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OBSERVATIONS ON THE PERMIAN FLORA OF THE LAW GLACIER AREA CENTRAL TRANSANTARCTIC MOUNTAINS

L.L. LAMBRECHT (**); W.S. LACEY (*) C.S. SMITH (*).

1. *Introduction*

This paper is concerned with a general description of a Permian Flora collected by L.L. LAMBRECHT in the central part of the Transantarctic Mountains. This author participated in the field investigations of the 1969-1970 U.S. Antarctic Research Program as a Belgian exchange scientist (Belgian Antarctic Expeditions). He enjoyed the hospitality of the Institute of Polar Studies team, Ohio State University, who investigated the Law Glacier and Bowden Névé area, between the Queen Alexandra Range and the Queen Elisabeth Range. His aim was the detailed study of the Permian coal-bearing formations which crop out on the flanks of the Coalsack Bluff and of Mounts Sirius, Ropar and Picciotto (Fig. 1).

A preliminary paper on this subject was read at the meeting of October 30th, 1970 of the "Société belge de Géologie".

During the fieldwork, some plant-containing localities were encountered. The localisation and description of the main fossiliferous beds are given. The method of plant study, the lists of fossils, and the botanical observations are due to Dr W.S. LACEY and Miss C.S. SMITH. The material is housed at present in the School of Plant Biology, University College of North Wales, Bangor, U.K.

(*) School of plant Biology, University College of North Qales, Bangor, U.K.

(**) U.S.A.R.P. 1969-1970.

2. *Main features of the Permian in the area* (L.L. LAMBRECHT)

The general stratigraphy of the Beacon "Group", including the Permian, is given in the preliminary paper (LAMBRECHT, in press). We note here only some stratigraphical features facilitating the understanding of the local geological conditions.

The outcrops are very important. Made up of sandstones, shales and coal, the strata are very generally horizontal or dip slightly westward. Tabular blocks extending sometimes over several kilometres are bordered by dolerite sills and dykes. Very locally the strata have been toppled over by a lava thrust. In many places the baking action of the intrusive material on the sediments is striking.

The sedimentary sequences examined crop out in cliffs or over slopes dipping at 20° to 40°. In many cases these slopes are strewn with polished dolerite blocks.

3. *Method of investigation in the field* (L.L. LAMBRECHT)

The small thickness of scree and disaggregated rocks, save at the foot of the cliffs, and the quasi absense of snow, at this time of the year November-December) and in this area, permitted the discovery of some continuous sequences of beds, with the help of a trenching spade, an ice-pick or some more appropriate tools. In these circumstances it is possible to describe in a detailed manner sequences from several tens to several hundreds of meters thick.

By these means six plant-containing localities were discovered in the four principal sequences described: in the Coalsack Bluff (2), at Mount Sirius (1), at Mount Ropar (1) and at Mount Picciotto (2).

Lithologic samples were collected in every distinct layer and a stratigraphical scale has been drawn for three sequences. These scales, with the position of the main plant-containing beds, are given in figure 2.

4. *Method of plant study* (W.S. LACEY, C.S. SMITH)

The collection has been studied four times: first by W.S. LACEY and C.S. SMITH working independently, then working together, finally by W.S. LACEY again. Specimens have been examined by hand lens and binocular microscope with strong unilateral illumination. No preparations have been attempted yet, but some slabs have been split up, some specimens have been ground down to trace *Vertebraria* axes crossing the bedding plane, and some specimens have been examined under water or xylol (LACEY, 1963).

In the absence of any evidence from cuticle structure or from attached well-preserved fructifications, considerable difficulty has been experienced in placing many of the *Glossopteris* leaves in named species, especially as many leaves appear to be small and probably represent juvenile stages, while others appear to show transitions from one form to another. This is a common experience with *Glossopteris* material. Nevertheless, several broad groups of species have been recognised. For example, fairly large ovate-lanceolate leaves with close lateral veins ascending at a steep angle to the midrib constitute the *Glossopteris communis — indica — browniana* group, where *G. communis* has the narrowest and *G. browniana* the widest meshes; leaves with more lax reticulation constitute the *Glossopteris conspicua — retifera* group, with *G. orbicularis* a possible juvenile form in this group; large broadly ovate leaves with lateral venation almost at right angles to the midrib constitute the *Glossopteris ampla — damudica* group; small narrow-linear leaves constitute the *Glossopteris angustifolia* group, but this may well include juvenile stages of various species; and long-stalked leaves, also probably belinging to several species, form the *Glossopteris longicaulis* group.

5. *Description of plant-containing localities with lists of plants.* (L.L. LAMBRECHT, W.S. LACEY, C.S. SMITH)

Many coal seams, more or less heavy in ash were encountered in the Permian sequences. All the rocks contain coaly material and fragments of plants have been found in the majority of the investigated layers. A few seatearths exist under the coal seams and stumps floated or in position of life have been found in a few points. Our purpose here is to describe only the main plant-containing localities, which provide a great number of specimens capable of being turned to account. These localities, with their collection numbers, are:

Coalsack bluff:	Col. No II - 2 - 1
	Col. No II - 2 - 110
Mount Sirius:	Col. No II - 6 - 4
Mount Picciotto:	Col. No III - - 1 - 5
	Col. No III - 1 - 6
Mount Ropar:	Col. No IV - 2 - 39

a. Coalsack Bluff / II-2-1

One hundred and seventy-six metres thick, the sequence is situated on the Western flank of the Coalsack Bluff (Fig. 1), between two doleritic sills. Above the second sill, the discovery of a Triassic bone bed (ELLIOT et al, 1970) suggests that the Permian sequence No II - 2 belongs to the upper part of the Permian deposits of this area.

The fossiliferous layer II - 2 - 1, a long shaly lens 0,30 m thick, lies 14 m above the lower sill, and about 3 m below a coaly complex 5 m thick. This lens, of which the visible length attains about 200 m, contains a great number of *Glossopteris* leaves and some other plant remains:

Paracalamites austrialis Rigby (1969) (leafless. Sphenopsid axes, formerly included in *Phyllotheca*)
Glossopteris ampla Dana (with some similarity to *G. damudica* Feist).
G. angustifolia Brongniart.
G. cf. *angustifolia* Bgt.
G. cf. *browniana* Bgt
G. communis Feist./ *indica* Schimper type.
G. cf. *conspicua* Feistmantel. (one specimen with some similarity to *G. retifera* Feist.)
G. cf. *stricta* Bunbury.
cf. *Gangamopteris angustifolia* McCoy (a small example).
? *Gangamopteris* sp.

b. Coalsack Bluff / II-2-110

In the same sequence, the second noteworthy layer is situated 112 m above the preceding one. A silty shale 5 m thick contains sandy lenses in the lower part. Plant remains are common on some bedding planes:
Woody stem (indeterminable).
Glossopteris ampla Dana (some specimens approaching *G damudica* Feist).
G. angustifolia Bgt.
G. browniana Bgt.
G. browniana with possible fructification on midrib (cf. *Scutum* or *Plumsteadia*).
G. brownian Bgt./*indica* Schimp. type.
G. communis Feist./*indica* Schimp. type
G. cf. *conspicua* Feist.
G. conspicua Feist. (approaching *G. retifera* Feist).
G. indica Schimp.
G. cf. *longicaulis* Feist.
G. cf. *orbicularis* Feist. (? juvenile leaf of *G. conspicua* Feist.)
Glossopteris scale leaves.
Arberiella sp. (sporangial sacs).
Fructification cf. *Plumsteadia waltonii* (See Plumstead 1958, Rigby 1968) (crushed and in three pieces).
cf. *Gangamopteris angustifolia* McCoy.
Vertebraria indica Royle (small star-shaped bodies on the bedding planes proved to be *Vertebraria* on grinding vertical sections through the rock. These specimens are therefore preserved in situ, as rootlets running at right angles to the bedding).

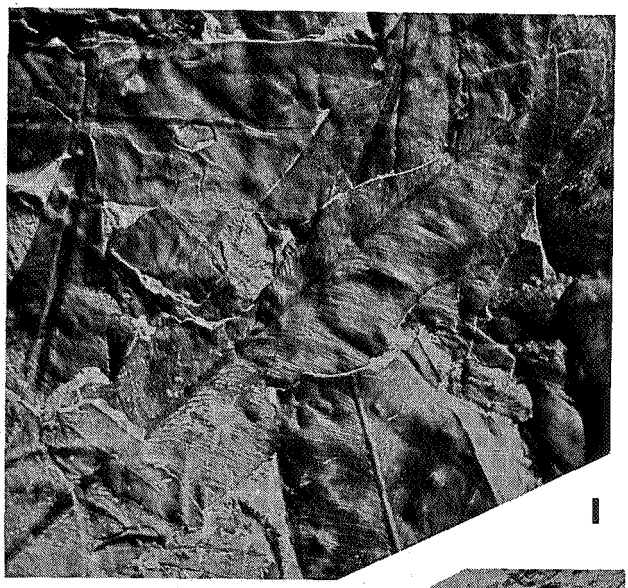
c. Mount Sirius / II-6-4.

A short Permian sequence, 22 m thick, crops out on the western slope of Mount Sirius, at the foot of the ice flow which joins the Walcott Névé and the Bowden Névé.

The roof and the upper roof of a coal-seam 0,70 m thick are formed by about 8 m of mudstone at the base, topped by silty or fine-grained sandy shale. The roof and upper roof are rich in plant remains at many levels:
Paracalamites australis Rigby (highly carbonaceous; this material may yield cuticles)
Glossopteris ampla Dana
G. angustifolia Bgt.
G. browniana Bgt.
G. browniana Bgt. / *indica* Schimp. type
G. communis Feist.
G. cf. *conspicua* Feist.
G. cf. *decipiens* Feist.
G. indica Schimp.
G. cf. *longicaulis* Feist.
G. orbicularis Feist. (could be a juvenile leaf of *G. conspicua* Feist).
Scale leaves of *Glossopteris*.
? *Gangamopteris angustifolia* McCoy
Vertebraria rootlets.

d. Mount Picciotto / III-1-5 / III-1-6.

No detailed study was carried out at Mount Picciotto. During a general visit to a slope, a few samples were collected under the second accessible doleritic sill. Some fine-grained shales yielded leaves and very sandy shales yielded *Paracalamites*; the two fossiliferous points are very near one another:
Col. No III-1-5
Faint impressions of small elongated leaves, with fine close-set spreading veins and apparently no midrib. Difficult was experienced in deciding whether veins form a network or not. If they are not reticulate, these leaves have some similarity to *Palaevittaria* already recor-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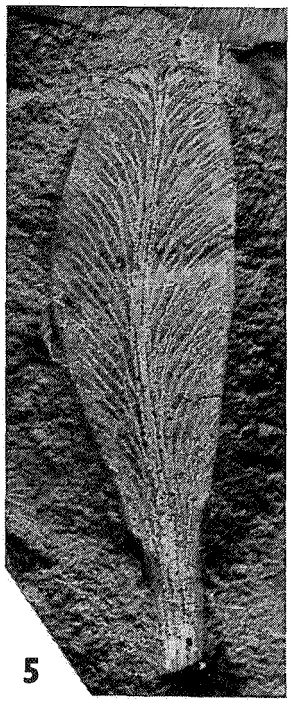
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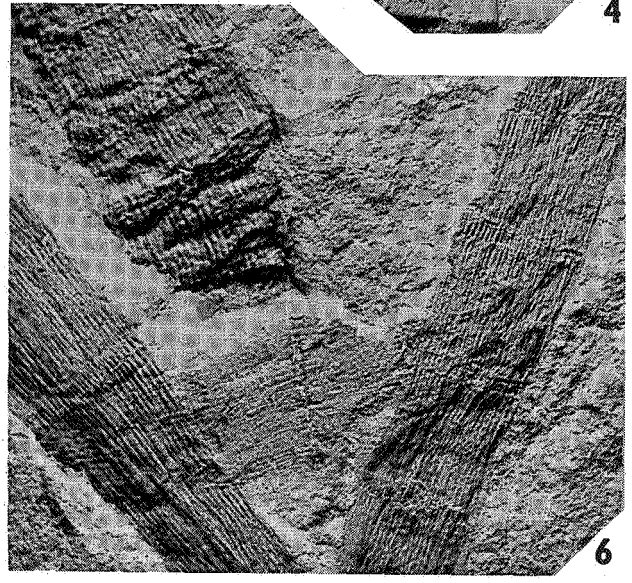
6

EXPLANATION OF PLATE I

1. A mixture of well-preserved leaves, mainly of the *Glossopteris communis* Feist. — *Glossopteris indica* Schimp. type x3/4
   Specimen N°. 73, collection N°. II-2-110, Coalsack Bluff.
2. Fructification cf. *Plumsteadia waltonii* (Plumstead) Rigby. x2
   Specimen N°. 71b, Collection N°. II-2-110, Coalsack Bluff
3. cf. *Gangamopteris angustifolia* Mc Coy. x2
   Specimen N°. 86, Collection N°. II-2-110, Coalsack Bluff
4. Small obovate leaf of *Glossopteris* cf. *orbicularis* Feist. x2
   Specimen N°. 48, Collection N°. II-6-4, Mount Sirius
5. Juvenile leaf of *Glossopteris*, somewhat intermediate between the form shown in Figure 4 and mature leaves of G. *conspicua* Feist. or *G. browniana* Bgt. x2
   Specimen N°. 85, Collection N°. II-2-110, Coalsack Bluff.
6. *Paracalamites australis* Rigby, showing two different types of axis. x3/4
   Specimen N°. 27a, collection N°. III-1-6, Mount Picciotto

ded from Antarctica by Plumstead (1962).

? *Gangamopteris* sp.

or? *Palaeovittaria* sp.

Col. No III-1-6

Paracalamites australis Rigby (Plate 1, Fig. 6)

Two types are present, possibly representing rhizomes and aerial branches (LACEY, 1966). Splitting the rock pieces yielded more specimens of the same taxon. No Glossopteris leaves are present. The presence of only one taxon suggests preservation of a particular environment for this Sphenopsid plant or differential sorting by water.

The taxon has no precise stratigraphical value and by itself is insufficient to establish a Permian age for the deposits in which it is found, but the presence of the ? *Gangamopteris* noted above would suggest Permian.

e. Mount Ropar / IV-2-39.

A thick stratigraphical succession appears on the eastern slope of Mount Ropar. The continuous and detailed study of a 132 m sequence was made between two deleritic sills, but the very sandy character of this sequence was not favourable to the preservation of good plant remains.

In the upper sequence, above the second doleritic sill, a cursory examination permitted the finding of some specimens noted IV - 2 - 39

Paracalamites australis Rigby.

Woody stems (indeterminable).

Glossopteris browniana Bgt. / *indica* Schimper type.

G. cf. *angustifolia* Bgt (but could be juvenile leaves of G. *browniana* / *indica*).

G. cf. *stricta* Bunb.

6. *General comments* (W.S. LACEY).

The collection as a whole is dominated by abundant *Glossopteris* leaves, of which species belonging to the *G. communis/ G. indica/G. browniana* group are the most common (plate 1, Fig. 1). Possibly as many as twelve species altogether are represented examples but it is difficult to separate them satisfactorily. Examples of *Gangamopteris* appear to be quite scarce; indeed, species of this genus have not been recognised with complete certainty (Pl. 1, Fig. 3)

There is a complete absence of lycopsids, *Sphenophyllum* or *Trizygia*, *Gondwanidium*, *Sphenopteris* or other fern-like foliage, *Taeniopteris*, *Noeggerathiopsis*, and seeds of any kind. Permian elements of extra-Gondwana affinity are also absent.

Of the six subcollections present, No II - 2 - 110 (Coalsack Bluff) is the most interesting botanically, not only because it contains the largest number of taxa but also because it has probable fructifications of the *Plumsteadia* Rigby type (formerly *Cistella* Plumstead). One specimen (pl. 1, Fig. 2) though badly crushed and broken into three pieces, closely resembles *Plumsteadia waltonii* (Plumstead) Rigby (see Plumstead, 1958; Rigby, 1968) and, if substantiated, will constitute a new record for the Permian flora of Antarctica. The flora of the Coalsack Bluff collections is quite similar to that described by CRIDLAND (1963) from the Ohio Range, Horlick Mountains.

The apparent scarcity of *Gangamocpteris* in the collections suggests that, by comparison with the situation in South Africa, an horizon equivalent to a position high in the Ecca Series is represented, i.e. in the upper part of the Permian. This suggestion receives support from the recent discovery of a Triassic bone bed in the upper part of the sequence investigated at Coalsack Bluff (ELLIOT et al., 1970).

7. *The microflora.*

An attempt has also been made to find out if microflora was present and determinable. This study was carried out by Dr Maurice STREEL, Department of Paleobotany and Paleopalynology, University of Liège, to whom we are deeply indebted.

Ten samples of different shales have been macerated by the classical method: hydrofluoric acid — oxidation by aqueous SCHULZE during two hours. A more coaly sample was treated directly by the SCHULZE method.

Two samples, coming from the Coalsack Bluff sequence (fig. 2, II-2 -83 et II-2-91) and one sample from the Mount Sirius sequence (II-6-12) contain spores and bissacate pollen grains abundantly but very badly preserved. The exine is densely perforated (due to attacks by microorganisms?). These perforations obliterate the arnamentation and original structure of the exine, for instance of possible proximal striae. This leads to the impossibility of making any accurate determination.

A sample (II-2-83) contains a trilete spore of the *Lophotriletes* type.

Another sample (II-2-93) yields fragments of reticulate or perhaps multiseriate bordered pitting tracheids.

Others samples of the Coalsack Bluff sequence (II-2-3) and of the Mount Ropar sequence (IV-1-30) contain pollen grains of which the silhouette can be distinguished but which cannot be made clear.

The other samples do not contain any plant microfossils.

Desposited in april 1972

REFERENCES

CRIDLAND, A.A. (1963). A Glossopteris from the Ohio, Range Antarctica. *American Journal of Botany*, 50, (2), 186-195.

ELLIOT, D.H.; COLBERT, E.H., BREED, W.J., JENSEN, J.A. and POWELL, J.S. (1970). Triassic Tetrapods from Antarctica: Evidence for Continental Drift. *Science*, 169, (3951), 1197-1201.

LACEY, W.S. (1963) Palaeobotanical Techniques. *Viewpoints in Biology*, 2, 202-243. Butterworths, London.

LACEY, W.S. and HUARD-MOINE, D. (1966). Karroo Floras of Rhodesia and Malawi. Part 2. The Glossopteris Flora in the Wankie District of Southern Rhodesia. *Symposium on the Floristics and Stratigraphy of Gondwanaland*, 13-25.
Birbal Sahni Institute of Palaeobotany, Lucknow.

LAMBRECHT, L.L.J. (in Press). The Permian sediments of the Law Glacier-Antarctica. *Société belge de Géologie.*

PLUMSTEAD, E.P. (1958). Further fructifications of the *Glossopterideae* and a provisional classification based on them. *Trans. Geol. Soc. South Africa*, LXI, 51-76.

PLUMSTEAD, E.P. (1962). Fossil Floras of Antarctica. *Trans-Antarctica Expedition Scientific Reports*, 9, 1-154. London.

RIGBY, J.F. (1968). The Conservations of *Plumsteadia* Rigby 1963 over *Cistella* Plumstead 1958. *Bol. da Sociedade Brasileira de Geologia*, 17, (1), 93.

RIGBY, J.F. (1969). Permian Sphenopsids from Antarctica. *Contributions to Palaeontology*, 1968, *Geol. Surv. Prof. Paper* 613-F, 1-13. Washington.