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Author: Crawford, J. A.

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Differential Prevalence of Avian Pox in Adult and Immature California Quail

J. A. Crawford, Department of Fisheries & Wildlife, Oregon State University, Corvallis, Oregon 97331, USA

Avian pox in California quail (*Callipepla californica*) was first reported from Oregon in a study that extended from fall 1975 through summer 1978 (Crawford et al., 1979, J. Wildl. Dis. 15: 447–449). In that study, 26% of 256 birds from the E. E. Wilson Wildlife Area were infected with pox virus; prevalence was slightly higher in immatures (19% in the sample from shooting and 35% in the sample from trapping) than in adults (10% in the sample from shooting and 25% in the sample from trapping), but the differences were not significant. None of 41 birds from other areas in Oregon was infected. Research on the prevalence of avian pox in California quail in Oregon continued from fall 1978 through fall 1980 on three areas used in the initial study. The objectives of this work were to determine if prevalence differed between adults and immatures, between males and females, and among seasons and to determine if avian pox occurred in birds from locations other than the E. E. Wilson Wildlife Area.

During fall 1978 and 1979, 18 California quail were collected by shooting on the E. E. Wilson Wildlife Area, 16 km north of Corvallis, Benton County, Oregon. An additional 52 birds were trapped during winter and spring 1979 on this area. In fall 1979, 25 birds were shot on an area 8 km south of Dayton, Yamhill County, Oregon, and during fall 1980, 10 birds were shot 8 km south of Monmouth, Polk County, Oregon. Avian pox was diagnosed in the field by the presence of lesions on the toes and tarsi (see Crawford et al., 1979, op. cit.). Lesions of a questionable nature were submitted to the Veterinary Diagnostic Laboratory of Oregon State University for diagnosis. Chi-square analysis with correction for continuity (Snedecor and Cochran, 1967, Statistical Methods, 6th Ed., Iowa State Univ. Press, Ames, Iowa, 593 pp.) was used to test for differences in prevalence of pox between adults and immatures, between males and females, and among seasons. Samples from shooting and trapping were treated separately because of the 2.5-fold greater prevalence of pox in trapped birds noted by Crawford et al. (1979, op. cit.). Trapping data included only initial captures of birds.

Five of 18 quail shot and 19 of 52 birds trapped on the E. E. Wilson Wildlife Area were infected with avian pox virus (Table 1). Prevalence was unrelated to sex of birds ($P > 0.10$), but the trapping samples revealed a greater proportion ($\chi^2 = 6.87$, $P < 0.01$) of immatures than adults was infected. No adults in the sample from shooting were infected, but the difference in prevalence between adults and immatures in this sample was not significant ($\chi^2 = 2.43$, $P = 0.13$). None of 10 birds from Polk County was infected, but three (all immatures) of 25 quail shot in Yamhill County had pox lesions.

Combination of data from this work and

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TABLE 1. Prevalence of pox in California quail, E. E. Wilson Wildlife Area, Oregon, 1978–1979.

Season	Collection method	Number examined				Number with pox			
		Adult	Immature	Males	Females	Adult	Immature	Males	Females
Fall 1978	Shot	5	9	8	6	0	5	4	1
Winter 1978–1979	Trapped	15	28	26	17	2	14	7	9
Spring 1979	Trapped	2	7	7	2	0	3	2	1
Fall 1979	Shot	2	2	3	1	0	0	0	0

the initial study (Crawford et al., 1979, op. cit.) on the E. E. Wilson Wildlife Area (fall 1975 through fall 1979) indicated that 39% of immatures (59 of 150) and 22% of adults (11 of 51) from the trapping sample and 23% of immatures (18 of 80) and 8% of adults (six of 72) in the sample from shooting were infected with avian pox virus. Both trapping ($\chi^2 = 4.10$, $P < 0.05$) and shooting ($\chi^2 = 4.70$, $P < 0.05$) samples indicated significantly higher prevalences of infection among immatures than among adults from 1975 to 1979. There were no significant differences ($P > 0.30$) in prevalence of pox for all data combined between males and females in either shooting or trapping samples. Prevalence of pox among birds trapped on the E. E. Wilson Wildlife Area from 1975 to 1979 was lowest during summer (17% compared with 35 to 42% for other seasons), but the differences were not significant ($\chi^2 = 0.29$, $P > 0.50$) likely because of the small number of birds trapped during summer. Contrastingly, among shot birds, prevalence was significantly lower ($\chi^2 = 6.34$, $P < 0.02$) during summer and fall (8 and 10%, respectively) than during winter and spring (27% each season) for all years combined. Summer and early fall correspond to the driest periods in the Willamette Valley, which is characterized by mild, wet conditions from November through March. The relationship of environmental conditions to prevalence of pox, however, remains obscure.

Prevalence of pox in California quail at the E. E. Wilson Wildlife Area was greater from 1978 to 1979, 28% of birds shot and 37% of trapped birds, than from 1975 to 1978, 14% of birds shot and 34% of birds trapped (Crawford et al., 1979, op. cit.). These prevalences were higher than values reported by Stoddard (1931, The Bobwhite Quail: Its Habits, Preservation, and Increase, C. Scribner's Sons, New York, 559 pp.) for northern bobwhites (*Colinus virginianus*) and Blankenship et al. (1966, J. Wildl. Manage. 30: 253–257) for Gambel's quail (*Callipepla gambelii*), which ranged from <2% to approximately 8%. Davidson et al. (1980, J. Wildl. Dis. 16: 293–298) noted a prevalence of avian pox in northern bobwhites of 1% in Georgia and Florida from 1957 to 1977, but during an outbreak in 1978 and 1979, prevalences ranged from 1 to 39% in local populations.

The trend noted by Crawford et al. (1979, op. cit.) for a higher frequency of pox in immature quail was confirmed and combined results from 1975–1979 indicated a significantly higher prevalence in this age group. By contrast, Davidson et al. (1980, op. cit.) found infection prevalences of avian pox were unrelated to sex and age of northern bobwhites, and 10 of 11 Gambel's quail (eight males and three females) with pox, examined by Blankenship et al. (1966, op. cit.), were adults. Prevalence of pox appears unrelated to sex of birds for these three species of quail. For California quail the relationship between prevalence of pox and age of birds,

however, seemingly differs from the other two species. Susceptibility to pox possibly is species-specific or perhaps different strains of pox virus infect the three species, resulting in differential prevalences of infection.

Avian pox in California quail other than at the E. E. Wilson Wildlife Area, where it was suggested that the occurrence of pox was associated with the propagation of gamebirds (Crawford et al., 1979, op. cit.), was recorded for the first time. The prevalence of infection of birds from Yamhill County (12%) was less than one-half that of the shooting sample from the E. E. Wilson Wildlife Area for 1978 and 1979 (28%), but sample sizes from both areas in the comparison were small, 25 and 18 birds, respectively.

Running ability of California quail with severe infections on the feet seemed somewhat impeded, possibly increasing their vulnerability to predation. Too few marked birds were recaptured, however, to test for differential survival of infected and uninfected birds. The higher prevalence of pox among trapped quail suggests that infected birds possibly were more attracted than uninfected birds to the abundant bait at trap sites. Perhaps quail with pox were slightly less efficient at foraging. No deaths of quail, however, were attributed directly or indirectly to avian pox and considerably more information is necessary to evaluate the influence of the high prevalence of pox on populations of California quail in western Oregon.

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Ichthyophonus Infection in a Pacific Staghorn Sculpin (*Leptocottus armatus*) from Oregon

Robert E. Olson, Department of Fisheries and Wildlife, Hatfield Marine Science Center, Oregon State University, Newport, Oregon 97365, USA

Ichthyophonus is a fungal pathogen that has been reported to infect a variety of marine and freshwater fishes. It typically causes the formation of characteristic lesions in various internal organs, especially the highly vascular spleen, liver, kidney and heart. The taxonomic status of *Ichthyophonus* has been reviewed by Alderman (1982, *In* Microbial Diseases of Fish, Roberts (ed.), Academic Press, London, pp. 189–242), who concluded that no species of *Ichthyophonus* has been described adequately to allow unequivocal identification. The literature on the host and geographic distribution of this pathogen has been reviewed by Neish and Hughes (1980, Diseases of Fishes. Book 6: Fungal Diseases of Fishes, T.F.H. Publications, Neptune, New Jersey, pp. 61–100) and by McVicar (1982, *In* Microbial Diseases of Fish, Roberts (ed.), Academic Press, London, pp. 243–269).

Ichthyophonus has been reported to cause extensive mortalities in several species of marine fishes (Sindermann, 1958, Trans. N. Am. Wildl. Conf. 23: 349–360; McVicar, 1982, op. cit.) and in farmed

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