

On the Type of *Pseudosporochnus* (Fossil Cladoxylopsida)

Author(s): Wang QiXue Jin-Zhuang

Source: *Novon: A Journal for Botanical Nomenclature*, 22(2):240-243.

Published By: Missouri Botanical Garden

DOI: <http://dx.doi.org/10.3417/2011006>

URL: <http://www.bioone.org/doi/full/10.3417/2011006>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

On the Type of *Pseudosporochnus* (Fossil Cladoxylopsida)

Wang Qi

State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, People's Republic of China. happyking@ibcas.ac.cn

Xue Jin-Zhuang

Key Laboratory of Orogenic Belts and Crustal Evolution, School of Earth and Space Sciences, Peking University, Beijing 100871, People's Republic of China. pkxue@pku.edu.cn

ABSTRACT. *Pseudosporochnus* Potonié & Bernard (1904; fossil Cladoxylopsida) has been viewed as one of the iconic vascular plants in the Middle Devonian, but the type of the generic name remains problematic. Although *P. verticillatus* (Krejčí) Obrhel has been previously regarded as the type of the generic name, its so-called basionym *Chondrites verticillatus* Krejčí was not validly published and thereby has no nomenclatural status. Thus, the specific epithet *verticillatus* has no priority over *krejčíi*, which Potonié and Bernard first used (1904) for the species of *Pseudosporochnus*, and the combination *P. verticillatus* was not validly published. The name *P. verticillatus* that Obrhel intended to combine in 1961 is rather a new species name and should be cited as *P. verticillatus* Krejčí ex Obrhel. However, *P. verticillatus*, when published (Obrhel, 1961), was an illegitimate superfluous name for *P. krejčíi* (Stur) Potonié & Bernard. Both names attach to a lectotype designated by Obrhel (i.e., D-364, National Museum at Prague) and were originally used under the name *Sporochnus krejčíi* Stur. *Pseudosporochnus krejčíi* (Stur) Potonié & Bernard should be the type of *Pseudosporochnus* Potonié & Bernard.

Key words: Cladoxylopsida, Middle Devonian, *Pseudosporochnus*.

Pseudosporochnus Potonié & Bernard, as an extinct vascular plant, has received extensive attention and been reported from the Middle Devonian of Scotland, the Czech Republic, Belgium, Germany, Estonia, Romania, Kazakhstan, South China, Norway, and the United States (Potonié & Bernard, 1904; Arber, 1921; Hirmer, 1927; Lang, 1927; Høeg, 1931, 1942; Kräusel & Weyland, 1933; Leclercq, 1940, 1970; Obrhel, 1959, 1960, 1961; Leclercq & Banks, 1962; Răleanu & Semaka, 1966; Stockmans, 1968; Jurina, 1969; Schweitzer & Cai, 1987; Kalamees, 1988; Stein & Hueber, 1989; Berry & Fairon-Demaret, 1997, 2002; Schweitzer, 1999; Berry, 2008; Xue &

Hao, 2008). *Pseudosporochnus* is characterized by its digitate branching pattern, terminal sporangia, and dissected xylem strands. The fossil taxon was assigned to its own family (Pseudosporochnaceae), order (Pseudosporochnales), and in turn to the Cladoxylopsida (Pichi-Sermolli, 1958, 1959; Leclercq & Banks, 1962; Berry & Stein, 2000; Taylor et al., 2009; Xue et al., 2010), which was the first plant group to attain an arborescent habit, forming one of the earliest known forests on the Earth (Dilcher et al., 2004; Meyer-Berthaud & Decombeix, 2007, 2009; Stein et al., 2007; Meyer-Berthaud et al., 2010). Phylogenetically, *Pseudosporochnus* is of significance in that it has been considered one of the stem groups or candidate ancestors of the ferns and/or sphenopsids (Stein et al., 1984; Kenrick & Crane, 1997; Wang & Guo, 2009). To date, eight species names have been used in *Pseudosporochnus* (Potonié & Bernard, 1904; Obrhel, 1959, 1960, 1961; Leclercq & Banks, 1962; Leclercq, 1970; Mustafa, 1978; Schweitzer & Cai, 1987; Kalamees, 1988; Stein & Hueber, 1989). However, the nomenclature of some of the species names and in particular the generitype of *Pseudosporochnus* remains problematic. In this paper, we intend to clarify the type of *Pseudosporochnus*.

Krejčí (1882) briefly described three kinds of fossil fucoids, which he described as *Haliserites zonarioides* Krejčí, *H. spinosus* Krejčí, and *Chordrites verticillatus* Krejčí, from the Middle Devonian of Bohemia, Czech Republic. Neither the cited specimens nor the illustrations were presented by Krejčí. It can be inferred that Krejčí utilized Sternberg's (1833) system of classification on fossil fucoids, as he mentioned two of his generic names, i.e., *Zonarites* Sternberg and *Haliserites* Sternberg. Meanwhile, the spelling as *Chordrites* was thought to be a typographical error or a lapsus calami (i.e., a slip of the pen) for the fossil fucoid generic name *Chondrites* Sternberg, 1833 (Stur, 1882; Potonié & Bernard, 1904; Obrhel, 1961), because there is no other internal evidence that

Krejčí intended to propose a new generic name. Krejčí (1882: 69) explicitly stated that *H. zonarioides*, *H. spinosus*, and *C. verticillatus* were “vorläufig” or “vorläufiger Name,” or provisional names.

As for *Chordrites verticillatus*, Krejčí's (1882: 69) original description in Old German is presented here: “Sehr zahlreich sind einzelne fein verzweigte strauchartige Formen, die in wirbelförmige, wie es scheint fructificierende Ästchen auslaufen. Sie wird vorläufig als *Chordrites verticillatus* Kr. Fixirt,” which was translated into English (by Christian Pott, 2012, pers. comm.): “Individual, delicately branched, shrub-like forms are very common, which branch out into curly, apparently fructifying twigs. This is provisionally named as *Chordrites verticillatus* Kr.” According to the *International Code of Botanical Nomenclature* (ICBN, Vienna Code, Art. 34.1b, Ex. 5, McNeill et al., 2006), *Chondrites verticillatus* Krejčí is a provisional name and was not validly published.

Soon after publication of *Chondrites verticillatus* Krejčí, Stur (1882: 343) cited it under a new name *Sporochnus krejčí* Stur, which was used and illustrated for similar fossil algae from Srbsko, Bohemia. Stur's (1882: 342) original description is presented here “*Sporochnus krejčí* Stur Taf. II Fronde compressa, ramis decompositis virgata, comosa; receptaculis clavatoeylindraceis, in pedicellum ipsis multo longio-rem attenuata,” but he did not designate a type specimen. Here, the specific epithet “*krejčí*” should be standardized as “*krejci*” by Article 60C.2 of the ICBN (McNeill et al., 2006).

Based on some of the original specimens of *Sporochnus krejci* Stur and *Hostinella hostinensis* Barrande as identified by Stur (1882), Potonié and Bernard (1904: 10, 34, fig. 70) discovered evidence of tracheids, such that they reclassified these specimens as a new genus and species in Psilotaceae (?), i.e., *Pseudosporochnus krejci* (Stur) Potonié & Bernard. Potonié and Bernard (1904: 25) provided an elaborated description for *P. krejci*, but they did not designate a type specimen. According to the ICBN (Art. 42.1, McNeill et al., 2006), *Pseudosporochnus* Potonié & Bernard and *P. krejci* were validly published, simultaneously established by provision of a single description, i.e., descriptio generico-specifica.

Obrhel (1959) subsequently argued that the specific epithet *verticillatus* had priority over *krejci*. Consequently, Obrhel (1959: 386; 1960: 102) combined the names of the Bohemian fossils, synonymizing *Pseudosporochnus krejci* under *P. verticillatus* (Krejčí) Obrhel, and accepted the latter name as the type of *Pseudosporochnus*. In both instances, however, Obrhel failed to designate a type

specimen, so *P. verticillatus* was not validly published (Art. 37.1, ICBN, McNeill et al., 2006). Obrhel (1961: 12) continued to use the combination *P. verticillatus* and did later designate a lectotype for *P. verticillatus* (i.e., D-364, National Museum at Prague). This specimen had been originally identified under the name *Sporochnus krejci* Stur (Stur, 1882: 342, pl. 2, fig. 1). Since then, Obrhel's proposal to treat *P. verticillatus* (Krejčí) Obrhel as the type of *Pseudosporochnus* has been adopted by subsequent palaeobotanists (Leclercq & Banks, 1962; Leclercq, 1970; Kalamees, 1988; Berry & Fairon-Demaret, 1997, 2002; Schweitzer, 1999).

In our opinion, the so-called basionym *Chondrites verticillatus* Krejčí was not validly published and had by no means nomenclatural status (ICBN, Arts. 12.1, 34.1b, McNeill et al., 2006), thus Obrhel's argument was untenable. Consequently, the combination *P. verticillatus* (Krejčí) used by Obrhel in 1959 was not validly published (ICBN, Art. 33.4, McNeill et al., 2006), and the name *P. verticillatus* that Obrhel intended to combine in 1961 was actually a new species name and should be cited as *P. verticillatus* Krejčí ex Obrhel.

According to the ICBN (Arts. 11.4, 11.5, and 52.1, McNeill et al., 2006), *Pseudosporochnus verticillatus* Krejčí ex Obrhel, when published, was an illegitimate and superfluous name for *P. krejci* (Stur) Potonié & Bernard; both of these names attach to the lectotype originally applied to the name *Sporochnus krejci* Stur. Hence, we conclude that the earlier and valid name *P. krejci* (Stur) Potonié & Bernard (1904) should be the type of *Pseudosporochnus* Potonié & Bernard, whose publication would be more precisely dated as “Jan-Mar 1904” in *Taxonomic Literature*, 2nd edition (Stafleu & Cowan, 1983: 362).

***Pseudosporochnus* Potonié & Bernard, Fl. Dévon., 25. 1904 [fossil Cladoxylopsida]. TYPE: *Pseudosporochnus krejci* (Stur) Potonié & Bernard [= *Sporochnus krejci* Stur]. *Sporochnus krejci* Stur, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl. 84: 342. 1882.**

Pseudosporochnus krejci (Stur) Potonié & Bernard, Fl. Dévon., 25. 1904. *Pseudosporochnus verticillatus* Krejčí ex Obrhel, Sborník Ústřed. Ústavu Geol., Paleontol. 26: 12. 1961, nom. illeg. superfl. TYPE: Bohemia [Czech Republic]. Beroun Town, Srbsko, Late Middle Devonian (Givetian), Srbsko Formation, D-364 (lectotype, designated by Obrhel [1961: 12], National Museum of Prague).

Acknowledgments. We greatly thank Patricia G. Gensel (University of North Carolina), William E. Stein (Binghamton University), Michael Krings (Ludwig-Maximilians-Universität in Munich), Chris-

topher M. Berry (Cardiff University), Victoria C. Hollowell (Missouri Botanical Garden), and John McNeill (Royal Botanic Garden, Edinburgh) for giving invaluable suggestions on early versions of this manuscript; Milan Libertín (National Museum, Prague) for access to the fossil collection; Christian Pott (Swedish Museum of Natural History) and Anne-Laure Decombeix (Université Montpellier 2) for their linguistic assistance in German and French, respectively; Dianne Edwards (Cardiff University), Brigitte Meyer-Berthaud (Université Montpellier 2), Guo Jinyan (Claremont Colleges), and Cyrille Prestianni (Royal Belgian Institute of Natural Sciences) for sending us pertinent literature. This study was supported by the National Natural Science Foundation of China (grant nos. 40972015 and 40802003) and the Institute of Botany, Chinese Academy of Sciences (grant no. 110100P008).

Literature Cited

- Arber, E. A. N. 1921. *Devonian Floras*. Cambridge University Press, Cambridge.
- Berry, C. M. 2008. The Middle Devonian plant collections of Francois Stockmans reconsidered. *Geol. Belg.* 12: 25–30.
- Berry, C. M. & M. Fairon-Demaret. 1997. A reinvestigation of the cladoxylipsoid *Pseudosporochnus nodosus* Leclercq et Banks from the Middle Devonian of Goé, Belgium. *Int. J. Pl. Sci.* 158: 350–372.
- Berry, C. M. & W. E. Stein. 2000. A new iridopteridalean from the Devonian of Venezuela. *Int. J. Pl. Sci.* 161: 807–827.
- Berry, C. M. & M. Fairon-Demaret. 2002. The architecture of *Pseudosporochnus nodosus* Leclercq et Banks: A Middle Devonian cladoxylipsoid from Belgium. *Int. J. Pl. Sci.* 163: 699–713.
- Dilcher, D. L., T. A. Lott, X. Wang & Q. Wang. 2004. A history of tree canopies. Pp. 118–137 in M. D. Lowman & H. B. Rinker (editors), *Forest Canopies*, 2nd ed. Elsevier Academic Press, Boston.
- Hirmer, M. 1927. *Handbuch der Paläobotanik*. Druck und Verlag von R. Oldenbourg, Munich and Berlin.
- Høeg, O. A. 1931. Notes on the Devonian flora of western Norway. *Kgl. Norske Vidensk. Selsk. Skrifter* 6: 1–33.
- Høeg, O. A. 1942. The Downtonian and Devonian flora of Spitzbergen. *Nor. Svalbard. Ishavs-unders. Skrifter* 83: 1–228.
- Jurina, A. L. 1969. Devonian Flora of Central Kazakhstan. *Mater. Geol. Centr. Kazakhstan* 8: 1–143.
- Kalamees, K. 1988. Some Middle Devonian plants from Estonia. *Proc. Acad. Sci. Estonian SSR, Geol.* 37: 83–88.
- Kenrick, P. & P. R. Crane. 1997. *The Origin and Early Diversification of Land Plants: A Cladistic Study*. Smithsonian Institution, Washington, DC.
- Kräusel, R. & H. Weyland. 1933. Die Flora des böhmischen Mitteldevons (Stufe Hh₁ Barrande = h Kettner-Kodym). *Palaeontographica, Abt. B, Paläophytol.* 78: 1–46.
- Krejčí, J. 1882. Über ein neues Vorkommen von Landpflanzen und Fucoiden in der böhm. Silurformation. *Sitzungsber. Königl. Böhm. Ges. Wiss. Prag, Jahr.* 1881: 68–69.
- Lang, W. H. 1927. Contributions to the study of the Old Red Sandstone flora of Scotland. VI. On *Zosterophyllum myretonianum*, Penh., and some other plant-remains from the Carmyllie Beds of the Lower Old Red Sandstone. VII. On a specimen of *Pseudosporochnus* from the Stromness beds. *Trans. Roy. Soc. Edinburgh* 55: 443–455.
- Leclercq, S. 1940. Contribution à l'étude de la flore du Dévonien de Belgique. *Acad. Roy. Belg., Cl. Sci., Mém. Collect. in-4°, 2e Série*, 12: 1–65.
- Leclercq, S. 1970. Classe des Cladoxylopsida Pichi-Sermolli, 1959. Pp. 119–177 in É. Boureau (editor), *Traité de Paléobotanique, Tome IV (1) Filicophyta*. Masson et Cie, Paris.
- Leclercq, S. & H. P. Banks. 1962. *Pseudosporochnus nodosus* sp. nov., a Middle Devonian plant with Cladoxylalean affinities. *Palaeontographica, Abt. B, Paläophytol.* 110: 1–34.
- McNeill, J., F. R. Barrie, H. M. Burdet, V. Demoulin, D. L. Hawksworth, K. Marhold, D. H. Nicolson, J. Prado, P. C. Silva, J. E. Skog, J. H. Wiersma & N. J. Turland (editors). 2006. *International Code of Botanical Nomenclature (Vienna Code)*. *Regnum Veg.* 146.
- Meyer-Berthaud, B. & A.-L. Decombeix. 2007. A tree without leaves. *Nature* 446: 861–862.
- Meyer-Berthaud, B. & A.-L. Decombeix. 2009. Evolution of earliest trees: The Devonian strategies. *Compt.-Rend. Palevol* 8: 155–165.
- Meyer-Berthaud, B., A. Soria & A.-L. Decombeix. 2010. The land plant cover in the Devonian: A reassessment of the evolution of the tree habit. *Geol. Soc., London, Spec. Publ.* 339: 57–68.
- Mustafa, H. 1978. Beiträge zur Devonflora II. *Argum. Palaeobot.* 5: 31–56.
- Obrhel, J. 1959. Neue Pflanzenfunde in den Srbsko-Schichten (Mitteldevon). *Věstník Ústřed. Ústavu Geol.* 34: 384–388.
- Obrhel, J. 1960. Die Flora der Choteč und Třebotov-Kalke (Eifel) des mittelböhmisches Devon. *Sborník Ústřed. Ústavu Geol., Paleontol.* 25: 99–107.
- Obrhel, J. 1961. Die Flora der Srbsko-Schichten (Givet) des mittelböhmisches Devons. *Sborník Ústřed. Ústavu Geol., Paleontol.* 26: 7–46.
- Pichi-Sermolli, R. 1958. The higher taxa of the pteridophyta and their classification. Pp. 70–90 in O. Hedberg (editor), *Systematics of To-Day, Proceedings of a Symposium held at the University of Uppsala in Commemoration of the 250th Anniversary of the Birthday of Carolus Linnaeus*. A.-B. Lundequistska Bokhandeln, Uppsala, and Otto Harrassowitz, Wiesbaden.
- Pichi-Sermolli, R. 1959. Pteridophyta. Pp. 421–493 in W. B. Turrill (editor), *Vistas in Botany*. Pergamon, London.
- Potonié, H. & C. Bernard. 1904. Flore dévonienne de l'étage H. de Barrande. Raimund Gerhard & Wolfgang Gerhard, Leipzig.
- Răleanu, G. & A. Semaka. 1966. Das devon von Mangalia (Rumänien) und seine Flora. *Neues Jahrb. Geol. Paläont., Abh.* 2: 65–73.
- Schweitzer, H.-J. 1999. Die Devonflora Spitzbergens. *Palaeontographica, Abt. B, Paläophytol.* 252: 1–122.
- Schweitzer H. J. & C. Y. Cai. 1987. Beiträge zur Mitteldevon-flora Südchinas. *Palaeontographica, Abt. B, Paläophytol.* 207: 1–109.
- Staffleu, F. A. & R. S. Cowan. 1983. *Taxonomic Literature*, 2nd ed. *Regnum Veg.* 110: 1–1214.

- Stein, W. E. & F. M. Hueber. 1989. The anatomy of *Pseudosporochnus*: *P. hueberi* from the Devonian of New York. *Rev. Palaeobot. Palynol.* 60: 311–359.
- Stein, W. E., D. C. Wight & C. B. Beck. 1984. Possible alternatives for the origin of Sphenopsida. *Syst. Bot.* 9: 102–118.
- Stein, W. E., F. Mannolini, L. V. Hernick, E. Landing & C. M. Berry. 2007. Giant cladoxylopid trees resolve the enigma of the Earth's earliest forest stumps at Gilboa. *Nature* 446: 904–907.
- Sternberg, K. M. 1833. Versuch einer Geognostisch-botanischen Darstellung der Flora der Vorwelt, Vol. 2(5–6). Johann Spurny, Prague.
- Stockmans, F. 1968. Végétaux mésodévonien récoltés aus confins du Massif du Brabant (Belgique). *Mém. Inst. Res. Sci. Nat. Belg.* 159: 1–49.
- Stur, D. 1882. Die Silur-Flora der Etage H-h₁ in Böhmen. *Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Jahrg. 1881*, 84: 330–391.
- Taylor, T. N., E. L. Taylor & M. Krings. 2009. *Paleobotany: The Biology and Evolution of Fossil Plants*, 2nd ed. Academic Press, New York.
- Wang, D. M. & Y. Guo. 2009. *Hamatophyton* from the Late Devonian of Anhui Province, South China, and evolution of Sphenophyllales. *Acta Geol. Sin. (Engl.)* 83: 492–503.
- Xue, J. Z. & S. G. Hao. 2008. A cladistic study on Devonian Cladoxylopsida. *Acta Sci. Nat. Univ. Pekin.* 44: 299–307.
- Xue, J. Z., S. G. Hao & J. F. Basinger. 2010. Anatomy of the Late Devonian *Denglongia hubeiensis*, with a discussion of the phylogeny of the Cladoxylopsida. *Int. J. Pl. Sci.* 171: 107–120.