

**SEDIMENTOLOGY, SEQUENCE STRATIGRAPHY
AND GEOCHEMICAL INVESTIGATIONS OF EARLY
EOCENE NAMMAL FORMATION, SALT RANGE,
PAKISTAN**



A thesis submitted to Bahria University, Islamabad in the partial fulfillment of the requirement for the degree of Masters of Science in Geology

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2016

CERTIFICATE OF ORIGINALITY

This is to certify that the intellectual contents of the thesis

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INVESTIGATIONS OF EARLY EOCENE NAMMAL FORMATION, SALT
RANGE, PAKISTAN**

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ABSTRACT

Eocene carbonate rocks show good outcrop exposures for the sedimentological studies in the Salt Range. In the present research work, Nammal Formation of Eocene age is selected for detailed sedimentological studies and depositional setting. Detailed Sedimentological studies were carried out based on data from 3 different stratigraphically important sections in the Salt Range from East to West (Tatral, Bestway Quarry near Katas, Nammal Gorge). Lithologically, the formation consists of interbedded nodular limestone, Marl and Shale. The Microfacies identified are mudstone, wackstone to packstone and grainstone in a fine grained matrix with abundant bioclasts of benthic foraminifera. The Nammal Formation presents retrogradational facies suggesting the Transgressive System Tract (TST). The Nammal Formation belongs to inner neritic environments because it contains larger benthic foraminifera in large quantities as compared to Planktons and Nano-fossils belonging to genera *Lockhartia*, *Assilina*, *Nummulites*, *Alvolina* and *Discocyclina* that are characteristic of shallow shelf environment. It suggests a carbonate platform deposition. Diagenetic features such as partial to complete neomorphism, obliteration of tests of foraminiferas, secondary cementation and partial dolomitization are observed in thin sections and outcrop studies. The TOC studies of 9 samples of shale and limestone were carried out. The TOC values are 0.0812. This suggests that no organic matter is present in Nammal Formation and has no Source Rock Potential. Lack of TOC may be caused by the oxidation of organic matter from the shale. Outcrop samples were used rather than core samples for analysis.

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ABBREVIATIONS

A.D	=	<i>Assilina dandotika</i>
A.G	=	<i>Assilina granulosa</i>
A.L	=	<i>Assilina laminosa</i>
A.S	=	<i>Assilina spinosa</i>
A.SS	=	<i>Assilina subspinosa</i>
A.V	=	<i>Alveolina</i>
ALG	=	<i>Algae</i>
BSF	=	Broken shell fragments
C.K	=	<i>Coskin Rajkanae</i>
D.D	=	<i>Discocyclina dispensa</i>
D.R	=	<i>Discocyclina ranikotensis</i>
I	=	Intraclasts
L.H	=	<i>Lockhartia haimei</i>
L.C	=	<i>Lockhartia conditi</i>
L.T	=	<i>Lockhartia tipperi</i>
L.SN	=	<i>Lockhartia shell neomorphosed</i>
M.T	=	<i>Millioids Triloculina</i>
MKT	=	Main Karakorum Thrust
MMT	=	Main Mantle Thrust
MCT	=	Main Central Thrust
MBT	=	Main Boundary Thrust
N	=	<i>Nodusaria</i>
N.A	=	<i>Nummulites atacicus</i>
N.M	=	<i>Nummulites mamilatus</i>
N.G	=	<i>Nummulites globulus</i>

N.S = Neomorphosed Shell

O.B = *Orbito cyclipeus*

P = Planktons

P.E = Pelecypods

SRT = Salt Range Thrust

S.T = *Setia tribecia*

V.A = *Vania antolica*

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