The Northern Range of Eastern Mistletoe, Phoradendron serotinum (Viscaceae), and Its Status in Ohio

David M. Spooner

Bulletin of the Torrey Botanical Club, Vol. 110, No. 4. (Oct. - Dec., 1983), pp. 489-493.

Stable URL:
http://links.jstor.org/sici?sici=0040-9618%28198310%2F12%29110%3A4%3C489%3ATNROEM%3E2.0.CO%3B2-I

Bulletin of the Torrey Botanical Club is currently published by Torrey Botanical Society.

BULLETIN OF THE TORREY BOTANICAL CLUB
VOL. 110, NO. 4, pp. 489-493 OCTOBER-DECEMBER, 1983

The northern range of eastern mistletoe, *Phoradendron serotinum* (Viscaceae), and its status in Ohio.[1]

David M. Spooner[2]

Department of Botany, The Ohio State University, Columbus, Ohio 43210

SPOONER, D. M. (Dept. Botany, The Ohio State Univ., Columbus, OH 43210). The northern range of eastern mistletoe, *Phoradendron serotinum* (Viscaceae) and its status in Ohio. Bull. Torrey Bot. Club 110: 489-493. 1983.—The northern limits of *Phoradendron serotinum* (Raf.) M. C. Johnston have often been believed to have been determined by cold temperatures. A map of the northern range of the species, from Long Island to Missouri, was constructed from herbarium specimens and published data. The northern limit is correlated with the mean minimum January temperature of −4.5°C. Areas where the gross climatological data do not fit the distribution of the species are in areas where mistletoe grows in locally warmer areas that are not reflected in these data. Field work in Ohio, part of the northern range of the species, has demonstrated that the majority of the present-day distribution is along the Ohio River from Washington County downstream, in areas that are kept relatively mild by the moderating effect of the river. The most northern inland Ohio populations, previously documented, are now believed extirpated. A disjunct Cuyahoga County record mentioned by Trelease (1916) is possibly in error. The Ohio populations have undergone reduction in recent years due to over-collecting, cutting of host trees, and the severe winters of 1977-1978.

Key words: *Phoradendron serotinum*, eastern mistletoe, distribution, isotherm.

Phoradendron serotinum (Raf.) M. C. Johnston [*P. flavescens* (Pursh) Nutt.] is an evergreen dioecious parasite of woody angiosperms. It occurs from eastern Texas to New Jersey, south to Florida (Trelease 1916, Wiens 1964, Kuijt 1982). It has been the subject of many studies documenting its distribution and host preference (Willis 1873, Collett 1876, Curtiss 1878, Canby 1881, Ward 1881, Ridgeway 1882, Schneck 1884, Bray 1910, Tatnall 1946, Baldwin 1949, Reed and Reed 1951, James 1958, Spaulding 1958, Reed 1960, Core 1966, Statler 1971, Eleuterius 1976, Ferguson and Hemmerly 1976, Rucker and Hemmerly 1976, Cole and Hemmerly 1981). Gill and Hawksworth (1961) provide an extensive literature review of the mistletoes. These studies demonstrate that (1) *P. serotinum* parasitizes a wide variety of taxonomically unrelated hosts; and (2) there are oftentimes host preferences in certain areas. This latter observation has led Harper (1928), Baldwin (1949) and Baldwin and Speese (1957) to suggest that genetic races or individual species of this taxon exist. Similar host preferences have been demonstrated with *P. villosum* (Nutt.) Nutt. subsp. *villosum* (Thomson and Mahall 1983). Other workers have commented on possible factors limiting the northern distribution of *P. serotinum*. These include length of the growing season and/or severity of winter temperatures (for a review see Lightle *et al.* 1964, to which I add Braun 1961; Gleason and Cronquist 1964). The distributions of other species of *Phoradendron* are also believed to be limited by low temperatures (Lightle *et al.* 1964).

Southern Ohio forms one portion of the northern range of *P. serotinum*. This species was listed as a threatened Ohio species in 1980 (Ohio Department of Natural Resources 1980), but has subsequently been reclassified as potentially threatened (Ohio Department of Natural Resources 1982).

[1] Financial support for this research was provided by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves.

[2] I thank Dr. Frank G. Hawksworth and Dr. Tod F. Stuessy for providing suggestions during the course of this work and critique of the final manuscript; The Ohio Department of Natural Resources, Division of Natural Areas and Preserves for financial support; Allison W. Cusick, A. M. Harvill and Marilyn W. Ortt for providing recent distribution data; Anne R. Filbert, John Frederick and Dr. Ronald L. Stuckey for references; Judith D. Dumke and Ann K. Spooner for field help; and the curators of BHO, CINC, CLM, ILL, KE, MARY, OS and US for herbarium records.

Received for publication September 29, 1983 and in revised form October 15, 1983.

Field studies were conducted in Ohio during the winters of 1980–1982 to assess its current Ohio distribution. During this time, all existing records were sought, and many new localities were discovered. The purpose of this study is to examine factors influencing its northern limit, and to comment on its status in Ohio.

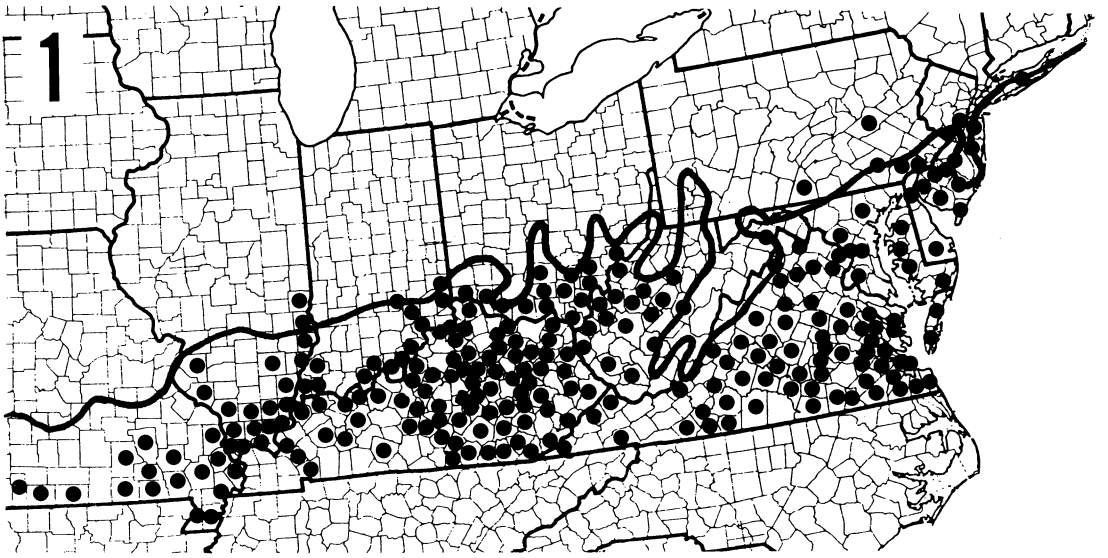
Materials and Methods. Ohio records of *P. serotinum* were obtained from the Ohio Natural Heritage Program data base. These records were obtained from a survey of 26 Ohio herbaria, as well as MARY and US. Additional records were obtained from Collett (1876), Coulter (1900), Taylor (1915), Trelease (1916), House (1924), Deam (1940), Reed and Reed (1951), Steyermark (1963), Wiens (1964), Strausbaugh and Core (1971), Mohlenbrock and Ladd (1978), Wherry *et al.* (1979), Harvill *et al.* (1981), Snyder and Vivian (1981). Climatic parameters were composed and redrawn from individual state maps (National Oceanographic and Atmospheric Administration 1980). Sight records and collection records have been incorporated into the Ohio Natural Heritage Program data base and specimens are deposited at OS.

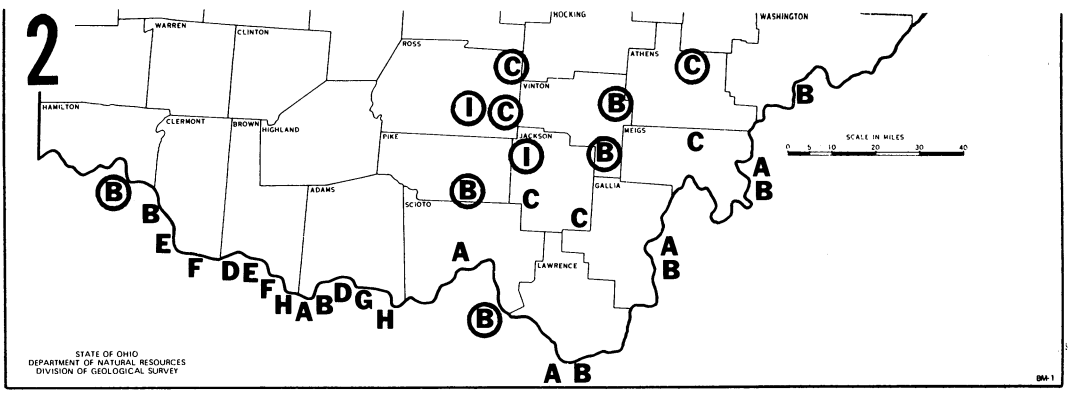
Results and Discussion. The northern distribution of *P. serotinum* is presented in Fig. 1. The northern limit closely corresponds to the mean minimum January temperature of −4.5°C. The only locations that do not fit this isotherm are in the mountainous areas of Pennsylvania and along the Wabash River Valley in southern Illinois. However, these occur within microhabitats that are not incorporated into the gross climatological data. In West Virginia, the species in mountainous areas near the −4.5°C isotherm occur in river valleys protected from the most extreme temperatures (E. L. Core, pers. comm.). Similar locally-warm habitats occur near rivers, as along the Wabash River in southern Illinois. It has been questioned whether occasional extreme low winter temperatures limit the northern range of this and other *Phoradendron* species, previously suggested by other authors (see Lightle *et al.* 1964, for a review). Data for record low temperatures in Chicago, Detroit, and Buffalo, areas north of the range of *P. serotinum,* are not lower than the record low temperatures in more southern cities of Cincinnati and Saint Louis, within its northern limit (United States Environmental Data Service 1968). Other plants are known from southern Ohio that may be similarly restricted in part by low temperatures. Braun (1961) lists *Ampelopsis cordata* Michx., *Bignonia capreolata* L. and *Chionanthus virginicus* L. Cusick and Silberhorn (1977) list *Penstemon canescens* Britt. and *Phacelia ranunculacea* (Nutt.) Constance. Cranfill (1983) demonstrates a somewhat similar northern distribution of *Woodwardia areolata* (L.) Moore, restricted by both temperature and substrates.

The Ohio distribution and host data of *P. serotinum* are presented in Fig. 2. Since 1980, the species has been recorded from 46 localities. *Celtis occidentalis* L. and *Gleditsia triacanthos* L. are new host records for Ohio. During this study, mistletoe was also found on *Juglans nigra* L., *Prunus serotina* Ehrh., and *Robinia pseudo-acacia* L. These latter three species are listed by Warder *et al.* (1882), but not by Braun (1961). All of the host species of Ohio populations of mistletoe have been reported from other states.

All but four of the currently-known localities of *Phoradendron serotinum* are from the Ohio River Valley. The interior Scioto County record is found in the Scioto River Valley, but the other current interior sites are on more upland areas of the unglaciated Allegheny Plateau. All other previously-known sites north of the Ohio River have been checked, and mistletoe is presumed extirpated from them. The following record from extreme northern Ohio, listed by Trelease (1916), is possibly in error: OHIO: [Cuyahoga County] Cleveland, *Krebs 101* (herbarium not listed). The specimen has not been located in any of the herbaria surveyed, including ILL, where Trelease worked, and it is not listed by Wiens (1964). It is possibly a transcription error for "Cincinnati". While the species could possibly survive at Cleveland on climatological grounds (Cleveland climate is moderated by Lake Erie), this record should be discounted at the present time.

As in other states, *P. serotinum* in Ohio shows host specificity in certain areas, but not in others, even though other seemingly suitable hosts grow nearby (Fig. 2). Of par-





A Acer saccharinum
B Ulmus americana
C Nyssa sylvatica
D Juglans nigra
E Robinia pseudo-acacia
F Celtis occidentalis
G Gleditsia triacanthos
H Prunus serotina
I Host data unavailable

Figs. 1 and 2. County and state distribution of *Phoradendron serotinum* in the northern part of its range. Fig. 1. The heavy line is the −4.5°C mean January isotherm. Fig. 2. Map of southern Ohio with host data for this species. Letters south of the Ohio River designate host data for many populations that are scattered along the Ohio River Valley on the Ohio side; those listed north of the river are individual populations mapped exactly. Circled populations are presumed extirpated.

ticular interest is the current limitation of mistletoe to *Nyssa sylvatica* Marsh. in upland areas of the unglaciated Allegheny Plateau, and its limitation to *Acer saccharinum* L. and *Ulmus americana* L. in Ohio River localities in southeastern Ohio. In southwestern Ohio, however, it is known on a wider variety of hosts (Fig. 2).

Ohio populations of *P. serotinum* have probably suffered significant declines since pre-settlement times, but early works failed to mention the abundance of mistletoe in

the state. Perhaps the first reference to its occurence in the state was by Riddell (1835, as *Viscum verticillatum* Nutt.), who listed it for the Ohio River Valley as far upstream as Marietta (Washington County). Subsequent works also listed its occurence, but not its abundance: Lea 1849, Newberry 1860, Beardslee 1878, Kellerman and Werner 1893, Aiken 1911, Schaffner 1932, Braun 1961. Cusick and Silberhorn (1977) list it as frequent in extreme southeastern Ohio. Ridgeway (1882) and Schneck (1884) mention an early abundance in southern portions of Indiana, but it is now much less common there (Deam 1924, 1940). Ohio populations have probably suffered similar declines. Over ten long-time Ohio River Valley residents told me of a much greater abundance of mistletoe in this valley in former times, with significant declines after the very cold winters of 1977-78. The cutting of host trees has probably been a significant factor in its reduction. Collection of mistletoe for commercial purposes has also reduced populations. The more recent decrease in the abundance of mistletoe during the winters of 1977-78, during which record low temperatures were recorded in southern Ohio (National Oceanic and Atmospheric Administration 1977, 1978), may only be temporary, as small shoots were observed growing out of sites of former infection in some cases. Quick reinfestation of an area after aerial portions have been eliminated by freezing has been noted by Schneck (1884); this may have been due to regrowth from endophytic portions remaining within the host tree. Regrowth after aerial portions have been broken off has been noted by Deam (1924).

In summary, the northern range of mistletoe is associated with −4.5°C mean minimum January temperature to the north. Its distribution in Ohio has probably declined in recent times. In certain areas, there is a tendency for host specificity.

Literature Cited

AIKEN, W. H. 1911. Catalogue of the ferns and flowering plants of Cincinnati, Ohio, and vicinity. Bull. Lloyd Lib. 15, botany series, 1:1-57.

BALDWIN, J. T., JR. 1949. Mistletoe on persimmon. Rhodora 51:105-106.

———, AND B. M. SPEESE. 1957. *Phoradendron flavescens:* chromosomes, seedlings, and hosts. Am. J. Bot. 44:136-140.

BEARDSLEE, H. C. 1878. Catalogue of the plants of Ohio, including flowering plants, ferns, mosses and liverworts, p. 335-363. *In:* 32nd Ann. Rept. Ohio State Board Agric., 1877, Columbus.

BRAUN, E. L. 1961. The woody plants of Ohio. Ohio State Univ. Press, Columbus, 362 p.

BRAY, W. L. 1910. The mistletoe pest in the southwest. U.S. Bur. Plant Indust. Bull. 166, 39 p.

CANBY, W. M. 1881. Notes. Bot. Gaz. 6:270-271.

COLE, T. W. AND T. E. HEMMERLY. 1981. American mistletoe (*Phoradendron flavescens*) in Walker County, Georgia. Georgia J. Sci. 39:37-38.

COLLETT, J. 1876. Geological report on Vanderburg, Owen and Montgomery Counties, Indiana, p. 240-422. *In:* 7th Annu. Rept. Geol. Surv. Indiana, 1875, Indianapolis.

COULTER, S. 1900. A catalogue of the flowering plants and of the ferns and their allies indigenous to Indiana, p. 553-1002. *In:* 24th Annu. Rept. Indiana Dept. Geol. and Nat. Res., 1899, Indianapolis.

CRANFILL, R. 1983. The distribution of *Woodwardia areolata.* Am. Fern J. 73:46-52.

CURTISS, A. H. 1878. Mistletoe parasitic on itself. Bot. Gaz. 3:36-37.

CUSICK, A. W. AND G. M. SILBERHORN. 1977. The vascular plants of unglaciated Ohio. Ohio Biol. Surv. Bull., N.S. 5(4):1-153.

DEAM, C. C. 1924. Shrubs of Indiana. Indiana Dept. Conserv., Indianapolis, 351 p.

———. 1940. Flora of Indiana. Indiana Dept. Conserv., Indianapolis, 1236 p.

ELEUTERIUS, L. N. 1976. Observations on the mistletoe (*Phoradendron flavescens*) in south Mississippi, with special reference to the mortality of *Quercus nigra.* Castanea 41:265-268.

FERGUSON, K. G., AND T. E. HEMMERLY. 1976. Host specificity of mistletoe in middle Tennessee II: Maury County. Castanea 41:71-72.

GILL, L. S., AND F. G. HAWKSWORTH. 1961. The mistletoes, a literature review. U.S.D.A. Tech. Bull. 1242, 87 p.

GLEASON, H. A., AND A. CRONQUIST. 1964. The natural geography of plants. Columbia Univ. Press, New York, 420 p.

HARPER, R. M. 1928. Economic botany of Alabama. Pt. 2. Geol. Surv. Ala. Monogr. 9:1-357.

HARVILL, A. M., T. R. BRADLEY, AND C. E. STEVENS. 1981. Atlas of the Virginia flora, Pt. 2, Dicotyledons. Va. Bot. Associates, Farmville. 148 p.

HOUSE, H. D. 1924. Annotated list of the ferns and flowering plants of New York State. N.Y. State Mus. Bull. 254, Albany, 759 p.

JAMES, R. L. 1958. Mistletoe in Tennessee. Castanea 23:91-95.

KELLERMAN, W. A. AND W. C. WERNER. 1893. Catalogue of Ohio plants. Rept. Geol. Surv. Ohio 7:56-406.

KUIJT, J. 1982. The Viscaceae of the southeastern United States. J. Arnold Arbor. Harv. Univ. 63:401-410.

LEA, T. G. 1849. Catalogue of the plants of Cincinnati collected by Thomas G. Lea. T. K. and P. G. Collins, Cincinnati, 77 p.

LIGHTLE, P. C., D. WIENS, AND F. G. HAWKSWORTH. 1964. Low temperature injury to *Phoradendron* in Arizona and New Mexico. Southwest Nat. 8:204-209.

MOHLENBROCK, R. H., AND D. M. LADD. 1978. Distribution of Illinois vascular plants. South. Ill. Univ. Press, Carbondale, 282 p.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION. 1977. Climatological data. Annual summary, Ohio. 82(13). U.S. Dept. Commer., Wash., D.C., 15 p.

———. 1978. Climatological data. Annual summary, Ohio. 83(13). U.S. Dept. Commer., Wash., D.C., 15 p.

———. 1980. Climates of the states, 2 vols. U.S. Dept. Commer., Wash., D.C., 1175 p.

NEWBERRY, J. S. 1860. Catalogue of the flowering plants and ferns of Ohio, p. 235-273. *In:* 14th Ann. Rept. Ohio State Board Agric., 1859, Columbus.

OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF NATURAL AREAS AND PRESERVES. 1980. Rare species of native Ohio wild plants. 20 p. (Mimeographed).

———. 1982. Rare species of native Ohio wild plants. 20 p. (Mimeographed).

REED, C. F. 1960. *Myrica pensylvanica*, a new host for *Phoradendron flavescens* in Virginia. Castanea 25:86.

———, AND P. G. REED. 1951. Host distribution of mistletoe in Kentucky. Castanea 16:7-15.

RIDDELL, J. L. 1835. Synopsis of the flora of the western states. W. J. Med. Phys. Sci. 8:489-556.

RIDGEWAY, R. 1882. Notes on the native trees of the lower Wabash and White River Valleys, in Illinois and Indiana. Proc. U.S. Natl. Mus. 5:49-88.

RUCKER, E., AND T. E. HEMMERLY. 1976. Host specificity of mistletoe in middle Tennessee I. Rutherford County. Castanea 41:31-33.

SCHAFFNER, J. H. 1932. Revised catalog of Ohio vascular plants. Ohio Biol. Surv. Bull. 25:87-215.

SCHNECK, J. 1884. Notes on *Phoradendron flavescens* Nutt. I and II. Bot. Gaz. 9:94-96, 101-103.

SNYDER, D. B., AND V. E. VIVIAN. 1981. Rare and endangered vascular plant species in New Jersey. U.S. Fish Wildl. Serv., Newton Corner, Mass. 98 p.

SPAULDING, P. 1958. Diseases of foreign forest trees growing in the United States. U.S. Dept. Agric. Handb. 139, 118 p.

STATLER, R. 1971. Arborescent preference of *Phoradendron flavescens*. Castanea 36:61-62.

STEYERMARK, J. A. 1963. Flora of Missouri. The Iowa State Univ. Press, Ames, 1728 p.

STRAUSBAUGH, P. D., AND E. L. CORE. 1971. Flora of West Virginia, Pt. 2, Ed. 2. W.V. Univ. Bull. 71:275-575.

TATNALL, R. R. 1946. Flora of Delaware and the eastern shore. Soc. Nat. Hist. Delaware, Wilmington, 313 p.

TAYLOR, N. 1915. Flora of the vicinity of New York. Mem. N.Y. Bot. Gard. 5:1-683.

THOMSON, V. E., AND B. E. MAHALL. 1983. Host specificity by a mistletoe, *Phoradendron villosum* (Nutt.) Nutt. subsp. *villosum* on three oak species in California. Bot. Gaz. 144:124-131.

TRELEASE, W. 1916. The genus *Phoradendron*. Univ. Ill. Press, Urbana, 224 p.

UNITED STATES ENVIRONMENTAL DATA SERVICE. 1968. Weather Atlas of the United States. U.S. Dept. Commer., Wash., D.C., 224 p.

WARD, L. F. 1881. Guide to the flora of Washington and vicinity. Bull. U.S. Natl. Mus. 22:1-264.

WARDER, J. A., D. L. JAMES, AND J. F. JAMES. 1882. Woody plants of Ohio. 36th Annu. Rept. Ohio State Board Agric., 1881, p. 73-112.

WHERRY, E. T., J. M. FOGG, JR., AND H. A. WAHL. 1979. Atlas of the flora of Pennsylvania. Morris Arbor. Univ. Penn., 390 p.

WIENS, D. 1964. Revision of the acataphyllous species of *Phoradendron*. Brittonia 16:11-54.

WILLIS, O. R. 1873. Mistletoe. Bull. Torrey Bot. Club 4:12.