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ACKNOWLEDGEMENTS. We thank Drs R. Srinivasan, P. Krishnamurthy and Y. J. Bhaskar Rao for providing the samples used in this study; Dr T. V. Sivaraman for help in the Sr isotopic analyses; and Dr S. K. Bhattacharya and Mr D. J. Patil for the stable-isotope data.

Received 10 January 1991; accepted 17 January 1991

Fossil fern *Goniopteris prolifera* Persl. from the Siwalik sediments near Nainital, North India

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Fern-leaflet (frond) impressions showing close resemblance with the modern *Goniopteris prolifera* Persl. of the family Thelypteridaceae have been recorded from the Siwalik sediments near Kathgodam in Nainital district, Uttar Pradesh, North India. This is the first record of the occurrence of fern leaflets in Siwalik sediments. The finding also suggests that the climate was possibly tropical, warm and humid during Miocene period.

THE Siwalik sediments around Kathgodam¹ are found in a northeast-southwest direction, exposed on Kathgodam-Nainital and Bhimtal road. Here the Lower Siwaliks are well developed, comprising hard, fine-grained sandstones and shales.

Plant megafossils, including petrified woods, leaf impressions, fruits and seeds, have been reported from the Siwalik sediments of Himachal Pradesh, Uttar Pradesh, Bihar and Nepal²⁻⁴. These plant remains mostly belong to angiosperms and palms.

Floristically, the Lower Siwalik sediments in the Kathgodam area show a rich assemblage of leaf impressions that have not been studied. Recently a large number of well-preserved leaf impressions were collected from shales in Balia riverbed west of Suriajala (29° 19'N, 79° 31'E), about 9 km north of Kathgodam on the Nainital road (Figure 1). Study of these fossils revealed the presence of fern leaflets (fronds) as well as dicot and monocot leaf impressions. The fern leaflets have been identified after consulting herbarium sheets in the herbarium of the Forest Research Institute, Dehra Dun.

Description: Fronds 5.5 cm × 1.0 cm and 4.6 cm × 2.0 cm in size; sessile; oblong to lanceolate shape; apex acuminate; base obtuse, seemingly auricled; margin smooth to crenulate; texture subcoriaceous; about 27

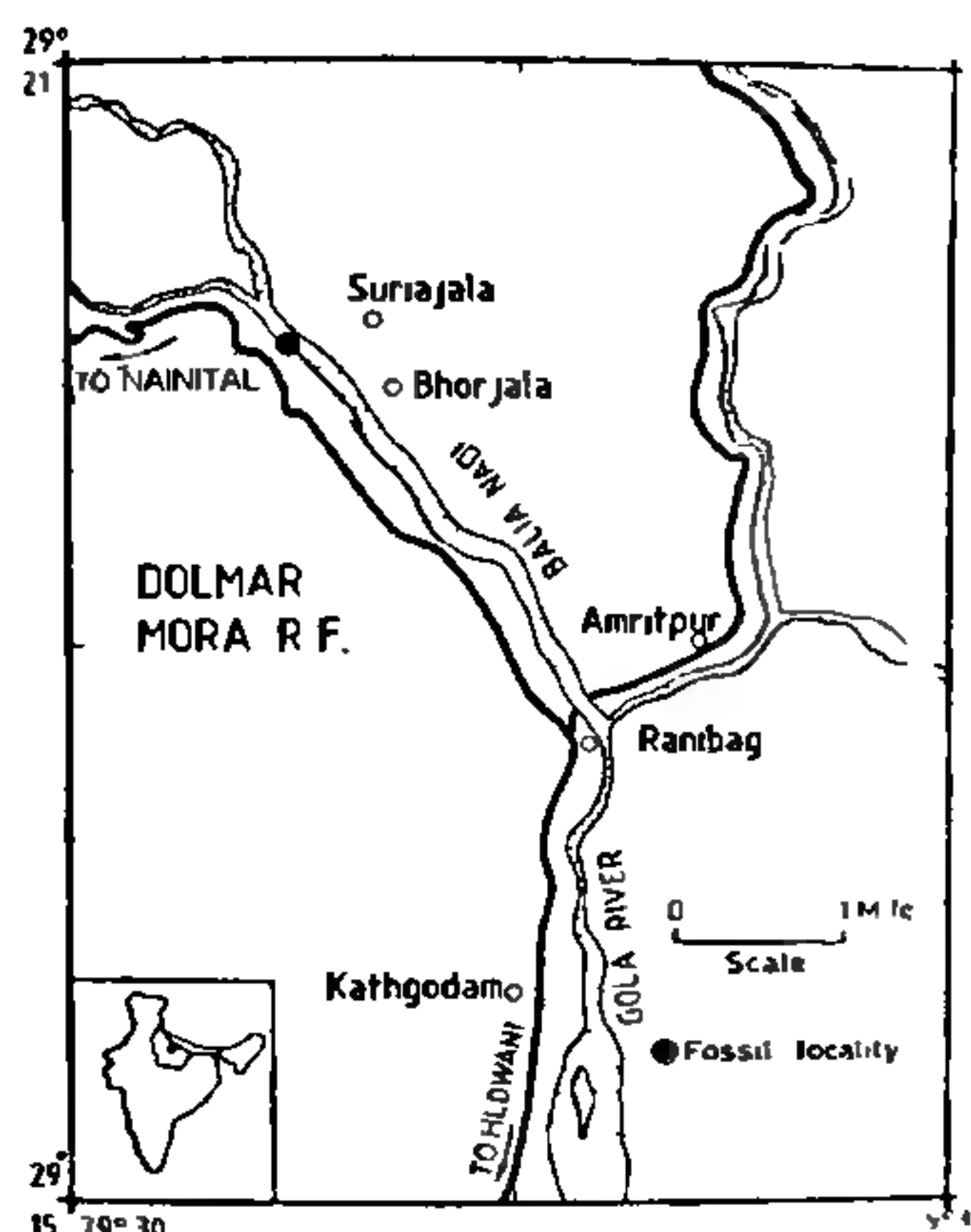


Figure 1. Map showing fossil locality.

pairs of pinnules visible, venules 5-10 pairs in each pinna, conivent at acute angle. (Figure 2,a,c).

Remarks: The shape, size and other features show similarity with the modern fronds of *Goniopteris prolifera* Persl. (FRI Herbarium sheet no. 22937a; Figure 2,b) of the family Thelypteridaceae.

The modern comparable fern *G. prolifera* now grows in the forests of Bengal and is very common in the Nilgiris. It grows in moist, shady places, usually along streams. Its present distribution suggests that tropical

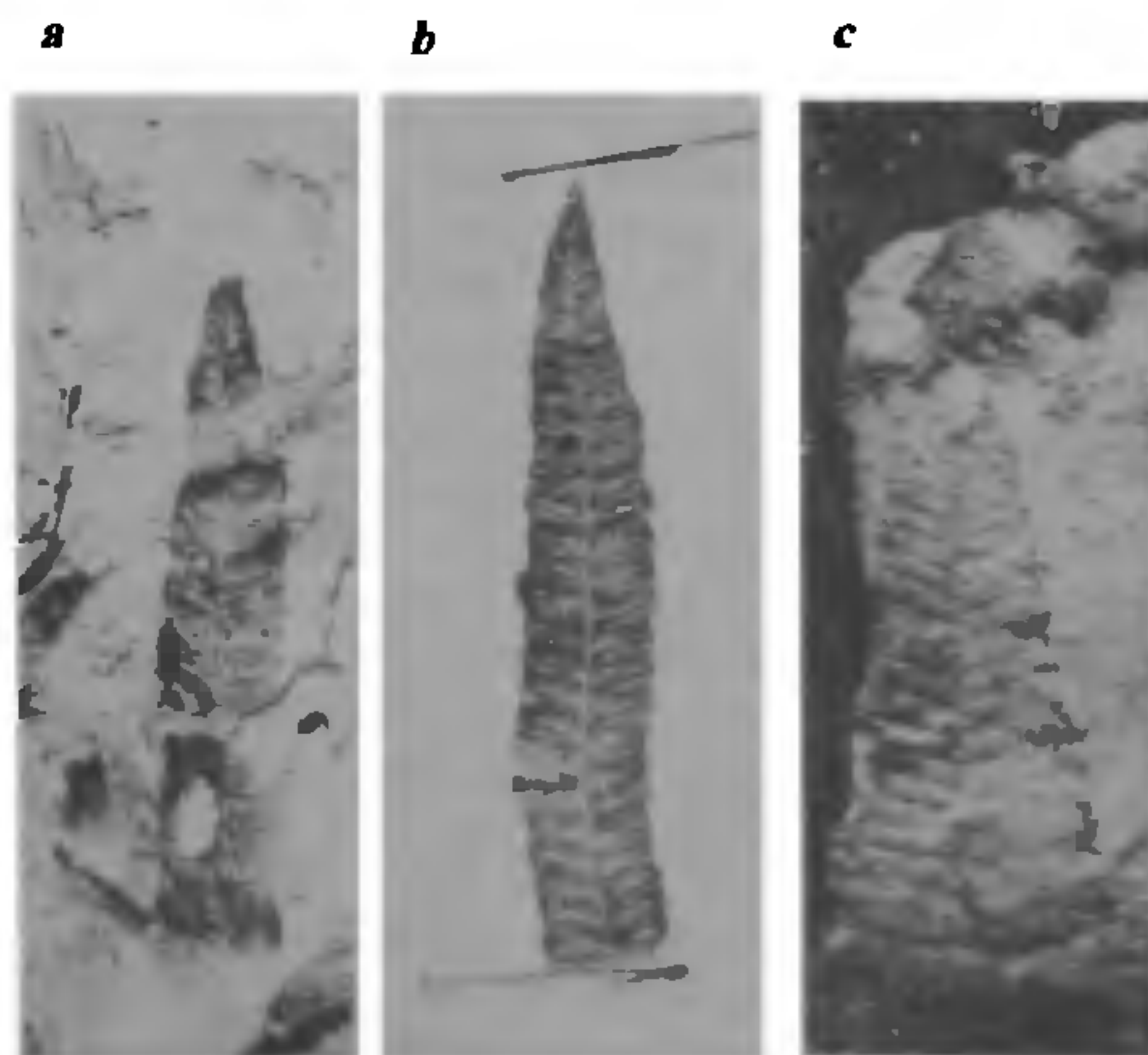


Figure 2. a and c, Fossil fronds; b, modern frond of *Goniopteris prolifera* Persl.

warm and humid climate prevailed in the Siwalik region during the Miocene period.

Specimen: BSIP Museum No. 36584, 36585.

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ACKNOWLEDGEMENTS. I thank the Department of Science and Technology, New Delhi, for financial support. I am grateful to the authorities of the Forest Research Institute, Dehra Dun, for permission to consult their herbarium.

Received 10 July 1990; revised accepted 8 January 1991

An interesting new hyphomycete genus with basauxic conidiophores and other unique features

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I describe two interesting hyphomycetes occurring on and isolated from *Xanthorrhoea preissii* Endl. (Xanthorrhoeaceae) collected in Western Australia. Among the few fungi characterized by basauxic conidiophores, these fungi are unique in that conidial cells of the muriform conidia function as conidiophore mother cells and produce basauxic conidiophores and further conidia in continued succession to form a complex system of conidia linked by 'connectives' that are morphologically and functionally the equivalent of basauxic conidiophores. The two fungi are accommodated in a new genus, *Catenospegazzinia*, as two new species, *C. pulchra* and *C. elegans*.

THE peculiar and interesting 'basauxic' nature of growth of conidiophores in some fungi was first noted by Hughes¹ who observed this feature in a few fungi which he classified in a separate section (VIII) in the scheme he proposed. Taking the hyphomycetes as a whole this feature has been reported in approximately as few as 45-50 species belonging to the six genera, *Spegazzinia* Sacc., *Arthrinium* Kunze, *Cordella* Speg., *Pteroconium* Sacc., *Dictyoarthrinium* Hughes and *Endocalyx* Berk. and Broome. The discovery of two interesting hyphomycetes with basauxic conidiophores and, additionally, with some quite unique features, in Western Australia is therefore of special interest.

I give below a description of an interesting

dematiaceous hyphomycete collected on dead inflorescence stalks of *Xanthorrhoea preissii* Endl. (Xanthorrhoeaceae).

The fungus forms dark, blackish, effuse colonies on the substratum. The colonies consist of massive, powdery aggregations of dry, muriform conidia forming a thick layer over an apparently inconspicuous stratum of underlying vegetative hyphae, conidiophore mother cells and basauxic conidiophores. The conidiophore mother cells are hyaline to subhyaline, variable in shape, and $7.4-9.7 \mu\text{m} \times 2.6 \mu\text{m} \times 4.4 \mu\text{m}$. The conidiophores are simple, basauxic, hyaline to subhyaline, and $3.7-18.5 \mu\text{m} \times 1.8-2.9 \mu\text{m}$. The conidia are dry, muriform, brown, variable in shape, globose to subglobose to ellipsoidal to flattened, verrucose to finely echinulate, slightly constricted at septa, and $13-21 \mu\text{m} \times 11-19 \mu\text{m}$. They are produced acrogenously on basauxic conidiophores and on 'connectives' arising from one or more cells of the primary conidium, and of successive conidia similarly produced on connectives, in an infinite sequence, the whole forming a complex network or system of solitary muriform conidia linked by connectives. The connectives closely resemble basauxic conidiophores in morphology, though considerably short, and show the circumscissile break in the outer wall characteristic of these structures. Indeed, functionally also, they are potentially basauxic and are therefore the equivalent of basauxic conidiophores. The conidial cells, then, are the equivalent of conidiophore mother cells and may function as such.

A similar fungus, apparently congeneric but distinct, was also isolated from the same material. The culture was designated 10-C; a description of this fungus is given below.

The vegetative hyphae are pale to golden brown, smooth, septate, and branched. The conidiophores are basauxic and arise from conidiophore mother cells which are produced in the vegetative mycelium. The conidiophore mother cells are subhyaline to pale brown, variable in shape and $3.7-15.5 \mu\text{m} \times 2.5-5.2 \mu\text{m}$. The conidiophores are simple, subhyaline to golden brown and $2.5-9.6 \mu\text{m} \times 1.4-3.0 \mu\text{m}$. The hyphae producing conidiophore mother cells invariably form strands or ropes. The conidia are brown, variable in shape, ovoid to clavate and mostly with 1-3 transverse septa, or globose to subglobose-triangular and muriform, constricted at septa, verrucose to finely echinulate: the elongate-ovoid conidia $20-25 \mu\text{m} \times 7-17 \mu\text{m}$; the globose to subglobose conidia $13-21 \mu\text{m} \times 11-17 \mu\text{m}$. The 'connectives' measure $2-4 \mu\text{m} \times 2 \mu\text{m}$, though occasionally they may be longer and then clearly show their true basauxic character.

The basauxic nature of conidiophores in certain hyphomycetes was first observed by Hughes¹ who, in calling attention to this unique feature, stressed its taxonomic significance. Of the genera he discussed,