



Table of Contents

1 Introduction

1.1 Mangroves and their benefits.....	1
1.2 Mangrove forests in Myanmar.....	3
1.3 Adaptation strategies of mangroves.....	7
1.4 Rationale of the study	9
1.5 Objectives of the study.....	11

2 Materials and methods

2.1 Study areas and study sites	12
2.2 General description of the study area in Rakhine State (upper coastal region)	
2.2.1 Location.....	12
2.2.2 Topography and Soil	12
2.2.3 Climate	13
2.2.4 Hydrology and salinity	14
2.2.5 Vegetation	14
2.2.6 Study sites in the upper coastal region, Rakhine state	15
2.3 General description of the study area in Ayeyarwady Region (central coastal region)	
2.3.1 Location.....	18
2.3.2 Topography and Soil	18
2.3.3 Climate	18
2.3.4 Hydrology and salinity	19
2.3.5 Vegetation	20
2.3.6 Study sites in the central coastal region, Ayeyarwady Region	20
2.4 General description of the study area in Tanintharyi Region (lower coastal region)	
2.4.1 Location.....	23
2.4.2 Topography and Soil	23
2.4.3 Climate	23



2.4.4 Hydrology and salinity	24
2.4.5 Vegetation	24
2.4.6 Study sites in the lower coastal region, Tanintharyi Region	25
2.5 Mangrove vegetation assessment	
2.5.1 Sampling design	28
2.5.2 Inventory parameters.....	29
2.5.3 Tidal inundation and ground level measurement	29
2.5.4 Diversity and similarity indices.....	32
2.5.5 Importance value index of the species	33
2.5.6 Stand diameter.....	34
2.5.7 Basal area calculation.....	35
2.5.8 Assessment of the diameter distribution of the stands	35
2.5.9 Measurement of the stand height.....	36
2.5.10 Fitting height curves.....	37
2.5.11 Measurement of stand volume	38
2.5.12 Natural regeneration assessment	38
2.5.13 Accuracy and error of the vegetation assessment	40
2.6 Measurements for osmotic potential analysis	
2.6.1 Field sample collections	41
2.6.2 Laboratory experiment	43
2.6.3 Data analysis.....	44
2.7 Measurement of oxygen and nitrogen status in plant species.....	45
2.8 Measurement of wood density and wood osmotic potential.....	46
3 Results and discussion	
3.1 Vegetation structures (Mangroves inventory)	
3.1.1 Accuracy of vegetation assessment and the species-area relationship..	48
3.1.2 Zonation of mangrove species.....	53
3.1.3 Species composition	67
3.1.4 Importance values of the species.....	73
3.1.5 Species Diversity	79
3.1.6 Species similarity	81
3.1.7 Mean diameters of the stands	82



3.1.8 Density and basal area.....	83
3.1.9 Diameter distributions	84
3.1.10 Stand height.....	87
3.1.11 Diameter–height relation.....	88
3.1.12 Stand volume.....	91
3.1.13 Natural regeneration assessment	92
3.1.15 General discussion.....	101
3.2 Plant and soil osmotic potentials	
3.2.1 Plant osmotic potential at different locations	107
3.2.2 Soil properties and soil osmotic potentials.....	136
3.2.3 Relation between plant and soil osmotic potentials	150
3.2.4 Effect of soil salinity on the sapwood osmotic potential.....	155
3.2.5 Relation between the osmotic potentials of leaves and wood	160
3.2.6 General discussion.....	165
3.3 Oxygen and nitrogen status of mangrove species	
3.3.1 Possible relationships between eco-physiological parameters of plants and soil	171
3.3.2 Oxygen uptake of mangroves under anaerobic site conditions	173
3.3.3 Effects of osmoregulation on the oxygen content of sapwood	177
3.3.4 Plant nitrogen content and sapwood density	179
3.3.5 Relation between wood nitrogen content and osmotic potentials	184
3.3.6 General discussion.....	185
4 Final conclusions and recommendations.....	189
5 Summary	199
6 References	212
7 Appendices	247