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Upper Triassic flora from »Raibl beds« of Julian Alps (Italy) and Karavanke Mts. (Slovenia)

Zgornjetriasna flora iz »rabeljskih plasti« Julijskih Alp (Italija) in Karavank (Slovenija)

Inna A. DOBRUSKINA[1], Bogdan JURKOVŠEK[2] & Tea KOLAR-JURKOVŠEK[2]
[1] The Hebrew University of Jerusalem, The Institute of Earth Sciences, Givat Ram, Jerusalem 91904, Israel
[2] Geološki zavod Slovenije, Dimičeva 14, 1000 Ljubljana, Slovenia

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Ključne besede: makroflora, zgornji trias, »rabeljske plasti«, Julijske Alpe in Karavanke, paleontološke zbirke

Abstract

Fossil megaflora from Upper Triassic (Carnian) »Raibl beds« of Julian Alps in Italy, which is kept in three paleontological collections in Vienna, is presented herein. The majority of the specimens (40-70%) belongs to *Voltzia*. In the second part of the paper, new finds of fossil flora of »Raibl beds« from Karavanke Mts. in Slovenia are documented.

Kratka vsebina

Predstavljena je fosilna makroflora iz zgornjetriasnih (karnijskih) »rabeljskih plasti« Julijskih Alp v Italiji, ki je shranjena v treh dunajskih paleontoloških zbirkah. Večina primerkov (od 40 do 70 %) pripada rodu *Voltzia*. V drugem delu članka so obravnavane nove najdbe fosilne flore iz »rabeljskih plasti« Karavank v Sloveniji.

Introduction

In spite of the fact that various fossil flora had been collected during the last two centuries in the wider Raibl area (presently Cave del Predil, Italy), the occurences of the Triassic plant fossils in the Alps are less well known compared to those in the German Basin. In 1986 and 1987, I. A. Dobruskina visited three paleontological museums in Austria and had the possibility to study their collections of fossil flora from Lunz and Raibl. She made inventory of the collections and partial revision of previous determination. On the account of generosity of the Geological Survey of Austria (GBA) and the Natural History Museum in Vienna she obtained pictures of the majority of the specimens. The paper on the Lunz plants of the Northern Calcareous Alps has already been published (D o b r u s k i n a , 1998). In this paper, the flora of Raibl is presented, and some new findings of plant fossils from the Julian-Tuvalian »Raibl beds« of the Karavanke Mts. in Slovenia (Fig. 1) are added.

Lithostratigraphic division of Carnian

Fig. 1. Geographic sketch map of the localities with Upper Triassic fossil plants.
Sl. 1. Geografska skica nahajališč z zgornjetriasnimi fosilnimi rastlinami.

carbonate-clastic sequences of the western Julian Alps has been improved in its essence during the last few decades (Assereto et al. 1968, Lieberman, 1978, De Zanche et al., 2000). The scant information available on the labels of the museum specimens, giving only the locality name of Raibl (only in a few cases locality »Rinngraben« is added), have proven to be insufficient to state precise position within the Raibl Group. It is most likely, though, that all the specimens originate from the Julian part of the terrigenous »Raibl beds«.

1. Raibl flora of Julian Alps in Italy

Rich collections of Raibl flora are kept in three museums in Vienna. There are 150 specimens from Raibl in Geologische Bundesanstalt Museum, more than 270 specimens in Naturhistorisches Museum Wien, and 246 specimens in Niederösterreichisches Landesmuseum.

The majority of the remains belongs to *Voltzia* (40-70%), long leaves of *Desmiophyllum* type constitute approximately 20%, all kinds of fructifications 20%, sterile cycadophyta 12%, sphenopsida 5-7%, and ferns 5% of the collections.

In the explanations to photoplates (Plates I-XVI) we prefer to hold on to the determinations written on the museums' labels. It is because the revision of Raibl plants is still at a very early stage. The later relates especially to the genus *Voltzia*, to which the majority of Raibl conifers are attributed. This genus needs to be completely revised (Dobruskina, 1993).

The lists of Raibl plants that have been published by now are given in Fig. 2. A small part of the Raibl flora was described by Bronn (1858), Schenk (1864, 1865) (for the lists see also Suess & Mojsisovics, 1867) and Arber (1907, 1909), while the only full list of determinations was presented by Stur (1885).

Due to different names and developments

Bronn, 1858 Descriptions and figures	Schenk, 1864 Descriptions and figures	Schenk, 1865 Descriptions And figures	Stur, 1885 Determinations only	Arber, 1907,1909 Revision with figures
(-)	*Equisetites arenaceus*	*Calamites arenaceus*	*Equisetum arenaceum*	(-)
Phylladelphia strigata	(-)	*Calamites arenaceus*	*E. strigatum*	(-)
(-)	(-)	*Calamites raiblensis*	(-)	(-)
(-)	(-)	(-)	*Rhacopteris raiblensis*	(-)
(-)	(-)	*Neuropteris ruetimeyeri*	*Speirocarpus* cf. *ruetimeyeri*	(-)
Taenioptéris marantacea	(-)	*Taenioperis marantacea*	*Danaeopsis* cf. *marantacea*	(-)
(-)	(-)	(-)	*Clathropteris* sp	(-)
Filices gen. indet.	*Cyatheites pachyrhachis*	*Cyatheites pachyrhachis*	*Dioonites pachyrrhachis*	(-)
Noeggerathia vogesiaca	(-)	(-)	*Cycadites suessi*	*Zamites grandis*
Pterophyllum minus	(-)	*Pterophyllum bronnii*	*Pterophyllum bronnii*	*Pterophyllum bronnii*
(-)	(-)	*P. giganteum*	*P. giganteum*	*Yuccites vogesiacus*
Monokotiledonen	(-)	(-)	*P. longifolium*	(-)
undeterminable leaf	(-)	*P. sandbergeri*	*P. sandbergeri*	(-)
Voltzia heterophylla	*Voltzia coburgensis*	*Voltzia coburgensis*	*Voltzia raiblensis*	(-)
(-)	(-)	(-)	*V. haueri*	(-)
(-)	(-)	(-)	*V. foetterlei*	(-)
(-)	(-)	(-)	*Cephalotaxites raiblensis*	(-)
Zapfen Schuppe	(-)	*Carpolithes*	*Carpolithes* sp.	(-)
Chiropteris	(-)	(-)	(-)	(-)

Fig. 2. Lists of all Raibl plants published by 1909 (= by now) and the correlation between the determinations of different palaeobotanists.

Sl. 2. Seznami vseh »rabeljskih« rastlin objavljenih do 1909 (= do sedaj) in primerjava determinacij različnih paleobotanikov.

of Triassic strata in different paleogeographic units, there are two comparisons of best studied beds with Triassic fossil flora of Northern and Southern Alps and German Basin (Figs. 3 and 4).

In the Figure 3, a position of the Raibl flora in the succession of the plant-bearing horizons in the Alps is shown.

In the Seefeld flora, the conifers form 90% of this flora. They belong to a single genus and maybe a single species related to *Voltzia* or *Brachyphyllum* (Dobruskina, 1993).

In the Lunz flora, Equisetales and ferns dominate. Many cycadophytes, small quantities of conifers and ginkgophytes have also been indentified. The special feature of Raibl flora is the dominance of *Voltzia* remains.

For Lunz and Raibl plants, the full lists of determinations were presented by Stur (1885) while the first inventory of the Lunz flora has been published recently (Dobruskina, 1998). All the other papers contain descriptions of one genus or one group of Lunz plants. Raibl plants have not been revised since publications of Arber (1907, 1909).

The flora from the Cassian and the Wengen formations consists of a single finding of *Williamsonia* from Sankt Cassian (San Cassiano) (Krasser, 1919) and of the Zoldo and Gardo floras in the Dolomites. The latter one includes only isolated pinnules of ferns, segments of cycadophytes, and leafy shoots and seeds of conifers (Leonardi, 1953).

From Recoaro, Prealpi Veneto an assemblage consisting mainly of conifers has been described (Zigno, 1862, Schenk, 1868, Selli, 1938).

From the Gailtal Alps two localities of *Pleuromeia* are known (Chair & Thiedig, 1973, Amerom et al., 1976). No other plant remains were found there except *Pleuromeia*.

			Northern Alps	Southern Alps
	RHAETIAN			
T3	NORIAN	Sevatian Alaunian Lacian	SEEFELD	
	CARNIAN	Tuvalian Julian Cordevolian	LUNZ "RAIBL"	RAIBL
	LADINIAN	Langobardian Fassanian		SAN CASSIANO WENGEN
T2	ANISIAN	Illyrian Pelsonian Bithynian Aegean		PRAGS RECOARO
T1	SCYTHIAN			GAILTAL ALPS

Fig. 3. Position of the Raibl flora in the succession of the plant-bearing horizons in the Alps.
Sl. 3. Položaj rabeljske flore v zaporedju horizontov z rastlinami v Alpah.

Lepidopteris flora	Seefeld Fm	Rhaetkeuper	Rhaetian Norian
Scytophyllum flora	Lunz Raibl	Semionotus Ss Schilfsandstein	Carnian
	San Cassiano Zoldo and Gardo	Lettenkohle	Ladinian
Voltzia-Pleuromeia flora	Recoaro	*Voltzia* Ss Roet	Anisian
	Gailtal Alps	Solling Hardegsen	Olenekian

Fig. 4. Correlation between the Triassic floras of the Alps and the German Basin (after D o b r u s k i n a , 1994).
Sl. 4. Primerjava med triasnimi florami Alp in Germanskega bazena (po D o b r u s k i n i , 1994).

2. Upper Triassic plants from Karavanke Mts. in Slovenia

Many geological investigations dealing with the problematics of the »Raibl beds« have been conducted in the western part of the southern Karavanke Mts. in the last two decades (Jurkovšek, 1987a, 1987b, Ramovš, 1993, Krystyn et al., 1994, Lein et al., 1995, Budkovič, 1999, Ogorelec et al., 1999). The »Raibl beds« were treated within two tectonic units, i. e. Košuta/Koschuta unit and Klek/Hahnkogel unit, as they differ completely in their stratigraphy according to Lein and the Austrian geologists. Lein and co-workers (1995) placed a succession of some 500 m thick terrigenous Raibl beds to the Raibl Group. »Raibl beds« situated north of Mojstrana between the Belca valley and Jepca (1610 m) were placed into the Košuta nappe by Jurkovšek (1987a) and according to his opinion it belongs to the same unit as the Julian Alps nappe. Fossil flora was collected in the upper part of an 85 m thick »Raibl beds« succession below Jepca (Fig. 1). According to preliminary determinations of I. A. Dobruskina it consists of *Voltzia haueri* Stur and *Desmiophyllum* sp. (Plate XVII). Examined samples yield the conodont apparatus *Nicoraella* ? *budaensis* Kozur & Mock, sponge spicules, ostracods and holothurians, as well as frequent alga *Clypeina besici* Pantić and bivalves of the genus *Posidonia* (Kolar-Jurkovšek & Jurkovšek, 1999). Ammonoids occur rather rare. Well preserved fishes (*Peltopleurus* sp.) can be found next to the plants in marly limestone and marl. Ramovš (1993) stated the ammonoids *Trachyceras aonoides* or *Austrotrachyceras austriacum* from the lower part of the Julian-Tuvalian succession and he compared these beds with the »Beli potok« development of Julian Alps.

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Uvod

Najdbe triasnih fosilnih ostankov v Alpah so manj znane kot v Germanskem bazenu, čeprav je bilo predvsem na širšem prostoru Rablja (Cave del Predil / Raibl) v Italiji že v preteklih dveh stoletjih zbrano veliko fosilne flore (slika 1). V letih 1986 in 1987 je I. A. Dobruskina obiskala tri paleontološke muzeje na Dunaju v Avstriji in pregledala njihove zbirke triasne fosilne flore ter opravila delno revizijo prejšnjih determinacij. Zbirka rastlin iz lunških plasti Severnih Alp je bila že tiskana (Dobruskina, 1998). V tem članku predstavljamo rabeljsko floro, kateri dodajamo najnovejše najdbe fosilnih rastlin iz julsko-tuvalskih »rabeljskih plasti« Karavank (sl. 1).

V zadnjih desetletjih je bila litostratigrafska členitev karnijskih karbonatno-klastičnih plasti zahodnih Julijskih Alp bistveno izpopolnjena (Assereto et al. 1968, Lieberman, 1978, De Zanche et al., 2000), vendar skromni podatki na spremnih listih muzejskih primerkov fosilnih rastlin, na katerih je zapisano le nahajališče Rabelj (samo v nekaj primerih je dodano tudi ime Rinngraben), ne zadoščajo za natančno opredelitev, v kateri od formacij rabeljske skupine so bili najdeni. Najverjetneje so vsi primerki iz julskega dela terigenih »rabeljskih plasti«.

1. Rabeljska flora Julijskih Alp v Italiji

Bogata zbirka rabeljske fosilne flore je shranjena v treh muzejih na Dunaju. V muzejski zbirki Geološkega zavoda (Geologische Bundesanstalt) je 150 primerkov, več kot 270 primerkov v Prirodoslovnem muzeju (Naturhistorisches Museum Wien) in 246 primerkov v Niederösterreichisches Landesmuseum.

Večina pripada rodu *Voltzia* (40-70%), dolgi listi tipa *Desmiophyllum* predstavljajo približno 20%, različne vrste fruktifikacij 20%, sterilni cikadofiti 12%, sfenopsidi 5-7% in praproti 5%.

Pri razlagah tabel fosilov (tab. I-XVI) je bolje zadržati determinacije kot so označene v muzejih, saj je revizija rabeljskih rastlin šele na začetku. Ta se nanaša predvsem na rod *Voltzia*, kamor prištevamo večino iglavcev iz Rablja. Ta rod je potrebno v celoti revidirati (Dobruskina, 1993).

Na sliki 2 so podani seznami doslej objavljenih rabeljskih rastlin.

Zaradi različnih imen in razvojev triasnih plasti v različnih paleogeografskih enotah sta prikazani tudi dve primerjavi najbolje raziskanih plasti s triasno fosilno floro Severnih in Južnih Alp ter Germanskega bazena (sl. 3 in 4).

2. Zgornjetriasne rastline iz Karavank v Sloveniji

V osemdesetih in devetdesetih letih preteklega stoletja je bilo na ozemlju zahodnega dela južnih Karavank opravljenih več geoloških raziskav, ki so posegale tudi na problematiko »rabeljskih plasti« (Jurkovšek 1987a, 1987b, Ramovš 1993, Krystyn et al. 1994, Lein et al. 1995, Budkovič 1999, Ogorelec et al. 1999). Avtorji so jih obravnavali v okviru dveh tektonskih enot in sicer Košutinega nariva in enote Klek (Hahnkogel unit). Triasne plasti obeh enot se po mnenju Leina in avstrijskih geologov med seboj bistveno razlikujejo. Lein in sodelavci (1995) v rabeljsko skupino (Raibl-Gruppe) uvrščajo okoli 500 m debelo zaporedje terigenih rabeljskih plasti (terrigene Raibler Schichten). »Rabeljske plasti« severno od Mojstrane, med povirjem Belce in Jepco (1610 m) Jurkovšek (1987a) uvršča v Košutin nariv, ki ga smatra za isto narivno enoto kot nariv Julijskih Alp. V zgornjih 85 m profila »rabeljskih plasti« pod Jepco (sl. 1) je bila najdena tudi obravnavana fosilna flora, v kateri so bili določeni primerki *Voltzia haueri* Stur in *Desmiophyllum* sp. (tab. XVII). V raziskanih vzorcih profila so poleg konodontnega aparata *Nicoraella ? budaensis* Kozur & Mock prisotne spikule spongij, ostrakodi in holoturije, razmeroma pogostna je alga *Clypeina besici* Pantić in školjke rodu *Posidonia* (Kolar-Jurkovšek & Jurkovšek 1999). Amoniti so redki. V laporjih in laporju so bile poleg rast-

lin najdene tudi lepo ohranjene ribe (*Peltopleurus* sp.). Ramovš (1993) iz spodnjega dela opisanega julsko-tuvalskega zaporedja plasti omenja amonite *Trachyceras aonoides* ali *Austrotrachyceras austriacum*, plasti pa primerja z »belopotoškim« razvojem Julijskih Alp.

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PLATES - TABLE

Plates / Table I - XIV

»Raibl beds«, Upper Triassic, Julian Alps, Italy
All specimens are stored in Geologische Bundesanstalt (GBA), Vienna
»Rabeljske plasti«, zgornji trias, Julijske Alpe, Italija
Vsi primerki so shranjeni na Geološkem zavodu, Dunaj

Plates / Table XV - XVI

»Raibl beds«, Upper Triassic, Julian Alps, Italy
All specimens are stored in Naturhistorisches Museum Wien
»Rabeljske plasti«, zgornji trias, Julijske Alpe, Italija
Vsi primerki so shranjeni v Prirodoslovnem muzeju, Dunaj

Plate / Table XVII

»Raibl beds«, Upper Triassic, Karavanke Mts., Slovenia
All specimens are stored in the Jurkovšek Paleontological Collection, Dol pri Ljubljani
»Rabeljske plasti«, zgornji trias, Karavanke, Slovenija
Vsi primerki so shranjeni v Paleontološki zbirki Jurkovšek, Dol pri Ljubljani

Plate I - Tabla I

1 - *Cephalotaxites raiblensis* Stur: 1986/2/63, x0.5

2, 3 - *Voltzia heterophylla* Brongn.: *2* - 1986/2/4, x0.5; *3* - 1986/2/6; x1

4, 5, 6 - *Voltzia raiblensis* Stur: *4* - 1986/2/68, x0.5; *5* - 1986/2/65; x0.5; *6* - 1986/2/69; x0.5.

Plate II - Tabla II

Voltzia raiblensis Stur: *1* - 1986/2/?, x1; *2* - 1986/2/60, x1; *3* - 1986/2/9, x0.5; *4* - 1986/2/8, x0.5; *5* - 1986/2/4, x0.5

Plate III - Tabla III

1, 2, 3, 5, 6, 8, 10 - *Voltzia haueri* Stur: *1* - 1986/2/1, x0.5; *2* - 1986/2/31, x0.5; *3* - 1986/2/32, x0.5; *5* - 1986/2/35, x1; *6* - 1986/2/33, x1; *8* - 1986/2/34, x1; *10* - 1986/2/33, x1

4 - *Voltzia pachyphylla* Schimper: 1986/2/139, x0.5

7 - *Voltzia* sp. Stur: 1986/2/30, x1

9 - *Voltzia foetterlei* Stur: 1986/2/?, x1

Plate IV - Tabla IV

1, 2, 3, 4, 6, 7 - *Voltzia foetterlei* Stur: *1* - 1986/2/?, x1; *2* - 1986/2/42, x0.5; *3* - 1986/2/49, x1; *4* - 1986/2/10, x1; *6* - 1986/2/57, x1; *7* - 1986/2/50, x1

5 - conifer cone, 1986/2/46, x2

Plate V - Tabla V

1, 2, 3, 4, 6 - *Voltzia haueri* Stur: *1* - 1986/2/22, x1; *2* - 1986/2/31, x1; *3* - 1986/2/32, x1; *4* - 1986/2/?, x1; *6* - 1986/2/71, x0.5

5 - *Voltzia* sp., 1986/2/92, x1

Plate VI - Tabla VI

1, 2, 3, 5, 6, 7, 8 - *Voltzia haueri* Stur: *1* - 1986/2/36, x1; *2* - 1986/2/22, x1; *3* - 1986/2/79, x1; *5* - 1986/2/47, x1; *6* - 1986/2/94, x1; *7* - 1986/2/7, x1; *8* -1986/2/37, x1

4 - conifer cone: 1986/2/48, x1

Plate VII - Tabla VII

1-6 - Voltzia haueri Stur: *1* - 1986/2/?, x0.5; *2* - 1986/2/3, x0.5; *3* - 1986/2/5, x0.5; *4* - 1986/2/55, x1; *5* - 1986/2/103, x1; *6* - 1986/2/55, x1

Plate VIII - Tabla VIII

1-7 - Voltzia foetterlei Stur: *1* - 1986/2/24, x1; *2* - 1986/2/24, x0.5; *3* - 1986/2/12, x0.5; *4* - 1986/2/40, x0.5; *5* - 1986/2/113, x1; *6* - 1986/2/59, x1; 7 - 1986/2/25, x0.5

Plate IX - Tabla IX

1, 3, 6 - Pterophyllum filicoides (Schloth.) Thomas: *1* - 1986/2/?, x1; *3* - 1986/2/38, x1; *6* - 1986/2/?, x0.5

2 - Pterophyllum longifolium Brongn.: 1986/2/14, x0.5

4, 5, 7, 8, 9, 10, 14 - Pterophyllum bronnii Schenk: *4* - 1986/2/52, x1; *5* - 1986/2/3, x1; 7 - 1986/2/113, x1; *8* - 1986/2/117, x1; *9* - 1986/2/114, x1; *10* - 1986/2/131, x1; *14* - 1986/2/108, x1

11 - Pterophyllum ? sp.: 1986/2/43, x1

12 - Pterophyllum ? sp.: 1986/2/46, x1

13 - Pterophyllum ? sp.: 1986/2/38, x1

Plate X - Tabla X

1, 2 - Dioonites pachyrhachis Schenk: *1* - 1986/2/56, x1; *2* - 1986/2/122, x1

3-11 - Equisetites strigatus Brongn.: *3* - 1986/2/101, x1; *4* - 1986/2/98, x1; *5* - 1986/2/149, x1; *6* - 1986/2/119, x1; 7 - 1986/2/135, x1; *8* - 1986/2/100, x1; *9* - 1986/2/111, x1; *10* - 1986/2/145, x1; *11* - 1986/2/120, x1

Plate XI - Tabla XI

1-12 - Desmiophyllum sp. (compare with *Yuccites* and *Glossophyllum*): *1* - 1986/2/140, x1; *2* - 1986/2/?, x1; *3* - 1986/2/126, x1; *4* - 1986/2/125, x1; *5* - 1986/2/25, x0.5; *6* - 1986/2/123, x0.5; 7 - 1986/2/124, x1; *8* - 1986/2/128, x1; *9* - 1986/2/134, x0.5; *10* - 1986/2/28, x0,6; *11* - 1986/2/44, x1; *12* - 1986/2/37, x1; *13* - 1986/2/?, x1

Plate XII - Tabla XII

1, 3, 8 - Podozamites ? sp.: *1* - 1986/2/33, x1; *3* - 1986/2/127, x1; *8* -1986/2/?, x1

2, 4, 5, 6, 7, 9 - Yuccites? sp.: *1* - 1986/2/22, x1; *4* - 1986/3/130, x0.5; *5* - 1986/3/131, x0.5; *6* - 1986/3/129, x1; 7 - 1986/2/?, x1; *9* - 1986/2/136, x1

Plate XIII - Tabla XIII

1, 5, 6, 8 - *Desmiophyllum* sp.: *1* - 1986/2/46, x1; *5* - 1986/2/91, x1; *6* - 1986/2/?, x1; *8* - 1986/2/88, x1

2, 3, 9 - Fucoides: *2* - 1986/2/71, x1; *3* - 1986/2/148, x1; *9* - 1986/2/147, x1

4, 7 - *Equisetites* sp.: *4* - 1986/2/86, x1; 7 - 1986/2/69, x1

Plate XIV - Plate XIV

1-27 - Fructifications and scales: *1* - 1986/2/82, x1; *2* - 1986/2/52, x1; *3* - 1986/2/26, x1; *4* - 1986/2/26, x1; *5* - 1986/2/62, x1; *6* - 1986/2/81, x1; *7* - 1986/2/40, x1; *8* - 1986/2/15, x1; *9* - 1986/2/87, x1; *10* - 1986/2/8, x1; *11* - 1986/2/104, x1; *12* - 1986/2/60, x1; *13* - 1986/2/14, x1,1; *14* - 1986/2/47, x1; *15* - 1986/2/138, x1; *16* - 1986/2/66, x1; *17* - 1986/2/31, x1; *18* - 1986/2/83, x1; *19* - 1986/2/53, x1; *20* - 1986/2/27, x1; *21* - 1986/2/A2, x1; *22* - 1986/2/?, x1; *23* - 1986/2/28, x1; *24* - 1986/2/32, x1; *25* - 1986/2/29, x1; *26* - 1986/2/74, x1; *27* - 1986/2/65, x1

Plate XV - Tabla XV

1, 2, 3 - *Voltzia haueri* Stur: *1* - c.3.14, x1; *2* - 1887.IX-21, x1; *3* - 1887.IX-20, x1

4, 6 - *Voltzia heterophylla* Brongn.: *4* - 1928, 23.1895, x1; *6* - 1928, 23.1895, x1

5 - *Voltzia* sp.: C3.15.1887.IX.33, x1

Plate XVI - Tabla XVI

1, 3 - cones of *Voltzia* sp.: *1* - 1887.IX.34, x1; *3* - 1887.IX.34, x1

2 - Aphlebia: 1887.IX.43, x1

4, 5 - *Voltzia foetterlei* Stur ?: *4* - 8017.1879, x1; *5* - 1887.IX.14, x1

6, 7 - *Voltzia* sp.

Plate XVII - Tabla XVII

1 - *Desmiophyllum* sp. (compare with *Glossophyllum*): BJ 1416, x1

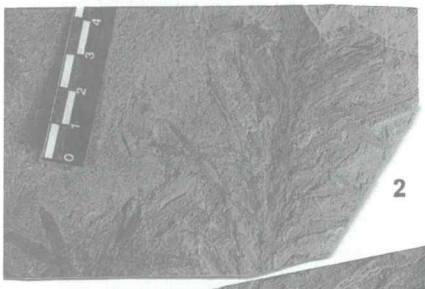
2, 3, 5 - *Voltzia haueri* Stur: *2* - BJ 1852, x1; *3* - BJ 2374, x1; *5* - BJ 1426, x1

4 - *Voltzia haueri* Stur ?: BJ 1958, x1

6 - Indeterminate specimen: BJ 1989, x5


1


3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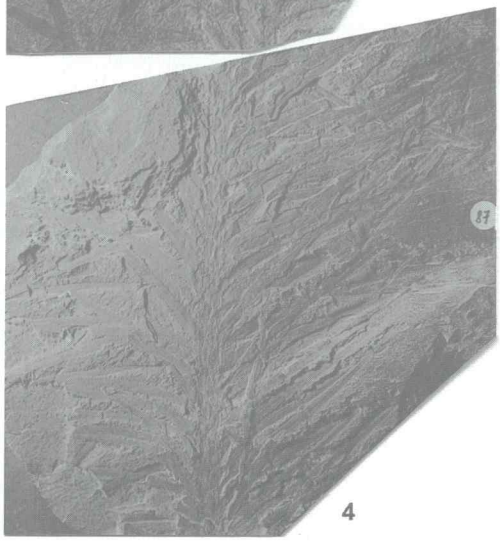
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Plate I - Tabla I

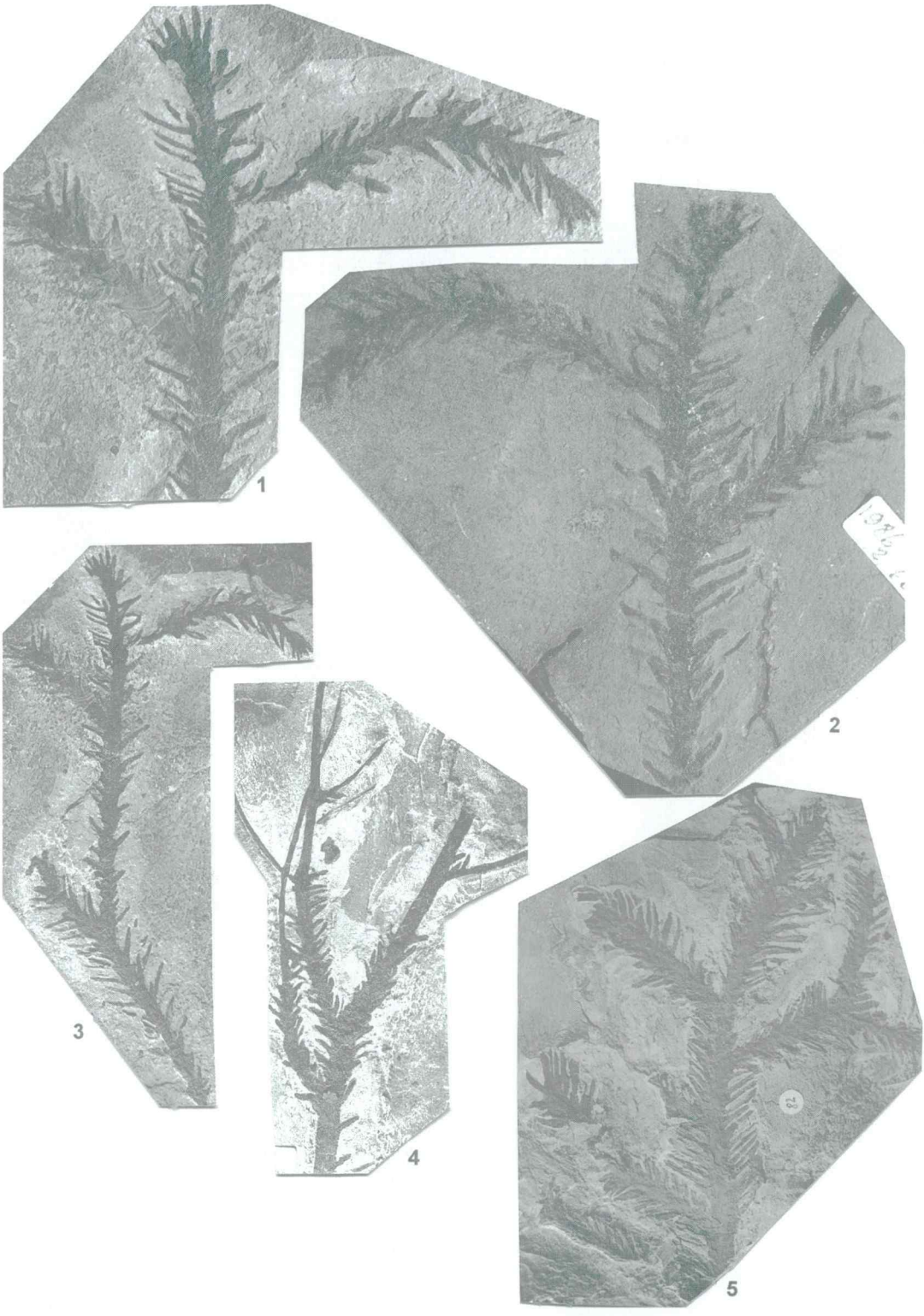

Plate II - Tabla II

Plate III - Tabla III

Plate IV - Tabla IV

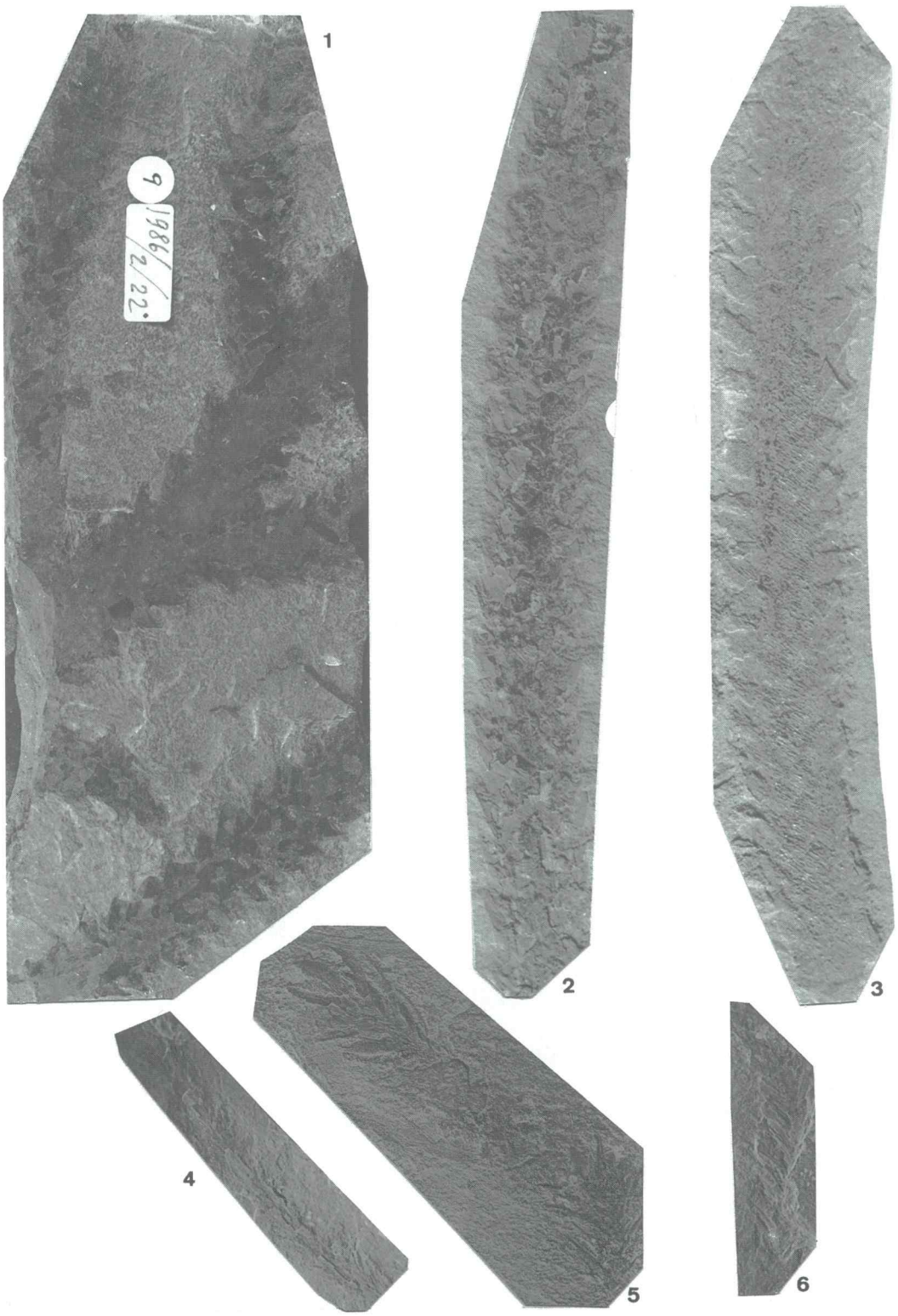

Plate V - Tabla V

Plate VI - Tabla VI

Plate VII - Tabla VII

Plate VIII - Tabla VIII

Plate IX - Tabla IX

Plate X - Tabla X

Plate XI - Tabla XI

Plate XII - Tabla XII

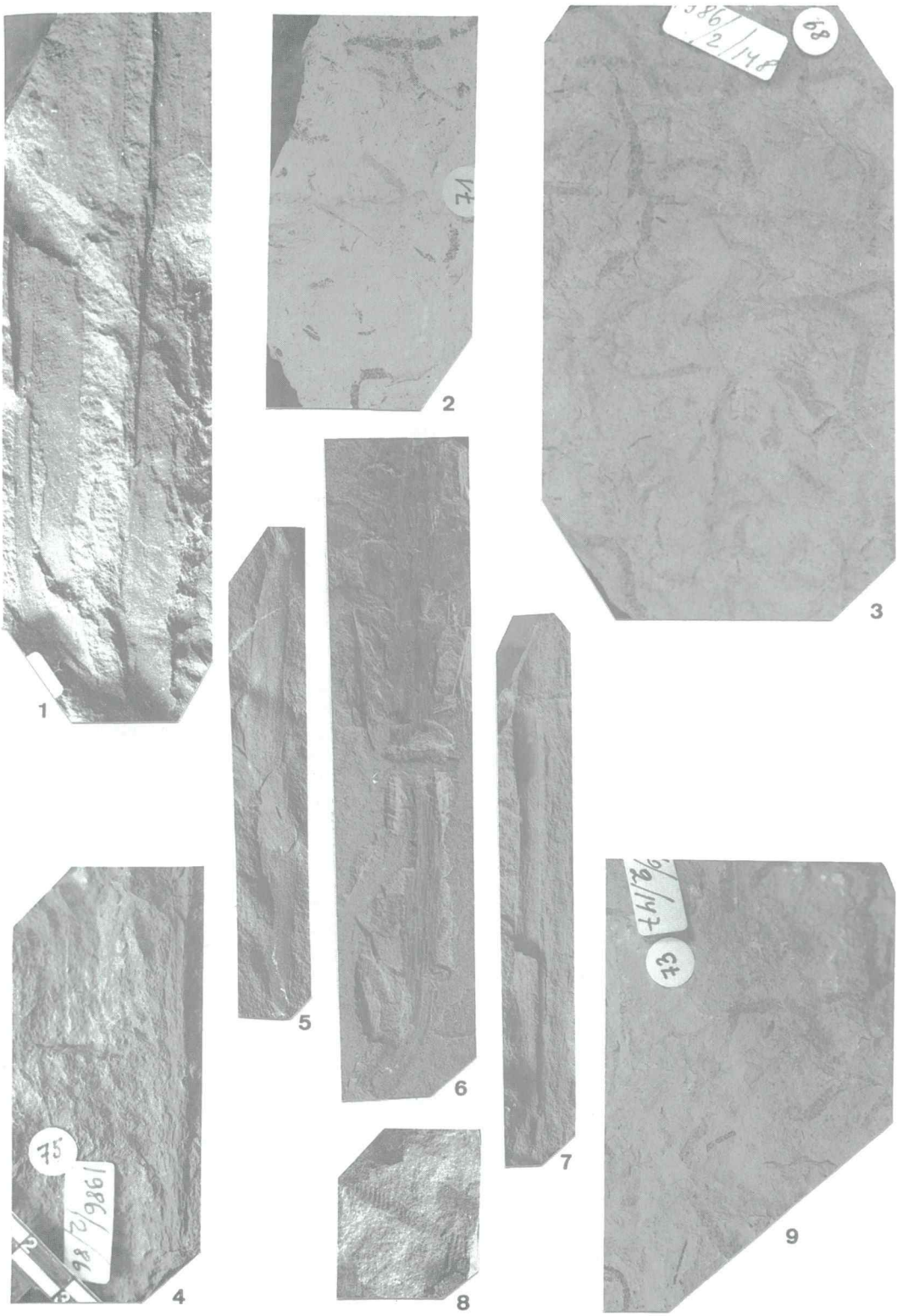

Plate XII - Tabla XII

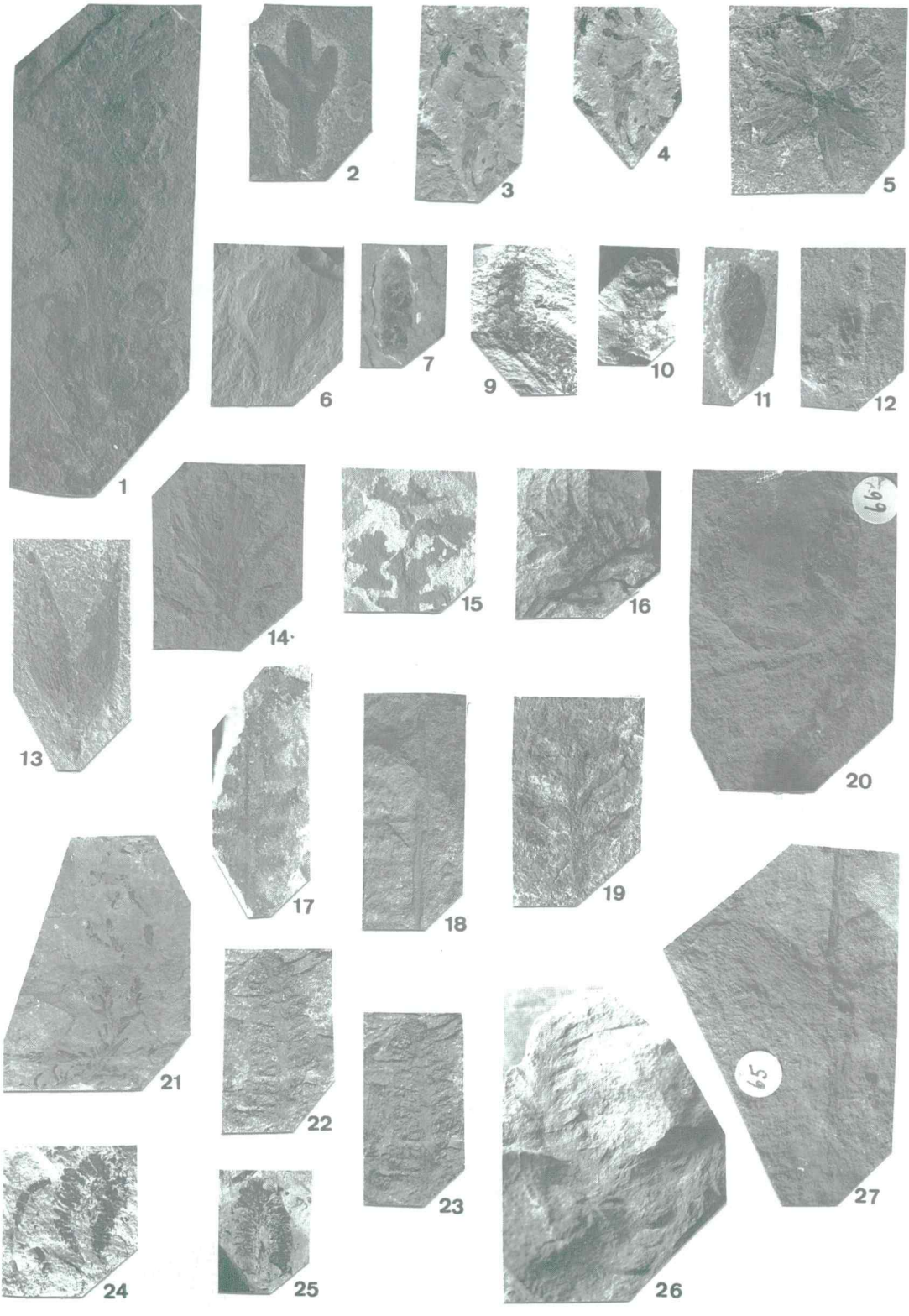

Plate XIV - Tabla XIV

Plate XV - Tabla XV


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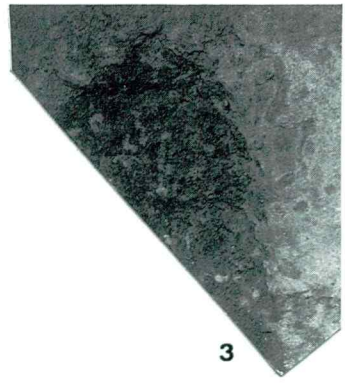
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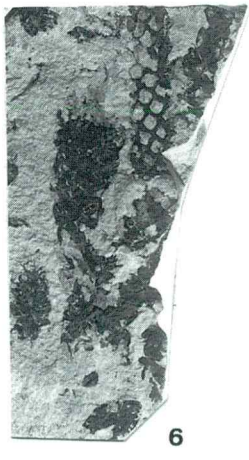
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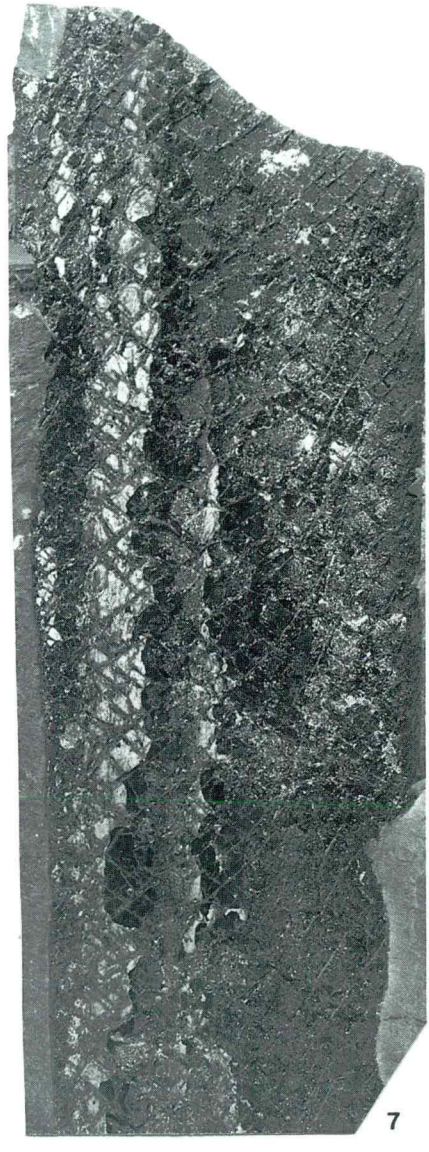
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Plate XVI - Tabla XVI

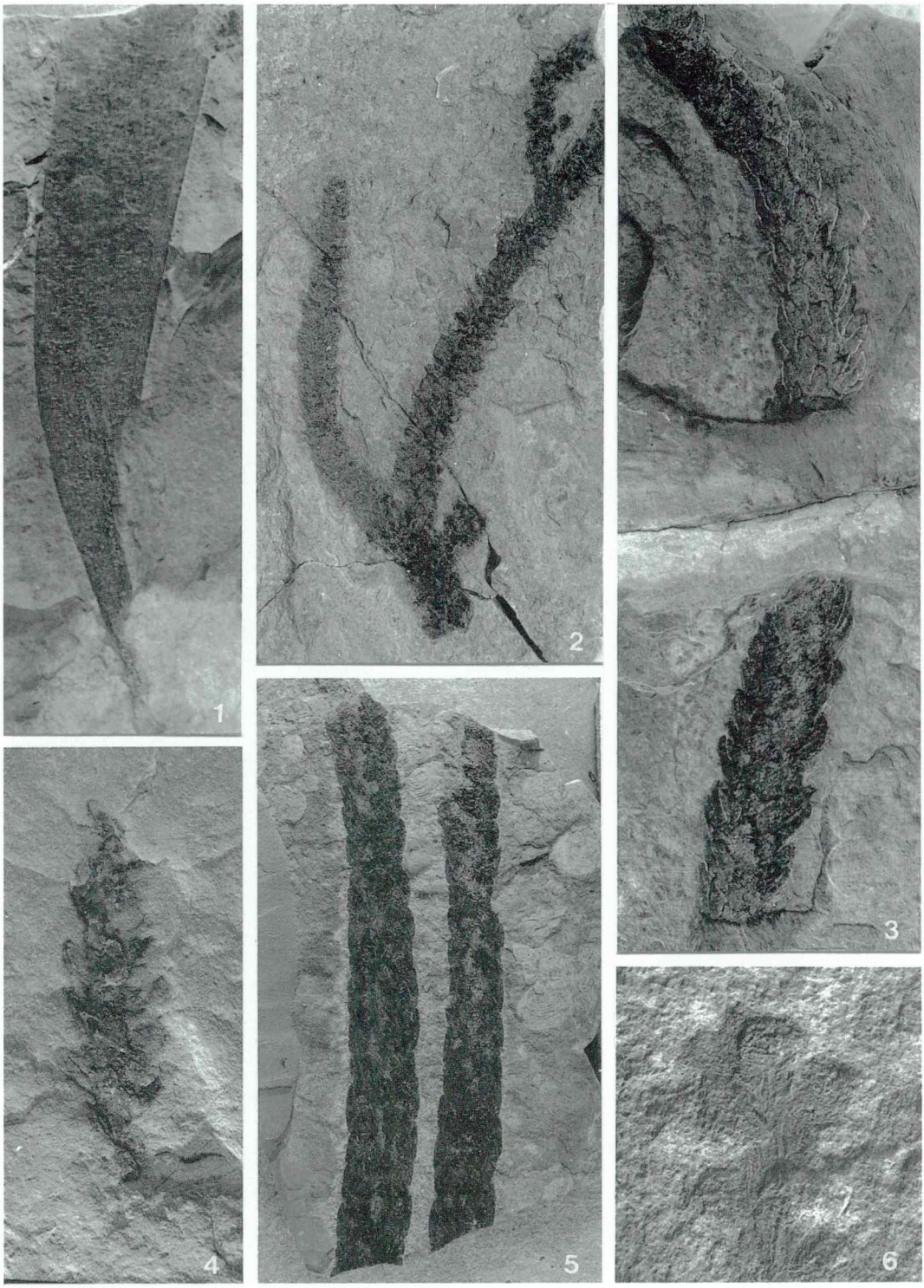

Plate XVII - Tabla XVII