STUDIES ON THE UPPER GONDWANA OF KUTCH — 3. *OTOZAMITES IMBRICATUS* FEISTMANTEL

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ABSTRACT

The present paper describes the cuticular structure of *Otozamites imbricatus* Feistmantel. The cuticle resembles most the cuticle of *O. venosus* Harris (1949) and *O. raciborskii* Reymanówa (1963).

INTRODUCTION

SEVERAL fragmentary specimens of *Otozamites imbricatus* were collected from Loharia (Kutch) by Wynne (1872). Out of these only one specimen was figured by Feistmantel (1876). He described only the external character of the fossil and did not give any detail of the cuticular structure.

The present observations on the cuticular feature of *O. imbricatus* Feistm. is based on a fragmentary carbonized specimen collected by me from Trambau in 1960. In the external feature my specimen is indistinguishable from the one described earlier by Feistmantel (*l.c.*). As all the specimens from Loharia are preserved in the form of impressions, no cuticular preparation could be made out of those specimens.

DESCRIPTION

Otozamites imbricatus (Feistmantel) emended

Pl. 1, Figs. 1-5; Text-figs. A-C

1876 — *Otozamites imbricatus* Feistm., Feistmantel, *Palaeont. ind.* **2** (1), p. 48.

1920 — *Ptilophyllum acutifolium* Morris, Seward & Sahni, *Palaeont. ind.* **8** (1), p. 21.

1963 — *Otozamites bellus* Roy, Roy, *Abst. 50th. ind. Sci. Congr.*, p. 397.

Emended Diagnosis — Frond pinnate, exceeding 8·5 cm in length. Rachis thick. Pinnae alternate, closely set, imbricate, falcate, approximate at the base, attached at an angle of 80° by a small portion near the middle of pinna base. Pinnae base asymmetrical, auriculate, auricle developed near the upper basal angle, lower basal margin of the pinna above partly covers the auricle of the pinna below. Veins diverging from the point of attachment, 6-8 in number, dichotomizing at all levels. Apex not well preserved, seems to be somewhat rounded or falciform.

Upper cuticle differentiated into rectangular cells along the veins, mostly 2 (or 3) cells wide, cells in between quadrangular, irregularly packed, sometimes tend to be serially arranged. Lateral- and end-walls sinuous, loops prominent. Surface-wall smooth.

Lower cuticle differentiated into wide stomatiferous and narrow non-stomatiferous zones. Cells along the vein longer than the upper surface, 2-4 cells wide, arranged mostly in three, sometimes in four vertical rows near bifurcations. Lateral- and end-walls sinuous. Surface-wall with a feebly developed papilla near the centre. Ordinary epidermal cells within the stomatal bands like the cells of the upper cuticle, but surface-wall of most of the cells with small circular thickening near the centre. Stomatal bands with 2-4 rows of stomata, mostly 3, stomata irregularly scattered, closely spaced, mostly transversely orientated, some oblique. Subsidiary cells slightly thicker than the ordinary epidermal cells, devoid of papilla. Guard-cells well cutinized, slightly sunken but not placed in pits, aperture slit-like or oval.

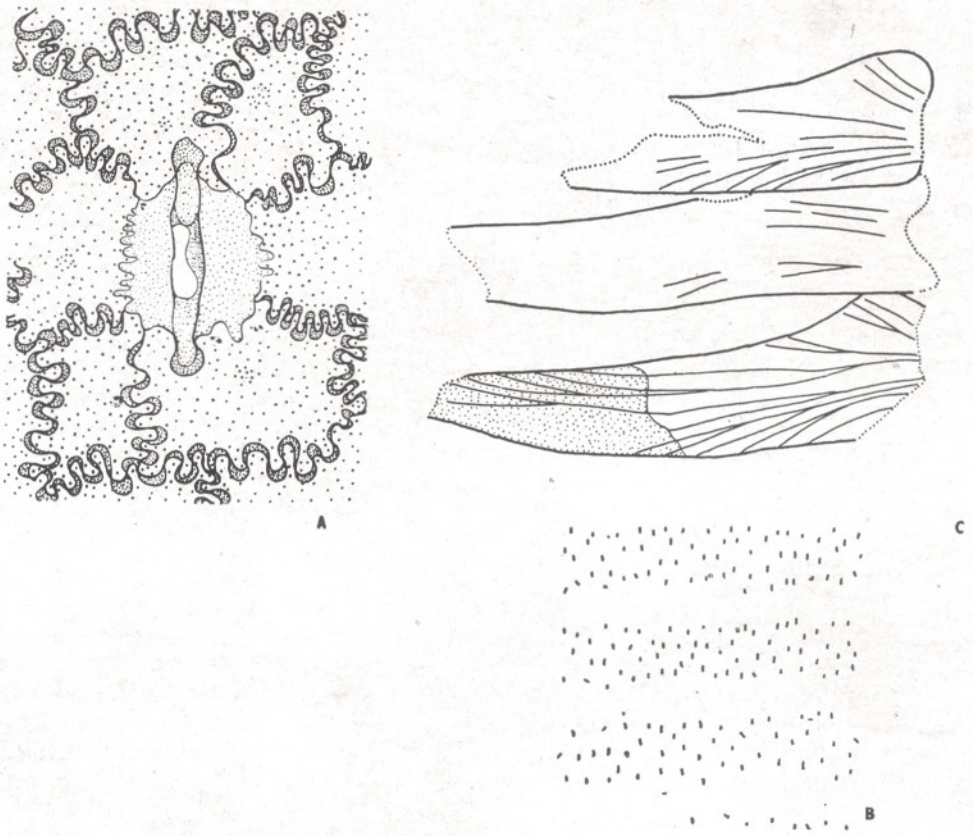
Locality — Loharia and Trambau, Kutch.

Horizon — Umia Stage, Jabalpur Series.

Collection — Lectotype no. 4/812 of the Geological Survey of India and Cotype no. 31926 of the Birbal Sahni Institute of Palaeobotany, Lucknow.

COMPARISON AND DISCUSSION

Among the other known species of *Otozamites* from the Upper Gondwanas of India, *O. bengalensis* (Oldh. & Morr.) Feistm. and *O. parallelus* Feistm. are comparable



A, one stoma enlarged No. 31926-1. × 500. B, distribution of stomata in 1 sq. mm. × 40. C, pinnae showing venation. × 5.

in their external features with the specimen described here. Like *O. bengalensis*, in the present case also the upper basal angle of the pinnae are auriculate and the apex is obtuse. But *O. bengalensis* has short, rhomboidal pinnae in contrast to falcate pinnae of *O. imbricatus*. The falcate pinnae *O. imbricatus* is comparable to *O. parallelus*, but the former species does not have a cordate base like the latter. Moreover, *O. parallelus* has 12-14 veins per pinnae as opposed to 6-8 veins in *O. imbricatus*.

Many species of *Otozamites* are known by their cuticular structure from Scoresby Sound, Greenland, Mesozoic rocks of Yorkshire, Ireland and Poland. In pinnae shape and general form *O. imbricatus* is similar to *O. graphicus* Harris (1949) but is markedly different in its cuticular structure. In *O. imbricatus* the stomata are not sunken inside an oval-pit having stellate opening as is found in *O. graphicus*. In this character the cuticle of *O. imbricatus* is quite distinct from most of the typical species of *Otozamites* and thus essentially similar to *O. venosus* Harris (1949) from the Jurassic of Yorkshire, *O. bechei* (Brongn.) Harris (1961) from the Rheatic of Ireland and *O. raciborskii* Reymanówna (1963) recorded from the Jurassic of Poland. Like *O. venosus* the upper cuticle of *O. imbricatus* has no hair or papilla, the course of veins are well marked and the lower cuticle has wide stomatiferous bands alternating with narrow, non-stomatiferous strips. Moreover, in both *O. venosus* and *O. imbricatus* a feebly developed papilla is seen near the centre in most of the cells of the lower cuticle. In external features also *O. imbricatus* and *O. venosus* resemble in many ways. Both the species have falcate pinnae whose upper basal angle is

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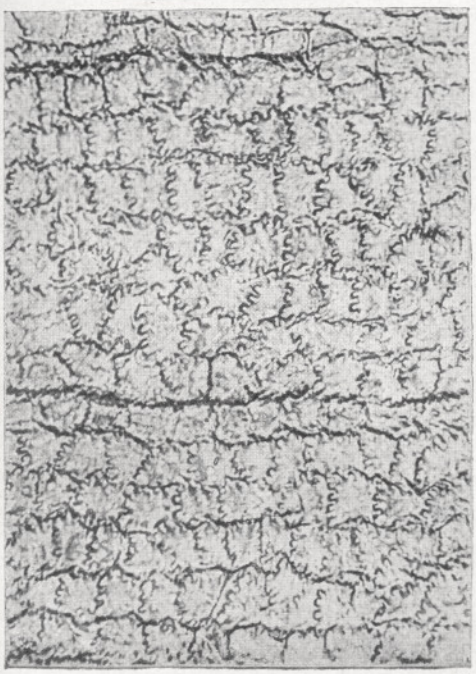

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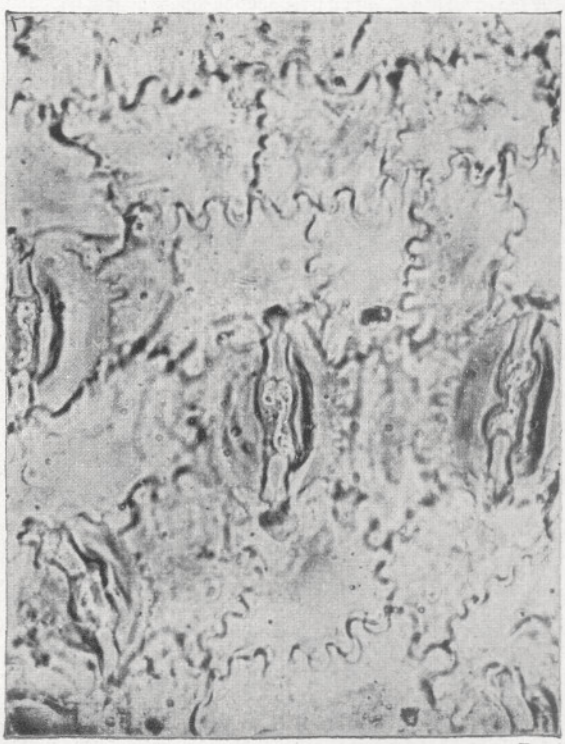

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auriculate and they are attached by a small portion near the middle of the pinna base. But *O. imbricatus* differs from *O. venosus* in its external features and in some respects in the cuticular structure. Whereas in *O. venosus* each pinna has exceedingly fine crowded veins, in *O. imbricatus* they are only 6-8 in number. The latter species differs from the former in possessing broader stomatal bands as well. *O. imbricatus* resembles *O. bechei* in possessing papilla in the centre of each cell on the lower cuticle in the non-stomatiferous strips. But *O. imbricatus* does not possess a papillae in the subsidiary cells as is seen in *O. bechei*. *O. raciborskii* resembles *O. imbricatus* in many characters. In both these species the lower cuticle has stomatiferous and non-stomatiferous bands, stomata within each band often forming longitudinal irregular rows and the outer wall of the subsidiary cells sinuous. But *O. raciborskii* always has a papilla on the inner wall of the subsidiary cells overhanging the pit, a character which is absent in *O. imbricatus*. Therefore in the absence of the typical stomatal pit of *Otozamites*-type, the cuticle of *O. imbricatus*, *O. venosus*, *O. bechei* and *O. raciborskii* are more like *Ptilophyllum*.

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EXPLANATION OF PLATE 1

Otozamites imbricatus Feistm.

1. *Otozamites imbricatus* Feistm. No. 31926. × 1.
2. The above specimen magnified showing venation. × 5.
3. Upper cuticle. Sl. No. 31926-1. × 150.
4. Lower cuticle, showing two stomatal bands and a nonstomatiferous strip. Sl. No. 31926-1. × 150.
5. Stomata and adjacent cells. Sl. No. 31926-1. × 500.