

THE FOSSIL CONTENT OF THE UPPER TRIASSIC MOLTENO FORMATION, SOUTH AFRICA

by

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ABSTRACT

A concise summary of the fossil content of the Molteno Formation is given. The megaflora (foliage, fruit, seed, and stem impressions) comprises the most significant fossil group. With 74 assemblages sampled and 115 foliage taxa encountered the Molteno is, by a wide margin, the most productive (localities and diversity) megaplant bearing formation in South Africa. The palynomorphs and silicified wood remain unpublished and are not dealt with in this paper. The animal fossils are represented mainly by insects with 25 genera and 32 species having been described. At least as many taxa await attention in the available collection of 300 individuals from 16 of the megaplant assemblages. A few undescribed species of conchostraca from 5 localities and one species of fish from a single locality round off the animal content. Trace fossils are not considered.

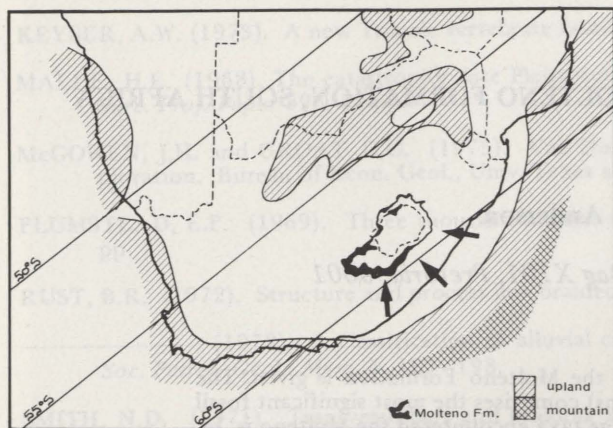
Classified lists, taxa/assemblage tables, locality maps, pen sketches and photographic plates for the megaflora and insect fauna are presented.

INTRODUCTION

The present paper is essentially drawn, with a few additions (the insects in particular) and changes, from the section on the Molteno Formation in the book *Prodromus of South African megafloras: Devonian to L. Cretaceous* currently in press (Anderson and Anderson 1984). The repetition is justified by the nature and scope of this Haughton Memorial Volume – an attempt to bring together a series of papers giving a general overview of the 'Stormberg Series' (Molteno to Drakensberg formations).

We are in the process of preparing a series of volumes on the palaeoflora of the Molteno Formation. These are based primarily on our own collections begun in 1967 and now amounting to 15 500 catalogued slabs from 74 assemblages. The first volume has been published (Anderson and Anderson 1983a) and provides an interim synthesis of the megaflora to species level as well as a detailed taxonomic account of *Dicroidium*, the dominant most diverse element.

For further detail and clarification of aspects of the paper presented here the above mentioned volumes should be consulted.



Environment – Extensive drainage basin within the Gondwana interior, braided and meandering rivers flow N and NW from the Proto-Cape-Foldbelt. The Molteno Basin at around 55-60° S, lay in the track of the westerly wind belt. Warm temperate woodland and swamp-land, seasons marked, winter rainfall.

Source & cyclicity – Cyclic sedimentation reflects repeated uplift and denudation in the source area. Seven cycles are recognised along the southern outcrop where the formation attains its fullest development. Only the second cycle occurs basin-wide.

Lithology – Conglomerates (channel bed), variously bedded coarse to fine sandstones (point bar, levee, crevasse splay), siltstones and silty shales (quiet parts of the channel or abandoned channels), shales and minor coals (back swamp areas of flood plain). Sandy facies prominent.

Thickness – ±600 m in SE, thinning rapidly to N and NW.

PLANT FOSSILS

Preservation

Foliage, fruit, seed, stem impressions (megaplants) – Good impressions in buff to carbonaceous, fine grained sediments (mostly well bedded shales to finely laminated slates).

Cuticle – Preserved in 7 of 74 sampled assemblages, confined to more northerly outcrop of cycle 2, particularly good preservation in 1 assemblage (Lit 111 Dic/Hei).

Palynomorphs – Good assemblages isolated from the 7 cuticle yielding assemblages, a few additional megaflores locations, and several non-megaflores locations.

Silicified stems – rare in cross-bedded sandstones.

Megaplant collections

Institution	slabs	principal localities	principal collectors
PRE (Pretoria)	8600	47	And. & And. 1978-82
BPI (Johannesburg)	6900		And. & And. 1967-73
SAM (Cape Town)	500	15	Du Toit 1903-13
TMP (Pretoria)	300	1	Van Hoepen 1917
AMG (Grahamstown)	100	3	Kannemeyer pre 1889
			Mountain ±1932
MML (Lesotho)	50	1	Ellenberger 1955-56
MMK (Kimberley)	50	5	various
superlocalities (10 km)	— 37	These statistics reflect only our own 1967-82 collections. Where traceable earlier localities have been resampled. The Molteno megaflores synthesis (Tab.2) is based solely on these collections	
localities (1 km)	— 47		
sublocalities (100 m)	— 51		
supersites (10 m)	— 56		
assemblages	— 74		
catalogued slabs	— 15500		
identifiable specimens	— 75000		

Megaplant diversity

organ	genera	species*
stem	3	3
foliage	37	115
female/male	7	10
female	16	18
seed	7	11
male	12	16
natural taxa	37	115

* includes infra-specific taxa

Maximum natural taxa per assemblage — 62
Average natural taxa per assemblage — 10

Megaplant associations

Dicroidium (seed fern), *Heidiphyllum* (conifer), *Neocalamites* (sphenophyte), and *Sphenobaiera* (ginkgophyte) are, in that sequence, clearly the dominant Molteno genera. Some 25 associations, considering dominant species, occur. The most frequently recurring are:

- (1) Neo car (13 times) — monospecific association (1 spp)
- (2) Hei elo (12 ") — low diversity " (1-5 spp)
- (3) Dic odo (10 ") — med. " (5-20 spp)
- (4) Dic/Hei (7 ") — med. to high " (5-60 spp)
- (5) Dic cra (4 ") — med. diversity " (5-20 spp)
- (6) Bai spA (3 ") — low " (1-5 spp)

Interpretation of associations:

Neocalamites — Monospecific bamboo-like thickets, shallow water in river channel and back swamp areas of flood plain.

Heidiphyllum — Monospecific to low diversity associations peripheral to swamps and low water in river channels. *Heidiphyllum* associations often pre-empt *Neocalamites* associations at a locality.

Sphenobaiera — Low diversity bush associations fringing lakes in the back swamp.

Dicroidium — More diverse forest and woodland associations, river bank (levee) and other elevated ground.

ANIMAL FOSSILS

Insects (Table 4 & Fig. 2)

Insects, primarily impressions of isolated wings, are the most frequently occurring animal fossils found.

	fam.	gen.	spp.	individ.
Ephemeroptera (mayflies)	1	1	1	5
Meganisoptera (protodragonflies)	1	1	1	2
Odonata (dragonflies)	1	1	3	16
Plecoptera (stoneflies)	1	1	1	1
Blattodea (cockroaches)	2	3	5	110
? Mantodea (mantids)	1	1	1	1
Orthoptera (grasshoppers)	3	3	3	11
Homoptera (bugs)	6	7	7	16
Megaloptera (aldersflies)	1	1	1	1
Mecoptera (scorpionflies)	1	1	1	11
Trichoptera (caddisflies)	-	-	-	7
Lepidoptera (butterflies)	1	1	2	3
Coleoptera (beetles)	3	4	6	61
Unidentified	-	-	-	56
	22	25	32	301

Collections — Insects have been collected from 16 of the 74 megaflores assemblages. They are unknown from elsewhere.

Diversity — The 22 families, 25 genera and 32 species noted include only described taxa. At least as many taxa remain, in the available collection, to be described. The 301 individuals include both described and undescribed identifiable material.

References — Zeuner 61, Riek '74, 76a,b, Hubbard & Riek '77.

Associations — Insects have been gathered in reasonable numbers from only 4 megaflores assemblages. In 3 of these, Lit 111, Umk 111 and Maz 211, cockroaches and beetles clearly dominate in relatively low diversity insect associations; whilst in the 4th, bugs and dragonflies are perhaps most characteristic in a distinctly more diverse insect association.

Insect/megaflores relationships — The 2 insect associations occur with 2 of the broad megaflores associations:

The cockroach/beetle association occurs with diverse *Dicroidium* associations (abandoned channel).

The bug/dragonfly association occurs with a less diverse *Sphenobaiera* association (lake in back swamp).

Other animal fossils

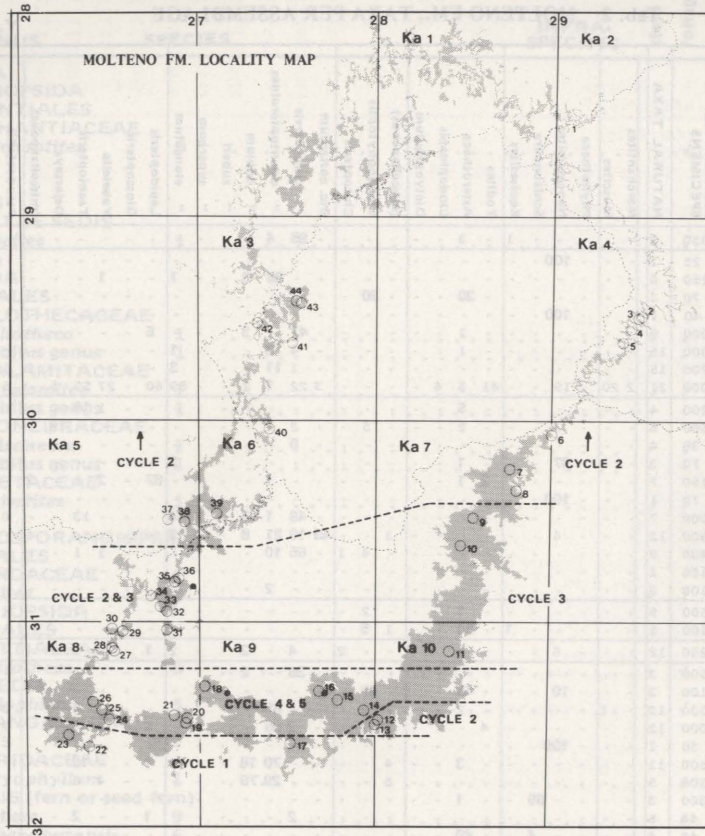
Conchostraca — Around 100 specimens representing a few species, from 5 megaplant localities (Maz 211, Lit 111, Umk 111, Hla 212, and Gre 111)

Fish — 3 specimens (impressions) of a single species, *Semionotus capensis* (see Jubb 1973), from 1 locality (Bir 111).

Tetrapods — Bone is not preserved in the Molteno Fm.

BIOSTRATIGRAPHIC AGE

Megaflores & palynoflores — L. Karnian (And. & And. 1983a).



Tab. 1 MOLTENO FM., MEGAPLANT LOCALITIES & ASSEMBLAGES

MAP REFERENCE (LOCALITIES)	SUPERLOC. (10 km)	LOCALITY (1 km)	SUBLOC. (100 m)	SUPERSITE (10 m)	ASSEMBLAGE	SUPERLOCALITY	MAP REFERENCE (LOCALITIES)	SUPERLOC. (10 km)	LOCALITY (1 km)	SUBLOC. (100 m)	SUPERSITE (10 m)	ASSEMBLAGE	SUPERLOCALITY
1	Lit	111			Dic/Hei	Little Switzerland	23	Aas	111			Hei elo	Aasvoëlberg
2	Hla	211			Dic 3spp	Hlatimbe Valley	24	Boe	111			Lep sto	Boesmanshoek Pass
"	"	212			Dic 3spp	"	"	"	"			Neo car	"
"	"	213			Dic elo	"	"	"	"			Dic/Hei	"
3	"	111			Neo car	"	"	"	112			Dic cor	"
4	Umk	111			Dic 2spp	Umkomaas Valley	25	Cyp	111			Dic cra	Cyphergat
5	San	111			Dic cra	Sani Pass	"	"	"			Hei elo	"
6	Mng	111			Dic 2spp	Mngeni Valley	26	Mol	111			Bai spA	Moltento
7	Qac	111			Hei/Dic	Qachasnek	27	KJe	111			Neo car	Klein Hoek
8	Mat	111			Dic dub	Matatiele	"	"	"			Hei elo	"
9	Ken	111			Dic cra	Kenegapoort	"	"	"			Hei/Dic	"
10	Tin	111			Sch spA	Tina Bridge	28	"	211			Bai spA	"
"	"	121			Bai 2spp	"	29	Kul	111			Bai spA	Kullfontein
"	"	131			Hei/Ast	"	30	Kom	111			Bai/Dic	Kommandantskop
11	Wal	111			Dic odo	Waldeck	"	"	"			Ast/Gin	"
12	Kon	222			Dic odo	Konings Kroon (K.Kr.)	31	Tel	111			Hei elo	Telemaghus Spruit
"	"	211,221			Ast 2spp	"	32	Vin	211			Neo car	Vineyard
"	"	"			Hei elo	"	33	"	111			Dic odo	"
13	"	111			Dic odo	" (Rooipoort)	34	Ela	111			Dic odo	Elandspruit
"	"	"			Neo car	"	"	"	112			Neo car	"
"	"	"			Hei elo	"	"	"	"			Hei/Neo	"
14	Kan	111			Hei elo	Kannaskop	"	"	"			Dic/Hei	"
"	"	"			Ast spA	"	35	Kra	211			Neo car	Kraai River (Plaatkop)
15	Nav	111			Neo car	Navar	36	"	111			Dic odo	" (Kraai R.)
"	"	"			Dic odo	"	36a	"	311			Dic odo	" (Glenburn)
16a	Cal	211			Hei elo	Cala Road	37	Nuw	211			Hei elo	Nuwejaarspruit
16	"	111			Neo car	"	"	"	"			Neo car	"
"	"	"			Dic/Hei	"	"	"	"			Dic 2spp	"
17	Ask	111			Neo car	Askeaton	38	"	111			♂ cone E	"
18a	Gre	121			Hei elo	Greenvale	"	"	"			Dic zub	"
"	"	111			Bai spA	"	39	Win	111			Hei elo	Winnaarspruit
"	"	"			Neo car	"	40	Qua	111			Dic odo	Qualasi Hill
18	Dor	111			Hei elo	Dordrecht	41	Mor	111			Dic zub	Morija
19	Bir	211			Bai 2spp	Birds River	"	"	"			Dic odo	"
20	"	311			Hei/Bai	"	42	Mak	111			Dic odo	Makoaneng
21	"	111			Bai 2spp	"	43	Maz	111			Dic cra	Mazenod (Luka)
22	Bam	111			Dic dub	Bamboeshoek	44	"	211			Hei/Dic	" (Lechesa)

Notes (a) 37 superlocalities, 47 localities, 56 supersites, 74 assemblages (see also Tab. 2).

(b) Includes collections to Dec. 1982.

(c) Localities 16a, 18a & 36a (discovered in 1982) are indicated by full dots.

(d) Bai (*Baiera*) should read Sph (*Sphenobaiera*).

(e) Full explanatory notes on location ranks and assemblage codes in And. & And. '83a

Tab. 2 MOLTENO FM., TAXA PER ASSEMBLAGE

[illegible]

±15500

Notes (a) 37 superlocalities, 47 localities, 56 supersites, 74 assemblages (see also Tab. 1).

(b) Includes collections to Dec. 1982.

(c) The localities and assemblages are included as far as possible in stratigraphic sequence and bracketed according to sedimentary cycle.

(d) Most genera and the more significant species are listed (foliage taxa only).

Genera not listed individually are combined under miscellaneous.

(e) Bai (*Baiera*) should read Sph (*Sphenobaiera*).

(f) Full explanatory notes on location ranks and assemblage codes in And. & And. '83a.

(g) Identifiable specimens (excl. seeds) — round figure estimates.

(h) Natural taxa — organ taxa combined into natural taxa where possible.

(i) **44** — bold figures are % counts.

70 — mild figures are actual numbers of specimens where the taxon makes up less than 1% of the assemblage

Tab. 3 MOLTENO FM.
MEGAFLOA, CLASSIFIED LIST.

DIVISION	CLASS	ORDER	FAMILY	GENUS	SPECIES	INFRA-SPECIFIC	stem	foliage	♂	♀	seed	♂
HEPATOPHYTA												
	MARCHANTIOPSIDA											
	MARCHANTIALES											
	MARCHANTIAACEAE											
				<i>Marchantites</i>	3	.....	-	✓	?	-	-	-
BRYOPHYTA												
	BRYOPSIDA											
	BRYALES											
	INCERTAE SEDIS											
				<i>Muscites</i>	1	.....	-	✓	✓	-	-	-
SPHENOPHYTA												
	SPHENOPSIDA											
	EQUISETALES											
	PHYLLOTHECACEAE											
				<i>Phyllothea</i>	1	.....	✓	✓	-	-	-	-
				strobilus genus	1	.....	-	-	✓	-	-	-
	APOCALAMITACEAE											
				<i>Neocalamites</i>	1	.....	✓	✓	-	-	-	-
				strobilus genus	1	.....	-	-	✓	-	-	-
	SCHIZONEURACEAE											
				<i>Schizoneura</i>	1	.....	-	✓	-	-	-	-
				strobilus genus	1	.....	-	-	✓	-	-	-
	EQUISETACEAE											
				<i>Equisetites</i>	1	.....	✓	✓	-	-	-	-
FILICOPHYTA												
	PROTOLEPTOSPORANGIOPSIDA											
	OSMUNDALES											
	OSMUNDACEAE											
				<i>Todites</i>	3	.....	-	✓	✓	-	-	-
	EUSPORANGIOPSIDA											
	MARATTIALES											
	MARATTIACEAE											
				<i>Asterotheca</i>	6	.....	-	✓	✓	-	-	-
	INCERTAE SEDIS											
				<i>Cladophlebis</i>	5	.....	-	✓	-	-	-	-
	LEPTOSPORANGIOPSIDA											
	FILICALES											
	DIPTERIDACEAE											
				<i>Dictyophyllum</i>	1	.....	-	✓	-	-	-	-
INCERTAE SEDIS (fern or seed fern)												
				9 genera	9	.....	-	✓	-	-	-	-
				<i>Ginkgophytopsis</i>	6	.....	-	✓	-	-	-	-
				<i>Chiropteris</i>	2	.....	-	✓	-	-	-	-
GYMNOSPERMOPHYTA												
	PTERIDOSPERMOPSIDA											
	CORYSTOSPERMALES											
	CORYSTOSPERMACEAE											
				<i>Dicroidium coriaceum</i> (Johnst. 1887) Townr. 1957 . . .	2	.....	-	✓	-	-	-	-
				" <i>crassinervis</i> (Geln. 1876) And. & And. 1982	5	.....	-	✓	-	-	-	-
				" <i>odontopteroides</i> (Morris 1845) Gothan 1912	5	.....	-	✓	-	-	-	-
				" <i>dubium</i> (Feistm. 1878) Gothan 1912	4	.....	-	✓	-	-	-	-
				" <i>zuberi</i> (Szajn. 1888) Archang. 1968	1	.....	-	✓	-	-	-	-
				" <i>superbum</i> (Shirley 1898) (Townr. 1957 . . .	4	.....	-	✓	-	-	-	-
				" <i>elongatum</i> (Carruth. 1872) Archang. 1968 .	7	.....	-	✓	-	-	-	-
				<i>Umkomasia</i>	4	.....	-	-	-	✓	-	-
				seed genus	3	.....	-	-	-	-	✓	-
				<i>Pteruchus</i>	4	.....	-	-	-	-	-	✓
	PELTASPERMALES											
	PELTASPERMACEAE											
				<i>Lepidopteris</i>	2	.....	2	✓	-	-	-	-
				<i>Peltaspermum</i>	1	.....	-	-	-	✓	-	-
				seed genus	1	.....	-	-	-	-	✓	-
				<i>Anteusia</i>	1	.....	-	-	-	-	-	✓
	GLOSSOPTERIDALES											
	GLOSSOPTERIDACEAE											
				<i>Glossopteris</i>	3	.....	-	✓	-	-	-	-
INCERTAE SEDIS												
				<i>Yabeiella</i>	2	.....	-	✓	-	-	-	-
				<i>Fraxinopsis</i>	2	.....	-	-	-	✓	-	-
				<i>Taeniopteris</i>	6	.....	-	✓	-	-	-	-
				<i>Dejerseya</i>	1	.....	4	✓	-	-	-	-
				♀ cone genus	1	.....	-	-	-	✓	-	-
				4 genera	4	.....	-	✓	-	-	-	-
	CYCADOPSIDA											
	CYCADALES											
				<i>Pseudoclenis</i>	7	.....	-	✓	-	-	-	-
				<i>Nilssoniopteris</i>	1	.....	-	✓	-	-	-	-
CONIFEROPSIDA												
	GINKGOALES											
	GINKGOACEAE											
				<i>Ginkgoites</i>	7	.....	2	✓	-	-	-	-
				<i>Sphenobaiera</i> spA . . . . .	.....	.....	-	✓	-	-	-	-
				" <i>tenuifolia</i> Johnston 1887 . . . . .	.....	.....	-	✓	-	-	-	-
				" <i>schenki</i> Feistmantel 1889 . . . . .	.....	.....	-	✓	-	-	-	-
				" <i>stormbergensis</i> Seward 1903 . . . . .	.....	.....	-	✓	-	-	-	-
				♀ cone genus	1	.....	-	-	-	✓	-	-
				<i>Feruglioa</i>	2	.....	-	-	-	-	✓	-
				<i>Stachyopitys</i>	2	.....	-	-	-	-	-	✓
	CONIFERALES											
	PODOCARPACEAE											
				<i>Rissikia</i>	3	.....	-	✓	-	-	-	-
				♀ cone genus	1	.....	-	-	-	✓	-	-
				♂ cone genus	1	.....	-	-	-	-	✓	-
	CYCADOCARPIDIACEAE											
				<i>Heidiphyllum elongatum</i> (Morris 1845) Retall. 1981 . . . . .	.....	.....	-	✓	-	-	-	-
				<i>Telemaghus elongatus</i> H. And. 1978 . . . . .	.....	.....	-	-	-	✓	-	-
				<i>Dordrechtites elongatus</i> H. And. 1978 . . . . .	.....	.....	-	-	-	-	✓	-
				<i>Heidiphyllum</i> spA . . . . .	.....	.....	-	-	✓	-	-	-
INCERTAE SEDIS (fertile structures)												
				♀ cone, 9 genera	9	.....	-	-	-	✓	-	-
				seed, 4 genera	4	.....	-	-	-	-	✓	-
				♂ cone, 7 genera	7	.....	-	-	-	-	-	✓

Notes (a) The foliage taxa named are those listed in Tab. 2.
Other taxa are included anonymously.

(b) Organ taxa taken to be associated are bracketed.

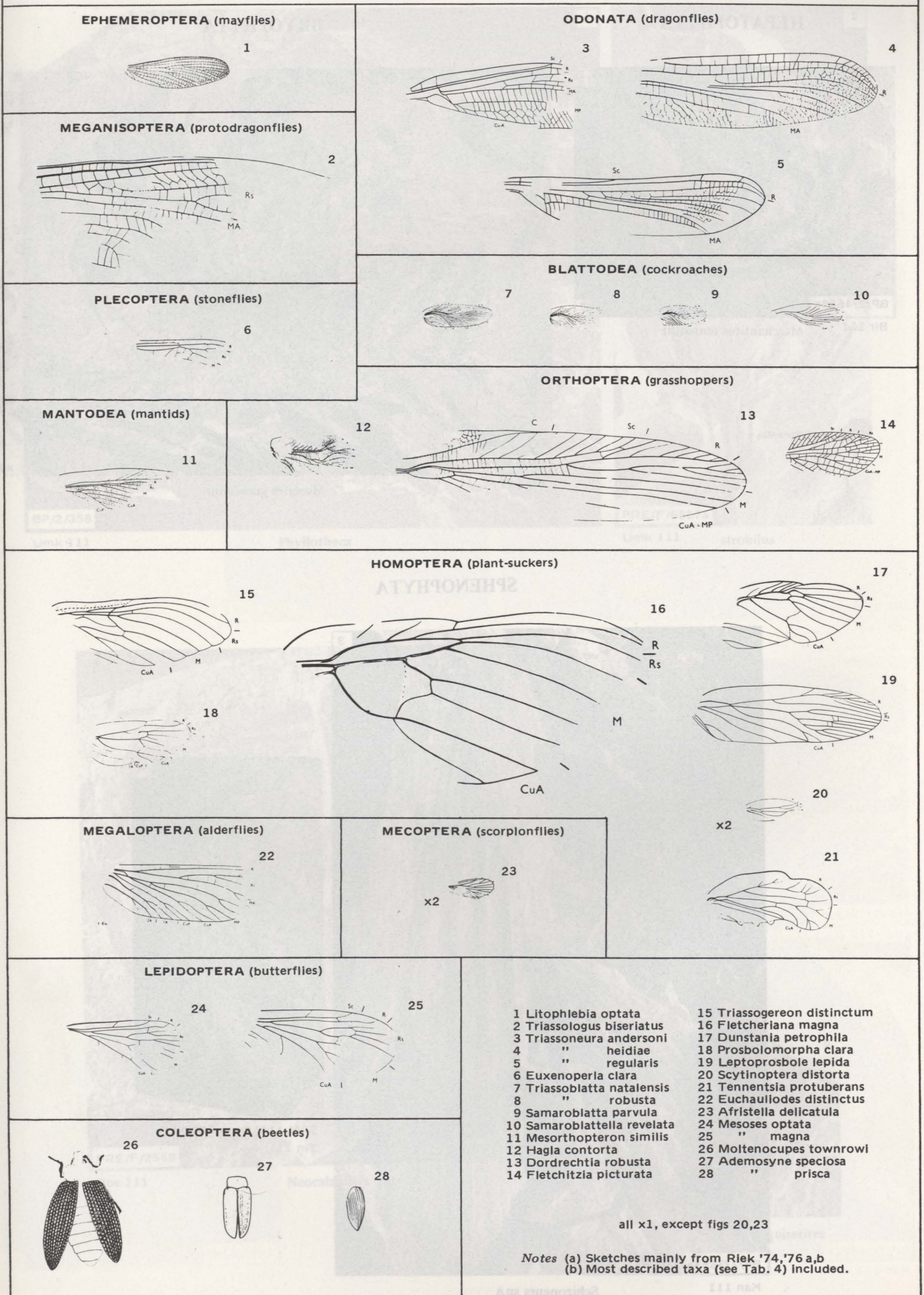
Tab. 4 MOLTENO FM.
INSECT FAUNA
CLASSIFIED LIST

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Notes (a) Includes collections (301 individuals) to Dec. 1982.
(b) Undescribed material placed according to Toms 1982 (pers. comm.).
(c) See further notes in text and illustrations in Fig. 2.

Fig. 2

MOLTENO INSECTS



- | | |
|------------------------------------|------------------------------------|
| 1 <i>Litophlebia optata</i> | 15 <i>Triassogereon distinctum</i> |
| 2 <i>Triassologus biseriatus</i> | 16 <i>Fletcheriana magna</i> |
| 3 <i>Triassoneura andersoni</i> | 17 <i>Dunstanian petrophila</i> |
| 4 " <i>heidiae</i> | 18 <i>Prosbolomorpha clara</i> |
| 5 " <i>regularis</i> | 19 <i>Leptoprosbole lepida</i> |
| 6 <i>Euxenoperla clara</i> | 20 <i>Scytinoptera distorta</i> |
| 7 <i>Triassoblatta natalensis</i> | 21 <i>Tennesia protuberans</i> |
| 8 " <i>robusta</i> | 22 <i>Euchauiodes distinctus</i> |
| 9 <i>Samaroblatta parvula</i> | 23 <i>Afristella delicatula</i> |
| 10 <i>Samaroblattella revelata</i> | 24 <i>Mesosoptera optata</i> |
| 11 <i>Mesorthopteron similis</i> | 25 " <i>magna</i> |
| 12 <i>Hagla contorta</i> | 26 <i>Moltenocupes townrowi</i> |
| 13 <i>Dordrechtia robusta</i> | 27 <i>Ademosyne speciosa</i> |
| 14 <i>Fletchitzia picturata</i> | 28 " <i>prisca</i> |

all x1, except figs 20,23

Notes (a) Sketches mainly from Riek '74,'76 a,b
(b) Most described taxa (see Tab. 4) included.

MOLTENO FM., PHOTOGRAPHIC CATALOGUE

all x1,
except where indicated

Typical examples of the genera & species listed in Tab. 2 & 3 are illustrated

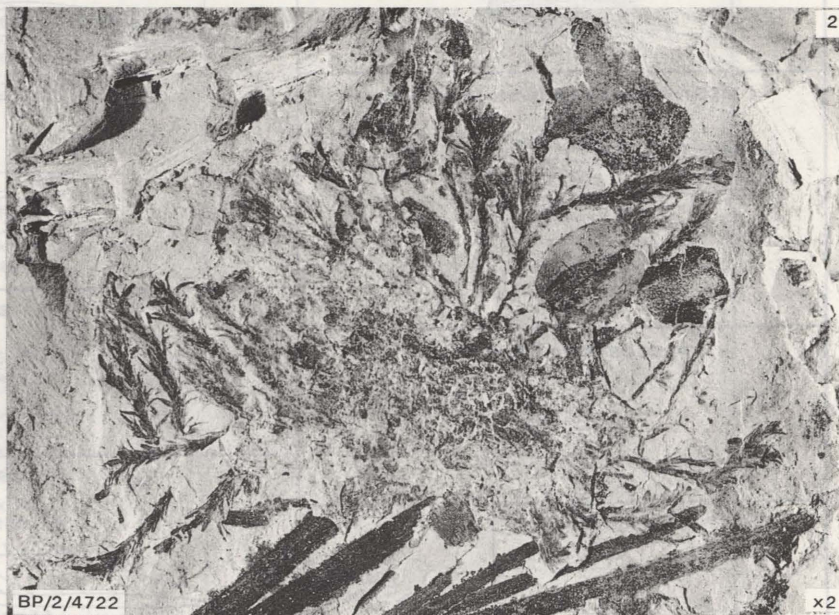
HEPATOPHYTA



Bir 111

Marchantites tennantii

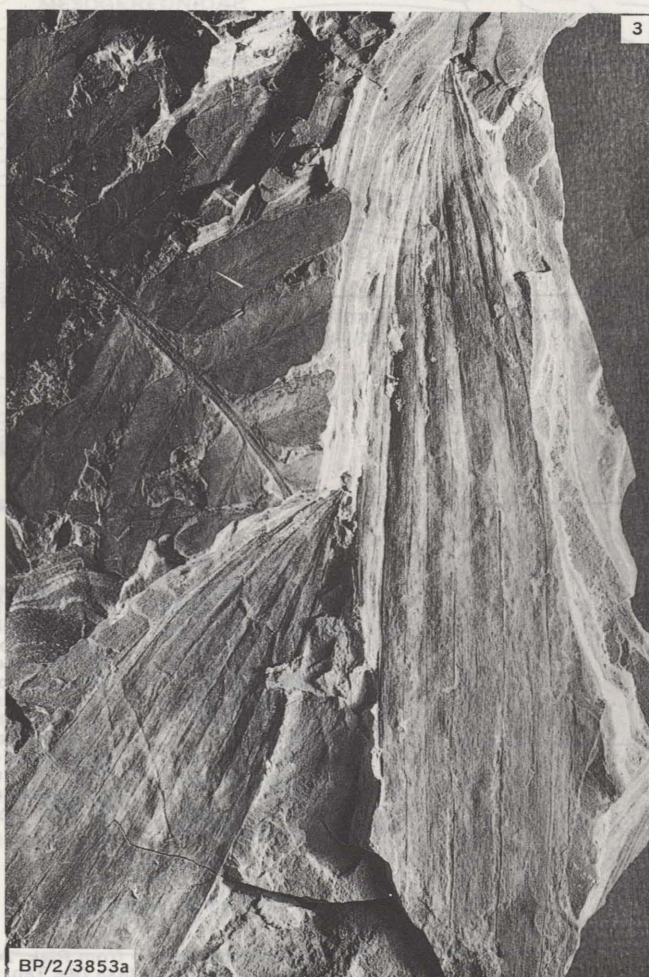
BRYOPHYTA



Bir 111

Muscites guescelini

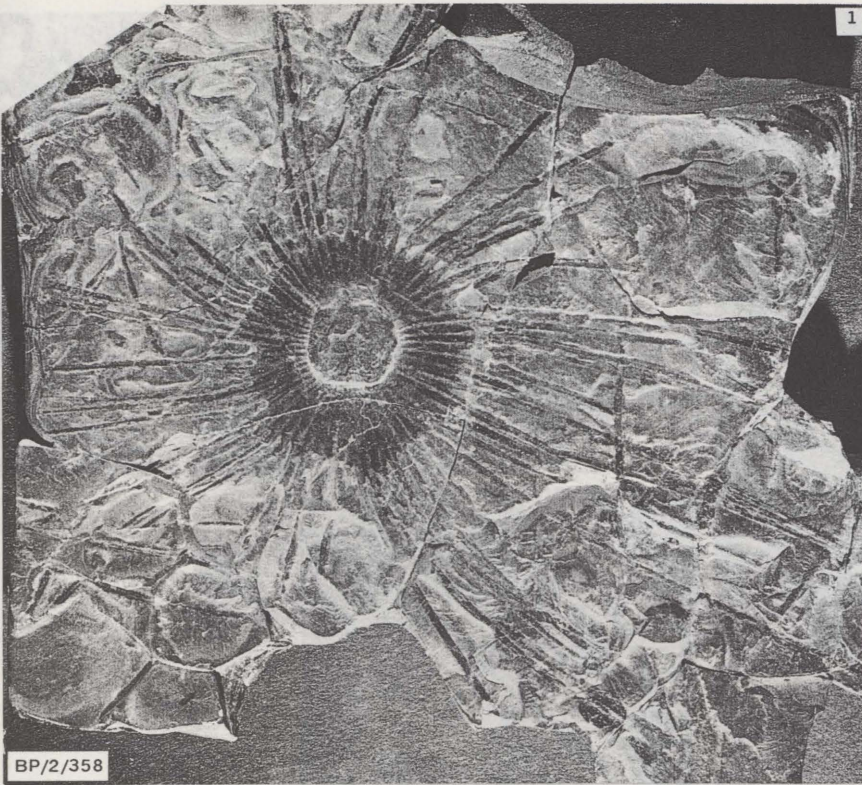
SPHENOPHYTA



Kan 111

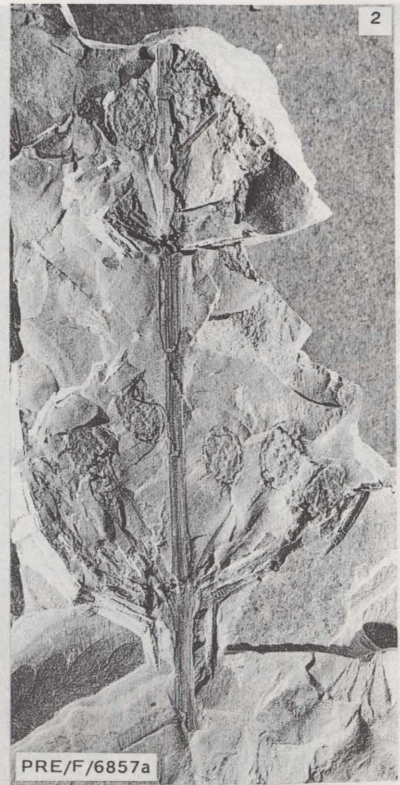
Schizoneura spASAM 11652 strobilus
Tin 111

SPHENOPHYTA



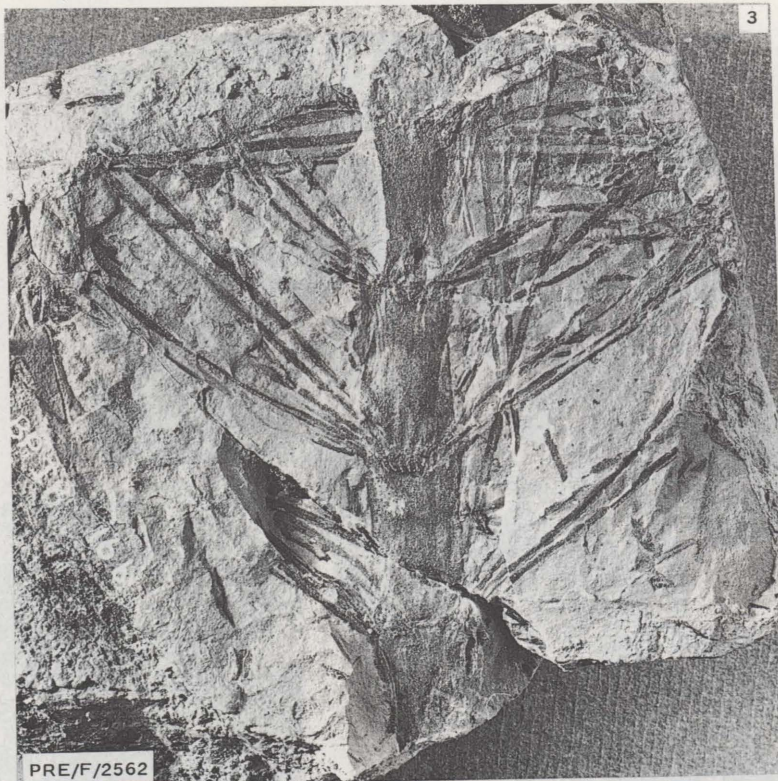
Umk 111

Phyllothea



Umk 111

strobilus



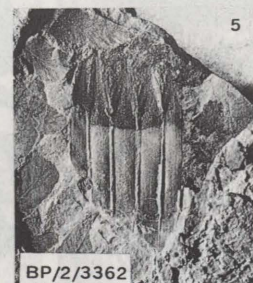
Boe 111

Neocalamites carrerei



Kra 211

strobilus

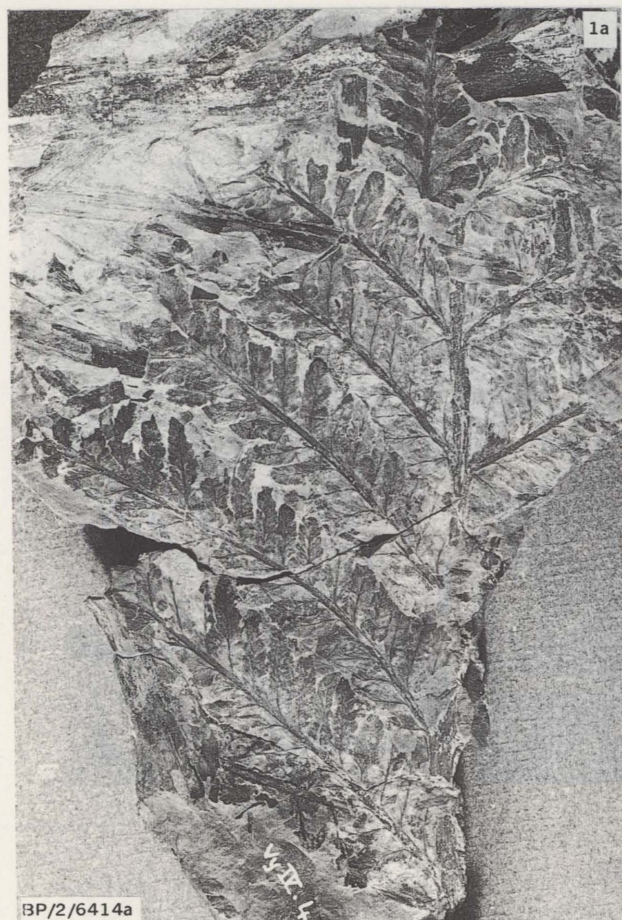


Kan 111

Equisetites

all x1,
except where indicated

Typical examples of the genera & species listed in Tab. 2 & 3 are illustrated



BP/2/6414a

Eil 112

Todites



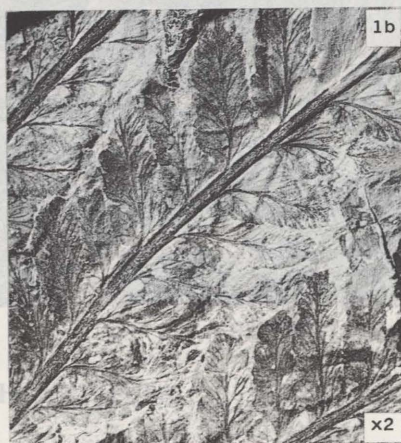
Eil 112

BP/2/6408a

x2

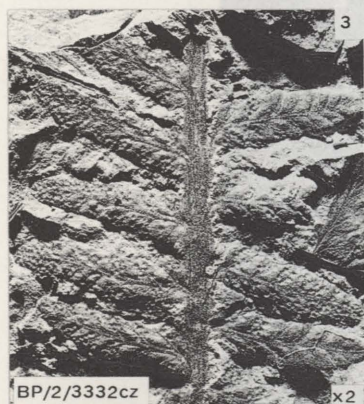


x10



1b

x2



BP/2/3332cz

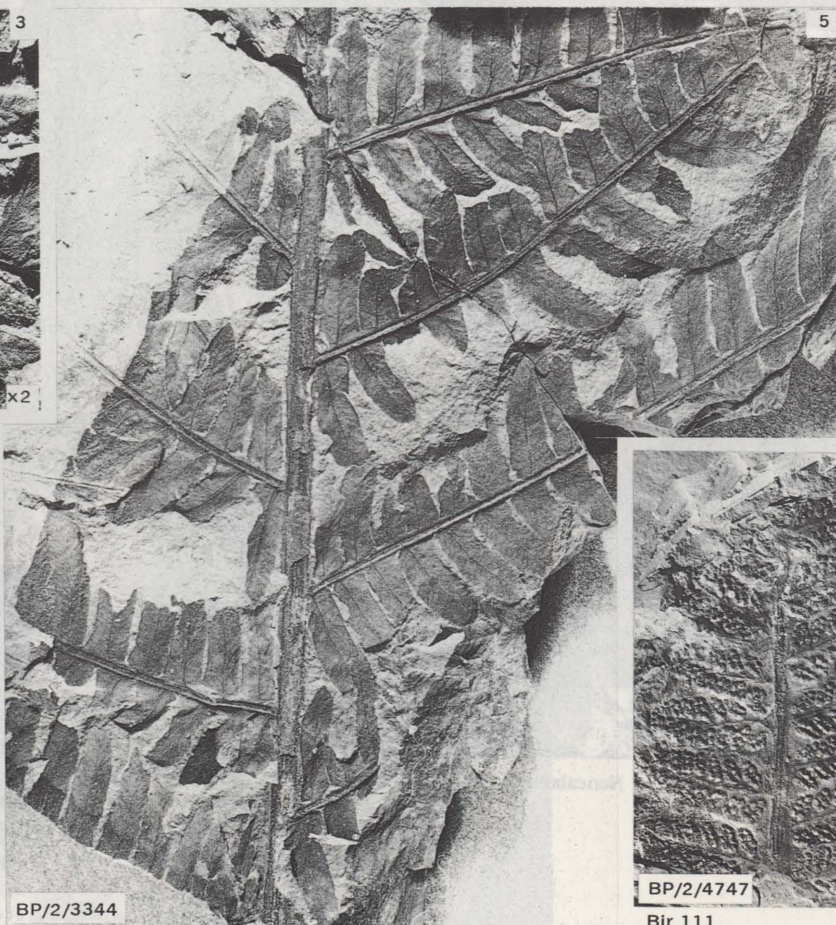
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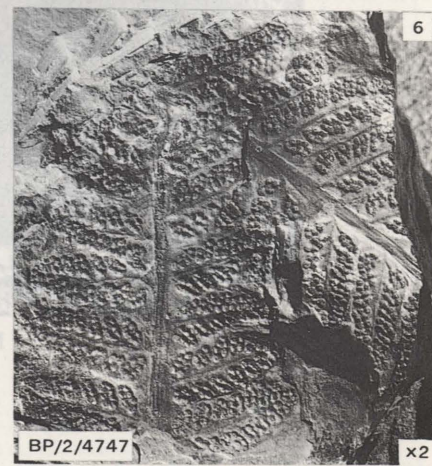
Kan 111



BP/2/3344

Kan 111

Asterotheca



BP/2/4747

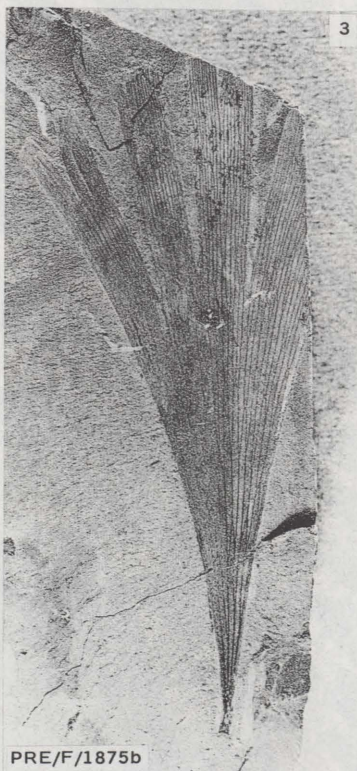
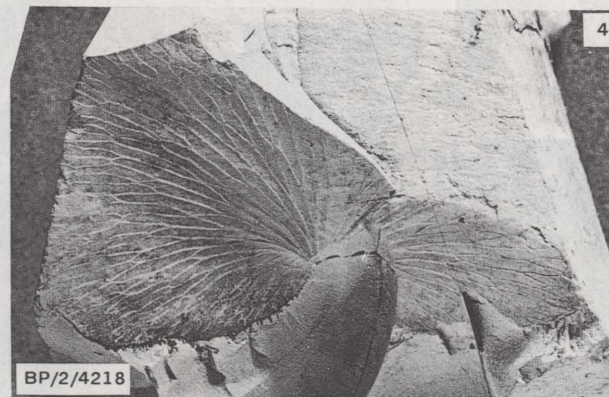
Bir 111

x2

FILICOPHYTA

Umk 111 *Cladophlebis*Mor 111 *Dictyophyllum ellenbergi*

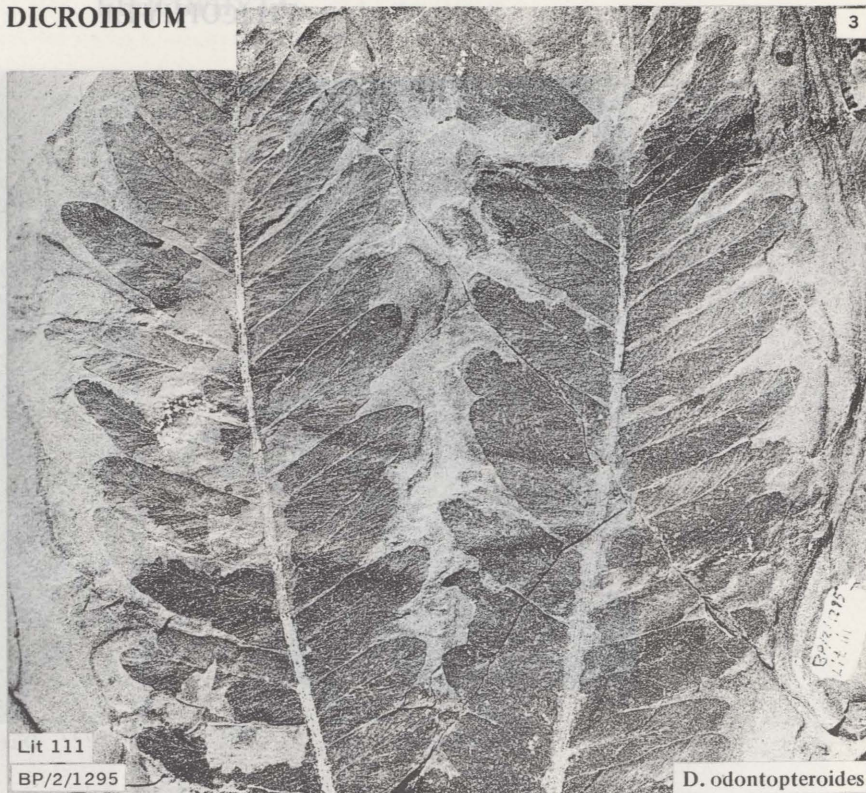
INCERTAE SEDIS

Mat 111 *Ginkgoephytopsis lacerata*Kon 211 *Chiropteris zeilleri*

DICROIDIDIUM

*D. coriaceum*

Umk 111
PRE/F/1



Lit 111
BP/2/1295

D. odontopteroides

San 111
BP/2/2397

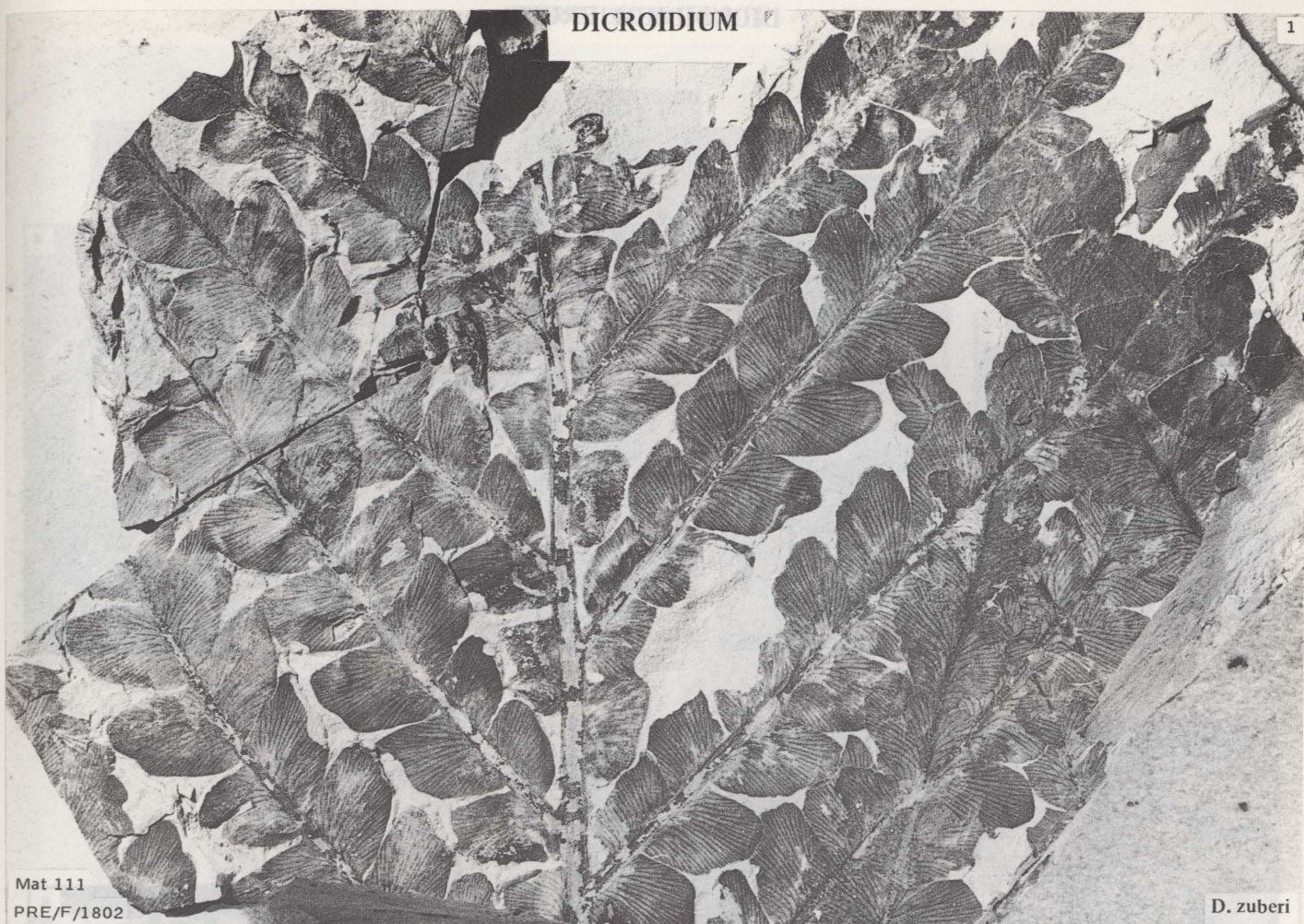
D. crassinervis

Mat 111
PRE/F/1782

D. dubium

DICROIDIUM

1



Mat 111
PRE/F/1802

D. zuberi

2



Umk 111
PRE/F/87a

D. superbum

3



Umk 111
PRE/F/53

D. elongatum

DICROIDIDIUM FRUIT



Umk 111



Maz 211



Mat 111



Kon 222



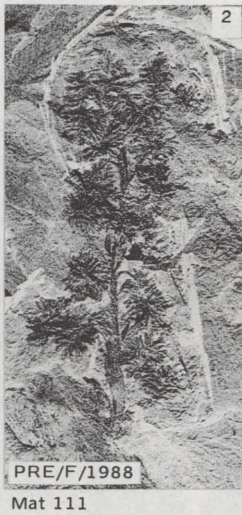
Mat 111



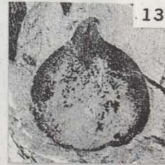
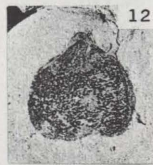
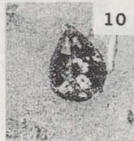
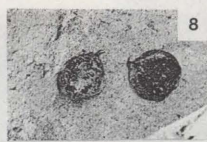
Mor 111

Umkomasia

DICROIDIUM FRUIT



Pteruchus

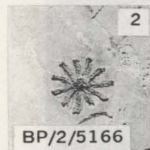


seed

PELTASPERMALES



Bir 111



BP/2/5166



BP/2/4137a

Kon 222

Peltaspermum



BP/2/5201a

Bir 111

Antevsia



BP/2/5210

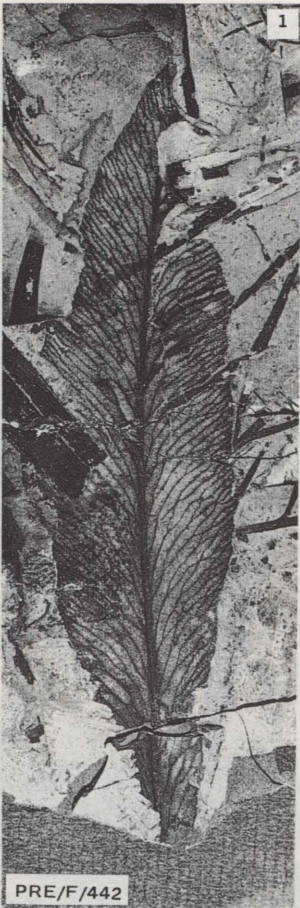
Bir 111

BP/2/604

Umk 111

Lepidopteris stormbergensis

GYMNOSPERMOPHYTA



PRE/F/442

Umk 111

Glossopteris verticillata

BP/2/3968

Kon 222

Yabeiella crassa

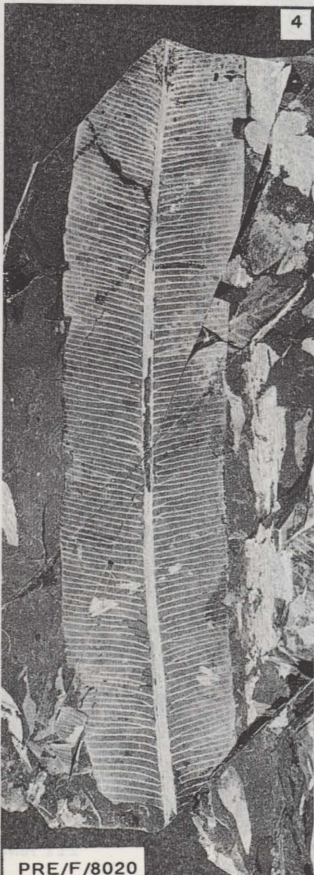
BP/2/5305

Bir 111

Fraxinopsis

PRE/F/5645

Lit 111

Dejerseya lobata

PRE/F/8020

Kra 111 *Taeniopteris*

BP/2/2165

Lit 111

♀ cone



PRE/F/5691

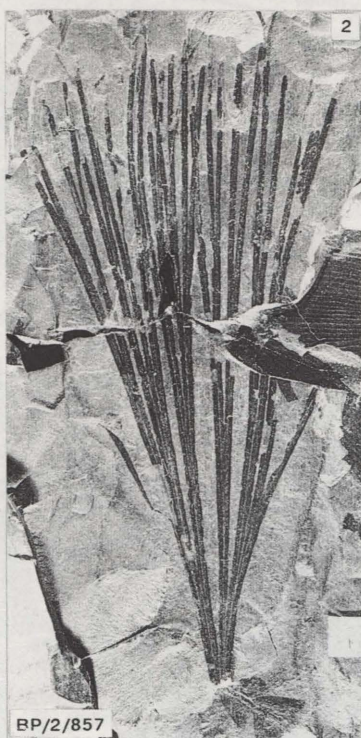
Lit 111

GINKGOALES



BP/2/5024
Bir 111

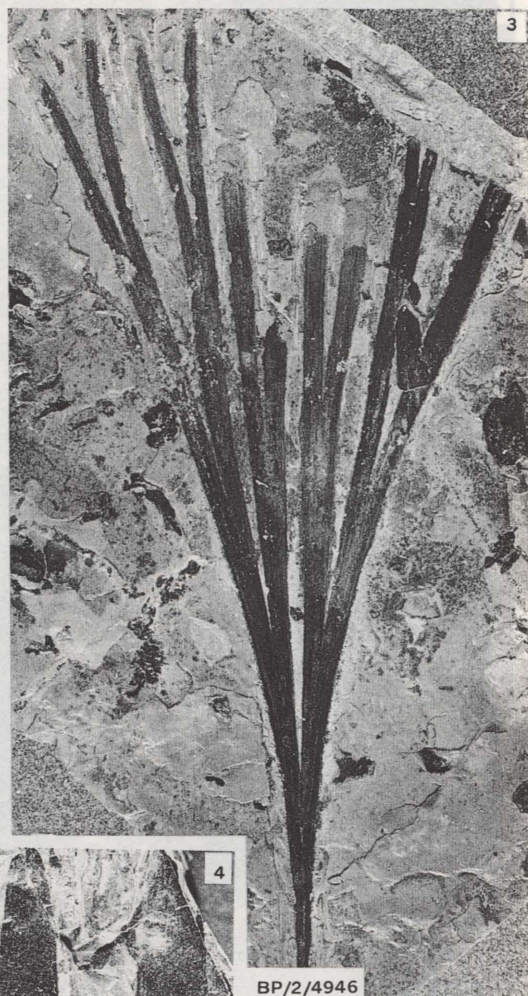
Sphenobaiera spA



BP/2/857

Umk 111

Sphenobaiera tenuifolia



BP/2/4946

Bir 111

Sphenobaiera schenki



PRE/F/6858

Wal 111

Ginkgoites digitata



BP/2/1885

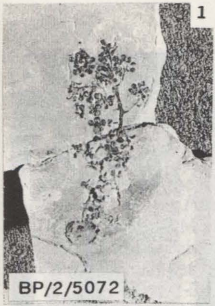
Lit 111

Sphenobaiera stormbergensis

SPHENOBAlERIA FRUIT

Stachyopitys

♀ cone



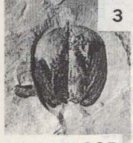
BP/2/5072

Bir 111



BP/2/5073b

Bir 111



BP/2/5335

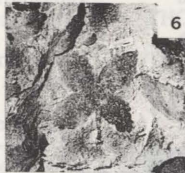
Bir 111

Feruglia



PRE/F/9535b

Wal 111



PRE/F/9536

Wal 111



PRE/F/9436a

Wal 111



PRE/F/9538a

Wal 111

Stachyopitys



PRE/F/9250b

Mat 111

Stachyopitys



PRE/F/9174a

Mat 111



BP/2/3115

Mat 111

Stachyopitys



PRE/F/2010

Mat 111

♀ cone



PRE/F/2045

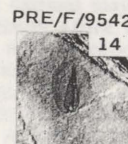
Mat 111

Feruglia



PRE/F/9776

Tin 121



PRE/F/9542

Tin 121



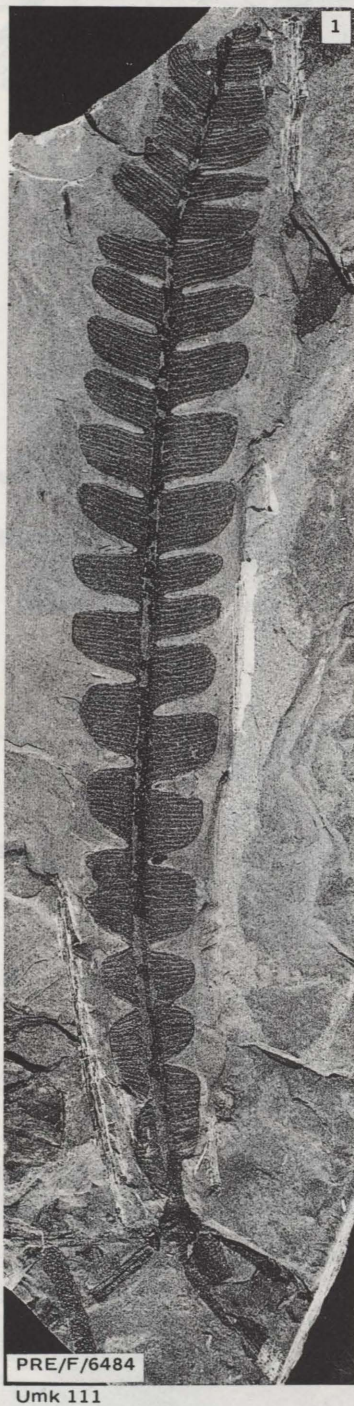
PRE/F/9778

Tin 121

Feruglia

CYCADALES

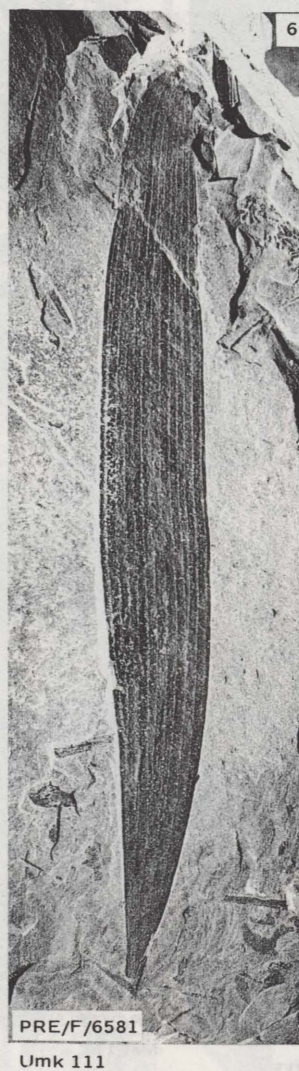
CONIFERALES



♀ cone



♂ cone



Heidiphyllum elongatum



Dordrechtites elongatus

Mat 111



Telemachus elongatus

MOLTENO FM.

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Annotations to megaplant references

- Carruthers 1871** – The earliest report of megaplants in the Molteneo Fm. A brief note on a few fragmentary specimens, referred to the genera *Danaeopsis* and *sphenopteris*, from Dordrecht.
- Shaw 1887** – Brief mention of a few taxa, *Pecopteris* (*Dicrodium*), *Cycadites* and *Sphenopteris*, from the coal deposits at Indwe and Cyphergat.
- Feistmantel 1889** – The first descriptions with illustrations of Molteneo megaplants – 6 genera and 7 species from Indwe and Cyphergat. The material was sent to Feistmantel by Schenk who spent 3 years working on Karoo strata in South Africa.
- Seward 1903, 04, 08, 11** – Descriptions of a number of taxa from some 15 to 20 localities. The material was forwarded to him by the Cape Geological Survey.
- Du Toit 1927, 32** – The earlier work is an extensive monograph in which he describes 25 genera (1 new) and 48 species (10 new) from 13 localities. It provides the only earlier comprehensive account of the Molteneo palaeoflora and is based largely on his own collections. The later work deals with Karoo floras of different ages. It includes the description of 2 genera and 2 species from 2 Molteneo localities.
- Thomas 1931, 33, 52, 55, 58** – Concerned primarily with *Dicrodium* and its fructifications. The works are based on collections (housed in the British Museum of Natural History) made by himself and Hoeg (Norway) in 1929 from the well known Umkomaas locality.
- Van Eeden 1937** – Illustrated some excellent cuticular fragments from a new locality near Kestell.
- Stockley 1947** – In a report on the geology of Lesotho he notes a number of new Molteneo plant localities and mentions the more evident taxa.
- Townrow 1956, 57, 59, 60, 62, 67** – This series of papers deals with particular genera (*Lepidopteris*, *Dicrodium*, Bryophyta, *Rissikia*) and their fructifications from the Umkomaas locality. The earlier work was based on the material of Thomas & Hoeg and the latter on his own collections made in 1956.
- Fabre & Greber 1960** – Described a new species of the Dipteridacean fern *Dictyophyllum* from the Morija locality in Lesotho.
- Plumstead 1969** – In a monograph on the succession of fossil floras in South Africa she gives a brief summary of the Molteneo megaflores.
- And. & And. 1970** – In a general synthesis of the biostratigraphy of the Gondwana Triassic an updated checklist of the Molteneo flora and a preliminary pictographic taxonomic revision of *Dicrodium* are presented.
- Anderson, H., 1974, 76, 78** – The earlier paper gives an overview of the Molteneo flora. The latter papers describe the bryophyta and the conifer *Podozamites* with its associated cones.
- Baldoni 1980a, b** – Taxonomic treatment of a few specimens of *Xylopteris* (*Dicrodium*) and *Baiera* from the Umkomaas locality. Collections in Buenos Aires.
- And. & And. 1983 a, b, 84** – Works initiating a monograph series on the 'Palaeoflora of Southern Africa'. Included is the 1st of 6 planned volumes on the Molteneo palaeoflora, and a volume covering the succession of fossil floras in South Africa.

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