

LEPIDOPTERIS INDICA SP. NOV. FROM THE LOWER TRIASSIC OF NIDPUR, MADHYA PRADESH

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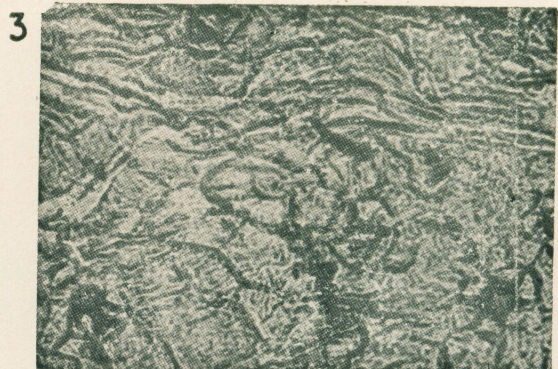
ABSTRACT—*Lepidopteris indica* sp. nov. is based on a carbonized specimen collected from Nidpur, Sidhi District, Madhya Pradesh, India. Its cuticle on one side is slightly thinner than the other. It is amphistomatic but has fewer stomata on the thinner side. Subsidiary cells on both the surfaces are 5-7 in number and bear a prominent cutinized lappet.

The occurrence of *Lepidopteris* is known both in the northern and southern hemispheres. So far only five species have been described. Out of these, *L. martinsii* (Kürtz) Townrow (1960), *L. stuttgardiensis* (Jaeger) Schimper (1869) and *L. ottonis* (Göeppert) Schimper are known from the northern hemisphere and *L. stormbergensis* (Seward) Townrow (1956) and *L. medagascariensis* (Carpentier) Townrow (1966) from the southern hemisphere. Their distribution, geological horizon and age has already been given by Townrow (1960 and 1966). In the southern hemisphere this genus was, so far, known only from Australia, South Africa, Madagascar and Argentina. Recently, from Nidpur (24°7' : 81°54'), Sidhi District, Madhya Pradesh (for details of the locality see Satsangi, 1964 and Bharadwaj and Srivastava, 1969) a detached pinna having the same cuticular structure as *Lepidopteris* has been discovered from amongst a large number of specimens of *Dicroidium*.

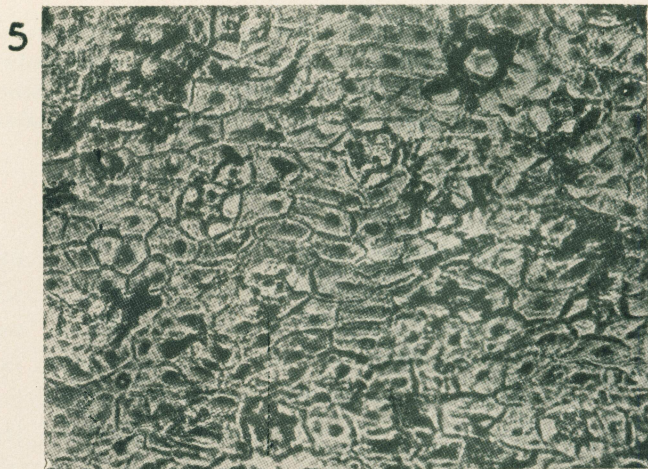
Frenquelli's (1943) generic diagnosis of *Lepidopteris* was further emended by Townrow (1956) on the basis of both external as well as cuticular characters. According to Townrow's (1966) diagnosis the important characters of *Lepidopteris* are as follows :

1. Lumps upon the rachis
2. Occurrence of *zwischenfidern*
3. Radially symmetrical arrangement of the stomatal pit, associated with the occurrence of lappets or papillae overhanging stomatal pit.

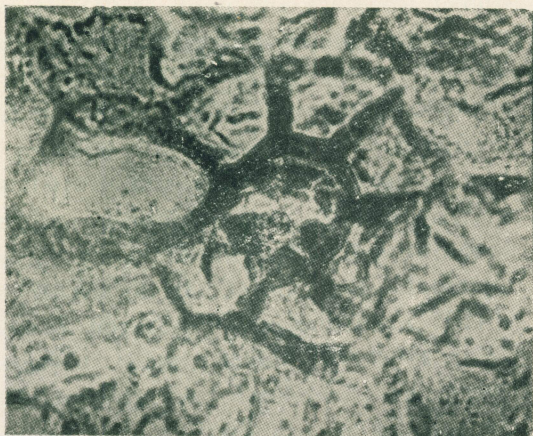
Out of the above three characters, the specimen from Nidpur possesses only the last character. As it is a detached pinna so it is not possible to know whether the complete frond had *zwischenfidern*. The Nidpur specimen does not show the lumps upon the rachis. This character of lumps upon the rachis is rather variable in the genus *Lepido-*



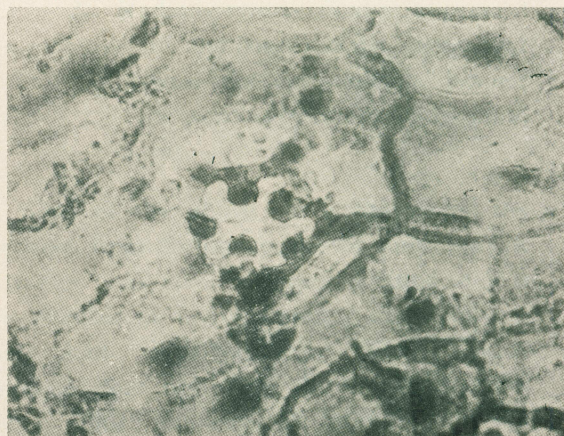
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pteris. Because they may be present all over the main rachis as well as on the pinnae rachis or they may be confined only to the rachis base. In one species i.e. *L. stormbergensis* there are forms which have smooth or nearly smooth rachis or forms with lumps upon the rachis. The present specimen from Nidpur may be a form with smooth rachis or may be it had lumps on the base of the rachis (this point can not be ascertained because the basal portion of the pinna rachis is missing).

Lepidopteris indica sp. nov.

Pl. 1, Figs. 1-7; Text.-figs. 1 A-F

Pinna (for description assumed to be bipinnate) measuring 4.3 cm in length and 1.9 cm in breadth. Rachis about 1 mm wide, more or less smooth. Pinnules sub-opposite, closely set, almost touching each other, arising at an angle of about 40-43°. Pinnules oval or broadly lanceolate, measuring 1.1 cm in length and 0.4-0.6 cm in breadth; apex rounded or obtuse, base decurrent; margin entire, rarely at places slightly wavy. Venation obscure.

Cuticle about 2.5 μ thick, one surface slightly thinner than the other, amphistomatic. Thinner surface with less stomata, not showing clear distinction between stomatal and non-stomatal regions. Cell walls usually not complete, cells mostly polygonal, sometimes rectangular, narrow and elongated, irregularly packed; when rectangular in shape cells mostly serially arranged; lateral and

endwalls usually straight, sometimes slightly wavy at places, unevenly thickened; surface-wall mostly unspecialized, sometimes mottled. Stomata sparse, irregularly distributed, longitudinally or obliquely orientated, dicyclic or incompletely dicyclic. Subsidiary cells mostly 5 or 6, rarely 7, forming somewhat circular or polygonal area bearing a cutinized lappet or papillae overhanging stomatal pit. Stomatal pit broadly oval or isodiametric, margin highly cutinized. Guard cells mostly sunken, thinly cutinized. Aperture slit-like. Encircling cells polygonal, varied, unspecialized.

Cells on thicker surface polygonal; lateral- and end-walls thick, straight, surface-wall papillate. Papillae solid, circular or oval in shape. Stomata on thicker surface much numerous than thinner surface. Stomata irregularly distributed all over the surface, sometimes avoiding vein region, closely placed but never sharing a common subsidiary cell. Stomatal apparatus broadly oval or circular, longitudinally or obliquely placed. Subsidiary cells 5-7 in number, mostly 6, each subsidiary cell with deltoid papillae or lappet. Stomatal pit and guard cells like thinner surface. Encircling cells usually present, polygonal with circular papillae.

Holotype. 33925.

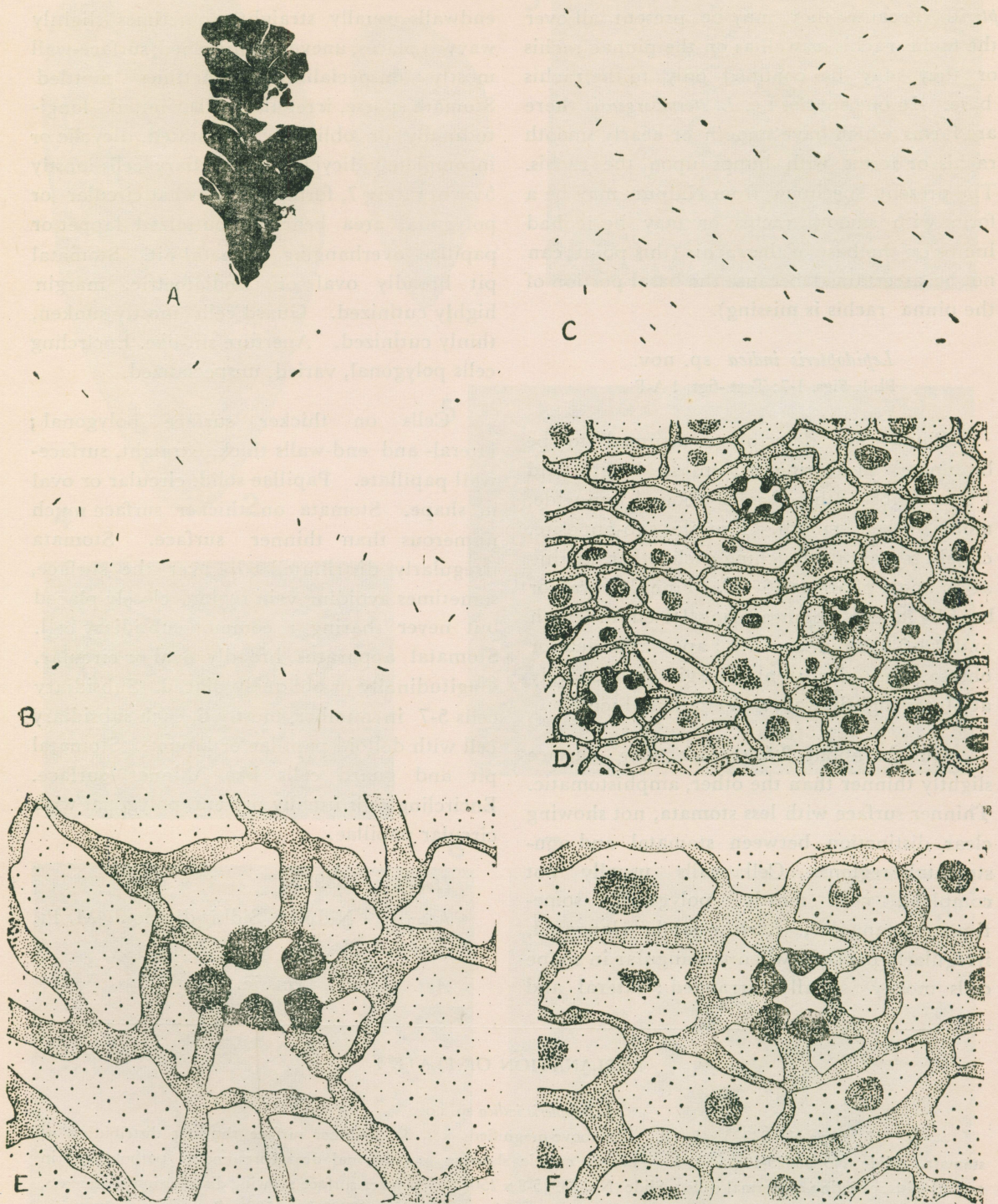
Locality. Nidpur, Sidhi district, M. P., India.

Age. Lower Triassic.

EXPLANATION OF PLATE 1

Lepidopteris indica sp. nov.

1. Holotype No. 33925.x 1, 2. The above magnified. x 2. 3. Thinner surface showing distribution of stomata. Slide No. 33925-1. x 150. 4. Thinner cuticle showing a polygonal area (presumably pathological in origin) with radiating epidermal cells. Slide No. 33925-3 x 250. 5. Thicker surface showing distribution of stomata. Slide no. 33925-2 x 150. 6. A stoma from the thinner side. Slide No. 33925-1 x 500. 7. A stoma from the thicker side. Slide No. 33925-2 x 500.



Text Fig. 1—*Lepidopteris indica* sp. nov. *A.* holotype No. 33925, x 1. *B.* thinner surface showing distribution of stomata (slide No. 23925-1), x 40. *C.* thicker surface showing stomatal distribution (slide No. 33925-2), x 40. *D.* thicker surface showing a few stomata and papillate epidermal cells (slide No. 33925-2), x 250. *E.* a stoma from the thinner surface (slide No. 33925-1), x 500. *F.* a stoma from the thicker (slide No. 33925-2), x 500.

Remarks. The macerated cuticle pieces obtained were rather small, and in them it was found that one side was slightly thinner than the other.

The cell walls on the thinner side are not well marked. This surface is also not clearly differentiated into stomatal and non-stomatal regions. The cells near the stomata are mostly polygonal and these are mostly irregularly packed. At places sometimes narrow, elongated rectangular cells are also met with, these are usually serially arranged. Perhaps they indicate the cells along the veins. Along with these polygonal and rectangular cells, at places a few large polygonal cells are met with. A few narrow and elongated cells are seen radiating around each of these polygonal cells (Pl. 1, fig. 4). These were perhaps formed during preservation or they may have been formed due to some pathogenic conditions. Pinnules with such pathogenic features are also met with in *L. stormbergensis*, *L. ottonis* and *L. martinsii*.

The thicker side is much better preserved than the thinner side. Cells here are all well marked and each have a circular or oval papillae. Most of the cells are polygonal, but at places a few elongated polygonal cells are found serially arranged. These cells perhaps represent the cells along the veins.

Comparison. *Lepidopteris indica* differs from all the so far described species of *Lepidopteris* in having smooth rachis. However, in this character it resembles some of the specimens of *L. stormbergensis* (Seward) Townrow (1956), because according to Townrow (1956 and 1960) leaves of *L. stormbergensis* have both smooth or nearly smooth rachae as well as leaves with blistered rachae. *L. indica* can readily be distinguished from

such specimens (with smooth rachis) and as well as other specimens of *L. stormbergensis* by the shape of the pinnules alone. In the former species the margin of the pinnules are entire, whereas, in the latter species margins are dentate. As for the cuticle, in *L. stormbergensis*, stomata are equal in number on both the surfaces but in *L. indica* on one surface stomata are fewer than the other. The subsidiary cells in the former species are 3-7 in number, whereas, in the latter species they are 5-7 in number. Besides these differences in the cuticular characters, in *L. stormbergensis* the cells on both the surfaces are papillate and also they have a few trichome bases, but in *L. indica* papillate cells are found only on one surface.

L. madagascariensis (Carpentier) Townrow (1966) has somewhat similar type of pinnules as *L. indica*. In both, margins of pinnules are mostly entire. But the latter species like the former do not have lumps on the rachis. Also in *L. madagascariensis* the cell walls are sometimes slightly sinuous and the cell surface is flat or showing low solid papillae. In the present specimen cell wall is not sinuous, also only one surface is papillate. In *L. madagascariensis* stomata are equal in number on both the surfaces, whereas, in *L. indica* stomata are more on one surface.

The pinnules of *L. martinsii* (Kurtz) Townrow (1960) resemble the pinnules of *L. indica* in general shape but the former are smaller in size. *L. martinsii* differs from the latter species in having blisters on the rachis. In *L. martinsii* the cell wall is smooth or papillate. *L. ottonis*, as described by Antevs (1914), Johansson (1922), Sze (1933), Harris (1926, 1932 and 1937) and Lundblad (1949), differs from *L. indica* in having smaller pinnules with entire or dentate margin and

pointed apex. In *L. indica* margin is not dentate and apex is obtuse. Like *L. indica* the thicker surface of *L. ottonis* also bears more stomata than the thinner surface. But *L. ottonis* is quite distinct from *L. indica* in having papillate cells on both the surfaces. Also in the former species stomata are usually confined between veins. *L. stuttgartiensis* (Jaeger) Schimper (1869) is based on external features only, it is quite distinct from *L. indica* in having shorter pinnules and lumpy rachis. In *L. indica*, pinna rachis is smooth.

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