

The Stratigraphic Section on the Southern Slope of Handyside Fort, Kohat, West Pakistan

By

MOHAMMAD A. KHAN

ABSTRACT

The area of investigation which lies on the southern slope of the Handyside Fort is formed of formations of Upper Mesozoic and Cenozoic ages.

The formations of Upper Mesozoic age are represented by Oolitic Limestone-Late Jurassic, Green Shale-Lower Cretaceous, Sandy-shale and Silt-stone Middle Cretaceous, and Limestone-Middle Cretaceous. The formations of Cenozoic age are represented by Nodular Limestone - Palaeocene and Gritstone-Conglomerate- Shale- Palaeocene.

Of all the formations, the Gritstone, Conglomerate, and Shale represent deposition under fluvial, fluvio-lacustrine, and lacustrine conditions.

The carbonate rocks (mainly limestone) account for more than three-fourth of the total thickness of the strata exposed in the area of investigation.

The area is very much disturbed. Intense folding and faulting which occurred during the Tertiary Era has complicated the stratigraphy and structure of the area.

INTRODUCTION

During a short trip to Kohat on a geological excursion the writer came across an interesting section exposed in a nala on the southern slope of the Handyside Fort. This section lies in the middle of the ranges which run from Attock to Khyber Agency and ultimately into Afghan territory.

The Kohat region as a whole is an interesting and important geologic province as it marks the break in the otherwise continuous argillaceous facies which is overwhelmingly displayed in Attock, Cherat, and Khyber Agency.

The Kohat Region was previously mapped and described geologically. However, no information is available about the section described in the present paper. This particular section is of great stratigraphic significance as it represents the formations from Jurassic to Palaeocene. In order to work-out the stratigraphy of the Kohat Region this section affords good starting point. The present paper is based on the preliminary investigations.

JURASSIC LIMESTONE

In the area of investigation, the oldest formation exposed is limestone though not very thick can, however, be classified into two types mainly on the basis of texture and bedding nature. The two main types distinguished are:

- ii. Massive-oolitic limestone
- i. Thin—bedded nodular limestone

Thin-Bedded Nodular Limestone

This unit is largely composed of light-gray to dark-gray limestone which is finely-crystalline to aphanitic in texture. The thickness of individual beds varies from 2 inches to 4 inches. No fossils are found. However, in the upper part of this unit the limestone is comparatively thick bedded. It is light-gray in colour and is interbedded with marly layers. It contains organic remains which are mainly fragments of megafossils. These fragments of megafossils indicate the prevalence of high energy environments and shallow conditions during its deposition.

Massive-oolitic Limestone

The above described unit is overlain by thick-bedded oolitic limestone which again contains abundant megafossil fragments. This unit shows greater affinities to the Baroch Limestone of the Surghar Range (Kalabagh) and the Samanasuk Limestone of the Samana Range (Kohat) respectively.

Age and Correlation

On the basis of the order of superposition of strata and the gross lithologic characteristics, this limestone is correlated with the Samanasuk Limestone of Upper Jurassic age. The total thickness of the unit is 40 feet.

waters, whereas, the middle and upper part of the formation is deposited under deep waters.

Age and Correlation

On the basis of the faunal assemblage the Green Shale is correlated with the Chichali formation formerly known as Belemnite Shale of the Kohat Range. The total thickness of the formation is 25 feet.

MIDDLE CRETACEOUS SANDY-SHALE AND SILTSTONE

Brownish-Shale and Siltstone

The Green Shale is overlain by brown and siltstone which frequently contains glauconite.

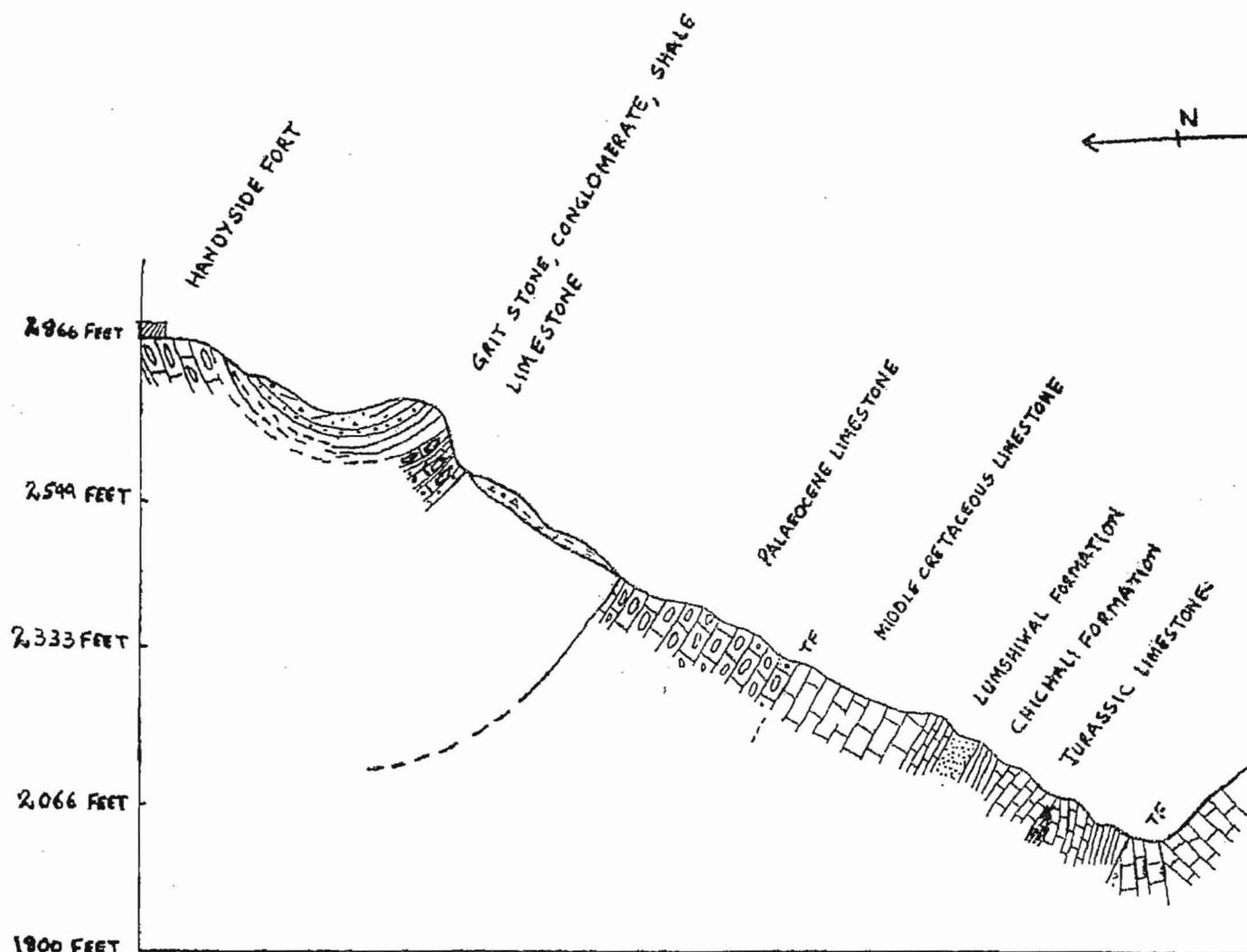


FIG. 1.— STRATIGRAPHIC SECTION ON THE SOUTHERN SLOPE OF
HANDYSIDE FORT, KOHAT.
(EXAGGERATED)

CRETACEOUS SHALE

Green Shale

The massive-oolitic limestone is unconformably overlain by the Green Shale. The unconformity is marked by the loss of formation, abundance of iron concretions, and disarticulated and derived fossils.

The Shale is composed of greenish-gray shale which is sandy in the lower part. Lenticles of sandstone containing glauconite are common. The lower part of the formation indicates deposition under shallow

Age and Correlation

On the basis of the order of superposition and lithologic characteristics, the formation is correlated with the Lumshihal formation. The total thickness of the formation is 5 feet.

Finely-Crystalline and Aphanitic Thin-Bedded

The sandy-shale and siltstone is overlain by gray, finely-crystalline to aphanitic limestone. It breaks with a conchoidal fracture.

when struck with the hammer breaks into splinters and sharp angular fragments with a metallic tone.

In the lower part it is sandy. No megafossils are found, however, microfossils are abundant. *Globotruncana* and *Gumbelina* are the most abundant of all the microfossils.

Age and Correlation

On the basis of fossils and lithologic characteristics this formation is correlated with the Darsamand Limestone. The total thickness of the limestone is 200 feet.

PALAEOCENE LIMESTONE

Nodular Limestone

The Darsamand Limestone is overlain by the light-gray limestone which weathers to dark-gray colour. It is coarsely crystalline and is nodular. Marly layers measuring 2 inches to 3 inches thick are interbedded with the nodular limestone. The nodular limestone is rich in both, microfossils and megafossils of which Foraminifera and corals are noteworthy.

Age and Correlation

The nodular limestone has direct contact with the Middle Cretaceous Darsamand Limestone because of faulting (fig. 1). The Palaeocene unconformity, which intervenes between the Mesozoic and Cenozoic formations, is not recognised here. However, on the basis of the faunal assemblage the formation is correlated with the Palaeocene Limestone of Attock and Cherat regions. The total thickness of the unit is 350 feet.

The Palaeocene Gritstone, Conglomerate, and Shale

The Palaeocene Nodular Limestone is unconformably overlain by 80 feet of the Gritstone, conglomerate, and shale. The whole formation indicates deposition under continental environments.

The gritstone and conglomerate are dark-rusty brown in colour and are composed of chert and limestone pebbles. The gritstone and conglomerate show prominent cross-bedding which indicates deposition under fluvial, fluvio-lacustrine, and lacustrine conditions.

The shale which is khaki-green in colour occurs in the upper part and probably represents residual type of deposit.

Age and Correlation

The exact stratigraphic position of the gritstone, conglomerate, and shale is not known. In the present paper this whole formation is placed in Late Palaeocene.

The total thickness of the formation is 80 feet.

GEOLOGIC HISTORY

The strata exposed in the area of investigation represent deposition from Upper Jurassic to Lower Tertiary. Sedimentation in the area, probably, started during marine transgression in the Late Jurassic. Shallow depths and warm temperatures seem to have persisted till the advent of the Cretaceous period. The evidence for the prevalence of shallow conditions is furnished by the massive accumulation of oolitic limestone rich in the fragments of Jurassic megafossils. Throughout Cretaceous period, a comparatively deep marine environment seems to have prevailed. During this period calcareous, argillaceous, siliceous, and glauconitic sediments were deposited.

By the late Cretaceous, shallow conditions were set as a result of orogenic movements. The sea withdrew from the area by the close of Cretaceous period and continued uplift of the area caused rapid removal of much of the Cretaceous formations. The Upper Cretaceous formation is completely lacking in the area.

The marine environments staged a return and the Palaeocene Limestone was deposited. No formation younger than the Palaeocene Limestone is exposed in the area. Further south-west younger Tertiary formations are exposed. It is most probable that in the area of investigation, the younger Tertiary formations were either completely removed by the extensive erosion or the area remained positive for the major part of the Tertiary Era.

A summary of the various formations, their lithologic characteristics, and thicknesses is given in table 1.

TABLE :—1

AGE		FORMATION	LITHOLOGIC CHARACTERISTICS	THICKNESS (FEET)
CENOZOIC	PALAEOCENE (LOCKHART)	Palaeocene Limestone	Limestone, light — gray to gray; coarsely crystalline, nodular; fossiliferous.	300 — 350
		Grit, Con- glomerate, and shale	Grit, darkbrown, coarse—grained, cross—bedded, mass- ive Conglomerate, dark redish brown chert and limestone pebbles, Shale, Brownish—green, blocky, ocassionally silty.	30 — 50
(UNCONFORMITY)				
MESOZOIC	CRETACEOUS (LOWER AND MIDDLE)	Drasamand Limestone	Limestone; Light—gray, finely—crystalline to aphanitic thin—bedded. Brittle breaks with conchoi- dal fracture. Fossiliferous, mainly genus <i>Globotruncana</i> and genus <i>Gumbelina</i> .	25
		Lumshiwai Sandstone	Sandstone and siltstone, brownish—red, intercalated with shale; glauconite present.	4' to 5'
		Chichali Formation	Shale, greenish — gray, greenish — brown sandy and glauconitic in lower part. Abundance of fossils—mainly <i>Belemnites</i> .	25' + —
	LATE JURASSIC	Samanasuk Limesotne	Limestone, light—gray, oolitic, massive, fossiliferous. Lower part mainly nodular, thin bedded and thick bedded alternately.	40' +

Table :— STRATIGRAPHY OF SOUTHERN SLOPE OF HANDYSIDE FORT, KOHAT.