A List of Coal Ball Plants from Calhoun, Richland County

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and

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The coal balls which form the basis of this study were collected in the Calhoun Coal Mine, Richland County, Illinois, under the auspices of the Illinois State Geological Survey. The McLeansboro or Upper Conemaugh, in which geological horizon they were found, is the youngest formation in Illinois and was contemporaneous with the Stephanian of western Europe.

Coal balls are nodules, usually calcareous, sometimes siliceous, found in certain localities in those coal seams which are overlaid by marine deposits. They are often crowded with plant remains of different kinds which have been petrified and so have not undergone carbonization. In order to study microscopically the plant structures found in them it is necessary to make sections of the coal balls. Thin sections may be made by sectioning with a diamond saw and then grinding with carborundum until they are transparent. A simpler method, that of making "peels," has made it possible to avoid some of the labor involved in making thin sections. Peels are made by polishing the cut surface of the coal ball with carborundum and subsequently etching with a weak solution of HCl, which dissolves the inorganic surface material, leaving the organic plant tissue in relief. A thin film of nitrocellulose in butylacetate is poured on the surface. The peel can be removed when dry, which is usually about twenty-four hours later. Subsequent study with the microscope usually reveals nice details of plant structure.

The work of preparing peels of over one hundred and fifty coal balls was done by the authors. The species identified were represented by one, but occasionally by several, of the following structures: petioles, stems, strobili, spores, sporangia, glandular hairs, seeds, and roots.

Explanation of Table

1. Table I indicates the relative frequency of the species identified in the coal balls studied.

(++) Very common
(+) Common
(—) Infrequent

2. The numbers of the coal balls, as given in the table, refer to those in the University of Chicago paleobotany collection.

3. The table also indicates which of the specimens identified are listed in Koopman's Monograph (14) on the coal balls of the Netherlands.

4. This American material is correlated with genera and species in Hirmer's study (9). Specimens included which are identical as to species with those of Hirmer's report are indicated with two stars; those which show generic relationship only are indicated with one star.

5. Each species included is followed by a letter in parentheses which indicates the initial of the author who has described or listed the species as occurring in Calhoun coal balls: Crocker (C); Fisher and Noé (FN); Graham (G); Hoskins (H); Reed (R); Steidtmann (S); Underwood (U).

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TABLE I.—FREQUENCY OF SPECIES IDENTIFIED IN COAL BALLS FROM CALHOUN, RICHLAND COUNTY, ILLINOIS

	Frequency	Serial Number of Calhoun Coal Ball in University of Chicago Collection			Holland (Koopman's Study)	Correlation with Hirmer's Study						
						England (Lower Coal Measures)	Finefrau Seam		Donetz Coal Seam C_2^3	Katharina Seam		Belgium Petit Buisson
							Belgium	Ruhr District		Aachen	Ruhr District	
	1	2			3				4			
Amyelon radicans Renault (U)	+	123	400		**	**	**	**		**	**	
Anachoropteris clavata Graham	+	77	44									
Anachoropteris decaisnei Renault (FN)	+	100										
Anachoropteris involuta Hoskins	+				*							
Anachoropteris pulchra Corda (FN)	+	145	375	167	*	*			*		*	
Ankyropteris westphaliensis P. Bertrand (FN)	+	179			**	**	**	**				
Annularia species (H)	+											
Bothrodendron mundum Will. (R)	+				**	**	**	**				
Botryopteris americanum Graham	+	44										
Botryopteris cf. cylindrica Will. (FN)	+	53				**	**					
Botryopteris forensis Renault (H & U)	+	95	197	175								
Botryopteris hirsuta Will. (G & H)	+				**	**	**	**			**	
Botryopteris ramosa Will. (H)	+	44				**	**	**			**	
Calamites communis Binney (R)	+	128	156	65	**	**	**	**	**		**	
Calamites (Astromyelon) Will. (U)	+	128			*	*		*			*	
Cardiocarpus spinatus Graham	+	44			*	*						
Conostoma platyspermum Graham	+	501	516		*	*		*				
Conostoma quadratum Graham	+	517	519									
Cyathotrachus bulbaceous Graham	+	535	541									
Etapteris lacattei P. Bertrand (FN)	+	189			*		*				*	
Etapteris scotti P. Bertrand (F)	+	179										
Heterangium species (F)	+	179			*	*					*	
Heterangium grievii Will. (U)	+											
Heterangium tiliaeoides Will. (G)	+	44										
Heterangium root (H)	+											
Lepidocarpon lomaxi Scott (FN)	+	187			**		**					
Lepidodendron selaginoides Stern. (G)	+	171	C225		*	*	*	*			*	
Lepidodendron leaves (G)	+		C225									
Lepidostrobus species (G)	+	103	104		*	*	*	*	*		*	
Lyginopteris species (R)	+				*	*		*	*	*	*	
Mazocarpon shorense Benson (G)	+	44			**	**					**	
Medullosa anglica Scott (FN)	++	146	183		**	**	**	**				

TABLE I—SPECIES IN CALHOUN COAL BALLS—*Continued*

	Frequency	Serial Number of Calhoun Coal Ball in University of Chicago Collection			Holland (Koopman's Study)	Correlation with Hirmer's Study						
						England (Lower Coal Measures)	Finefrau seam		Donetz Coal Seam C_2^3	Katharina seam		Belgium Petit Buisson
							Belgium	Ruhr District		Aachen	Ruhr District	
	1	2			3				4			
Medullosa species. Root (H)	+	86	375	110								
Medullosa species. Leaves (FN)	+++	91	58	92								
Medullosa noei Steidtman		86	375	110								
Myeloxylon species (G)	++	123	91	170	*			*	*		*	
Notoschizeae robusta Graham		549	553									
Pecopteris species (U)		*										
Psaronius illinoensis Hoskins												
Psaronius species. Stem (G)		C222	44		*	*	*					
Psaronius species. Root (U)	++	156	41	61								
Psaronius species. Rootlet (U)												
Scolecopteris latifolia (G)		542	544									
Scolecopteris minor (H)		C210	C211B									
Sigillaria cf. approximata Fontaine & White (G)		44										
Sigillaria elegans Kidson (FN)		113										
Sphaerostoma ovale Will. (U)												
Sphenophyllum plurifoliatum Will. & Scott (R)	++	120	145	77	**	**	**	**	**	**	**	
Sporangia cf. Botryopteris (G)		44			**							
Stigmaria ficoides Sternberg (G)	+	190	394	44	**	**	**	**			**	
Telangium pygmaeum Graham		545	548			*						

BIBLIOGRAPHY

1. Bertrand, Paul, Etudes sur la fronde des Zygopteridees. Lille, 1909.
2. Carpentier, Alfred, Etude de vegetaux a structure conservee. Lille, 1932.
3. Crocker, Louise, "Morphological Studies of some Illinois coal ball plants." Unpublished Master's thesis, Department of Botany, Syracuse University, 1933.
4. Graham, Roy, Preparation of paleobotanical sections by the peel method. Stain Technology. *8:* 65-68, 1933.
5. ———— Pennsylvanian flora of Illinois as revealed in coal balls. I. Bot. Gaz. *95:* 453-76. 1934.
6. ———— Pennsylvanian flora of Illinois as revealed in coal balls. II. Bot. Gaz. *97:* 156-68, 1934.
7. Hirmer, Max, Uber Vorkommen und Verbreitung der Dolomitknolen und deren Flora. In Congress pour l'advancement des etudes de stratigraphie carbonifere. Liege, 1927.
8. Hoskins, J., Structure of Pennsylvanian plants from Illinois. I. Bot. Gaz. *82:* 427-36. 1926.
9. ———— Notes on the structure of Pennsylvanian plants from Illinois. II. Bot. Gaz. *85:* 74-82. 1928.
10. ———— Contributions to the coal measure flora of Illinois. The American Midland Naturalist. *12:* 154-63. 1930.
11. ———— Structure and classification of certain Cycadofilicinean roots from the McLeansboro of Illinois. American Midland Naturalist. *12:* 533-48. 1931.
12. Koopman, R. G., Flora en fauna van het Nederlandsche karbon (Researches on the flora of the coal balls from the "finefraunebenbank" horizon in the province of Limburg). N. V. Boek, Heerlen, 1928.
13. Krick, Harriette Valletta, Structure of seedlike fructifications found in coal balls from Harrisburg, Illinois. Bot. Gaz. *93:* 151-172. 1932.
14. Noé, A. C., Coal balls. Science *57:* 385. 1923.
15. Noé, A. C., Pennsylvanian flora of northern Illinois. Ill. Geol. Survey Bull. *52.* 1925.
16. ———— Coal balls here and abroad. Trans. Ill. State Acad. Sci. *17:* 179-80. 1925.
17. ———— Coal-ball floras of Illinois. Trans. Ill. State Acad. Sci. *23:* 429-. 1931.
18. Reed, Fredda Doris, Flora of an Illinois coal ball. Bot. Gaz. *81:* 461-69. 1926.
19. ———— Lepidocarpon sporangia from the Upper Carboniferous of Illinois. Bot. Gaz. *98:* 307-15. 1937.
20. Stopes, M. C., and Watson, D. M. S., On the present distribution and origin of the calcareous concretions in coal-seams, known as "coal balls." Phil. Trans. Roy. Soc. London, *200*(B): 167-218. 1909.
21. Steidtmann, Waldo E., A preliminary report on the anatomy and affinities of *Medullosa noei* sp. nov. from the Pennsylvanian of Illinois. Am. Jour. Bot. *24:* 124-25. 1937.
22. Underwood, Mary Ellen, "Morphology of some Illinois coal ball plants." Unpublished Master's thesis, Syracuse University, 1934.