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F. NĚMEJC:

TAXONOMICKÁ STUDIE O PLODNÍCH ŠIŠTICÍCH CALAMITACEÍ ZE STŘEDOČESKÝCH KAMENOUHELNÝCH PÁNVÍ

TAXONOMICAL STUDIES ON THE FRUCTIFICATIONS OF THE CALAMITACEAE COLLECTED IN THE COAL DISTRICTS OF CENTRAL BOHEMIA

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F. NĚMEJC:

Taxonomická studie o plodních šišticích Calamitaceí ze středočeských kamenouhelných pánví

Таксономическое изучение спороносных колосков каламитов из среднечешских каменоугольных бассейнов

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Při revisi permokarbonské květeny našich kamenouhelných pánví, kterou jsem podnikl za tím účelem, aby bylo vneseno náležité světlo do stratigraficko-geologických poměrů kamenouhelných ložisek ve středních Čechách (t. j. západně od toku Vltavy), zjistil jsem v různých sbírkách, hlavně ve sběrech geologicko-paleontologického oddělení Národního musea v Praze, značný počet různých druhů plodních šištic, které bezesporu náležejí tehdejším rostlinám přesličkovitým. Při jejich bližším studiu se ukázalo, že jejich počet jest větší než počet druhů vymezených na podkladě kmenů anebo na podkladě nalezených olistněných větviček. Pro druhovou rozmanitost naskytla se též možnost případného využití jejich výskytu pro praktické účely stratigrafického výzkumu, což ovšem předpokládalo předem jejich přesné taxonomické zhodnocení. Podrobné výsledky tohoto studia s příslušnými diagnosami jednotlivých vymezených forem podávám v následující anglicky sepsané stati. Vzhledem k tomu, že většina nálezů představuje pouhé otisky, nemohl jsem brát zřetel k velmi důležité stránce anatomické a zejména k povaze výtrusů. Jednotlivé uvedené „druhy" jsou vymezeny jen podle znaků morfologických; — jsou tedy jistě místy rázu poněkud umělého. Nicméně právě proto, že jsou vymezeny na základě nejběžnějšího způsobu zachování (otisky), mohou vyhovovati poměrně dobře požadavkům praktických stratigrafů, kteří jen v mizivé menšině případů mají příležitost studovat své nálezy i s jiných hledisek. Snad později se naskytne příležitost studovat alespoň některé zde vymezené „druhy" též s hlediska anatomického neb podle obsažených výtrusů a tím doplniti aspoň částečně stávající mezery.

Veškeré prostudované nálezy patří k 5 různým rodům a to: *Palaeostachya* WEISS (7 neb snad spíše 8 druhů: *P. ettingshauseni* KIDST. a snad též *P. pedunculata* WILL., *elongata* PRESL in STBG., *distachya* STBG., *ra-*

conicensis n. sp., *feistmanteli* n. sp., *cylindrica* n. sp., *gracillima* WEISS), *Calamostachys* SCHIMPER (10 druhů: *C. tuberculata* PRESL in STBG., *incrassata* n. sp., *longibracteata* n. sp., *calathifera* WEISS, *germanica* WEISS., *intermedia* n. sp., *ramosa* WEISS., *grandis* JONGM., *tenuis* O. FEISTM., *charaeoformis* JONGM.), *Huttonia* STBG. (1 druh: *H. spicata* STBG.), *Macrostachya* SCHIMP. (1 druh: *M. carinata* GERM.) a *Cingularia* WEISS (1 druh: *C. typica* WEISS).

Stratigraficky se ukázalo, že většina jich se objevuje v radnické serii (incl. lubenské sloje) spodních šedých vrstev (t. j. prakticky ve westfalienu C a snad na basi v přechodu do westfalienu B). V nýřanské serii spodních šedých vrstev (t. j. ve westfalienu D) a v serii kounovské (t. j. svrchní šedé vrstvy; stefanien) jsem zjistil zatím pouze *Calamostachys tuberculata* PRESL in STBG., *calathifera* WEISS a *germanica* WEISS, *Macrostachya carinata* GERM., jakož i některé vzácné nálezy upomínající úplně na *Palaeostachya ettingshauseni* KIDST. Druhy *Calamostachys tuberculata* PRESL in STBG. a *calathifera* WEISS, právě tak jako *Macrostachya carinata* GERM. nebyly zatím zjištěny v hlubších (t. j. radnických) obzorech, ačkoliv jsou z těchto obzorů uváděny olistěné větévky až k nerozeznání podobné oněm, které jsou právě typické pro přesličkovité rostliny nesoucí takové šištice. Konečně bylo shledáno, že všechny prozatím zjištěné nálezy pravých *Cingularií* pocházejí pouze z obzoru lubenských slojí radnického pásma.

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При ревизии пермокарбонской флоры наших каменноугольных бассейнов, которую я предпринял за тем, чтобы как надо объяснить стратиграфическо-геологические отношения каменноугольных залежей в средней Чехии (т. е. на запад от течения Влтавы) я установил в разных коллекциях особенно в коллекциях геологическо-палеонтологического отделения Национального Музея в Праге, значительное количество разных видов спороносных колосков, которые без всякого сомнения принадлежат к тогдашним хбощевым растениям. При их близшем изучении показалось, что их количество превышает количество видов определенных на основании стволов или на основании найденных веток с листьями. Благодаря сортовой разнообразности показалось также возможность случайного использования их нахождения для практических целей стратиграфического исследования, что конечно предполагало наперед их точное таксономическое обсуждение. Подробные результаты этого изучения с принадлежащими диагнозами отдельных точно определённых форем я сообщаю в следующей по английски написанной статьи. Смотря на то, что большинство находок представляет только отпечатки, я не мог обращать внимание к очень важной части анатомической и особенно к характеру спор. Отдельные показанные виды определены только на основании знаков морфологических. Значит они по истине иногда характера немножко искусственного. Тем не менее, именно что они определены на основании самого обычного способа сохранения (отпечатки), могут удовлетворять совсем хорошо требования практических стратигра-

фов, которые только в ничтожном количестве случаев имеют возможность изучать свои находки также с других точек зрения. Может быть позже случатся также возможность изучать хотя бы некоторые здесь определённые виды тоже с анатомической точки зрения или на основании содержащихся спор и тем дополнить хотя бы частично существующие проблемы.

Все изучаемые находки относятся к 5 разным родам и то: *Palaeostachya* WEISS (7 или по всей вероятности 8 видов: *P. ettingshauseni* KIDST., — а может быть тоже *P. pedunculata* WILL. —, *P. elongata* PRESL. in STBG., *distachya* STBG., *raconicensis* n. sp., *feistmanteli* n. sp., *cylindrica* n. sp., *gracillima* WEISS), *Calamostachys* SCHIMPER (10 видов: *C. tuberculata* PRESL. in STBG., *incrassata* n. sp., *longibracteata* n. sp., *calathifera* WEISS., *germanica* WEISS., *intermedia* n. sp., *ramosa* WEISS., *grandis* JONGM., *tenuis* O. F., *charaeformis* JONGM.), *Huttonia* STBG. (1 вид: *H. spicata* STBG.), *Macrostachya* SCHIMP. (1 вид: *M. carinata* GERM.) и *Cingularia* WEISS (1 вид: *C. typica* WEISS).

Стратиграфически показалось, что большинство их появляется в радницкой серии нижной серой свиты (т. е. практически вестфал Ц). В ныржанской серии нижной серой свиты (т. е. вестфал Д) и в серии коуновской (т. е. верхной серой свиты; стефан) я установил до сих пор только *Calamostachys tuberculata* PRESL. in STBG., *calathifera* WEISS, *germanica* WEISS и *Macrostachya carinata* GERM., так же как и некоторые редкие находки, припоминающие в полне *Palaeostachya ettingshauseni* KIDST. Виды *Calamostachys tuberculata* PRESL. in STBG. и *calathifera* WEISS, так само как *Macrostachya carinata* GERM. не были до сих пор найдены в глубших сериях, несмотря на то, что из этих сериев показываются ветки с листьями почти в ничем не отличающиеся от тех, которые так типичны для хвощевых приносающих такие колоски. На конец было установлено, что все до сих пор существующие находки настоящих Цингулярий происходят только из зоны лубенских пластов радницкой серии.

Taxonomical studies on the fructifications of the Calamitaceae collected in the coal districts of Central Bohemia

Introduction.

Revising the large material of various articulatinean remains from the coal districts of Central Bohemia contained in the collections of the geological and paleontological department of the National Museum, Prague, I stated a rather large number of various types of fructification cones, which according to their external features may be ascribed without any doubt to the family of the *Calamitaceae*. The number of discovered well defined "palaeontological species" of these fructifications is greater than the number of various calamarian leaf types, which were stated hitherto from the same regions. This fact attests anew the well known

experience, that many Calamites species, which were provided by rather similar leaves, bore very often a different kind of cones.

In this study I am presenting the results of my taxonomical investigations on the above mentioned cone like fructifications, based only on various external morfological features of their impressions taking not into account the internal structures or the character of the spores contained eventually within their sporangia. As to our material from Central Bohemia, I have to point out, that such tasks (connected eventually with other anatomical problems) might be answered only in several exceptional cases, where some coaly films are adhering to the respective impressions. Perhaps I shall discuss them later on in a separate study. The present paper was written with the aim to show the relatively very large number of various Calamites fructifications of our coal districts, of which several have not yet been registered in the literature dealing with the flora of our Bohemian Carboniferous and more over several represent even quite new forms. The second aim of this study is the examination of the stratigraphical distribution of the various "species" and the eventual determination of their relations to some of the hitherto known "species" of the leafy twigs or truncs of the Calamitaceae.

Until present I was able to distinguish according to the external morphological features the following "species", which are to be ranged into 5 distinct natural genera as follows:

Palaeostachya:

ettingshauseni KIDST. and perhaps also *pedunculata* WILL.
elongata PRESL in STBG.
distachya STBG.
raconicensis n. sp.
feistmanteli n. sp.
cylindrica n. sp.
gracillima WEISS.

Calamostachys:

tuberculata PRESL in STBG.
incrassata n. sp.
longibracteata n. sp.
calathifera WEISS.
germanica WEISS.
intermedia n. sp.
ramosa WEISS.
grandis JONGM.
tenuis O. FEISTM.
charaeformis JONGM.

Huttonia:

spicata STBG.

Macrostachya:

carinata GERM. (i. e. *infundibuliformis* BGT. et auct.)

Cingularia:

typica WEISS (i. e. *infundibuliformis* BRONN.)

As to the stratigraphical distribution of the various species cited just above, I have to state that the greatest part of them is restricted to the Radnice coal measure series (incl. the Lubná coal measures), i. e. the transition from Westphalien B to C. Within the Nýřany (Westph. D) and Kounov coal measure series (Upper Stephanien) only *Calmostachys tuberculata , calathifera. germanica,* several rare specimens reminding strongly *Palaeostachya ettingshauseni* and *Macrostachya carinata* have been found. As to these just named species, I never have seen any specimen of true *Calamostachys tuberculata* and *calathifera,* just as *Macrostachya carinata* among fossils from deeper (i. e. Radnice coal measure series) horizons. Further it may be emphasized that true *Cingularia typica* was collected until present only in the highest zone of the Radnice coal measure series i. e. in the shales accompanying the Lubná coal measures; it never has been found in deeper zones of that series.

Description and discussion of the species.[1])

I. Palaeostachya WEISS.

The main character of this genus, i. e. the axillary position of the sporangiophores, is very often difficult to be clearly verified in the impressions because these are mostly wholly covered by the sterile bracts which generally are turned upwards and adpressed to the cones hidding thus the inner parts of the cones. Then we have to refer to the general appearence of the respective cone impressions, eventally in more suitable cases we have to examine very thoroughly the cone axis in places where accidentally the bracts are torn off and the position of the small scars showing the insertion of the sporangiophores is visible.

Comparing the size and shape of the various Palaeostachya cones collected in the coal districts of Bohemia as well as their arrangement on the respective Calamitean twigs, the size and shape of their sterile bracts and not in the last range also their eventual relations to several species of the Calamites truncs resp. the Asterophyllites or Annularia leafy shoots I was able to distinguish among the specimens from Central Bohemia at least the 6 above named more or less easy distinguishable forms ("species"). Most of them are distributed only in the Radnice coal measure series. Only 1 species (identical most probably with *Palaeostchya ettingshauseni* KIDST.) may be found also in younger horizons.

[1]) I regard here as quite superfluous to recapitulate in this special taxanomic study all features characterising the single abovementioned genera (resp. fructification form genera). We may find detailed descriptions in all greater textbooks on palaeobotany (A. C. SEWARD [I. Vol.] 1898, D. SCOTT [Vol. I.] 1920, R. ZEILLER 1900, H. PÓTONIÉ—W.GOTHAN 1921, M. HIRMER 1927, W. C. DARRAH 1939, CH. A. ARNOLD 1947, L. EMBERGER 1944, A. KRIŠTOFOVIČ 1935) as well as in many special monographs like the works by CH. E. WEISS 1876 and 1884 and W. J. JONGMANS 1911.

1. *Palaeostachya ettingshauseni* KIDST. (Pl. I, fig. 1, 2) and several notes on the possible presence of *P. pedunculata* WILL. (Pl. I, fig. 3, 4, 5.)

This form is one of the most common Calamites fructifications met with in the Radnice coal measure series. It was also found, but much rarer, within the Nýřany c. m. series as well as in the Kounov c. m. series. Further I know also very similar (perhaps even quite identical) casts of cones also from various places in the lower permian beds of Bohemia as well as of Central Moravia. The precise definition of this "species" was fixed rather very late, first by R. KIDSTON in 1903 (pp. 791). Before KIDSTON these cones were ascribed to various externally more or less similar species, like *P. pedunculata* WILL., *elongata* PRESL, or *Calamostachys ludwigii* WEISS. ROEHL (1898—1899, pp. 19, Pl. 7, fig. 1) described and figured this form as *Volkmannia elongata* PRESL, CH. E. WEISS (1884, pp. 163, Pl. 18, fig. 2) joined it to CARRUTHER's *Volkmannia* (later *Calamostachys) ludwigii* (ibid. Pl. 22, fig. 1—8, Pl. 23, Pl. 24; as true *Cal. ludwigii* may be regarded from all WEISSE's specimens only the original Ludwig's type, which is conserved in a pelosideritic concretion). R. ZEILLER (1886—1888, Valencienne, pp. 382, Pl. 60, fig. 1, 2) ascribed several cones from Northern France, without regard to their larger size,[2]) to WILLIAMSON's *P. pedunculata,* the cones of which are considerably shorter, mostly only about 2—3 cm long. W. P. SCHIMPER joined our *P. ettingshauseni* KIDST (l. c. 1869 [Traité] Vol. I., pp. 328, Vol. III., pp. 457) to LUDWIG's specimen (WEISS's *P. ludwigii*) under the name of *Calamostachys typica.*

This very complicated synonymity was definitely cleared up, — as just mentioned —, by R. KIDSTON, who separated it from all just mentioned similar forms as a distinct independent fructification "species" (1903, pp. 794; 1909—1911 [Hainaut belge] pp. 127). And just with this KIDSTON's type I am identifying a great number of specimens collected especially in the deapest horizons of our Central Bohemian coal series.

From the Bohemian coal districts *P. ettingshauseni* KIDST. was figured and described especially distinctly by *C.* r. *Ettingshausen* in 1854 (Radnitz) pp. 24, Pl. 8, fig. 1, 4. He regarded it as cones of his *Calamites communis,* without giving to it any special name.

Palaeostachys ettingshauseni KIDST. represents cylindrical cones in fact very similar to *P. enlongata* PRESL. They are considerably more slender and their bracts are shorter. They are placed by 4 in whorls at the nodes of rather slender axis, are provided by short pedicles (½—1 cm) which consist only of 1 internode, and attain a length of 4 till 7 cm and a width of ca. 6—8 mm. The basal parts of their sterile bracts are nearly vertically orientated with regard to the cone axis, the distal parts are turned upwards and often more or less adpressed to the

[2]) W. J. JONGMANS believes (1911, pp. 33) therefore that these ZEILLER's specimens are to be compared with PRESEL's *P. elongata.* Their dimensions coincide but wholly within the limits of the variability of the size of our *P. ettingshauseni* KIDST. ZEILLER's cones are only cca. 6—8 mm thick and till about 7 cm long, whereas true PRESL's *P. elongata* attains ca. 9 — 12 mm across.

cones, but mostly slightly declined under a rather acute angle; they are mostly straight (not arclike bent) cca 0.5 cm long and 1 mm broad in their lower portions and slowly narrowed toward their ends tapering into very acute tops. The internodes of the coneaxis are 3—3.5 mm long (between two neighbouring sterile bract whorls); the bracts of the neighbouring whorls are therefore overlapping even the sporangia of the next higher whorl. At the top the cones are slowly attenuate and narrowed into a sharp conical (about 30—50°) top consisting of about 3 till 4 last internodes.

Most similar to our *P. ettingshauseni* KIDST. are, besides the already mentioned *Calamostachys ludwigii* WEISS (which differs of course from our species essentially by a different kind of position of its sporangiophores: a Calamostachys type), *Palaeostachya elongata* PRESL and *P. pedunculata* WILL. The first of both differs as already told by its considerably larger dimensions (see the following chapter on *P. elongata* PRESL in STBG.). As to *P. pedunculata* WILL., I regard its separation as much more difficult. According to the original figures and descriptions by various palaeobotanists (CH. E. WEISS 1884, pp. 182; W. J. JONGMANS 1911, pp. 331; A. RENIER 1910 Pl. 50) the differences are only very slight. The cones of *Pal. pedunculata* are shorter, only 2—3 cm long (therefore I believe that the above cited fructifications mentioned by ZEILLER 1886—1888 are to be identified rather with our *P. ettingshauseni* KIDST) but at the same time nearly just as thick as in our species, and the distal portions of the bracts are mostly said to be more declined from the cone-body than in the most cases of the true *P. ettingshauseni* (which may be of course effected also only by special state of preservation or fossilisation). Otherwise their whole external appearence as well as their arrangement by 4 in whorls at the nodes is so similar in both cone types that many authors have admitted the possibility of an eventual mutual identity of both these "species" (W. J. JONGMANS 1911, pp. 331; JONGMANS-KUKUK 1913, pp. 63), which might then represent only different stages of the development or states of fossilisation.

At present I am not yet able to state with certainty if several specimens collected in Bohemia belong really to the true *P. pedunculata* Will. Perhaps we have to ascribe to it several specimens collected in the shales accompanying the coal measure of the coal district of Merklín as well as other ones from the interlayer called „Velká Opuka" in the Main coal measure of Kladno coal district, which are only 3—3,5 cm long. Otherwise I believe that the most part of our specimens in consideration according to their shape and size belong to the true KIDSTON's *P. ettingshauseni* (most part of the specimens from the regions of Kladno, Rakovník, Třemošná and Nýřany). Smaller sized specimens, measuring only 4—5 cm, represent perhaps transition forms (Merklín and elsewhere) to the just mentioned short forms (*P. pedunculata* WILL.), to which they resemble very much by their external appearence.

Palaeostachya ettingshauseni ETT. is mostly ascribed to Calamitean truncs named as *Calamites sachsei* STUR. But just this Calamites type is not mentioned from any Central Bohemian coal district in the great monograph of european Calamites by KIDSTON and JONGMANS (1917) just as

in Jongmans's index in Fossilium Catalogus II (Plantae, pars 5, 1915). Nevertheless this fructification type is in all Central Bohemian coal districts extraordinary frequent.

Distribution. Typical specimens of *Palaeostachya ettingshauseni* KIDST. are widely distributed in the whole westphalian series of our Central Bohemian Carboniferous, i. e. in the Radnice as well as in the Nýřany coal measure series.

Specimens reminding strongly *Palaeostachya pedunculata* WILL. have been stated only in the deeper zones of the Central Bohemian westphalian series i. e. only within the Radnice coal measure series.

Typical specimens of *P. ettingshauseni* KIDST.:

a) Radnice coal measure series:

Merklín (S. of Plzeň), various mines in the forests between Merklín and Staňkov (mine Andreas, Holzner a. o.) — Hanging shales of the Plzeň coal measures.

Nýřany (W. from Plzeň), mine Krimich I.—Hanging shales of the coal measure no. 2 (upper Radnice c. m.) and of the coal measure no. 3 (Plzeň coal measure).

Nová Lhota (N. from Dobřany near Plzeň), mine Dobré Štěstí. — Hanging shales of the Upper Radnice coal measure.

Chlumčany (at Dobřany near Plzeň), mine Eliška. — Hanging shales of the Upper Radnice coal measure.

Třemošná (N. from Plzeň), various coal mines in the surroundings (mine Prokop a. o.). — In the hanging shales of the Upper Radnice coal measure.

Bílá Hora (N. from Plzeň). — In the iron stone nodules of the coal measures which are to be correlated most probably with the Lower Radnice coal measure or perhaps still more probably with the Plzeň coal measures.

Břasy near Radnice. — In the hanging shales of the Upper Radnice coal measure.

Svinná near Radnice. — In the Schleifsteine beds (brousky) in the hanging of the Lower Radnice coal measure.

Holoubkov (near Rokycany), outcrops of a shaly bed with thin coaly layers at the road from Holoubkov to Rokycany (just behind the named village) correlated mostly with the deepest coal measures of Central Bohemia (Plzeň coal measures).

Zdejciná near Beroun. — Hanging shales of the coal measure (to be correlated with the Upper Radnice coal measures).

Malé Přílepy near Beroun. — In the Schleifsteine beds (brousky and bělky) of the hanging of the coal measure (Lower Radnice c. m.).

Kralupy („Červená Hůrka"). — In a series of beds containing many iron stone nodules, which are to be correlated with the Upper Radnice coal measures.

Kladno, mines in the surroundings: Ronna at Hnidousy, Max at Libušín, Mayrau at Vinařice a. o. — In the hanging shales called „Mydláky" as well as in the interlayer of whitish fire clays called „Velká Opuka"

of the Main Kladno coal measure (correlated with the Upper Radnice coal measure).

Rakovník. — Coal mines called „Na Spravedlnosti" eastward from the town. — In the hanging shales of the coal seam correlated with the Upper Radnice coal measures.

Příčina (W. from Lubná, near Rakovník). — Coal mines at the place called „Na Brantech". — In the grayish micaceous shales of the deeper coal seams correlated with the Upper Radnice coal measures.

b) Nýřany coal measure series:

Třemošná (N. from Plzeň), mines in the neighbourhood of Vorlík. — In the cannel coal of the Nýřany coal measure.

Nýřany (W. from Plzeň). — Coal mines Humboldt, Krimich a. o. — In the cannel coal and in the hanging shales of the Nýřany coal measure as well as in the hanging shales of the Hanging Nýřany coal measure.

Specimens strongly similar (or identical?) to *Palaeostachya pedunculata* WILL.:

Merklín (S. from Plzeň). — Coal mines in the forests between Merklín and Staňkov. — Hanging shales of the Plzeň coal measures.

Kladno. — Coal mines in the surroundings: Mayrau at Vinařice, Ronna near Hnidousy. — In the grayish hanging shales called „Mydláky" as well as in the interlayer of whitish fire clays called „Velká Opuka" of the Main Kladno coal measure (correlated with the Upper Radnice coal measure).

2. *Palaeostachya elongata* PRESL in STBG. (Pl. II, fig. 1—5).

Most of the figures and descriptions of this type of fructification presented in the various textbooks or monographs are generally relating only to one and the same specimen, the type specimen which was originally described and figured by PRESL in K. c. STERNBERG's classical work (STERNBERG 1838, pp. 27, Pl. I) from the horizon of gorlitic shales and sandstones („brousky" and „bělky", „Schleifsteine") of the roof of the Lower Radnice coal measure at Svinná near Radnice under the name of *Volkmannia elongata*. We find it refigured (often only parts of the whole specimen) for instance in the following papers:

1872 — O. FEISTMANTEL — pp. 20, Pl. 4, fig. 3,
1875—76 — O. FEISTMANTEL — pp. 119, Pl. 13, fig. 2.
1876 — CH. E. WEISS — pp. 108, Pl. 15.
1872 — M. B. RENAULT — Vol. II, pp. 115, Pl 19, fig. 4.
1887 — Gr. zu SOLMS LAUBACH — pp. 342, Pl. 46, fig. 1, 2.
1890 — W. PH. SCHIMPER-A. SCHENK — pp. 171, Pl. 130, fig. 1, 2 (non Pl. 128, fig. 3).
1899 — A. HOFMANN-F. RYBA — pp. 30, Pl. 2, fig. 15—17.
1911 — W. J. JONGMANS — pp. 324, fig. 281.
1913 — W. J. JONGMANS-W. KUKUK — pp. 61, fig. 4, 5.

To this just mentioned PRESL's specimen from Svinná a second new figure was joined only by O. FEISTMANTEL (1872, Pl. 5. fig. 2 and 1875—76, Pl. 13, fig. 1.) relating to a specimen collected at Žebnice near Plasy in the roof of the Upper Radnice coal measure. I am unable to state with utter certainty if we have to regard as true *P. elongata* also the specimens figured by O. FEISTMANTEL in 1873 (1874), pp. 70, Pl. I, fig. 1. from the Main Kladno coal measure at Otvovice, as well as that figured by E. W. BINNEY in 1868, pp. 29, Pl. 6, fig. 4, as believed by W. J. JONGMANS (Catalogus etc. 1922, pp. 643). Feistmantel's specimen (only a small fragment of a cone) is too badly preserved and do not allow any precise determination. Binney's specimen exhibits 4 cones in a whorl, whereas Presl's type only 2; its cones if compared with Presel's form are essentially thinner, only 6—7 accross (Presel's true P. elongata measures about 1 cm across), which seems evidently to point against a mutual identity. Perhaps Binney's specimen has nearer relations with the foregoing *P. ettingshauseni* KIDST.

In PRESL's type specimen the cones are attached by two at the nodes of some side twigs of a bigger Calamites stem cca. 1,5 cm thick. The side twigs bearing these cones are cca. 6—8 mm thick and are arranged also by two at the nodes of the mentioned main stalk. The single cones are provided by short (cca 0,5, 1,5 till 2,5 cm long and 2,5 mm thick) and mostly unarticulated and leafless stalks; only in a few of them we find just at the base of the conebody 1 or two whorls of sterile bracts and thus 1 or two further very short sterile internodes. They are (according to the degree of the declining of the bracts) 0,9—1,2 cm thick and often more than 1 dm long. The bracts are linear, lanceolate, slowly tapering into a sharp point, never overreaching the length of two neighbouring internodes, cca. 0—9 mm long (the length of the internodes of the cone axis being only cca. 4—5 mm) and mostly more or less adpressed to the cone body, rarer slightly declined.

True *P. elongata* PRESL is indeed a very rare species (most of the specimens which I found labelled in various collections as *P. elongata* agree usually with the preceeding more slender type of *P. ettingshauseni* KIDST). This is also one of the various reasons, why we do not yet know the mother plant to which these cones belong.

Distribution: All specimens of true *P. elongata* PRESL collected until present in Central Bohemia are coming from the Radnice coal measure series of the Lower gray beds.

PRESEL's typ specimen: Svinná (near Radnice), hanging shales of the Lower Radnice coal measure.

O. FEISTMANTEL's cotype: Žebnice (N. of Plzeň), hanging shales of the Upper Radnice coal measure.

Further specimens in the collections of the Nat. Museum, Prague, which are to be safely identified with PRESEL's type:

Nýřany, „Na Pankráci" (between Nýřany and Doubrava): in the whitish fire clays between the coal measure no. II (Upper Radnice c. m.) and the „Mezisloj" („Zwischenflöz" i. e. the Lower Radnice c. m.).

Kladno: in the interlayer of whitish fire clays called „Velká Opuka" within the Main Kladno coal measure (the Upper Radnice coal m.).

Příčina at Lubná (near Rakovník), coal mines at the place „Na Brantech". — In the whitish fire clays of the hanging of the coal seam no. I B as well as in the normal gray shales of the deeper coal seams correlated with the Upper Radnice coal measure.

Lužná (near Rakovník), mine Lužná. — In the whitish interlayers of the Main Kladno coal measure (i. e. the Upper Radnice coal measure).

Moštice (near Radnice): hanging shales of the Upper Radnice coal measure.

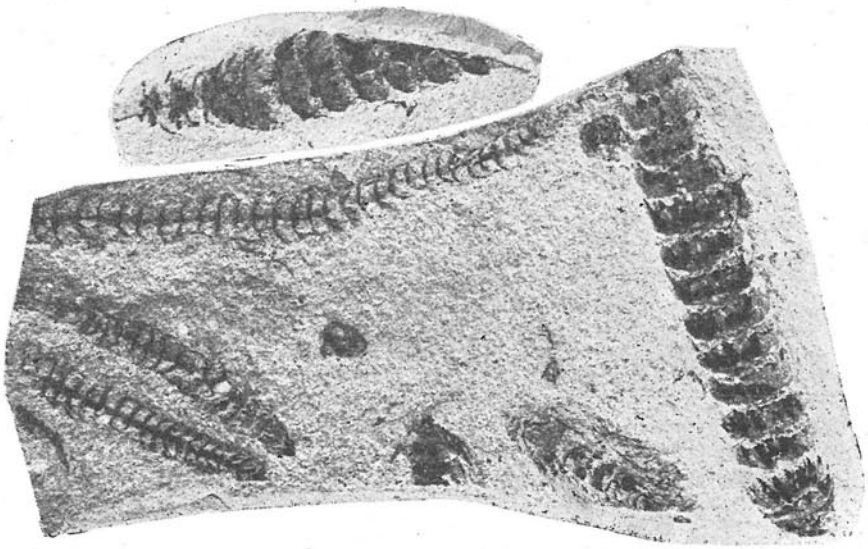

Fig. 1. Cones very similar to Palaeostachya elongata Presl. in Stbg. — Loc.: Mine Rako near Lubná, in the whitish sadny tuffitic interlayer of the Upper Lubná coal measure. — Coll.: Nat. Museum, Praha. — Nat. size.

Notes on further specimens collected in Central Bohemia and resembling strongly to the true *P. elongata:*

1. First we have perhaps to identify with PRESL's *P. elongata* several specimens collected at Lubná (near Rakovník) by O. FEISTMANTEL, J. KUŠTA and V. TREYBAL (coll. of the Nat. Museum, Prague) in the coal mines directly in Lubná or in the coal mines at the place „Na Brantech" at Příčina (W. from Lubná; — here in the hanging shales of the coal seam No. I a) in the shales of the Lubná coal measures. Their size as well as their whole outer appearence differ by no means from specimens collected in deeper horizons.

2. From PRESL's type differ slightly several cones (especially specimens with strongly adpressed bracts) collected fragmentary (by

the insp. of the "Rako" mines F. Hlíza; coll. of the Nat. Museum, Prague) at the mine Rako near Lubná in the upper bank of the tuffitic whitish sandstones of the Lubná coal measures (see Textfig. 1). According to the at present available specimens it is unfortunately impossible to state whether these cones are true Palaeostachiae or perhaps Calamostachys. One of these fragments bears at its base 3 whorls of sterile leaflets of the type of a very robust *Asterophyllites grandis* STBG. Sterile twigs bearing leaves of the same kind are to be observed isolated on the same rock plates. These cones are cca. 1.2 thick and (according to the length of the fragments) certainly more than 7 cm long. The single whorls of sterile bracts are 4—5 mm. distant, their bracts are arclike bent upwards, cca. 7 mm. long and overreaching by their tops only the lowest part of the neighbouring higher whorl (hardly ¼).

By their external appearence these cones are also very similar to the cones figured and described by A. C. NOÉ (1925, Pl. 5, fig. 5) under the name of *Calamostachys magna* LXQ. from the famous locality Mazon Creek in USA. They are only slightly more slender; NOÉ's specimens are cca. 14—16 mm thick.

3. *Palaeostachya distachya* STBG. (Pl. III, fig. 4—9.)

The term of *Palaeostachya distachya* STBG. is inseparably connected not only with a certain type of very big cones but also with a certain "species" of Calamites truncs, to the nodes of which the single cones are attached by short stalks mostly in pairs. Unfortunately during the later times various authors joined to this STERNBERG's type still several further similar big Calamites cones (resp. also Calamites truncs)[3] which after a very thorough monographical study by R. KIDSTON and W. J. JONGMANS (1947 pp. 136: *Calamites arborescens* STBG.;[4] pp. 138: *Cal. distachyus* STBG.; pp. 139: *Cal. schultzi* [STUR ex p.] KIDST.—JONGM.) appeared as independent forms without any nearer relation to the original STERNBERG's form. Equally we cannot identify with the true *P. ("Volkmannia") distachya* STBG. (1820—1838, Vol. I, pp. XXX, Pl. 48, fig. 3) specimens described as *Volkmannia distachya* by O. FEISTMANTEL[5] (1872, pp. 23, Pl. 5, fig. 1 and 1875—1876, pp. 121, Pl. 14,

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[3]) The rather obscure description and discussion in W. J. JONGMANS, 1911, pp. 191 and 335 is no doubt the result of all older errors.

[4]) These cone like impressions, just as O. FEISTMANTEL's *Huttonia arborescens* STBG. (1872, pp. 13, Pl. III; 1875—1876, pp. 107, Pl. 6, fig. 3) are indeed no fruit cones, but young sterile leafy side shoots.

[5]) This FEISTMANTEL's type has an appeareance of some mid robust (cca. 1—1,5 cm thick) Palaeostachyae resp. Calamostachys. The single cones are attached by 1 or 2 to the leafy whorls on rather thin and poorly branched shoots slightly similar to some short leafy *Asterophyllites longifolius* STBG. or *Annularia pseudostellata*. POT. In all safely known *Calamites distachyus* STBG. specimens the cones are described as bigger and in contrary attached directly to the nodes of much thicker stalks or truncks, but not to slender leafy shoots. FEISTMANTEL's specimens were collected in the well known "Schleifsteine" (or "brousky") beds at the now wholly abandoned collieries "Na Štilci" at Tlustice near Žebrák. — Further notes on this form see in the following chapter on *Pal. feistmanteli* n. nom.

fig. 5) as well as STUR's *Macrostachya* (resp. *Volkmannia*) *gracilis*[6]) (1871, pp. 27, fig. 10), WEISS's very similar *Palaeostachya schimperiana* (1876, pp. 105, Pl. 5 and 1884, pp. 185, Pl. 21, fig. 8) and *P. arborescens* var. *schumanniana* (1884, pp. 124, Pl 21, fig. 1, 2). Finally it was stated, that all cones regard by CH. E. WEISS as *Calamites arborescens* STBG. (1884, Pl. 14, Pl. 15, Pl. 16, fig. 1, 2) and therefore united by him also only as a mere synonyme with STERNBERG's term of *Calamites distachyus* (see in R. KIDSTON—W. J. JONGMANS, 1917, pp. 139) are also quite different types (R. KIDSTON and W. J. JONGMANS identified WEISS's specimens ex parte with STUR's *Calamites schultzi*).

As to the specimens described and figured hitherto from the coal districts of Central Bohemia, we may regard only the following ones as more or less identical with STERNBERG's *Palaeostachya* (resp. *Calamites) distachya:*

1. C. r. ETTINGSHAUSEN's *Calamites communis* from 1854, Pl. 8, fig. 2 and 3. — In this case the identity is not yet utterly safely attested, though it is highly probable. There remains for future still to examine, if perhaps the figured supposed cones do not represent only mere young sterile leafy side shoots and therefore if we have perhaps not to do here with *Calamites arborescens* STBG. (see more on this task in KIDSTON—JONGMANS 1915, pp. 136—139 as well as in W. J. JONGMANS 1915, pp. 212—213), just as we may see it in K. c. STERNBERG's type specimen of *Calamites arborescens* 1820—1838 (Vol. II, Pl. 14, fig. 1), which later was refigured by O. FEISTMANTEL in his paper from 1872 Pl. 3 (under the name of *"Calamites approximatus* BGT. mit *Huttonia arborescens* STBG.") and from 1875—1876, Pl. 6 (*Calamites approximatus* BGT. [fructificans?]"). ETTINGSHAUSEN's specimens were collected in the Schleifsteine ("brousky") beds of the hanging wall of the Lower Radnice coal measures at the collieries of Svinná (near Radnice).

2. A. HOFMANN—F. RYBA's *Cingularia typica* from 1899, Pl. 3, fig. 16 (not the other figures, of which fig. 1 and 2 represent copies of WEISS's figures of true *Cing. typica* and fig. 3 an undeterminable cone from the Mirošov coal district). This specimen was collected at the collieries of Kladno. Its identity with the true STERNBERG's type is much more probable than in the just foregoing case, though the features of its sterile bracts remind slightly cones of *Huttonia spicata* STBG. HOFMANN—RYBA's specimen is but much thinner than this last named *Huttonia* species and agrees therefore whooly with STERNBERG'S *P. distachya.*

Typical specimens of *Palaeostachya distachya* represent rather big cones attached, as already mentioned, generally by two to the nodes of bigger Calamites stalks or trunks. They are cca. 15—17 mm. thick

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[6]) STUR's type is something quite different from O. FEISTMANTEL's *Volkmania gracilis* (1871, Pl. 1, fig. 1 and 1872, Pl. 4, fig. 1, Pl. 5, fig. 1), which represents in fact a *Sphenophyllostachys ("Bowmannites")*, just as the rather thin spike like cone described by K. STTENBERG as *Volkmannia gracilis* (1820—1838, Vol. II, pp. 53, Pl. 15, fig. 3, which according to W. J. Jongmans 1922, pp. 706, on account of its very unfavourable state of preservation is rather indeterminable: ..."perhaps a fragment of a Palaeostachya or Calamostachys cca. 8 mm thick").

and very shortly stalked. The cone axis is about 3,5 till 4,5—5 mm. thick. The number of bracts per whorle is more numerous than in the somewhat similar *Huttonia spicata* STBG. i. e. about 12—14 on one side of the imprints (i. e. 2 x as much in the whole whorle); in *Huttonia spicata* STBG. we find only 6—7 bracts. They are mostly slightly obliquely declined from the cone body, by which the cones assume a rather bristly appearence. Their basal invisible cca. 4 mm. long portions are slightly arclike bent, their visible proximal portions are about 14—16 mm. long and about 2 mm broad, narrowly lanceolate and slowly tapering into very sharp points. Their Palaeostachya nature were already sufficiently demonstrated.

Distribution: Specimens of true *P. distachya* seem to be in our coal districts rather rare and confined only to the Radnice coal-mesure series.

Svinná near Radnice. — In the "Schleifsteine" ("brousky") beds of the hanging of the Lower Radnice coal measure. (STERNBERG's type specimen.)

Kladno. — Various mines in the surroundings of the villages of Libušín, Vinařice, Hnidousy and Motyčín (mine Max, Mayerau, Ronna a. o.). — In the interlayer of whitish fire clays called "Velká Opuka" in the Main Kladno coal measure (i. e. Upper Radnice c. m.).

4. *Palaeostachya raconicensis* n. sp. (Pl. IV, fig. 1—3.)

Under this new name I figure on Pl. IV, fig. 1—3 specimens of some very long and relatively thin cones which were collected at the collieries "Na Brantech" at Příčina (W. from Lubná near Rakovník) in the light gray hanging shales of the coal measure No. 1 a ("Lubná coal measure"). They are no doubt till more than 2,5 dm. long (the whole fragment of which parts are figured on Pl. IV, fig. 1,2 is cca. 23 cm long) and their cone body (without the long bracts) measures cca. 1,2 to 1,5 mm across. The cone axis is cca. 0,6 cm thick and the distances between the neighbouring whorls of sterile bracts measure about 0,6—0,7 cm (the internodes). The free parts of the bracts are very long, till about 2 cm; they are linear, narrow and slowly tapering into a sharp point, in their lower portions about 1,5 mm broad. Their lowermost portions, i. e. just below the sporangia, are orientated nearly vertically to the cone axis or are even slightly declined downwards and then arclike bent up. Their long free distal parts are moderately declined from the cone body. The kind of attachement and position of the sporangiophores is unfortunately not quite clearly visible in our specimens; they seem to exhibit a typical Palaeostachya arrangement (in the axils of the sterile bract whorls).

As to several already described Calamites cones, which exhibit much similarity in their external appearence with our specimens, we have especially to mention the following two types: *Calamostachys thuringiaca* WEISS and *Calam. superba* WEISS (see in W. J. JONGMANS

1911, pp. 300 and 311). The first of both is slightly thinner than our species (without the long bracts only about 1 cm), the second one agrees in this respect much more to our type. But both these forms are till yet very incompletely known (the first one on the bases of several specimens from Mannebach, the second one from the permian coalbasin of "Plauenscher Grund" near Dresden) and from much younger beds (uppermost Stephanian or Permian) than our specimens from Rakovník (Westphalian C). During the latest time the possibility of a nearer relation especially between WEISS's *Cal. superba* and our species became rather very serious, because W. J. JONGMANS stated also in this WEISS's species a Palaeostachya like arrangement of the fertile and sterile elements; this WEISS's species is therefore no Calamostachys as assumed formerly by WEISS (see W. J. JONGMANS—J. KUKUK 1913, pp. 64; W. J. JONGMANS 1915, pp. 491, 492). But I believe that only new better preserved specimens from both sides may solve in future this task. At first sight also WEISS's *Macrostachya hauchecornei* (see in W. J. JONGMANS 1911, pp. 350) exhibits a very similar outer appearence. But it was already safely stated (W. J. JONGMANS 1922, pp. 625), that this fructification represents cones of certain *Sphenophylla;* besides its bracts are split into two linear laciniae,[7]) whereas the bracts of our cones are quite simple.

Distribution:

Specimens of this large *Palaeostachya* type are known until present only from one collection of fossils made at the mentioned locality at Příčina (W. from Lubná near Rakovník): pit Ludvík of the collieries "Na Brantech". — In the hanging shales of the coal seam no. I a (Lubná coal measures).

5. *Palaeostachya feistmanteli* n. nom. (Pl. II, fig. 6, 7; Pl. III, fig. 1—3.)

Under this new name I figure several specimens of cones, which were already described by O. FEISTMANTEL (1872, pp. 23, Pl. 5, fig. 11; 1875—1876, pp. 121, Pl. 14, fig. 5) from the "Schleifsteine" (brousky) rocks of the collieries „Na Štilci" at Tlustice near Žebrák as *Volkmannia distachya* STBG. and later also by A. HOFMANN and F. RYBA (1899, Pl. 2, fig. 2) from the same locality and horizon as *Asterophyllites longifolius.*

O. FEISTMANTEL erroneously believed that these cones belong to the sterile twigs of the type of *Asterophyllites foliosus* L. H. under which name he described a certain type of Calamites foliage discovered in the "Schleifsteine" ("brousky") beds at Stradonice[8]) (see O. FEISTMANTEL 1875—1876, pp. 121, Pl. 14, fig. 2, 3, 4), which remind by their general appearence some short leafy *Asterophyllites equisetiformis,* but the leaflets and in a high measure also the whole whorls of which

[7]) See in D. STUR 1887, pp. 180 under the name of *Cal. Sachsei* STUR.

[8]) A quite identical specimen was described also under the same name by A. HOFMANN and F. RYBA from Břasy (1899, pp. 48, Pl. 2, fig. 8).

exhibit a considerable similarity to several *Annulariae*[9]) espcially *A. sphenophylloides* ZENKER or several broadleafy *A. radiata* BGT [forma *karvinensis* TRAPL.]).

In the newer rather rich material coming from the same locality as all the above mentioned FEISTMANTEL's specimens, we may safely state that these cones do not belong to FEISTMANTEL's *Ast. foliosus*, but that they are attached to some rather slender twigs provided by rather long and straight (nearly stiff) leaves and relatively short internodes (leaves often till about 5 times as long as the respective internodes). These leafy twigs remind therefore STERNBERG's *Asterophyllites longifolius*. But I do not believe that this foliage type is identical with the true *Ast. longifolius* STBG. First the whorls are poorer in leaflets and second the found shoots are mostly (though only poorly) ramified, whereas true *Ast. longifolius* represents generally only simple shoots which only in rare cases exhibit also some side twigs.

The cones in consideration are indeed slightly similar to *P. distachya* STBG. with which as already mentioned they were often identified. But in fact they have nothing in common with that species. Already W. J. JONGMANS (1922, pp. 703) stated: "Die Abbildungen bei O. FEISTMANTEL 1872 und 1874 werden am besten als unbestimmbar betrachtet, sie haben Ähnlichkeit mit *Macrostachya gracilis* STUR ..." But they cannot be identified even with this form because just this form represents fructifications of certain *Sphenophylla*. With these Stur's cones it has in common the kind of attachement to the rather slender twigs, by which if differs from the true *P. distachya*, where the cones are sitting on rather big branches or trunks. Another difference consists also in the more slender (thinner) shape of our cones.

Our cones of *P. feistmanteli* n. nom. are generally more than 7—8 cm long and cca. 1—1,7 thick. Most of the specimens exhibit rather adpressed bracts. In several rare cases (most probably mature specimens) the bracts are as in the most part of the Calamites cones, slightly declined from the cone body. The cones are shortly stalked, their stalks being 0,5—0,8 cm long and 1,5—2 mm thick. At their top they are attenuate into a sharp point. Most part of the impressions of these cones do not exhibit well their inner structures. As far as it was possible to verify, I stated that the mostly adpressed free parts of the sterile bracts are narrow linear lanceolate, sharply pointed and longer than 2 cone axis internodes, cca. 1 cm long and nearly 1 mm broad. The single bract whorls are cca. 3,5 mm distant. The sporangiophores are attached as in all Palaeostachyae obliquely within the axils of the bract whorls. Mature specimens with declined bracts remind at first sight very much

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[9]) W. J. JONGMANS (1911, pp. 257; 1914, pp. 120) and R. KIDSTON (1911 [1909], pp. 109) regard this form as a broad leafy variety from *Annularia radiata* BGT. ST. TRAPL (1927, pp. 34) named it *Annularia radiata* var. *strádonicensis*. Finally T. G. HALLE, perhaps justly believes it to represent a very broad leafy variety of *Asterophyllites equisetiformis* (1928, pp. 235, Pl. 1, fig. 6), with which it has in common the same kind of ramification and orientation of the side twigs and leaves. In any case we cannot identify this curious type of Calamites foliage with the original LINDLEY-HUTTON's type of *A. foliosus* (1831—1833 Pl. 25, fig. 1).

the appearence of the cones of *Calamostachys germanica* WEISS (which last exhibits of course much smaller dimensions).

In the most cases the cones are attached only by one at the nodes among the leaves, but we find also specimens exhibiting 2 cones in one leaf whorl.

In the true *Asterophyllites longifolius* STBG., which resemble in a certain measure to the foliage type in connection with which our cones are to be found, quite different fructifications were discovered by CH. E. WEISS (1876, I, pp. 50, Pl. 10, fig. 1 and II, pp. 171, Pl. 20, fig. 6, Pl. 21, fig. 11) as well as by W. J. JONGMANS (1915, pp. 482, 483). These cones have been named as *Calamostachys longifolia* WEISS, but later identified with *Calamostachys ludwigii* CARR. (see in W. J. JONGMANS l. c.; here see also the further bibliographical notes especially as to the papers by RENIER). This fructification differ from our specimens at first sight by a much narrower shape (only cca. 4 mm thick). This fact attests also that the above mentioned ramified shoots bearing our cones of *P. feistmanteli,* though resembling very much to *Asterophyllites longifolius,* must be regarded as specifically distinct from the true *Ast. longifolius* STBG. In a certain measure they remember POTONIÉ's *Annularia pseudostellata* as originally mentioned and figured by this author from the Fettkohlenpartie of the coal district of Saarbrücken (see H. POTONIÉ [Lehrbuch] 1897—1898, pp. 201; SIMSON-SCHAROLD, 1934, pp. 23; W. J. JONGMANS, 1911, pp. 251), but they do not agree in such a measure with specimens of *An. pseudostellata* as found in the upper stephanian beds of various countries.

Rather similar cones to our *P. feistmanteli* have been described in *Calamites Schultzi* STUR ex p. (KIDST.-JONGM. 1917, pp. 139). They were figured already by WEISS (1884, II, Pl. 14, 15) as *Palaeostachya arborescens.* Our cones are shorter (and also slightly thinner) and are not attached directly to bigger Calamites trunks as in the just named Calamites Schultzi, but to slender leafy twigs.

Distribution:

Tlustice (near žebrák), coal mines at the place "Na štilci". — The "Schleifsteine" ("brousky" and "bělky") beds in the direct hanging of the Lower Radnice coal measure.

6. *Palaeostachya cylindrica* n. sp. (Textfig. 2, 3.)

Under this new term I am describing here a form of *Palaeostachya,* which was found not only in association but also in direct connection with a special form of *Asterophyllites* foliage mostly resembling to *Asterophyllites equisetiformis* SCHL. in a bank of whitish and hard tuffitic sandstones within the upper part of the Lubná coal measures at the coal mine Rako at Lubná (near Rakovník).

The sterile shoots in consideration exhibit the same general appearence and the same kind of ramification as the just named *Asterophyllites* (— see Textfig. 3.), but their leaves are much longer (nearly

3 till 4 times as long as the internodes), by which they point to the conditions known in *Asterophyllites longifolius* STBG. Their leaves are much broader than in the true *Ast. equisetiformis* showing at the same

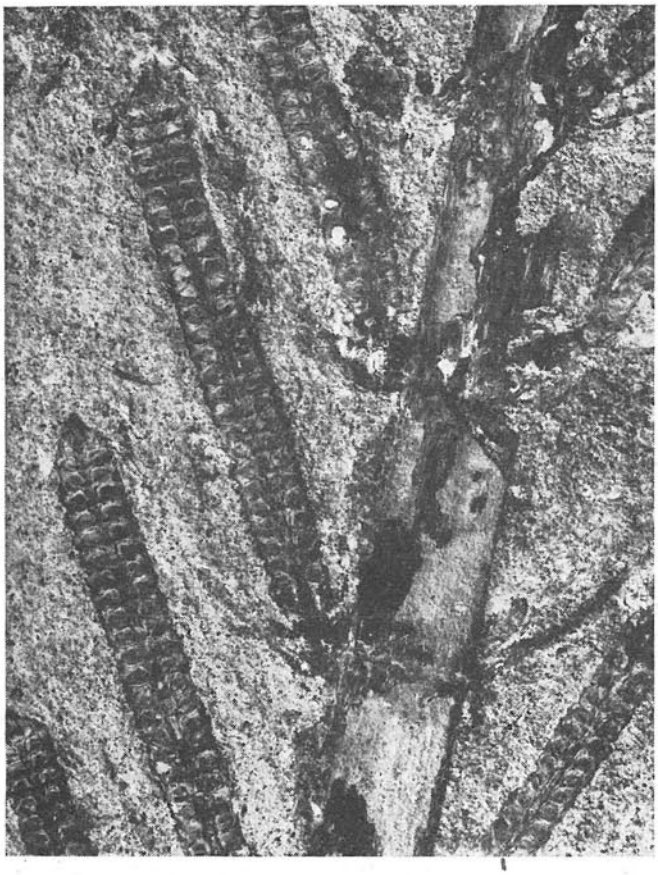

Fig. 2. Palaeostachya cylindrica n. sp. Loc.: Mine Rako near Lubná, in the whitish sandy tuffitic interlayer of the Upper Lubná coal measure. — Coll.: Nat. Museum, Praha. — Nat. size.

time more longitudinal ridges like in *Calamocladus parallelinervis* GR. EURY and *Asterophyllites viticulosus* GR. EURY which by several authors are believed to be identical or at least very nearly allied with *Asterophyllites longifolius* STBG. (W. J. JONGMANS 1911, pp. 224; 1914 [Fos. cat.] II/4). They show also a great similarity with *Asterophyllites lignosus* REN. or *Ast. flexuosus* REN. considered by many authors as related with *Asterophyllites equisetiformis* SCHL. (W. J. JONGMANS 1911, pp. 209; 1914 [Fos. cat.] II/4).

The figured cones (see Textfig. 2.) resemble at first view to *Palaeostachya ettingshauseni* KIDST. or to *Calamostachys germanica* WEISS,

or finally to *Cal. Ludwigii* CARR. Many of them are conserved nearly as non-compressed specimens in longitudinal sections, showing by that way very distinctly their *Palaeostachya* construction.

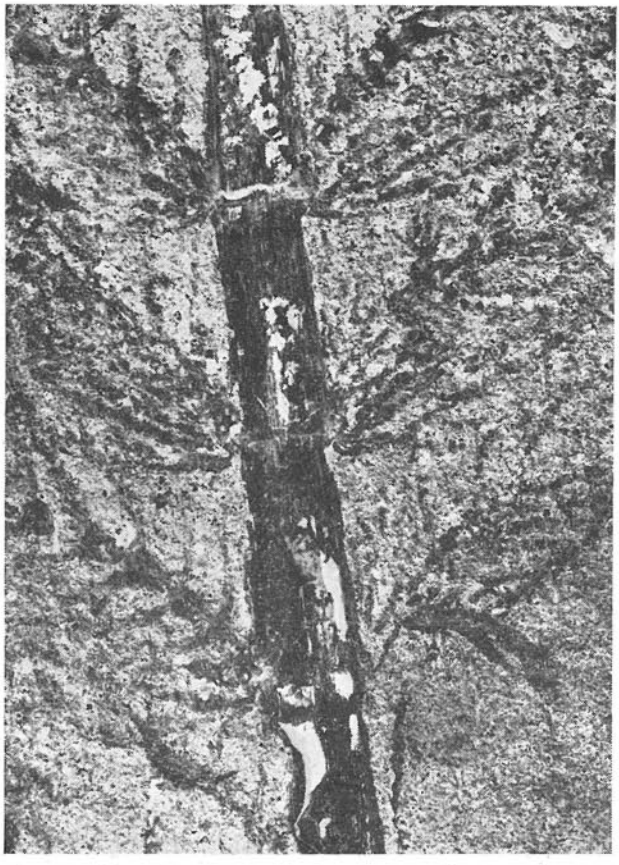

Fig. 3. Part of the foliage of the calamarian twigs bearing the fructifications of Palaestachya cylindrica n. sp. — Loc. and Coll. The same as in the fig. 2. — Nat. size.

They are attached mostly by 4 to the nodes of the penultimate branches, which are cca. 1,5 cm thick. They are relatively shortly stalked (only ½ cm) and about 8 mm thick and till 8,5 cm long. The cone axis is cca 1,5 mm thick, its internodes are 3,5 mm long. Their sterile bracts are very closely adpressed to the cone body.

The most characteristical feature of these cones are their very suddenly attenuate conical tops, composed only of two internodes; in the most part of their longitudinal sections they are 70 till nearly 90° wide, i. e. much broader and shorter than in *P. ettingshauseni* KIDST. or in the young and therefore still closed cones of *Calamostachys germanica* WEISS.

As already told they resemble much to *Calamostachys ludwigii* WEISS or to young and still closed cones of *Cal. germanica* WEISS, but they differ from both essentially by their inner construction (true *Palaeostachya)*, from the second one also by their short and wide tops. As to their size and inner construction they resemble very to *Palaeostachya ettingshauseni* KIDST., from which they differ also by the shape of their tops, which in the last are much slowly attenuate (under a more acute angle).

Distribution:

This species was hitherto collected only in the bed of the whitish hard and clayish (tuffitic) sandstones of the upper coal measure of the Lubná coal measure series at the mine Rako near Lubná (S. of Rakovník).

7. *Palaeostachya (?Calamostachys) gracillima* WEISS. (Pl. I, fig. 6—8.)

To this species belong perhaps several cone casts (impressions), which were collected in the coal district of Malé Přílepy (near Beroun) and in the coal mines "Na Brantech" at Příčina (W. of Lubná near Rakovník). Considering the deficiency of these specimens, I am not utterly certain about their precise identity with WEISS's above named species, though as to their external appearence they cannot be distinguished from WEISS's figured and described fructifications (CH. E. WEISS 1884, pp. 184, Pl. 18, fig. 1: *"Palaeostachya ? gracillima"*) by any essential feature.

CH. E. WEISS was unable to state the true position of the sporangiophores with respect to the sterile bracts in his specimens (collected at the mine Rubengrube near Neurode, coal seam "Josephiflöz"), wherefore it is not certain if his specimens represent a *Palaeostachya* or a *Calamostachys*. The external appearence of his type specimens reminds more a *Calamostachys*. Later under the same name several very similar cones were figured from the coal districts of Great Britain by R. KIDSTON (1886, 1890) as well as by E. A. N. ARBER (1910/11, pp. 143, Pl. 12) and further by W. J. JONGMANS and P. KUKUK (1913, pp. 60, Pl. 19, fig. 9; Pl. 22, fig. 5) from the coal districts of Rheinland and Westphalen, on which (especially on ARBER's specimens) the *Palaeostachya* construction was well proved. But comparing all figures of the specimens from Gr. Britain as well as of those from Western Europe with the original WEISS's picture of the specimens from the Lower Silesian coal district (Neurode),[10]) I went to the opinion, that their true identity with WEISS's original type specimens is by no means well attested. WEISS's type specimen is much thinner (nearly of about ⅓), whereas specimens figured by the mentioned british authors as well as those by JONGMANS

[10]) I regret, that the respective type specimens were not accessible to me at the present time.

and KUKUK are much more robust. Also the whole external appearence, the features of the sterile bracts, seem to me not enough in agreement. WEISS's specimen from Neurode reminds rather a *Calamostachys* cone, whereas the mentioned specimens from Western Europe as to their external shape are much more similar to cones of several *Palaeostachyae*, like *Pal. elongata* PRESL in STBG., *ettingshauseni* KIDST. a o. Especially the mentioned ARBER's specimens remind by the rather robust shape and their length so much PRESEL's *Pal. elongata* (perhaps only the slightly shorter sterile bracts testify against a true identity), that we are not far from the temptation to compare them rather with the mentioned PRESEL's species than with the true WEISS' slender *P. gracillima*.

I am ascribing therefore our mentioned cone fragments from Central Bohemia (Malé Přílepy, Příčina near Lubná) to the true Lower Silesian WEISS's *Palaeostachya (?) gracillima* (from Neurode), with which they agree by the whole external appearence as well as by the shape and orientation of its sterile bracts, just as by their size. I am sure that they cannot be identical with the much more robust form from Gr. Britain (of KIDSTON and ARBER) or with that from the regions of Rheinland and Westphalen (JONGMANS and KUKUK). If perhaps the figures by WEISS are not enough accurate and if then WEISS's type specimen is perhaps to be regarded as identical with the mentioned british and West European forms, as it would result from the synonymity cited by both mentioned authors (ARBER 1910/11 pp. 143, JONGMANS 1922 [VI] pp. 646), than of course our bohemian fragments would represent another hitherto undescribed independent cone type. Meanwhile, I believe according to WEISS's figures that these fragments correspond wholly with WEISS's lower silesian forms, whereas the mentioned west-european forms are to be regarded as some similar but essentially larger forms standing much nearer (or identical ?) to our robust form of *P. elongata* PRESL.

Our Central Bohemian fragments (just as those of WEISS's figures) represent rather long and thin cylindrical cones with bracts very much and arclike declined (nearly under a right angle) from the cone body. They are (without the bracts) cca. 4,5—5,5 mm thick, their linear and arclike bracts are about 5 mm long. In contrary ARBER's specimen (1910—11) without its bracts measures cca. 6,5—7,5 mm across, its sterile bracts are obliquely bent upwards, at their base cca. 1 mm broad, slowly narrowed towards their tops and cca. 6,5 mm long. The internodes of our bohemian cones are rather thin and cca. 3—3,5 mm long; in ARBER's cones they measure about 4,5 mm. As evident all dimensions of ARBER's cones correspond wholly with PRESEL's *P. elongata*.

The precise position of the sporangiophores with regard to the sterile bracts on the cone axis cannot be in our specimens well stated. Their *Palaeostachya* character must be regarded as not yet safely attested.

I have still to mention several interesting conditions as to the occurrence of our cones in the beds of the above mentioned localities. In both places these cones are accompanied with the impressions of

Annularia radiata BGT., but with a form which slightly differs from specimens of *An. radiata* accompanying cones of *Calamostachys ramosa* WEISS, generally regarded as fructifications of the typical true *Annularia radiata* BGT. (in Bohemia we know these last cones in association as well as in connection with this normal type of *A. radiata* BGT. e. g. in the "Schleifsteine" shales at Pejpina near Beroun). The leaflets of the *Annularia* form in question compared with normal forms of *An. radiata* BGT., are unusually enlarged in their middle part and slowly narrowed to the base as well as to their tops, reminding enough several atypical forms of *A. radiata* BGT. described especially from the Karviná coal measure series of Upper Silesia as *A. radiata* var. *karvinensis* TRAPL.

Distribution:

Malé Přílepy, near Beroun. — In the whitish interlayers (called "košile") of the coal measure (correlated with the Lower Radnice coal measure).

Bílá Hora (near Plzeň), in the iron stone nodules of the hanging shales of the coal measure which is mostly correlated with the deepest coal measures of Central Bohemia ("Plzeň coal measures" of the author).

Kladno, mine Ronna at Hnidousy. — The interlayer of whitish fire clays (called Velká Opuka) of the Main Kladno coal measure) (ie. Upper Radnice coal measure).

Kralupy, outcrops of a shaly bed with iron stone nodules (correlated mostly with the Upper Radnice coal measure) on the hill "Červená Hůrka".

Zeměchy. —The interlayer of whitish fire clays (Velká Opuka) of the Main Kladno coal measure.

Příčina (W. of Lubná near Rakovník); coal mine Ludvík at the place called "Na Brantech". — In the bed of the whitish fire clays called "brus" of the coal seam no. I b (in the upper part of the coal measure series, correlated by A. ORLOV with the Lubná coal measures).

Otvovice. — The interlayer of whitish fire clays (Velká Opuka) of the Main Kladno coal measure.

II. Calamostachys SCHIMPER.

The verification of the various impressions of cones as *Calamostachys* cones is generally more easy than that of the previous *Palaeostachyae*. Their sterile bracts are in mature state mostly very declined (often under a right angle) from the cone axis downwards, wherefore they do not cover the sporangiophores with the sporangia in such a measure as we have seen it in the most part of the *Palaeostachya* cones. The position of the insertions of the sporangiophores on the cone axis are therefore much more clearly visible than in the impressions of the

Palaeostachyae, where the sporebearing organs are mostly wholly covered by the upwards bent sterile bracts reaching often till to the second or even to the third neighbouring higher internode.

Among the 10 *Calamostachys* species, which I have recognized in the coal districts of Central Bohemia, 7 are restricted to the Radnice coal measure series (*C. incrassata* NJC., *longibracteata* NJC., *intermedia* NJC., *ramosa* WEISS, *grandis* JONGM., *tenuis* O. F.), 1 (*C. germanica* WEISS. belonging to *Asterophyllites equisetiformis* SCHL.) occurs in all our three coal measure series (the Radnice, Nýřany, as well as in the Kounov coal measure series) and finally 2 species (*C. tuberculata* STBG. and *calathifera* WEISS) are to be found only within the Nýřany and Kounov coal measure series.

1. *Calamostachys tuberculata* STBG. (Pl. V, fig. 1—10.)

These cones were already known in 1809; they have been described and figured of course only very schematically by the late SCHEUCHZER (l. c. pp. 13, Pl. 2, fig. 6) but without any special name. The next later descriptions and figures are by K. c. STERNBERG (1820—1838, Vol. I [1825] pp. XXIX, Pl. 45, fig. 2), which are but very insufficient. As stated by STERNBERG himself, the designer has forgotten to draw the sporangia, which on the type specimen are enough distinctly visible, wherefore STERNBERG's figure shows only the cone axis, cca. 5—7 mm thick (in the mentioned SCHEUCHZER's figure 6—7 mm) bearing in intervals of cca. 4,5—6,5 mm whorls of rather short sterile bracts (cca. 6 mm long) vertically declined from the cone axis and slightly arclike bent upwards. No of his figures show the arrangement of the sporangia resp. of the sporangiophores. STERNBERG's type specimens were collected in Germany, but he does not state the precise locality; SCHEUCHZER's specimen came from the Permian of Mannebach. According to the quality of the shales within which STERNBERG's specimens are impressed, I believe that his type specimens were collected at Wettin, from which place came also many other plant impressions of STERNBERG's collections.

Although the fructification of *Cal. tuberculata* STBG. is one of the most frequent articulatinean fructifications in all coal series from the Upper Westphalian up until to the Permian ,the taxonomical problems concerning this form became during later times more complicated and obscure than we would believe. The reason of that may be seen in the first range just in the rather incomplete figures by STERNBERG and SCHEUCHZER. Later authors have joined to this "species" partly also forms, which have absolutely nothing in common with the true *C. tuberculata,* and in contrary they have described under special new names several specimens, which in fact are identical with it. They have often described as *C. tuberculata* even specimens of impressions the morphological features of which are quite indistinctly marked and which therefore cannot be taken into consideration.

From the later descriptions and figures[11]) we have to take into account the diagnosis and figures of the following authors: O. FEISTMANTEL 1872, 1875/6, F. A. ROEMER 1876, E. C. GR.'EURY 1877, M. B. RENAULT 1881—1885, 1882, CH. E. WEISS 1876, H. B. GEINITZ 1885, J. T. STERZEL 1893, A. HOFMANN—F. RYBA 1899, R. KIDSTON 1890—1891, 1893—1894, J. LINDLEY—W. HUTTON 1831—1837, W. J. JONGMANS 1911, 1915, R. ZEILLER 1888, DE STEPHANI 1901.

In the most of the just cited publications we find chiefly specimens collected in foreign countries. Only in ROEMER's, O. FEISTMANTEL's and HOFMANN—RYBA's papers we find figured specimens from our Bohemian coal districts, which eventually later have been refigured or discussed in the foreign literature (WEISS. JONGMANS a. o.). From the above cited authors GRAND 'EURY (1877, Pl. 6, fig. 4, 4 a) and T. J. STERZEL (1893, Pl. 9, fig. 9) presented only rather schematized figures, which therefore cannot be taken as reliable material in determination and identification problems, though all more important morphological structures are here rather distinctly and enough accurately sketched. M. B. RENAULT in 1881/85 (II [1882], Pl. 21, fig. 1—6) presents a copy of GR. 'EURY's figure (Pl. 21, fig. 1), to which he added a series of detailed figures concerning the anatomical structures; in his work from 1888/90 (with R. ZEILLER; pp. 402, Pl. 45, fig. 3 and Pl. 46, fig. 5—6) he presented several of the most instructive and reliable figures, which ever have been done. Equally convenient figures for determination purposes may be found also in ZEILLER 1888, Pl. 61, fig. 3 as well as in GEINITZ 1855, Pl. 18, fig. 8 (slightly schematized). All these figures are without any doubt well comparable with the already mentioned STERNBERG's type specimens. Of rather less use in this respect are the figures by de STEPHANI (1901, Pl. 9, fig. 10) showing a slightly strange appearence (most probably on account of a less convenient state of preservation); I believe that they are also quite identical with the other just mentioned specimens.

According to the figures in ROEMER's, ZEILLER's as well as in GEINITZ's works and according to the rather rich material of specimens collected in our bohemian coal districts we may characterize the *Calamostachys tuberculata* cones as follows:

Cal. tuberculata cones do not compose any special complicated "inflorescences" i. e. they are not arranged in greater number on special branches or branch systems. As attested by several specimens figured in the above cited papers, they were attached in greater number (12—16) to the nodes of some bigger (20—35 or even more cm thick) branches in whorls. Otherwise they are found mostly as isolated specimens. They

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[11]) BALFOUR's (1872: *Annularia* sp. — pp. 62, Pl. 48, fig. 3 [non 4]) and CARRUTHER's (1869: *Annularia* sp. — pp. 6, fig. 3 [non 4]) works were not accessible to me.

The figures in GOMES (1865: *Asterophyllites tuberculata* BGT. — pp. 4, Pl. 4, fig. 1) are rather indistinct and it is impossible to get any precise idea, with which form we have here to do. It was collected in the *Mixoneura ovata* horizon at San Pedro da Cova. — Rather schamatical are also the figures by L. LESQUEREUX 1879 (pp. 2 *"Asterophyllites"* fruit — Pl. 3, fig. 10).

attain a considerable length, till more than 1,5 dm, in the most cases about 10—12 cm; specimens longer than 15 cm are very rare. They are broadest in their middle parts being slightly attenuate towards their tops and bases. Their cone axis is mostly very thick, cca. 3—5 mm, but their internodes (measured between two neighbouring sterile whorls) are rather short (½—¾ cm), mostly a little longer than broad or even just as long as broad; in several cases also internodes shorter than thick may be observed. The sporangiophores are attached nearly to the middle part of these internodes i. e. nearly to the middle between two whorls of sterile bracts (resp. their free portions). The bracts are linear, lanceolate rather narrow and pointed, rather short (mostly cca. 5 mm, in bigger specimens till 7 mm), bent upwards arclike round the sporangia and mostly adpressed to the last ones. They do never overreach the next neighbouring higher sporangiophore whorl and often they do not cover even wholly the sporangiophores of their own whorl.

Cones of *Calamostachys tuberculata* STBG. are most often associated to the leafy twig fragments of *Annularia stellata* SCHL. and there are already many serious arguments presented in the literature attesting, that these cones belong in fact to the same mother plant as this *Annularia* species.

The most of the figures published as *C. tuberculata* STBG. in the above cited papers agree well with that description. Nevertheless in the later literature doubts were expressed on the identity of several of them and it seems quite certain that some of them are in fact to be excluded from the list of the synonyms. Without regard to those figures, which are rather schematized or otherwise unconveniently sketched, we have especially to pay attention to figures published by LINDLEY and HUTTON, ROEMER, FEISTMANTEL as well as by HOFMANN and RYBA. Those by LINDLEY and HUTTON represent foreign specimens, all others are specimens collected in our bohemian coal districts.

LINDLEY and HUTTON's form (l. c. Pl. 14 and 180) named as *Asterophyllites tuberculatus*, was studied later by R. KIDSTON, who recognized, that it represents a quite different species and named it *Calamostachys northhumbriana*. Its axis is still bigger than in our true *C. tuberculata* measuring about 1 cm across. Its internodes are very short (0,5 till 0,6 cm), nearly twice as broad as long. The sterile bracts are rather short and provided by very blunt tops. Evidently this type of cones cannot be joined to our true *C. tuberculata*.

O. FEISTMANTEL (i. c.) figured under the name of *C. tuberculata* STBG. two distinctly different fructification types:

a) Some rather thin cones measuring (without regard to their very declined bracts) only 4,5—5 mm across and coming from the well known "Schleifsteine" beds of Stradonice near Beroun (see in 1872, Pl. 5, fig. 3, 4; 1874, Pl. 1, fig. 6 and Pl. 16, fig. 2, 3). Their axis are cca. 0,5—1 mm thick and the arclike declined bracts are cca. 5—6 mm long. — Another quite identical cone was figured from the same locality but slightly schematized also by F. A. ROEMER) — he erroneously speaks about Stradonice as laying in Moravia; l. c. Pl. 50, fig. 9) under the name of *Bruckmania tuberculata*. ROEMER's figures are sketched slightly bigger

than they are in reality (just as in the above mentioned plates by O. FEISTMANTEL). All these specimens are much slender than the typical *C. tuberculata;* nevertheless they have been, evidently by mistake, regarded as true *C. tuberculata* STBG. also by W. J. JONGMANS (1915, pp.. 494).

b) A cone, which in all essential characters corresponds with the true *C. tuberculata* STBG., but which differs from it by unusually large dimensions (O. FEISTMANTEL: 1872, Pl. 6, fig. 1; 1875—1876, Pl. 17, fig. 1). Both just mentioned figures are termed by O. FEISTMANTEL as *Bruckmannia tuberculata.* The respective impression was collected in the hanging shales of the Nýřany coal measure (Westphalian D) at the „Pankrác" coal mines northward of Nýřany. This FEISTMANTEL's specimen became in the later literature just for its unusually big size somewhat problematical. Revising the whole material of various specimens not only from the mines of the surroundings of Nýřany, but also from Mirošov, I stated that such big specimens are not as rare as it would seem and that they represent only extreme cases of variability, which in this species seems to be rather large. — C. de STEPHANI (l. c. pp. 78) cites this FEISTMANTEL's form directly under the synonyms of the true *Cal. tuberculata.* R. KIDSTON (1903, pp. 803) included it also under the synonyms of the true *C. tuberculata* but added hereto a sign of ?. W. J. JONGMANS, who refigured FEISTMANTEL's curious specimen (1911, pp. 290, fig. 239) expressed finally a suspicion, whether FEISTMANTEL's specimen is perhaps not identical with KIDSTON's *Cal. northhumberiana,* though it is well evident that the features of its axis exclude utterly such a determination (the internodes are much thinner and slightly longer than broad).

As to the three figures by HOFMANN and RYBA (l. c. Pl. 2, fig. 12, 13 and 14) only the fig. 12 (specimen coming from Mirošov; westph. D) is to be regarded with certainty as true *Cal. tuberculata* STBG. In the case of the fig. 14 (specimens coming also from Mirošov) an identity with the true *C. tuberculata* was already denied by W. J. JONGMANS (1915, pp. 443): the single bodies regarded here as sporangia resp. group of spores are sitting in the axils of the bracts, which last seem to be not arranged in whorls but more likely spirally or alternately on the axis. Therefore this fructification does not belong to the group of the Articulatineae at all. HOFMANN—RYBA's fig. 13 (specimen coming from Svinná near Radnice) is very undistinct; it exhibits rather long sterile bracts but it is impossible to state, whether its sporangiophores are attached in a *Palaeostachya* or *Calamostachys* way to the cone axis. Its upper part remembers much PRESL's *Palaeostachya elongata,* whereas its lower part is very similar to *Calamostachys germanica.*

Very important seems to me still the point of view of CH. E. WEISS on the various specimens published or collected from Bohemia. As true Cal. tuberculata he takes into consideration only STERNBERG's original type specimens. Further he speaks also about one specimen (but without figuring it) from Studňoves near Slaný (evidently from the Kounov coal measures i. e. Upper Stephanian). On the other hand he joined to the true *C. tuberculata* several rather differing cones from Ilmenau, Saxony

(loc. Kammerberg), which remind in a high measure the already mentioned FEISTMANTEL's very big specimen (1875—1876, Pl. 17, fig. 1). The internodes of these specimens are much thicker and shorter wherefore they resemble much more to KIDSTON's *Cal. northhumberiana*, as already stated also by W. J. ONGMANS 1911, pp. 220, 1915, pp. 486). It seems but very unprobable that we have here to do with a true identity, because between the beds within which both these types were collected exists a too large stratigraphical distance (LINDLEY—HUTTON's resp. KIDSTON'S specimens came from the Lower coal measures of England, whereas WEISS's type was collected in the german Lower Rothliegendes). Evidently these specimens from Ilmenau cannot be identified with the very big FEISTMANTEL's specimens of true *C. tuberculata* from Bohemia.

A further important specimen of true *Cal. tuberculata* was figured by H. B. GEINITZ from the saxonian coal districts under the name of *Annularia longifolia* (l. c. Pl. 18, fig. 8). This specimen illustrates very instructively the considerable length as attained by the cones of this type. But besides this specimen and under the same name he figured also a smaller cone of a quite different appearence (ibid. Pl. 18, fig. 9). This last specimen was later separated by CH. E. WEISS from the true *Cal. tuberculata* as a distinct independent "species" under the name of *Calamostachys mira* (WEISS 1876, pp. 43, W. J. JONGMANS 1911, pp. 291 and 1915, pp. 485). Unfortunately until now we do not know any further specimen of that kind. Besides by its more slender resp. thinner appearence it differs from our true *C. tuberculata* (as mentioned also by WEISS and JONGMANS) also by the presence of special outgrowths on the abaxial side of the sterile bracts. These organs are bent downwards and recovering the sporangia from above.

As evident from the just presented critical review, though this "species" is unusually frequent in all upper westphalian till permian beds, not all figures in the literature are able to serve as enough characteristical and reliable terms for comparison at various determination studies. Moreover we have to state that during the later time there have been joined to this "species" also cones, which absolutely do not belong hereto and which show only several very slight and by no means essential similarities.

As to forms, which (especially if not well preserved) are rather easy to be mistaken for our *Calamostachys tuberculata*, we have especially to mention besides the already cited WEISS's *Cal. mira* RENAULT's *Calamostachys grand'euryi* and *decaisnei* (originally under the generic terms of *Arthropityostachys* or later also as *Bruckmania*). Both have been described from the quartzitic rocks of the Permian of Autun (1878 pp. 41, Pl. 4, fig. 12, 14; 1882 [Cours] Vol. II, pp. 136—139; 1896, pp. 135, Pl. 2, fig. 1—6; — see also in W. J. JONGMANS 1911, pp. 291—292 and 1914 pp. 26). They are still more similar to WEISS's *C. mira* than to our *C. tuberculata;* their general appearence is much more slender and their axis thinner. On the backside of their bracts they exhibit similar outgrowths as mentioned in *Cal. mira. C, descaisnei* is slightly thinner than *C. grand'euryi* (the first one exhibit 24 sterile

bracts and 12 soprangiophores per whorl, the second one 36 sterile bracts and 18 sporangiophores per whorl).

Distribution: *Calamostachys tuberculata* STBG. is a very frequent fructification type in the Nýřany as well as in the Kounov coal measure series (i. e. Westfalian D and Upper Stephanian). I have stated specimens at the following localities.

Nýřany coal measure series:

Nýřany, mines Krimich I, Humboldt, Karel a. o. — In the hanging shales as well as in the cannel coal bed of the Nýřany coal measure and in the hanging shales of the "Hanging Nýřany" coal measure.

Nýřany, mines at the place „Na Pankráci" between Nýřany and Doubrava. — In the hanging shales of the Nýřany coal measure.

Týnec, mine Masaryk. — Hanging shales of the Augustus coal seam.

„Na Borech" between Plzeň and Litice. — Outcrops of the Nýřany coal measure in a sandstone quarry at the road and railway leading to the railway-station of Litice (Sulkov).

Kbelany, mine Josef. — In the hanging shales of the coal measure.

Nová Lhota (near Dobřany), mine Anna. — Hanging shales of the Nýřany coal seams.

Horní Bříza, coal mines „V Jalovčinách" (E. of the village). — Hanging shales of the coal seams.

Chrašťovice (near Mladotice), mine Karel. — Hanging shales of the coal seams.

Potvorov. — Mines at cô. 463 S. W. from the village near to the forester's house of Řemešín. — Hanging shales of the coal measure correlated with the Nýřany coal measure.

Vranov (near Stříbro), galleries above the river Mže (E. from the village). — Hanging shales resp. iron stone nodules of the coal seam.

Mirošov, various coal mines in the surroundings. — In the hanging shales of the coal seams.

Mirošov, arkose sandstone quarries at Janov. — In the whitish clays containing *Mixoneura plicata* STBG.

Kounov coal measure series:

Trnová, Kotíkov, Košutka (N. from Plzeň). — Shales in the arkose sandstone quarries.

Ledce (N. from Plzeň). — In a bed of whitish clays in the caolinic arkose sandstone quarries below the hill Krkavec.

Horní Bříza (N. from Plzeň). — Hanging shales of the coal seam of the mine Pokrok at the place „Na Čabalkách".

Tlučná (between Nýřany and Plzeň), mine Krimich II. — In the shales accompanying the „Líny" coal seam.

Studňoves (near Slaný). — In the hanging shales of the „Kounov" coal measure.

Kralupy. — Light greyish shales W. from the town (between Olovnice and Kralupy above the brook „Knovízský potok") accompanying the outcrops of the „Kounov" coal seam.

Přerubenice (near Slaný), mine Humboldt. — In the hanging shales of the Kounov coal measure.

2. *Calamostachys incrassata* n. sp. (Pl. IV, fig. 4—6.)

This unusually big fructification type was collected at the coal mine Rako at „Krčelák" W. from Lubná (near Rakovník) by the mining insp. F. HLÍZA in the whitish and hard tuffitic sandstone bed of the Upper Lubná coal seam.

At the first sight these cones remind in some respects the genus of *Macrostachya* or several unusually large specimens of *Calamostachys tuberculata* STBG. According to the specimens known at present they overreach a length of more than 1 dm. Their breadth is very variable. Mostly they are about 12 mm thick, but several of them attain hardly only 1 cm, other ones until 16 mm and the biggest specimens I ever have seen was 2 3mm thick. The single fertile internodes resp. whorls with their bracts upwards arclike bent arround the sporangiophores are generally barrel like inflated and mostly shorter than broad e. g.:

12 mm thick	$7\frac{1}{2}$ mm long
13 mm thick	$7\frac{3}{4}$ mm long
$14\frac{1}{2}$ mm thick	8 mm long
15 mm thick	9 mm long
10 mm thick	$7\frac{1}{5}$ mm long
20 mm long	11 mm long
26 mm thick	12 mm long

Their sterile bracts are linear lanceolate slowly attenuate into a sharp point and their end portions are mostly slightly declined from the cone body. By their tops they are reaching until to $\frac{1}{4}$ of the next higher neighbouring fertile internode.

I never have observed any specimens in which such cones would be attached terminally or at the nodes of several leaf bearing thinner side branches. In contrary I stated some rare specimens where such cones are attached in greater number at the nodes of some bigger Calamites branches or stems (cca. 4 cm thick) like in the preceding *Calam tuberculata*. It is therefore highly probable that they did not compose any special inflorescences.

The *Calamostachys* nature of these cones is meanwhile not yet well attested because nearly all hitherto collected specimens show only impressions of their outer surface. Only one specimen, which exhibits another kind of preservation (having all spaces between the bracts, sporangiophores and the cone axis filled up by a fine caolinic substance) and which is partly crushed along its cone axis, showed clearly the position of the sporangiophores. This whole fragment is cca. 7 cm long attains a breadth till 14—15 mm and its axis is cca. 3—4 mm thick. The attachments of the sporangiophores are situated nearly in the middle between the neighbouring sterile whorls, i. e. in the same manner as in the *Calamostachys tuberculata* STBG.

It is very difficult to find out in the older literature among the Cala-

marian cones any species, which would be at least slightly similar to our big cones from the mine Rako at Lubná. In the well known monograph by W. J. JONGMANS (1911) we find absolutely no species, which would show a closer resemblance. Only the following 4 "species" show some slight similarities:

1. The fructifications, which were originally described by E. WEISS under the name of *Palaeostachya arborescens* STBG., 1884, Pl. 14 and 15 and which afterwards were joined by W. J. JONGMANS (1911) to the *Palaeostachya distachya* STBG. KIDSTON and JONGMANS separated them later (1817) on account of several special features (see in our notes on *Pal. distachya*) as an independent species i. e. as the fructifications of *Calamites schultzi* KIDST.-JONGM. named *Palaeostachya schultzi*. These cones are but cylindrical in shape, their single segments being not barrel like inflated. Just by this last feature they differ remarkably at first sight from our specimens from Lubná.

2. *Calamostachys northumberiana* KIDST., which resembles to our fossils by its barrel like inflated fertile segments. It differs from our type by a different shape of its sterile bracts, which are rather broad and provided by blunt, rounded tops.

3. *Calamostachys solmsi* WEISS (pro var.). — These cones are cylindrical without having specially barrellike inflated fertile segments. They remind by their outer appearence some very thin *Macrostachyae*. It was stated that these cones were sitting terminally on some leafy twigs (see in W. J. JONGMANS 1911, pp. 288, textf. 236; E. WEISS, 1876, Pl. 18, fig. 1, 3, 4).

4. *Calamostachys tuberculata* STBG. — As to the similarity and differences between this species and our big cones the most necessary has already been stated. Both these forms agree in being in a larger number attached to the nodes of some bigger Calamites casts. But they differ essentially by their size, the first of them being much more slender than the other one.

In the newer literature we find a very similar and most probably even quite identical specimen described and figured by SIMSON-SCHAROLD under the name of *Macrostachya infundibuliformis* BGT. (1934, Pl. 2, fig. 18.) The figured specimens agree with our specimens from Lubná not only by their size (they are cca. 10—12 mm thick) and their shape (their single fertile segments are also barrellike inflated), but also by their arrangement in whorls at the nedes of some bigger Calamites casts. As just told, SIMSON-SCHAROLD named his specimens as *Macrostachya infundibuliformis*, but at first sight we see that they have absolutely nothing in common with the true *M. infundibuliformis*, which is much bigger and exhibiting a far greater number of sterile bracts per whorls. SIMSON-SCHAROLD's specimens were collected in the so called Fettkohlenpartie of the Lower coalmeasures of Saarbrücken (i. e. Westf. C) of the coal mines at Wellesweiler, which is a similar stratigraphical niveau as our Lubná coal measure beds from which came our just described specimens.

Finally we have to mention also a Calamarian cone figured in 1925 by A. C. NOE (Pl. 5, fig. 5) under the name of *Calamostachys magna* LQX.

This cone is considerably similar to the more slender specimens of our present type; it measures cca. 14—16 mm across. Also its general outline is similar to our cones. NOE's *C. magna* LQX was collected at the famous locality called Mazon Creek (Westph. C—D).

Distribution: *C. incrasata* NJC. is known hitherto only from the tuffitic sandstone bed of the Upper Lubná coal seam of the Lubná coal measure series in the Lower grey beds of the mine Rako at „Krčelák" E. from Lubná (near Rakovník).

3. *Calamostachys longibracteata* n. sp. (Pl. VII, fig. 8—10.)

This species belongs to several very common and very characteristical fossils of the whitish fire clay interlayers of the Main Kladno coal measure (Upper Radnice coal measure) called „Opuka". It was also collected within deeper horizons of our Central Bohemian Carboniferous (f. inst. in the whitish shaly interlayers of the Lower Radnice coal seam called „košile" at Malé Přílepy near Beroun). It is very remarkable by its unusually prolongated sterile bracts.

Cones of this type attain mostly a length of about 9 cm, they are shortly stalked (cca. 1 cm) and without their bracts they measure about 0,8 mm across. They are provided by rather slender axis (cca. 0,5 mm) the internodes of which (i. e. the distances between two neighbouring whorls of sterile bracts) are cca. ½ cm long. The sporangiophores are attached to the lower portion of these internodes in a ⅓ or ¼ above the sterile bract whorls. The sterile bracts are about 1,9 till 2,1 cm long. They are attached to the cone axis under a right angle or more often they are sligthly declined downwards and then arclike bent upwards round the sporangiophores; their long, free distal portion is rather straight and orientated obliquely to the cone body, never adpressed to it.

Till present I did not find in the accessible literature any Calamarian fructification, which would agree in all details with our type. Very similar cones were described and figured by R. ZEILLER (1899 [1902], pp. 65—69, Pl. 5, fig. 11, 11a) as the fructification of his *Phyllotheca ralli* ZEIL. (see also in W. J. JONGMANS, 1911, pp. 235, 236 and 301). But these cones are much more slender than our *C. longibracteata;* their sterile bracts are only 7 till 8 mm long and the whole cones are scarcely 4 mm broad (without their bracts). Our type is at least twice as robust.

As to the outer appearence some similarity may be stated also in WEISS's *Palaeostachya gracillima* (1884, pp. 184, Pl. 18, fig. 1.; see also in W. J. JONGMANS 1911, pp. 326), as well as in several other smaller forms of the genus of *Calamostachys,* e. g. WEISS's *Cal. ramosa* (W. J. JONGMONS 1911, pp. 300; here see also the older bibliography), FEISTMANTEL's *Bruckmannia tuberculata* STBG. (1875—76, Pl. 16, fig. 2 and 3, as well as 1872, Pl. 2, fig. 3, 4; — not the other figured specimens in both these papers under the same name), WEISS's *Volkmannia tenera* (see in W. J. Jongmans 1911, pp. 339) a. o. All these forms are but much more slender and provided mostly by shorter sterile bracts.

As to several bigger forms hitherto discribed, especially *Calamostachys superba* WEISS reminds very much our type by its very long sterile

bracts; they are about 2 cm long. But these cones are essentially thicker, about 1,3 cm across (without the bracts) and resemble therefore slightly to our *Calamostachys tuberculata* STBG. Unfortunately *C. superba* was described only on the bases of a very imperfect material (see in W. J. JONGMANS, 1911, pp. 311 and the further literature cited here).

Still more similarity seems to exhibit WEISS's *Calamostachys sarana* (see in W. J. JONGMANS 1911, pp. 299 and 1915 [V] pp. 490) coming from Sulzbach in the Sarre coal district. Also this species was described on the bases of a very defective specimen. It has rather declined and long (about 1 cm) sterile bracts and measures cca. 0,8 mm across (without the bracts). But having no further better preserved specimens it is impossible to state anything more precise about its eventual relations to our *C. longibracteata.*

Distribution: Specimens of *C. longibracteata* have been found till now only within various horizons of the Radnice coal measure series.

Malé Přílepy near Beroun. — The whitish thin interlayers in the coal measure, which corresponds to the Lower Radnice coal measure.

Kladno, coal mines in the surroundings (Max at Libušín, Mayerau at Vinařice a. o.). — In the interlayers of whitish fireclays called „Opuka" (mostly in the so called „Velká Opuka") of the Main Kladno coal measure.

Příčina, W. from Lubná (near Rakovník). — Coal mines at the place „Na Brantech" (mine Ludvík). — In the hanging gray shales of the coal seam No. I a (corresponding with the Lubná coal measure).

Radnice (most probably coal mines at Břasy, W. from Radnice). — In the whitish sandy rocks of the „Schleifsteine" (brousky) beds in the hanging of the Lower Radnice coal measure.

4. *Calamostachys calathifera* WEISS. (Pl. V, fig. 11—13; Pl. VI, fig. 13.)

This slender *Calamostachys* type was found especially numerously in the clayish bed of the caolinic arkose sandstones of the Upper grey beds (Kounov coal measure series) at Ledce below the Krkavec hill N. from Plzeň. They are here associated to the impressions of *Annularia sphenophylloides* ZENKER twigs, to which also some specimens of *Annularia spicata* v. GUTB. are admixed. Several of them were observed in direct connection with *An. sphenophylloides* ZENKER.

Our specimens attain a length more than 4,5 cm and measure cca. 5,5 till 7 mm across. Their sterile bracts are more or less adpressed to the cone body. The distance between two neighbouring whorls of sterile bracts measures cca. 3,5—5 mm. Their sporangiophores are inserted slightly below the middle of the respective internodes. The whole external appearence of these cones as well as of their single fertile segments is very similar to *Calamostachys tuberculata;* they are only much smaller. The free end portions of their sterile bracts are here also narrow linear lanceolate, pointed and bent arclike upwards round the sporangia, to

which they are partially adpressed; but they do not reach to the next higher fertile segment, covering hardly the whole sporangiophores of their own segment.

Our Bohemian founds of *Calamostachys calathifera* are to be best compared with utterly similar cones, which were described and figured by T. J. STERZEL (1882, pp. 685, Pl. 28) also in connection with *Annularia sphenophylloides* ZENKER from the coal mines of the Saxonian coal districts of Lugau and Ölsnitz. STERZEL compared his specimens also with WEISS's *Calamostachys calathifera* (described originally from the Sarre coal district: colliery Reden 'pit Itzen' near Saarbrücken; „mittlere Saarbrückener" Schichten; — only 1 fragment). But he pointed out that WEISS's specimen is slightly bigger in size than his Saxonian forms (measuring cca. 7 till 7,5 mm across) and exhibiting nearly 5 mm long internodes and an axis nearly 2 mm thick. STERZEL regarded this fact as not very important (STERZEL l. c., pp. 689). In contrary WEISS in his later paper (1884 pp. 178) points out just this moment as highly important and believes, that both these types are specifically different (specimens from the Sarre on the one side and specimens from Saxonia on the other side).

Studying from this point of view our specimens from Bohemia, I went to the conviction, that the variability as to the size of our cones is considerably large (just as in *C. tuberculata*) and further that the bredth of the cones depends partially also from the fact whether the bracts are adpressed or more declined from the cone body. As mentioned above among our cones are also bigger specimens measuring about 7 mm across just as the specimen of WEISS. Therefore I do not see any serious reason why to distinguish here two different species.

In the present literature we find still 3 conelike fructifications, which by their general outer appearence are rather similar to our *Calamostachys calathifera*. They differ however essentially by their inner morphological construction: their sporangiophores are attached closely below each sterile bract whorl *(Metacalamostachys)* and are arclike resp. hooklike bent down (see W. J. JONGMANS, 1911, pp. 296, 1915 pp. 478, 1922, pp. 711, 712). Especially the following species are to be taken into account:

1. GRAND'EURY's *Volkmannia pseudosessilis* (1877, pp. 43, Pl. 6, fig. 3 [*V. sessilis*]), which is regarded by GR.'EURY (no doubt by mistake) as the fructification of *Annularia sphenophylloides* ZENKER, but without any well founded proof.

2. SCHENK's fructification of *Annularia brevifolia* (from China), which reminds several small leafy specimens of *Annularia radiata* BGT (see in SCHENK, 1833, textfig. 12, Pl. 40).

3. KIDSTON's fructification of *Calamites paleaceus* STUR (see in KIDSTON 1911 [1909], pp. 110, Pl. 10, fig. 1—4).

All these specimens are mostly of a still thinner shape than our cones of *Calamostachys calathifera*. Finally none of them do represent fructifications of true *Annularia sphenophylloides* ZENKER. Even GRAND' EURY's statement is utterly improbable.

Distribution: Fructification of *Calamostachys calathifera* WEISS are sometimes found associated, as already told, to leafy twigs of *Annularia sphenophylloides* ZENKER, which is a very common fossil in our coal districts up from the Westphalian D (Nýřany coal measure series) until into the Permian. As stated above I found them especially numerousely in the material of fossils from the clayish bed in the caolinic arkose sandstones at Ledce below the hill Krkavec (N from Plzeň). Some of them are attached to the bigger twigs of the ramified leafy shoots of the just named *Annularia*.

Nýřany coal measure series:

Nýřany, mine Humboldt. — In the hanging shales of the Nýřany coal measure.

Kounov coal measure series:

Horní Bříza (near Plzeň), mines at the place „Na Horách". — In the hanging shales of the Kounov („Líny") coal measure.

Ledce (near Plzeň), caolin mines below the hill Krkavec (at the road leading from Ledce to Plzeň). — In a greyish bed of soft clays correlated with the Kounov coal seam, in the caolinic sandstone quarries.

5. *Calamostachys germanica* WEISS. (Pl. VII, fig. 2—7.)

The morphological features and the taxonomy of WEISS's fructification type of *C. germanica* is at present in the whole well cleared up [see in CH. E. WEISS, 1876, pp. 47; W. J. JONGMANS 1911 (sub *Asterophyllites equisetiformis* as well as *Cal. germanica)*, 1914, III, pp. 105 (sub *Ast. equisetiformis*), 1915, V, pp. 480 (sub *Cal. germanica*)]. Very instructive figures and very detailed descriptions may be found in R. ZEILLER 1886 (88) pp. 368 (sub *Asterophyllites equisetiformis*). Also its relations to the leafy shoots of *Asterophyllites equisetiformis* SCHL., especially to the typical forms as found especially in the middle and upper westphalian series, were also already many times well attested, first by D. STUR in 1887 (pp. 161).

The cones of *C. germanica* WEISS are rather long, till about 1—1,5 dm, cylindrical in shape and provided with short stalks. They are attached mostly by 2 to the nodes of some thinner branches and the single pairs of cones are always superposed forming thus an inflorescens, the main axis of which bears 2 rows of cones. The sterile bracts of the cones are only in young state adpressed to the cone body, otherwise (in normal ripe state) they are declined from the axis under a very wide till nearly right angle and slightly arclike bent. Their free portions are narrow, linear, till 8 mm long (in smaller specimens often only 4—6 mm). They overreach until 2—3 times the length of the single internodes, which are cca. 2,5—3 mm long. The cone body (without the more or less declined sterile bracts) measures about 6—8 mm across, the cone axis is 2—2,5 mm thick. The sporangiophores are inserted to the lower part of the internodes above each bract whorl in a ¼—⅓ of the length of the internodes.

Young still closed cones with adpressed sterile bracts are of a compact cylindrical appearence, cca 6—8 mm thick. At the top they are rather abruptly attenuate; their conical tops are cca. 6 mm high and 60° wide. In this state of preservation the impressions of cones of *C. germanica* remind very much cones of *Palaeostachya ettingshauseni* KIDST. They differ from the last chiefly by longer and perhaps also narrower sterile bracts.

Further they resemble also to WEISS's *Paracalamostachys striata* (see in W. J. JONGMANS 1911, pp. 315). But these are essentially shorter (only 4—5 cm long, whereas our cones of *C. germanica* measure at least always more than 7—8 cm). Just on account of this feature (unusually short cones) some botanists (also W. J. JONGMANS 1911) regarded WEISS's *Paracalamostachys striata* as probably related to *Palaeostachya pedunculata* WILL.

In the coal districts of Central Bohemia this type of cones was collected most abundantly in beds of the stratigraphical niveau of the Upper Radnice coal measure (especially at Třemošná near Plzeň, in the coal districts of Rakovník, on the hill Červená Hůrka at Kralupy a. o.). In all places they are accompanied by many casts of typical leafy shoots of *Asterophyllites equisetiformis* SCHL. Though this species, as already told, was rather well cleared up on the bases of various specimens described from abroad, nevertheless I regard as very important to add several remarks on specimens described or figured from our Bohemian localities, as just these specimens have not been always taken into account with the same accuracy as those from abroad.

Before all a very obscure specimen seems to be PRESL's *Volkmannia sessilis* (in STERNBERG 1838, pp. 28, Pl. 2, fig. 1). On account of its considerable similarity with the just described cones it was regarded by CH. E. WEISS (1869, pp. 126) as identical with *C. germanica*. But in fact we stand here before a question whether PRESL's specimen represents a Calamarian cone from the Carboniferous at all. PRESL defined its stratigraphical origin as follows: "In argillo igne indurata (gebrannter Thon) formationis lithanthracum ad Klein-Priesen, Bohemiae" i. e. as if collected in the well known „ausgebrannten Letten" of the tertiary lignitic districts of Duchcov and Most in Northern Bohemia. The type specimen was not accessible to me. According to PRESL's notes, it was originally part of the collections of count MÜNSTER at Bayreuth, Bavaria. PRESL's figure was accomplished according to a sketch, which count MÜNSTER has sent to him. Several imprints associated to the cone impression and figured at the same time in PRESL's figure though very schematically resemble to some carboniferous *Alethopterids*, wherefore I suppose that we have here in fact to do with a slab of a carboniferous fire clay and that Presl's communication of the respective locality is erroneous. Then WEISS's identification of it with *C. germanica* must be regarded as quite just (see also in W. J. JONGMANS 1922 [VI] pp. 712).

Further we have to examine several specimens, which O. FEISTMANTEL regarded as fructifications of *Asterophyllites equisetiformis* SCHL. I have to state here, that in the most cases we have not to do here with our *C. germanica* WEISS at all, because most of them are in no

relation to any Calamarian leafy twigs; they are mostly in connection with twigs of *Sphenophylla*. Specimens in consideration according to my revision are to be identified as follows:

1871 („Kralup"): „Fruchtstand von *Asterophyllites equisetiformis*, die sog. *Volkmannia gracilis* STBG." — Pl. 1, fig. 1 —: are twigs of a *Sphenophyllum* deprived of leaves (most probably *Sph. cuneifolium* STBG.) with cones of the *Bowmannites* type.

1872 („Fruchtstadien..."): „*Volkmannia gracilis* STBG. von Kralup; Mutterpflanze: *Asterophyllites equisetiformis*" — Pl. 4, fig. 1, 2: Fig. 1. is a twig of a *Sphenophyllum* without leaves and bearing a cone of the *Bowmannites* type.
Fig. 2 is most probably a sterile leafy young shoot of *Asterophyllites equisetiformis*, but without cones.

1874 („Studien etc. in Böhmen"): „*Volkmannia gracilis*... zu *Asterophyllites equisetiformis* BGT." — Pl. 1, fig. 4 —: is a true *Calamostachys germanica* WEISS.

1875 („Versteinerungen etc. in Böhmen"): „*Volkmannia gracilis* STBG. zu *Asterophyllites equisetiformis*" — Pl. 10, fig. 3; Pl. 12, fig. 1: From the text of this work (pp. 114—118) as well as from all respective figures contained therein (also the figures entitled as *Asterophyllites equisetiformis* BGT: Pl. 10, fig. 1, 2; Pl. 11; Pl. 12, fig. 2) we see clearly, that FEISTMANTEL, just as also many of other our palaeobotanists, regarded various *Sphenophyllum* shoots provided with very deeply divided leaves into arrow linear laciniae as leafbearing poorly ramified twigs of *Asterophyllites equisetiformis* (especially twigs of *Sph. myriophyllum Crep.*; see for instance Pl. 12 fig. 2 in the cited FEISTMANTEL's work). On account of that also several similar but leafless *Sphenophyllum* shoots bearing fructifications have been by mistake also regarded as fertile twigs of *Asterophyllites* (e. g. FEISTMANTEL's Pl. 12, fig. 3).

These all are the reasons which led me to the following identification of all just named FEISTMANTEL's figures:

Pl. 10, fig. 1 (Kralupy) — *Asterophyllites equisetiformis* SCHL.
Pl. 10, fig. 2 (Rakovník) — *Asterophyllites equisetiformis* SCHL.
Pl. 11 (Kralupy) — *Asterophyllites equisetiformis* SCHL.
Pl. 10, fig. 3 (Kralupy) — *Calamostachys germanica* WEISS.
Pl. 12, fig. 1 (Kralupy) — *Sphenophyllostachys* of the *Bowmannites* type.
Pl. 12, fig. 2 (Břasy) — *Sphenophyllum myriophyllum* CRÉP.

FEISTMANTEL's erroneous identifications were caused perhaps in a high measure by STERNBERG's figures 1825/38, II, pp. 53, Pl. 15, fig. 1—3, because every of the three figured specimens represent something quite different (all were collected in the coal mines at Radnice):

Fig. 1 is a sterile twig of *Sphenophyllum myriophyllum* CRÉP.

Fig. 2 was regarded by W. J. JONGMANS as an indeterminable cast of a leaf bearing shoot (1922, pp. 708). The leaves are here entirely adpressed to the stalk and it is indeed very difficult to decide whether it is a cast of *Sphenophyllum myriophyllum* or an *Asterophyllites (longifolius* STBG. or *equisetiformis* SCHL.). I regard it most probably as an *Asterophyllites.*

Fig. 3 is certainly a Calamirian cone impression, but it is impossible to decide whether we have to do with a *Palaeostachya* or a *Calamostachys.*

I suppose that it was especially STERNBERG's fig. 1, which caused the mentioned mistakes in the just mentioned FEISTMANTEL's papers, just as in several works of the later palaeontologists, or in the collections of several collectors-amateurs, who so often are identifying by mistake shoots of *Sphenophylla* (especially of *Sph. myriophyllum* CRÉP.) with deeply divided leaflets as *Asterophyllites* twigs.

Distribution: As already mentioned this type of fructification accompanies leafy shoots of *Asterophyllites equisetiformis* SCHL., which is no doubt a very common fossil of all our coal bearing horizons in Central Bohemia. Nevertheless nearly all specimens conserved in the collections of the National Museum, Prague, are coming only from the Radnice coal measure series:

Kralupy (Červená Hůrka). — Beds correlated with the Upper Radnice coal measure (resp. the Main Kladno c. m.).

Kladno (various coal mines in the surroundings: Ronna at Hnidousy, Max at Libušín a. o.). — In the hanging shales called "Mydláky" and in the interlayer of whitish fire clays called "Velká Opuka" of the Main Kladno coal measure (Upper Radnice c. m.).

Lány. — In the hanging shales called "Mydláky" of the Main Kladno coal measure.

Lužná (near Rakovník), mine Lužná. — In the whitish interlayer (called Opuka) in the Main Kladno coal measure (i. e. Upper Radnice coal measure).

Rakovník, coal mines of the Comp. Moravia E. of the town. — In the whitish interlayers called "opuky" of the Upper Radnice coal measures.

Příčina at Lubná (near Rakovník), coal mines at the place "Na Brantech". — In the whitish fire clays of the Lubná coal measures (called "brus") as well as in the grayish shales of the Upper Radnice coal measures.

Třemošná (N. from Plzeň) — Grayish hanging shales of the Upper Radnice coal measures of the various mines in the surroundings (pit Ignác, pit Maria [at the road to Zruč] a. o.).

Nýřany, coal mine Josef N. from the village. — Hanging shales of the Upper Radnice coal measure (c. m. no. II).

Blatnice. — Iron stone nodules from the hanging shales of the Plzeň coal measures.

Malé Přílepy (near Beroun). — In the rocks of the "Schleifsteine" beds ("brousky" and "bělky") in the hanging of the coal measure (correlated with the Lower Radnice coal measure).

6. *Calamostachys intermedia* nov. nom. (Pl. VIII, fig. 7—14.)

This new name is here applied to certain cone like fructifications collected mainly in the Schleifsteine rocks of the ravine between Zdejciná and Stradonice near Beroun (the famous locality called mostly briefly "Stradonice"), which were figured by O. FEISTMANTEL (1872, Pl. 5, fig. 3, 4; 1874, Pl. 1, fig. 6; 1875/6, Pl. 16, fig. 2, 3) and identified by him as *Bruckmannia tuberculata* STBG. (which means *Calamostachys tuberculata* of the present authors). This identification is regarded as just also in several newer taxonomic works (W. J. JONGMANS 1911, in the list of synonyms pp. 239; 1914, under *Bruckmannia tuberculata* pp. 283; 1915 under *Calamostachys tuberculata* pp. 493) though already KIDSTON (1903 [Canonbie] pp. 807) payed attention to the uncertainty of this identification joining a sign of ? to the respective synonym.

From the true *Calamostochys tuberculata* STBG. these FEISTMANTEL's cones differ by several important features: their axis are much more slender, their sterile bracts with respect to the sporangiophores are much longer and very declined from the cone body, similarly as in *Calamostachys germanica* WEISS, and finally the whole cones are attached to rather slender twigs (also as in *Calamostachys germanica* WEISS) and not to big branches resp. trunks (like in the true *C. tuberculata* STBG.). In the whole there is much more similarity with the conditions as stated in *Cal. germanica* WEISS, than with those found in *Cal. tuberculata* STBG. with which it was mostly compared by various botanists. A certain difference from *Cal. germanica* WEISS may be seen in the kind of attachement of the sporangiophores with regard to the whorls of sterile bracts: in *C. germanica*, as told above, they are situated in a $\frac{1}{3}$ or even $\frac{1}{4}$ of the length of the internodes above the insertion of the sterile bracts, whereas in our form of Stradonice the sporangiophores are situated nearly in the middle between two sterile whorls like in *Cal. tuberculata* STBG.

As to the size, our *Calamostachys intermedia* stands between *Cal.. tuberculata* STBG. and *Cal. ramosa* WEISS (which last is mostly regarded as the fructification of *Annularia radiata* BGT.). They are more than $\frac{1}{2}$ dm long (unfortunately there are no quite whole specimens in the accessible material), in ripe state very similar to the ripe cones of *Cal. germanica* WEISS, having very declined sterile bracts. Without the declined bracts they measure nearly 4—5 mm across (with the bracts till 11 mm). The free portions of the sterile bracts attain a length of about 6—7 mm. The cone axis is about 1,5—2 mm thick, its internodes cca. 2,5 mm long.

In the whole these cones represent a much more slender type than *Calamostachys germanica*, to which they mostly resemble (see especially the figures in WEISS 1876, Pl. 16, fig. 3, 4).

At the mentioned locality of Stradonice these cones were associated with leafbearing shoots of FEISTMANTEL's *Asterophyllites foliosus* (non L.-H.!), which by several authors (W. J. JONGMANS 1911, ST. TRAPL 1927) have been considered as identical with some broad leafy forms of *Annularia radiata* BGT., by others (e. g. T. G. HALLE 1928) as a variety of *Asterophyllites equisetiformis* SCHL. No specimen was yet found in direct contact with these leafy shoots, but the conditions of the simultaneous occurrence of the impressions of both these parts make their origin from one and the same mother plant highly probable. Besides the great similarity of these cones to the cones of *Asterophyllites equisetiformis* SCHL. (i. e. *Cal. germanica* WEISS) seems on the other hand to be in favour of HALLE's opinion as to the relations of *Asterophyllites foliosus* O. F. (non L. H.) to *Asterophyllites equisetiformis* SCHL.

Besides in the works of O. Feistmantel, we find the same type of cones figured and described from the same locality (i. e. Stradonice) also in F. A. ROEMER 1876, Pl. 50, fig. 9. Also this specimen was often erroneously regarded as identical with *Calamostachys tuberculata* STBG. (see in W. J. JONGMANS 1915, pp. 494).

Distribution: As already told the fructification type of *Calamostachys intermedia* NJC. is meanwhile known only from the Schleifsteine rocks (below the coal measure) of the famous locality of Stradonice near Beroun.

7. *Calamostachys ramosa* WEISS. (Pl. VI, fig. 9—12; Pl. VII, fig. 1; Pl. VIII, fig. 1—6.)

With this small WEISS's *Calamostachys* I am identifying the small cones which in our Radnice coal measure series have been collected associated and in some cases even in direct connection with the slender leaf bearing shoots of the typical very narrow leafy *Annularia radiata* BGT.[12]) (specimens in the coll. of the Nat. Museum, Prague, are coming mostly from the small coal district "Na Lísku" at Zdejcina near Beroun

[12]) The "species" of *Annularia radiata* BGT. just as the most part of other our "species" of Calamarian leafy shoots, does not appear as an enough homogenous true species. But at the mean time it is very difficult to recognise and delimitate several narrower species on the bases of the mere shape of the leaflets as well as of the character of the sterile ramifications. JONGMANS and KUKUK in accordance with WEISS excluded from this "species" the so called *Annularia* (resp. *Calamites*) *ramosa* WEISS, to which they ascribe just our fructification of *Cal. ramosa* (see in JONGMANS—KUKUK 1913 pp. 42 and 45; W. J. JONGMANS 1915, pp. 28 and 33; event. also WEISS 1884, pp. 105, 106). Unfortunately such delimitation of narrower "species" is not yet enough clear, as evident also from the list of synonyma as presented just by W. J. JONGMANS (1913 and also 1915).

The type of *Annularia radiata* BGT., which was collected in association (and also in direct connection) with our *Calamostachys ramosa* WEISS. in the Schleifsteine rocks of the arkose sandstone quarries at Pejpina (near Beroun), represents a very narrow leafy from. The more slender shoots of it reminds strongly specimens figured by JONGMANS and KUKUK (1913) under the term of *"ramosa"* Pl. 16 fig. 8, but not their specimen figured on Pl. 17, fig. 1, which last shows a too strong similarity to some *Asterophyllites* shoots. If we take into consideration our specimens with larger leaves, then these remind JONGMANS—KUKUK's Pl. 16, fig. 3 and 4, which are termed by these authors as *"Annularia radiata"* BGT.

from the Schleifsteine rocks below the coal measure, especially in the old arkose sandstone quarries at Pejpina, signed often in various collections also as "Stradonice" or "Dibří").

Our *Calamostachys ramosa* cones are rather short, mostly only about 3—4 cm (in the literature their length is cited as 1,5 till 6 cm) and stalked. They represent indeed terminal portions of several twigs in the whole system of slender leaf bearing shoots. Their stalks are therefore often composed of several internodes bearing whorls of sterile normal leaflets. They are cylindrical, at the tops slowly conically narrowed. In their largest portion they are (without the sterile bracts; the cone body alone) about 3—4 mm thick. The free portions of their sterile bracts are about ½ cm long. The internodes of the cone axis are cca. 2,5—3 mm long and about 1 mm thick. The bracts are linear arclike bent roud the sporangiophores and then mostly slightly arclike declined from the cone body. Their tops are hardly reaching until to the basal part of the next higher bract whorl. The sporangiophores are joined to the middle part between two neighbouring bract whorls.

As to the figures presented till present in the literature, which especially resemble to our specimens from Bohemia, the following ones are especially to be mentioned: CH. E. WEISS 1884 (II, Pl. 6 [*ramosa*]); W. J. JONGMANS—P. KUKUK 1913 (pp. 65, Pl. 19, fig. 10 [*ramosa*]; R. ZEILLER 1888 (Pl. 59, fig. 8 [*radiata*]), W. J. JONGMANS 1911 (pp. 300, fig. 255 and 256 [*ramosa*]). They are mostly termed as *Calamostachys ramosa* event. as fructification of *Annularia radiata*, thus according to the respective "species" of the Calamites trunks or Annularia leafy shoots, with which in connection they have been observed (see also notes in W. J. JONGMANS 1915 [V] pp. 489).

In the literature dealing with the floras of the Bohemian coal districts I do not find any specimens figured, which might be really identical with this species, though at several places just the foliage type of *Annularia radiata* BGT. is very frequent and long ago well known.

Occurrence:

Pejpina near Zdejciná (between Beroun and Hudlice; in the older literature often called "Dibří"). — Arkose sandstone series below the coal measure (correlated with the Upper Radnice coal measure).

Stradonice (near Beroun). — In the "Schleifsteine" rocks ("brousky") of the series of arkose sandstones below the coal measure (correlated with the Upper Radnice coal measure) within the ravine between Stradonice and Zdejciná at the river Berounka.

8. *Calamostachys grandis* JONGM. (Pl. IX, fig. 1—5.)

With this name W. J. JONGMANS (1911, pp. 320; 1915, pp. 481) signed the small cones, which as already stated by R. ZEILLER (1886—1888, pp. 378, Pl. 59, fig. 6), represent the fructifications of the well known leafy shoots of *Asterophyllites grandis* STBG.

According to the data in the literature (ZEILLER l. c.) as well as according to some specimens collected in our coal districts, these cones attain a length of about ¼—½ dm. Without their sterile bracts they are cca. 4,5—5,5 mm thick (the bracts including till 6,5—9 mm). The cone axis is cca. 1 mm thick, its internodes about 2—3 mm long. The sterile bracts are attached to the cone axis nearly vertically and they are then arclike bent upwards round the sporangiophores. Their free end parts are cca. 5—6 mm long, overreaching thus the basal part of the next higher internode. They are linear and very similar to the normal sterile leaves of the above named *Asterophyllites* type. The sporangiophores are attached to the middle part of the internodes.

An utterly safe recognition of these cones if found only in an isolated state is rather difficult on account of a strong similarity with other small and slender *Calamostachys* "cone species". We get generally an utter certainty only if we find in the same rock slab associated at least casts of sterile shoots of the named *Asterophyllites* species.

Beside the various impressions of similar slender Calamarian cones there have been described also several casts of incrustated (mostly dolomitic) specimens which exhibit a strong similarity with our form. These are especially *Calamostachys binneyana* CARR. and *C. casheana* WILL. as well as the slightly more robust type of *C. ludwigii* CARR. Especially both first named species on account of their size are no doubt justly regarded by many botanists (see in W. J. JONGMANS 1911, pp. 314; 1915, pp. 481 — under *C. grandis*) as most probably quite identical with our form.

As to the various specimens known only as impressions, especially *Paracalamostachys williamsoniana* WEISS (W. J. JONGMANS 1911, pp. 313, 1922 pp. 653) is believed by several botanists as probably identical with our cones. But the whole outer appearence of this species is slightly different, though its size is nearly the same. It exhibits strongly adpressed sterile bracts to the cone body, which is generally not the case in our *C. grandis* (see in CH. E. WEISS 1884, pp. 193, Pl. 22, fig. 9).

All these tasks are meanwhile on account of the rather unsufficient material very difficult to be answered. As to the 4 just named "species" I regard as clearly settled only the case of *C. ludwigii* CARR., which without any doubt represents an independent essentially bigger type. As to the other three species, we must leave meanwhile this task undecided and expect the answer from future studies till better material will be available.

A certain similarity with our cones exhibit also the cones of *Asterophyllites charaeformis* STBG., which I am describing in the following chapter under the name of *Calamostachys charaeformis* JONGM. But these last are still thinner and in all respects smaller. But nevertheless without a simultaneous occurrence of casts of sterile leafy shoots it is also rather difficult to decide with which of both types we have to do.

Finally a very similar type was described by O. FEISTMANTEL under the name of *Volkmannia tenuis*, which I am describing in the next chapter

under the name of *Calamostachys tenuis* O. F. sp. This type differs from our cones of *Cal. grandis* also only by slightly smaller size.

Distribution: Cones of *Calamostachys grandis* JONGM. are known in the same beds, where *Asterophyllites grandis* occurs in considerable quantity. I know them mainly from the Kladno coal district, from horizons equivalent to the Upper Radnice coal measures.

Kladno, coal mines in the surroundings of this town (mine Max and Jan near Libušín, Ronna at Hnidousy a. o.). — In the interlayer of whitish fire clays (called "Velká Opuka") of the Main Kladno coal measure.

9. *Calamostachys tenuis* O. F. sp. (Pl. VI, fig. 1—8.)

These very slender Calamarian conelike fructifications were collected in a large number in the very fine grained, soft and clayish shales of light gray colour in the hanging of the Upper Radnice coal measure at Břasy near Radnice. They occur here in association and sometimes also in direct connection with a certain type of *Asterophyllites* shoots, which hardly are to be distinguished by anything more substancial from STERNBERG's *Asterophyllites grandis;* they are perhaps only of a slightly smaller size (shorter and thinner leaflets, more slender axis a. o.). They have been described and figured already by C. r. Ettingshausen (1854, pp. 27, Pl. 2, fig. 2, 3) as the fructifications of his *Calamites tenuifolius* ETT. (to which he ascribed leafy twigs partly of the type of *Ast. grandis,* partly also of that of *Ast. longifolius*). Later the same type was figured and described by O. Feistmantel as *Volkmannia tenuis* O. F. (1872, pp. 28, Pl. 6, fig. 2, 3; 1875/6, pp. 124, Pl. 14, fig. 7). O. FEISTMANTEL ascribed them to *Asterophyllites longifolius* STBG.

These cones are strongly similar to the cones, which CH. E. WEISS (1884, pp. 193, Pl. 22, fig. 9; see also in W. J. JONGMANS 1911, pp. 313 and 1922 pp. 653) named *"Paracalamostachys" williamsoniana.* On the other hand they resemble also in a very high measure to the type of *Calamostachys grandis* JONGM. From this last type (see in our foregoing chapter) they differ by slightly smaller dimensions, but chiefly by their sterile bracts, the free upwards bent portions of which are rather straight and adpressed to the cone body; at the top of the cones they compose something like a pointed cap. Just by these all features our slender cones of *C. tenuis* O. F. agree well with the mentioned WEISS's *Paracalamostachys.*

On several of our specimens, which are preserved as longitudinal sections, we easely are able to state, that the sporangiophores are attached to the middle part of the axis internodes, which attest their Calamostachys nature. In the most part of the impressions however this character is not to be observed, as they exhibit generally only the outer surface of the cones with their adpressed bracts covering wholly the inside of the cones.

Our *Calamostachys tenuis* O. F. cones are about 2,5—3 cm long (sometimes even longer, till 4 cm) and about 4 mm thick. They are

provided by a very thin axis (only cca. ¾ mm). Their internodes are about 1,5 mm long. They are narrowed conically at both ends and pointed at the top. The sterile bracts are linear, slowly attenuate into a sharp point and mostly very closely adpressed to the cone body, reaching by their tops nearly to ½ of the next higher internode. Their free upwards bent portion is cca. 2,5 mm long (their whole length thus nearly 4 mm).

All the features by which these cones are to be distinguished from the preceding *Calamostachys grandis* JONGM., are, as evident, only of such a character, that they do not exclude the possibility, that these cones might represent eventually only a special state of preservation or perhaps a state of growth (young, not yet mature) of *Cal. grandis* JONGM. But till now we have no reliable proof of such an eventual identity. Even the simultaneous occurrence (sometimes even in direct connection) of leafbearing shoots very similar to *Ast. grandis* type is to be regarded as not enough reliable proof, because we know well that even very similar leafy shoots belonged to different Calamites species. I believe therefore, that only very detailed anatomical studies of the leaflets, of the cone bracts as well as the study of the spores in some better preserved specimens (especially in a carbonized state and not only as mere impressions) can solve this task. Meanwhile I am describing it as a special independent "species".

O c c u r r e n c e: These very slender cones of *Calamostachys tenuis* O. F. are known till present only within the Radnice coal-measure series.

Břasy near Radnice. — Hanging shales of the Upper Radnice coal measure.

Vejvanov near Radnice. — Hanging shales of the Upper Radnice coal measure.

Nýřany, mine Krimich I. — In the hanging shales of the coal measure no. 2. (Upper Radnice coal measure.)

Lubná (near Rakovník), hanging shales of the Lubná coal measures.

10. *Calamostachys charaeformis* JONGM. (Pl. IX, fig. 6.)

With this name were signed by W. J. JONGMANS (1911, pp. 312) the very slender cones, which D. STUR long ago figured in connection with his *Asterophyllites roehlii* (1872, pp. 211) and afterwards ZALESKIJ (1907, pp. 366) in connection with *Asterophyllites charaeformis* STBG. By later researches it was stated that both just mentioned *Asterophyllites* types are identical (see W. J. JONGMANS 1914 [III], pp. 147).

From our Central Bohemian coal districts I know till present only one not very conveniently preserved specimen as a mere impression. It was collected at Kralupy and is attached to a ramified system of leafbearing twigs of the type of *Asterophyllites charaeformis* STBG., which in our coaldistricts is less frequent than the somewhat similar but much more robust type of *Asterophyllites grandis* STBG.

Cal. charaeoformis is a very thin type of cones, only about 2,5 mm thick. Their internodes are only cca. 1 mm long. The sterile bracts are

rather short, linear, arclike bent upwards round the sporagia and closely adpressed to them.

Their whole outer appearence is rather similar to the cones, which have been described by CH. E. WEISS (1884, pp. 194, Pl. 22, fig. 10—14) as *Paracalamostachys minor* (see also in W. J. JONGMANS 1911, pp. 317). But these last differ much from our type in several details, especially in having fused their sterile bracts into some starlike discs.

Several years ago I have described quite identical cones under the term of *"Calamostachys sp."* from the Carboniferous of the region of Svoge in western Balkan mountain range in Bulgaria, where in the respective beds (Westphalian A till B) true *Asterophyllites charaeformis* is very frequent (F. NĚMEJC, 1942, pp. 143, Pl. 3, fig. 20).

Occurrence: At present known only from the Radnice coal measure series.

Kralupy. — In the outcrops of the carboniferous beds on Červená Hůrka. In a series of shales accompanied by iron stone nodules correlated mostly with the horizon of the Main Kladno coal measure (i. e. the Upper Radnice coal measure).

Holoubkov (near Rokycany). — Outcrops of a shaly bed with thin coaly layers at the road from Holoubkov to Rokycany (just behind the village), correlated mostly with the deepest coal measures of Central Bohemia ("Plzeň coal measures" of the author).

III. Huttonia STBG.

This genus of Calamarian cones remained for a considerable time rather obscure as to its internal morphological features. Finally it was recognized as a special extreme type derived from the genus of *Palaeostachya,* distinguished by sterile bracts joined together into broad radiating disclike organs, which are provided on their dorsal side by rather large umbrellalike outgrowths cowering the sporangia from above (see F. NĚMEJC 1950). Until present we know from Central Bohemia only 1 species, the *Huttonia spicata* STBG., which was collected only in the Radnice coal measure series.

1. *Huttonia spicata* STBG. (Figured specimens see in NĚMEJC 1950.)

This rather big cone type was first described and figured by K. c. STERNBERG in 1873 (pp. 69) from the "Schleifsteine" rocks in the hanging of the Lower Radnice coal measure of the sandstone quarries at Vránovice near Radnice. It is very similar to some big Palaeostachya cones, especially to *Palaeostachya distachya* STBG., or it resembles to some smaller cones of the genus of *Macrostachya.* As I pointed out in detail in my special study on these cones in 1950, *Huttonia spicata* was later investigated by CH. E. WEISS (1876, pp. 81, 82, 87; 1877, pp. 267, 268; 1884, pp. 188, 19) and D. STUR (1877, pp. 19, 20). Further remarks were then added by W. J. JONGMANS (1911, pp. 353—356), by O. H. SELLING (1944, pp. 316—317) as well as by lady I. BROWN (1927, pp. 302).

All these studies have suggested, that there are many features attesting the probability of a Palaeostachya nature of these cones. But nevertheless an utter certainty about the morphological nature of these cones was not settled. As the type specimens of Sternberg as well as some additional material of these cones was easely accessible to me in the collections of the National Museum, I examined anew these cones on several conveniently orientated sections, by means of which I went to the conviction that the supposed opinion, i. e. that these cones stand very near to the Palaeostachya type, is quite just (F. Němejc, 1950).

The cones of *Huttonia spicata* STBG. are rather big and cylindrical, about 16 cm (or even more) long, broadest in their lower $^2/_3$ (cca. 2,5 cm across) and slowly attenuate to the top as well as to the base, measuring in their upper $^1/_4$ only about 1,5 cm across. They are shortly stalked, their stalks being composed only of one internode and about 2 cm long and 4—5 mm thick. The whorls of sterile bracts are cca. $^3/_4$ cm appart and contain about 16 bracts (of which on the impressions only 8 are visible). These are bent upwards and closely adpressed to the cone body; their visible portions are narrow lanceolate, slightly and slowly narrowed toward the base and toward the top into a very sharp and prolongated point. Their surface is longitudinally finely striated. They are about 18—20 mm long broadest in their lower $^1/_3$ (up from the very base), cca. 3,5 mm. In their lower portion where they are more or less vertically orientated to the cone axis, they are collarlike united together in a length of cca. 3,5 mm) forming thus a disclike radiating organ. On their dorsal side in the places where they are bent upwards and split into the radiating free portions, they bear special prolongated outgrowth cca. 3—4 mm long which are also united together into a kind of an umbrella covering from above the sporangia. The detailed conditions of the sporangiophores and sporangia are unfortunately not well visible on the available material. On the sections we may only safely state that the sporangiophores are attached in the very axils of the disclike united bract whorls, thus in the same kind as in the type of Palaeostachya.

As already told, our *Huttonia spicata* STBG. exhibits a considerable similarity to *Palaeostachya distachya* STBG. especially if only mere impressions are available. The chief differences between the impressions of both these types are as follows: The visible portions of the sterile bracts in *Pol. distachya* STBG. are essentially narrower and their number per whorl is nearly twice as high (cca. 24—28) as in our *Huttonia* (12—16). The cones of *P. distachya* STBG. are mostly always thinner (only 15—17 cm; whereas in Huttonia till 17—25 mm) and their bracts are often slightly declined from the cone body. In the whole our *Huttonia* represents an essentially bigger form with rather adpressed bract end portions.

Occurrence: The cones of *Huttonia spicata* STBG. were found till present only in the Radnice coal measure series.

Vránovice (near Radnice). — The "Schleifsteine" ("brousky" and "bělky") horizon in the hanging of the Lower Radnice coal measure of the famous sandstone quarries (STERNBERG's type specimens and other additional material).

Svinná (near Radnice). — The "Schleifsteine" horizon ("brousky" and "bělky") in the hanging of the Lower Radnice coal measure (only one small fragment).

IV. Macrostachya SCHIMPER.

Macrostachya is at present still a rather poorly defined generic term. It is applied mostly to Calamarian cones of an extraordinarily large size, with a very thick axis provided with rather short internodes, wherefore the bractwhorls containing a large number of sterile bracts are very approached. The inner morphological conditions of these cones are mostly unknown and we find only very scattered, rare and not enough clear reports about this task in the literature. I. BROWN believed for instance *Macr. carinata* GERM. to be of a Calamostachys nature. W. C. DARRAH suggests the same in the case of the North American species of *Macr. thompsonii*. Newly O. H. SELLING (1944) discovered in one species from the Chinese Permocarboniferous named by him as *Macr. multibracteata*, just immediately below every bract whorl (which on account of the fused single bracts represent radiating disclike bodies) by one disclike organ (no doubt fused sporangiophores) bearing on its lower (i. e. abaxial) side along the margin a series of sporangia. These conditions remind very strongly those of the genus of *Cingularia*.

On account of that all it seems that the present term of *Macrostachya* is very far from a natural generic term. May be that there are joined together strobili of *Calamostachys, Palaeostachya* as well as of other not yet well cleared up genera. It seems to be essentially artificial.

As to the taxonomy of the various hitherto described species, a certain confusion may be found in the literature. We easely may see that to the term of *Macrostachya*, which was originally constructed for some very big Calamarian cones, also several strobili of the genus of *Sphenophyllum* have been erroneously joined, for instance *M. gracilis* STBG., *hauchecornei* WEISS, *caudata* WEISS. This problem was solved partly by W. J. JONGMANS (1922 — in the Fossilium Catalogus). D. STUR in 1874 (pp. 262) on the bases of the older literature defined 3 main types resp. "species" of *Macrostachya* in the European carboniferous flora:

a) Extremely thick cones, measuring till over 3,5 mm across:

M. infundibuliformis BGT. sp. (i. e. BRONGNIART's *Equisetites infundibuliformis* from 1828, pp. 119, Pl. 12, fig. 14, 15 [non 16!])[13])

M. geinitzi STUR sp. (i. e. GEINITZ's *Equisetites infundibuliformis* BGT., 1855, pp. 3, Pl. 10, fig. 6)

b) Some rather thinner cones measuring only 2—2,5 cm across:

M. carianata GERM. (i. e. GERMAR's *Huttonia carinata*, 1844/53, pp. 90, Pl. 32, fig. 1, 2)

[13]) This last BRONGNIART's figure is a mere copy of BRONN's *Eq. infundibuliformis*, 1828, pp. 52, Pl. 4, fig. 4, which is identical in fact with our *Cingularia typica* WEISS sp.

c) Thinner cones, only cca. 2 cm across, bearing sterile bracts provided by bristlelike prolongated tops:
M. gracilis (STBG.) STUR.

Both first named big STUR's species *(infundibuliformis* and *Geinitzii)* as evident from all later studies (see in JONGMANS 1922) are specifically identical, but not so all specimens, which by various later authors were joined to them. We have to join hereto only the following specimens mentioned in the older literature:

1822, A. BRONGNIART: Pl. 4, fig. 2 *"Emprinte de plante analoque aux gaines des Equisetum et appartenant a une Calamite"*.

1828, A. BRONGNIART: *"Equisetum infundibuliforme"*, only Pl. 16, fig.14, 15 (non 16), which represent the same type as his fig. from 1822. Brongniart regarded both these figures as only cotypes of his species, regarding in contrary as type specimen his fig. 16 (of the same plate), which represents in fact something quite different. This figure (i. e. Pl. 16, fig. 16) is a mere copy of BRONN's fig. from 1828 (pp. 52, Pl. 4, fig. 4 *"Equisetites infundibuliformis")*, which as already mentioned has nothing common with the "genus" of *Macrostachya,* but represents our present *Cingularia typica* WEISS sp. (collected in the coal mines of Saarbrücken).

1836, A. v. GUTBIER: pp. 30, Pl. 3 b, fig. 5, 6 *"Equisetum infundibuliforme"* (loc.: "Zwickauer Schwarzkohle" in Saxonia i. e. Westphalian D).

1844/53, E. F. GERMAR: Pl. 32, fig. 3 *"Equisetum infundibuliforme* var. β GUTB.". This is a mere copy from GUTBIER's l. c. presented here only for comparative purposes.

1855, H. B. GEINITZ: pp. 3, Pl. 10, fig. 6 (not the other fig.) *"Equisetites infundibuliformis"*. — Loc.: Saxony, "Scherbenkohlenflöz von Bockwa und Oberhohendorf", Westphalian D.

1877, C. GRAND 'EURY: pp. 48, Pl. 32, fig. 1, *"Macrostachya infundibuliformis"* — the figure is here rather schematical.

1888/90, B. RENAULT—R. ZEILLER: Pl. 51, fig. 3 — *"Macrostachya crassicaulis"* n. sp. — loc.: Commentry, trenchée de l'ouest, 2^{me} couche.

1899, A. HOFMANN—F. RYBA: pp. 31, Pl. 2, fig. 18 — *Huttonia (Macrostachya ?) carinata* GERM. — loc. Mirošov (westphalian D; Nýřany coal measure series).

In all these specimens we have to do with very big strobili measuring about 3 till 3,5 cm across and of a nearly equal outer appearence. All have been collected in the youngest carboniferous series i. e. partly in the Westphalian D partly in the stephanian beds. It is but very difficult to distinguish among them the above mentioned two STUR's species *M. infundibuliformis* and *M. geinitzii* by means of features deduced solely from their outer appearence. Having till now no knowledge of their inner construction, I regard them all therefore as only one well defined "species".

Description, discussion as well as figures of the mentioned thinner STUR's species of *Macrostachya carinata* GERM. sp. may be found in the following papers:

1844/53, E. F. GERMAR: *„Huttonia carinata"*. — pp. 90, Pl. 32, fig. 1, 2. — Loc.: Wettin.

1876, CH. E. WEISS: I, pp. 71, Pl. 6, fig. 1. — *„Macrostachya infundibuliformis* BGT." Loc.: Sulzbach, Untere Saarbrückener Schichten.

1880, R. ZEILLER: pp. 23, Pl. 159, fig. 4 *„Macrostachya carinata* GERM.", Loc.: Tarn, Mines de Carmaux, bassin d'Alais, houiller supérieur.

Also these thinner[14]) *„Macrostachya"* cones were mostly found in rather very young carboniferous beds, as evident from the places where they have been collected.

The third STUR's *Macrostachya* type (i. e. rather thin strobili, the sterile bracts of which are bristlelike elongated) is of less interest for our present paper. These strobili represent most probably bigger cone like fructification of various species of the genus *Sphenophyllum*, the well known type of *„Bowmannites"*. We have to do here mostly with cones measuring (without the bristle-like prolongations of the bracts) hardly some 2 cm across, which were named by D. STUR as *Macrostachya gracilis*. D. STUR believed that these cones belong to a certain type of Sphenophylla, on the sterile shoots of which he found leaflets divided into 5 till 15 mm long, narrow, linear laciniae. He named these sterile shoots *Volkmannia gracilis*, identifying them with STERNBERG's *Volkmannia gracilis*. But K. C. STERNBERG described under this term 2 different plantremains, which do not belong to only one mother plant: sterile shoots of *Sphenophyllum myriophyllum* CRÉP. and some *Palaeostachya* cones (nearer not determinable on account of a rather bad state of preservation). I am therefore of the opinion that STUR's specimens have indeed nothing in common with the original STERNBERG's *Volkmannia*. STUR's *M. gracilis* was collected at Vondráček's coal mines near Hostokryje (in the district of Rakovník), in the hanging shales of the coal seam No. 2. It is very similar to several specimens, which were described by O. FEISTMANTEL (1872 pp. 9, Pl. 1, fig. 2) as *Huttonia carinata* from Břasy, near Radnice (see also O. FEISTMANTEL, 1875/6, pp. 103, Pl. 3, fig. 3). These FEISTMANTEL's specimens are also about 2 cm thick, their bracts are provided by until 6 cm long bristlelike prolongations. Both types, but especially the last one (by O. FEISTMANTEL)[15])

[14] Besides the just named specimens we find in the literature several still thinner types described also under the term of *Macrostachya*, no doubt quite unjustly. Two of such better defined forms are as follows:

1876, CH. E. WEISS: I, pp. 75, Pl. 18, fig. 1, 3, 4: *"Macrostachya infundibuliformis* var. *solmsi"* Loc.: Dudweiler, Skalley Schächte, Untere Saarbrückener Schichten. — This form, as already stated later by the author of this species himself (CH. E. WEISS 1884, II) and as attested also by W. J. JONGMANS and R. KIDSTON, represents only a bigger type of the genus of *Calamostachys* i. e. our present *C. Solmsi* WEISS.

1884, CH. E. WEISS: II, pp. 119, Pl. 16, fig. 3: *"Macrostachya carinata* var. *approximata"* Lok.: Orzesze in Upper Silesia. This specimen is to be regarded as a *Sphenophyllostachys* and indeed it was found associated to sterile *Sphenophyllum* shoots.

[15]) Under Sternberg's term of *Volkmannia gracilis* O. FEISTMANTEL described and figured several *Sphenophyllostachys* specimens (1871, Pl. 1, fig. 1; 1872 Pl. 4, fig. 1 and Pl. 5, fig. 1; 1875/6, Pl. 12, fig. 1), in 1875/6 even an *Asterophyllites equisetiformis* branch with cones of *Calamostachys germanica* WEISS.

resemble strongly to WEISS's *Macrostachya caudata* (see CH. E. WEISS 1876 [1], pp. 77, Pl. 13, fig. 2), which was collected at Hermsdorf in Silesia (mine „Beste Grube") accompanied by *Sphenophyllum „Schlotheimi"* (the type specimen forms part of Beinert's collections).

Not only the whole outer appearence of these cones but also their simultaneous occurrence with certain types of *Sphenophyllum* shoots attest that all these cones grouped round STUR's *M. gracilis* resp. WEISS's *M. caudata* have absolutely nothing to do with the group of the *Calamitaceae* but that they represent cone like fructifications of the *Sphenophyllaceae* i. e. the so called *Sphenophyllostachys* or *Bowmannites*.

As to the first mentioned STUR's true *Macrostachia* types, which have their bracts not prolongated bristlelike (i. e. *M. carinata* GERM., *M. geinitzi* STUR and *M. infundibuliformis* BGT. [ex p.]), I believe that especially STERZEL's point of view is very important (see J. T. STERZEL 1878/80 as well as also W. J. JONGMANS 1911, pp. 348). GERMAR's *Huttonia carinata* from Wettin is generally described as an essentially thinner cone type than the Saxonian GEINITZ's resp. GUTBIER's *Macrostachya* specimens. It is till 15 cm long and about 2,1, 2,3 until 2,6 cm broad showing in the impressions cca. 12—13 bracts across (i. e. 24—26 bracts per whorl), which are strongly keeled and provided by a distinct central vein. Studying thoroughly the rich material of the various cone impressions from Wettin, STERZEL stated that the keellike central nerve is in fact only the bristlelike prolongation of the nextlower sterile bract adpressed very closely to the cone body. Further STERZEL stated that these cones are much more variable, than as mostly assumed in the literature, their length being about 7—17 cm, their width cca. 2,5—3,5 cm (their whorls contain according to Sterzel 20 till 36 bracts). That means that both STUR's types (the broader form of *M. infundibuliformis* resp. *Geinitzi* and the thinner form of *M. carinata*) represent only two extreme variations of cones of one and the same species ;at Wettin they have been met simultaneousely and even with many transition forms. The same fact is to be observed also in our material of fossils from the coal measures of the Nýřany series at Mirošov in Central Bohemia. Just as in Wettin also here were collected specimens measuring across 2, 2,5 till 3 cm. Therefore I believe also that only according to the outer appearence and according to the size it is impossible to distinguish here any narrower defined natural "species" in STUR's sense and that only the knowledge of the internal structures, of the character of the spores a. o. may decide if we have here to do with only one rather variable species or with two resp. even more very similar allied species.

As to the name, which is to be used for this *Macrostachya* type in STERZEL's sense, I believe that the most convenient term is that of *Macrostachya carinata* GERM., especially for the following reasons:

1. *Equisetites infundibuliformis* in the original sense of BRONN represents a quite different cone type, — our *Cingularia typica* WEISS.

2. *Equisetites infundibuliformis* BGT is not applicable because A. BRONGNIART united under this term, — perhaps only by mistake —, BRONN's type with specimens, which are identical with GERMAR's *M. carinata*.

3. The term of *M. geinitzi* was used by D. STUR only for the extremely thick specimens measuring across 3—3,5 cm i. e. it comprises only a small extreme part of the whole form series met at Wettin and known there as *M. carinata* GERM., indistinguishable as to the general appearence, form of the bracts, as well as all outer morphological features from the last.

At present I know from Central Bohemian coal districts only 1 well defined "species", that of *Macrostachya carinata* GERM. (in STERZEL's sense).

1. *Macrostachya carinata* GERM. emend. STERZEL. (Pl. X, fig. 1—6.)

To this "species" belong all specimens collected hitherto in the coal districts of Central Bohemia. All specimens which were available to me came mostly from very high beds of our Carboniferous i. e. from our Westphalian D and from stephanian beds (the Nýřany coal measure series and the Kounov coal measures).

Their main features, their general outer appearence as well as all problems connected with the synonymity resp. taxonomy of this "species" were already discussed in the above chapter dealing in general with this formgenus and need no further remarks. No new discoveries as to the inner morphology of these cones on our material have ever been made. I present therefore here only the following data concerning its distribution.

The species of *M. carinata* GERM. em. STERZEL is slightly similar to the conelike fructifications of Calamites Schultzi (STUR ex. p.) KIDST.-JONGM. But these last are essentially thinner, measuring only about 1¾ cm across (otherwise they exhibit similarly imbricated and very closely adpressed distal parts of the sterile bracts).

Occurrence:

The chief part of the specimens of *Macrostachya carinata* GERM. em. STERZEL is known from the Nýřany coal measure series. Besides it occurs also in the Kounov coal measure series.

Nýřany coal measure series:

Mirošov. — In the hanging shales of the coal measures (correlated with the Nýřany coal measures in the Plzeň surroundings). — From this place both types, the bigger ones as well as the thinner forms (and some transitional specimens) are known.

Nýřany, coal mines in the surroundings. — In the cannel coal of the Nýřany coal measure. — Mostly bigger specimens measuring about 3,5 cm across.

Nýřany, mine Humboldt and Krimich. — Hanging shales of the Nýřany coal measures. — Mostly bigger specimens, cca. 3,5 mm thick.

Potvorov, mines at cô. 463 S. W. from the village near to the forester's house of Řemešín. — Hanging shales of the coal measure correlated with the Nýřany coal measure.

Kounov coal measure series:

Kvílice, mine Magdalena. — In the iron stone nodules accompanying shales of the Kounov coal measure.

V. Cingularia Weiss.

This genus of Calamarian cones, which as well known is characterised by an utterly different kind of sporangiophores (flat and partly collarlike fused together, bearing for sporangia at the end on their abaxial side and attached immediately below the collarlike resp. disclike united sterile bracts) than as seen in all preceeding "genera", is recorded meanwhile in the literature in 2 species (see in: W. J. Jongmans 1911, pp. 357; 1915, pp. 501; 1924, pp. 791; Ch. E. Weiss 1876, pp. 88; R. Kidston, 1917, pp. 1042; E. Simson-Scharold 1934, pp. 25) i. e. *Cingularia typica* Weiss (*C. infundibuliformis* Bronn sp.) and *C. cantrilli* Kidst. The first of both bears normally alternating whorls of sterile bracts and fertile sporangiophores, whereas in the second form the sterile bract whorls are missing and the cone axis bears only whorls of the mentioned flat sporangiophores.

Until now I verified in our Central Bohemian coal fields only one species, i. e. *C. typica* Weiss.

1. *Cingularia typica* Weiss. (Pl. IX, fig. 7—11.)

The morphological construction, the whole outer appearence, as well as the size of these cones have been described and discussed enough in detail in the cited monograph by Ch. E. Weiss, as well as later in various special monographical works and textbooks dealing with palaeobotany in general, wherefore I regard as quite superfluous to repeat here the whole description of these cones. I present only on Pl. IX, fig. 7—11 photos of several specimens collected in our Bohemian coal districts (Lubná near Rakovník: mine Rako at the place called „Krčelák"), wherefrom true *Cingulariae* have not yet been figured.

Also the synonymity resp. taxonomy of this "species" has been already well worked out (see especially in R. Kidston 1917 and W. J. Jongmans 1915 and 1924). All palaeobotanists (also in all greater newer textbooks like those by M. Hirmer, L. Emberger, Ch. A. Arnold, W. C. Darrah, J. Walton a. o.) generally are using for these cones Weiss's name of *C. typica*, though it was already also very clearly pointed out that the so called *Equisetites infundibuliformis* Bronn published in 1828 (Pl. 6, fig. 4) is quite identical with Weiss's specimens. Unfortunately Bronn just as Ad. Brongniart (1822 and 1828) have figured simultaneously with it still another type of cones (under the same term) known to day as *Macrostachya carinata* Germ. and made thus their species rather obscure (see in our chapter about *Macrostachya*). Just this fact was later the chief reason, why nearly all palaeontologists refused to use the original Bronn's term for the designation of our *Cingularia* species, resp. they used it for the designation of certain cones of the genus of *Macros-*

tachya (M. infundibuliformis i. e. our *Macrostachya carinata* GERM. emend. STERZEL).

True *Cingularia typica* WEISS was not yet published from Bohemian coal fields. Some specimens are cited from Bohemia as Cingularia typica by A. HOFMANN and F. RYBA (1899) but all their figures except Pl. 3, fig. 16 are mere copies of WEISS's figures. Their figure on Pl. 3, fig. 16 represents a Calamarian cone specimen collected at Kladno, about which already W. J. JONGMANS (1911, pp. 357; 1915 Equisetales V. pp. 501/2) pointed out, that it belongs certainly not to the true *Cingularia*. But he tells nothing about with which form it is to be identified. HOFMANN-RYBA's specimen has an appearence very like a *Huttonia* or a large *Palaeostachya* with rather short and more or less adpressed bracts. It is considerably thinner than our *Huttonia spicata* STBG. measuring only about 1,6 cm across. I regard it as most probably identical with *Palaeostachya distachya* STBG. (some similarity may be found also in the rather big cones of *Calamites schultzi* KIDST. JONGM.).

Distribution:

Until now I know true *Cingularia typica* WEISS in Bohemia only from the highest horizons of the Radnice coal measure series, i. e. from the Lubná coal measures.

Lubná near Rakovník, Coal mines Rako at the place called „Krčelák". — In a bank of whitish, clayish and rather hard tuffitic sandstones within the upper part of the Lubná coal measure No. I.

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EXPLANATION OF PLATES.

Plate I.

Fig. 1. *Palaeostachya ettingshauseni* KIDST. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; shales of the roof (called "mydláky") of the Main Kladno coal measure. — Coll.: National Museum, Prague (leg. Ing. J. Hummel, 1931).

Fig. 2. *Palaeostachya ettingshauseni* KIDST. — 1/1 — Loc.: Vinařice near Kladno, mine Mayrau; shales of the roof (called "mydláky") of the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Dr. Ing. G. Měska, 1928).

Fig. 3. *Palaeostachya pedunculata* WILL. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; the interlayer of whitish fire clays (called "Velká opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Ing. J. Hummel, 1931).

Fig. 4. *Palaeostachya pedunculata* WILL. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; shales of the roof (called "mydláky") of the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Ing. J. Hummel, 1929).

Fig. 5. *Palaeostachya pedunculata* WILL. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; the interlayer of whitish fire clays (called „Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Ing. J. Hummel, 1928).

Fig. 6. *Palaeostachya gracillima* WEISS. — 1/1 — Loc.: Kladno; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Dr. J. Kratochvíl, univ. prof., 1909).

Fig. 7. *Palaeostachya gracillima* WEISS. — 1/1 — Loc.: Příčina at Lubná (near Rakovník), mine Ludvík ("Na Brantech"); whitish fire clays (called "brus") of the roof of the coal seam No. I b. — Coll.: N. M., Prague (leg. Dr. F. Němejc, 1932).

Fig. 8. *Palaeostachya gracillima* WILL. — Part of the specimen given at fig. 7. enlarged 3/1.

Plate II.

Fig. 1. *Palaeostachya elongata* PRESL. — 1/1 — Loc.: Doubrava at Nýřany, mines at the place "Pankrác"; whitish fire clays of the roof of the Lower Radnice coal seam. — Coll.: N. M., Prague (leg. J. Matiasko, 1924).

Fig. 2. *Palaeostachya elongata* PRESL. — 1/1 — Loc.: Kladno; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Univ. prof. Dr. J. Kratochvíl, 1909).

Fig. 3. *Palaeostachya elongata* PRESL. — 1/1 — Loc.: Žebnice at Plasy (N. from Plzeň); shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel; O. FEISTMANTEL's type specimen 1875/6, Palaeontographica, Cassel, Pl. 13, fig. 1).

Fig. 4. *Palaeostachya elongata* PRESL. — 1/1 — Loc.: Moštice near Radnice; shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague (leg.: K. Feistmantel).

Fig. 5. Aff.: *Palaeostachya elongata* PRESL. — 1/1 — Loc.: Rakovník, mines of the company "Moravia" (E. from the town); shales of the roof of the coal seam called "Věnec" (-i. e. the Nýřany coal seam). — Coll.: N. M., Prague (leg. Treybal, 1931).

Fig. 6. *Palaeostachya feistmanteli* NJC. — 1/1 — Loc.: Tlustice near Žebrák, mines at the place "Na Štilci"; whitish clayish sandstones called "Bělky" in the roof of the Lower Radnice coal measure. — Coll.: N. M., Prague (leg. J. Müller, 1930).

Fig. 7. *Palaeostachya feistmanteli* NJC. — 1/1 — Loc.: Tlustice near Žebrák, mines at the place "Na Štilci"; whitish clayish sandstones called "Bělky" in the roof of the Lower Radnice coal measure. — Coll.: N. M., Prague (leg. J. Müller, 1930).

Plate III.

Fig. 1. *Palaeostachya feistmanteli* NJC. — 1/1 — Loc.: Tlustice near Žebrák, mines at the place "Na Štilci"; whitish clayish sandstones called "Bělky" in the roof of the Lower Radnice coal measure. — Coll.: N. M., Prague (leg. J. Müller, 1930).

Fig. 2. *Palaeostachya feistmanteli* NJC. — 1/1 — Same loc. and coll. as fig. 1.

Fig. 3. *Palaeostachya feistmanteli* NJC. — 1/1 — Same loc. and coll. as fig. 1.

Fig. 4. *Palaeostachya distachya* STBG. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Ing. J. Hummel, 1931).

Fig. 5. *Palaeostachya distachya* STBG. — 1/1 — Same loc. as fig. 4. — Coll.: N. M., Prague (leg. Schmidt, 1908).

Fig. 6. *Palaeostachya distachya* STBG. — 1/1 — Same loc. as fig. 4. — Coll.: N. M., Prague (leg. J. Hummel, 1924).

Fig. 7a, b and c. *Palaeostachya distachya* STBG. — three fragments showing the cone axis and the attachment of the sterile bracts and of the sporangiophores. — 1/1 — Same loc. as fig. 4. — Coll.: N. M., Prague (leg. J. Hummel, 1923).

Fig. 8. *Palaeostachya distachya* STBG. — Part of the specimen given at fig. 7 a. enlarged 3/1.

Fig. 9. *Palaeostachya distachya* STBG. — Part of the specimen given at fig. 7 c. enlarged 3/1.

Plate IV.

Fig. 1 and 2. *Palaeostachya raconicensis* NJC. — Apical and basal part of a cone. — 1/1 — Loc.: Příčina at Lubná (near Rakovník), mine Ludvík at the place "Na brantech"; shales of the roof of the coal seam no. I a. of the Lubná coal measure series. — Coll.: N. M., Prague (leg. F. Šilhánek, 1932).

Fig. 3. *Palaeostachya raconicensis* NJC. — Part of the specimen given at fig. 2, enlarged 3/1.

Fig. 4, 5, 6. *Calamostachys incrassata* NJC. — 1/1 — Loc.: Lubná near Rakovník, mine Rako at the place "V Krčeláku"; the interlayer of whitish hard clayish sandstones within the upper coal measure of the Lubná coal measure series. — Col.: N. M., Prague (leg. F. Hlíza, 1932—1937).

Plate V.

Fig. 1. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Nýřany, mine Humboldt; shales of the roof of the Nýřany coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel, 1870).

Fig. 2. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Nýřany; shales of the roof of the Nýřany coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel, 1870/71).

Fig. 3. *Calamostachys tuberculata* PRESL. in STBG. — Part of the specimen given at fig. 2, enlarged 3/1.

Fig. 4. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Kralupy n. Vlt.; shales of the roof of the Kounov coal measure. — Coll.: N. M., Prague.

Fig. 5. *Calamostachys tuberculata* PRESL. in STBG. — Part of the specimen given at fig. 4, enlarged 3/1.

Fig. 6. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Nýřany, mine Krimich; shales of the roof of the Nýřany coal measure. — Coll.: N. M., Prague (leg. Kolář, 1925).

Fig. 7. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Ledce (N. from Plzeň), quarries in the kaolinic arkoses below the hill Krkavec; whitish clays of the Kounov coal measure horizon. — Coll.: N. M., Prague (leg. Dr. J. Šetlík, 1923).

Fig. 8. *Calamostachys tuberculata* PRESL. in STBG. — Loc.: Mirošov; hanging shales of the coal measures. (Nýřany coal measure series.) — Coll.: N. M., Prague.

Fig. 9. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Mirošov, mine Gustav; shales of the roof of the coal seam no. 1. (Nýřany coal measure series.) — Coll.: N. M., Prague (1887).

Fig. 10. *Calamostachys tuberculata* PRESL. in STBG. — 1/1 — Loc.: Doubrava (N. from Nýřany), mines at the place "Pankrác"; shales of the roof of the Nýřany coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel; Feistmantel's type specimen: Palaeontographica, Cassel, 1875/6, Pl. 17, fig. 1).

Fig. 11. *Calamostachys calathifera* WEISS. — 1/1 — Loc.: Ledce (N. from Plzeň), quarries in the kaolinic arkoses below the hill Krkavec; whitish clays of the Kounov coal measure horizon. — Coll.: N. M., Prague (leg. Dr. J. Šetlík, 1924).

Fig. 12. *Calamostachys calathifera* WEISS. — Part of the specimen given at fig. 11, enlarged 3/1.

Fig. 13. *Calamostachys calathifera* WEISS. — Part of the specimen figured on Pl. VI, fig. 13, enlarged 3/1.

Plate VI.

Fig. 1 and 2. *Calamostachys tenuis* O. F. — 1/1 — Loc.: Břasy (near Radnice); shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague (leg. Lorenz, 1867).

Fig. 3 and 4. *Calamostachys tenuis* O. F. — Parts of the specimens given at fig. 1 and 2, enlarged 3/1.

Fig. 5. *Calamostachys tenuis* O. F. — 1/1 — Loc.: Břasy (near Radnice); shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel, 1867).

Fig. 6 and 7. *Calamostachys tenuis* O. F. — Parts of the specimen given at fig. 5, enlarged 3/1.

Fig. 8. *Calamostachys tenuis* O. F. — 1/1 — Loc.: Břasy (near Radnice), mines of the bar. Riese; shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel, 1867).

Fig. 9 and 10. *Calamostachys ramosa* WEISS. — 1/1 — Loc.: Pejpina near Beroun, arkose sandstone quarries. — Coll.: Nat. Museum, Prague.

Fig. 11 and 12. *Calamostachys ramosa* WEISS. — 1/1 — Loc.: Strádonice, sandstone quarries in the ravines between Strádonice and Zdejcina (near Beroun). — Coll.: N. M., Prague, (leg. J. Barrande).

Fig. 13. *Calamostachys calathifera* WEISS. — 1/1 — Loc.: Ledce (N. from Plzeň), quarries in the kaolinic arkoses; whitish clays of the Kounov coal measure horizon. — Coll.: N. M., Prague (leg. J. Šetlík, 1924).

Plate VII.

Fig. 1. *Calamostachys ramosa* WEISS. — 1/1 — Loc.: Strádonice, sandstone quarries in the ravines between Strádonice and Zdejcina (near Beroun). — Coll.: N. M., Prague (leg. J. Barrande).

Fig. 2. *Calamostachys germanica* WEISS. — 1/1 — Loc.: Třemošná, mine Ignác; shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel, 1867).

Fig. 3. *Calamostachys germanica* WEISS. — 1/1 — Loc.: Třemošná; shales of the roof of the Upper Radnice coal measure. — Coll.: N. M., Prague.

Fig. 4. *Calamostachys germanica* WEISS. — 1/1 — Loc.: Rakovník, mines of the Comp. "Moravia", E. from the town.; an interlayer within the Upper Radnice coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel, 1870).

Fig. 5. *Calamostachys germanica* WEISS. — 1/1 — Loc.: Kladno; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Univ. prof. Dr. K. Vrba, 1909).

Fig. 6. *Calamostachys germanica* WEISS. — 1/1 — Loc.: Kralupy, at the place called "Červená Hůrka"; shales of the horizon of the Radnice coal measure. — Coll.: N. M., Prague (leg. O. Feistmantel).

Fig. 7. *Calamostachys germanica* WEISS. — Part of the specimen given at fig. 6, enlarged 3/1.

Fig. 8. *Calamostachys longibracteata* NJC. — 1/1 — Kladno; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: Nat. M., Prague (1930).

Fig. 9. *Calamostachys longibracteata* NJC. — 1/1 — Loc.: Libušín near Kladno, mine Max; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll. N. M., Prague (leg. Ing. J. Marek, 1928).

Fig. 10. *Calamostachys longibracteata* NJC. — 1/1 — Loc.: Vinařice near Kladno, mine Mayerau; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Univ. prof. Dr. J. Kratochvíl, 1909).

Fig. 11. *Calamostachys longibracteata* NJC. — Part of the specimen given at fig. 10, enlarged 3/1.

Plate VIII.

Fig. 1. *Calamostachys ramosa* WEISS. — 1/1 — Part of the specimen figured on Pl. VII, fig. 1, enlarged 3/1.

Fig. 2 and 3. *Calamostachys ramosa* WEISS. — 1/1 — Parts of the specimen figured on Pl. VI, fig. 9, enlarged 3/1.

Fig. 4. *Calamostachys ramosa* WEISS. — 1/1 — Loc.: Strádonice, sandstone quarries in the ravines between Strádonice nad Zdejcina (near Beroun). — Coll.: N. M., Prague (leg. J. Barrande).

Fig. 5. *Calamostachys ramosa* WEISS. — Part of the specimen given at fig. 4, enlarged 3/1.

Fig. 6. *Calamostachys ramosa* WEISS. — Part of the specimen figured on Pl. VI, fig. 12, enlarged 3/1.

Fig. 7. *Calamostachys intermedia* NJC. — 1/1 — Loc.: Strádonice, sandstone quarries between Strádonice and Zdejcina (near Beroun). — Coll.: N. M., Prague (leg. Ing. R. Růžička, 1950).

Fig. 8. *Calamostachys intermedia* NJC. — Part of the specimen given at fig. 7, enlarged 3/1.

Fig. 9. *Calamostachys intermedia* NJC. — 1/1 — Loc.: Strádonice, sandstone quarries in the ravines between Strádonice and Zdejcina (near Beroun). — Coll.: N. M., Prague (leg. K. Feistmantel).

Fig. 10. *Calamostachys intermedia* NJC. — 1/1 — Same loc. and coll. as fig. 9. — Type specimen of O. Feistmantel's *Bruckmannia tuberculata* STBG. in Palaeontographica, Cassel, 1875/6, Bd. 23, Pl. 16, fig. 3.

Fig. 11 and 12. *Calamostachys intermedia* NJC. — Parts of the specimen given at fig. 10, enlarged 3/1.

Fig. 13. *Calamostachys intermedia* NJC. — 1/1 — Same loc. and coll. as fig. 9. — Type specimen of O. Feistmantel's *Bruckmannia tuberculata* STBG. in Palaeontographica, Cassel, 1875/6, Bd. 23, Pl. 16, fig. 2.

Fig. 14. *Calamostachys intermedia* NJC. — Part of the specimen given at fig. 13, enlarged 3/1.

Plate IX.

Fig. 1. *Calamostachys grandis* JONGM. — 1/1 — Loc.: Kladno; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Dr. Edv. Bayer).

Fig. 2 and 3. *Calamostachys grandis* JONGM. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Ing. J. Hummel, 1928).

Fig. 4. *Calamostachys grandis* JONGM. — 1/1 — Loc.: Libušín near Kladno, mine Max; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Univ. prof. Dr. J. Kratochvíl, 1909).

Fig. 5. *Calamostachys grandis* JONGM. — 1/1 — Loc.: Hnidousy near Kladno, mine Ronna; the interlayer of whitish fire clays (called "Velká Opuka") within the Main Kladno coal measure. — Coll.: N. M., Prague (leg. Dr. J. Šetlík, 1923).

Fig. 6. *Calamostachys charaeformis* JONGM. — 1/1 — Loc.: Kralupy (at the place "Červená Hůrka"); shales of the Radnice coal measure horizon. — Coll.: N. M., Prague (leg. K. Feistmantel).

Fig. 7—11. *Cingularia typica* WEISS. — 1/1 — Loc.: Lubná near Rakovník, mine Rako (at the place called "V Krčeláku"); the interlayer of whitish hard clayish sandstones within the Upper coal measure of the Lubná coal measure series. — Coll.: N. M., Prague (the specimens of fig. 7—10 were collected by Dr. J. Šetlík in 1921—1923, the specimen of fig. 11 by F. Hlíza in 1937).

Plate X.

Fig. 1. *Macrostachya carinata* GERM. — 1/1 — Loc.: Nýřany; from the bed of the cannel coal in the Nýřany coal measure. — Coll.: N. M., Prague (leg. Ing. F. Hanuš, 1923).

Fig. 2. *Macrostachya carinata* GERM. — 1/1 — Loc.: Nýřany; from the bed of the cannel coal in the Nýřany coal measure. — Coll.: N. M., Prague (leg. Ing. R. Růžička, 1950).

Fig. 3. *Macrostachya carinata* GERM. — 1/1 — Loc.: Nýřany; from the bed of the cannel coal in the Nýřany coal measure. — Coll.: N. M., Prague (leg. Dr. J. Němejc, 1927).

Fig. 4 and 5. *Macrostachya carinata* GERM. — 1/1 — Loc.: Mirošov; black shales of the hanging walls of the coal measures (Nýřany coal measure horizon). — Coll.: N. M., Prague.

Fig. 6. *Macrostachya carinata* GERM. — 1/1 — Loc.: Kvílice near Slaný; iron stone nodules of the Kounov coal measure. — Coll.: N. M., Prague (leg. K. Feistmantel).

SBORNÍK NÁRODNÍHO MUSEA V PRAZE - ACTA MUSEI NATIONALIS PRAGAE
IX. (1953) -B (PŘÍRODOVĚDNÝ) No. 1. - GEOLOGIA ET PALAEONTOLOGIA No. 1.
REDAKTOR IVAN KLÁŠTERSKÝ

F. Němejc:

TAXONOMICKÁ STUDIE O PLODNÍCH ŠIŠTICÍCH CALAMITACEÍ ZE STŘEDOČESKÝCH KAMENOUHELNÝCH PÁNVÍ — TAXONOMICAL STUDIES ON THE FRUCTIFICATIONS OF THE CALAMITACEAE COLLECTED IN THE COAL DISTRICTS OF CENTRAL BOHEMIA

V lednu 1953 vydalo svým nákladem v počtu 1100 výtisků Národní museum v Praze
Vytiskl Knihtisk, n. p., základní záv. 01 v Praze - Cena brožovaného výtisku 18 Kčs


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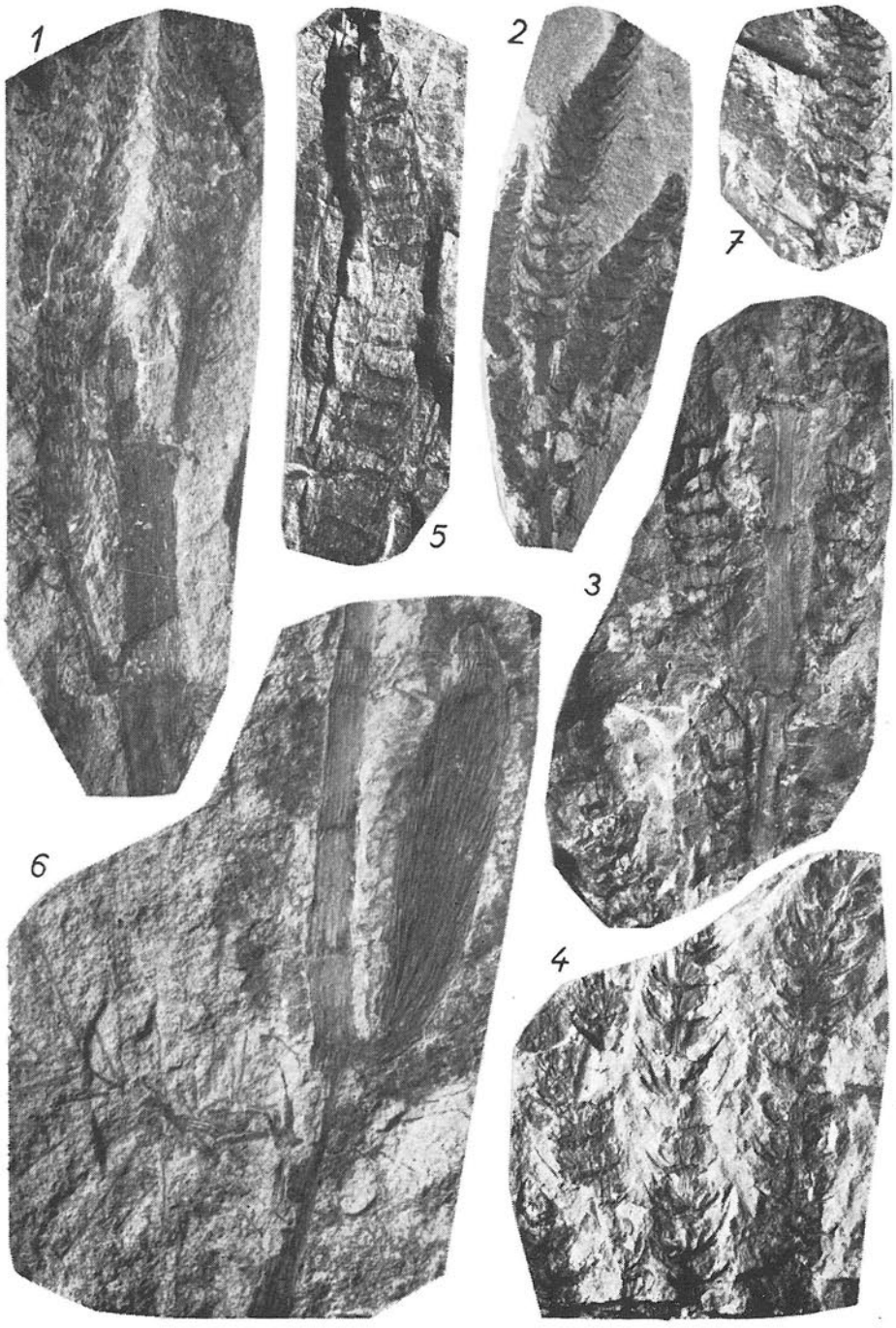
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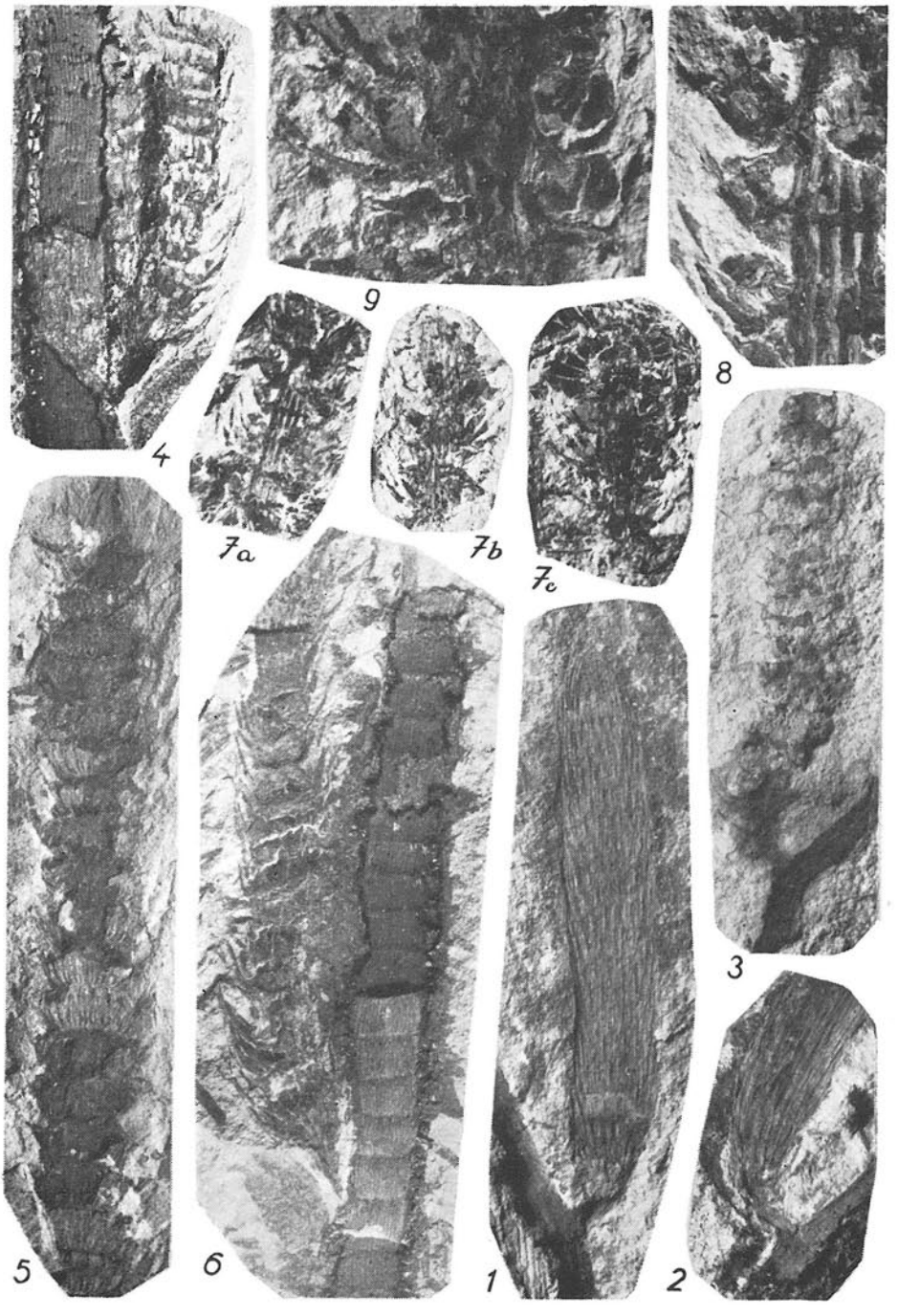
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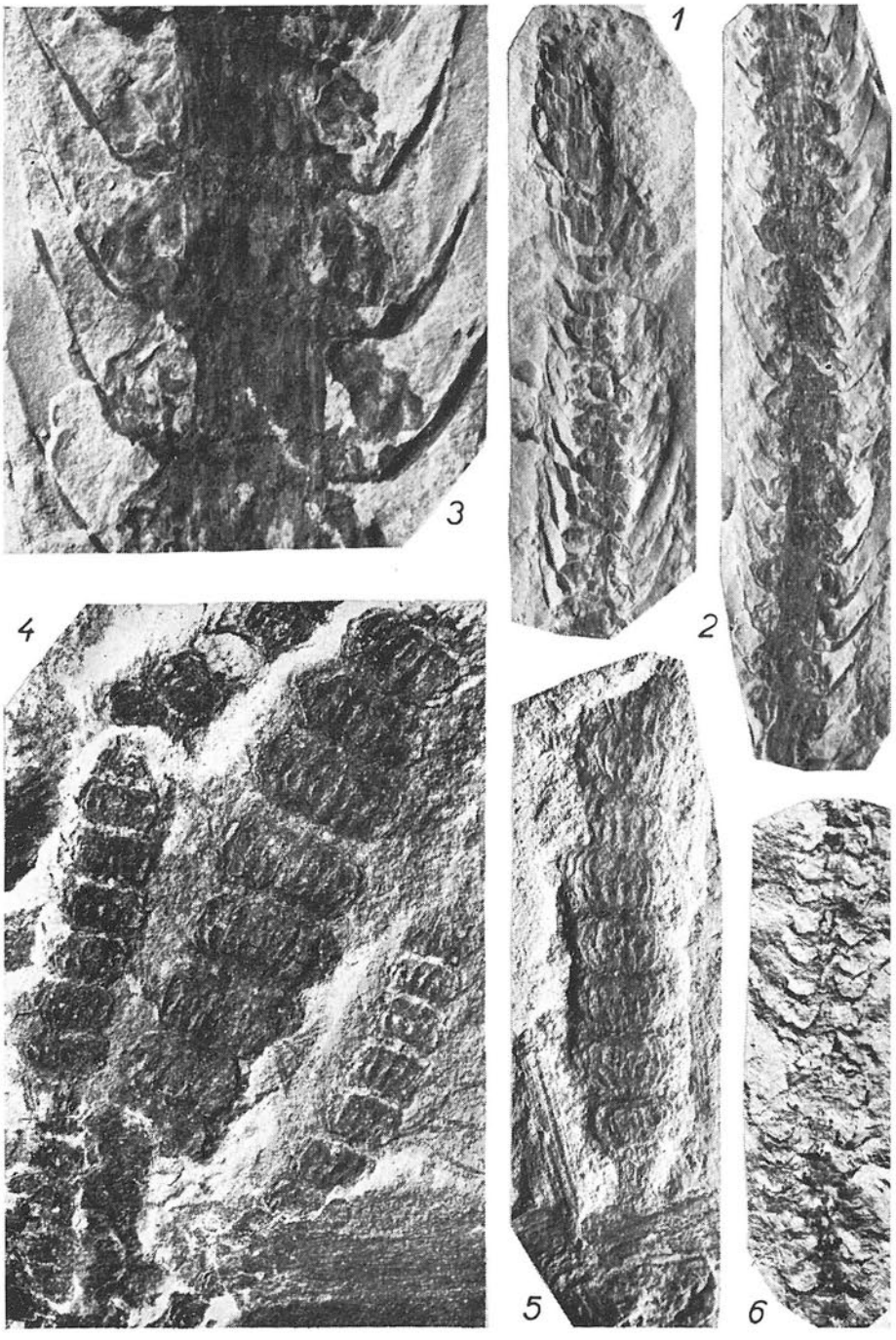
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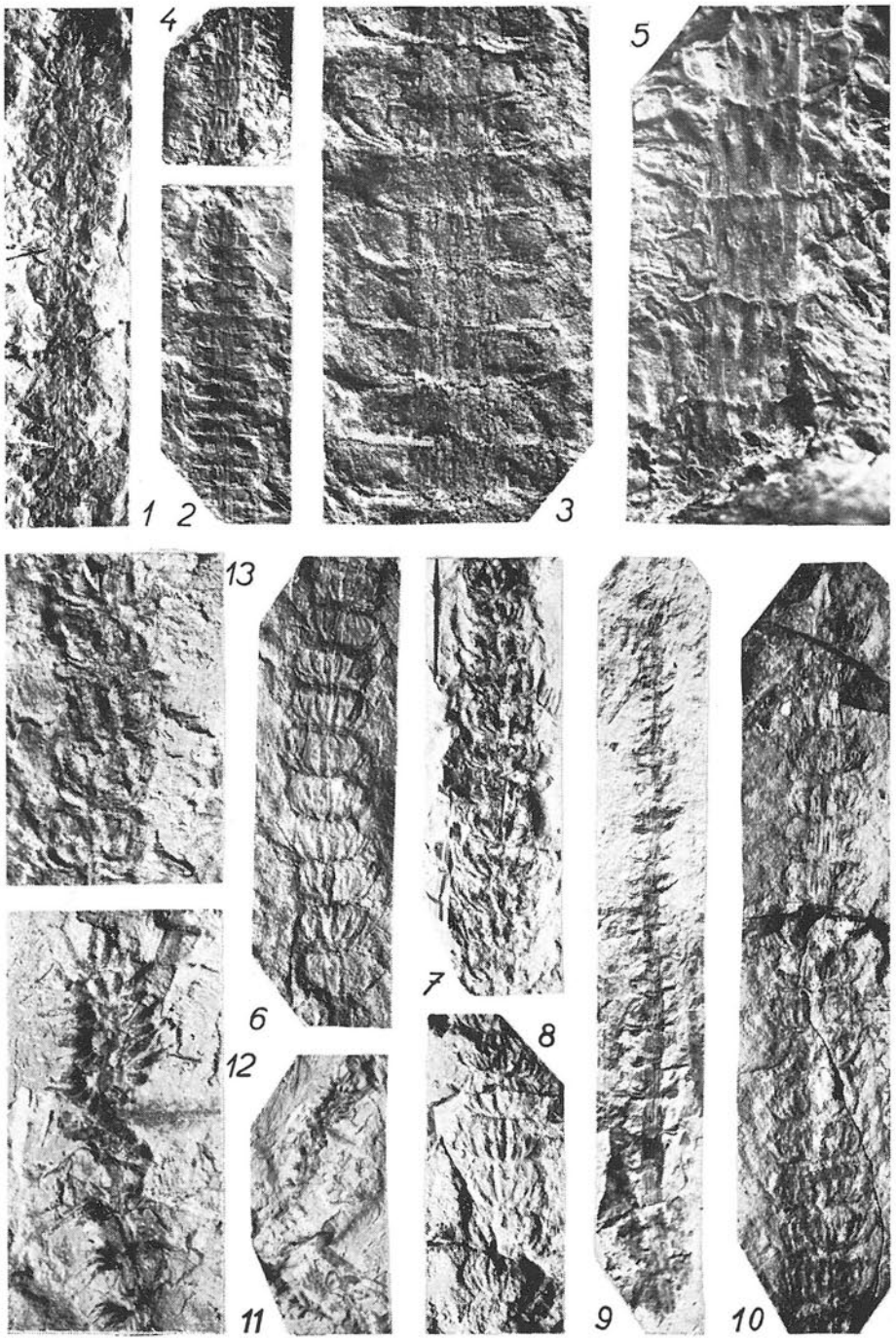
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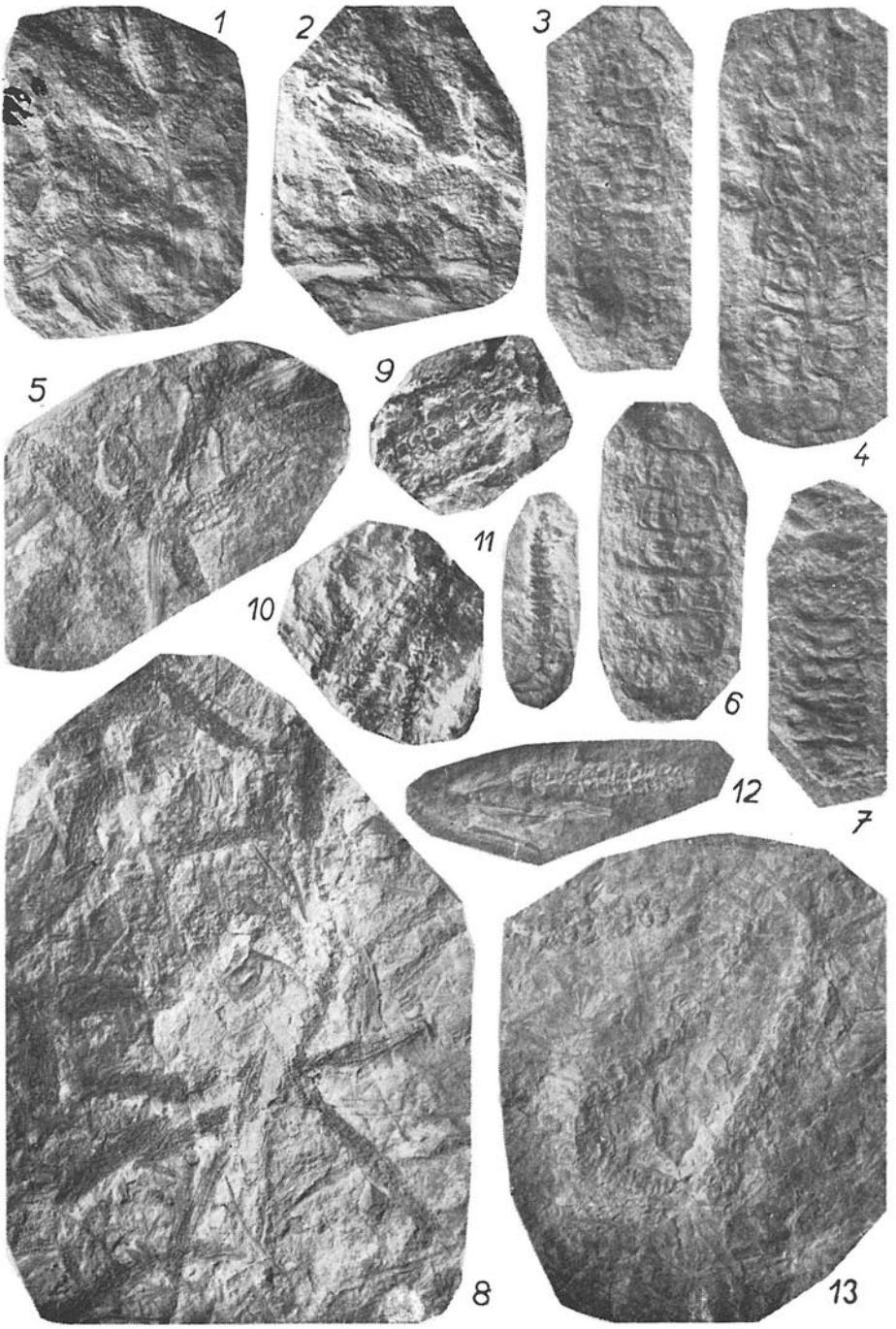
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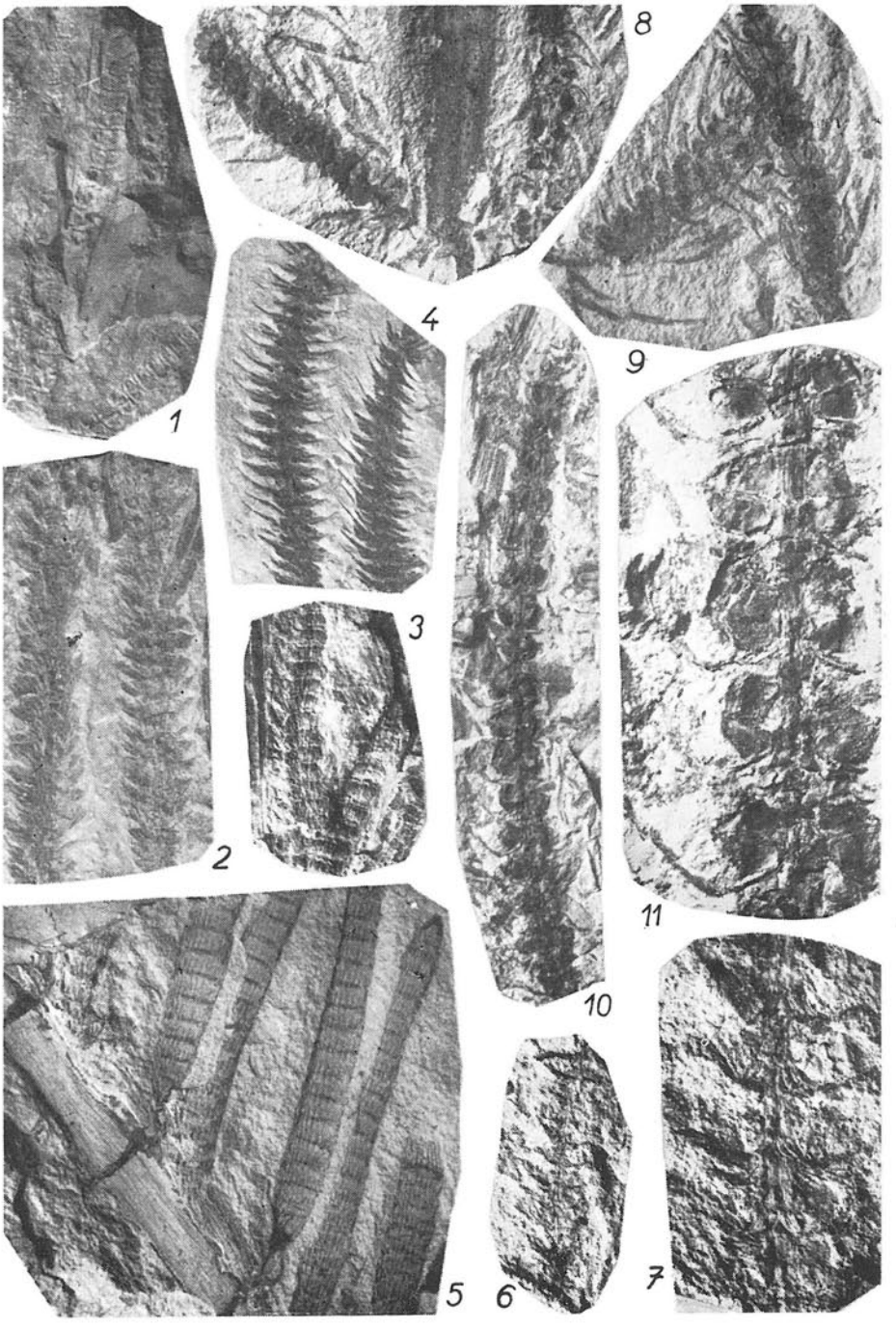
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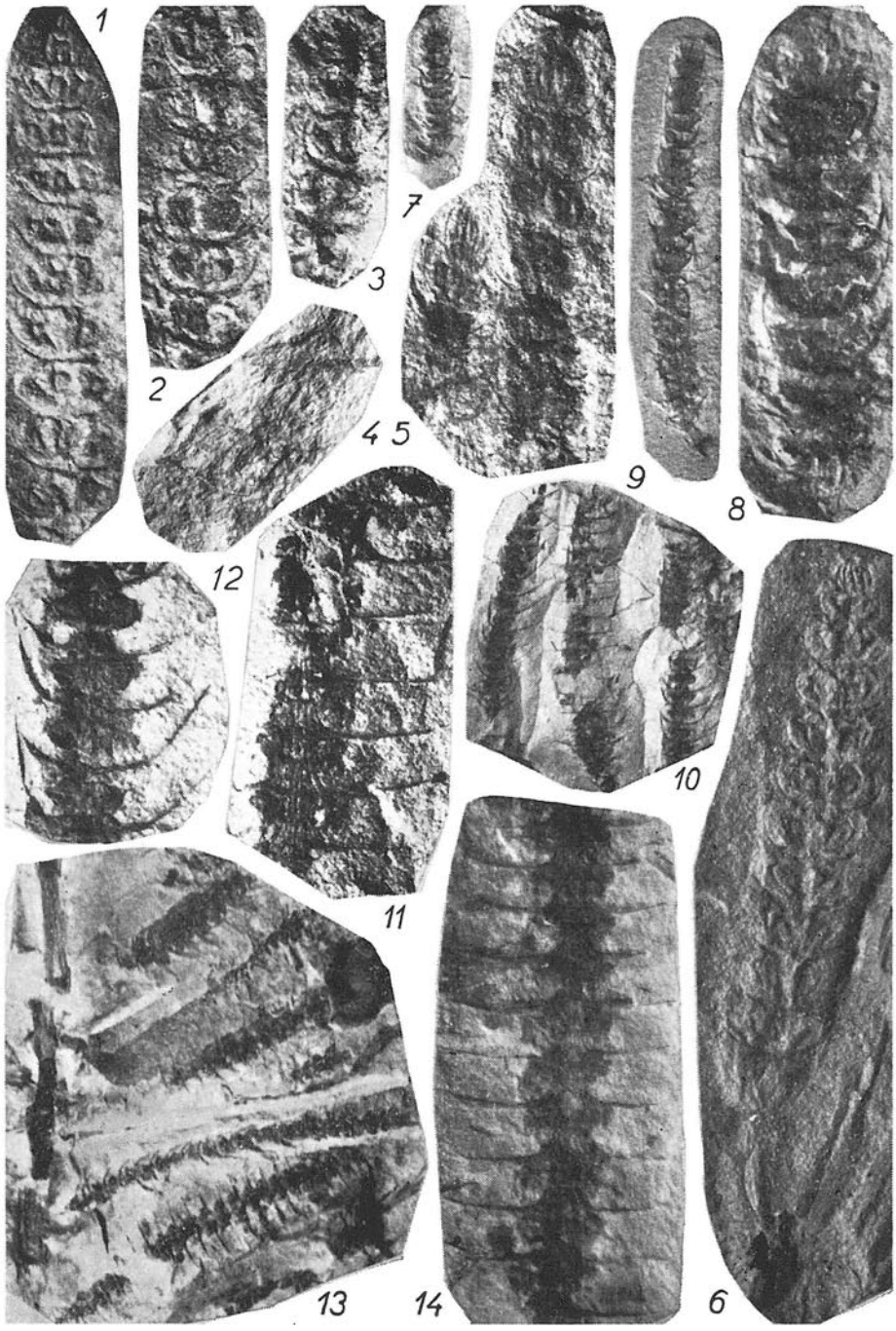
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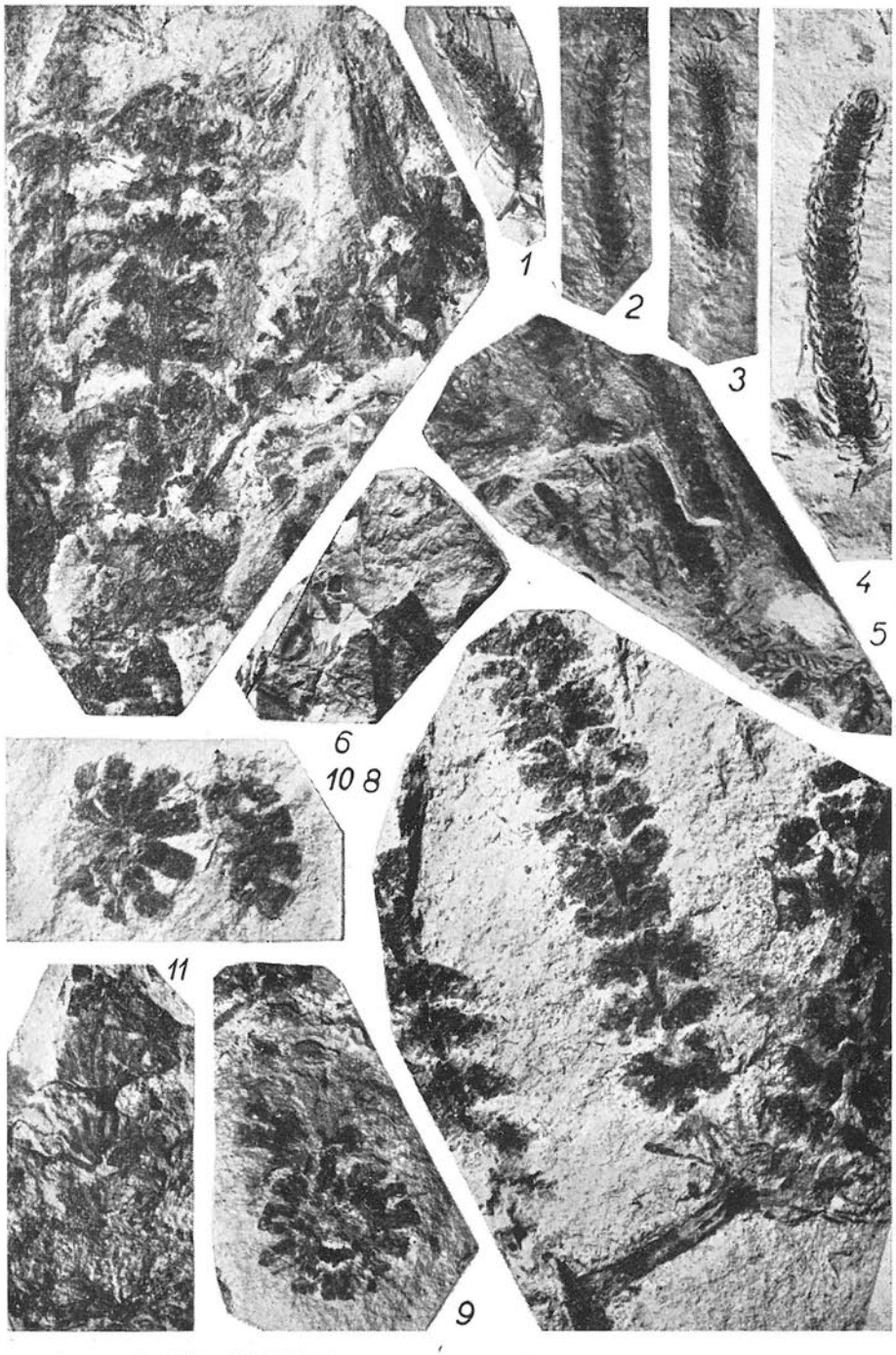
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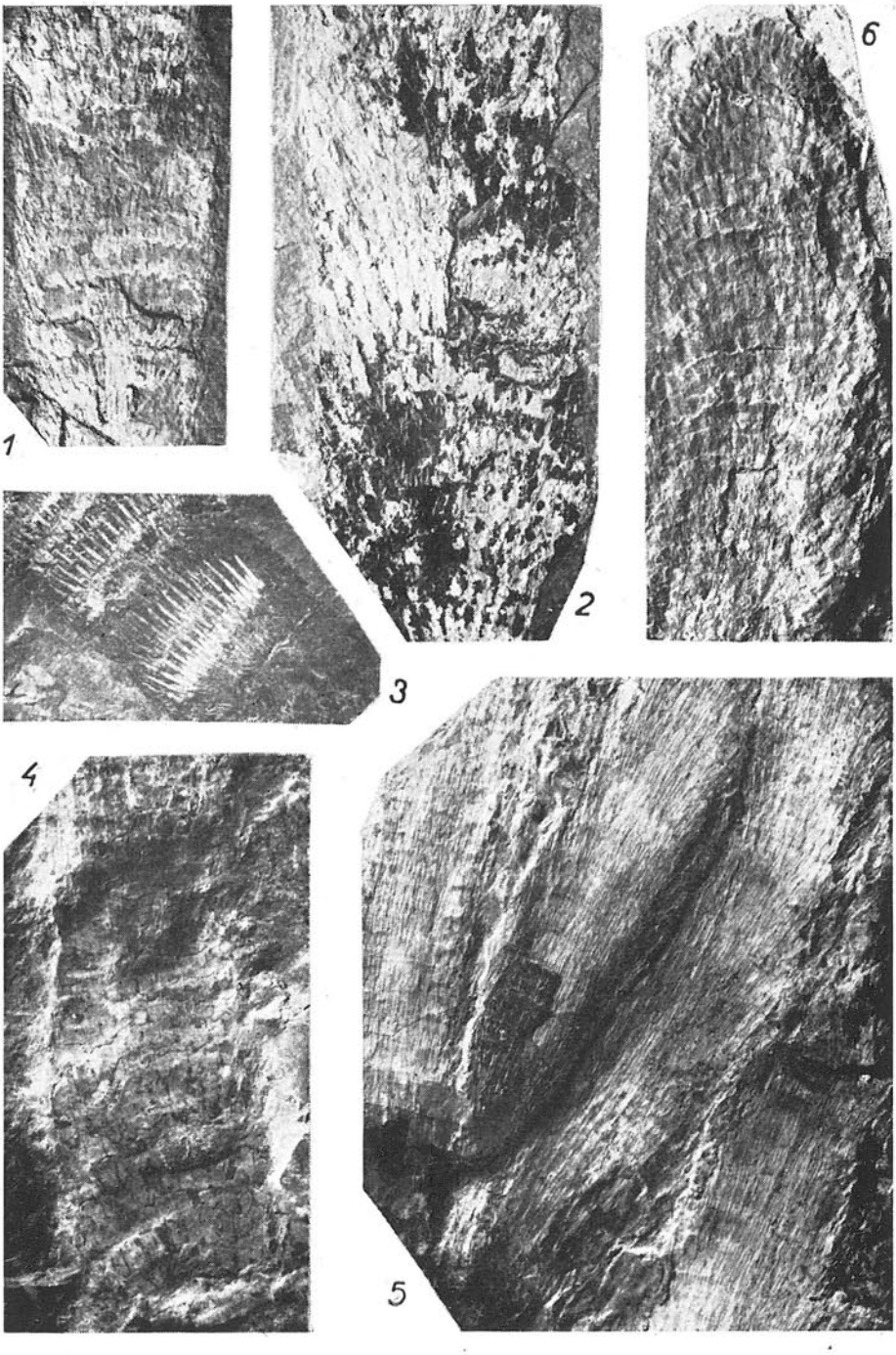
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