

**A Hierarchical Analysis of the Niche Relationships of Four Amphibians  
from Forested Habitats of Northwestern California**

**by**

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## Abstract

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Professor Michael L. Morrison, Chair

Knowledge of the habitat associations of the Del Norte salamander (Plethodon elongatus), the southern torrent salamander (Rhyacotriton variegatus), the tailed frog (Ascaphus truei), and the Pacific giant salamander (Dicamptodon tenebrosus) derives primarily from anecdotal and general literature accounts. These accounts are based on museum collections and a small number of studies, most from single localities, focused on natural history aspects other than habitat. Such sources are from few localities with a preponderance of sites near major roads where collectors tend to focus, which can result in a biased view of habitat relationships. I used stratified systematic sampling to quantify the habitat of these species across their ranges in northwestern California. Variables representing three spatial scales and up to 11 ecological components were examined. Using discriminant analysis and multiple regression techniques I found these species were restricted to specific habitat features and microclimatic conditions.

The habitat of the terrestrial Del Norte salamander consists of older forests (>200 years) with large trees, closed, multi-storied canopy

comprised of both conifers and hardwoods, a cool, moist, and stable microclimate, a deep litter layer, and rocky substrates dominated by cobble-size pieces. The three aquatic species have niches consisting of a relatively narrow range of physical and microclimatic conditions associated with, cold, clear headwater to mid-order streams with loose, coarse substrates and low sedimentation, in older, more structurally complex forests.

These results are consistent with earlier research indicating that these amphibians require conditions of microclimate and forest structure which are typically created, stabilized, and maintained within late seral stage forest ecosystems. These habitat conditions appear to be required for both survival and reproductive success and therefore indicate an ecological dependency by these species on late seral stage forest habitats.

 11/22/83

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Chair

Date

to the memory of my grandparents

Frank and Lou Harlow

&

Jack and Marie Welsh

and to my parents

Hartwell H. Welsh

&

Frances Claire Harlow

## TABLE OF CONTENTS

DEDICATION.....	iii
TABLE OF CONTENTS.....	iv
LIST OF FIGURES.....	xii
LIST OF TABLES.....	xiv
ACKNOWLEDGEMENTS.....	xvii
CHAPTER 1. FORESTS AND HERPETOFAUNA.....	1
THE ROLE OF HERPETOFAUNA IN FOREST ECOSYSTEMS.....	1
SPECIES OF SPECIAL INTEREST IN CALIFORNIA.....	3
CHAPTER 2. THEORETICAL CONSIDERATIONS.....	7
COMMENTS ON NICHE ANALYSIS.....	7
NICHE AND HERPETOFAUNA.....	8
A HIERARCHICAL ORDERING OF SPATIAL SCALES.....	10
DENSITY CONSIDERATIONS.....	13
CHAPTER 3. FIELD METHODS.....	15
RESEARCH APPROACH.....	15
STUDY REGION.....	16
SITE SELECTION.....	17
Minimum essential microhabitat.....	20
MEASURING BIOTIC AND ABIOTIC PARAMETERS OF THE FOREST ENVIRONMENT.....	22
Climatic variables.....	25
ANIMAL SAMPLING.....	26
CHAPTER 4. METHODS OF ANALYSIS.....	27
VARIABLE REDUCTIONS, TRANSFORMATIONS, AND ORDERING.....	27

An Ecological Ordering of Variables .....	27
Variable Reductions .....	28
Variable Transformations and Interrelationships .....	29
Sample Size Considerations .....	29
STATISTICAL ANALYSES .....	30
Univariate Analyses .....	30
Multivariate Analyses .....	30
Discriminant Analyses of Ecological Components .....	31
Evaluation of Classification Success for Discriminant Models .....	34
Multiple Regression Analyses of Ecological Components .....	35
Interpretation of Analyses .....	37
MODELING HABITAT RELATIONSHIPS .....	37
CHAPTER 5. A HIERARCHICAL ANALYSIS OF THE NICHE OF THE TAILED FROG .....	39
INTRODUCTION .....	39
RESULTS .....	41
Applicability of the Results to the Adult Life Stage .....	41
Variables Used in the Niche Analysis of the Tailed Frog...	43
Discriminant Analysis I .....	44
Landscape Scale .....	44
Macrohabitat Scale .....	44
Microhabitat Scale .....	51
Composite Model .....	52
Discriminant Analysis II .....	54



Landscape Scale .....	54
Macrohabitat Scale .....	54
Microhabitat Scale .....	59
Composite Model .....	60
All-Possible-Subsets Regressions of Ecological Components..	61
Landscape Scale .....	61
Macrohabitat Scale .....	61
Microhabitat Scale .....	64
Composite Model .....	64
Descriptive Statistics for Sites with Adult Tailed Frogs ..	65
DISCUSSION .....	66
Landscape Scale .....	66
Macrohabitat Scale .....	69
Trees .....	69
Dead and Down Wood .....	71
Shrub and Understory Composition .....	72
Ground-level Vegetation .....	72
Ground Cover .....	73
Stand Climate .....	74
Microhabitat Scale .....	75
Aquatic Microhabitats .....	75
Coarse Aquatic Substrates .....	75
Fine Aquatic Substrates .....	77
Aquatic Conditions .....	78

Differences in Habitat Use between Larval and Adult Tailed Frogs.....	81
The Grinnellian Niche of the Tailed Frog.....	82
<b>CHAPTER 6. A HIERARCHICAL ANALYSIS OF THE NICHE OF THE PACIFIC GIANT SALAMANDER .....</b>	<b>85</b>
INTRODUCTION.....	85
RESULTS.....	87
Variables Used in the Niche Analysis of the Pacific Giant Salamander.....	87
Discriminant Analysis I.....	87
Landscape Scale .....	87
Macrohabitat Scale .....	95
Microhabitat Scale .....	96
Composite Model .....	96
Discriminant Analysis II.....	97
Landscape Scale .....	97
Macrohabitat Scale .....	103
Microhabitat Scale .....	104
Composite Model .....	104
All-Possible-Subsets Regressions of Ecological Components .	105
Landscape Scale .....	105
Macrohabitat Scale .....	109
Microhabitat Scale .....	109
Composite Model .....	109
DISCUSSION.....	110
Landscape Scale.....	110

Macrohabitat Scale .....	114
Trees.....	114
Dead and Down Wood.....	118
Shrub and Understory Composition.....	119
Ground-level Vegetation.....	119
Ground Cover.....	120
Stand Climate.....	121
Microhabitat Scale .....	123
Aquatic Microhabitats.....	123
Coarse Aquatic Substrates.....	124
Fine Aquatic Substrate.....	124
Aquatic Conditions .....	125
The Grinnellian Niche of the Pacific Giant Salamander ....	128
<b>CHAPTER 7. A HIERARCHICAL ANALYSIS OF THE NICHE OF THE DEL NORTE SALAMANDER.....</b>	<b>132</b>
INTRODUCTION .....	132
RESULTS .....	133
Variables Used in the Niche Analysis of The Del Norte Salamander .....	133
Discriminant Analysis .....	133
Landscape Scale.....	133
Macrohabitat Scale.....	139
Microhabitat Scale.....	140
Composite Model.....	140
All-Possible-Subsets Regressions of Ecological Components .	140

Landscape Scale .....	140
Macrohabitat Scale .....	140
Microhabitat Scale .....	144
Composite Model .....	144
DISCUSSION .....	145
Landscape Scale .....	145
Macrohabitat Scale .....	146
Trees .....	146
Dead and Down Wood .....	147
Shrub and Understory Composition .....	148
Ground-level Vegetation .....	148
Ground Cover .....	148
Forest Climate .....	150
Microhabitat Scale .....	152
Substrate Composition .....	152
The Grinnellian Niche of The Del Norte Salamander ...	153
CHAPTER 8. A HIERARCHICAL ANALYSIS OF THE NICHE OF THE SOUTHERN TORRENT SALAMANDER .....	155
INTRODUCTION .....	155
RESULTS .....	156
Variables Used in the Niche Analysis of The Southern Torrent Salamander .....	156
Discriminant Analysis .....	159
Landscape Scale .....	159
Macrohabitat Scale .....	159

Microhabitat Scale..... 159

Composite Model..... 164

All-Possible-Subsets Regressions of Ecological Components . 164

Landscape Scale..... 164

Macrohabitat Scale..... 164

Microhabitat Scale..... 168

Composite Model..... 168

DISCUSSION ..... 169

Landscape Scale ..... 169

Macrohabitat Scale ..... 170

Trees..... 171

Dead and Down Wood..... 171

Shrub and Understory Composition..... 172

Ground-level Vegetation..... 172

Ground Cover..... 172

Stand Climate..... 173

Microhabitat Scale ..... 174

Aquatic Microhabitats..... 174

Coarse Aquatic Substrates..... 175

Fine Aquatic Substrates..... 175

Aquatic Conditions..... 176

The Grinnellian Niche of the Southern Torrent Salamander . 177

CHAPTER 9. ECOLOGICAL DEPENDENCY..... 180

LITERATURE CITED..... 183

APPENDIX A. Variables measured during sampling for four forest  
amphibians at random sites in northwestern California  
during 1989 ..... 200