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Annotated Bibliography of the Coal Flora (Pennsylvanian) of Massachusetts and Rhode Island

Paul C. Lyons, Compiler

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature

ANNOTATED BIBLIOGRAPHY OF THE COAL FLORA (PENNSYLVANIAN) OF MASSACHUSETTS AND RHODE ISLAND

Compiled by Paul C. Lyons

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Abbott, M. L., 1958, The American Species of *Asterophyllites*, *Annularia*, and *Sphenophyllum*: Bulletins American Paleontology, v. 38, no. 174, p. 289-390, pls. 35-49.

Author indicates *Asterophyllites grandis*, *Annularia mucronata*, and *Annularia sphenophylloides* from Rhode Island and correctly identifies Hitchock's (1841) illustrations (pl. 22, fig. 2; pl. 23, fig. 1) of *Annularia* as *A. stellata*, from Mansfield, Massachusetts.

Bailey, R. H., and Newman, W. A., 1978, Origin and significance of cylindrical sedimentary structures from the Boston Bay Group, Massachusetts. Am. Jour. Sci., v. 278, p. 703-711.

Authors interpret the cylindrical "plant fossils" of Burr and Burke (1900) as sandstone pipes produced by plastic flow. Definitive evidence of flow is not given. An inorganic origin of these forms is plausible but not proven by their data.

Bowen, G. T., 1822, Vegetable impressions of ferns and other plants remarkably distinct in transition slate, Providence, Rhode Island; American Journal Science, v. 5, p. 42.

U. S. GOVERNMENT PRINTING OFFICE : 1959 O - 511171
867-100

Article does not give more information than the title. This is probably the first report in a scientific publication of plant fossils from the Narragansett basin.

Brongniart, Adolphe, 1822, Notice of American specimens of organized remains: American Journal Science, v. 5, p. 397.

Specimens received from E. Hitchcock, E. Granger, Z. Cist, and G. T. Bowen of Providence, Rhode Island. No specimens from Narragansett Basin are indicated, but it is likely that some from the Portsmouth coal mine which opened in 1808 were also received by Brongniart around the same time. See Brongniart (1828).

_____1828-1838, Histoire des végétaux fossiles: Paris, G. Dufour et E. d'Ocagne, 2 v., 195 pls. (reprinted by A. Asher, Amsterdam, 1965, 2 v. in 1 and plates for both in separate atlas).

This monumental work contains the first modern identification of a plant fossil from the Narragansett Basin. Specimen was identified as *Pecopteris arguta* [= *P. feminaeformis*]* and was apparently collected at the Mount Hope Coal mine, Portsmouth, Rhode Island (Hitchcock, 1841).

Brown, Alton, Murray, D. P., and Barghoorn, E. S., 1978, Pennsylvanian fossils from metasediments within the Narragansett Pier Granite: Geological Society of America Abstracts with Programs, v. 10, no. 2, p. 34-35.

Important discovery of Pennsylvanian plant megafossils in xenoliths. These fossils support radiometric dating indicating a post-Pennsylvanian age of this granite.

*In this paper, square brackets contain information supplied by Lyons.

Burr, H. T., and Burke, R. E., 1900, The occurrence of fossils in the Roxbury Conglomerate: Boston Soc. Natural History Proc., v. 29, p. 179-184.

Report of cylindrical structures, referred to the form genus *Artesia*, in the Roxbury Conglomerate of the Boston Basin.

Clark, E. F., 1883, Studies in the Rhode Island coal measures: Newport Natural History Society, Proceedings, Document 2, p. 0-12.

Contains a list of 61 species of plants collected from the coal-bearing rocks of the Narragansett Basin, Rhode Island. Locality data are not given.

Crosby, W. O., and Barton, G. N., 1880, Extension of the Carboniferous Formation in Massachusetts: American Journal Science, v. 120, p. 416-420.

They report *Sigillaria* and possibly *Calamites* or *Lepidodendron* from type locality of the Pondville Conglomerate in the Town of Norfolk, Massachusetts.

Dale, T. N., 1883, A contribution to the geology of Rhode Island: Boston Society Natural History, Proc., v. 22, p. 179-201.

Report on the collection of plants in a shale overlying the Purgatory Conglomerate from Wood's Castle on the eastern shore of Aquidneck Island. He also reports a floral locality along the Little Compton shore and *Annularia longifolia* [=*A. stellata*] from Sachuest Neck.

_____1884-85, The geology of the mouth of Narragansett Bay: Newport Natural History Society, Proc., Document 3, p. 5-14.

This is a report of plant fossils in coal-bearing slate along the cliffs at Newport, Rhode Island. Author reports again on collecting *Annularia*

longifolia from Sachuest Neck in "small seams of black slate."

Darrah, W. C., 1935, Permian elements in the fossil flora of the Appalachian Province. *I. Taeniopteris*: Harvard University Botanical Museum Leaflets, v. 3, no. 9, p. 137-148.

Author mentions that *Diplotmema* [*Diplothmema*] *ribeyroni* has been found at Providence, Rhode Island. He notes that this species has been erroneously referred to *Pseudopecopteris cordata-ovata* Lesquereux *non* Weiss. The former species, according to Darrah, is most abundant in the lower Monongahela.

_____1969, A critical review of the Upper Pennsylvanian floras of eastern United States, with notes on the Mazon Creek flora of Illinois: (privately printed) Gettysburg, Pa., 220 p., 80 pls.

The following species are indicated: *Neuropteris agassizi* from Mount Hope coal mines, Portsmouth, Rhode Island; *Linopteris obliqua*, Rhode Island; *Alethopteris grandini*, Newport, Rhode Island; *Pecopteris arborescens*, Seekonk, Massachusetts; *Pecopteris candolleana*, Newport Beach, Rhode Island; *Pecopteris miltoni* from Marshfield [probably Mansfield, Massachusetts]; *Pecopteris oreopteridia*, Rhode Island; *Pecopteris polymorpha*, Mansfield; *Pecopteris unita*, Rhode Island and Massachusetts. Author provides a previously unpublished list of plant species collected from Seekonk, Massachusetts, by him and others. He concludes that the Portsmouth coal beds and the Seekonk beds are probably Late Pennsylvanian in age.

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De La Beche, H. T., 1833, A Geological Manual: London, Charles Knight, 3rd ed., 629 p.

Lists two species, *Pecopteris arguta* [= *P. feminaeformis*] and *Asterophyllites equisetiformis* from Rhode Island. Specimens probably came from Mount Hope coal mine, Portsmouth, Rhode Island (Hitchcock, 1841). Compiler has not been able to trace the original source publication of the second species.

Dodge, W. W., 1875, Note on the geology of eastern Massachusetts: Boston Society Natural History, Proc., v. 17, p. 414.

Report of a discovery of a plant fossil locality in the Norfolk basin at Canton, Massachusetts.

Fuller, M. L., 1896, A new occurrence of Carboniferous fossils in the Narragansett Basin: Boston Society Natural History, Proc., v. 27, p. 195-199.

Report of "dozens" of *Calamites* in sandstone, some coalified, at Brockton, Massachusetts. A coal analysis of anthracitic bark is included.

Grew, E. S., 1976, Pennsylvanian rocks of east-central Massachusetts, in New England Intercollegiate Geological Conference, 68th Annual Meeting, Boston, Mass., Oct. 8-10, 1976, Geology of southeastern New England; a guidebook for field trips to the Boston area and vicinity: Princeton, N.J., Science Press, p. 383-404.

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Illustrates *Calamites* [probably *Cordaites*], *Cordaites*, a neuropterid pinnule, and an unidentified fossil, possibly a vertebrate jawbone [probably *Lepidodendron*]. Contains a previously unpublished evaluation of the Worcester flora by Lyons who indicates the presence of *Neuropteris cf. scheuchzeri*. Lyons concluded (written communication to Grew, 1970) that the flora is of Alleghenian age (Middle Pennsylvanian).

Grew, E. S., Mamay, S. H., and Barghoorn, E. S., 1970, Age of plant fossils from the Worcester coal mine, Worcester, Massachusetts: American Journal Science, v. 268, p. 113-126.

Important documentation of the Pennsylvanian age of the Worcester coal based upon new collections of plant fossils. Illustrated are: *Cordaites*, *Cordaicarpus*, *Neuropteris*, a *Calamites* [probably *Cordaites*], and a new picture of *Lepidodendron* collected by Perry in 1885 and figured in Perry and Emerson (1903). They also report a *Mariopteris*-like pinnule, "pinnules reminiscent of *Neuropteris pocahontas*, and *Mariopteris* " Collections are stored in the reference collections of the U.S. Geological Survey. Authors conclude flora is of Pottsvillian age [Early Pennsylvanian].

Hitchcock, C. H., 1860, Synchronism of coal-beds in the New England and western United States coal-basins: American Association Advancement Science, Proc., v. 14, p. 138-143.

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This is one of the first floral biostratigraphic works in the United States. Collections of plants from several localities in the Narragansett basin: Wrentham [now Plainville] Massachusetts; Valley Falls, Portsmouth, and Newport, Rhode Island. The specimens from Wrentham were presented by H. Rice, of North Attleborough to the State Agricultural Museum of Boston where they could then be seen as labeled by Lesquereux. Many of the specimens are now in Pratt Museum, Amherst College.

From Wrentham the following species were obtained: *Asterophyllites lanceolata* Lesqx., *A. equisetiformis* Brgt., *Calamites suckowii* Brgt., *C. cistii* Brgt., *Neuropteris flexuosa* Brgt., *N. hirsuta* Lesqx., *N. loschii* Brgt., *Alethopteris pennsylvanica* Lesqx., *A. nervosa* Gopp., *Pecopteris miltoni* Brgt., *P. arborescens* Brgt., *Sphenopteris abbreviata* Lesqx., *Lepidophyllum* nov. sp., and *Trigonocarpon* nov. sp. "The exact geological horizon of the shales where these species of fossil plants have been collected is obvious ... It corresponds with the shales covering over No. 3 coal of the Western sections of the coal-measures, equivalent of coal D (Lower Freeport) of J. P. Lesley's Manual of coal" (p. 140). In Rhode Island, C. E. Hammett, Jr., and J. H. Clark collected plants from 2,357 feet above the base of the Carboniferous System. These plants are reported by Hitchcock as being *Pecopteris affinis* Brgt. (never before found in America)*, *P. arborescens* Brgt., *P. unita* Brgt.,

*Information in parentheses supplied by Hitchcock.

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Asterophyllites sublaevis Lesq, *Annularia sphenophylloides* Brgt., *Aphlebia* nov. sp., *Sphenophyllum emarginatum* Brgt., *S. schlotheimii* Sternb., *Sphenopteris* nov. sp., and *Annularia fertilis* Sternb. Hitchcock reported that in the north part of Portsmouth at the Mount Hope mine there are eleven different beds of coal. Above the beds worked for coal, three beds of anthracite have been found and there are six below. From the shales at the mine Hitchcock reported the following species of plants: *Annularia fertilis* Sternb., *Odontopteris brardii* Brgt., *Neuropteris* nov. sp., related to *N. grangeri* Brgt., *Pecopteris arborescens* Brgt., *Sphenopteris gravenhorstii* Brgt., and several others not described by Lesquereux. He concludes that the coals of the Narragansett basin belong to the lower coals and probably all lie below the Mahoning Sandstone and that the Upper coal-measures probably are not present in New England. To the contrary, it is the compiler's opinion that the floral assemblage from the Mount Hope mine is probably of Late Pennsylvanian age.

Hitchcock, E., 1833, Report on the geology, mineralogy, botany, and zoology of Massachusetts: Amherst, Massachusetts, J. S. and C. Adams, 700 p.; Atlas, 14 pls.

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Listed in his "Catalogue of Specimens" are the following:

No. 395 Impressions of fern on slate, Newport, R. I.

No. 396 *Equiactum* ? [*Equisetum*] on anthracitic slate, Newport, R. I.

No. 397 Unknown impressions on same; Newport, R. I.

No. 398 *Calamites*, Wrentham, coal mine

No. 399 *Neoropteris?* [*Neuropteris?*] on slate, Wrentham, coal mine.

No. 400 *Fucoides?* on hard schistose rock, Attleborough

Note (p. 284) indicating that *Pecopteris arguta* and *Asterophyllites equisetiformis* are listed in De La Beche's (1833) Manual; probably both from Portsmouth, Rhode Island. This is probably the first report illustrating plant fossils from the Narragansett Basin. Plate XI, fig. 10 is probably *Asterophyllites equisetiformis*, southeast of Newport; pl. XIII. fig. 41, "*Calamites*", Wrentham [now Plainville], Massachusetts ; questionable identification, no node is apparent in this figure; pl. XIII, fig. 42, "*Equisetum*," Wrentham [now Plainville]. This is *Sphenophyllum* cf. *emarginatum*.

Pl. XIII, fig. 43, "*Nerropteris*" [*Neuropteris*], looks like *Pecopteris* cf. *feminaeformis*.

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_____1841, Final Report on the geology of Massachusetts: Amherst, Massachusetts, J. S. and C. Adams, and Northampton, Massachusetts, J. H. Butler, 831 p.

Illustrates plant fossils from Hardon coal mine, Mansfield, pls. 21-25, and Wrentham, Massachusetts, pl. 27. Illustrations indicate the excellent quality of many specimens.

pl. 21, fig. 1 [*Neuropteris scheuchzeri*]

pl. 21, fig. 2 [*Asterophyllites* cf. *equisetiformis*]

pl. 22, fig. 1 [*Cordaites* sp.]

pl. 22, fig. 2 [*Sphenophyllum* sp.]

pl. 22, fig. 3 [*Annularia stellata*]

pl. 22, fig. 4 [*Sphenopteris*?]

pl. 22, fig. 5 [*Neuropteris*?]

pl. 23 - - [*Annularia stellata*, *Pecopteris*?]

pl. 24, figs. 1, 2 [*Stigmaria*]

pl. 24, fig. 3 [*Calamites* cf. *suckowii*]

pl. 25, figs. 1-3 [*Cordaites principalis*]; fig. 3 shows apex

pl. 27, fig. 1, [*Palmatopteris*?]

pl. 27, fig. 2 [*Calamites* cf. *suckowii*]

pl. 27, fig. 3 [*Calamites* cf. *cistii*]

pl. 27, fig. 4 [*Neuropteris*?]

pl. 27, fig. 5 [*Pecopteris* sp.]

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_____1853a, The coal field of Bristol County and of Rhode Island: American Journal Science, 2nd ser., v. 16, p. 327-336. Mentions five genera of Carboniferous plant fossils found in the Narragansett basin. Fossils are illustrated in Hitchcock (1853b).

_____1853b, Report of certain points in the geology of Massachusetts: Commonwealth of Massachusetts House No. 39, 44 p. Illustrations of five plant fossil species indicated in Hitchcock (1853a) pl. 1, fig. 1 - *Stigmaria*, Wrentham mine [Plainville, Mass.] and at a depth of 500 feet at Valley Falls.

pl. 1, fig. 2 - *Annularia* [probably A. *stellata*], Mansfield; Warren and Newport, Rhode Island.

pl. 2, fig. 2 - *Pachypteris* or *Odontopteris*; localities as directly above.

pl. 2, fig. 3 - *Neuropteris* [probably *N. scheuchzeri*], Mansfield.

Jackson, C. T., 1840, Report on the geological and agricultural survey of the State of Rhode Island: Providence, Rhode Island, 312 p. Report of about a dozen plant fossil species from the Hardon coal mine, Mansfield, Massachusetts. A few of the species, including *Annularia stellata*, are illustrated.

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_____1844, Singular position of fossils at Mansfield, Massachusetts, and overturn in coal strata: Boston Society Natural History, Proceedings, v. 1., p. 26.
This note or article was not found.

_____1851, Note on fossil calamite from Bridgewater, Massachusetts: Boston Society Natural History, Proc., v. 3, p. 223.
Report of a one foot-long specimen. Description fits *Calamites cistii*.

Johnson, W. R., 1841, [on the anthracite and plant fossils of Rhode Island]: Philadelphia Academy Natural Sciences, Proc., v. 1, p. 118-119.
This is a report of "vegetable impressions" in anthracitic beds in Rhode Island. No other information is given.

Kemp, J. F., 1887, On fossil plants from near Worcester, Massachusetts: New York Academy Science Transactions, v. 4, p. 75-76.
Report of *Sigillaria*, *Lepidodendron*, and fern stipes all collected by Perry in 1883 and reported in Perry (1885).

Knox, A. S.,1944, A Carboniferous flora from the Wamsutta Formation of southeastern Massachusetts: American Journal Science, v. 242, p. 130-138.

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This is the first detailed floral assemblage reported from the Wamsutta Formation. The following assemblage was reported:

Annularia stellata (Schl.) Wood

Calamocladus [*Asterophyllites*] *longifolius* (Stb.) Brgt.

C. equisetiformis (Schl.) Brgt.

Calamites suckowi Brgt.

Pecopteris sp.

Neuropteris cf. *N. rarinervis* Bunb.

Sphenopteris valida Daws.

Sphenopteris sp.

Oligocarpa splendens Daws.

Cordaites cf. *C. robbii* Daws.

Cordaites cf. *C. communis* Lx.

Sigillarian leaves

Previously, Foerste in 1887 (Shaler and others, 1899) discovered *Calamites* and *Cordaites* in red shales. Both localities are in the type area of the Wamsutta Formation in North Attleborough. Knox's floral horizon is in the upper part of the Wamsutta Formation. He concluded the assemblage indicates an Alleghenian age.

La Porte, L. F., 1962, Rhode Island plant fossils: Narragansett Naturalist, v. 5, p. 100-104.

Poor illustrations of *Calamites*, *Sigillaria*, *Lepidodendron*, and *Alethopteris*. Author indicates eight floral localities in Rhode Island.

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Lesquereux, Leo, 1866, Report on the fossil plants of Illinois: Geological Survey of Illinois, Paleontology, v. 2, sec. 3, p. 425-470.

Reports two species from the Narragansett basin. One is considered new, *Hymenophyllites clarkii*, named in honor of James H. Clark of Newport, Rhode Island. Lesquereux correlated the Newport flora with the Mazon Creek flora which is Alleghenian in age (Darrah, 1969, p. 31).

_____1880-1884, Description of the coal flora of the Carboniferous formation in Pennsylvania and throughout the United States: Pennsylvania Geological Survey, 2d, [v.] P, 3 v. in 2: 977 p., and atlas (1879).

This monumental work lays the foundation of Pennsylvanian paleobotany in the United States. Sixty-nine species, including four *Odontopteris* species, from the Narragansett basin are listed. *Neuropteris agassizi*, *Lepidophyllum fallax*, *Odontopteris deformata*, *O. patens*, *Pecopteris clarkii*, *Pseudopecopteris dimorpha*, and *Sphenopteris pseudomurrayana*, are newly named from the Narragansett basin.

_____1884, The Carboniferous flora of Rhode Island: American Naturalist, v. 18, p. 921-923.

List of 88 species of plant fossils from the Narragansett basin. Specimens were collected mainly by J. H. Clark and A. S. Packard. *Callipteridium sp. nov.* is described but not illustrated.

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_____1889, Fossil plants of the coal measures of Rhode Island: American Journal Science, 3rd ser., v. 37, p. 229-230.

Reports 26 species from Pawtucket, Valley Falls, and Bristol, Rhode Island. *Neuropteris dentata* Lesqx., Pawtucket, Rhode Island, is briefly described. No illustrations or other descriptions are given. Fossils were sent for determination to Lesquereux by Brown University, May, 1888.

Lyons, P. C., 1969, Bedrock geology of the Mansfield quadrangle, Massachusetts [unpub. Ph.D. dissert.]: Boston University, 283 p., 18 pls.

This thesis describes and illustrates a new Alleghenian floral horizon in the Rhode Island Formation at Foxboro, Massachusetts. Illustrations are also given of plant fossils from Wrentham and Mansfield, Massachusetts.

_____1971, Correlation of the Pennsylvanian of New England and the Carboniferous of New Brunswick and Nova Scotia: Geological Society America Abstracts with Programs, v. 3, no. 1, p. 43-44.

Foxboro assemblage is reported and correlated with the Minto flora of Maritime Canada of Westphalian C age.

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_____1976, Implications of coal flora and stratigraphy of the Narragansett basin, New England on plate tectonic models: Geological Society America Abstracts with Programs, v. 8, no. 6, p. 989-990.

Author indicates the Newport beds of Hitchcock (1860) are of Late Pennsylvanian age.

Lyons, P. C., and Chase, H. B., Jr., 1976, Coal stratigraphy and flora of the northwestern Narragansett basin, in New England Intercollegiate Geological Conference, 68th Annual Meeting, Boston, Mass., Oct. 8-10, 1976, Geology of southeastern New England; a guidebook for field trips to the Boston area and vicinity: Princeton, N.J., Science Press, p. 405-427.

Partial summary of plant fossils of Pennsylvanian age known from Massachusetts. Illustrations are given of selected species from Mansfield, Wrentham, Foxboro, and Seekonk, Massachusetts.

Lyons, P. C., and Darrah, W. C., 1977, Floral evidence for Upper Pennsylvanian in the Narragansett basin, southeastern New England: Geological Society of America Abstracts with Programs, v. 9, no. 3, p. 297.

Authors suggest *Odontopteris* species and *Sphenophyllum oblongifolium*, and numerous pecopterid species at Newport and Portsmouth, Rhode Island, indicate a Late Pennsylvanian age.

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_____1978, A late Middle Pennsylvanian flora of the Narragansett basin, Massachusetts: Geological Society America Bulletin, v. 89, p. 433-438.

This documents the most abundant species from a new floral horizon of late Middle Pennsylvanian age. Forty species are indicated in the assemblage. Recent communication with Robert Wagner (Univ. Sheffield, England, written commun., 1978) indicates this is probably a Cantabrian flora, one of the few known outside of Spain. Authors indicate a Westphalian D age.

Lyons, P. C., and Tiffney, B., 1973, New paleobotanical evidence on the Pennsylvanian age of the Norfolk basin of southeastern Massachusetts: Geological Society America Abstracts with Programs, v. 5, no. 2, p. 190.

Summary of a new discovery of plant fossils in Norfolk basin at Dodge's (1875) locality.

Lyons, P. C., Tiffney, B., and Cameron, B., 1976, Early Pennsylvanian age of the Norfolk basin, southeastern Massachusetts, based on plant megafossils, in Lyons, P. C., and Brownlow, A. H., eds., Studies in New England geology (Wolfe Vol.): Geological Society America Memoir 146, p. 181-197.

Summary of plant fossil occurrences in the Norfolk basin. Described and illustrated is a new florule from Canton, Massachusetts. This paper proves the Pennsylvanian age of the basin. *Neuropteris obliqua*

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and a probable *Lonchopteris* species collected from the upper member of the Pondville Conglomerate indicate a late Pottsvillian [Early Pennsylvanian] age; latter genus was not previously known in North America west of Maritime Canada.

Oleksyshyn, John, 1976, Fossil plants of Pennsylvanian age from northwestern Narragansett basin, in Lyons, P. C., and Brownlow, A. H., eds., Studies in New England geology (Wolfe volume): Geological Society of America Memoir 146, p. 143-180.

Important documentation of a florule from the Rhode Island formation, Masslite quarry in Plainville, Massachusetts. Twenty-eight species are reported including two new *Palmatopteris* species. Excellent illustrations of most species. Age is probably late Westphalian B to early Westphalian C [=early Allegheny].

Packard, A. S., 1889, Recent discoveries in the Carboniferous flora and fauna of Rhode Island: American Journal Science, 3d ser., v. 37, p. 411.

Plant fossils collected by E. F. Clarke from a carbonaceous shale in Pawtucket are referred to the Upper Pennsylvanian. A list of the plant species is in Lesquereux (1889).

Perry, J. H., 1885, Note on a fossil coal plant found at the graphite deposit in mica schist, at Worcester, Massachusetts: American Journal Science, 3d ser., v. 29, p. 157-158.

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Author reports two specimens of *Lepidodendron* [one specimen is now in Pratt Museum, Amherst College].

Perry, J. H., and Emerson, B. K., 1903, The geology of Worcester, Massachusetts: Worcester, Massachusetts, Worcester Natural History Society, 166 p.

Illustrates *Lepidodendron* from Worcester coal mine. Identified by Lesquereux as *L. acuminatum*.

Pollard, M., 1965, Age, origin and structure of the post-Cambrian Boston strata: Geol. Soc. America Bull., v. 76, p. 1065-1068.

Report of plant fossils in the Mattapan Volcanic Complex of the Boston basin. Many of the illustrations appear to be inorganic structures and this "flora" assigned by him to the Mississippian is very doubtful.

Pollock, S. J., 1964, Bedrock geology of the Tiverton quadrangle, Rhode Island-Massachusetts: U.S. Geological Survey Bulletin 1158-D, 16 p.

Reports plants fossils along shore south of Portsmouth Park.

Providence Franklin Society, 1887, Report on the geology of Rhode Island: Providence, Rhode Island, 130 p.

Important summary. Lists all previously known or reported plant fossil species from the Rhode Island section of the Narragansett basin. Also lists a few species from Massachusetts.

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Quinn, A. W., 1952, Bedrock geology of the East Greenwich quadrangle, Rhode Island: U.S. Geological Survey Geol. Quad. Map GQ-17.

Author reports plant fossils along shore at Warwick Neck.

___1959, Bedrock geology of the Providence quadrangle, Rhode Island: U.S. Geological Survey Geol. Quad. Map GQ-118.

Author reports seed ferns at Rocky Hill and Sockanosset Hill, Rhode Island; also *Calamites* at Rock Island and East Providence. Plant fossil specimens from railroad tunnel near Brown University excavated in 1906 to 1908 were collected by the late C. W. Brown.

_____1973, Rhode Island geology for the non-geologist: Providence, Rhode Island, Rhode Island Department of Natural Resources, 63 p.

Calamites [probably *C. cistii*] were reported from Rock Island. Other localities are along Cliff Walk [Newport] between Easton Beach and Ochre Point, Rhode Island.

Quinn, A. W., and Springer, G. H., 1954, Bedrock geology of the Bristol quadrangle and vicinity, Rhode Island, Massachusetts: U.S. Geological Survey Geol. Quad. Map GQ-42.

Plant fossils found at Bay Spring, Barrington, Rhode Island, and at south end of the Neck in the East Greenwich quadrangle.

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Read, C. B., and Mamay, S. H., 1964, Upper Paleozoic floral zones and floral provinces of the United States: U.S. Geological Survey Professional Paper 454-K, p. K1-K34, 19 pls.

This is an important work on floral zonation in the Pennsylvanian System of the United States. However, no localities or data are given for Massachusetts or Rhode Island.

Rhode Island Mineral Hunters, 1965, Maps of Rhode Island mineral locations, 23 p.

Some floral locality information is given:

p. 10, ferns and *Calamites*, Jamestown area

p. 12, *Annularia* and fern, Bristol

p. 13, neuropterid fern, *Annularia*, *Lepidodendron*, Portsmouth area.

Layman's guide to ferns, *Calamites*, *Annularia*, *Lepidodendron*, *Neuropteris*, and other ferns at Jamestown, Bristol, Portsmouth and other localities in Rhode Island.

Round, E. M, 1920, The Carboniferous flora of Rhode Island and its probable correlation [unpublished Ph.D. thesis]: Providence, R. I., Brown University, pt. 1, 194 p.; pt. 2, 255 p.

Undoubtedly the single most important reference work on the flora of the Rhode Island section of the Narragansett basin. Unfortunately, photographs are only fair, but generally each plate illustration [photograph] is accompanied by a plate with good to excellent sketches.

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She reported 13 new taxa but because her thesis was never published these names are *nomina nuda*. Most of the specimens illustrated are probably from the lower part of the Rhode Island Formation. Author concludes the assemblage is of Alleghenian age [Middle Pennsylvanian].

_____1920, Annularia with Paleostachya fruit: Botanical Gazette v. 73, p. 326-328.

A new species, *Annularia clarkii*, Rhode Island is described and illustrated. Type specimen is in Roger Williams Park Museum, Providence, Rhode Island.

_____1921, Odontopteris genuina in Rhode Island: Botanical Gazette, v. 72, p. 397-403.

Author reports this Grand 'Eury species at eight localities in Rhode Island and that this species has been previously confused, in lists of plant fossils from Rhode Island, with *Odontopteris brardii* Brgt.

_____1922, A *Crossotheca* from the Rhode Island Carboniferous: American Journal Science, 5th ser., v. 4, p. 131-135.

Documentation of a new pecopterid species from the Narragansett basin.

_____1924, Correlation of fossil floras of Rhode Island and New Brunswick: Botanical Gazette, v. 78, p. 116-118.

Comparison of ten common species found in Rhode Island with the flora of St. John, New Brunswick [M. C. Stopes, 1914, Canada Geol. Survey Mem. 41, 142 p.]. Sketches of *Sphenopteris valida* Daws., *Pecopteris miltoni* Artis, *Neuropteris heterophylla* Brong., and *Oligocarpia splendens* Daws. from Rhode Island are included.

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1927, Correlation of fossil floras in Henry County Missouri, and the Narragansett basin: Botanical Gazette, v. 83, p. 61-69.
Author reports that over fifty percent of the Rhode Island species are found in the Cherokee shales of Missouri.

Sanford, S. N. F., 1938, New England's ancient fern garden: New England Natural History Museum Bulletin 88, p. 3-8.
Popular account of plant fossils of Narragansett basin. Illustrations of plant fossils from Mansfield and Wrentham, Massachusetts, and Valley Falls, Rhode Island.

Shaler, N. S., Woodworth, J. B., Foerste, A. F., 1899, Geology of the Narragansett basin: U.S. Geological Survey Monograph 33, 402 p.
Foundation of physical stratigraphy of Narragansett and Norfolk basins. Many floral localities are given. Most plant species are unidentified.

Taylor, S., and Webb, T. H., 1824, Notice of miscellaneous localities of minerals: American Journal Science, v. 8, p. 225-227.
One of the first reports of plant fossils of Narragansett basin: Vegetable impressions on argillaceous shale at Pawtucket, on the shore E. and S.E. of the village. They are found in waterworn fragments along the shore for the distance of half a mile. Some of the shale appears *in situ* about ten feet from the top of the bank. The

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impressions differ from those that had been before observed in this state; although the shale is probably a continuation of that which is associated with the anthracite on Rhode Island.

Teschemacher, J. E., 1846, On the fossil vegetation of America: Boston Society Natural History Memoir, v. 5, p. 370-385.
One of the earliest scientific contributions to American paleobotany. Poor illustrations are given for many Mansfield species. First illustration of *Neuropteris agassizi*, named by Lesquereux almost forty years later (Lesquereux, 1880-1884).

Ward, L. F., 1889, The geographical distribution of fossil plants: U. S. Geological Survey 8th Annual Report, Pt. II, p. 663-960.
Shows geographical distribution of fossil plants in the United States. Includes localities in Rhode Island and Massachusetts.

Watt, A. D., compiler, [undated, 1973?], Catalog of specimens illustrated in Lesquereux's "Coal Flora": [no place, no publisher] 42 p. (Copy held by U. S. Geological Survey Library, Reston, Va. Copies were mimeographed and distributed to members of the Paleobotanical Section of the Botanical Society of America.)
Gives data, often with type specimen location and museum number, on the following species from Narragansett basin, Rhode Island. All are illustrated or referred to in Lesquereux 1880-1884.

1. *Neuropteris agassizi* Lesq.; type specimens are at Harvard University

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2. *Pseudopecopteris dimorpha* Lesq.; Pratt Museum, Amherst College C. P. 48

3. *Odontopteris deformata* Lesq.; U.S. National Museum, No. 11287

4. *O. patens* Lesq.; U.S. National Museum, No. 11274

5. *O. neuropteroides* Stern.; U.S. National Museum, No. 11279

6. *Sphenopteris cristata* Stern.; U.S. National Museum, No. 14644

7. *Lepidophyllum fallax* Lesq.; U.S. National Museum, No. 15896

Weston, M. D., 1917, Pt. I, Illustrated key to the fossil flora of the Upper Paleozoic coal measures of the United States, Pt. II, Study of the Rhode Island species of *Pecopteris*, *Aloiopteris*, and *Mariopteris*, [unpublished Ph.D. Thesis]: Providence, Rhode Island, Brown University, pt. I, 178 p., pt. II, 328 p.

Richly illustrates many plant fossils from Narragansett basin. Unfortunately, almost no locality data are cited. Thesis was previously examined by Drs. M. L. Abbott and William Tidewell.

White, C. D., 1912, Age of the Worcester phyllite: Washington Academy Science Journal, v. 2, p. 114-118.

Report of "plentiful cordiatean foliage," a leaf cushion of *Lepidodendron*, a *Sporocystis*, a leaflet of *Sphenopteris*, and an equisetalean cone (Grew and others, 1970). Author correctly concluded age of coal is Carboniferous. He referred Perry's *Lepidodendron* to *L. veltheimii* or *L. obovatum*.

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Woodworth, J. B., 1894, Carboniferous fossils in the Norfolk basin: American Journal Science, v. 148, p. 145-148.

Reported *Calamites* (probably C. *cistii* Brgt.) and *Sigillaria* from Canton, Massachusetts.

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