

Table of Contents

	Page
Acknowledgments.....	iii
Abstract in English.....	iv
Abstract in Thai.....	vi
List of Tables.....	x
List of Figures.....	xi
Abbreviation.....	xiii
Chapter 1 Introduction.....	1
Chapter 2 Literature Review	
2.1 Water Studies and Statistics.....	7
2.2 Water Quality Indexes.....	11
Chapter 3 Methodology	
3.1 Site Description.....	19
3.2 Sample Analysis.....	23
3.3 Quality Control of the Experiment.....	32
3.4 Data Analysis.....	32
Chapter 4 Results	
4.1 Results of Analyzed Samples.....	37
4.2 Multiple Analysis of Variance.....	41
4.3 Cluster Analysis.....	42
4.4 Water Quality Index	
4.4.1 Selection of Determinants.....	46
4.4.2 Weighting.....	49
4.4.3 Rating Curves.....	49
4.4.4 Aggregation Process.....	51
4.4.5 Water Quality Index and Classification.....	51
4.5 The Application of Water Quality Index.....	54
4.6 Testing of the Water Quality Index System.....	59
4.7 Water Quality Monitoring using WQI.....	61

4.8 Relationship Between Physio-chemical Variables and Macroinvertebrates	
4.8.1 Ordination.....	73
4.8.2 Classification.....	75
Chapter 5 Discussion.....	86
Chapter 6 Conclusion and Recommendation.....	91
References.....	93
Appendices	
Appendix A.....	99
Appendix B.....	102
Appendix C.....	104
Appendix D.....	118
Appendix E.....	124
Appendix F.....	140
Curriculum Vitae.....	154

List of Tables

	Page
Table 1 Holding time,type of container,sampling size and preservation procedure for sampling condition storage.....	24
Table 2 Data of analyzed samples with 16 parameters during May to December 1996.....	37
Table 3 Correlation coefficient of rotated factor matrix,significances, KMO values and % of variance.....	48
Table 4 Weights of variables.....	49
Table 5 Mathematical expression functions for each selected parameters.....	50
Table 6 Aggregation functions.....	51
Table 7 Score range and class of water	52
Table 8 Calculation for final index score.....	54
Table 9 Water quality classification using SWQSC and WQI with three aggregation functions.....	54
Table 10 % agreement of three aggregation functions compared to SWQSC.....	59
Table 11 Water quality classification of test data set using SWQC and WQI with three aggregation functions.....	60
Table 12 % agreement of three aggregation functions of the test data set compared to SWQSC.....	60
Table 13 Eigenvalues, % of total variance explained and cumulative % variance explained for each DECORANA axes.....	73
Table 14 Transformation applied and the abbreviations of each variable.....	74
Table 15 Product-moment correlation between sites score of DECORANA axes 1-4 and physio-chemical variables.....	74
Table 16 Frequencies of taxonomic (families) in TWINSpan groups.....	77
Table 17 Correlation with canonical discriminant functions and standardize discriminant function coefficient at $P < 0.05$	82

List of Figures

	Page
Fig.1 Map of study areas.....	20
Fig.2 Mae Sa stream site 1.....	24
Fig.3 Mae Sa stream site 2.....	25
Fig.4 Mae Sa stream site 3.....	25
Fig.5 Huay Kaew stream site 4.....	26
Fig.6 Ping river site 1.....	26
Fig.7 Ping river site 2.....	27
Fig.8 Irrigation canal site 1.....	27
Fig.9 Irrigation canal site 2.....	28
Fig.10 Mae Kha canal site 1.....	28
Fig.11 Mae Kha canal site 2.....	29
Fig.12 Significant differences among 4 types of water.....	41
Fig.13 Differentiation of water quality by clustering.....	42
Fig.14 Cluster analysis : dendograms of using three measurement methods.....	46
Fig.15 BOD rating curve development.....	50
Fig.16 A diagram of water quality index construction.....	52
Fig.17 Derivation of subindex scores.....	53
Fig.18 Water quality monitoring process.....	61
Fig.19 Trend of water quality of stream sites.....	62
Fig.20 Trend of water quality of river sites.....	63
Fig.21 Trend of water quality of irrigation sites.....	63
Fig.22 Trend of water quality of sewage sites.....	64
Fig.23 Map of water quality classification of May 1996.....	65
Fig.24 Map of water quality classification of June 1996.....	66
Fig.25 Map of water quality classification of July 1996.....	67
Fig.26 Map of water quality classification of August 1996.....	68
Fig.27 Map of water quality classification of September 1996.....	69
Fig.28 Map of water quality classification of October 1996.....	70

	Pages
Fig.29 Map of water quality classification of November 1996.....	71
Fig.30 Map of water quality classification of December 1996.....	72
Fig.31 Dendogram of TWINSpan classification of sites on the basis of macroinvertebrate faunas.....	76
Fig.32 Cluster analysis using Pearson correlation measurement.....	80
Fig.33 DECORANA plot grouped by TWINSpan sites classification on the basis of macroinvertebrates.....	84
Fig.34 DECORANA plot grouped by CLUSTER sites classification on the basis of physico-chemical parameters.....	85

Abbreviations

CI = Chemical Index
DECORANA = Detrended Correspondence Analysis
GW = Geometric Weighted aggregation function
MDA = Multiple Discriminant Analysis
MO = Minimum Operator
MVSP = Multivariate Statistical Package
ONEB = Office of National Environmental Board
SPSSWIN = Statistical Package for the Social Science for Windows
SW = Solway Modified Arithmetic Weighted aggregation function
SWQSC = Surface Water Quality Standard and Classification
TWINSpan = Two-Way Indicator Species Analysis
WQI = Water Quality Index
WQIA = Arithmetic water quality index
WQIAU = Unweighted arithmetic index
WQIM = Multiplicative index
WQIMU = Unweighted multiplicative index