Dedicated to

My Parents,

My Mentor, Dr. Min Bahadur

And

My Husband

DECLARATION

I declare that the thesis entitled "**Cytogenetic Divergence in the Indian Pygmy Field Mice *Mus terricolor*, Blyth of The Dooars and Terai regions of West Bengal**" has been prepared by me under the guidance of Dr. Min Bahadur, Professor of DEPARTMENT OF ZOOLOGY, UNIVERSITY OF NORTH BENGAL. No part of this thesis has formed the basis for the award of any degree of fellowship previously.

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CERTIFICATE

I certify that Ms. MAHUA RUDRA has prepared the thesis entitled "**Cytogenetic Divergence in the Indian Pygmy Field Mice *Mus terricolor*, Blyth of The Dooars and Terai regions of West Bengal**" for the award of Ph.D. degree of the University of North Bengal, under my guidance. She has carried out the work at the Department of Zoology, University of North Bengal.

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ABBREVIATIONS

APD	:	Alipurduar
BDN	:	Bidhan Nagar
CBH	:	Cooch Behar
GDH	:	Garidhura
KGM	:	Kumargram
MLB	:	Malbazar
MNG	:	Maynaguri
NGK	:	Nagraka
NXL	:	Naxalbar
RBD	:	Rohimabad
mtDNA	:	mitochondrial DNA
Mya	:	million years ago
RFLP	:	Restriction fragment length polymorphism
PCR	:	Polymerase Chain Reaction
NOR	:	Nucleolus Organizer region
rDNA	:	Ribosomal DNA
FISH	:	Fluorescence in situ hybridization
UBF	:	Upstream Binding Factor
SL1	:	Promoter selectivity factor
Topo I	:	DNA topoisomerase I
RP 1	:	RNA polymerase 1
IGS	:	intergenic spacer
SatDNA	:	Satellite DNA
F-statistics	:	Statistics of Fixation Index
Nm	:	Gene flow
I	:	Nei's Genetic identity
A_E	:	Effective number of allele

H_o	:	Observed heterozygosity
H_E	:	Expected heterozygosity
D	:	Nei's Genetic Distance
HVR I	:	Hypervariable Region I
HVR II	:	Hypervariable Region II
dNTPs	:	deoxynucleotides
ddNTPs	:	dideoxynucleotides
UPGMA	:	Unweighted pair group method with arithmetic mean
π	:	Nucleotide diversity
NJ	:	Neighbour joining analysis
MP	:	Maximum parsimony

PREFACE

Indian subcontinent has been proposed as the place of origin of genus *Mus* and is the habitat of largest number of *Mus* species. The Indian pygmy field mice, *Mus booduga* and *Mus terricolor* (= *M. dunni*) are sibling species of India and occur in the same habitat. They heavily infest wheat and paddy fields, however, show differences in site preference for burrows. Both have 2n=40 chromosomes. *M. terricolor*, in comparison to conserved karyotype of *M. booduga* with all acrocentric chromosomes, possesses divergent karyotypes with large submetacentric X and large acrocentric Y- chromosomes which is a unique feature of the species. Divergent karyotypes in *M. terricolor* are due to the presence of variable number of heterochromatic short arms on the autosomes. This species is a chromosomal complex with three distinct chromosome types I, II and III having apparently non-overlapping distribution.

M. terricolor chromosome type I, distributed in Northern India; Goa, Pune and Kolhapur in Western India; Jhansi in the Central India and as far as Alipurduar in Eastern India, have all acrocentric autosomes with minute heterochromatic short arms. The chromosome type II has been shown to be distributed in Mysore and Erode possessing two submetacentric autosome pairs 1 and 3 with heterochromatic short arms while the other autosomes are either telocentric or acrocentric with C-band positive minute arms. The populations of *M. terricolor* from Chennai (Madras), Tirupati, Pondicherry and Madurai are chromosome type III having autosome pairs 1, 3 and 6 with heterochromatic short arms. The large submetacentric X and the large acrocentric Y are identical in all types of *M. terricolor*. The short arm of X and the entire Y in *M. terricolor* are heterochromatic. Studies have also shown qualitative as well as quantitative differences in heterochromatin between *Mus terricolor* and its sibling species, *Mus booduga*.

The karyotype differentiation due to acquisition of heterochromatin in *Mus* terricolor complex indicates that it is still in the process of evolutionary divergence and has been considered as an incipient species. Therefore, *Mus terricolor* complex provide a novel model system to investigate the role of heterochromatin in evolutionary differentiation of species.

In this investigation a study on cytogenetic, allozyme and mitochondrial DNA of M. terricolor type I has been carried out from different populations of Terai and the Dooars of Darjeeling foot hills. The Section-3 of this dissertation deals with intra and inter population variation of constitutive heterochromatin and nucleolus organizing regions (NORs), the Section-4 is devoted to electrophoretic study of some enzyme and non-enzyme protein loci, the Section-5 deals with the analyses of sequence variation of control region of mtDNA and conclusion of the entire study has been included in the Section-6.

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