

# EARLY CAMBRIAN BRACHIOPODS FROM 'UPPER TAL', MUSSOORIE SYNCLINE, DEHRADUN DISTRICT, UTTAR PRADESH, INDIA

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## ABSTRACT

This note relates to the first record of a well-preserved and rich inarticulate brachiopod fauna consisting of *Obolella* cf. *crassa* *Obolella* spp., *Magnicanalis* sp., *Lingulella* cf. *haimentensis*, *Lingulella* sp., *Obolus kashmiricus*, *Obolus* sp., brachiopod form A and brachiopod form-B from the upper part of the Tal Formation ('Upper Tal'), Mussoorie Syncline, Uttar Pradesh. The assemblage belongs to an early Cambrian age and, thus, extends early Cambrian time-range into the upper part of the Tal sequence.

## INTRODUCTION

Of late, the Tal Formation (AUDEN 1934) of the Blaini-Krol-Tal succession of Krol Belt, Lesser Himalaya, is receiving increasing attention of stratigraphers and palaeontologists because of the find of early Cambrian (Tommotian to Atdabanian Stages) fossils by several workers (BHATT *et al.*, 1983; KUMAR *et al.*, 1983 and TEWARI, 1984) from the sediments of its lower part or 'Lower Tal' (SHANKER, 1971); thus affording observable proofs for its definite stratigraphic status as opposed to tentatively suggested, though long entrenched, Mesozoic age (AUDEN, 1934). Whereas the biostratigraphic status of lower part ('Lower Tal') is gradually getting better defined within early Cambrian based on records of various groups of animal fossils, a complete lack of such records from sediments of upper part of Tal Formation (Phulchatti Quartzite Member, DHAUNDIYAL & KUMAR, 1976 or 'Upper Tal', SHANKER, 1971) so far forebade definite placement of 'Upper Tal' in the stratigraphic ladder.

Recently, two of the authors (GK & BKR), continuing their field studies especially after the find of Atdabanian horizon in the Calcareous Member of Tal Formation (KUMAR *et al.*, 1983), located a shale horizon containing several layers rich in primitive brachiopods in the lower part of the Phulchatti Quartzite Member ('Upper Tal'), in February, 1984. The fossil-yielding shale horizon occurs about 52 m above the underlying Calcareous Member of 'Lower Tal', forming part of the southern limb of Mussoorie Syncline exposed along Maldeota-Dhanulti road section, 1.6 km south-east of Loarkha (Fig. 1).

It is intended here only to record the presently discovered brachiopod fauna as, besides imparting definite age to atleast a part of 'Upper Tal' sequence, it has significant bearing on the biostratigraphy of the Tal Formation—the well-recognised but biostratigraphically misunderstood, lithounit of the Lesser Himalayan carbonate complexes.

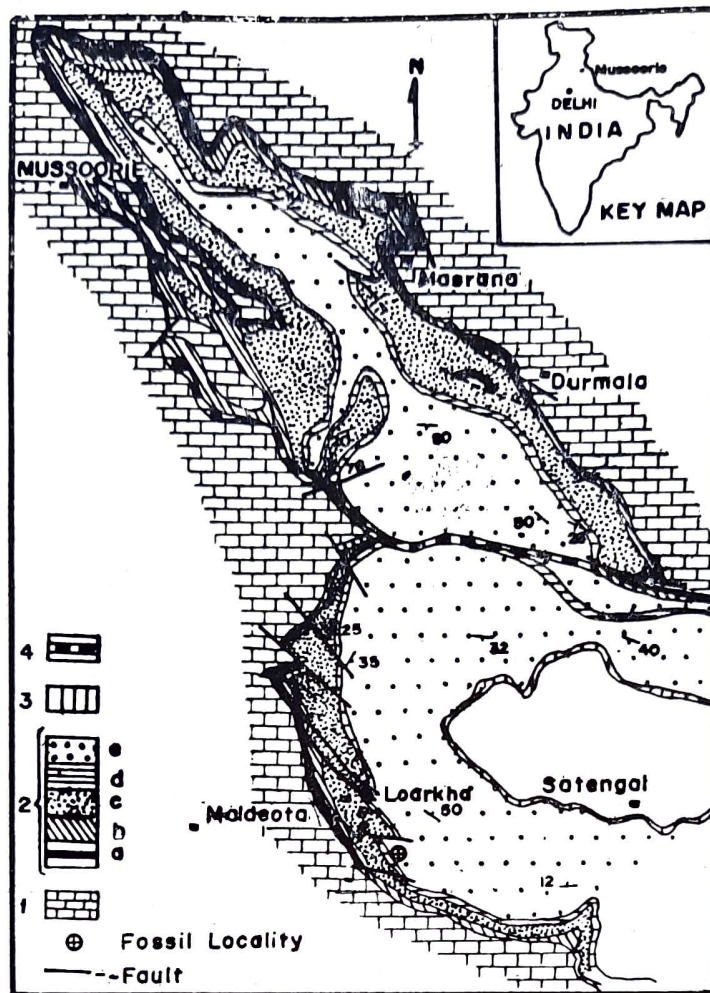


Fig. 1. Location and sketch geological map of part of Mussoorie Syncline (after Shanker, 1971) showing fossil locality. 1. Krol Formation; 2—Tal Formation, a—Chert-Phosphate Member, b—Argillaceous Member, c—Arenaceous Member, d—Calcareous Member, e—Phulchatti Quartzite Member ('Upper Tal'); 3—Manikot Shell Limestone Formation; 4—Dolerite.

## FAUNA

The fossil material is well preserved along the bedding planes of shale exhibiting fine shell sculpture and other morphologic features. The fossil layers are usually crowded with brachiopod shells, sometimes densely clustered, though in almost all cases the preservation of single valve only is available for observation. Invariably, only the outer surface of the brachiopod valve is found to be preserved. Therefore, the consideration of internal parts remains out of perview for the present preliminary identification. The fauna is only being listed for the present, with some general remarks on identification; more detailed systematic description is intended for a future work.

The identifications have been based on the descriptions and illustrations provided by REDLICH (1901), REED (1910, 1934) and ROWELL (1962, 1977).

The illustrated fossil material is (Plate 1) deposited in the Palaeontology and Stratigraphy Division, Geological Survey of India, Calcutta bearing G. S. I. Type Nos. 20008 to 20023.



The litholog of the Tal Formation (Fig. 2) shows the fossiliferous horizons. The sample-wise record of the brachiopod taxa is given below:

Sample No. KT/262

*Lingulella* sp.  
*Obolus* sp.

Sample No. KT/263

*Obolella* sp. (abundant)  
*Lingulella* sp.  
*Obolus* sp.

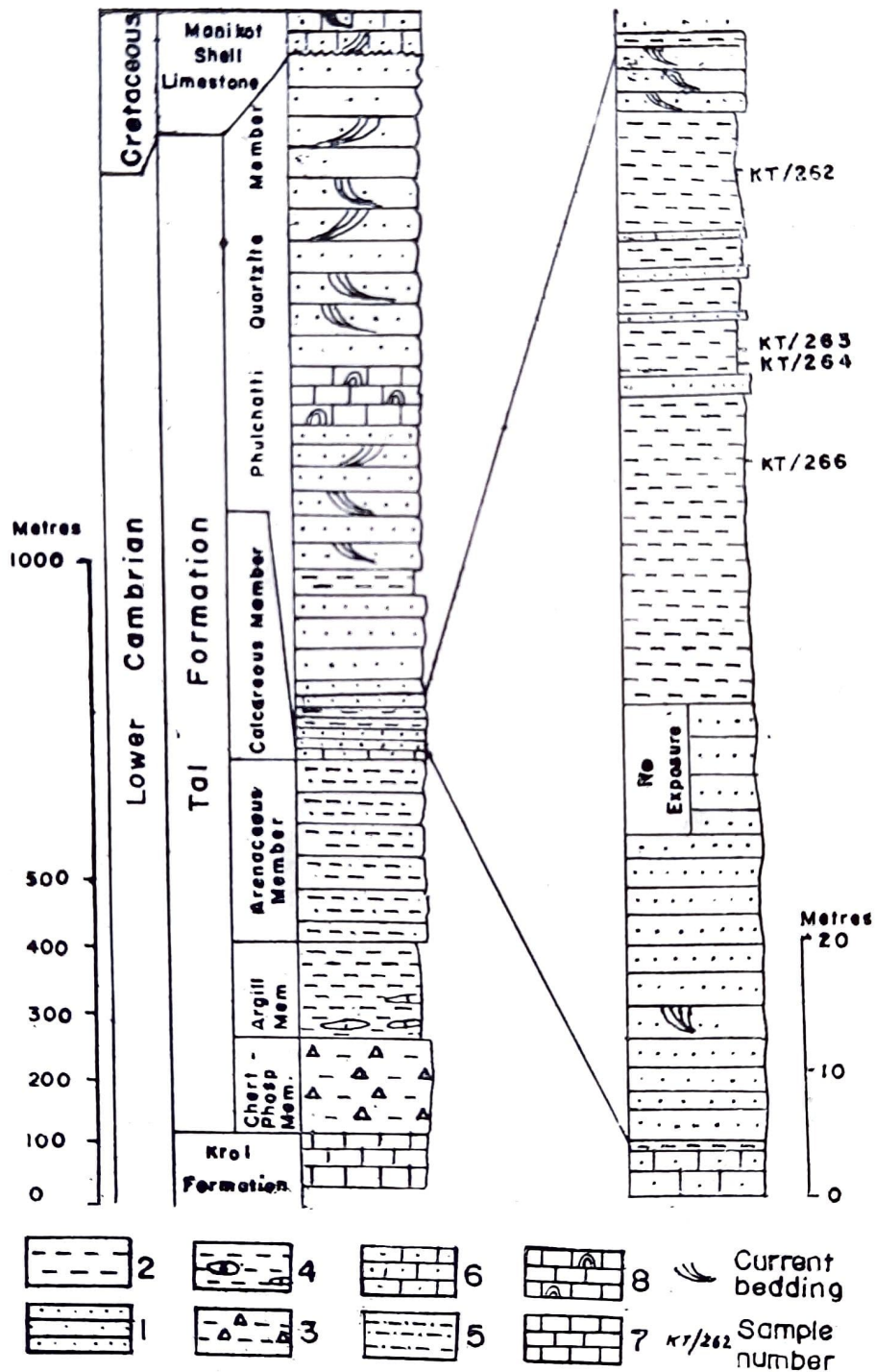


Fig. 2. Lithocolumn of the Tal Formation, Mussoorie Syncline showing fossiliferous horizon. 1—Quartzite/sandstone; 2—Grey shale; 3—Chert, phosphorite, shale; 4—Shale with calcareous bands and concretions; 5—Siltstone; 6—Calcareous siltstone; 7—Dolomite/limestone; 8—Algal limestone.

Sample No. KT/264

*Obolella* cf. *O. crassa* Reed  
*Obolella* sp. (abundant)  
*Magnicanalis* sp. (abundant)  
*Lingulella haimentensis* Reed. (few)  
*Obolus* sp.  
*Walcottina* sp. (single)

Sample No. KT/266

*Magnicanalis* sp.  
*Obolella* sp.  
*Obolus kashmiricus* Reed  
form A (single)  
form B (single)

The preliminary identification of the brachiopod genera present in the collection from 'Upper Tal' shows great preponderance of obolellids, a group of brachiopods that was "widely distributed and locally numerically abundant in the early Cambrian, but the initial success of the stock was short lived and it was extinct by the middle Cambrian" (MOORE, 1965; p. H 292). The obolellid genus *Magnicanalis* is characterised by strong concentric growth lines and the presence of deep pedicle groove. These characters are well preserved in the numerous specimens in the present collection. Some other taxon, e. g. *Obolella* cf. *crassa* (Hall) ? have been compared with the description and illustrations given by REED (1910) from the material from Parahio Member ('Parahio series') of the Kunzam La Formation, Spiti. The obolid genus *Obolus* has a suboval shell outline. Some of the forms present in the collection have been compared with *Obolus kashmiricus* Reed described from the Cambrian of Kashmir (REED, 1934). *O. kashmiricus* Reed is characterised by nearly straight anterior outline of the shell. The lingulelline genus *Lingulella* has an elongate oval to sub-triangular outline. *Lingulella haimentensis* Reed has also been described from the Parahio Member of the Kunzam La Formation of Spiti (REED, 1910). The paterinid genus *Walcottina* has a transversely oval shell outline. The beak is recurved. The posterior margin of the pedicle valve is nearly straight. Brachiopod form A has an obolellid outline with deep pedicle groove. In addition to strong concentric growth lines like that in *Magnicanalis*, it has prominent radial ornamentation. Brachiopod form B is more or less similar to brachiopod form A in shell sculpture, but has a prominent beak.

#### DISCUSSION

In the present collection, the brachiopods in order of abundance are those belonging to obolellida, lingulida and paterinida. The obolellids are represented by *Obolella* spp. and *Magnicanalis* sp., the lingulids by *Lingulella* spp. and *Obolus* sp., and paterinida by *Walcottina* sp. According to ROWELL (1977) the obolellids do not appear in early Cambrian until the *Nevadella* zone of Great Basin, U. S. A. (which may correspond to Botomian Stage of Siberia, U. S. S. R). *Obolella* is also known to occur in Tsanglangpu Formation of Lower Cambrian in Yunnan Province, China (LIWEN *et al.*, 1981) where it occurs in association with trilobite *Redlichia chinensis* and *Palaeolenus lenticolensis*. The genus *Obolella* only doubtfully survives into Middle Cambrian (ROWELL in MOORE, 1965). *Magnicanalis* is a Lower Cambrian taxon and is known from Lower Cambrian *Holmia* Shale, Norway (in ROWELL, 1962). This brachiopod taxon does not survive into Middle Cambrian (ROWELL in MOORE, 1965). The lingulellide, on the



other hand, though present in the Lower Cambrian become more frequent higher in the Cambrian sequence. The genus *Lingulella* is known from *Nevadella* zone (ROWELL, 1977), Tsanglangpu Formation (Lower Cambrian) of Yunnan Province, China (LIWEN *et al.*, 1981), Kussak Stage/Neobolus Shale Stage in Salt Range, Pakistan (REDLICH, 1901). *Obolus* is also common in the Middle Cambrian but is also known from Lower Cambrian Ac<sub>2</sub> and Ac<sub>3</sub> horizons of Comley, England (COBBOLD, 1921). The paterinida is restricted to the Lower Cambrian and has been recorded from *Nevadella* zone (ROWELL, 1977) and Ab<sub>1</sub> horizon of Lower Comley Sandstone, England (COBBOLD, 1921).

The above data on worldwide biostratigraphic distribution of the different brachiopod taxon is clearly suggestive of an early Cambrian age for the brachiopod fauna of 'Upper Tal' (Phulchatti Quartzite Member) of Lesser Himalaya.

The presently recorded brachiopod fauna resembles rather strikingly the fauna described and illustrated surprisingly as 'estherids' by Shrivastava (1973) from the upper part of his 'Middle Tal'. Unfortunately the type specimens have not been catalogued and are not available for examination. In the present study, however, the two faunas are considered identical.

## CONCLUSION

The horizons of the 'Upper Tal' bearing brachiopod fauna described above are correlatable with the *Nevadella* zone of U. S. A., Tsanglangpu Stage of China, Botomian Stage of Siberia, U. S. S. R., Kussak Stage of Salt Range, Pakistan and *Redlichia* zone (SHAH *et al.*, 1980), Kashmir, India. This places the fossiliferous horizons in the younger part of the Lower Cambrian.

The present find has further established that not only the lower part of the Tal Formation (Chert-Phosphorite Member to Calcareous Member) is of early Cambrian age, but a considerable part (atleast basal 52 m) of the overlying Phulchatti Quartzite Member ('Upper Tal') is also of the same age.

The present biotope is typically the one which includes trilobites in other areas of Himalaya or elsewhere in the world. In the present area, though impressions of trilobite have been recorded from the underlying Arenaceous Member (RAI & SINGH, 1983), the non-record of true trilobites so far from the Tal sediments is considered here to be attributable to the lack of sufficient search.

Remarks on the identification of the brachiopod fauna from the 'Upper Tal' made earlier in this note and the close similarity of some of the elements with those from (but little younger horizons) the so-called Tethyan realm in Kashmir and Spiti calls for a close link between the early Cambrian sea in the two areas of Himalaya, viz. the so-called Tethyan realm of Kashmir, Sipti and Kumaun on one hand, and the Lesser Himalayan region on the other.

## ACKNOWLEDGEMENTS

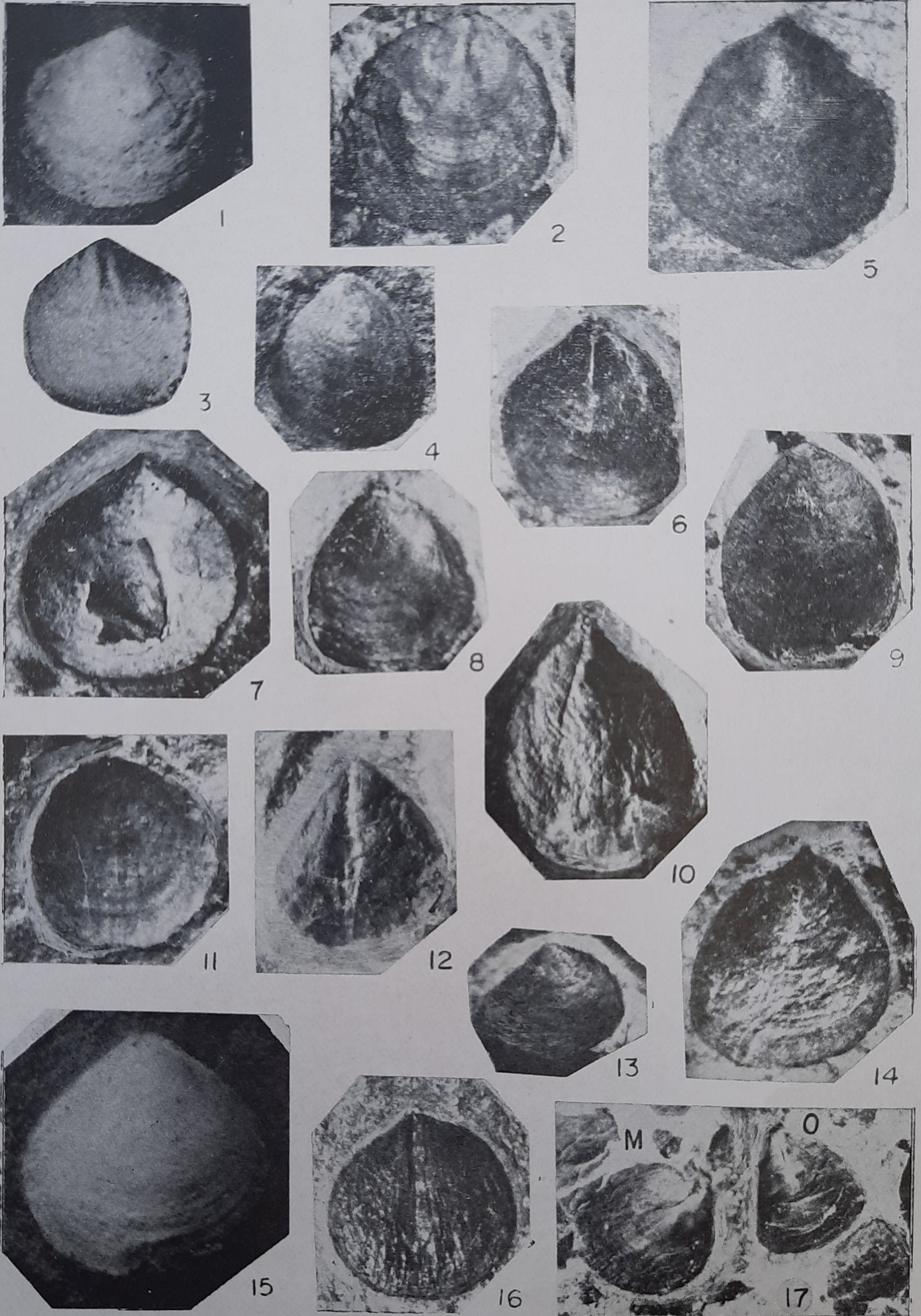
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## EXPLANATION OF PLATE I

1. *Obolella* sp., sample No. KT/264,  $\times 9$ , GSI Type No. 20008
2. *Magnicanalis* sp., sample No. KT/266,  $\times 13$ , GSI Type No. 20009
3. *Obolella* sp., sample No. KT/264,  $\times 10$ , GSI Type No. 20010
4. *Obolus* sp., sample No. KT/263,  $\times 9$ , GSI Type No. 20011
5. *Obolus* sp., sample No. KT/264,  $\times 13$ , GSI Type No. 20012
6. *Lingulella* sp., sample No. KT/266,  $\times 10$ , GSI Type No. 20013
7. *Obolella* sp., sample No. KT/266,  $\times 13.3$ , GSI Type No. 20014  
Some lingulellid form is visible under the eroded cast of *Obolella*.
8. *Obolus* sp., sample No. KT/264,  $\times 10$ , GSI Type No. 20015
9. *Lingulella* sp., sample No. KT/262  $\times 10$ , GSI Type No. 20016
10. form B, sample No. KT/266,  $\times 10$ , 5, GSI Type No. 20017
11. *Obolella* cf. *crassa* Reed, sample No. KT/263,  $\times 10.5$ , GSI Type No. 20018
12. *Lingulella* cf. *haimentensis* Reed, sample No. KT/266, GSI Type No. 20019
13. *Walcottina* sp., sample No. KT/264,  $\times 8.5$ , GSI Type No. 20020 Slight oblique view.
14. *Magnicanalis* sp., sample No. KT/266,  $\times 16$ , GSI Type No. 20021
15. *Obolus* sp., sample No. KT/264,  $\times 9.5$ , GSI Type No. 20022
16. form A, sample No. KT/266,  $\times 14$ , GSI Type No. 20023
17. *Magnicanalis* sp. (M) and *Obolus kashmiricus* Reed (O), sample No. KT/266,  $\times 9$ , GSI Type No. 20009

The rock specimen gives the idea of clustering of brachiopod fauna.