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Author(s): Christopher K. Williams, William R. Davidson, R. Scott Lutz and Roger D. Applegate

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Research Note—

Health Status of Northern Bobwhite Quail (Colinus virginianus) in Eastern Kansas

Christopher K. Williams,[A] William R. Davidson,[B] R. Scott Lutz,[A] and Roger D. Applegate[C]

[A]Department of Wildlife Ecology, University of Wisconsin, Russell Labs, 1630 Linden Drive, Madison, WI 53706–1598
[B]Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia, Athens, GA 30602
[C]Department of Wildlife and Parks, Research and Survey Office, P.O. Box 1525, Emporia, KS 66801-1525

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SUMMARY. The health status of wild northern bobwhite quail (*Colinus virginianus*) from Lyon County, Kansas, was evaluated by conducting comprehensive health assessments on 25 birds. Gross lesions indicative of avian pox, ulcerative enteritis, and quail bronchitis were not present. Serologic tests for antibodies to *Salmonella pullorum, Salmonella gallinarum, Pasteurella multocida, Mycoplasma gallisepticum, Mycoplasma synoviae,* and avian adenoviruses were all negative. Intestinal coccidia (*Eimeria* spp.) were found in 36% of the birds. Only three species of helminth parasites were found: *Dispharynx nasuta* in two birds, *Cyrnea colini* in one bird, and larval *Physaloptera* sp. in four birds. Arthropod parasites (ticks, lice, mites, and/or chiggers) were present on 96% of the birds examined. Compared with wild bobwhite populations in the southeastern United States, the diversity, prevalence, and intensities of microbial and parasitic agents were low.

RESUMEN. *Nota de Investigación*—Estado de salud de la codorniz blanca del Norte en el oriente de Kansas.

Se realizó un estudio detallado del estado de salud de la codorniz silvestre blanca del norte (*Colinus virginianus*) en el condado de Lyon, Kansas en 25 aves. Las lesiones a la necropsia indicaron que la viruela aviar, la enteritis ulcerativa y la bronquitis de la codorniz no estaban presentes. Las pruebas serológicas para anticuerpos contra *Salmonella pullorum, Salmonella gallinarum, Pasteurella multocida, Mycoplasma gallisepticum, Mycoplasma synoviae* y adenovirus aviares fueron negativas. Se observó coccidia intestinal (Eimeria spp.) en 36% de las aves. Se encontraron tres especies de helmintos únicamente, *Dispharynx nasuta* en dos aves, *Cyrnea colini* en un ave y un estado larvario de *Physaloptera* sp. en cuatro aves. Los parásitos artrópodos (garrapatas, piojos, ácaros y niguas) estuvieron presentes en el 96% de las aves examinadas. La diversidad, la prevalencia y la intensidad de agentes parasiticos y microbianos fue baja, comparada con las poblaciones silvestres de codornices blancas en el sureste de los Estados Unidos.

Key words: avian pox, coccidia, Kansas, *Mycoplasma,* northern bobwhite, parasite, *Salmonella*

Abbreviations: EDTA = ethylenediaminetetraacetic acid; RPA = rapid plate agglutination

Although northern bobwhite quail (*Colinus virginianus*) are susceptible to numerous diseases found in domestic poultry and/or pen-raised game birds (19), wild bobwhite populations historically have not been affected by many of the diseases characteristic of domestic poultry or pen-raised game birds. Increases in the practice of releasing pen-raised bobwhites into the wild and a developing poultry industry in east-central Kansas have prompted concern that pathogens may be transferred to wild bobwhite populations (Roger Applegate, pers. comm.).

Some of the pathogens of concern in this regard include avian poxvirus, *Mycoplasma* spp., and *Salmonella* spp. All of these pathogens infect domestic chickens, turkeys (*Meleagris gallopavo*), pheasants (*Phasianus colchicus*), and pen-raised bobwhite (7,8,13,30). Because of long-term declines in bobwhite quail populations in Kansas (3), we wanted to examine a sample of quail to evaluate population health. We report prevalence of parasites and selected infectious diseases in eastern Kansas northern bobwhite.

MATERIALS AND METHODS

We randomly collected bobwhite quail throughout 12 259-ha (1^2 mile) areas scattered throughout Lyon County, Kansas. Because of the public concern of the release of pen-raised bobwhite in east-central Kansas, this county was chosen as a representative sample. The distance between study areas was small enough to eliminate confounding climate and habitat heterogeneity affects on the population yet large enough to avoid bobwhite quail interchange between study sites. Land use within study areas was typical of agricultural areas within Lyon County (6). We captured bobwhites intermittently from October 1, 1997, to January 31, 1998 with baited funnel traps (31) or night lighting (21). We euthanatized these birds by cervical dislocation (1) and collected blood samples in tubes containing ethylenediaminetetraacetic acid (EDTA) anticoagulant. We individually labeled each bobwhite and its corresponding blood sample, immediately chilled them, and packaged and shipped them following procedures outlined in Franson (18) to the Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia.

For 25 birds, the gender and age were determined on the basis of plumage (28,31), each was weighed to the nearest gram, and each was examined for arthropod parasites as described by Doster *et al.* (16). Carcasses were opened by removing the breast structures (bone and muscle), and the carcass and visceral organs were examined *in situ* for any gross lesions. Representative portions of trachea, lungs, heart, kidney, spleen, pancreas, proventriculus, breast muscle, and any lesions were collected in 10% neutral buffered formalin. The gastrointestinal tracts were examined for helminths as described by Kellogg and Prestwood (20). Other organs (eyes, oral cavity, trachea, lungs, liver, pancreas, kidney, spleen, reproductive organs, bursa, and air sacs) and breast musculature were teased apart with scalpels and dissecting needles in order to detect and recover helminth parasites. Direct wet mount fecal smears were prepared and examined at 40–100× for intestinal protozoans. Samples of plasma harvested from EDTA-preserved blood were tested for antibodies as follows: *Mycoplasma gallisepticum* and *Mycoplasma synoviae* by a rapid plate agglutination (RPA) test (34), *Salmonella* spp. by an RPA test (2), *Pasteurella multocida* by enzyme-linked immunosorbent assay (27), and avian adenoviruses (group specific) by double agar diffusion test (23). Examination on an additional 44 birds was limited to determining gender, age, weight, and an inspection for gross lesions. If lesions were noted, histoparasitic examinations of the lesions were done as above.

RESULTS AND DISCUSSION

We did not find gross lesions typical of avian pox or ulcerative enteritis, which suggests that these diseases were rare or absent in this population. By comparison, avian pox historically occurred in 1%–2% of southeastern bobwhite populations, but since 1977, it has become more common, resulting in localized and regional outbreaks (12). To our knowledge, ulcerative enteritis has not been reported in wild bobwhites, but it is an important disease among pen-raised bobwhites (5,13). Serologic tests for antibodies to *Salmonella pullorum, Salmonella gallinarum, P. multocida, M. gallisepticum, M. synoviae,* and avian adenoviruses were negative in all 25 birds. The failure to find any evidence of these important avian pathogens indicates they are not likely prevalent in birds on our study areas. Interestingly, Veatch *et al.* (32) also found limited prevalence of *Mycoplasma* in wild turkeys in Kansas.

We detected intestinal coccidia, identified only to the genus level, *Eimeria* spp., in 36% of the 25 birds examined. *Eimeria* spp. that infect bobwhites are host specific and result in disease only when acquired in large numbers in very young birds (22,29). Ruff and Wilkins (29) suggested that *Eimeria* represent little health risk to wild bobwhites.

The diversity, prevalence, and intensity of helminth parasitism noted in Kansas bobwhites are low compared with Georgia, Florida, Louisiana, South Carolina, and Tennessee (10,14,17,19,24,25). Two of the examined birds were infected with single specimens of the proventriculus nematode *Dispharynx nasuta.* This parasite infects a diverse array of birds and can cause morbidity and mortality when present in large numbers, especially among juvenile birds (26,33). The prevalence and intensity of infection in our sample of

Kansas bobwhites do not suggest a population-level impact. One bird was infected with a single specimen of a second proventricular nematode, *Cyrnea colini*. This parasite occurs principally in bobwhites and infrequently in wild turkeys (11), but at such a low prevalence and intensity, it would not likely have any harmful influence on the bobwhite quail population.

We found second- and third-stage larvae of a *Physaloptera* sp. within granulomas (<2 mm diameter) in the breast musculature of four birds. The intensity of infection ranged from 1 to 10 worms. Granulomas without worms were present in one other bird. The small focal granulomas associated with these *Physaloptera* sp. larvae did not appear to impair the health of infected birds. *Physaloptera* sp. larvae previously have been reported to cause granulomatous myositis in bobwhite quail (9,15). Unfortunately, determination of the specific identity of the parasites was not possible because only larvae were present.

Arthropod parasites were present on 24 of 25 (96%) of the birds examined. We found feather mites *Megninia* sp. and *Colinolichus virginianus* were most common, infesting 22 (88%) and 15 (60%) of the birds, respectively. We found the chigger mite (*Neotrombicula whartoni*) on two (8%) birds and a single larva of the tick (*Haemaphysalis leporispalustris*) on one bird. Four species of lice were found including *Gonoides ortygis* from 14 (56%), *Oxylipeurus clavatus* from 14 (56%), *Colinicola numidiana* from 8 (32%), and *Menacanthus pricei* from 2 (8%) of the birds. All of these arthropods have been reported previously from bobwhites, but none has been associated with significant pathologic processes in this host (4,16). The diversity and prevalence of arthropods generally were similar to arthropod parasitism data from other bobwhite quail populations (4,16).

In addition to parasitic granulomas noted above, gross and histologic examinations disclosed lesions in three additional birds. One bird had a small oral ulceration, another had a healing puncture wound in the breast muscle, and a third had mild visceral gout with urate deposition in the kidneys, air sacs, and gall bladder. Although the specific causes of these lesions could not ascertained, they were not considered significant to the population health.

Overall, the prevalence and intensity of various disease agents and parasites, particularly helminths and arthropods, among these Kansas bobwhite quail generally were lower than among bobwhites from many locations in the southeastern United States (13).

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