

CONTENTS

| | Page |
|---|------|
| Acknowledgements | xi |
| List of Tables | xiii |
| List of Figures | xvii |
| List of Plates | xxi |
| SUMMARY | 1 |
| CHAPTER 1 General Introduction | 4 |
| 1.1 Definitions | 5 |
| 1.2 Regional Role of Mangroves | 5 |
| 1.3 Mangroves of Sri Lanka | 6 |
| 1.4 Value of mangroves and the environment as a resource - Sri Lanka context | 7 |
| 1.4.1 Products | 9 |
| 1.4.2 Amenities | 9 |
| 1.5 Study area | 9 |
| 1.6 Objectives | 12 |
| CHAPTER 2 Distribution, Extents and Classification of Mangrove Ecosystems (Mangals) in Puttalam Lagoon and Dutch Bay | 13 |
| 2.1 Introduction | 19 |
| 2.1.1 Distribution and extent | 19 |
| 2.2 Materials and Methods | 22 |
| 2.3 Results | 22 |
| 2.3.1 Riverine mangals | 30 |
| 2.3.2 Fringe and Overwash mangals | 33 |

| | | |
|-----------|---|----|
| 2.3.3 | Scrub mangal | 36 |
| 2.3.4 | Salt marsh communities | 39 |
| 2.4 | Discussion | 39 |
| CHAPTER 3 | Structural Properties of Mangals in Puttalam Lagoon and Dutch Bay | 41 |
| 3.1 | Introduction | 42 |
| 3.2 | Materials and Methods | 43 |
| 3.2.1 | Floristic composition | 43 |
| 3.2.2 | Community structure | 43 |
| 3.2.2.1 | Stand density | 45 |
| 3.2.2.2 | Basal area | 45 |
| 3.2.2.3 | Mean stand diameter | 46 |
| 3.2.2.4 | Tree height | 47 |
| 3.2.2.5 | Complexity index | 47 |
| 3.2.2.6 | Standing above-ground biomass | 47 |
| 3.2.2.7 | Leaf area index (LAI) and canopy cover | 49 |
| 3.2.2.8 | Relative density, dominance frequency and importance values of mangrove species | 50 |
| 3.3 | Results | 51 |
| 3.3.1 | Floristic composition | 51 |
| 3.3.2 | Community structure | 51 |
| 3.3.2.1 | Stand density | 51 |
| 3.3.2.2 | Stand basal area, mean stand diameter and stand height | 52 |
| 3.3.2.3 | Complexity index | 52 |
| 3.3.2.4 | Above-ground biomass | 52 |
| 3.3.2.5 | Leaf area index and canopy cover | 53 |

| | | |
|-----------|--|-----|
| 3.3.2.6 | Relative density, dominance, frequency and importance values of constituent species | 53 |
| 3.3.3 | Distribution of true mangrove species and ecological features | 82 |
| 3.3.4 | Mangrove associated species | 90 |
| 3.4 | Discussion | 91 |
| 3.4.1 | Floristic composition | 91 |
| 3.4.1.1 | Number of species | 91 |
| 3.4.1.2 | Distribution of species | 93 |
| 3.4.1.3 | Zonation of species | 94 |
| 3.4.2 | Structural parameters | 97 |
| 3.4.2.1 | Tree density | 97 |
| 3.4.2.2 | Mean stand diameter | 104 |
| 3.4.2.3 | Stand basal area | 105 |
| 3.4.2.4 | Stand height | 105 |
| 3.4.2.5 | Complexity index | 105 |
| 3.4.2.6 | Above-ground biomass | 105 |
| 3.4.2.7 | Leaf area index and canopy cover | 106 |
| CHAPTER 4 | Above-ground Net Primary Productivity and Detritus Production in the Mangals in Dutch Bay | 109 |
| 4.1 | Introduction | 110 |
| 4.2 | Materials and methods | 113 |
| 4.2.1 | Litterfall | 113 |
| 4.2.2 | Leaf litter turnover rates | 116 |
| 4.2.3 | Above-ground woody biomass production | 116 |
| 4.2.4 | Leaf litter decomposition rates | 116 |
| 4.2.5 | Statistical analyses | 117 |
| 4.3 | Results | 118 |

| | | |
|------------|--|-----|
| 4.3.1 | Litterfall | 118 |
| 4.3.2 | Leaf litter turnover rates | 135 |
| 4.3.4 | Annual above-ground woody biomass production | 135 |
| 4.3.5 | Total above-ground net primary productivity (NPP) | 139 |
| 4.3.6 | Leaf litter decomposition rates | 145 |
| 4.4 | Discussion | 154 |
| 4.4.1 | Litter production and turnover rates | 154 |
| 4.4.1.1 | Annual litterfall rates by component | 154 |
| 4.4.1.2 | Seasonality in litterfall | 158 |
| 4.4.1.3 | Leaf litter turnover rates | 160 |
| 4.4.1.4 | Above-ground woody growth of mangroves | 161 |
| 4.4.1.5 | Above-ground net primary productivity (NPP) | 162 |
| 4.4.1.6 | Leaf litter decomposition rates | 163 |
| CHAPTER 5 | General Discussion | 167 |
| REFERENCES | | 178 |
| APPENDICES | | |
| Appendix I | Quantitative structural parameters of the mangals in Puttalam lagoon and Dutch bay | 190 |
| II | Dry weights of leaves, branches, trunk, prop roots and total dry weight of 10 <u>Rhizophora mucronata</u> trees harvested from Kala Oya estuarine mangals. | 191 |
| III | Dry weights of leaves, branches, trunk, prop roots and total dry weight of 10 <u>Rhizophora mucronata</u> trees harvested from Erumathivu fringing mangals | 192 |

| | |
|---|-----|
| IV - Dry weights of leaves, branches, trunk, prop roots and total dry weight of 10 <u>Avicennia marina</u> trees harvested from the riverine mangals of Kala Oya estuary. | 193 |
| V - Dry weights of leaves, branches, trunk, prop roots and total dry weight of 19 <u>Avicennia marina</u> trees harvested from the fringing mangals at Erumathivu island. | 194 |
| VI - Mean monthly and annual litterfall rates in <u>Rhizophora mucronata</u> zone of the riverine mangals at Kala Oya estuary (September 1985-August 1986). | 195 |
| VII - Mean monthly and annual litterfall rates in <u>Rhizophora mucronata</u> zone of the riverine mangals of Kala Oya estuary (September 1986 - August 1987). | 196 |
| VIIIa - Mean monthly and annual litterfall rates in the mixed mangrove zone of the riverine mangals of Kala Oya estuary (September 1985 - August 1986). | 197 |
| VIIIb - Mean monthly and annual litterfall rates by species in the mixed mangrove zone of the riverine mangals of Kala Oya estuary (September 1985 - August 1986). | 199 |
| IXa - Mean monthly and annual litterfall rates in the mixed mangrove zone of the riverine mangals at Kala Oya estuary (September 1986 - August 1987). | 199 |
| IXb - Mean monthly and annual litterfall rates by species in the mixed mangrove zone of the riverine mangals at Kala Oya estuary (September 1986 - August 1987). | 200 |
| X - Mean monthly and annual litterfall rates in <u>Rhizophora mucronata</u> zone of the fringe mangals at Erumathivu island (1985/1986) | 201 |
| XI - Mean monthly and annual litterfall rates in <u>Rhizophora mucronata</u> (water-front) zone of the fringe mangals at Erumathivu island (1986/1987). | 202 |

- XII - Mean monthly and annual litterfall rates in Avicennia marina (back-mangrove) zone of the fringe mangals at Erumathivu island (1985/1986). 203
- XIII - Mean monthly and annual litterfall rates in Avicennia marina zone of the fringe mangals at Erumathivu island (1986/1987). 204
- XIV - Two way analysis of variance for mean monthly litterfall rates in Rhizophora mucronata and mixed mangrove zones of the riverine mangals at Kala Oya estuary during September 1985 - August 1986 and September 1986 - August 1987. 205
- XV - Two way analysis of variance for mean monthly litterfall rates in Rhizophora mucronata and Avicennia marina zones of the fringe mangals at Erumathivu island during September, 1985 - August 1986 and September 1986 - August 1987. 206
- XVI - Two way analysis of variance for mean monthly litterfall rates in Rhizophora mucronata (water-front) zones in fringe (Erumathivu island) and riverine (Kala Oya estuary) mangals during September 1985 - August 1986 and September 1986 - August 1987. 207
- XVII - Two way analysis of variance for mean monthly litterfall rates in the back mangrove zones (A. marina) zone at Erumathivu and mixed mangrove zone at Kala Oya estuary) of the fringe and riverine mangals during September 1985 - August 1986 and September 1986 - August 1987. 208
- XVIII - Two way analysis of variance for mean monthly litterfall rates both in Rhizophora mucronata and back mangrove zones of the fringe mangals at Erumathivu island and the riverine mangals at Kala Oya estuary. 209

| | |
|--|-----|
| XIX - Two way analysis of variance for mean monthly litterfall rates in the water-front (<u>R. mucronata</u> zone) zones and the back mangrove zones in fringe mangals at Erumathivu island and in riverine mangals at Kala Oya estuary during September 1985- August 1987. | 210 |
| XX - Spearman rank correlation coefficients (r_s), computed for mean monthly litterfall (total) in the major zones of the mangals at Kala Oya estuary and Erumathivu island during September 1985 - August 1986 and September 1986 - August 1987. | 211 |
| XXI - Correlation of component and total monthly litterfall in the zones of the mangals at Kala Oya with climatic factors | 212 |
| XXII - Correlation of component and total monthly litterfall in the major zones of the fringe mangals at Erumathivu with climatic factors. | 213 |
| XXIII - Autocorrelation analyses between mean monthly litterfall and mean monthly rainfall. | 214 |
| XXIV - Dry weight of <u>R. mucronata</u> leaf litter remaining over time during decomposition in the major zones of the mangals at Kala Oya estuary and Erumathivu. | 215 |
| XXV - Dry weight of <u>A. marina</u> leaf litter remaining over time during decomposition in the major zones of the mangals at Kala Oya estuary and Erumathivu. | 216 |
| XXVI - Regional comparison of litter production. | 217 |