

# Contribution to the Lower Palaeozoic Stratigraphy of Western Nepal

V. J. GUPTA \*)

Schlüsselwörter

*Himalaya (Nepal)*  
*Tibet-Zone*  
*Ordoviz-Devon*  
*Fossilien*

## Introduction

FUCHS carried out detailed fieldwork in western Nepal and made valuable contributions to the geology of this part of the Himalayas (1967). He collected fossils from several stratigraphic horizons and results of their identifications were published in a series of papers. The author studied a few specimens collected by FUCHS from the Lower Palaeozoic rocks and the results of his identifications and their bearing on the stratigraphy of the area are discussed in the present paper.

This note may be read along with the classic memoir of FUCHS (1967) and for details of fossil localities the readers may consult plates 4, 7 and 9 of FUCHS's memoir and plate I of FUCHS and FRANK (1970).

## Discussion

### Ordovician:

The 2000—4000 meters thick monotonous succession of thickly bedded argillaceous and arenaceous limestone forming the basal part of the Tibetan Zone was named as Dhaulagiri Limestone by FUCHS (1967, p. 16). This limestone formation conformably overlies the metamorphic complex. FUCHS considered the Dhaulagiri Limestone to be of Cambro-Ordovician age and he recorded the occurrence of Ordovician fossils (brachiopods, crinoids and *Orthoceras*) from the upper members of this succession. HEIM and GANSSER (1939) and EGELER et al. (1964) assigned Cambrian age to the corresponding units in other areas. FUCHS (1967) correlated the Dhaulagiri Limestone with the Nilgiri Carbonate Group and North Face Quartzite Formation of central west Nepal. According to FUCHS the lower members of Dhaulagiri Limestone may be Cambrian in its lower parts.

FUCHS collected a few casts of brachiopods (144, 50 and F 20), gastropods (W 195 and W 196), crinoids and orthoceratids from this limestone formation.

\*) Address: Dr. V. J. GUPTA, Centre of Advanced Study in Geology, Panjab University, Chandigarh.

The gastropod specimen according to FUCHS was collected from loose blocks in the lower parts of Dhaulagiri Limestone. The specimen consists of fairly well preserved flat shells with sunken spire and can be compared with the well known Middle Ordovician gastropod *Eccyliopteris kushanensis* GRABAU. In China this form is known from the Machiakou or Actinoceras limestone of Manchuria which lies in Kaiping Basin. GRABAU (1926) considered Machiakou Limestone to be of late Middle Ordovician which corresponds to the Black River, and perhaps the early Trenton (early Upper Ordovician) of North America.

The precise stratigraphic horizon from whence these specimens have come is not known but according to FUCHS they seem to have come from the lower parts of the Dhaulagiri Limestone. The stratigraphic horizon yielding these specimens can be assigned Middle Ordovician age.

Specimen no. 50 from the limestone succession of Tarap Khola resembles *Glossorthis* sp. *Glossorthis* is a characteristic form found in the Middle Ordovician of Europe (SCHUCHERT and COOPER, 1932, p. 78).

Specimen no. F 20 from the Dhaulagiri Limestone of Kagmara Range of Kanjiroba Himal consists of poorly preserved casts and moulds of brachiopods. On the basis of surface ornamentation and other external characters the following forms can be identified in this specimen: — *Dalmanella* sp., *Isorthis* sp., *Reserella* sp. — All these forms are indicative of Upper Ordovician age for the fossiliferous horizon from whence these specimens have been collected.

Specimen no. 144 from the Dhaulagiri Limestone of Lulo Khola-Atali Range is in good state of preservation. The size and proportion of the shell, the degree of convexity, surface ornamentation and other characters suggest that the specimen can be compared with *Strophomena neglecta* known from the Upper Ordovician of Ohio (MOORE et al., 1952 and ZITTEL, 1937).

From the above it is clear that the fauna from the lower part of the Dhaulagiri Limestone (sp. nos. W 195, W 196 and 50) indicates Middle Ordovician age and the specimens (nos. F 20 and 144) from the higher horizons are indicative of Upper Ordovician age for the beds from which they have been collected.

On the basis of discussion given above it can be concluded that the Dhaulagiri Limestone represents an Ordovician succession which in its upper parts may include parts of Silurian System. The metamorphic carbonate rocks grading upwards into the Dhaulagiri Limestone may be of Cambrian age.

### Silurian:

As referred earlier the upper members of Dhaulagiri Limestone may represent Silurian horizons. The definite Upper Ordovician rocks are followed by a transition zone into a Devonian carbonate complex (in the W) and by graptolite bearing dark beds of Llandoveryan age (in the E). The transition zone consists of light dolomitic marls, siltstone, dark limestone and black shales which are mostly unfossiliferous. This transition zone which has a conformable relation with the fossiliferous Upper Ordovician rocks below and Devonian rocks above can be assigned Silurian age.

The succession from Ordovician to Devonian is conformable and there is no evidence of any break in between. EGELER et al. (1964) and STRACHAN et al.

(1964) recorded the occurrence of Llandoveryan graptolites from the corresponding formation (Dark Band Formation) of central west Nepal.

#### Devonian:

The Devonian succession in western Nepal is represented by a dolomite and limestone complex in the western part of Dolpo whereas in the E there is a flysch formation (Tilicho Pass Formation). At the top of latter FUCHS found a conspicuous band of micaceous sandstone, calcareous quartzite and arenaceous limestone. He collected a few fossils from this horizon. As it is succeeded immediately by the Lower Carboniferous limestone (Ice Lake Formation) FUCHS assigned Upper Devonian age to this horizon.

The author studied two specimens (no. 34 and 75) from the Barbung-Mukur area. Both the specimens are in fairly good state of preservation. The specimens resemble similar forms collected by the author from the Muth Quartzite of several parts of the Himalayas and the Middle Devonian fauna described by REED (1908) from the Padaukpin Limestone, Northern Shan States, Burma.

Specimen no. 75 can be compared with the world known species *Atrypa reticularis*. *Atrypa reticularis* is known from Middle Devonian rocks of several parts of Asia including the Himalayas (GUPTA, 1970 a) and Burma (REED, 1908). Specimen no. 34 has a well preserved cast of *Schellwienella williamsi* which resembles in all its characters the type species described by GUPTA (1969) and GUPTA and BATES (1968). The specimen from Nepal has well preserved surface ornamentation; umbo inflated; interarea apasacine, delthyrium open; dental lamellae diverge from each other at less than 90° with well developed crural fossettes. *Schellwienella williamsi* has been described from the Middle Devonian Muth Quartzite of Kashmir (GUPTA, 1969), Ladakh and Lahaul-Spiti (GUPTA, 1970 b). Another piece of the same specimen (no. 75) has poorly preserved *Palaeoneilo* aff. *plana*, *Nucula* (?), and *Salopina* sp. All these forms are also known from the Middle Devonian of the Himalayas and Burma.

On the basis of forms referred above it can be concluded that the fossiliferous horizon undoubtedly belongs to Middle Devonian age.

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## Note on the Age of the Kalhel Limestone, Chamba Dist., H. P.

V. J. GUPTA \*)

The present note is important in that it defines the stratigraphic position of the Kalhel Limestone and associated rocks exposed around Kalhel ( $32^{\circ} 45' 00''$  N :  $76^{\circ} 11' 28''$ ) on fossil basis. This note may be read as a supplement to the detailed paper published by FUCHS & GUPTA (1971) on the Palaeozoic stratigraphy of Kashmir, Kishtwar and Chamba regions. The Geological section as worked out by FUCHS on the basis of his field observations is given in the abovementioned paper.

The blue and grey limestone succession in the area around Kalhel conformably overlies the Agglomeratic Slates and trap succession of the Chamba syncline (FUCHS & GUPTA, 1971, p. 94). McMAHON (1883, p. 40) reported the occurrence of crinoid ossicles from the limestone succession and considered it to be of Upper Silurian age. GUPTA & BEDI (1970) on the basis of a poorly preserved ammonite assigned Lower to Middle Carboniferous age for it. FUCHS (personal communication) on the basis of his field observations considered this limestone in parts to be equivalent of Zewan Series and in parts to the Triassic succession of Kashmir.

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Address: V. J. GUPTA, Centre of Advanced Study in Geology, Panjab University, Chandigarh.

The abovementioned field observations of FUCHS have been proved by the find of fossils from the Agglomeratic Slates and Kalhel Limestone exposed between Tissa and Kalhel.

The fossils from the Agglomeratic Slates from the road section north of Mandwal on the Tissa-Kalhel road include *Spirifer nagmarensis*, *S. spitiensis* and a poorly preserved bryozoan. All these forms are known from the Agglomeratic Slate succession of the Kashmir Valley.

The fauna from the blocks of Kalhel Limestone lying near Sathiala on the foot path between Kalhel and Tissa has yielded a few poorly preserved brachiopods and one fairly well preserved specimen of a pelecypod. Among the forms identified from these limestones are *Lyttonia* sp., *Enteletes* sp., *Productus* sp. and *Bakewellia parva*.

*Lyttonia* is a characteristic Permian genus known from China, Japan, Indo-China, Salt Range, Kashmir etc. In Kashmir this genus is found in the *Protoperora* Zone of Zewan Series. *Bakewellia parva* has been reported from the Permian rocks of Kansas (MOORE et al., 1952, p. 424).

On the basis of the fossils found in the succession under discussion it can be concluded that the Kalhel Limestone corresponds to the Zewan Series of Kashmir. The dolomitic and quartzitic portions of the limestone succession exposed along the road SW of Kalhel may correspond to the lower part of the Triassic of Kashmir.

The author is grateful to Dr. G. FUCHS for giving details of his field observations, going through the manuscript and for the useful suggestions which he gave from time to time.

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