APHELENCHOIDES XYLOPHILUS, N. SP., A NEMATODE ASSOCIATED WITH BLUE-STAIN AND OTHER FUNGI IN TIMBER

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INTRODUCTION

A new case of unusual ecological conditions to which nematodes have adapted themselves has been found in a nematode species apparently specialized to live in timber affected by blue-stain and other wood fungi. This new species is described herein.

ECOLOGICAL RELATIONS

The first observation of *Aphelenchoides xylophilus*, n.sp., the timber nema, dates back to 1929, when a small piece of wood that had been cut, in the process of roofing, from the top of a green pole of longleaf Louisiana pine (*Pinus palustris* Mill.) was received from Orange, Tex. This piece of wood had streaks of a bluish color caused by blue-stain fungi. The nemas were found in these streaks and in bordering portions. Larval specimens, males and females, were observed. Although they were not numerous, a dozen or more specimens could be found in a small portion of wood when soaked and dissected properly. Soaking the wood in water activated the nematodes, whereas drying the wood induced dormancy. Some tests showed revival of the nematodes after a dormancy of 1 year but not after 2 years.

Later, through the courtesy of Ross W. Davidson, of the Division of Forest Pathology, Bureau of Plant Industry, there were received four different plate cultures of wood fungi in which nematodes had developed. All of these nematodes proved to be *Aphelenchoides xylophilus*. Three of the cultures were from a sawmill in Bogalusa, La., and were also obtained from blue-stained logs of *Pinus palustris*. These logs had previously been attacked by beetles of the genus *Ips*, which, according to Davidson, usually carry the blue-stain fungus *Ceratostomella ips* Rumbold, but which in these three cases contained a brown fungus belonging probably to the genus *Trichosporium*, of the "Fungi Imperfecti."

The fourth culture on which the same species of nematode developed was obtained from a pine tree (*Pinus echinata* Mill.) that had been recently killed by an attack of the beetle, *Dendroctonus frontalis* Zimm., near Fairfax, Va. In this case the nematodes originated in the interior of unstained wood, one-sixteenth to one-fourth of an inch below the insect galleries. The fungus here associated with this nematode is said by Davidson to be entirely hyaline and also to belong

1 Received for publication Apr. 4, 1934; issued July 1934.
2 Received through the courtesy of T. E. Snyder, of the Bureau of Entomology, U.S. Department of Agriculture, who received the wood from C. H. Lyon, chemist of the Texas Creosoting Co. Mr. Lyon wrote: "All such poles came from an area including western Louisiana and southeastern Texas. The climate is hot and, at the time of finding that specimen, was very humid. The average annual humidity is given by the Government observer of this region as of 83.3 percent. The specimen had not been treated nor come in contact with creosote. It has been at all times exposed to weather."
Figure 1.—Aphelenchoides xylophilia, n.sp. A.—Head of female: cut th, Cuticular thickening in cephalic portion of alimentary tract; gd ry, guiding rings of stylet; sty, stylet. × 2,800. B.—Front view of head: amph, Amphid. × 1,370. C.—Extruded spicula showing circular expansion. × 1,370. D.—Tail of male: vnt apph, Ventral apophysis; sp, spicula; cop ppl, copulatory papillae (three pairs); gub, gubernaculum. × 1,060. E.—Anterior end of larva. × 1,060. F and G.—Tails of larvae, showing variation in shape. × 1,060. H.—Tail of female: rct, Rectum. × 1,060.
to the "Fungi Imperfecti." However, according to the same authority, this particular "isolation" was taken only a short distance (1 inch or less) from wood which was blue-stained by Ceratostomella pini Münnch, a fungus associated with D. frontalis. It is thought that the nematode might also have been present in this blue-stained wood.

This constant association suggests that the nematode described herein uses the insects as carriers and probably feeds on the various fungi involved in the same association. Similar carrier relationships between nematodes and insects are known, especially in connection with bark beetles, dung beetles, flies frequenting fermenting substances, etc. In this respect the observations made herein offer nothing new, but the apparent specialization of this nematode to a life in wood and its association with fungi of the blue-stain type merit special attention.

**TECHNICAL DESCRIPTION**

*Aphelenchoides xylophillus*, n.sp.

Like the other members of the genus, *Aphelenchoides xylophillus* is of slender shape and has the following dimensions:

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<th>1.8</th>
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<th>8.7</th>
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<tr>
<td>Female</td>
<td>1.0</td>
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<td>2.2</td>
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<td>M</td>
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<tr>
<td>Female</td>
<td>1.2</td>
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The cuticle is very finely annulated (8 annules to 6μ in the head region); the head well set off; the tail of the larva and female more or less obtuse and slightly longer than the rectum (fig. 1, F, G, H), that of the male conically pointed, ventrally curved, and slightly longer than the spiculum (fig. 1, D). A front view of the head shows a six-radiate cuticular structure. The lobes between the radii carry the sense organs in the order typical for the genus, i.e., on the lateral lobe the amphids, on each submedial lobe one papilla (fig. 1, B). The stylet is very fine and about one and one-half times as long as the head is wide; its knobs are minute; two fine guiding rings are present and the wall of the cephalic portion of the alimentary tract is reinforced by short cuticular thickenings (fig. 1, A).

It seems that the esophageal glands open in the middle bulb of the esophagus in the manner typical of the genus; the bodies of the glands, however, have a dorsal situation outside the alimentary tract at the beginning of the intestine; they extend to about 85μ behind the esophageal bulb and have a strictly serial arrangement. The length of the rectum is about twice the anal body diameter. An obscure excretory pore opens ventrad of the nerve ring (fig. 1, E). The vulva is a narrow transverse slit but stands out rather well because the body narrows suddenly behind it. The testis is outstretched forward to the right of the intestine, and ends about 300μ behind the esophageal bulb. The spicula resemble those of other members of the genus but have in addition an extremely well-developed ventral apophysis at the proximal end. In some specimens this apophysis seemed to connect with the ventral body wall (fig. 1, D), but in others no such connection was seen. Figure 1, C, shows the distal end of the spiculum as forming a circular expansion. A small gubernaculum is present. The copulatory musculature is shown in figure 1, D. There are two pairs of large, somewhat mammillate ventrosubmedial copulatory papillae (fig. 1, D), one pair at about the middle of the tail and the other just in front of the anus. A third pair seems to have a dorsolateral position also in the middle of the tail.

**DIAGNOSIS.**—*Aphelenchoides* with an obtusely rounded conical tail in the larva and in the female, but pointed in the male, with a fine, barely knobbed buccal stylet. The spiculum of the male proximally with long ventral apophysis; a short, linear gubernaculum present; male tail with large mammillate copulatory papillae; a pair ventrosubmedial in front of anus, a second pair ventrosubmedial in the middle of the tail, and a third dorsolateral also in the middle of the tail. Associated with blue-stain and similar wood fungi.

**TYPE HOST.**—*Pinus palustris*.