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F. NĚMEJC:

The Pecopterides of the coal districts of Bohemia.

(A preliminary study.)

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Just in the same way or the same reason as I have treated in the year of 1937 the various species of the formgenus of *Sphenopteris** found in the coal districts of Central Bohemia, I am presenting in this paper a short review of the species of the formgenus of *Pecopteris* as far as stated in the Permocarboniferous coal districts of Bohemia (— many of the localities cited here are now Munich agreement of 1938 beyond the new Czech frontier —). It was impossible to study only specimens coming from Central Bohemia without respecting all allied forms from the coal districts of Eastern and Southern Bohemia. Therefore many Permian specimens ar inclosed hereto.

I. Dactylotheca Zeiller and Senftenbergia Cda.

According to the newest studies of Mr. W. Radforth (Toronto) "An analysis and comparition of the structural features of Dactylotheca plumosa Artis sp. and Senftenbergia ophiodermatica Goepp. sp." (Transactions of the roy. soc. Edinburgh, Vol. LIX, part II. No. 14, 1937—8), it seems that the sporangia of *Dactylotheca* are provided by a similar annulus as described already long ago in the fertile specimens of *Senftenbergia,* though this is not so strongly marked by the cell wall thickenings as in the last genus. Mr. Rad-

* The Sphenopterides stated in the Permocarboniferous of Central Bohemia (a preliminary report. — I, II part). — Věstník král. české společnosti nauk. Tř. II. Ročník 1936

forth points out that also the spore exinae show the same features in both named genera. Nevertheless I think, that before a definitive fusion of both named genera (— sporangia of the genus of *Dactylotheca* have been supposed by all authors till present as exannulate —) it would be very useful to undertake similar studies on various *Dactylotheca* specimens also from other localities. Further informations about the sporangial structures of *Dactylotheca* and *Senftenbergia* see in M. Hirmer (1) and R. Kidston (3).

1. *Dactylotheca plumosa Art. sp.*

Bibliography and synonyms:

F. T. Artis (1) — Filicites plumosus pp. 17.

A. Brongniart (1) — Pecopteris dentata pp. 346, Pecopteris delicatula pp. 349, Pecopteris plumosa 348.

C. v Ettingshausen (1) — Pecopteris Glockeriana pp. 44; Pecopteris angustifida pp. 45, P. plumosa pp. 45, P. mucronata pp. 46, P. radnicensis pp. 46.

R. Goeppert (1) — Aspidites caudatus pp. 363, Aspidites silesiacus pp. 364, Aspidites Glockeri pp. 375, Cyatheites dentatus pp. 325, Cheilanthites crenatus pp. 248.

R. Kidston (3) — here see a detailed account of all synonyms — Dactylotheca plumosa pp. 383.

J. Lindley - W. Hutton (1) — Sphenopteris crenata pp. 57, Pecopteris serra pp. 71, Sphenopteris caudatus pp. 137, 157.

K. c. Sternberg (1) — Steffensia silesiaca pp. 123, Pecopteris Brongniartiana pp. 160, P. mucronata pp. 159, P. radnicensis pp. 161, P. plumosa pp. 152, P. dentata pp. 152, P. delicatula pp. 157, P. crenata pp. 154, P. debilis pp. 159, P. serra pp. 159.

D. Štúr (1) pp. 293 and (3) pp. 92: Senftenbergia plumosa; (2) pp. 44 and (3) pp. 72: Senftenbergia crenata.

D. plumosa is a very common species of all horizons of the Carboniferous and Permian of Bohemia. On various specimens the same variability of the shape of the leaflets (— especially as to their width —) was stated as mentioned by Kidston and others. I have not tried to split this species into subordinate categories.

Figures of typical specimens see in R. Kidston (3): Pl. 92, Pl. 93, Pl. 94, fig. 1—3, Pl. 95, fig. 1—3, Pl. 96, fig. 2—3, Pl. 110, fig. 1—2, Pl. 112, fig. 2—2a; textfig. 32.

* Localities:

The coaldistricts of Central Bohemia:

The Plzeň coal series: Merklín ("Na Výtuni"); Nýřany.*

* Official german names of the localities, which remained after the Munich agreement beyond the Czech frontier (— and which are here marked by an asterisk —) see at the end of this paper.

The Lower-Radnice coal series (incl. the horizon of the "bělky" and "brousky" [Schleifsteine]): Dubí (near Kladno); Zdejčiná, Strádonice; Chomle, Svinná, Vránovice; Nýřany ("Pankrác"),* Blatnice,* Bílá Hora.

The Upper Radnice coal series (incl. the Lubná coal measures): Kralupy, Votvovice, Mínice, Zákolany, Brandýsek, Vrapice, Dubí (near Kladno), Motyčín (near Kladno), Libušín (near Kladno), Lány, Rakovník, Lubná, Senec; Břasy; Třemošná, Nýřany ("Pankrác"),* Nýřany,* Kamenný Újezd,* Týnec,* Mantov.*

The Nýřany coalseries: Rakovník, Blevice (near Kralupy); Mirošov, Nýřany,* Nýřany ("Pankrác"),* Kamenný Újezd,* Třemošná, "Jalovčiny" (near Horní Bříza), Plasy, Heřmanova Huť,* Vlkýše*; Vranov* (near Stříbro).*

The Kounov coal series: Lobeč, Zeměchy, Kounov,* Kvílice; Horní Bříza ("Na Horách"), Ledce (the kaolin beds of the hill Krkavec).

The Permian coal district of Český Brod:

Peklov (near Kostelec nad Černými Lesy).

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

Westphalian:

The Žacléř* coal measure series: Žacléř* (mine Georg and Maria-Julia).

The Lower Svatoňovice coal measure series: Markoušovice* (mines: Petri, Erbstollen).

The coal series of Žďárky: Žďárky (mine Wilhelmina).

Stephanian:

The Lower Stephanian coal series of Ida or the Upper Svatoňovice coal series: M. Svatoňovice (Idastollen).

2. *Senftenbergia pennaeformis Bgt. sp.*

Bibliography and synonyms:

A. Brongniart (1) — Pecopteris aequalis pp. 343, Pecopteris pennaeformis pp. 345.
A. J. Corda (1) — Senftenbergia elegans pp. 91.
W. Gothan (1) — Senftenbergia pennaeformis pp. 157.
F. Němejc (1) — Senftenbergia pennaeformis pp. 43 and 87.
D. Štúr (3) — Senftenbergia Brandauensis pp. 83.
C. v. Ettingshausen (1) — Pecopteris pennaeformis pp. 45, Cyatheites setosus pp. 44.

Figures of typical specimens: see in R. Corsin (2) Pl. 15, fig. 1—3.

Localities:

The coal districts of Central Bohemia.

The Plzeň coal series: Merklín ("Na Výtuni").

The Upper Radnice coal series (incl. the Lubná coal measures): Lubná; Břasy; Nýřany* ("Pankrác"), Týnec.*

The Nýřany coal series: Nýřany* (cannel-coal); Rakovník.

The coal districts of Brandov in the Rudohoří [Erzgebirge] mountains (Upper Westphalian): Brandov (— Brandau —).

II. Ptychocarpus Weiss.

1. *Ptychocarpus unitus Bgt. sp.*

Bibliography and synonyms:

see in R. Kidston (3) part 6, pp. 548.

Figures of typical specimens see in R. Kidston (3) Pl. 131, fig. 1—9, 9a, textfig. 70, 71.

Localities:

This species was found till present only in the Nýřany* and Kounov* coal series of the coal districts of Central Bohemia as well as in the Upper Svatoňovice and Radvanice* coal series of the Bohemian part of the coal basin of Lower Silesia and in the Permian of Eastern Bohemia (i. e. Westphalian D, Stephanian and Permian).

The coal districts of Central Bohemia:

The Nýřany coal series: Vranov* (near Stříbro*); Nýřany,*, Nýřany* ("Pankrác"), Kamenný Újezd,* Sulkov, Líny, Nová Lhota,* Vlkýše,* Heřmanova Huť,* "Jalovčiny" (at Horní Bříza); Letkov; Skořice; Rakovník.

The Kounov coal series: Tlučná, Horní Bříza ("Na Čabalkách", "Na Horách"), Ledce, Ledce (the kaolin and clay beds of the hill Krkavec), Kotíkov,* the hill Malý Krkavec (near Kotíkov*), Košutka, "Na Vinici" (near Plzeň), Žilov, Trnová; Kounov,* Studňoves, Hvězda, Kvílice, Slané, Saky.

The Permian coal district of Český Brod:

Kšely, Vitice, Močidlo.

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

Stephanian:

The Upper Svatoňovice coal series (i. e. the Lower Stephanian coal series of "Ida"): Malé Svatoňovice ("Ida"), Hronov ("Maternice").

The Radvanice* coal series (i. e. Upper Stephanian): Radvanice.*

III. PECOPTERIDES inc. aff.: — the group of *P. feminaeformis.*

1. *Pecopteris feminaeformis Schl.*

Bibliography and synonyms:

see in *R. Zeiller* (6) pp. 55.

Figures of typical specimens see in R. Zeiller (6) Pl. 12, fig. 1—3.

Localities:

I stated this species only in the highest series of the Bohemian Carboniferous (i. e. Upper stephanian) and in the Permian beds.

The coal districts of Central Bohemia:

The Kounov* coal series: Trnová, Žilov; Kounov,* Mutějovice, Kroučová, Záboří, Hvězda, Tuřany, Kvílice, Slané, Kralupy.

The Permian coal district of Český Brod:

Český Brod (Permian limestones).

The Permian basin below the Krkonoše* mountains:

Košťálov (Permian).

IV. ACITHECA SCHIMPER.

1. *Acitheca ambigua Stbg. sp.*

Bibliography and synonyms:

P. Bertrand (1) — Pecopteris saraefolia pp. 87.
F. Němejc (2) — Acitheca ambigua pp. —.
E. Simson - Scharold (1) — Pecopetris saraefolia pp. 32.
K. c. Sternberg (1) — Strephopteris ambigua pp. 120.
D. Štúr (3) — Pecopteris (Danaeites ?) Röhli pp. 227.

Figures of typical specimens see in F. Němejc (2) Pl. 2.

Localities:

Untill present I know this species only from the Nýřany* coal series i. e. Westphalian D.

The coal districts of Central Bohemia:

The Nýřany* coal series: Nýřany,* Nýřany* ("Pankrác"), Kamenný Újezd,* Mantov,* Nová Lhota,* Sulkov, Heřmanova Huť,* Vlkýše,* "V Jalovčinách" (near Horní Bříza), Plasy; Mirošov; Skořice; Letkov.

2. *Acitheca polymorpha Bgt. sp.*

Bibliography and synonyms:

see in R. Kidston (3) part 6, pp. 539 and in F. Němejc (2).

Figures of typical specimens see in B. Renault-R. Zeiller (1) Pl. 16, fig. 5—6.

Localities:

This second species of *Acitheca* has been collected in Bohemia in the highest zones of the Nýřany coal series (in the coal seam called "stropová nýřanská sloj" or "Nýřaner Hangendflötz") of the Westphalian D, further within the Stephanian and Permian beds.

The coal districts of Central Bohemia:

The Nýřany* coal series: Nýřany;* Vladoměřice (near Manetín).

The Kounov* coal series: Tlučná; Trnová, Žilov, Horní Bříza ("Na Čabalkách", "Na Horách"), Ledce, Kotíkov,* Košutka, "Na Vinici" (near Plzeň); Kounov,* Kroučová, Studňoves, Záboří, Slané, Líbovice, Kvílice, Kralupy.

The Permian basin below the Krkonoše* mountains:
Košťálov (-Permian).

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):
Stephanian:

The Radvanice* coal series (Upper Stephanian): Radvanice,* Chvaleč.*

V. ASTEROTHECA PRESL.

This genus includes the greatest part of our *Pecopterids.* Species collected in the Bohemian coal districts may be classified into 4 groups:

A. Forms grouped arround Artis's species of *A. Miltoni*, characterised by rather broad tonguelike leaflets, slightly S-like bent central veins and once or twice divided secondary nerves.

B. Forms grouped round Brongniart's *A. Candolleana*, with relatively narrow leaflets, joined to the rhachises under rather acute (— more than in arborescens group —) angles (especially in the tops of the pinnae), with more or less straight central nerves and regularly once divided secondary nerves.

C. Forms grouped round Göppert's *A. densifolia*, with relatively broad tongue like leaflets, joined to the rhachises in a similar way as in the foregoing group. Central veins rather straight or only slightly S-like bent, secondary nerves regularly once divided.

D. Forms grouped arround Schlotheim's *A. arborescens* with leaflets narrow and relatively long, tongue like, joined to the rhachises under rather wide till almost right angles. Central veins always very straight, secondary nerves simple or once divided.

A. **The *Miltoni* group.**

1. *Asterotheca avoldensis Stur sp.*

Bibliography and synonyms:

R. Corsin (1) — Asterotheca avoldensis pp. 28.
R. Kidston (3) — Zeilleria avoldensis part 5, pp. 432.

Critical remarks:

Asterotheca avoldensis Stur sp. is characterised by similar but much smaller leaflets than the following *A. Miltoni* and by synangia situated at the extreme tops of the secondary nerves. I know it only from deeper horizons of the Bohemian Westphalian series.

Figures of typical specimens see in R. Corsin (1) Pl. 1, fig. 1—7, Pl. 2, fig. 2, 5, 6; R. Corsin (2) Pl. 30, fig. 3, 3a.

Localities:

The coal districts of Central Bohemia:

The Plzeň coal series: Nýřany,* Nýřany* ("Pankrác").

The Lower Radnice coal series (incl. the horizon of the "brousky" and "bělky" [Schleifsteine]): Dubí (near Kladno); Blatnice,* Kamenný Újezd,* Nýřany* ("Pankrác"), Bílá Hora.

The Upper Radnice coal series: Kralupy, Motyčín (near Kladno), Lubná ("Na Brantech").

2. *Asterotheca Miltoni Artis sp.*

Bibliography:

F. T. Artis (1). — *A. Brongniart* (1) pp. 56—58, 317; 337, 333. — *W. Gothan* (1) pp. 154. — *C. Grand'Eury* (1) pp. 68, 71, 72. — *C. Grand'Eury* (2) pp. 272. — *R. Kidston* (2) pp. 371, 374. — *R. Kidston* (3) 501—516, 495—500. — *H. Potonié* (1) pp. 68, 72, 76. — *K. c. Setrnberg* (1) pp. 120, 147. — *J. T. Sterzel* (2) pp. 417. — *D. Štúr* (3) pp. 108, 120, 126. — *B. Renault - R. Zeiller* (1) pp. 136. — *R. Zeiller* (1) pp. 85. — *R. Zeiller* (2) pp. 186—192. — *R. Zeiller* (4) pp. 17. — *R. Zeiller* (6) pp. 39, 44.

Figures of typical specimens see in: R. Corsin (1), Pl. 2, fig. 1, 3, 4; D. Štúr (3) Pl. 59; W. Gothan (1) Pl. 35, fig. 1, 2, 3.

Critical remarks:

It is very difficult to find in any greater monograph about the palaeozoic floras a sufficiently clear description of this species, as well as a reliable list of its synonyms. Perhaps in all (— even in the most recent —) publications, this form is partially mistaken for various similar forms identical with Sternberg's *P. alpina, undulata, aspidioides* and others. Such forms are certainly very similar to the true Artis's *P. Miltoni;* if only smaller leaf fragments available, it is rather impossible to distinguish, to which of them tey are belonging. But sufficiently great parts of fronds may be always easely identified. The best diagnosis may be perhaps found in D. Štúr (3) under the term of *Hawlea Miltoni* and in *W. Gothan* (1) under the term of *Pecopteris (Asterotheca) Miltoni.*

As to the definition of the true Artis's species of *P. Miltoni,* the chief uncertainty was caused by the want of knowledge of Artis's original specimen from 1825 (collected in the Westphalian coal measures of El se car colliery near Milton Furnace, Yorkshire), which has not been studied by any of the later scientists, because it was lost long ago. Therefore only a very thorough study of the later original specimens regarded by the various authors as *P. Miltoni,* a sufficient knowledge of various closely allied *Pecopteris* species collected in various coal basins of Western and Central Europe as well as a thorough comparision of them with the published figures and descriptions may lead us to an exact definition of the true *A. Miltoni.*

According to my opinion the first mistake was made here already by *A. Brongniart* (1), who under the term of *P. Miltoni* has joined together 3 different species: 1. The true Artis's *P. Miltoni* from the Westphalian of El se car, 2. *P. polymorpha Bgt.* from the Stephanian of Le Bousquet (Lodève) and finally 3. *P. aspidioides Stbg.* coming from Saarbrück. At the same time he described under the term of *P. abbreviata* true *P. Miltoni Art.* specimens from Bath (England) and Anzin (France). Further in 1890 C. Grand'Eury (2) described under the term of *Pecopteris abbreviata* specimens from the Carboniferous of the Gard coal districts, which are not identical with Artis' *Mil-*

toni, but with Sternberg's *Pecopteris alpina* (i. e. *polypodioides Stbg.*). This last species was described also by A. Brongniart (1) from the Carboniferous of Alais and Le Lardin under the term of *P. oreopteridia Schl.*, just as later by R. Zeiller (4) from the Carboniferous of Brive. H. Potonié (1) described the same *Pecopteris* species from the Stephanian and Permian of Thüringen partly as *P. pseudooreopteridia n. sp.* partly as *P. abbreviata.* In 1888 R. Zeiller (2) describes and figures under the term of *P. abbreviata* specimens, which may be rather identified with Sternberg's *P. aspidioides* than with Artis's *P. Miltoni.* R. Kidston includes in 1888 (2) among the true *P. Miltoni* specimens also Germar's *Miltoni* specimens from Wettin and Lebejün in Saxonia, which are nothing else than Sternberg's *P. alpina*, further Sterzel's *P. Miltoni* from N. W. Saxony, which are also only Sternberg's *P. alpina*, and finally Corda's *Hawlea pulcherrima*, which is the fertile state of Sternberg's *P. aspidioides.* In 1924 the same author (Kidston [3]) — as I convinced myself in Kidston's collections of the Geol. survey of Great Britain, London — has mistaken partially Sternberg's *Pecopteris alpina* for normal *P. Miltoni;* further he consequently described as Schlotheim's *Pecopteris oreopteridia* specimens of Sternberg's *Pecopteris alpina* (rsp. *polypodioides*).

For more detailed informations as to this taxonomic problem see the above mentioned bibliography.

True *Asterotheca Miltoni Artis sp.* is characterised by large fronds, the rhachises of which are always quite smooth, hairless. Their pinnae and leaflets are very similar to those of *A. avoldensis* Stur., and *A. aspidioides* Stbg. (resp. *undulata Stbg.);* but they are larger than in *A. avoldensis* and rather smaller than in *A. aspidioides.* Their central veins are slightly S-like bent, the secondary nerves are twice (at the base of the leaflets), or once furcated, or they are simple (in the tops of the leaflets). The synangia are situated between the margin and the central vein on the secondary or tertiary nerves, generally very near to the margin. In many cases, especially if the leaf margin is slightly turned over into the rock substance, it seems as if they would be attached directly on the leaf margin at the top of the secondary or tertiary nerves.

As to the stratigraphy we find true *A. Miltoni* in the coaldistricts of Western and Middle Europe chiefly in the Westphalian A and B. In the uppermost series of the Westphalian B and in the lower part of the Westphalian C it becomes rarer and is more and more replaced by Sternberg's *P. aspidioides* (resp. *undulata*) and similar forms. Later, especially in the Westphalian D, in the Stephanian and Permian series it is entirely missing and is substituted by *A. alpina Stbg.*

Localities:

The coal districts of Central Bohemia:

The Plzeň coal series: Nýřany,* Nýřany* ("Pankrác"); Merklín ("Na Výtuni").

The Lower Radnice coal series (incl. the "bělky" and "brousky" [Schleifsteine] horizon): Zbuch,* Nýřany* ("Pankrác"), Blatnice,* Bílá Hora; Zdejčiná (and perhaps some specimens from Strádonice); Malé Přílepy.

The Upper Radnice coal series (incl. the Lubná coal series): The occurrence of true P. Miltoni in this series is very doubtful. Perhaps some specimens from the following localities belong hereto: the surroundings of Kladno, Mínice, Rakovník; Nýřany,* Chlumčany, Žebnice.

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

Westphalian:

The Žacléř* coal series: Žacléř* (mine Maria-Julia).

The Lower Svatoňovice coal series: Markoušovice* (mine Ptri, Erbstollen).

3. *Asterotheca aspidioides Stbg. sp.*

Bibliography and synonyms:

A. Corda (1) Hawlea pulcherrima pp. 90.
C. v. Ettingshausen (1) Cyatheites oreopteridis pp. 43, Cyatheites undulatus pp. 44.
K. Feistmantel (2) Sphenopteris sporangifera pp. 58.
W. Gothan (1) Pecopteris pseudovestita pp. 163.
K. c. Sternberg (1) Pecopteris undulata pp. 154, Pecopteris aspidioides pp. XX., Pecopteris oreopteridis (ex parte) pp. 149.
D. Štúr (3) Hawlea žďárkensis pp. 126, Hawlea Schaumburg-Lippeana pp. 120.
R. Zeiller (2) Pecopteris abbreviata (at least ex parte) pp. 186—192, Pecopteris integra pp. 211.

Figures of typical specimens see in: D. Štúr (3) Pl. 57, fig. 1 and Pl. 58, fig. 1—4 ("Schaumburg Lippeana"), Pl. 58, fig. 5 ("Žďárkensis"); C. v. Ettingshausen (1) Pl. 21, fig. 3 ("undulata"), Pl. 15, fig. 2 ("oreopteridis"); W. Gothan (1) Pl. 34, fig. 2, 3, 4 ("pseudovestita Goth" i. e. "aspidioides Stbg.").

Critical remarks:

Fronds, their leaflets and nervation very similar to those of the foregoing species, but in all parts rather larger. Rhachises provided by scattered hairs (— sometimes they seem to be almost smooth). The synangia are situated between the margin and the central vein, they are of rather large size (— larger than in the foregoing species —) and are often covering the whole lower surface of the leaflets.

Fronds of this species have been of very large size, their pinnae rather polymorphous, which caused the complicated synonymity: parts from the tops have been described under the terms of *undulata Stbg. žďárkensis Stur*

or *integra Zeiller* (— hereto belongs also the fertile specimens of *Sphenopteris sporangifera* of K. Feistmantel —). Pinnae from the middle parts of the fronds with well expanded leaflets may be found in the respective bibliography under the names of *aspidioides Stbg.*, *pseudovestita Gothan* and partly also under the terms of *oreopteridis* (especially in Ettingshausen) and *abbreviata* (— hereto belongs Corda's fertile specimen of *Hawlea pulcherrima*). Finally pinnae from the basal parts of the fronds, where the relatively long leaflets are provided by rather strong central veins, represent Stur's *Hawlea Schaumburg-Lippeana.*

Stratigraphically this species, which in many cases is very difficult to be distinguished from Artis's *A. Miltoni*, seems to be a very characteristical Westphalian C element. It seems that it replaces slowly at the end of Westphalian B true *A. Miltoni.* At the end of Westphalian C it disappears slowly being replaced by Sternberg's *A. alpina* (resp. polypodioides).

Localities:

The coal districts of Central Bohemia:

The Lower Radnice coal series (incl. the horizon of the "bělky" and "brousky" [Schleifsteine]): Dibří, Strádonice; Vránovice, Svinná, Vejvanov; Nýřany* ("Pankrác").

The Upper Radnice coal series (incl. the Lubná coal measures): Kralupy, Mínice, Votvovice, Zákolany, Brandýsek, Motyčín (at Kladno), Libušín (at Kladno), Lány, Rakovník, Lubná; Břasy, Vranov; Nýřany* ("Pankrác"), Týnec,* Třemošná, Kazňov.

The Nýřany coal series: the occurrence of A. aspidioides in this series is very doubtful. Perhaps some specimens from Mirošov and Třemošná may belong hereto.

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

Westphalian:

The Lower Svatoňovice coal series: I am not quite sure about the occurrence of A. aspidioides in this coalseries. May be that some specimens collected at Markoušovice* (mine Petri or the gallery Erbstollen) as A. Miltoni belong hereto.

The coal series of Žďárky: Žďárky (near Hronov — mine Wilhelmine and some neighbouring galleries).

4. *Asterotheca alpina Stbg. sp.*

Bibliography and synonyms:

A. Brongniart (1) Pecopteris oreopteridius pp. 317 (Pl. 104, fig. 1, 2; pl. 105, fig. 1, 2, 3); Pecopteris villosa ? pp. 316 (Pl. 104, fig. 3).

C. *Grand'Eury* (2) Pecopteris abbreviata pp. 272 (Pl. 20, fig. 4).

R. *Kidson* (3) Asterotheca oreopteridia pp. 495—500; Asterotheca Miltoni (ex parte — only specimens cited from the Radstockian series) pp. 495; Pecopteris crenulata ?, pp. 516.

R. *Kidston* (2) Asterotheca oreopteridia pp. 371; Asterotheca Miltoni (ex parte — only specimens cited from the Radstockian series) pp. 374.

L. *Lesquereux* (1) Pecopetris vestita pp. 252.

H. *Potonié* (1) Pecopteris pseudovestita pp. 72 (Pl. 8, fig. 1—6), P. abbreviata pp. 76 (Pl. 8, fig. 5, Pl. 13, fig. 5), P. crenulata (ex parte) pp. 65 (Pl. 5, fig. 6).

K. c. *Sternberg* (1) Goeppertia polypodioides pp. 120, 121 (Pl. 50, fig. 1, 1a; fertile sp.), Pecopteris alpina pp. 147 (Pl. 39, fig. 5; sterile sp.).

D. *White* (1) Pecopteris vestita pp. 91.

R. *Zeiller* (4) P. (Asterotheca) oreopteridia pp. 17 (Pl. 5, fig. 7—9).

R. *Zeiller* (6) Pecopteris oreopteridia pp. 39.

Figures of typical specimens see in R. Zeiller (4) Pl. 5, fig. 7, 8, 9.

Critical remarks:

The complicated synonymity of Sternberg's *A. alpina* was without any doubt caused by the following facts: 1. By the want of knowledge of Sternberg's original specimens of *Pecopteris alpina* and *Goeppertia polypodioides* (— which both are conserved in the collections of the National Museum, Praha —) as well as of the original specimen of Schlotheim's *Filicites oreopteridius* (— which was lost —). — 2. By the fact, that Brongniart described under the term of *Pecopteris oreopteridia* leaves identical with Sternberg's *Pecopteris alpina.* — 3. Though Potonié (1) in 1893 pp. 62 showed clearly on the bases of Schlotheim's figures, that *Filicites oreopteridius Schl.* is identical with Goeppert's *Pecopteris densifolia* (—see also in T. J. Sterzel [2] 1901, pp. 417 —) and that therefore it is not to identify it with Brongniart's *Pecopteris oreopteridius,* Zeiller (6) insisted in 1906 on the justness of Brongniart's erronous identification. It seems, that this last Zeiller's point of view was followed by all later authors (also by Kidston).

Asterotheca alpina Stbg. is very similar to *Asterotheca Miltoni Art.* as to the size of the fronds and the shape of the leaflets. The nervation is somewhat simpler, the secondary nerves being generally only once furcated or simple. Twice divided secondary nerves are rather rare. The central vein of the leaflets is slightly S-like bent as in the foregoing *A. aspidioides.* The position of the synangia is the same as in *A. aspidioides,* but they are smaller. The rhachises are provided by numerous hairs.

Stratigraphically this form is still younger than the previous *A. aspidioides Stbg.* Its occurrence seems to begin at the top of the Westphalian C; in the Westphalian D and in the whole Stephanian it represents the most common form among the Pecopterids and we meet it also within the Permian.

Localities:

The coal districts of Central Bohemia:

The Nýřany* coal series: Blevice, Olovnice, Rakovník; Vladoměřice and the hill Sauberg at Stvolno* (near Manetín); Skořice; Mirošov; Vranov* (at Stříbro*); Vlkýše,* Heřmanova Huť,* Týnec,* Líny, Sulkov, Nová Lhota,* Dobřany,* Nýřany* ("Pankrác"), Tlučná, Třemošná, "V Jalovčinách" near Horní Bříza, Plasy.

The Kounov* coal series: Bílenec,* Kounov,* Kvílice, Záboří, Saky, Kamenomost, Zeměchy, Kralupy, Lobeč; Trnová, Ledce, Žilov, "Na Čabalkách" and "Na Horách" near Horní Bříza, Vorlík, Kotíkov,* Košutka.

The Permian coal district of Český Brod: Peklov, Kšely.

The Permian coal district of Vlašim: Chobot.

The Permian coal district of České Budějovice: Rudolfov.

The Permian basin below the Krkonoše* mountains:

Permian:

Dolní Kalná, Horní Kalná, Na Lísku (at Stará Paka), Ploužnice, Újezd pod Kumburkem, Smita, Košťálov.

Stephanian: Čikváska.

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

Stephanian:

The Upper Svatoňovice (or »Ida«) coal series: Malé Svatoňovice (the gallery "Ida").

B. **The Candolleana group.**

1. *Asterotheca candolleana Bgt. sp.*

Bibliography and synonyms:

A. Brongniart (1) Pecopteris candolleana pp. 310 (Pl. 100, fig. 1); Pecopteris cyathea pp. 307, ex parte (Pl. 101, fig. 4); Pecopteris affinis pp. 306 (Pl. 102, fig. 2, 3); Pecopteris lepidorhachis pp. 313, ex parte (Pl. 103, fig. 1).

C. Purkyně (1) Pecopetris hemitelioides.

Further see also the bibliography cited in the following critical remarks.

Figures of typical specimens see in: B. Renault-R. Zeiller (1) Pl. 11, fig. 3; H. Potonié (2) No. 10, fig. 1; Purkyně (1) Pl. 2, fig. 2.

Critical remarks:

As to the synonymity of *A. candolleana*, the most important statements were made by R. Zeiller (1) in 1880. According to him Schlotheim's *Filicites affinis* is not identical with *Pecopteris affinis Bgt.*, the first being equal with *Pecopteris cyathea Schl.*, the second with *Pecopteris candolleana Bgt.* This certainly just point of view was then followed by Potonié, Kidston and others. — Further I regard as very important a note by H. Potonié in 1893 (1) pp. 72, wherein he points out that the figure Pl. 103, fig. 1 by Brongniart (1) of *P. lepidorhachis* is rather differing from *P. lepidorhachis* as figured by Zeiller and Renault (1) in 1888. The mentioned Brongniart's figure may represent also only a specimen of *P. Candolleana.* — Finally I mention that H. Potonié in 1903 (2) joined erroneously to the true *P. Candolleana* also some small leafy specimes described originally in 1893 (1) under the name of *P. pennaeformis.* I convinced myself on a large material of specimens from the coal district of Č. Brod, that such specimens cannot be identified with the true *P. Candolleana* but that they represent an independent species, which I mention in the following as *A. Potoniéi n. nom.*

True *Asterotheca candolleana* has leaflets of a narrow tonguelike shape cca. 10 till 13 *mm* long joined to the respective rhachises under rather acute angles (never as wide as in *A. cyathea* or *arborescens).* The central vein in the leaflets is straight or only very slightly S-like. The secondary nerves are always once forklike divided, which happens nearly at the half way between the margin and the central vein (see also a note in *A. lepidorhachis Bgt. sp.).* Rhachises are provided with scattered hairs.

Localities:

The coal districts of Central Bohemia:

The Kounov* coal series: specimens of A. Candolleana are in the coal districts of Central Bohemia doubtful. Perhaps some rare specimens from Kounov* belong hereto.

The Permian coal district of Český Brod: Peklov.

The Permian basin below the Krkonoše* mountains:

Upper Stephanian: Dolní Štěpanice.*
Permian: Ploužnice, Krsmoly, Smity, Bytouchov.

2. *Asterotheca Potoniéi nov. nom.*

Bibliography and synonyms:

H. Potonié (1) Pecopteris pennaeformis pp. — (Pl. 9, fig. 1, 2).
H. Potonié (2) Pecopteris Candolleana Nro. 10, fig. 2 A, B.

Figures of typical specimens see in H. Potonié (1) Pl. 9, fig. 1, 2.

Critical remarks:

This species is very similar as to the shape of the pinnae, leaflets and of the nervation to *Asterotheca candolleana* Bgt. sp., but as to the size it is nearly half as small in all its parts, though its rhachises are very big. The leaflets are about 5—8 *mm* long.

Localities:

The Permin coal district of Český Brod: Kšely, Vitice.

The Bohemian part of the Lower Silesian coal district:

The Permian of Broumov:* Otovice.*

C. The densifolia group:

1. *Asterotheca densifolia Goepp. sp.*

Bibliography and synonyms:

H. R. Goeppert (2) Cyatheites densifolius pp. 120 (Pl. XVII, fig. 1, 2).
H. Potonié (1) Pecopteris oreopteridia pp. 68 (Pl. 5, fig. 5; Pl. 7, fig. 1—3).
B. Renault - R. Zeiller (1) Pecopteris densifolia pp. 152
E. F. Schlotheim (1) Filicites oreopteridius pp. 36 (Pl. 6, fig. 9).

Figures of typical specimens see in: R. Goeppert (2) Pl. 17.

Critical remarks:

It seems that Goeppert's *Cyatheites densifolius* (especially parts of fronds, where the ratio of the width to the length of the leaflets is about 1 : 2) is identical with Schlotheim's *Filicites oreopteridus*. Unfortunately Schlotheim's original specimen is lost and therefore no objective statement is to day possible. The only author pointing out this fact was H. Potonié. All the rest identified erroneously various specimens from the Miltoni group especially specimens identical with *Asterotheca alpina Stbg.* or *A. aspidioides Stbg.* with the named Schlotheim's specimen.

A. densifolia shows leaflets of a tongue like shape; the ratio of their width to their length is about 1 : 2 till 2·5 (sometimes even more). Their central vein is slightly S-like bent till nearly straight with a slightly decurrent base (— if in some impressions the base of the central vein is covered by the impression of the rhachis, to which the leaflets are joined, these veins seem to be quite straight and not decurrent —). The secondary veins are generally all once forklike divided, rarely simple. Rhachises are marked by scattered hairs or small scars left by them.

Localities:

The Permian coal district of Český Brod: Peklov.

The Permian coal district of České Budějovice: Lhotice.

2. *Asterotheca imbricata Goeppert sp.*

Bibliography and synonyms:

H. R. Goeppert (2) Neuropteris imbricata pp. 100 (Pl. 10, fig. 1, 2).
H. Potonié (1) pp. 68 and following.
B. Renault - R. Zeiller (1) Pecopteris densifolia pp. 152 (Pl. 16, fig. 1—4).

Figures of typical specimes see in H. R. Goeppert (2) Pl. 10, fig. 1, 2.

Critical remarks:

This species is very similar to the foregoing *Ast. densifolia.* It differs from it chiefly by the shape of the leaflets, which are relatively shorter and broader, the ratio of their width to their length being 1 : 1·5 till 1·8 (or some times nearly 2).

The occurrence of *A. imbricata* is the same as that of the foregoing species.

Localities:

The Permian coal district of Český Brod: Peklov.

The Permian basin below the Krkonoše* mountains: Dolní Kalná.

Note to the described forms of the densifolia group:

Both just described forms are very similar each to the other. If we have parts of fronds, where the ratio of the width to the length of the leaflets measures about 1 : 2, the determination is practically impossible. And just such specimens correspond best with Schlotheim's figure of *P. oreopteridia.* — Further Goeppert (l. c.) described some very young frond parts (or tops of fronds) under the name of *Sphenopteris integra.* A reliable determination of such specimens seems to me to be also impossible. Goeppert's figures of *Sphenopteris integra* may be perhaps *A. densifolia.* — In the whole it is a serious question whether both cited forms *(densifolia* and *ibricata)* do not perhaps belong to one and the same species as only various parts of its large and very compound fronds.

D. **The arborescens group:**

1. *Asterotheca arborescens Schl. sp.*

Bibliography and synonyms:

A. Brongniart (1) Pecopteris arborescens pp. 310 (Pl. 102; ? Pl. 103, fig. 2, 3); ? Pecopteris cyathea (ex parte) pp. 307 (Pl. 101, fig. 1, 2).
E. F. Germar (1) pp. 97 (Pl. 34, fig. 1, 2, 3; Pl. 35, fig. 5, 6, 7 non 4).
H. R. Goeppert (2) Cyatheites Schlotheimi pp. 120—122 (Pl. 15, fig. 1, Pl. 16, fig. 12).
R. Kidston (3) part 5, pp. 483.
H. Potonié (1) pp. 57 (only Pl. VI, fig. 6).
B. Renault - R. Zeiller (1) pp. 111 (Pl. 11, fig. 1, 2).
E. F. Schlotheim (1) Filicites arborescens pp. 41 (Pl. 8, fig. 13).
C. De Stephani (1) pp. 14.
J. T. Sterzel (1) pp. 17.
J. T. Sterzel (3) pp. 537.
R. Zeiller (1) pp. 81 (Pl. 164, fig. 4).
R. Zeiller (3) pp. 45.

Figures of typical specimes see in B. Renault-R. Zeiller (1) Pl. 11, fig. 1, 2.

Critical remarks:

Asterotheca arborescens is characterised by leaflets of a very regular tonguelike shape, joined to the respective rhachises at a very open angle (till 80° or even more, sometimes nearly 90°). The ratio of their width to their length is generally 1 : $2^1/_3$ till $2^1/_2$. The central vein is straight just as the secondary nerves, which are generally simple or some of them rarely once furcate. The rhachises of true *A. arborescens* are always provided with scattered hairs or little scars left by them (— some authors supposed them to be quite smooth —).

Many palaeobotanists supposed *A. arborescens* to be identical with *Pecopteris cyathea Schl.* This last may represent only basal parts of the large fronds of the first one [H. Potonié (1), H. B. Geinitz (1) pp. 24, R. Schimper (1), O. Heer (1) pp. 27, R. Kidston (1; non 3) pp. 113 and 115, C. de Stephani (1), J. T. Sterzel (3) pp. 537 (non 1 — pp. 19)]. In the contrary Germar in 1851 (1), Zeiller in 1890 (3) further Sterzel in 1893 (1) and Kidston in 1924 (3) think both to be independent species. According to my experiences (see also in *Asterotheca nýřanensis nov. nom.* and *Ast. cyathea Schl. sp.)* the first idia is more probable, but untill present I could not find sufficiently large specimens, on which this relation might be conspicuous. It is very remarcable that both forms *(arborescens* and *cyathea)* are often found together. Nevertheless I describe here both Schlotheim's species separately.

True *Asterotheca arborescens Schl.* may be perhaps found already in extreemely high horizons of the Westphalian D. It is very frequent in the Stephanian and Permian beds.

Localities:

Coal districts of Central Bohemia:

The Nýřany coal series: Specimes of true *A. arborescens Schl.* are rather doubtful; perhaps some specimens from Nýřany* and Mirošov may belong hereto.

The Kounov coal series: Kounov,* Kroučová, Kvílice, Hvězda (near Slaný); Tlučná, "Na Vinici" at Plzeň, the hill Malý Krkavec (near Kotíkov*), the caolin beds of the hill Krkavec near Ledce, Ledce, "Na Horách" and "Na Čabalkách" near Horní Bříza, Trnová.

The Permian coal district of Český Brod: only some doubtful specimens from Peklov.

The Permian below the Krkonoše* mountains:
Stephanian: Dolní Štěpánice,* Nedvězí, Čikváska.
Permian: Košťálov, Ploužnice, Smita.

The Permian coal districts of Vlašim and of České Budějovice: hereto belong perhaps some very doubtful specimens collected at Chobot (near Vlašim), and at Rudolfov (near Č. Budějovice).

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

The Upper Svatoňovice (or "Ida") coal series: Malé Svatoňovice (gallery "Ida"), Jibka* (mine: Tmavý důl), Hronov ("Maternice").

2. *Asterotheca cyathea Schl. sp.*

Bibliography and synonyms:

A. Brongniart (1) Pecopteris cyathea pp. 307 (only 101, fig. 3).
O. Heer (1) Cyatheites arborescens var cyathea pp. 28.
B. Renault - R. Zeiller (1) pp. 119 (Pl. 13, fig. 1—4).
E. F. Schlotheim (1) Filicites cyatheus pp. 38 (only Pl. 7, fig. 11).
K. c. Sternberg (1) Pecopteris lanceolata pp. 147.
R. Zeiller (1) pp. 82 (Pl. 169 fig. 5, 6).
Further see also the bibliography and notes cited under the foregoing *A. arborescens Schl. sp.*

Figures of typical specimens see in B. Renault-R. Zeiller (1) Pl. 13, fig. 1—4.

Critical remarks:

Asterotheca cyathea Schl. sp. is very similar to *A. arborescens Schl. sp.* The specimens included generally hereto are more robust than those of the

foregoing species. Their leaflets are longer and the furcated secondary nerves are more numerous. Otherwise I am anable to state any differences.

As once told, this form was generally regarded by the most palaeobotanists as identical with *Asterotheca arborescens Schl.* Only Zeiller in 1890 (3) and Germar in 1851 (1) pointed out some slight differences. R. Kidston originally (1 — see pp. 113, 115) agreed also with the point of view of the most palaeobotanists, but later in 1924 (3), undoubtedly misled by a very similar species from the uppermost Westphalian (— see the following *A. nýřanensis n. nom.*), he returned to the view of Zeiller and Germar.

Specimens of true Schlotheim's *A. cyathea* (i e. Sternberg's *P. lanceolata)* were rather rarely collected in our coal districts. They have been found generally in the same places where *A. arborscens* occured.

Localities:

The coal districts of Central Bohemia:

Typical specimens of *A. cyathea Schl.* are not known to me from those regions. Perhaps some *A. arborescens* specimens showing relatively long leaflets from the various localities within the Kounov coal series may be ranged hereto.

The Permian coal district of Český Brod: Peklov.

The Permian basin below the Krkonoše* mountains:

Stephanian: Dolní Štěpanice,* Čikváska.

3. *Asterotheca nýřanensis n. nom.*

Bibliography and synonyms:

R. Kidston (3) Asterotheca cyathea pp. 488 (perhaps only ex parte); Asterotheca hemitelioides pp. 519 (ex parte ?; Pl. 117, fig. 1, 2, 4, 5).
E. F. Schlotheim (1) cf.: Filicites affinis pp. 38 (Pl. 8, fig. 14).

Figures of typical specimens see in R. Kidston (3) Pl. 116, fig. 3, Pl. 117, fig. 3.

Critical remarks:

This species is in a high measure similar to the preceeding species of *A. cyathea Schl.* and thus also sometimes to *A. arborescens Schl.* (— see our note about Kidston's view in the description of both just mentioned species —). It is characterised by the very variable length of the leaflets of the last pinnae. The leaflets are relatively narrower and longer than in *A. arborescens* resp. *cyathea.* If they are smaller, their secondary nerves are generally all simple or only exceptionally some of them are once furcated. Well

developed or larger (— in the pinnae of the middle or lower parts of the fronds —) leaflets are generally always provided by some once furcated secondary nerves. The rhachises if well preserved are always provided by scattered hairs (similarly as in *arborescens* and *cyathea*).

This species seems to be charcteristic for the uppermost Westphalian D, partly also for the Lower Stephanian.

Localities:

The coal districts of Central Bohemia:

The Nýřany* coal series: Vranov* (near Stříbro*); (?) the hill Sauberg at Stvolno* (near Manetín); Letkov; Mirošov; Skořice; Kralupy, Rakovník; Heřmanova Huť,* Přehýšov,* Vlkýše,* Týnec,* Líny, Sulkov, Nová Lhota,* Kamenný Újezd,* Nýřany,* Nýřany* ("Pankrác"), Tlučná, Třemošná, "V Jalovčinách" (at Horní Bříza), Plasy.

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

The Upper Svatoňovice (or "Ida") coal series: Malé Svatoňovice (the gallery "Ida").

4. *Asterotheca permica n. nom.*

Bibliography and synonyms:

H. Potonié (1) Pecopteris arborescens pp. 57 (ex parte, only Pl. 6, fig. 5).

Figures of typical specimens see in H. Potonié (1) Pl. 6, fig. 5.

Critical remarks:

The whole aspect of the specimens, which I range under the name of *A. permica*, is similar to *A. arborescens Schl.* resp. also *A. cyathea Schl.* and *A. nýřanensis n. nom.*, but their leaflets are far more slender. Even if the rhachises are relatively big, the pinnae and leaflets are generally strikingly small. The rhachises are hairy, the leaflets are similar to those of *A. nýřanensis*, but their secondary nerves are mostly once furcated, some of them also simple and slightly arclike bent (— not quite straight as in *A. arborescens* —).

As to the vertical distribution of this species, it seems to be restricted to the Permian and the uppermost parts of the Stephanian.

Localities:

The Permian coaldistricts of Český Brod:

Kšely, Český Brod.

The Permian coal district of Vlašim:
Chobot.

The Permian coal district of České Budějovice:
Lhotice, Rudolfov.

The Permian basin below the Krkonoše* mountains:

Permian: Košťálov, Heřmanovy Seify,* Ploužnice, Smita, Lhota Bradlecká, Horní Kalná.

The coal districts of Žacléř,* Svatoňovice, Radvanice* and the Permian of Broumov* (i. e. the Bohemian part of the Lower Silesian coal basin):

Stephanian: Radvanice, Chvaleč.

Permian: Otovice* (near Broumov*).

5. *Asterotheca thuringiaca n. m.*

Bibliography and synonyms:

Pecopteris crenulata H. Potonié 1893 (1) — pp. 65 (ex parte — only Pl. 6, fig. 1—4); — non R. Kidston 1924 (3) pp. 516, nec. R. Zeiller 1888 (2) pp. 192, nec A. Brongniart 1828 (1) pp. 300.

Figures of typical specimens see in H. Potonié (1) Pl. 6, fig. 1—2.

Critical remarks:

H. Potonié described under the term of *Pecopteris crenulata* parts of a very small leafy frond of an *Asterotheca* from the Permian of Mannebach (Thüringen), which as to its top parts reminds slightly the foregoing form of *A. permica.* But the leaflets of the middle and basal parts of its fronds are always crenulated till lobed. The nervation of the leaflets shows almost straight central veins and slightly arclike bent and generaly once till twice furcated secondary nerves. The rhachises are rather big and provided with numerous hairs.

Specimens described under the same name (i. e. *crenulata*) by Brongniart, Zeiller and Kidston, are more robust and seem to belong as special fossilisation states to various species of the *Miltoni* group.

Localities:

Specimens of true *A. thuringiaca* has been untill present very rarely collected in the Permian of Bohemia. I know it only from the bituminous limestones of Otovice* near Broumov.*

6. *Asterotheca hemitelioides Bgt.*

Bibliography and synonyms:

A. Brongniart (1) Pecopteris hemitelioides pp. 314 (Pl. 108, fig. 1, 2).
R. Kidston (3) pp. 514 (the figures on Pl. 117, fig. 1, 2, 4, 5 seem to represent lerger specimens of our Asterotheca nýřanensis Njc).
H. Potonié (1) pp. 51 (Pl. 7, fig. 6, 7; — ? Pl. 5, fig. 7).
J. T. Sterzel (1) P. hemitelioides, P. Zeilleri, P. subhemitelioides (all are very typical specimens of Brongniart's P. hemitelioides).
B. Renault - R. Zeiller (1) pp. 133 (Pl. XI, fig. 7 [non 6, which is perhaps Schlotheim's P. cyathea ?]).
R. Zeiller (3) pp. 50 (Pl. 9 A, fig. 2).
R. Zeiller (4) pp. 15 (Pl. 3, fig. 1—3 [very typical specimens]).
R. Zeiller (6) pp. 38.

Figures of typical specimens see in: J. T. Sterzel (1) Pl. 2, fig. 1—9, Pl. 3, fig. 1, 2; B. Renault - R. Zeiller (1) Pl. 11, fig. (? 6), 7; R. Zeiller (4) Pl. 3, fig. 1—3.

Critical remarks:

Asterotheca hemitelioides is characterised by leaflets similar to *Asterotheca arborescens*, but their size is far larger (2 till 3 times). The nervation agrees also with that of *A. arborescens*; the secondary nerves are always simple. Once forked veinlets in true *A. hemitelioides* are extreemely rare. The rhachises are rather densely covered by hairs or show small scars left by them.

Stratigraphycally true *A. hemitelioides Bgt. sp.* seems to be restricted to the Stephanian and Permian strata.

Localities:

The coal districts of Central Bohemia:

The Kounov* coal series: Kounov.*

7. *Asterotheca lepidorhachis Ren. - Zeil. sp.*

Bibliography and synonyms:

A. Brongniart (1) pp. 313. Pecopteris lepidorhachis (Pl. 103, fig. 1 is rather identical with P. Candolleana Bgt. and not with specimens described by later authors as P. lepidorhachis; Pl. 103, fig. 5, has simple secondary nerves and seems thus to correspond with Ast. arborescens or cyathea Schl.).
R. Kidston (3) pp. 535.
H. Potonié (1) pp. 72.
C. Purkyně (2) Pecopteris lepidorhachis (Pl. 1; Pl. 2, fig. 1).
B. Renault (1) Vol. III., Pl. 18, fig. 9, 10 — are copies from Brongniart.
B. Renault - R. Zeiller (1) Pecopteris lepidorhachis pp. 123 (Pl. 13, fig. 5, Pl. 14, fig. 1—3).

Figures of typical specimens see in: C. Purkyně (2) Pl. 1, Pl. 2, fig. 1; B. Renault - R. Zeiller (1) Pl. 14, Pl. 13, fig. 5.

Critical remarks:

H. Potonié in his work from 1893 (1) points out, that the figure Pl. 103, fig. 1 of Brongniart (1) differs widely from specimens figured by Renault and Zeiller in 1888 (1) as *Pecopteris lepidorhachis* and that they are rather similar to *P. Candolleana Bgt.*, which after a thorough reexamination of both species I suppose to be quite just (— but Potonié's fig.: Pl. V. fig. 2 seems to represent rather a form of the group of *A. densifolia* showing too short and broad leaflets —). And as the second fig. of A. Brongniart (1) (i. e. Pl. 103, fig. 5) shows only simple secondary nerves (— pointing by this feature to *A. arborescens* or *cyathea Schl.* —), it is sure that no of any mentioned Brongniart's specimens of *A. lepidorhachis* is identical with specimens termed by the later authors [especially by Renault and Zeiller (1)] as *A. lepidorhachis.* In 1925 R. Kidston (3) pp. 535 thought (partly on the bases of Zeiller's letter) some specimens of Great Britain (Radstockian series: — Pl. 127, fig. 1, 2) to be identical with Renault - Zeiller's species of *P. lepidorhachis* from 1888. After a reexamination of a large material of specimens from the coaldistricts of Bohemia, which could be identified with *P. lepidorhachis* and after a thorough comparison of them with both forms — i. e. the French form of Renault - Zeiller and with the British specimens of Kidston —, I am convinced that Renault - Zeiller's French form and the British form of Kidston are two independent (though rather similar) species, which both are also present in our Bohemian coal districts. They differ essentially by the form of the last pinnae and by the character of the fertile leaflets (— see also in the following species of *Ast. raconensis n. nom.* —).

A. lepidorhachis is very similar to some larger specimens of *Ast. cyathea Schl.* Its ultimate pinnae are characterised by rather suddenly rounded tops. The secondary nerves are all (very near at their base) once forklike divided. The rhachises are hairy. The consistence of the leaflets seems to have been rather thick or leathery on account of the thick coaly film adhering to the imprints. The lamina of the fertile leaflets is always divided into two longitudinal rows of quadrangular areas.

As to the stratigraphy, this species seems to be very characteristical for Stephanian series.

Localities:

The coal districts of Central Bohemia:

The Kounov* coal series: Kounov,* Mutějovice, Kroučová, Studňoves, Kvílice; "Na Čabalkách" and "Na Horách" at Horní Bříza, Vorlík, Kotíkov,* "Na Vinice" at Plzeň.

The Permian coal district of Český Brod: Specimens of true A. lepidorhachis are rather doubtful from this region. Perhaps some small specimens collected at Peklov belong hereto.

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

The Radvanice* coal series (Upper Stephanian): Radvanice,* Vernéřovice.*

8. *Asterotheca raconensis n. nom.*

Bibliography and synonyms:

R. Kidston (3) Pecopteris lepidorhachis pp. 525 (Pl. 127, fig. 1, 2).

Figures of typical specimens see in: R. Kidston (3) Pl. 127 fig. 1, 2.

Critical remarks:

This species is very similar to the true *Ast. lepidorhachis.* It differs from the last: 1. by the shape of the last pinnae, which are slowly narrowed towards their tops. 2. By the consistence of the leaflet lamina, which according to the coaly film adhering to the respective impressions was thinner than in *A. lepidorhachis.* 3. Fertile specimens do not show the mentioned remarcable sculpture of two rows of quadrangular areas (see also in the preceeding diagnosis of *A. lepidorhachis).*

This species seems to be geologically older than the true *A. lepidorhachis.* Its main occurrence seems to be in the uppermost Westphalian (chiefely Westphalian D). Some specimens are known also from the Lower Stephanian.

Localities:

The coal districts of central Bohemia:

The Nýřany* coal series: Rakovník; Mirošov; Letkov; Nýřany,* "V Jalovčinách" at Horní Bříza; Heřmanova Huť;* Vranov* (near Stříbro*).

The coal districts of Žacléř,* Svatoňovice and Radvanice* (i. e. the Bohemian part of the Lower Silesian coal basin):

The Upper Svatoňovice (or "Ida") coal series (Lower Stephanian): Malé Svatoňovice (the gallery "Ida"), Hronov ("Maternice").

List of the localities and of their present German official names, which after the Munich agreement (1938) remained beyond the new frontier in the Sudetengau of Germany:

Central Bohemian coal districts:

Heřmanova Huť	Herrmannshütte
Vlkýše	Wilkischen
Přehýšov	Přeheischen
Blatnice	Blattnitz
Kamenný Újezd	Stein-Aujezd
Nýřany	Nürschan
Mantov	Mantau
Týnec	Teinitzl
Zbuch	Zwug
Dobřany	Dobrzan
Nová Lhota	Elhotten
Kotíkov	Kottiken
Stříbro	Mies
Vranov	Wranowa
Stvolno	Zwollen
Bílenec	Willenz
Kounov	Kaunowa

Lower Silesian coal districts:

Žacléř	Schatzlar
Markoušovice	Markausch
Radvanice	Radowenz
Chvaleč	Qualisch
Vernéřovice	Wernersdorf
Jibka	Jibka
Broumov	Braunau
Otovice	Ottendorf

The permian basin below the Krkonoše mountains (= Riesengebirge):

Dolní Štěpanice	Nieder-Stepanitz
Heřmanovy Sejfy	Hermannseifen

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