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NASAL BOTS OF WHITE-TAILED DEER IN THE SOUTHEASTERN UNITED STATES[1]

by
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ABSTRACT

Nasal bots (*Cephenemyia* sp.) were found in 107 (4.4 percent) of 2,423 white-tailed deer (*Odocoileus virginianus*) examined from the following states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. Infected deer were not found in Alabama, Kentucky, and Tennessee. The parasite was most prevalent in the winter and summer. There were no significant differences in infestations between sexes or age groupings. The average infestation was 9 larvae per infested deer and only 5 deer harbored more than 30 larvae. *Cephenemyia* sp. did not appear to be a significant disease factor for white-tailed deer of the southeastern United States.

INTRODUCTION

The parasitic larvae of *Cephenemyia* sp. are frequently discovered by hunters when field dressing deer. The parasites, variously termed nasal, pharyngeal, head, or throat bots, are relatively large larvae of dipterous insects that require deer as hosts. Their presence frequently causes alarm that moves the sportsman to seek more information. These inquiries usually relate to the public health significance of *Cephenemyia*, life history, and pathogenicity for deer and domestic livestock. Data herein presented hopefully will serve as an aid to biologists in answering such questions.

MATERIALS AND METHODS

From February 1960 to December 1973, 2,423 white-tailed deer from 164 counties of 13 southeastern states were examined for *Cephenemyia* larvae. Of these, 1,417 were heads from hunter-killed deer; 905 were deer collected for herd health evaluations; and 101 were sick or dead deer submitted for diagnostic examinations.

Retropharyngeal pouches and oral cavities were examined by removal of the lower jaw. Nasal passages were exposed with the aid of a saw, bone forceps, and screwdriver. The esophagus,

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trachea, and larger bronchi were examined when available. Physical condition was rated excellent, good, fair, or poor depending upon muscle condition and the amount of fat deposits. Ages of the deer were determined by incisor eruption and cheek tooth wear (Severinghaus 1949). The number of larvae was recorded, and in some instances larvae were preserved in 70 percent alcohol and sent to the Veterinary Services Diagnostic Laboratory, Parasitology Section, USDA, APHIS, Beltsville, Maryland.

Seasonal incidence was analyzed using a chi-square one way analysis of variance. Comparisons of prevalence according to sex or age group were made using the method of chi-square. The authors are indebted to Dr. John Brown, Department of Medical Microbiology, University of Georgia, for aid in statistical analysis.

RESULTS

Of 2,423 deer examined, 107 animals from 23 localities were infested with *Cephenemyia* larvae (Fig. 1). Calculations of differences in prevalence by season, sex, or age were limited to 539 deer from these known endemic areas. Nasal bots were not found in samples from 96 other areas widespread throughout the Southeast.

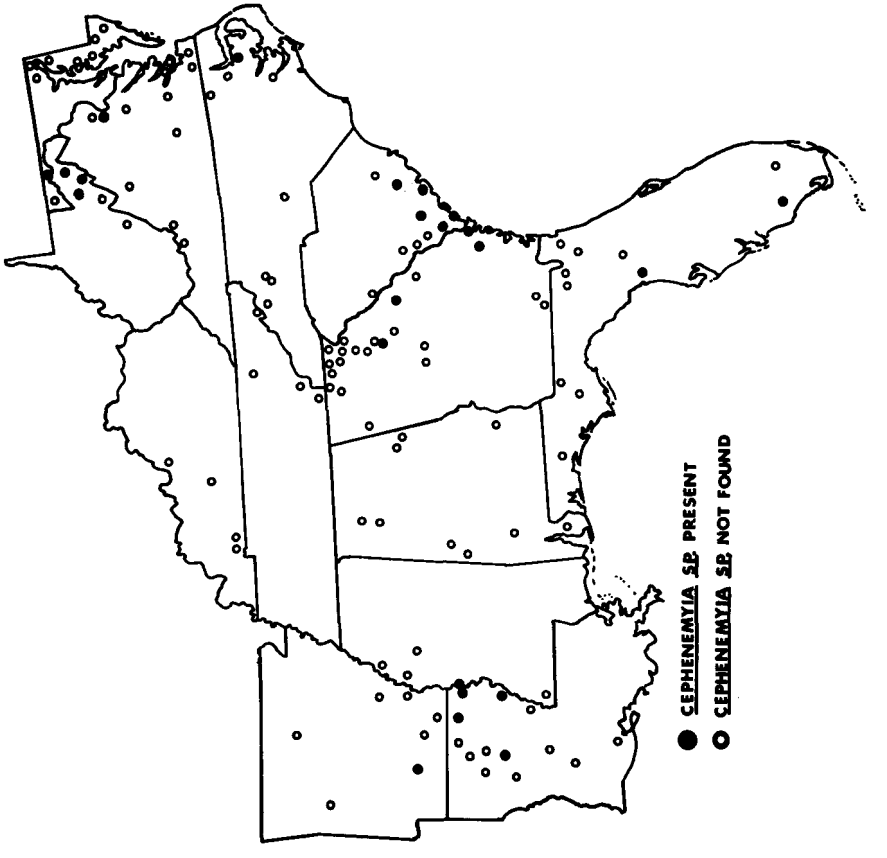

Figure 1. Map of the southeastern United States depicting areas where white-tailed deer were infested with *Cephenemyia* sp.

Table 1 presents the prevalence of infestation by season and sex in areas where bots were disclosed. *Cephenemyia* infestation rates observed during the winter (41 percent) and the summer (31 percent) were not significantly different from each other. Both of the infestation rates, however, were significantly higher ($P > 0.01$) than the prevalence exhibited during the spring (9 percent) and the fall (6 percent). Significant differences were not apparent between the rate of occurrence in males and females during any season. The magnitude of infestation was similar in both sexes, with an average of 9.3 larvae per infected deer. Only 5 deer had more than 30 larvae present.

Table 1. Seasonal prevalence of *Cephenemyia* sp. larvae in male and female white-tailed deer in endemic areas of the southeastern United States.

	Number Infected/Number Examined		
Season	*Males*	*Females*	*Both Sexes*
Winter	23/ 52	40/101	63/153
Spring	1/ 18	5/ 46	6/ 64
Summer	8/ 28	15/ 46	23/ 74
Fall	8/ 90	7/158	15/248
All Seasons	40/188	67/351	107/539

Table 2 depicts the prevalence of *Cephenemyia* in different age groups of deer. Although there were no significant differences present, older deer had a slightly higher rate of infestation.

Physical condition was evaluated for 102 deer infested with *Cephenemyia*. Of these animals, 6 were in poor condition, 47 fair, 44 good, and 5 excellent. In deer with more than 30 larvae, 3 were in fair condition and 2 were in good condition.

Table 2. Prevalence of *Cephenemyia* sp. in different age groups of white-tailed deer in endemic areas of the southeastern United States.

Age	*Number Examined*	*Number Infested*	*Percent Infested*
1 year or less	131	27	21
1½—2 years	130	27	21
2½—4½ years	172	36	21
Over 4½ years	44	14	32

All larvae sent to the Veterinary Service Diagnostic Laboratory in Beltsville, Maryland, were tentatively identified as *C. phobifer*, however, some larvae originating from Florida and coastal Georgia did not conform well to the key (Dr. Curtis W. Sabrosky, 1972, Personal Communication). Dr. Sabrosky stated it would be necessary to rear larvae from these areas to adults to ascertain species.

DISCUSSION

Geographic distribution of infested deer (Fig. 1) indicated several separate endemic areas. This factor, plus the discovery of atypical larvae, suggested the possibility of a new species of *Cephenemyia* or a subspecies of *C. phobifer* in the Southeast. It also should be noted that most of the endemic areas were bottomland or coastal terrain. This was contrary to previous reports where male *C. phobifer* were found primarily in higher altitudes (Townsend 1917, Bennett 1962). Samuels et al. (1971) found the highest prevalence of *Cephenemyia* in white-tailed deer in coastal south Texas occurred in "brushy plant communities with a high, relatively continuous canopy."

It is likely that *Cephenemyia* existed in some areas that are depicted as negative in Figure 1 because the first instar is very small and could have been overlooked. Examination of deer during seasons when the larval form is normally absent also could result in negative findings.

GENERAL INFORMATION

Five species of *Cephenemyia* have been described in North America (Bennett and Sabrosky 1962). Samuel et al. (1971) tentatively identified *C. pratti*, *C. jellisoni*, and *C. phobifer* from white-tailed deer in south Texas, but only *C. phobifer* has been reported from the 13 southeastern states (Walker and Becklund 1970).

The life history of *Cephenemyia* is based on the compiled knowledge of several species (Bennett 1962). Adult flies do not feed and only live 2 to 3 weeks, during which time breeding occurs and the female deposits small larvae in the nostrils of the host (Golini et al. 1968, Anderson 1975). These larvae enter the nasal passages and develop into first instars. After a molt, the larvae migrate to the retropharyngeal pouches where they develop to second and finally third instars. Escape of the third instar is probably by sneezing, though Blickle (1956) reported apparent passage out the alimentary tract. Once outside, the larva pupates and later emerges as an adult fly.

These data suggest that nasal bots complete two life cycles annually in the Southeast, whereby parasitic larvae probably occur in the winter and summer. In Texas, parasitism occurs during a 6-month period through winter (Samuel et al. 1971). Bennett (1962) found two life cycles annually in Ontario, with a 3-month summer cycle and a 6-month winter cycle.

Bots attach by oral hooks to the mucosa of the nasal cavities and pharyngeal region of deer. Although deer erythrocytes have been demonstrated in the digestive tract of the larvae (Bennett 1962), the effect on the host has been debatable. Gross lesions associated with heavy infestations were erosions of the mucosa at the site of attachment, excessive mucus production, and enlargement of the retropharyngeal pouches (Bennett 1962). In many cases gross lesions are inapparent (Kellogg et al. 1971).

Several reports have attributed mortality and sinusitis to bot infestation (Walker 1929, Van Roekel 1929, Cowan 1946), but the pathogenicity of botfly larvae to white-tailed deer in the southeastern United States is doubtful. Although data from 101 clinically-ill deer were included in this presentation, an additional 224 diagnostic case records were examined for information pertaining to bot larvae. There was no instance of *Cephenemyia* being considered as cause for death or debilitation in any case reviewed.

Parasitism by nasal bots is not a problem for humans or domestic livestock as the genus *Cephenemyia* is limited to Cervidae (Zumpt 1965). Furthermore, the presence of nasal bots in deer in no way impairs the carcass for human consumption.

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POSTAL AND PERSONAL INTERVIEW SURVEYS OF SOUTH CAROLINA DEER HUNTERS

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ABSTRACT

A postal survey of 1,323 game management area permit holders (5%) was made in early 1972 to determine the utilization of game management areas for deer hunting. Responses (777) were inadequate for projecting utilization of many of the 35 state game management areas for deer hunting. Thus responses from the postal survey and from a subsequent personal contact survey, were grouped into major hunt units.

Sixteen percent of the 777 postal survey respondents were selected for personal contact. This survey was more comprehensive than the postal survey, and provided an estimate of the number of management area deer hunters utilizing non-management areas.

Estimates from the personal interview survey were uniformly higher and more variable than those projected from the responses of the same hunters in the postal survey. The apparent overestimation from the interview data on buck deer killed, for example, may be viewed as confirming the tendency of hunters to report number of kills greater than had occurred. The personal-contact survey with its smaller sample size and more extensive questions provided less reliable information than that of the complete postal survey.

Comparisons of projected mean estimates of the utilization data from the personal contact survey, its counterpart from a postal survey and the entire postal survey are included along with standard deviations.

INTRODUCTION

Check stations to monitor deer harvest and game management area utilization in South Carolina were not required during the 1971 deer hunt season. To provide some continuity of deer harvest estimates taken from stations from 1964 through 1970, a postal survey was conducted employing a technique similar to that outlined by Legler and Haynes (1967). A recognized problem with such techniques is the inaccuracy of responses due to the faulty recall by hunters of numbers killed and locations of harvesting. Webb and Loadholt (1971) found that archery hunters reported in April the killing of three times as many deer than were reported by the same hunters at the conclusion of the archery hunts during the previous December. It was suggested by biologists and administrators that some comparison be made between data from the postal survey and those collected during the personal interview survey, with both surveys involving identical hunters.

METHODS

A 5 percent random sample was made of 26,460 hunters who had purchased "game management area permits" by 1 December 1971. The postal survey was initiated on 3 January 1972 immediately after deer hunting stopped on the management areas. The questionnaire asked for specific information on the number of visits, number of hours hunted, and the number of deer killed on each management area during the 1971 season. The survey was conducted according to procedures recommended by the Southeastern Cooperative Statistics Project. The third mailing to nonrespondents was made 1 February 1972 and, after allowing time for responses, the returned questionnaires were coded and delivered to the Experimental Statistics Unit, College of Agricultural Sciences, Clemson University (hereafter ESU) in early March for keypunching and analysis.

Following receipt of the questionnaires, 126 respondents were selected for the personal contact survey. A 10 percent random sample was selected from respondents for each major management area (or hunt unit). No hunter was selected twice if he hunted on two or more areas, but his responses for each area were used in the study.