

The taxonomic status of the genus *Rubidgea*

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ABSTRACT

The genus *Rubidgea* Tate of the fossil family Glossopteridaceae was reduced to a synonym of *Glossopteris* by Seward (1907). Seward's conclusion is now confirmed by a study of a wide range of imprints from a quarry near Hammanskraal, South Africa. The upper and lower surface imprints of a single leaf found on a split fragment of carbonaceous shale provides the main evidence presented. The finely striated upper surface imprint of the leaf could be identified with *Rubidgea*, whereas the lower surface imprint represents the typical strong venation of a *Glossopteris*. The type species of *Rubidgea* is transferred to *Glossopteris* as *G. mackayi* (Tate) Kovács comb. nov. The characteristics of upper and lower surface imprints of a number of *Glossopteris* species are discussed.

RESUME

STATUT TAXONOMIQUE DU GENRE RUBIDGEA

Le genre *Rubidgea* Tate de la famille fossile des Glossopteridaceae fut considéré par Seward (1907) comme un synonyme de *Glossopteris*. La conclusion de Seward se voit confirmée par l'étude d'un vaste éventail d'empreintes en provenance d'une carrière près d'Hammanskraal en Afrique du Sud. Les empreintes supérieure et inférieure d'une même feuille, trouvées sur un fragment de clivage d'un schiste carbonifère, fournissent le principal argument qui est présenté ici. L'empreinte finement striée de la face supérieure de la feuille pourrait être identifiée comme *Rubidgea*, tandis que l'empreinte de la face inférieure présente la forte nervation typique de *Glossopteris*. L'espèce-type de *Rubidgea* est transférée au genre *Glossopteris*, soit: *G. mackayi* (Tate) Kovács comb. nov. Les caractéristiques des empreintes supérieures et inférieures de plusieurs espèces de *Glossopteris* sont discutées.

INTRODUCTION

The family Glossopteridaceae appeared approximately in the Upper Carboniferous and disappeared more or less synchronously in the Lower Triassic. Though the species changed in time due to evolution and adaptation to changing climatic conditions, they are nevertheless generally recognizable as glossopterids. All evidence points to the family Glossopteridaceae of the Order Pteridospermales being a monophyletic and natural group of plants. As in most fossil groups, the classification presents considerable difficulties. Recently doubts have been expressed about the feasibility of a classification of the Glossopteridaceae based on leaf impressions when no cuticles or attached fructifications are available. In this and other papers, the author defends the point of view that taxa, at least at the specific level, may be distinguished by normal taxonomic methods, provided that sufficient good material, which is synchronous, is available and is studied in detail. The basic venation patterns of leaves are typical for all members of the group, but venation characters display definite and useful differences. The fact is that all fossil plants represent once living plants and this realization is necessary for real progress to be made. A knowledge of living extant plants should form an essential part of the equipment of the palaeobotanist.

In the investigation here reported the author has attempted to apply these views to the study of a rich deposit of glossopterid fossils. Special attention is given to the taxonomic status of the genus *Rubidgea* Tate. The material for this study was collected on the farm of Mr J J Brits, 30 km north of Pretoria near Hammanskraal. The carbonaceous shales, in which the leaf impressions are preserved, are of Ecca age. All the specimens studied are deposited in the offices of the Geological Survey, Pretoria, South Africa.

THE IDENTITY OF THE GENUS *RUBIDGEA*

The genus *Rubidgea* was described by Tate in Q. Jl Geol. Soc. Lond. in 1867. The description is as follows:

"*Rubidgea* Mackayi, gen. et spec. nov.

Frond oblong, obovate, rounded and obtuse at the apex; secondary veins very slender, very much crowded, dichotomous, oblique. There is no indication of anastomosis of

the veins. *Localities*. Bloemkop, near the Sunday's River, Graaff Reinet (Dr Rubidge); East London, at the mouth of the Buffalo River (Mr. McKay)."

In the preamble to this description Tate, however, says the following:

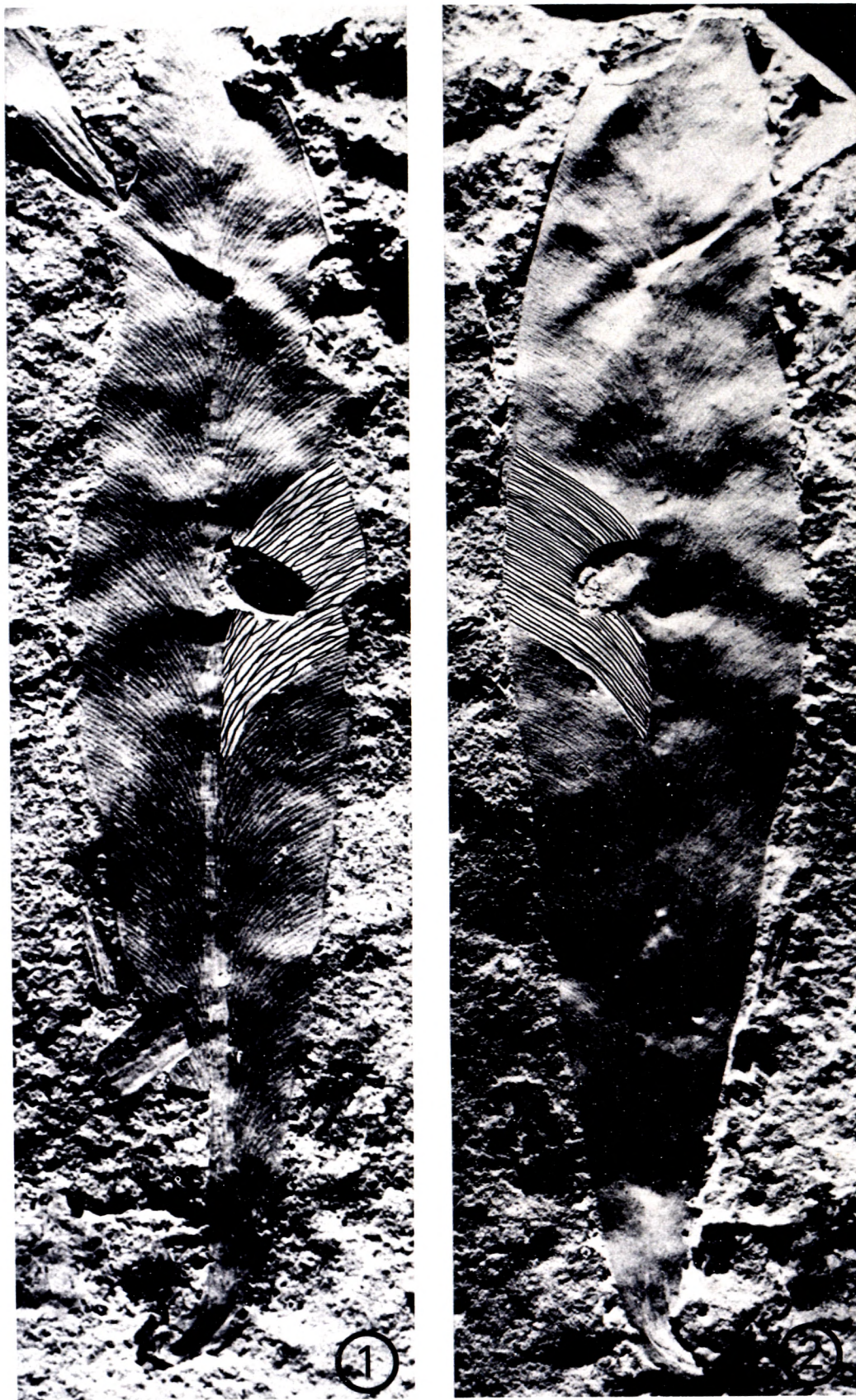
"With the above-mentioned specimens from Bloemkop are some of an apparently, at first sight, second species of *Glossopteris*; these do not exhibit fructification. Dr Rubidge however, has communicated a drawing (by Mr McKay) of a specimen of this species obtained by Mr McKay near East London: and I find that it presents characters generically distinct from those of *Glossopteris*; for the position of the fructification is indicated by a few large elevated rings, arising from many veins, and somewhat regularly arranged in a row coincident with the margin, and not by numerous spots, small in size, supported by one vein, distributed over much of the surface of the frond".

Whereas the description of the new genus and species is clearly based on the leaf, Tate's comments in the second paragraph quoted here, show that it is only because of the so-called fructifications that he considered creating a new genus. It so happens that the two specimens cited by Tate have, in spite of several searches, not been traced. A comparison of the specimens with the McKay drawing has thus not been possible. It seems clear that Seward (1907), who regards *Rubidgea* as a synonym of *Glossopteris*, also did not see Tate's syntypes. Since the specimens are missing, there seems to be no alternative but to accept the drawing by McKay published by Tate as Plate 5, Fig. 8, as the lectotype of *Rubidgea* Tate. It has already been pointed out by Seward (1907) that the so-called fructifications depicted by McKay, are artefacts and I agree with this view.

THE RELATIONSHIP BETWEEN *RUBIDGEA* AND *GLOSSOPTERIS*

When studying the fossil flora of the Hammanskraal quarry, many leaf impressions were found which show the characteristic venation described and figured by Tate for his genus *Rubidgea*. A venation, such as figured by Tate, is difficult to interpret morphologically. The very fine veins arise from the median line of the leaf, but are apparently not joined into a true midvein. A closer examination of these "*Rubidgea*" leaves from Hammanskraal shows that some of them exhibit areas of stronger venation with anastomoses typical of the genus *Glossopteris* (Fig. 3). It seems

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FIGS 1 & 2.—*Glossopteris* sp.* Counterpart “*Rubidgea*”. Catalogue Nos HI 103a & b. $\times 2$.

* The species of *Glossopteris* discussed and figured in this paper was recently described by me as *G. pseudocommunis* (1976). However, this name is a later homonym of *G. pseudocommunis* Pant & Gupta (1968) and consequently illegitimate. I therefore rename the species, *G. andreánszkyi* in honour of Professor G. Andreánszky, my mentor in palaeobotany at the University of Budapest.

Glossopteris andreánszkyi Kovács, nom. nov.

G. pseudocommunis Kovács in *Palaeontogr. Afr.* 19: 81 (1976) non *G. pseudocommunis* Pant & Gupta in *Palaeontogr.* 124B: 57 (1968).

fairly certain that in these leaves part of the upper surface has decayed or peeled off revealing the nervation of the lower surface. In other instances both kinds of "venation" are seen on the leaf as if superimposed. On these imprints dense and fine lines are visible between the typical *Glossopteris* veins (Fig. 4). Amongst the many slabs of slate split, one showed an almost entire leaf with clear upper and lower surface imprints. These imprints are dissimilar, one being typical of *Glossopteris*, the other of *Rubidgea* (Figs 1 and 2). It is obvious also that the impression of the lower surface, which shows *Glossopteris* characters, represents the imprint of the venation. The very slender lines of the *Rubidgea* imprint, which do not match the nervation of the lower surface, have to be interpreted as fine grooves found on the

upper surface of some *Glossopteris* species. The leaves of many extant species of plants would show featureless upper surface imprints, because their veins are not raised. There are many examples of these three states, viz. parts of *Glossopteris* leaves which show *Rubidgea* characters or *vice versa* and both kinds of "venation" next to one another on the same leaf.

These observations indicate that the genus *Rubidgea* and some species of *Glossopteris* were based on impressions of upper and lower surfaces of leaves respectively, *Rubidgea* representing impressions of the upper and *Glossopteris* of the lower surface. There is real proof, therefore, that the genus *Rubidgea* must be regarded as a synonym of *Glossopteris* as concluded, on rather slender evidence, by Seward.

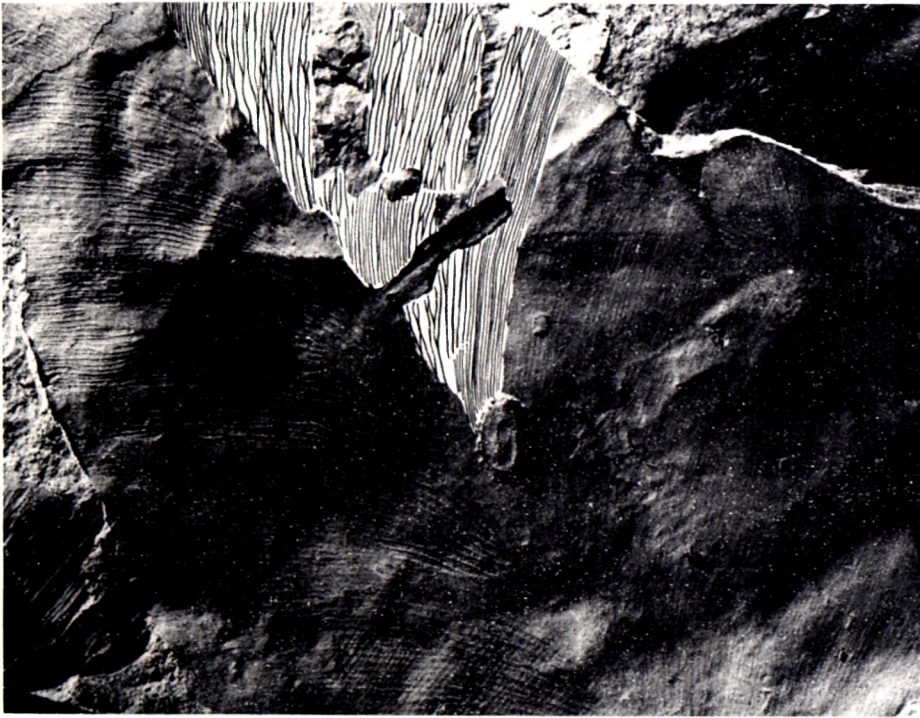


FIG. 3.—*Glossopteris* sp. "Rubidgea" surface with patches of *Glossopteris* venation. Catalogue No. HI 10a. $\times 1,3$



FIG. 4.—*Glossopteris* sp. With "fibres". Catalogue No. HI 165. $\times 3,4$.

The study of several glossopterid species of the Hammanskraal fossil flora showed that in all species investigated, except for *G. indica*, the upper and lower surfaces differed in a characteristic and specific manner. In *G. indica* both surfaces were more or less similar. Of the species examined, all leaves with "*Rubidgea*" features proved to belong to the same species (Kovács, 1976). It is possible, however, that other species may also exhibit a "*Rubidgea*" type of upper surface.

As I mentioned before, in some instances the imprint of what appears to be both upper and lower surfaces, can be seen on the same leaf impression (Fig. 4). In such cases there are thinner lines between the strong, anastomosing veins. This feature merits further discussion. Pant (1958) described two new species, namely *Glossopteris fibrosa* and *G. hispida*, based mainly on cuticular examinations. He mentions that *G. fibrosa*: "looks much like many of the figures given by various authors under the names *G. browniana* var. *indica* (*G. indica*), *G. angustifolia*, *G. browniana* var. *australasica*, (*G. browniana*) and *G. communis* . . . All are clearly different because they lack fibres in vein meshes".

On the evidence of the leaves from Hammanskraal, I interpret such fibres as being the markings of the upper (or "*Rubidgea*") surface showing through on the lower surface. This interpretation is to some extent confirmed by Pant (1958). He mentions that *G. fibrosa* and *G. hispida*, which both show the so-called fibres in the vein meshes, have rather thin laminae. Prior to these studies, differences between upper and lower surfaces of a *Glossopteris* leaf were already reported for *G. browniana* by Dana (1849, p. 717).

In the light of the foregoing, it is of some interest to establish how it has come about that the upper and lower surface leaf impressions were described as separate genera and why, one hundred years later these genera were still being recognized and expanded.

The description and identity of *Rubidgea* have already been discussed. It is clear, as stated before, that Tate believing these plants to be ferns, separated the new genus from *Glossopteris* mainly because of the presence of so-called "fructifications". In his diagnosis of the species he does not comment on the presence of a midrib, but implies this by stating: "secondary" veins very slender, very much crowded. The "secondary" veins arise from the midline of the blade and not from the base, which logically indicates a mid-vein or a structure resembling a midvein.

Feistmantel's (1881, p. 91) statement when comparing *Palaeovittaria* with *Rubidgea*, viz. "this latter (i.e. *Rubidgea*) showing no indication of a midrib in the lower part", is therefore incorrect. On the drawing by McKay, published by Tate, the lower part of the leaf is missing but, as already indicated, shows the situation where the "secondary" veins arise from the median part of the leaf. In spite of this, *Rubidgea* is still usually characterized by the absence of a midrib as was done recently by Maheshwari (1965, p. 37).

Maithy (1965) accepted *Rubidgea* as a generic entity, but amended it to accommodate several species found in the Karharbari Beds of the Ciridih Coalfield in India. Maithy (p. 42) also starts the description of the venation with the statement "devoid of a midrib". The characterization of taxa such as *Gangamopteris* and *Rubidgea* by the "absence of a midrib", and the failure of authors to refer back to the type specimens, contributed to the confusion which arose. The morphological terms applied to extant plants are not always appropriate to extinct

groups: "midrib" does not mean the same in *Glossopteridaceae* as it does, for example, in *Angiosperms*. *Glossopteris* leaves have a bundle of veins down the middle, but no clear single midrib. When Maithy writes of "numerous veins arising from the median longitudinal position of the frond, occasionally simulating a false midrib", he accurately describes Tate's drawing. Later in his paper, Maithy refers to median veins, however, and omits the important character mentioned in Tate's description, that the secondary veins are very slender and closely crowded together. Ignoring this character, he described two new species, *Rubidgea obovata* and *R. lanceolatus*, both of which have rather strong veins. On the photographs of the leaf impressions of the two species, three of the four leaves have parallel veins fanning out from the narrowed base, yet Maithy himself characterizes *Rubidgea* by "veins arising from the median longitudinal position".

At the end of his paper, Maithy indicates that the leaf of *Lanceolatus palaeovittarius* Plumstead "appears to be a *Rubidgea* because no midrib is evident, and the median region of the leaf seems to be occupied by the subparallel veins". In Feistmantel's time the more crowded subparallel median veins of glossopterid leaves were described as a midrib, and it is possible that this condition is found in *Palaeovittaria* Feistm. (1876, p. 368).

In Plumstead's figure (1958, Pl. 16, Fig. 1) the strong, rigid, straight veins clearly do not resemble those of *Rubidgea* as defined by Tate. The leaf of *Lanceolatus palaeovittarius*, however, resembles *Rubidgea lanceolatus*, a fact also mentioned by Maithy. Furthermore it is likely that *Rubidgea lanceolatus* Maithy (Pl. 1, Fig. 5) represents the same species as *Palaeovittaria kurzii* Fstm.

Maithy also mentions *Gangamopteris obovata* Carruthers as a possible *Rubidgea*, because "secondary veins emerge from median veins". Carruthers's figure (1869) depicts a whole leaf and the equally strong subparallel veins radiate from the base. Dr C. R. Hill of the British Museum of Natural History checked the holotype (v.229, Geol. Surv., British Museum Nat. Hist.) at my request. He found the drawing remarkably accurate, except in showing the anastomoses between the veins.

The confusion that exists in the taxonomy of *Glossopteris* and related genera can be attributed to poor descriptions and circumscription of new taxa; to the difficulties inherent in the interpretation of what represents a "midrib" of the leaf of the *Glossopteridaceae*; and to the fact that the differences in the upper and lower surfaces of glossopterid leaves are usually ignored.

If progress is to be made with the taxonomy of the *Glossopteridaceae*, these pitfalls will in future have to be avoided.

A NEW COMBINATION IN *GLOSSOPTERIS*

In order to comply with the Rules of Botanical Nomenclature the formal transfer of the type species of *Rubidgea* to *Glossopteris* is hereby made.

Glossopteris mackayi (Tate) Kovács comb. nov.
Basionym: *Rubidgea mackayi* Tate in Q. Jl Geol. Soc. Lond. 23: 141 (1867).

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UITTREKSEL

Die genus Rubidgea Tate van die fossiele familie Glossopteridaceae is in 1907 gereduseer tot 'n sinoniem van Glossopteris deur Seward. Seward se opinie word bevestig deur die bestudering van 'n wye reeks van blaarafdrucke afkomstig van 'n steengroef naby Hammanskraal, Suid-Afrika. Die beste bewys hieroor is vervat in die afdrucke van die onderste en boonste blaaroppervlak van 'n enkele blaar op 'n gesplete fragment van skalie. Die fyngestreepte afdruk van die boonste blaaroppervlak kan met Rubidgea geïdentifiseer word, terwyl die afdruk van die onderste oppervlak die tipiese sterk be-aring van 'n Glossopteris verteenwoordig. Die tipe-soort van Rubidgea word oorgeplaas na Glossopteris as G. mackayi (Tate) Kovács comb. nov. Die kenmerke van die boonste en onderste afdrucke van die blaaroppervlakte van 'n aantal Glossopteris-soorte word bespreek.

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