and Balph 1982). Here we report a larger number of longevity records for Blue Grouse, including those noted above, that lend support to Johnsgard's suggestion that Blue Grouse are long-lived.

Study Areas and Methods

The majority of records considered here are from population studies of *D.o. fuliginosus* on Vancouver Island, British Columbia, (Zwickel et al. 1983). Comox Burn, a study area of 485 ha in the Brown's River drainage, was worked intensively in all years 1962 to 1965 and 1969 to 1978, with less intensive censusing and banding from 1966 to 1968 and in 1979. Banding and censusing also were done in peripheral regions in this general area: the Brown's River, Anderson Lake, and Mt. Washington areas. Banding/census crews of up to six persons per year assisted in studies here; only in 1962 was a single person involved.

Grouse also were banded and censused over an extended period of time at Middle Quinsam Lake (Bendell and Elliott 1967), some 30 km NNW of Comox Burn. Here, intensive studies were conducted on plots totaling about

140 ha from 1959 to 1963, 1966 to 1969, and 1973 to 1978, with general search on about 600 ha. Many banded birds were removed during an experimental population manipulation in 1970 (Bendell et al. 1972). Intensive censusing in connection with the latter study continued through 1972 on about 700 ha. Size of the total census areas varied among years, depending on the particular studies in progress. Two to four bander/observers were involved each year.

Other records are from a population of *D.o. richardsonii* on a 250 ha study area, Gorge Creek, in the Sheep River drainage of southwestern Alberta. Intensive studies were conducted here from 1955 to 1962 (Boag 1966), with less intensive censusing and banding continuing through 1974. In all years, a single bander/observer was involved.

Virtually all birds were banded in spring or summer, on breeding range. Birds first marked as juveniles or yearlings (Braun 1971) were classified as to age in years when last seen or killed. Birds first banded as adults (≥ 2 years of age) were classified as of a minimum age only when last seen or killed. Within areas and sexes, all other banded birds were younger when last seen or killed than the youngest ages considered here. Individuals were identifiable from unique combinations of colored leg bands at all areas.

We document banding and resighting or recovery information for all males ≥ 11 years of age, for all females ≥ 9 years of age, and for the oldest bird of each sex at each area, if less than these ages. In cases with only one or two resightings, or if the bird was killed, we report specific dates, if known. The number of other birds within the two or three oldest age classes at each area are noted, but individuals are not specifically identified.

For purposes of this analysis, we assume that birds were dead following the year last sighted. This is likely

Longevity in Blue Grouse (cont.)

true for virtually all adult males on our intensive census plots because of their high fidelity to relatively small territories (Boag 1966, Bendell and Elliott 1967, McNicholl 1978, Lewis 1979) and the high intensity of search. It may not be true for males that settled in peripheral areas. The assumption also is less valid for females because of their wider movements on breeding range (Boag 1966, Bendell and Elliott 1967) and because most individuals are identified when with brood; i.e., unsuccessful breeders may be missed in some years. Thus, in cases in which the bird was not killed, our longevity records can be considered most accurate for males, and minimal for both sexes. All areas were open to hunting each autumn.

Results

Comox Burn. Two 12-year-old males have been identified at Comox Burn or its surrounding areas (Table 1), the oldest birds recorded on Vancouver Island. Three ≥ 11 , one 11, two ≥ 10 , and two 10-year-old birds constitute the next oldest males found there. The oldest female lived to at least 11, two attained ≥ 9 , another 9 (Table 1), and two, 8 years of age. One bird whose sex was not known was shot by a hunter when 10 or 11 years of age.

Middle Quinsam. One male ≥ 11 years of age (Table 1) and seven males ≥ 8 years of age were recorded at Middle Quinsam Lake. The oldest females found here were ≥ 8 years of age ($n=2$), followed by three ≥ 7 , and

Table 1. Maximum longevity records for banded Blue Grouse at Comox Burn and vicinity, Middle Quinsam, and Gorge Creek.

COMOX BURN	Brown's River area, 1971 and 1976. 11 years of age, 1976.	MIDDLE QUINSAM
Males	Females	Male
#10539, banded Mt. Washington area, yearling, 16 July 1976, L.G. Sopuck; resighted and clear color photo taken by J. A. Barrie, < 1 km from where banded, singing and in display, 22 April, 1987. 12 years of age, 1987.	#2821, banded Comox Burn, adult, 7 May 1969, P. Nicholson; resighted Comox Burn, 1970, 1973, 1978 with brood, 1971, 1974 without brood. ≥ 11 years of age, 1978.	#362, banded Middle Quinsam, adult, 5 May 1960, J. Loyns; resighted Middle Quinsam, all years 1961 to 1963 and 1966 and 1967. Shot 11 June 1969, T.B. Barnes ≥ 11 years of age, 1969.
#1763, banded Comox Burn, yearling, 9 July 1965, F.C. Zwickel; resighted on territory, Comox Burn, all years 1966 to 76, except 1968. 12 years of age, 1976.	#1148, banded Comox Burn, adult, 26 June 1963, F.C. Zwickel; resighted Comox Burn, 1964, 1969, 1970, with brood all years. ≥ 9 years of age, 1970.	Female
#1313, banded Comox Burn, adult on territory, 23 May 1964, J.E. Dixon; resighted on territory, Comox Burn, 1967 and all years 1969 to 1973. ≥ 11 years of age, 1973.	#3127, banded Mt. Washington area, adult, 12 September 1970, D.G. King; shot by hunter, Mt. Washington area, 4 September 1977. ≥ 9 years of age, 1977.	#3412, banded Middle Quinsam, adult, 6 May 1970, D.G. King; resighted Middle Quinsam, 1973, 1975, 1976. ≥ 8 years of age, 1976.
#1930, banded Comox Burn, adult on territory, 10 May 1968, T.B. Barnes; resighted on territory, Comox Burn, all years 1969 to 1977. ≥ 11 years of age, 1977.	#11424, banded Brown's River area, yearling, 23 April 1977, L.G. Sopuck; shot by hunter, Brown's River area, mid September 1985. This bird was first marked with patagial wing-tag #4516, Brown's River area, juvenile, 14 July 1976, J.A. Schuh. 9 years of age, 1985.	GORGE CREEK
#2836, banded Comox Burn, adult on territory, 13 May 1969, F.C. Zwickel; resighted on territory, Comox Burn, all years 1970 to 1978, shot 11 April 1978, R.A. Lewis. ≥ 11 years of age, 1978.	Sex unknown	Male
#1805 or 1838 (same color combination both birds), banded Comox Burn, both yearlings, 19 June or 17 May 1966, R.D. King or D.G. King, respectively; resighted on territory,	#3974, banded Brown's River area, juvenile, sex unknown, 17 August 1970, R. Zach; shot by hunter, Mt. Washington area, 1980 or 1981 (specific date not known), sex not reported. 10 (1980) or 11 (1981) years of age when shot.	#A39404, banded Gorge Creek, adult on territory, 26 May 1964, D.A. Boag; resighted Gorge Creek, all years 1965 to 1974, found freshly killed and partly eaten in clutches of goshawk, Gorge Creek, April 1976 (day not recorded), W. Dwernychuk. ≥ 14 years of age, 1976.
		Female
		#526-89930, banded Gorge Creek, yearling, 7 July 1956, D.A. Boag; resighted Gorge Creek, all years 1959 to 1962. 7 years of age, 1962.

three 7-year-olds. Another female ≥ 8 years of age is known from the Lower Quinsam area (Bendell 1955), about 10 km from Middle Quinsam.

Fewer old-aged birds were found at Middle Quinsam than at Comox Burn and this might indicate a higher mortality rate there. We suspect, however, that fewer old birds were recorded at Middle Quinsam because of less consistency in the areas censused each year, because many banded birds were removed in 1970, and because forest succession was more advanced than at Comox Burn.

Gorge Creek. The oldest age that we documented for any Blue Grouse was ≥ 14 years of age: adult male #A39404, killed by a goshawk, *Accipiter gentilis*, in the Gorge Creek area in 1976 (Table 1). The next oldest male recorded there was ≥ 9 , and the next, ≥ 7 years of age. The oldest female was 7 (Table 1), followed by three 5-year-olds.

Although the oldest Blue Grouse yet recorded was at Gorge Creek, return/recoveries in the older age classes there were sporadic and less continuous among age classes than on Vancouver Island. Intensive studies were conducted for only eight years at Gorge Creek, however, and this alone might explain the difference between areas. Other factors that may have contributed to this difference were: a higher yearling/adult mortality rate (Boag 1966), or fewer observations and grouse banded than on Vancouver Island.

Discussion

Male #A39404, at ≥ 14 years of age, was older than any other grouse as documented by Johnsgard (1983). Of 11 species of grouse considered by him, only in Capercaillie, *Tetrao urogallus*, and Ruffed Grouse, *Bonasa umbellus*, have birds been reported to attain at least 10 years of age: three Capercaillie, 11, 12, and 13 years; and one Ruffed Grouse, 11 years. It thus seems of interest that we recorded 12 male, one female, and one Blue Grouse of unknown sex that reached at least 10 years of age. Blue Grouse, if not the longest lived grouse, surely must approach that status.

Numbers of longevity records for a species, of course, are dependent in part on numbers of birds marked, the intensity of observations or follow-up of these birds, and the subsequent reporting of these observations. Our intensive long-term studies on Vancouver Island have certainly contributed to the large number of older-aged Blue Grouse that have been recorded. Nevertheless,

long-term banding studies with Willow Grouse, *Lagopus lagopus* (Myrberget 1984); Red Grouse, *Lagopus lagopus scoticus* (Watson et al. 1984); White-tailed Ptarmigan (Braun 1984); and Ruffed Grouse (Gullion 1981) have failed to document long-lived birds equivalent to those in Blue Grouse. We predict, however, on the basis of low adult mortality rates reported for White-tailed Ptarmigan (Choate 1963) and Franklin Spruce Grouse, *Dendragapus canadensis franklinii*, (Keppie 1979) that comparable ages will be documented for these species. Adult mortality rates for most other species of grouse (Johnsgard 1983) suggest shorter life spans for them.

Bendell (1955) estimated, from banding samples, that the annual adult male mortality rate for Blue Grouse at Lower Quinsam was 31 percent. He used this figure, along with other data, to develop a life table for his study population. He showed that for every 1000 eggs laid, 105 grouse should reach one year of age, and of these, one should live to 12, two to 11, and three to 10 years. In our banding sample at Comox Burn, where the census plot and intensity of census were consistent among most years, only birds that were one-year-old by 1968 could attain an age of 12 by 1979, the last year of censusing there. From 1962 to 1968, we marked 69 yearling males at Comox Burn, and by 1979, had identified one 12, one 11, and two 10-year-old survivors from among these birds. These data are consistent with Bendell's life table analysis for males on Vancouver Island. Five minimum-aged males 10 years and older among birds first banded as adults lend further support to this contention. Since no males exceeded 12 years of age, even though 50 yearlings and 70 adults banded prior to 1968 could have attained ages of 13 years or more (up to 18) by 1979, 12 years may be at, or near, the maximum longevity to be expected for male Blue Grouse on Vancouver Island.

Returns and recoveries of "older" females were clearly less common than for males on Vancouver Island, and only one (#2821) exceeded 10 years. Other evidence suggests that the mortality rate of females at Comox Burn was higher than for males, at least since 1969 (Zwickel et al. 1983), and this may account for some of the difference between the sexes. We suspect this is true but the conclusion is confounded by the fact that females may be less identifiable as individuals than are males, as noted above. A shorter lifespan for females than males also is suggested by the longevity records from Gorge Creek but these too may be affected by biases in identification.

Longevity in Blue Grouse (cont.)

In summary, we think it clear that Blue Grouse are one of, if not the most, long-lived species among the Tetraoninae, as suggested by Johnsgard (1983). It may be noteworthy that the two other North American grouse that likely have equivalent life expectancies, White-tailed Ptarmigan and Franklin Spruce Grouse, are geographically sympatric with Blue Grouse in mountainous regions of western North America, although the three species tend to occupy strikingly different habitats in the breeding period. It also seems of interest that these species differ greatly in body size (White-tailed Ptarmigan, smallest; Blue Grouse, second largest of North American grouse), in terms of sexual size dimorphism (White-tailed Ptarmigan and Spruce Grouse, small difference; Blue Grouse, large difference), and that they represent both monogamous (White-tailed Ptarmigan) and polygamous (Blue and Spruce Grouse) mating systems.

Acknowledgements

Our studies were supported by the National Research Council of Canada, the Alberta Division of Wildlife, the British Columbia Wildlife Branch, the Canadian National Sportsmen's Show, and the Universities of Alberta, British Columbia, and Toronto. Studies at Comox Burn were on land administered by Crown Zellerbach of Canada, Ltd. Many persons, too numerous to name, assisted with this work. J.A. Barrie of Courtenay, British Columbia, provided the photograph and longevity record for adult male #10539. K.P. Reese provided helpful comments on the manuscript. We greatly appreciate all assistance received.

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