WHAT IS "BLACK-TONGUE" AMONG DEER

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In August 1939 a disease spread among the deer of the Pisgah National Game Preserve, in western North Carolina. By the time the epizootic subsided in the last week of October, it was estimated that about 1,000 deer had died. The disease had struck suddenly, spread rapidly and subsided, apparently when cold weather occurred. Old local residents called it "black-tongue," presumably because one of the post-mortem characteristics of an animal was a discolored and swollen tongue which generally protruded from the mouth.

The term "black-tongue" is a colloquialism that has been applied in the South to epizootics among the white-tailed deer. Rumors of black-tongue outbreaks are prevalent among local people wherever a deer herd exists or had existed. In all places, the general descriptions of the circumstances are similar. It is probable that most epizootics have been caused by the same disease.

Evidence of unusually heavy losses among deer in the South has been accumulated in U. S. Forest Service files for about 40 years. Early records are sketchy and rare, but 40 years ago deer were also relatively rare. The first record of heavy deer losses is from the Pisgah National Game Preserve, North Carolina. It is a reference by C. G. Smith to the excessive mortality among deer on the Preserve sometime between 1908 and 1912, as reported by Supervisor Verne Rhoads. The ailment was allegedly referred to as black-tongue, and it was the opinion of some that it might have been foot-and-mouth disease. No detailed investigation had been successfully made, however.

The next available record refers to unusual deer losses which occurred on Cherokee Game Refuge No. 1, about 18 miles south of Etowah, Tennessee, which is now part of the Ocoee Wildlife Management Area. The losses were first reported on October 8, 1932. Up to that date, 20 deer carcasses had actually been found. The report stated that local residents identified the disease "black-tongue" and had informed the investigator that this ailment killed off practically all the deer in the section once before. Opinions as to identification of the disease included mycotic stomatitis, hoof-and-mouth disease, black-leg, and hemorrhagic septicemia. The last two diseases were apparently prevalent among livestock. A sidelight in the final report by C. G. Smith indicated the identified presence of hemorrhagic septicemia among the deer of the Wichita National Game Refuge in eastern Oklahoma a number of years previously.

A report dated July 26, 1933, stated that virtually no deer existed at that date on Cherokee Refuge No. 1. The absence of the animals was ascribed to the ravages of disease during the previous year.

The next reports in the files of the Forest Service deal with the outbreak in 1939 of the deer epizootic in western North Carolina. The investigation of this epizootic was relatively detailed and was tied in with certain previous findings on the Pisgah National Game Preserve.

A final analysis of the correspondence and reports indicates that a disease began spreading among the deer of the Preserve during the first week of August

1939. First indications were noticed at the fawn rearing station, where about 200 animals were being hand-raised for restocking purposes. The personnel in charge of rearing diagnosed the disease as hemorrhagic septicemia. They based their diagnosis on experience during the two previous years, when a few deer died each time from this disease as identified by local veterinarians. During 1938, the spread of the disease had apparently been halted at the rearing station by inoculating all animals with hemorrhagic septicemia bacterin. Such bacterin inoculation had been instituted as a standard treatment for all fawns during 1939. Despite this action, however, losses from what was identified as hemorrhagic septicemia started on August 22. On the same day, losses were discovered among wild animals on the Davidson River watershed. Concurrently, losses were reported from the Wayah Bald Game Refuge in Macon County, North Carolina.

The disease was eventually diagnosed by a number of investigators. Dr. A. A. Hussman of the Bureau of Animal Husbandry diagnosed hemorrhagic septicemia from the carcass of a buck from Macon County. Local verterinarians who had been familiar with previous losses among fawns at the rearing station diagnosed the same disease. Dr. J. E. Shillinger and Dr. Don R. Coburn of the U. S. Fish and Wildlife Service diagnosed the disease during their several trips to the Pisgah Preserve. Doctors Brown and Blumberg of the Veterans Administration Hospital, Oteen, North Carolina, also diagnosed this disease and eventually succeeded in culturing a bipolar organism which they identified as the causative organism of hemorrhagic septicemia.

It is of interest to note that a series of three separate attempts was made to demonstrate the disease in laboratory animals without success. It is reported that the one attempt was made by a local veterinarian, who used rabbits as test animals. The results were reported to be negative. Dr. Coburn made an attempt at the Patuxent Research laboratories from material he had collected. His results were negative also. The third such test was made by the Veterans Administration laboratory at Oteen. Six guinea pigs and three rabbits were "injected with citrated blood taken from a typical case, but the results failed to show indications of disease."

The epizootic subsided in middle October and apparently was terminated in the last week of the month. It was estimated that 1,000 deer were lost in the wild. Actually, 238 carcasses were found in the wild and 83 fawns perished from the disease at the rearing station. Records for the Wayah Bald Game Refuge are not complete, but 40 carcasses had been found up to September 25.

The next outbreak of "black-tongue" was reported again from East Tennessee. A report dated September 14, 1945, states that 8 deer were found dead on the Ocoee Wildlife Management Area, which apparently had died during the previous week. By September 25 the total had risen to 21, and by October 26, 58 deer had been found on the Ocoee Area and 25 on the Tellico Wildlife Management Area near Tellico Plains, Tennessee. It was also reported that 6 had been found in northern Cooke County and 24 about Norris Dam.

Again it was difficult to identify the disease. A veterinarian in Chattanooga, Tennessee, had diagnosed hemorrhagic septicemia from a fresh carcass recovered in the Norris Dam region. The U. S. Fish and Wildlife Service, Patuxent Research Refuge, studied portions of a carcass from the Ocoee Area. The report stated that "tissue smears showed presence of long Gram-negative rods and bipolar organisms. The latter bacterial forms and hemorrhagic lesions observed in the heart muscle

are pathognomonic of hemorrhagic septicemia. Test animal inoculation, including rabbits, rats, and mice, did not result in the development of any infections.

"There is probably little question that the infection in the deer was the so-called hemorrhagic septicemia, but we have been unable to verify it by culture or animal test methods from the tissues supplied."

It was reported in 1948 that several deer were again found on the Ocoee area to have died of hemorrhagic septicemia, but the disease did not appear to be widespread. No other records of abnormally heavy deer losses are available in the Forest Service files between 1945 and this summer. A report was prepared in August 1949 on findings in Connection with the known loss of 58 deer on the Choccolocco Wildlife Management Area near Heflin, Alabama. Apparently, the first evidence of unusual mortality among deer was discovered about August 1, 1949. The causes of death were variously ascribed to the current use of the product "ammate" (ammonium sulfamate) in removal of "weed-trees" from timber stands, and to several probable diseases. The writer of the report assured himself that ammate was not responsible because of the widespread occurrence of deaths and because any significant toxins had not been found in examination of a rumen by the state toxicologist.

Concurrent with widespread evidence of mortality on this area, reports of death were also received from the Oakmulgee Wildlife Management Area near Centerville, Alabama, and the Black Warrior Wildlife Management Area near Haleyville, Alabama. In addition, it was learned that a number of dead animals found in the southern part of the state had been examined by the School of Veterinary Medicine and the cause of death tentatively ascribed to diphtheria.

A sick fawn was made available on August 16, 1949, to the School of Veterinary Medicine, Auburn, Alabama. The autopsy report prepared by Dr. Dean S. Folse read like those prepared during the Pisgah epizootic of 1939. A later report from Dr. Folse stated that the Toxicologist was not able to find any poisonous substance in the fawn. It also stated that "the guinea pigs inoculated with hemorrhagic material showed muscular soreness the following day, but have been normal ever since. Intravenous inoculation of a culture from the deer heart was made into a rabbit, with no ill effects. This was a Gram-negative rod, and we thought it might be a hemorrhagic septicemia organism. The rabbit didn't think so!"

The next report of unusual deer mortality came from the Pisgah National Game Preserve, dated August 31, 1949. By September 7, a total of 14 dead deer had been found, largely confined to the North Mills and Upper Bent Creek Areas. A fresh carcass had been examined by a local veterinarian who had had considerable experience with the 1939 epizootic. He diagnosed hemorrhagic septicemia as the disease.

On September 15, 1949, the date on which this account is being prepared, a verbal report from the Fish and Wildlife Service indicates abnormal mortality in deer of eastern Kentucky.

Certain resemblances exist in all reported epizootics. They are:

1. All epizootics occurred during late summer and early fall, and were terminated at the onset of cold weather.
2. They started at widely separated spots and spread from these foci during a subsequent 8 to 10-week period.

The general characteristics of the epizootics were:

1. The rate of mortality generally increased after a period of cool, rainy weather.
2. Most animals were found near water, indicating an attempt to reach water before death.
3. Illness was generally of short duration, apparently not over four days.
4. Areas where deer were well fed and forage was plentiful sustained as many losses as areas where forage was scarce.
5. No relationship has yet been determined between the season's average weather conditions and virulence of the disease. The 1939 epizootic on the Pisgah Preserve occurred after a rather dry spell. That of 1949 on the same area broke out after an especially rainy period.

The observed effects of the disease on the animal are summarized as follows:

1. Animals generally died with fever and intense convulsions. Frequently the head was thrown far back at death. The rectal temperature of one sick fawn was 102.4°F.
2. Many animals apparently went blind shortly before death, and would stagger about in a dazed condition.
3. Hemorrhagic lesions were generally found in all specimens examined. Blood masses under the skin were frequent. Hemorrhaged capillaries, leaving blood spots the size of a pinhead and larger, were noticeable. Mesentery tissue was generally injected.
4. The tongue of most animals was swollen, discolored and injected. At this stage, it generally protruded from the mouth.
5. Eyelids of many animals were red and bloodshot in early stages of the disease, as noted among fawns. Eyes frequently were bloodsot and often exuded blood from behind and around them. Frequently, lacrimation was evident.
6. Blood, serous fluid, or both, were frequently passed from the mouth and nostrils. Coughing was evident in some sick animals.
7. Yellow serous fluid was frequently present in large quantities about the throat, at the base of the ear, in the region of the lower jaw, in the pericardium, or free in the body cavity. Blood was also found free in the body cavity.
8. The spleen was found to be generally normal. Kidneys frequently showed signs of disintegration, the liver was frequently swollen, the brain was generally normal, and the lungs generally appeared normal except for hemorrhages. Some hemorrhagic lesions have been found in almost all organs, however.
9. An intestinal form of the disease was evident at the Pisgah Fawn Rearing Station in 1937 and 1938. The deaths in 1939 showed completely over-all infection, however.
10. Significantly, a total of 5 separate series of attempts to demonstrate the disease in test animals (all mammals) were reported to be negative.

It is evident that a disease of considerable virulence periodically results in an epizootic among the deer in the South, especially in the region of the Appalachians. From the best available information, it is hemorrhagic septicemia caused by a variety of the organism *Pasteurella bipolaris septicus*. So far, remarkably little is known about it. For instance, nothing is known about its transmission among deer,

its possible characteristics of becoming pathogenic under certain conditions, the conditions that may cause this, the concentration of deer per unit area which may be highly susceptible to the disease, and many other questions regarding its effect on future deer management in the South.

One of the important reasons that so little is known of the disease is that it has occurred at unexpected times for a relatively short period, and perhaps in an area not previously infected. Consequently, there has been almost no interchange of observations between investigators and no summation of past positive or negative results.

In view of the nature of the periodic infections, the disease takes on the aspect of an interstate problem. As such, it appears that the most logical method by which to solve this problem is to direct the efforts of each state toward a common goal, to coordinate the work of each with the other and to combine and compile the findings of all under a single project. Such a project may be guided by a committee of game directors, by the Fish and Wildlife Service, or by some other selected central agency.

Whatever the method chosen, however, it appears essential that the existence of the condition be recognized as being widespread in the South. It is therefore most probable that each state and each technician will have the opportunity of contributing to the solution of this much misconstrued problem of "black-tongue" in deer.