

SCWDS BRIEFS

A Quarterly Newsletter from the
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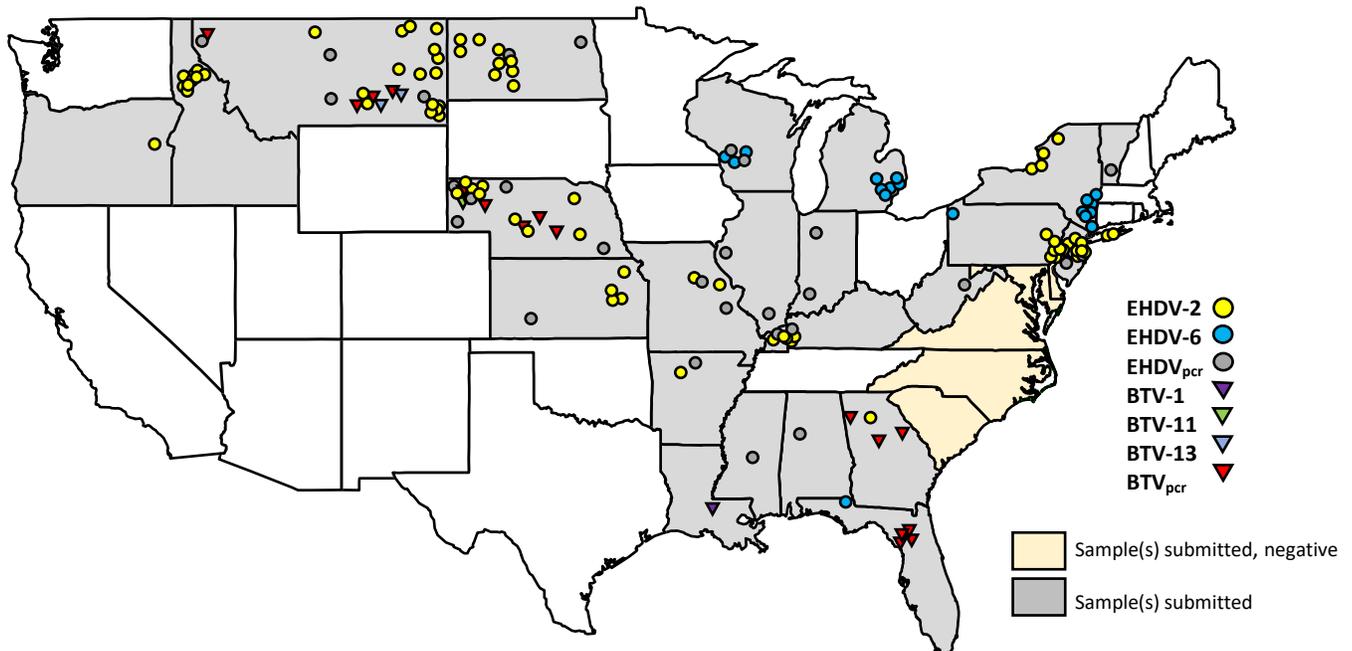
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2021 Detections of EHDV and BTV by SCWDS



2021 Hemorrhagic Disease Summary

Hemorrhagic disease (HD) has historically been described as one of the most important diseases of white-tailed deer in North America. Although CWD has taken center stage more recently and questions related to “new” pathogens such as SARS-CoV-2 continue to emerge, HD remains an important disease. This year, as in every year since the early 1990’s, SCWDS conducted annual surveillance for EHDV (epizootic hemorrhagic disease viruses) and BTV (bluetongue viruses) in the U.S. using classical and molecular virologic methods in support of diagnostic investigations of sick and dead ruminants. For all submissions, samples were screened for EHDV and BTV using real-time reverse transcription polymerase chain reaction (RT-PCR) assays, and virus isolation attempted on positive samples. Virus isolates were further

identified to serotype. We also assisted some state veterinary diagnostic laboratories with EHDV/BTV validation, isolation, and serotyping, and worked closely with partners at USDA’s National Veterinary Services Laboratories (NVSL) to identify all BTV that could not be identified through standard serologic tests (BTV-2, -10, -11, -13, and -17). The viruses isolated from this surveillance and the supportive data are shared with others, as needed.

During 2021, a total of 333 white-tailed deer, mule deer, elk, pronghorn, moose and bighorn sheep samples were received from 28 states. This number was consistent with most recent years in which submissions ranged from 200–400 samples annually. Also consistent with most previous years was the detection of the first case in late July. This first positive case, confirmed by both RT-PCR and virus isolation (EHDV-2), was detected from a

Continued...

white-tailed deer from Kansas that was found dead on July 25, 2021. This year, samples were tested from Alabama, Arkansas, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, New Jersey, New York, North Carolina, North Dakota, Oregon, Pennsylvania, South Carolina, Vermont, Virginia, West Virginia, and Wisconsin. From these submissions, 103 EHDV and BTV were isolated (see map). EHDV-2 was isolated from 82 samples submitted from 13 states including Arkansas, Georgia, Idaho, Kansas, Kentucky, Missouri, Montana, Nebraska, New Jersey, New York, North Dakota, Oregon, and Pennsylvania. Most of these positive cases were from white-tailed deer; however, EHDV-2 was also isolated from a mule deer sample and two pronghorn samples submitted from Montana. EHDV-6 was isolated from 17 samples from white-tailed deer submitted from Florida, Michigan, Missouri, New York, Pennsylvania, and Wisconsin. Several BTV were detected including BTV-11 from a white-tailed deer in Nebraska, BTV-13 from a white-tailed deer and mule deer in Montana, and BTV-1 from a white-tailed deer in Louisiana.

During 2021, most positive EHDV and BTV cases were detected from samples submitted from western and northern states, and this is consistent with the reported northern expansion of this disease. As in all previous years, EHDV-2 represented the predominant serotype but mortality associated with EHDV-6 was not uncommon. In western states (Idaho, Montana, Nebraska, North Dakota, Oregon), EHDV-2 was widespread and associated with most of the reported mortality. In many areas in the Upper Midwest and Northeast (Michigan, New York, Wisconsin) however, EHDV-6 represented the dominant serotype detected and outbreaks appeared more focal. Uncharacteristically, very few isolates of EHDV were detected from the Southeast. Of the three serotypes of BTV that were isolated, BTV-1 was most notable and was confirmed by NVSL from an isolate from a white-tailed deer sample submitted from Louisiana. Although not historically present in the United States, BTV-1 has been identified from infected white-tailed deer on multiple occasions since 2004, most recently from Kansas (2020) and West Virginia (2018). Other than BTV-1, all other positive BTV cases were from western states where BTV detections are common; as in 2020, HD outbreaks often were associated with both EHDV

and BTV. There were also numerous positive EHDV or BTV cases confirmed by RT-PCR from which a virus could not be isolated nor the serotype determined. Overall, the 2021 findings are not unexpected and are consistent with the historic and changing distribution of these viruses, with EHDV occurring throughout most of the United States but increasing in northern states, and BTV more associated with the western and southeastern states.

As always, we thank the many wildlife professionals and veterinary diagnostic laboratory personnel who submitted tissue samples for diagnostic testing this past season. We also thank NVSL for their continued assistance with confirming BTV isolates. (Prepared by Dave Stallknecht, Rebecca Poulson, and Mark Ruder)

CWD in Wild Cervids in North America—February 2022

It has been some time since the last CWD update in the *SCWDS BRIEFS* and a lot has happened in the interim. Rather than trying to list everything, we will cover some of the more significant events in free-ranging cervids here. Follow-up articles containing more information will appear in future issues.

To say the geographic distribution of CWD in wild cervids has increased since our last update would be an understatement. The disease has been detected at new locations in previously affected states through the apparent expansion of endemic foci. However, CWD also has been found at locations remote from known foci within those states; detections in southern Arkansas and southwestern Virginia are prime examples. However, the most significant development in CWD distribution in free-ranging deer and or/elk is the recent addition of one Canadian province and three states to the list of affected jurisdictions.

On November 1, 2021, the Manitoba government announced confirmation of the first case of CWD in the province in an unhealthy, male mule deer in the western part of the province. The location is near the border with Saskatchewan, where CWD has been found in wild and captive deer and/or elk for many years. Another clinically affected deer tested positive a few weeks later; however, this animal was found in southwestern Manitoba near the Saskatchewan and United States borders

approximately 250 kilometers distant from the first case. After detection of the first case, the province issued a temporary ban on all cervid hunting in the affected area to reduce the risk of hunters spreading CWD via carcass movement. Following this ban, permit-based, local community deer hunting was offered under permits that contained certain conditions, such as required submission of harvested animals for CWD sample collection. Two mule deer bucks tested positive for CWD among the 132 deer harvested and tested. The province also contracted for aerial shooting of deer in mid-December within the affected area: 503 deer were removed, no positive animals were found among the 426 deer tested.

On November 17, 2021, Idaho Fish and Game announced the detection of CWD in two mule deer bucks that were harvested by hunters in October. Both animals came from Idaho County, which is the southern-most county in the Idaho Panhandle. Two game management units (14 and 15) were designated as a CWD Management Zone and a surveillance area expands beyond these two units to include portions of four adjacent hunting units. Emergency hunts were authorized to obtain additional samples in order to identify the extent of the affected area and the percentage of infected deer within it. Subsequently, it was announced in late December and early January that two male white-tailed deer, one female whitetail, and one cow elk have tested positive for CWD. All six cases detected so far have been found in Unit 14.

On January 10, 2022, the Alabama Department of Conservation and Natural Resources announced the first detection of CWD in a hunter-harvested white-tailed deer in Lauderdale County in the northwest corner of the state bordering Mississippi and Tennessee. Lauderdale and adjacent Colbert counties have been designated as a CWD Management Zone, which is further divided into a High Risk Zone (HRZ) and a Buffer Zone. Hunting regulations were relaxed to remove seasonal and daily bag limits, as well as antler restrictions, on privately-owned or open-permit public lands in the CWD Management Zone for the remainder of the 2021-22 season. Hunters are required to submit deer harvested in the HRZ for testing while testing of deer harvested in the Buffer Zone is highly encouraged.

On February 2, 2022, the Louisiana Animal Disease Laboratory detected CWD in a sample submitted by

the Louisiana Department of Fisheries and Wildlife (LDFW) from a hunter-harvested white-tailed buck in Tensas Parish. That sample has been sent to the USDA National Veterinary Services Laboratories for confirmation. An emergency rule adopted on February 4 calls for the LDWF to implement its CWD Management Plan to monitor and curb the spread of CWD in the state. To this end, transport of intact carcasses or tissues containing high risk material is prohibited from Franklin, Madison and Tensas Parishes as is all supplemental feeding with the exception of feral hog bait, not normally ingested by deer, that is contained within hog traps. A similar ban on supplemental wildlife feeding was implemented in early December in Morehouse and Union Parishes in northern Louisiana after CWD was found a few miles away from the border in Union County, Arkansas. Wild bird feeding is allowed.

As of February 5, 2022, the number of states and provinces in which CWD has been detected in free-ranging deer, elk, and/or moose stands at 28 and three, respectively. There are some striking similarities among the four recent events described above. Chronic wasting disease was detected in active surveillance programs aimed at hunter-harvested cervids as part of active surveillance plans in the three states and under passive surveillance of clinically affected animals in Manitoba. All four point to hypervigilance for the presence of the disease. Following detection, all four jurisdictions implemented response plans that had been prepared well in advance of the discovery of CWD. The response plans typically called for designation of management and buffer zones as well as efforts to determine and limit the geographic distribution and prevalence of CWD within their borders. (Prepared by John Fischer with information from the websites of the wildlife management agencies Alabama, Idaho, Louisiana, and Manitoba)

Highly Pathogenic Influenza in North America – An Emerging Concern

In the April 2021 issue of the *SCWDS BRIEFS*, we provided an update on the highly pathogenic (HP) H5 influenza A virus (IAV) situation in Europe and highlighted the potential threat of the 2.3.4.4 lineage of A/Goose Guangdong (GsGD-H5) HP H5 IAV to wildlife health. Unfortunately, much has changed during the past year, and this situation is no longer restricted to Eurasia. Nearly seven years after the

2014/2015 GsGD-H5 outbreak in North America, another introduction to North America has occurred. On December 22, 2021, the Canadian Food Inspection Agency confirmed the presence of 2.3.4.4B lineage HP H5N1 IAV in a domestic poultry farm and in wild great black-backed gulls (*Larus marinus*) in Newfoundland, Canada. Not unexpectedly, detections have not been limited to Canada, but are occurring along the Atlantic Coast of the United States in association with wintering waterfowl populations. In January, the USDA National Veterinary Services Laboratories (NVSL) confirmed the presence of HP H5N1 in an American wigeon (*Mareca americana*) and a blue-winged teal (*Spatula discors*) in Colleton County, South Carolina, and in a northern shoveler (*Spatula clypeata*) in Hyde County, North Carolina. As of February 3rd, the NVSL also has confirmed HP H5N1 in additional counties in North Carolina (Beaufort, Bladen, Pamlico Counties) as well as ducks sampled in Florida (Palm Beach County), Maryland (Kent County), and Virginia (Henrico County and Virginia Beach).

Although current concerns related to this outbreak are centered on preventing spillover to commercial poultry, it needs to be emphasized that this lineage of HP IAV represents an emerging disease threat to North American wildlife. In Europe, wild bird mortality associated with GsGD-H5 has been documented in at least 80 species including ducks, geese, swans, and some shorebirds and, in some cases, has been extensive. For example, estimates of influenza mortality in a barnacle goose (*Branta leucopsis*) population in the UK exceeded 10%. More recently, an outbreak in Israel was linked to the deaths of thousands of Eurasian cranes (*Grus grus*) and hundreds of white pelicans (*Pelecanus erythrorhynchos*) and ducks.

A recent and very timely manuscript published in the *Journal of Wildlife Management* (citation below) just prior to the 2022 introduction of this virus into North America stresses the economic and ecological consequences of incursions of HP viruses of concern into North American wildlife and domestic bird holdings and clearly emphasizes the need for North American wildlife managers to be informed. The manuscript stresses the need for remaining proactive and vigilant in efforts aimed at understanding and mitigating such consequences. Current efforts related to this incursion are focused on detection through surveillance, which is extremely important to fully understand the scope of this outbreak and to provide situational awareness

to inform both wildlife and domestic bird interests. However, larger questions relate to what is next, and these unknowns cannot be answered by surveillance alone. It is possible that this virus will not become endemic in North American wild birds but this is by no means assured. It is possible that the virus will represent a significant wildlife health issue but mortality may vary among age-classes, species, and populations. If it becomes endemic it also is possible that the virus will continue to evolve in North American wild birds and potentially reassort with North American low pathogenic IAV. These potential outcomes may be detected by surveillance efforts but understanding the “why and how” behind them also will require substantial research efforts.

SCWDS is committed to assisting member states and regional partners in disease investigations. For all raptor, waterfowl, shorebird, gull, or other aquatic bird carcasses submitted to SCWDS for routine wildlife mortality investigation, we will perform IAV testing and will rely on NVSL for confirmatory HP H5 diagnostics. If you have plans for more targeted surveillance (swab-based live or dead bird sampling) and want SCWDS involved, please communicate with us directly about such efforts.

For more information:

- <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/2022-hpai>
- Ramey et al. 2022. Highly pathogenic avian influenza is an emerging disease threat to wild birds in North America. *The Journal of Wildlife Management*. <https://doi.org/10.1002/jwmg.22171>
 - <https://wildlife.org/jwm-avian-flu-poses-a-growing-risk-for-wild-birds/>
- https://www.fao.org/ag/againfo/programmes/en/empres/Global_AIV_Zoonotic_Update/situation_update.html

(Prepared by Becky Poulson and Dave Stallknecht)

RHDV2 Update and New Informational Website (<https://rhdv2.org>)

In the October 2021 issue of the *SCWDS BRIEFS*, we provided an update of the ongoing rabbit hemorrhagic disease virus 2 (RHDV2) outbreak among wild and domestic lagomorphs in the United States and Mexico. Since then, RHDV2 has been confirmed in domestic rabbits in additional states in the eastern United States, including New York

(December 2021), Kentucky (December 2021), and Tennessee (January 2022). Following the initial detection of the RHD outbreak in the United States during March 2020, RHDV2 has been confirmed in wild lagomorphs and/or domestic rabbits in 19 states (Figure 1). To date, RHDV2 has not been detected in wild lagomorphs in the eastern U.S.

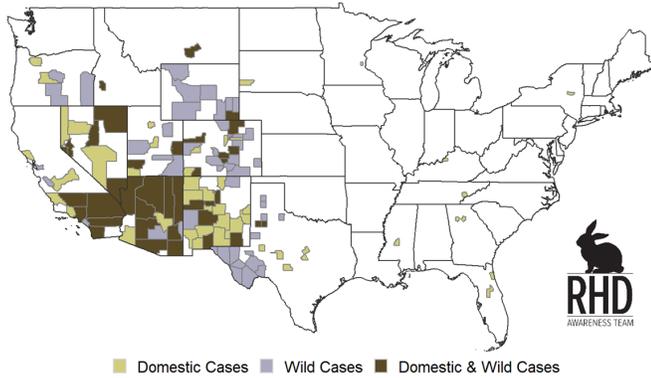


Figure 1. Map showing counties with confirmed RHDV2 detections beginning with the initial detection in the Southwest during March 2020. Data obtained from USDA-APHIS.

In order to support agency efforts regarding RHDV2 outreach, prevention, and management, researchers at the Warnell School of Forestry and Natural Resources and SCWDS are collaborating on human dimensions research funded by the Multistate Conservation Grant Program. As part of this ongoing project, this research group (RHD Awareness Team) has created an informational website to assist wildlife agencies. The information being developed on the website provides basic information regarding RHDV2 transmission, geographic distribution, clinical disease, and prevention, all of which are relevant to wild and domestic animal health professionals and the general public. Additional information, news updates, and more can be found at <https://rhdv2.org/>. (Prepared by Mark Ruder and Michel Kohl, Warnell School of Forestry and Natural Resources)

***Echinococcus* Species Found in Wild Canids from Pennsylvania: A Parasite on the Move?**

Echinococcus species are zoonotic cestodes (i.e., tapeworms) of veterinary and medical concern. Two species of *Echinococcus* in North America are *E. multilocularis* and *E. granulosus canadensis* (hereafter referred to as *E. canadensis*), and both persist in classic predator-prey cycles. Wild canids (i.e., red foxes [*Vulpes vulpes*], gray foxes [*Urocyon*

cinereoargenteus], coyotes [*Canis latrans*], and wolves [*Canis lupus*]) serve as the primary definitive hosts for both *Echinococcus* species in the United States, but domestic dogs can also act as definitive hosts. The *E. multilocularis* life cycle includes rodents as intermediate hosts, while *E. canadensis* utilizes both wild and domestic ruminants (e.g., white-tailed deer [*Odocoileus virginianus*], elk [*Cervus elaphus*], sheep, and goats) as intermediate hosts. Therefore, the diet of each canid species has an impact on the species of *Echinococcus* that could become established in an area. Furthermore, there is an increased likelihood of *Echinococcus* species co-infections in canids that consume rodents and ruminants. Red and gray foxes ingest rodents and small mammals as their primary form of prey (though gray foxes are more omnivorous), while coyotes are less specialized and consume small mammals as well as cervids. Therefore, *E. multilocularis* is more often found in foxes and coyotes, while *E. canadensis* is more commonly detected in coyotes and wolves.

Infections in intermediate hosts (i.e., prey species) typically cause cyst-like lesions in the lungs and liver that can lead to severe morbidity and mortality. The forms of disease associated with *E. multilocularis* and *E. canadensis* are referred to as alveolar echinococcosis and cystic echinococcosis, respectively. Globally, livestock infections result in economic losses of \$1.5-\$2 billion annually. In wild canid definitive hosts, infections typically present as an intestinal cestode infection, with little disease noted. Domestic dogs have recently been shown to exhibit both cystic and alveolar echinococcosis infections alongside intestinal infection, indicating that the definitive hosts can occasionally act as a dead-end host.

Historically in North America, *Echinococcus* species have been noted in the midwestern and northern regions; however, *E. multilocularis* was recently reported in domestic dogs in Virginia and Missouri, and in a human in Vermont, while *E. canadensis* has been reported in coyotes in Maine and elk in Tennessee translocated from Canada. A 1990 survey for *E. multilocularis* in wild canids in Ohio, Indiana, Illinois, Michigan, and Kentucky revealed *E. multilocularis* in coyotes and red foxes from Ohio, Illinois, and Indiana.

Wild canids exhibit broad geographic distributions and occupy diverse habitats, with increasing frequency in anthropogenic and urban locations.

Coyotes in particular have moved southward from Canada, and eastward from the Midwest into the eastern United States, indicating a possible sylvatic system for the establishment of *Echinococcus* species in new regions. The establishment of these definitive hosts throughout the eastern US coupled with the recent detection of *E. multilocularis* and *E. canadensis* in eastern states represents a possible establishment of a zoonotic pathogen in this region that could put humans, domestic animals/agricultural animals, and wildlife (specifically game species such as white-tailed deer and elk) at risk.

In partnership with USDA-APHIS Wildlife Services and Penn State University, we conducted a study to better understand the prevalence and distribution of *Echinococcus* species in wild canids from Pennsylvania. Further, we aimed to genetically characterize species of *Echinococcus* present, and determine the wild canid species potentially acting as sylvatic definitive hosts. We screened intestinal tracts for evidence of parasite infection from a total of 307 wild canids collected 2019-2020: 154 (50%) coyotes, 137 (45%) red foxes, and 16 (5%) gray foxes. Evidence of *Echinococcus* tapeworm infection was documented in two adult coyotes collected in 2020, one each from Bradford and Wyoming Counties. Interestingly, both animals had evidence (presence of adults and/or eggs) of *E. multilocularis* and *E. canadensis* co-infections. Both counties are in the northeastern portion of the state, close to the border of New York State.

The presence of *Echinococcus* in Pennsylvania represents a historically unrecognized risk to humans, agricultural/domestic animals, and wildlife. Thus far, the risk to wildlife in Pennsylvania remains unclear. *Echinococcus multilocularis* has a canid-rodent lifecycle but is also associated with human and domestic dog cases in North America. *Echinococcus canadensis* could be a concern when considering management of game species, such as white-tailed deer and elk. Further, the establishment of *E. canadensis* in the state of Pennsylvania could have negative impacts on the health of white-tailed deer, a major game species in the state; however, it is still uncertain to what extent wild cervids would display clinical disease. For example, moose in Maine that had cysts in their lungs showed no apparent clinical signs; however, another study in Quebec, Canada suggests that heavy burdens of parasitic cysts lead to a higher rate of predation in moose. It is likely that the

intensity and the organ that is infected will affect the pathogenesis and risk to intermediate hosts.

While our documentation of *Echinococcus* species in wild canids is important, additional studies are needed to investigate the origin of these cestodes and their potential movement alongside expanding coyote distribution throughout the eastern US. Furthermore, the potential for *Echinococcus* species to become established in new areas, utilize deer and elk as intermediate hosts, and infect domestic animals highlights the importance for future work on this well-known, yet relatively understudied parasite in the eastern US. (Prepared by Christopher Cleveland, Kayla Garrett, and Michael Yabsley)

A Case of the Piebald Anomaly

A white-tailed deer fawn was found dead in King William County, Virginia on October 26, 2021. This fawn was collected by Virginia Department of Wildlife Resources personnel and submitted to SCWDS for necropsy and diagnostic evaluation due to white discoloration of the hair and spinal deformities. On necropsy, approximately 80% of the hair was white with intermittent patchy brown hair, and there was mild to moderate dorsal bowing of the muzzle (Figure 1). Additionally, necropsy and radiographs revealed severe dorsal (upward) deviation of the thoracolumbar vertebrae (kyphosis; Figures 1 and 2 [see arrows]), and severe deviation to the right of the cervical (neck) vertebrae (scoliosis). These characteristics are consistent with a condition termed “piebald anomaly” (also referred to as piebaldism), which is due to a heritable genetic mutation that causes a decreased number of pigmented cells (melanocytes) in some parts of the skin. Piebaldism differs from albinism, which occurs when melanocytes are present but fail to synthesize pigment (melanin), resulting in a uniformly white body.

Many wild and domestic animals can be affected to varying degrees by the piebald trait. White-tailed deer are among the most commonly described wildlife species with this trait, particularly in the southeastern United States. Expression of piebald traits can range from mild deviation in hair color with minimal lifelong consequences to severe deviations in hair color along with other abnormalities, including skeletal malformations (as observed in this case), organ maldevelopment, and other anomalous physical developments. Characteristics

commonly observed in piebald deer include variable amounts of white hair (often confined to the legs and sides in less affected deer), dorsal bowing of the muzzle (Roman nose), short legs, spinal malformities, deviation of limb joints, short mandibles, and malformation of internal organs.

Alterations in hair coloration generally are considered maladaptive and as a result, rarely are widespread in populations. Although individuals with milder expressions of piebald traits may survive to maturity, individuals with more severe abnormalities (as evidenced in this fawn) often do not survive for an extended period after birth, with the most severely affected frequently dying shortly postpartum. Low survivorship can be attributed to multiple factors, many of which are dependent on

the presence and severity of anatomical abnormalities. In the current case, these abnormalities likely contributed to the overall poor condition and ultimate demise of the fawn. Piebaldism reportedly affects less than 1% of white-tailed deer populations, although this may vary regionally due to differing hunting restrictions on deer affected by the piebald trait. In one population, prevalence reached nearly 2% following temporary hunting restrictions. The piebald anomaly typically is not expected to be a significant threat to wildlife populations, nor is it considered a public health threat. SCWDS would like to thank the Virginia Department of Wildlife Resources for submission of this interesting case, which represents a rare genetic mutation. (Prepared by Melanie Kunkel and Nicole Nemeth)



Figures 1-2. (1) Multifocal white patches of hair and dorsal bowing of the muzzle, and (2) lateral thoracic radiograph revealed dorsal (upward) deviation of thoracolumbar vertebrae (kyphosis; arrows point to this in both images).

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