

Chart 1.

#### General procedure for the preparation of II and III

A mixture of pulvinic dilactone (0.005 mol) and aromatic acid hydrazide (0.005 mol) was refluxed either in xylene (20 ml) or in *n*-butanol (15–20 ml) in the presence of catalytic amount of pyridine for 3 h. The solvent was removed under reduced pressure. The gummy nature of some products was removed by triturating with petroleum ether and if necessary by acidification with dil. HCl. The products were purified by recrystallization from appropriate solvents (table 1).

The authors thank Prof. G. W. Kirby, Regius Professor, Glasgow University, Glasgow for providing the spectral data and Dr Kurt L. Loening, Chemical Abstract Service for naming the compounds.

16 May 1988; Revised 16 September 1988

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#### RECORD OF INARTICULATE BRACHIOPODS FROM THE ARENACEOUS MEMBER OF THE TAL FORMATION, GARHWAL SYNCLINE, LESSER HIMALAYA, INDIA

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THIS note records the Lower Cambrian (Botomian Stage=? Tsanglangpuian) inarticulate brachiopods belonging to four genera, viz. *Magnicanalis*, *Obolella*, *Paterina* and *Obolopsis*, from the greyish siltstone unit of the Arenaceous Member of the Tal Formation exposed in a section south-east of Kauriyala village (30°03'N and 78°00'E) on the Rishikesh–Badrinath highway in the northern limb of the Garhwal Syncline (figure 1). Of late, this fossil horizon has also yielded redlichiid trilobites (under communication) and small shelly fossils<sup>1</sup>. A similar Early Cambrian brachiopod assemblage was earlier reported from the basal part of the Phulchatti Member of the Tal Formation from Mussoorie Syncline, Uttar Pradesh<sup>2,3</sup>, and Nigalidhar Syncline,

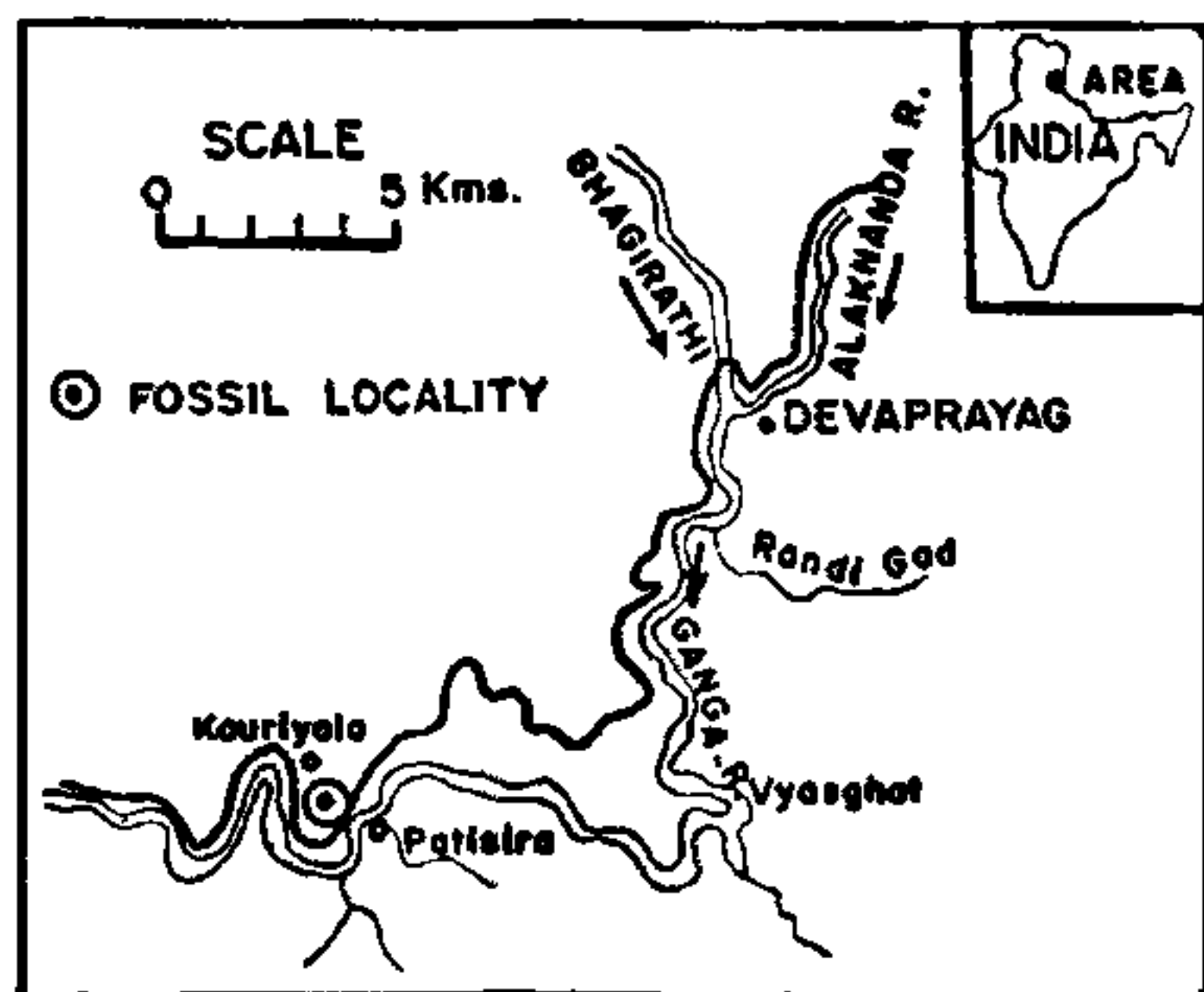


Figure 1. Location of the fossils.

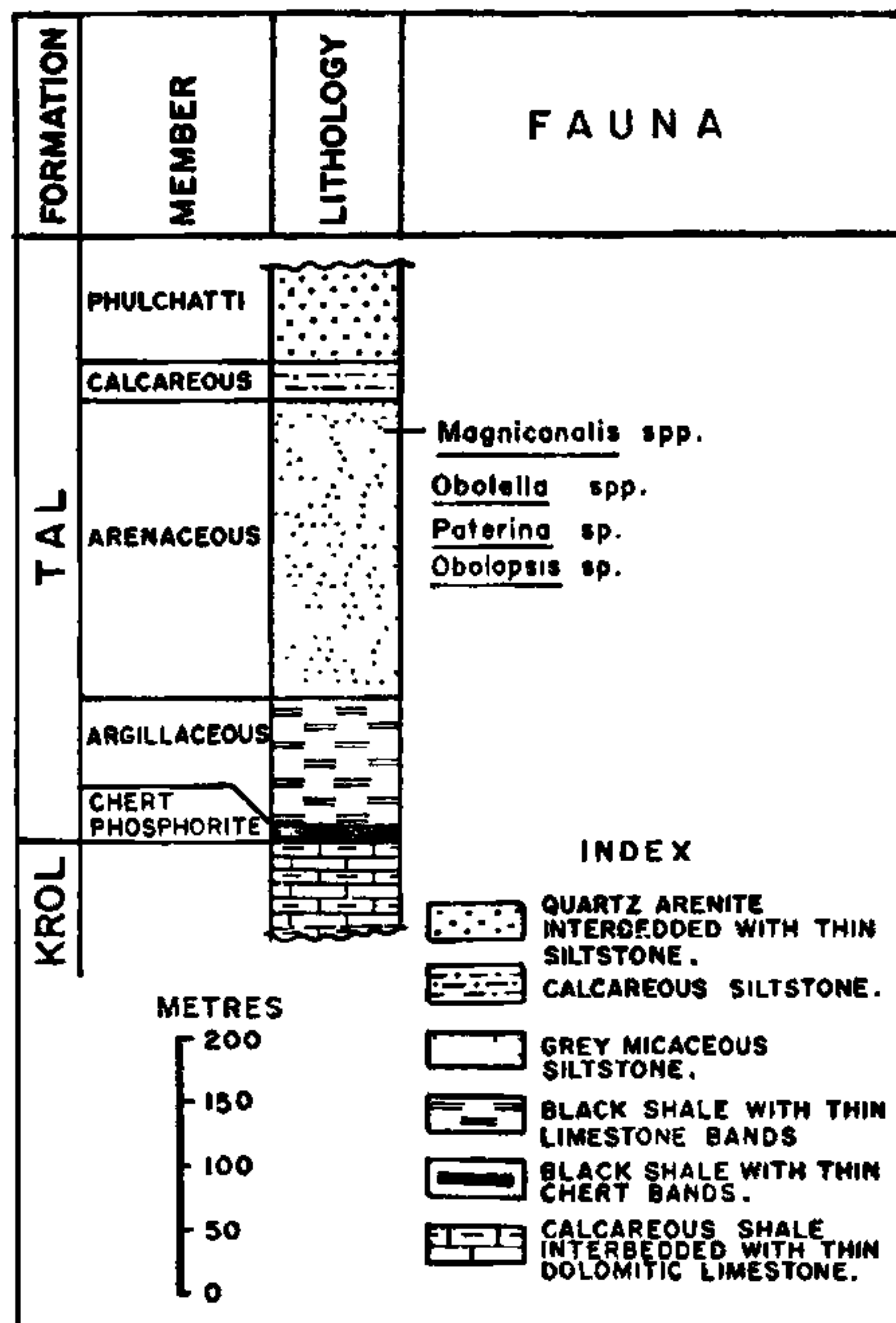


Figure 2. Stratigraphic section at fossil location, showing position of fossils.

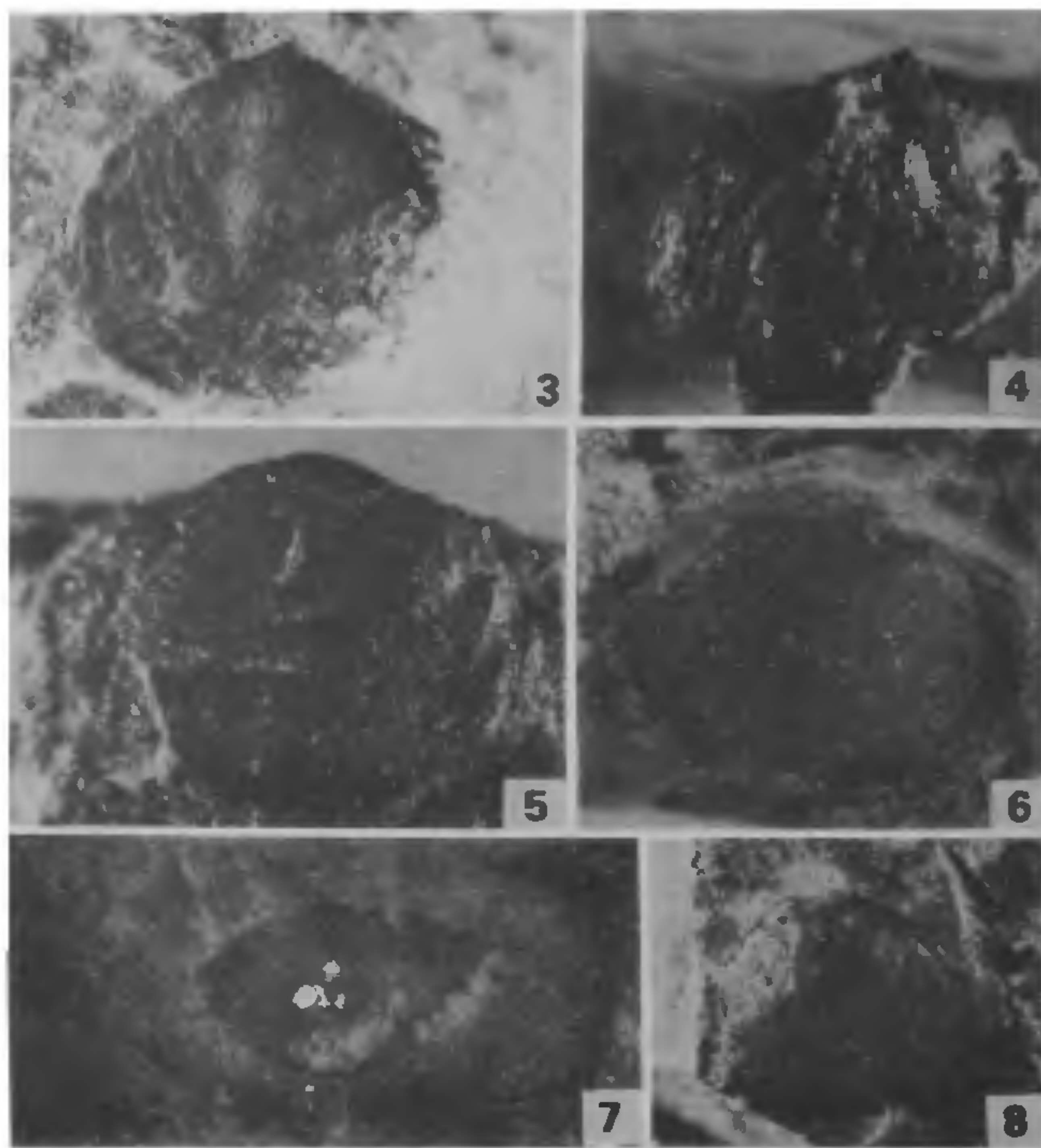
Himachal Pradesh<sup>4</sup>. The Lower Cambrian (Atdabanian Stage) gastropod *Pelagiella* and brachiopod *Diandongia* of *D. pista* were reported from the Calcareous Member of the Tal Formation from the Garhwal Syncline<sup>5</sup>. Significantly, the present fossiliferous horizon from the Garhwal Syncline is from a much lower horizon in the Tal Formation, about 210 m above the base of the Arenaceous Member, i.e. 25 m below the top of the Member (figure 2).

The faunal elements are well preserved as casts along the bedding planes of grey siltstone, exhibiting fine shell sculpture and other morphological features. The fossils are crowded in places, though in almost all cases, only a single valve is preserved. Generally, the outer surface of the brachiopod valve is found to be preserved. Hence, a detailed study of fauna based on the presently available material is not possible. General remarks on the faunal identification only up to the generic level have been attempted for the present. In the present collection, the brachiopods, in order of abundance, are those belonging to Obolellida, Paterinida and Lingulida. The Obolellida genus *Magnicanalis* is suboval in outline. The pedicle valve is 10 mm long and 11 mm wide (figure 3) and 10 mm long and 10 mm wide (figure 4), characterized by strong concentric growth lines parallel to the base and the presence of a deep pedicle groove. *Magnicanalis* is a Lower Cambrian taxon and is known from Lower Cambrian Holmia shale, Norway<sup>6</sup>. This brachiopod does not survive into Middle Cambrian<sup>7</sup>. The obolellid genus *Obolella* is a transversely elongated obolellid; ventral valve is about 20% wider than long, maximum width near mid-length, 10 mm long and 13 mm wide (figure 5) and 10 mm long and 12 mm wide (figure 6), posterior platform of ventral valve is weakly

developed, lateral margin strongly curved, anterior margin more gently so, posterolateral margin nearly straight, subtending an angle of about 130° at beak. The obolellids do not appear in Early Cambrian until the Nevadella zone of Great Basin, USA<sup>8</sup> (which may correspond to the Botomian Stage of Siberia, USSR). *Obolella* is also known to occur in Tsanglangpu Formation of Lower Cambrian in Yunan Province, China<sup>9</sup>. The paterinid genus *Paterina* has a semicircular ventral valve, is 7 mm long and 9 mm wide (figure 7); shell is widest at about a quarter of the length from the posterior margin. *Paterina* is a Cambrian taxon. The lingulid genus *Obolopsis* has a suboval shell outline, gently convex, pedicle valve is 8 mm long and 9 mm wide (figure 8). *Obolopsis* is a Lower Cambrian taxon.

The fossils are deposited in the Palaeontology and Stratigraphy Division, Geological Survey of India, Calcutta, bearing GSI Type No. 20,276 to 20,281.

The authors are grateful to Shri B. D. Dungrakoti, Director, Himalayan Geology Division, and Shri



Figures 3–8. The fossils: 3. *Magnicanalis* sp. ( $\times 3$ ); 4. *Magnicanalis* sp. ( $\times 3.4$ ); 5. *Obolella* sp. ( $\times 3.6$ ); 6. *Obolella* sp. ( $\times 3$ ); 7. *Paterina* sp. ( $\times 2.6$ ); 8. *Obolopsis* sp. ( $\times 2.6$ ).

Gopendra Kumar, Director, Arunachal Pradesh Operation, Geological Survey of India, for their able guidance and keen interest in the work.

7 December 1987; Revised 16 August 1988

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