THE ALI MASJID GROUP, JAMRUD, KHYBER AGENCY

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ABSTRACT

Of all the formations exposed in the north of Jamrud, the Ali Masjid Formation is the most diverse lithologically. A detailed work revealed that the so-called Ali Masjid Formation contains many well-defined and stratigraphically valid formations. As such the Ali Masjid Formation is considered here as a group. Evidence for this conclusion consists of:

(i) The snowy white and grayish-white quartzites, which form the base of the group, are traceable over most of the Khyber Agency, Mulla Gori, and in Hazara.

(ii) The Kandar Phyllite, a formation of considerable distribution, ranges in thickness from 600 to 900 feet. Both lithologically and palaeotologically, it is distinguishable from the underlying and the overlying rocks.

(iii) The Ghundai Sar Reef, already recognized as the Nowshera Formation (Siluro-Devonian), forms a part of the Ali Masjid Group.

(iv) The quartzite conformably overlying the Nowshera and other reef carbonates and measuring about 600 feet in thickness is recognized as the Misri Banda Quartzite.

(v) The Warran Ghundai Formation, about 1,200 feet thick, is both lithologically and palaeontologically different from other formations exposed in the area. It represents varieties of environment of deposition.

INTRODUCTION

In the Khyber Pass, near the village of Ali Masjid (lat. 34°02′N, log. 71°15′ E), Stauffer (1966, 1967) recognized a formation above the Shagai Limestone which was divisible into two distinct units—a lower member of tuffaceous slaty shales measuring 400 feet in thickness and an upper member of gray coloured quartzite measuring 60

feet in thickness — which he named collectively as the Ali Masjid Formation. Stauffer's investigations were limited only along the Khyber Pass, he could record the lithological heterogeneity of the Ali Masjid "Formation".

During 1968, 1969, and 1970, the writer had numerous opportunities to visit Khyber Agency. During these visits a number of observations were made. In 19 and 1970, in the course of geological mapping, it was observed that Stauffe Ali Masjid Formation was an extremely heterogeneous assemblage of rock un Each of these units deserves a status of an individual and well-defined stratigrap formation. These differentiated formations are genetically associated with ea other and represent deposition from (?) Middle Silurian to (?) Carboniferous tin over a fairly large area as evident from the extensive distribution of the various uni

Other investigators have also noted the heterogeneous composition of the Masjid "Formation". Ibrahim Shah (1969) states that the "Ali Masjid Formati ....lies superpositionally over the Shagai Limestone. In the Khyber Pass, Masjid Formation is composed of "varicoloured" shales, siltstones, sandston quartzite and limestone. To the west of Khyber Pass this formation changes fac from predominantly shales and quartzite to limestone, in places it is reefoid" (p. 3

It is notewrothy that north of Jamrud the Ali Masjid Formation of Staul (1966, 1967) is exposed with its full lithological manifestations. Structurally t stretch of rocks, overlying the Landikotal Slate and extending up to the southe bank of the Kabul River, appears to be pushed over from east or northeast. Howev it was observed that the various rock units comprising this block occur in s in Mulla Gori (Khyber Agency), traceable for miles without any break, and ha remarkable lithological affinities with the Ali Masjid "Formation" of Stauffer a Shah. It is to be noted that the entire outcrops are in alignment with the regio strike of the definitely known, and probable Siluro-Devonian formations of t Northwestern Pakistan.

Many of the rock units, exposed in the sequence comprising the so-called Masjid Formation, have already been recognized as definite and distinct stratigrapl formations (*viz.* the Kandar Phyllite, the Nowshera Formation, and the Misri Ban Quartzite (Stauffer, 1968). As such the writer believes that it will be more logical call the Ali Masjid "Formation" a "Group".

In this paper, each unit is lithologically examined and described. Appropria names for these units are suggested after the appropriate and easily accessible localiti In the proposed correlation chart, which is included in the present issue, the Masjid is treated as a "Group" and only lithological names are assigned to vario

On the basis of stratigraphic succession, lithological, and palaeontological similarities, the names Kandar Phyllite, Nowshera Formation, and Misri Banda Quartzite, as proposed by Stauffer (1968), are extended to Phyllite, reef carbonate and quartzite of Guddar — Warran Ghundai Section.

TYPE SECTION

The stretch of the sedimentary and metasedimentary rocks, intruded by acidic and mafic rocks, between Guddar (lat.34°N and long. 71°02'E) and Warran Ghundai (lat. 34° 3'N and long. 71° 22'E) constitutes the type section for the various formations distinguished within the proposed "Ali Masjid Group". The following is the description in sequential order of various formations (N to S approximately):

(vi) Warran Ghundai Formation.

Dominantly metasedimentary rocks of mostly gray, dark gray, and grayish-brown colours. Slates, phyllites, quartzites with interbedded thin dolomitic limestone containing abundant crinoidal columnals, fragments of brachiopod shells, and Bryozoa. The limestone beds occur throughout the thickness of the formation associated with the graphitic schist showing pinch and swell structure. The alternation of limestones, quartzites, and graphitic schists is suggestive of cyclic sedimentation occasionally in swampy and lagoonal environments (as indicated by the presence of graphitic schists—the metamorphic equivalents of the originally deposited carbonaceous shales). The entire formation forms a flat surface which is repeatedly interrupted by ridges formed by more weather-resistant and hard rocks like dolomitic limestones, quartzites, and intrusive rocks like pure milky white quartz and (?) aplitic veins.

The Warran Ghundai Formation conformably overlies the Misri Banda Quartzite and is the youngest formation in the Ali Masjid Group. It measures 1,200 feet in thickness. On the basis of superposition a Carboniferous age is assigned.

(v) Misri Banda Quartzite (Stauffer, 1967 and 1968).

The name Misri Banda Quartzite was coined by Tiechert and Stauffer (1965), and Stauffer (1968) to describe the quartzite conformably overlying the Nowshera Formation of the Nowshera reef complex. The same name is assigned to the quartzite which conformably overlies the reef carbonates at Ghundai Sar.

The Misri Banda Quartzite, which ranges in thickness from 300 to 600 feet, is dominantly pinkish-white and grayish-white in colour. It is composed of medium to coarse, texturally and mineralogically mature quartz sand. Massive, cross-bedded, and rarely ripple-marked. The textural and mineralogical maturity is suggestive of considerable transport and repeated winnowing before final deposition. Forms prominent escarp.

The Misri Banda Quartzite may represent deposition from Middle Devonian to Carboniferous.

(iv) **Nowshera Formation** (Stauffer, 1967 and 1968).

Mainly dolomitized limestones and dolomites, converted to white and pinkish-white marble by regional metamorphism. The entire formation is abundantly fossiliferous. *Favosites*, *Heliolites*, *Thamnopora*, *Cladopora*, remains of crinoidal columnals and stems, obliterated rugose corals, orthoconic nautiloids, and massive colonies of stromatoporoids occur throughout the thickness of the formation. The abundance of reef building organisms suggests that the entire formation represents the reef core or the axial portion of the reef. Pockets of reef debris or reef breccia, and silty and clayey material also occur within the reef core. This is suggestive of the spongy and cavernous nature of the reef core during its growth. The spongy or cavernous nature of the reef core must have been responsible for its latter dolomitization and partial destruction of fossils. Throughout the thickness, stringers of white and pink orthoquartzite are intercalated with the carbonates of the reef which are 900 feet thick.

The reef breccia pockets contain fragments of stromatoporoids, bryozoan colonies (mostly ? fenestrenellids), and atrypoid brachiopods (? *Atrypa*).

The Nowshera Formation forms rounded and domal hills. It has a gradational contact with the overlying Misri Banda Quartzite and conformably overlies the Kandar Phyllite. On the basis of palaeontological and lithological characters, and stratigraphic position, it is correlated with the Nowshera reef and consequently a Late Silurian-Early Devonian age is assigned to it.

(iii) **Kandar Phyllite** (Stauffer, 1967 and 1968).

Dominantly phyllites and phyllitic-schist of brown and grayish-brown colour constitute this formation. It is profusely interbedded with crinoidal limestone of brown and grayish-brown colour. The limestone bands contain abundant remains of crinoids, mainly disarticulated stems. No other fossil is found in the Kandar Phyllite. It is most probable that "the phyllites (orginally shales), along with the interbedded crinoidal limestone provided a sea bed upon which the reef growth took place" (Khan, 1969, p. 79). It is to be noted that characteristic fossils of the overlying Nowshera Formation are conspicuously absent from the limestone bands interbedded with the phyllites. "Although tabulate and rugose corals are not usually associated with argillaceous facies, such organisms would, if present, be found in the limestone strata, as well as the crinoids. As they are lacking in the limestone strata also.....the contact between them could be an unconformity (Khan, 1969, p. 79). However, it conformably overlies the Oosi Nala Limestone.

The Kandar Phyllite is intruded by the sills of mafic rocks such as gabbro and dolerite. These intrusions have caused soapstone mineralization at various stratigraphical levels within them and in limestone overlying the Kandar Phyllite. It forms a well marked and continuous escarpment marked by white pockets of soapstone. The thickness of the formation ranges from 600 to 900 feet.

The phyllite is correlated with the phyllites exposed at the base of the Nowshera Formation in Nowshera and Akora Khattak. An age between Middle and Upper Silurian is assigned to the formation.

(ii) Oosi Nala Limestone.

This unit is composed mainly of light gray and grayish-brown autoclastic and lithographic limestones interbedded with silty shales. Abundant large fragments, mostly angular, of fine-grained gray quartzite (from the underlying gray quartzite) are incorporated within this unit. A thorough search for fossils was made without any success.

The Oosi Nala Limestone is intruded by mafic rocks causing the development of soapstone lenses. It forms escarpment and steep dip-slopes along the western bank of the Oosi Nala. The total thickness of the unit is 100 feet.

On the basis of superposition an age between Middle and Upper Silurian is assigned.

(i) Spin Rag Quartzite.

The Spin Rag Quartzite forms the basal unit of the Ali Masjid Group. The formation can be divided into two parts on the basis of colour and texture. The lower part is characterized by snowy white colour, almost pure in composition, and massive to thick bedded with prominent cross bedding. The average particle size ranges from coarse sand to medium sand. Excellent sorting, well rounded grains, high sphericity, and quartz enlargement are other characteristics of the lower part of the Spin Rag Quartzite.

The upper part is formed by gray and grayish-brown cross-bedded quartzite. The average particle size ranges from medium to fine grade sand. It is also characterized by excellent sorting, however, the entire upper part is composed of poorly rounded to sub-angular grains with low sphericity.

The textural difference between the lower and upper parts of the Spin Rag Quartzite can be attributed to the differential settling velocities of the two types of sands. The more spherical and rounded particles comprising the lower part settled faster, whereas the angular and less spherical particles comprising the upper part of the quartzite remained in suspension and settled afterward. The colour difference is

mainly due to the presence of calcareous cement in the upper part which weathers to various shades of gray and grayish-brown colours. The colour difference is also partly due to the leaching of iron oxides from the overling Oosi Nala Limestone.

The Spin Rag Quartzite represents blanket sand deposited under stable conditions with very mild subsidence during its accumulation, and with considerable transport and repeated winnowing before final deposition. It is 100 to 120 feet thick and forms a prominent white escarpment, the highest point of which is known as "Spin Rag."

It lies over the Landikotal Slate of deep eugeosynclinal origin with a thrust contact. The upper contact of the Spin Rag Quartzite with the overlying Oosi Nala Limestone appears to be conformable.

The Spin Rag Quartzite is correlated with the Tanawal Quartzite and consequently is assigned a Middle Silurian to Upper Silurian age.

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