CONTENTS

Declaration ii
Certificate iii
Acknowledgements iv
List of abbreviations x
List of tables xii
List of figures xv
List of plates xviii

Chapter 1  INTRODUCTION  1-26

1.1.  Background and Scope of the study  1
1.2.  Objectives of the study  8
1.3.  Description of the species  9
1.3.1.  Family Palinuridae  9
1.3.2.  Family Scyllaridae  16

Chapter 2  REVIEW OF LITERATURE  27-59

SECTION-A  LOBSTERS- THE PRESENT PROFILE  27-36

2A.1.  Lobsters of the world: genera, species, classification and time of evolution  27
2A.1a.  Family Palinuridae and Scyllaridae  27
2A.1b.  Offshore shift and diversification  30
2A.2.  Commercial importance of lobsters- catch, fishing areas, species and aquaculture  30
2A.3.  Biology, aquaculture importance, breeding and larval dispersal of lobsters  32
2A.4.  Lobsters of the Indian Seas: Commercial importance, fishery, species distribution and abundance along the Indian coast  34

SECTION- B  MOLECULAR MARKERS  36-59

2B.1.  Need for genetic markers  36
2B.2.  Molecular markers in use for population and phylogenetic studies  38
Chapter 3. MATERIALS AND METHODS

3.1. Collection of samples
3.1.1. Population genetic study of lobsters
3.1.2. Species-specific DNA signatures
3.2. Genomic DNA isolation
3.3. Methods employed in population genetic study of lobsters
3.3.1. Random Amplified Polymorphic DNA (RAPD)
3.3.2. Hypervariable COI region of mitochondrial DNA
3.4. Species-specific DNA signatures and phylogenetic study of 11 species of lobsters
3.4.1. PCR amplification
3.4.2. Phylogenetic analysis using species-specific DNA markers

Chapter 4 RESULTS

4A. Population genetic structure analysis of Panulirus homarus homarus and Thenus unimaculatus
4A.1. Population structure analysis using RAPD PCR
4A.1.1. Panulirus homarus homarus
4A.1.2. Thenus unimaculatus
4A.2. Population genetic structure analysis of lobster species using hypervariable COI region of mtDNA
4A.2.1. Panulirus homarus homarus
4A.2.2. Analysis of *Thenus unimaculatus* populations 104

**4B. DNA barcoding and phylogeny** 112

4B.1. Mitochondrial DNA analysis of eleven species of lobsters along the Indian coast 113
- 4B.1a. COI gene 113
- 4B.1b. 16SrRNA 118
- 4B.1c. 12SrRNA 121
- 4B.2 Analysis of nuclear 18SrRNA gene among 11 species of lobsters 125
- 4B.3. Combined mitochondrial DNA data set analysis 126

**Chapter 5 DISCUSSION** 133-173

5A. Genetic structure analysis of *Panulirus homarus homarus* and *Thenus unimaculatus* along the Indian Coast 133-161

- 5A.1. RAPD markers 134
  - 5A.1.1. Genetic variability in RAPD analysis 135
  - 5A.1.2. Genetic differentiation and gene flow 138
  - 5A.1.3. Genetic distance between populations 139
- 5A.2. Hypervariable mitochondrial COI marker 143
- 5A.2.1. Intra-specific variability and population structure 144
- 5A.2.2. Demography 149
- 5A.3. Hypothesis for connectivity and panmixia in spiny and slipper lobster populations along the Indian coastline 150
- 5A.4. Comparative assessment of RAPD and mtDNA marker studies in population structure of lobsters 156
- 5A.5. Management implications of the present study 157

5B. Barcoding and phylogeny of eleven commercially important species of lobsters along the Indian coast 162-173

- 5B.1. Morphological groupings of the species 163
- 5B.2. Nucleotide composition comparisons in the sequence data sets 164
- 5B.3. Parsimony information from various data sets 166
- 5B.4. Intra-specific variation in sequence data 166
- 5B.5. Inter-specific and inter-generic sequence divergence 167