

cases¹¹, of which 13 were correlated paralysis in the injected limb and of these, 6 were in the arm, a rare site of paralysis in India. Examination of the case histories of hundreds of children with polio at Children's Hospital, New Delhi showed that no more than 2% involved provocation following DPT¹². At JIPMER, Pondicherry, four of the 262 cases were provoked by DPT and another three had received DPT injections less than 48 h before paralysis—aggravation rather than provocation¹⁰. In Bombay, a survey showed that eight cases of 82 with residual paralysis had developed polio after their first DPT dose¹³. The most recent outbreak occurred in an orphanage in Delhi in 1992 when of 37 children 'inadvertently administered DPT', five were paralysed^{14,15}.

Discussion

When polio is endemic as it was in India and still is in many parts of Africa, DPT injections carry the risk of resulting polio, a risk acceptable if thousands of children are protected against diphtheria, whooping cough and tetanus. However, if DPT injections caused 1 to 2% of the polio cases in India (see above), then 20 to 40 thousand children were affected in the ten years from 1980. This might be acceptable for the greater good, but was a disaster for the families.

WHO policy that children with fever should be given DPT because otherwise

they might be liable to life-threatening infections, has resulted in cases of aggravation polio. When circumstances change so that diphtheria, whooping cough and tetanus are no longer as threatening, policy should be reconsidered. Textbooks from western countries with different practices and circumstances must be used with caution.

Health authorities are reluctant to admit that immunizations carry any risk and may even delude themselves that such risks do not exist or that faulty injection practices, not the vaccine, are the cause. Nevertheless, it is difficult to understand how papers published in Indian journals have been so completely forgotten. We must face unpleasant facts and report them honestly in the literature, not only because this is right and ethical, but also to prevent future misfortunes. I was informed by an anonymous referee that public health officials knew of a few cases of polio resulting from DPT injections, but keep silent rather than cast doubts on the safety of the vaccine⁵. Their silence condemned many children to paralysis when mass campaigns with DPT began in 1949 (ref. 5).

As Richard Feynman reported on the Challenger Space Shuttle disaster, '... reality must take precedence over public relations, for Nature cannot be fooled'.

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SCIENTIFIC CORRESPONDENCE

First occurrence of *Isoetites serratifolius* Bose & Roy from the Deccan intertrappean beds of Kutch, Gujarat

The Deccan intertrappean/infratrappean beds of Kutch represent the westernmost exposures in Peninsular India. The main localities are Anjar, Dayapar, Kora and Lakhmipar. Of these, at Anjar, several intertrappean beds are exposed. The third intertrappean bed is rich in dinosaurian remains and an iridium anomaly has been recorded. In other localities only one intertrappean/infratrappean bed is observed.

Some of these beds were noticed by Wynne¹ as early as 1872. The geology

and palaeontology of these beds were worked out by various geologists and palaeontologists from time to time^{2–10}.

For the present investigation, intertrappean beds at Anjar, Dayapar and Kora were studied. Anjar did not yield any plant megafossils whereas the exposures at Dayapar and Kora are rich in fragmentary leaf impression of *Isoetites*. No other plant megafossils could be recovered from these beds. Maceration for palynological fossils also turned barren.

At Dayapar, a couple of exposures of

infratrappean beds are observed on the eastern side of the Bhuj–Lakhpat metalled road between Dolatpar and Dayapar (Figure 1). The sedimentary rocks are capped by more than 1 m of basalt but no basaltic bed could be traced at the base. The lowermost bed consists of roughly 3 m grey to slightly brown variegated shale. It is overlain by one fourth metre of brown, gritty sandstone. Between this sandstone and the topmost basalt, one metre greyish marl and limestone is sandwiched. This bed is particularly rich in

Physa, ostracodes, fishes, dinosaur remains and egg shells. *Isoetites* fragments were observed in plenty from the lowermost grey to brown variegated shale¹¹.

Around the deserted village of Kora, in between Dayapar and Kora, a few intertrappean beds were noticed. In most of the sections, the lower and upper basaltic beds were observed. They generally exhibit approximately 2 m thick white ash-bearing mudstone just at the top of the lower basalt. This mudstone is overlain by half a metre of green shale

followed by 0.7 m of yellowish white mudstone with limestone lenses. This is overlain by 0.6 m of grey bentonitic mudstone. Between this bed and the topmost basalt there is a brownish yellow splintery shale with numerous remains of *Isoetites*. These fossils were also recovered from the lower white ash-bearing mudstone and to a certain extent from the green shale.

Genus – *Isoetites* Munster, 1842

Isoetites serratifolius Bose & Roy, 1964 Figure 3 a–e

1964 *Isoetites serratifolius*, Bose & Roy¹²; p. 226, pl. 1, figs 1–5.

1966 *Isoetites serratifolius* Bose & Roy; Surange¹³, pl. 19, figs 9D–F.

1974 *Isoetites serratifolius* Bose & Roy; Sukh-Dev¹⁴, p. 73.

1984 *Isoetites serratifolius* Bose & Roy; Bose & Banerji¹⁵, p. 4, pl. 1, figs 3–8, Text figs 2C–J & # A–C.

Detached leaf fragments preserved as impression, incomplete, largest available fragment is 5 cm in length. Lamina width varies from 4 mm to 9 mm, midvein distinct, 0.2 mm–2 mm wide. Margin serrated, at places fine serrations are not well preserved and margin seems to be entire, serrations vary in size and shape, curved upward, 0.1 mm–0.5 mm long.

Isoetites serratifolius is so far known only from the different localities of Bhuj Formation (Early Cretaceous). The occurrence of this species has been recorded

from Khari and Chawad River sections, Ugardi, Lakhpar, Shiyot, Artara, Katesar, Ghuneri and Dharsi in Kutch District, Gujarat¹⁵. The present record is the first occurrence of this species from the Deccan intertrappean beds of Dayapar and Kora also from the same district.

The fragmentary nature of the specimens, absence of sporophylls and spores are limitations for further investigation. It is hoped that with better and more complete specimens further information could be accumulated and a proper assessment of the specimens would be possible in the near future. The illustrated specimens clearly show the existence of wide variations in the nature of serrations (Figure 3 a–f) of margins of different leaf fragments. The variations of serrated sporophyll margins, i.e. finely serrated margin and sparsely serrated margin may either represent the two different species or the sporophylls at different stages of maturations are yet to be confirmed.

The extant *Isoetes* grows in a variety of habitats where the soil is saturated with water for at least some period of the year¹⁶. It generally grows in lakes, ponds and rivers or in temporary pools. The study of Indian species of *Isoetes* revealed that of the six Indian species, *I. coromandelina* is the most widely distributed species and grows in damp places, river banks, marshy lands and swamps¹⁷. *Isoetes sahyadrii* has been found to grow in the mountain lakes and ponds above

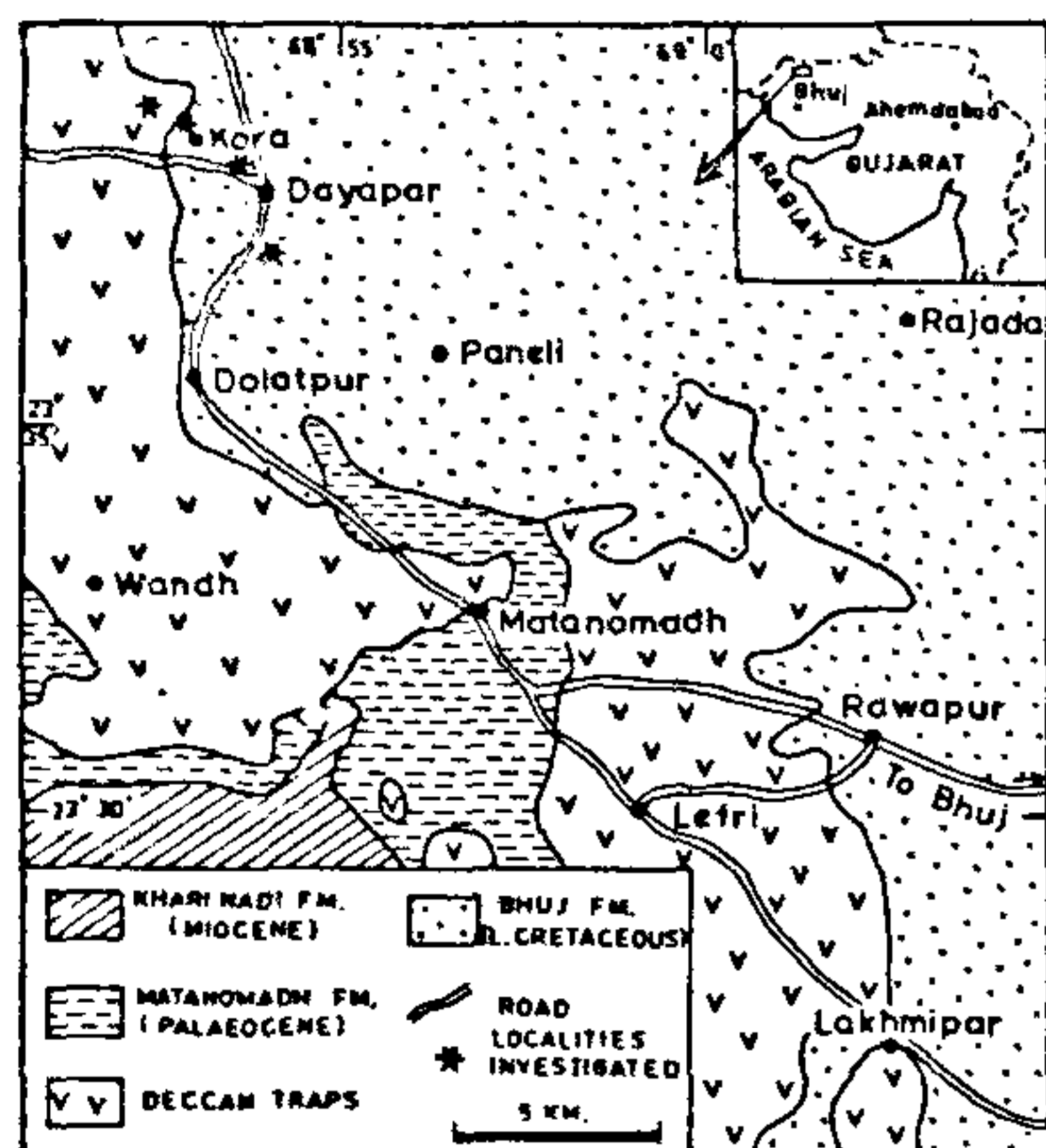


Figure 1. Map showing the locations of different intertrappeans in western Kutch (in part) around Dayapar, Kora and Lakhmipar (after Khanna and Mohan²).

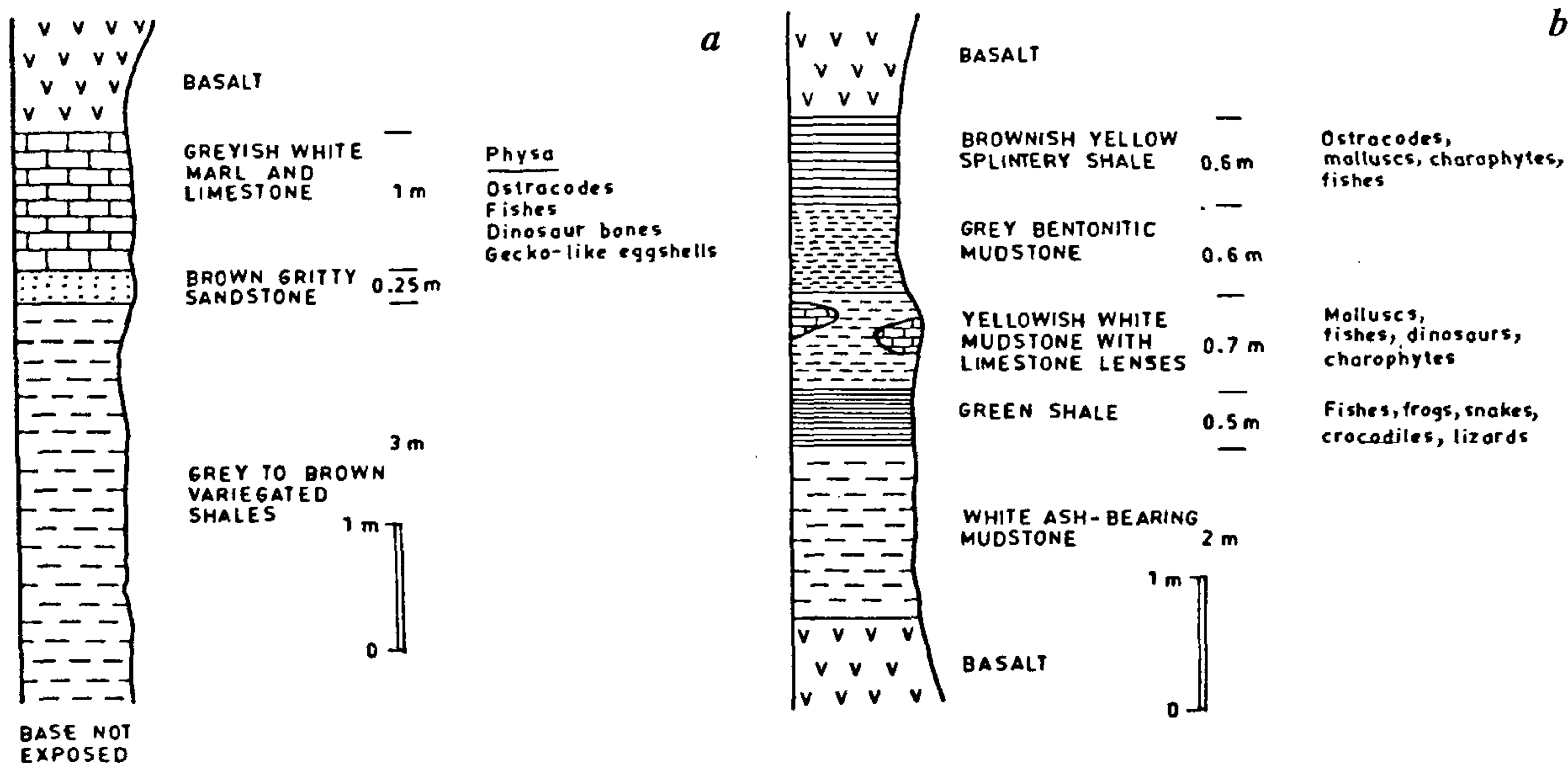


Figure 2. Stratigraphic succession at Dayapar (a) and Kora (b) (after Bajpai *et al.*¹¹).

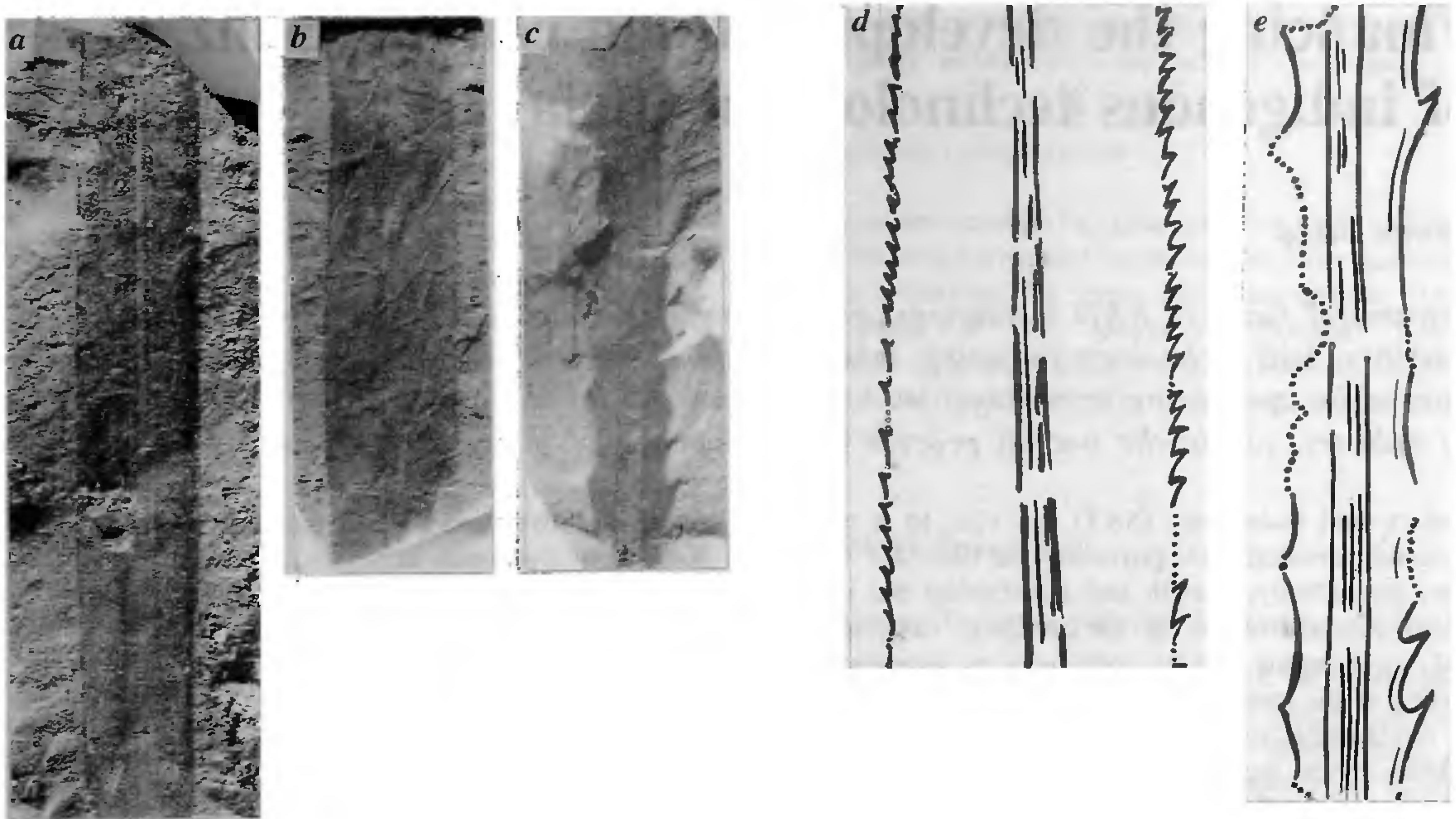


Figure 3. *Isoetites serratifolius* Bose & Roy (a-c, $\times 2$, specimen nos., BSIP 37701, 37702, 37702; d, $\times 4$, specimen no. BSIP 37700; e, $\times 3$, specimen no. BSIP 37702).

the height of 200 m in Western Ghats, Karnataka¹⁸ and *I. dixitei* has been recorded from shallow rock pools of Panchgani, Maharashtra¹⁹.

The occurrence of *Isoetites serratifolius* in the intertrappean/infratrappian beds of Kutch indicates that it was growing there during the eruption of the Deccan volcanics, when many lakes and pools were developed due to outpouring of lavas and uneven topography of the region.

The existence of environmental stress had been observed in Deccan volcanism²⁰. The trap flows over the Bagh beds, Lameta Formation and intertrappean beds with a sharp contact without any lithological evidence of lava flowed into a water body or even over a wet ground. These observations lead to the conclusion that the lakes, pools and other sedimentary basins, prior to their getting covered by the overlying basalt flows, were completely desiccated following the total extinction of flora and fauna inhabiting them. This was due to climatic changes resulting from continuing volcanism in the region far away from them.

Isoetes could not withstand the enormous temperature and the desiccation so they died out periodically but whenever the water accumulated and favourable

condition prevailed, they grew luxuriantly at the bottom over and over again.

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