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Source: Journal of Wildlife Diseases, 32(4) : 701-703

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-32.4.701

Journal of Wildlife Diseases, 32(4), 1996, pp. 701–703

Parelaphostrongylus tenuis on Wassaw Island, Georgia: A Result of Translocating White-tailed Deer

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ABSTRACT: Meningeal worms (*Parelaphostrongylus tenuis*) were found in each of five white-tailed deer (*Odocoileus virginianus*) examined from Wassaw Island, Chatham County, Georgia, in September 1993. This represents the first reported occurrence of the parasite on a southeastern barrier island and extends its geographic distribution approximately 140 km beyond the nearest known infected mainland deer population. According to an anecdotal account, six white-tailed deer were imported from Pennsylvania and released on Wassaw Island in 1905 or shortly thereafter. Based on its absence elsewhere along the southeastern coast from North Carolina to Louisiana and its high prevalence in Pennsylvania, the enzootic focus of *P. tenuis* on Wassaw Island was attributed to translocation of infected deer.

Key words: *Parelaphostrongylus tenuis*, meningeal worm, white-tailed deer, *Odocoileus virginianus*, host translocation, parasite introduction.

Comer et al. (1991) recently reviewed the distribution of the meningeal worm (*Parelaphostrongylus tenuis*) in the southeastern United States using data from over 3,800 white-tailed deer (*Odocoileus virginianus*). In this region, *P. tenuis* was virtually absent in the Atlantic and Gulf coastal plain between North Carolina and Louisiana. Exceptions were rare; within the coastal plain physiographic province in Georgia, the parasite was found only in Dougherty and Ware counties. In Florida, a single infected deer was found in Collier County in 1968.

Because *P. tenuis* has considerable pathologic consequences for other North American cervids as well as a variety of domestic and exotic ungulates (Anderson and Prestwood, 1981; Comer et al., 1991), the distribution of the parasite is important to wildlife managers. Of particular concern is the potential for spread of the parasite into non-enzootic regions, either by natural range expansion (Anderson, 1972; Bindernagel and Anderson, 1972) or by translocation of infected hosts (Anderson and Prestwood, 1981; Samuel et al., 1992). The occurrence of *P. tenuis* in the one deer in Collier County, Florida, has been attributed to introduction of infected white-tailed deer from Wisconsin (Prestwood and Smith, 1969), but subsequent surveys of over 300 deer from that county have not disclosed other infected deer (Forrester, 1992) indicating that the parasite did not become enzootic. Since there is little documentation for the establishment of *P. tenuis* in non-enzootic locations due to translocation of infected hosts, we describe an enzootic focus of *P. tenuis* on Wassaw Island, Georgia attributable to translocation of infected white-tailed deer.

Wassaw Island (31°51′ to 31°54′N, 81°00′ to 81°01′W) is located in Chatham County, Georgia, and is one of 13 major barrier islands along the Georgia coast. Johnson et al. (1974) described the general history and ecology of Georgia's barrier islands, including Wassaw Island. Most (approximately 4,070 ha) of the island and surrounding salt marsh is administered as the Wassaw Island National Wildlife Refuge (NWR) by the Fish and Wildlife Service, U.S. Department of the Interior; a much smaller portion of the island is privately owned.

At the request of the Fish and Wildlife Service, the Southeastern Cooperative Wildlife Disease Study (College of Veterinary Medicine, The University of Georgia, Athens, Georgia 30602 USA) conducted a health evaluation of white-tailed deer on Wassaw Island NWR on 22 Sep-

tember 1993. The health evaluation involved the examination of five deer and followed general procedures described by Nettles (1981) and Davidson et al. (1985). Examination specifically for adult *P. tenuis* was done by the sagittal sectioning method described by Comer et al. (1991); detection of first stage larvae was based on histologic examination of 10 randomly selected, 0.8 cm^2 formalin-fixed sections of lung stained with hematoxylin and eosin from each animal.

Based on tooth eruption and wear (Severinghaus, 1949), animals examined included three 2.5-yr-old females, one 3.5-yr-old female, and one 1.5-yr-old male. From two to five (mean 3.4 ± 1.14) adult *P. tenuis* were found associated with the cranial meninges of each deer. All animals had small accumulations of yellow exudate adherent to the cranial meninges. Eggs and larvae morphologically compatible with the eggs and first stage larvae of *P. tenuis* (Anderson and Prestwood, 1981) were present in histologic sections of lung in all deer. Eggs and larvae typically were surrounded by microgranulomas within the alveolar walls; a few larvae were noted free within alveoli or small bronchioles. All animals had a mild to moderate verminous pneumonitis that was attributed to these eggs and larvae. Representative specimens of *P. tenuis* have been deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705, USA (USNPC Accession No. 86175).

The occurrence of *P. tenuis* on Wassaw Island is the first record of the meningeal worm on a barrier island in Georgia or elsewhere in the southeastern United States. The parasite has not been found in deer populations on Skidaway, Ossabaw, Blackbeard, Sapelo, St. Simons, Jekyll, and Cumberland Islands in Georgia or on barrier islands in other southeastern states (Comer et al., 1991; SCWDS, unpublished). The three nearest known infected deer populations on the mainland are in Ware, Richmond, and McDuffie counties, Georgia (Comer et al., 1991) and were approximately 140, 180, and 210 km from Wassaw Island, respectively.

Prior to European colonization, white-tailed deer were indigenous to Wassaw Island, but the history of deer on the island during much of the post-colonization era is unclear (Francisco et al., 1970; Johnson et al., 1974). In an unpublished anecdotal account by a member of the family which formerly owned Wassaw Island (*Recollections of Wassaw*), Joseph Parsons suggests that deer may have been exterminated in the 1860s (Francisco et al., 1970). Mr. Parson's account also states that beginning about 1905 Wassaw Island was restocked with deer, mainly from the local area including nearby St. Catherines Island, and that by 1920 deer were numerous. Of particular significance to the discovery of *P. tenuis* is mention of the translocation of six white-tailed deer from "Wackensen's" in Pennsylvania during this same time period. Because *P. tenuis* is common in Pennsylvania and surrounding states (Anderson and Prestwood, 1981) and was presumably enzootic in that region when the deer were relocated to Wassaw Island, it is almost certain that this translocation was the source of *P. tenuis*.

The portion of the coastal plain region of the southeastern United States where *P. tenuis* typically is absent is characterized by certain major soil types and associated vegetative communities (Prestwood and Smith, 1969; Anderson and Prestwood, 1981; Comer et al., 1991). These or possibly other ecologic characteristics have been suggested as factors that might potentially exclude *P. tenuis* from much of the southeastern coastal plain (Prestwood and Smith, 1969); however, a causal relationship has not been confirmed for any of these variables (Comer et al., 1991). The current high prevalence and apparent persistence of *P. tenuis* in deer on Wassaw Island for almost 90 yr indicate that ecologic factors associated with the southeastern coastal plain region will not necessarily exclude the parasite. Other information also supports the idea that the range of *P. ten-*

uis potentially could expand within the coastal plain. For example, the muscleworm, *P. andersoni,* occurs in deer in numerous locations in the coastal plain physiographic province in the southeastern United States (Anderson and Prestwood, 1981; Forrester, 1992). The common occurrence of *P. andersoni* in the coastal plain conceivably could be attributed to utilization of indigenous gastropod intermediate hosts which are not suitable for development of *P. tenuis.* However, the ability of both species to successfully develop in many of the same species within a broad range of terrestrial gastropods (Anderson and Prestwood, 1981) and the occurrence of *P. tenuis* at some mainland sites within the coastal plain of Georgia, Maryland, Virginia, North Carolina, and Louisiana (Comer et al., 1991) are evidence that *P. tenuis* is biologically suited to exist in that portion of the coastal plain region where it currently is absent.

The introduction and establishment of *P. tenuis* on Wassaw Island through the translocation of a small number of white-tailed deer lends credence to concerns that the parasite could be spread to non-enzootic regions through relocation of infected cervid hosts. Further, it indicates that this can occur in ecologic settings which previously have been considered inhospitable for survival of the species.

This work was conducted through the sponsorship of the fish and wildlife agencies of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, and West Virginia. Funds were provided by the Federal Aid to Wildlife Restoration Act (50 Stat. 917) and through Grant Agreement 1448-0004-93-909, Fish and Wildlife Service, U.S. Department of the Interior. We thank Tess Ewing and Susannah Gourevitch for providing historical information on Wassaw Island from family records, especially the appropriate portion of *Recollections of Wassaw.*

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Received for publication 23 January 1996.