STATISTICAL ANALYSIS OF H.J. ANDREWS EXPERIMENTAL FOREST LEPIDOPTERA COMMUNITY DATA

Prepared for

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H.J. ANDREWS EXPERIMENTAL FOREST

LEPIDOPTERA COMMUNITY DATA

I. TABLE OF CONTENTS

II. EXECUTIVE SUMMARY

This is a report of the results of statistical analysis of Lepidoptera community data collected in twelve plant habitat zones on the H.J. Andrews Experimental Forest in the Cascade Range of western Oregon. The data were received from the Dr. Jeff Miller, OSU Department of Entomology. Data to be analyzed were counts of four hundred eighty-four Lepidoptera species in twelve plant habitat zones. Additionally, functional group identities were given for each species. Questions of interest were defined after an initial consultation and discussion. A list of those questions of interest is included in this report.

The report includes a summary of the project and discussion of the structure of the data, and explanatory and response variables, and the statistical procedures employed in the analysis.

After reducing the number of species for analysis to those defined as not rare (i.e., those whose abundance were more than 12), the data were analyzed using multivariate techniques to discover patterns in the distributions of species. Specifically, the data were first analyzed using Principal Coordinate Analysis (ORD) and Principal Component Analysis (PCA) to find general ordination patterns of the sites in species space. The resulting ORD configuration was rescaled using Nonmetric Multidimensionall Scaling (NMDS). The data were also inspected using cluster and Two-Way Indicator Species Analysis (TWINSPAN) techniques to find spatial relationships between logical groups sampling sites (plant habitat zones). The affinities of the members of the groups and distance

relationships between groups were investigated using Multigroup Discriminant Analysis. The results of these analyses are reported and statistical inferences discussed.

Data decks, analysis output files, and electronic copies of this report are provided on an accompanying CD. This work is in partial fulfillment of a Professional Services Contract Index Code S0310Q, Account Code 24599.

III. INTRODUCTION

Summary of the experiment and objectives

This is a retrospective study designed to investigate the patterns of Lepidoptera species distributions in twelve plant habitat zones on the H.J. Andrews Experimental Forest in the Cascade Range of western Oregon.

Questions of Interest

1. What is the pattern of Lepidoptera species distribution among the plant habitat zones sampled?
2. Do sampled plant habitat zones form groups with similar Lepidoptera species composition?
3. What is the strength of the association within groups?
4. What is the strength of the association between groups?
5. What Lepidoptera species drive differences between groups?

Populations of Interest

The population of interest is the total counts of adult Lepidoptera species collected in light traps in 12 plant habitat zones on the H.J. Andrews Experimental Forest.

Structure of the Experiment

Experimental Units

Experimental units are twelve sampled plant habitat zones.

Response variables

Counts of adult Lepidoptera species in light traps

Explanatory variables

Plant habitat zones

IV. STATISTICAL PROCEDURES

Summary Statistics

The original data set contained abundance information for 484 species collected in twelve plant habitat zones on the H.J. Andrews Experimental Forest. The total abundance of each species was tabulated from the data over the entire sampling period. Species were sorted in ascending order according to abundance.

Species were also assigned to five functional groups according to known or extrapolated biological and life history information. The five functional groups were Gymnosperm feeding species, hardwood feeding species, herb feeding species, mixed feeding species, and species whose feeding preferences were unknown (Table IV-1). The species were then assembled into five categories for analysis. These analytical categories were 1) All Species, 2) Gymnosperm and mixed feeding species, 3) Hardwood and mixed feeding species, 4) herb feeding species, and 5) Species of the Geometridae genera *Drepanulatrix, Eudrepanulatrix, and Sericosema* (Table IV-2).

Dataset Reduction

Some of the species were present at very low abundance, an expected condition in biologically diverse communities. Low abundance may indicate truly rare species (i.e., those whose abundance is typically low in the sampled habitats) or species that occur temporarily or accidentally as migrating or vagrant species. Many forest-dwelling arthropods are vagile,

and stragglers are often found in habitats where they perform no regular ecological function (or where they are not able to reproduce) (Niemelä 1997).

Non-abundant species are typically removed from data analyzed with multivariate techniques because the occurrences are usually due more to chance than some underlying ecological condition (i.e., the absence of a "rare species" in site traps may be due to chance, not the absence of the species at that site). Sampling artifacts may influence analyses, because outliers (low abundance of rare or vagrant species) increase the statistical "noise", often masking underlying patterns (Gaston 1994).

Pilanka (1986) recommends eliminating non-abundant species from multivariate analyses, only after careful consideration and with standards applied to all species. After consultation with Dr. Miller, it was decided to identify species whose average abundance was less than or equal to once per site (i.e., more than 12 specimens in the entire transect collection) as non-abundant and candidates for removal from the multivariate analysis.

The datasets for the five species groups to be analyzed were reduced to appropriate species. A list of the species in each analytical group is included in the results section.

Table IV-1. Species Functional Groups. The number of species in each of the five functional groups, before and after dataset reduction.

	Species Groups					
Dataset	ALL SPECIES	GYMNO	HARDWOOD	HERB	MIXED	UNKNOWN
FULL	484	45	251	107	14	67
REDUCED	216	26	129	39	6	16

Table IV-2. Species Analytical Groups. The number of species in each of the five analytical groups (after dataset reduction).

Species Groups				
ALL SPECIES	GYMNO	HARDWOOD	HERB	SPECIAL
216	32	135	39	9

Similarity Indices

Similarity indices measure the ecological relationship among sites based on the abundance of species collected at those sites. The measurements are expressed in the form of an association coefficient. The result is a site-by-site association matrix. More than four dozen similarity indices have been developed and the selection of which to apply is largely personal (Krebs 1989). The performance of similarity indices may be influenced by sample size, number of rare species, and species diversity, and some indices may perform better than others depending on the nature of the community information. Several reviews have described the application of similarity indices and offer guides for their use (e.g., Janson and Vegelius 1981, Wolda 1981, Hubalek 1982, Krebs 1989, Pimentel 1993).

The indices can be calculated from binary (presence/absence) data, from qualitative data with multistate variables, or from quantitative data,

usually representing some form abundance of species within the sampling units. The data in this analysis is in the latter form, and the association matrices were formed from a site-by-species matrix with counts of the species in each of the 12 plant habitat zones.

There are several ecological indices that perform well for analysis of community data. The Percentage Similarity index values between plant habitat zones were calculated using the Lepidoptera community data. Of the many quantitative similarity indices available, Percentage Similarity appears to perform very satisfactorily over a diverse set of ecological data sets (Gauch 1982, Ludwig and Reynolds 1988, Krebs 1989).

Percentage Similarity is one of the best quantitative indices. It was first proposed by Renkonen (1938) and is sometimes called Renkonen index (Krebs 1989). The index is calculated as:

$$P = \sum \text{minimum}\left(p_{1i}, p_{2i}\right)$$

where P = Percentage similarity between samples 1 and 2,

p_{1i} = Percentage of species i in sample 1

p_{2i} = Percentage of species i in sample 2

The index ranges from 0 (no similarity) to 100 (complete similarity). Sample size and diversity have only small effects on the performance of the index to measure actual similarity between sampling units (Krebs 1989).

Multivariate Analysis

Ordination

It is sometimes useful to sort sampling units into groups based on species composition. Communities of interest may then be designated for research and management purposes. Several techniques have been developed that group similar sampling units. Since low-cost computing has become available, calculation-intensive multivariate statistical analysis has been widely used to discover patterns or relationships between species, communities, and/or environmental factors. Comprehensive discussions of the techniques and their applications in ecological studies are available (e.g., Poole 1974, Gauch 1982, Pielou 1984, Digby and Kempton 1987).

Ordination is one of the many multivariate techniques used to analyze community data. Ordination is the collective term for multivariate analytical methods that arrange sampling units along axes such that similar sites are close together and dissimilar sites are far apart. The result is an objective summary of the relationships between sampling units in a low-dimensional species space. The goal is to reveal underlying structure in the data that represent patterns of species occurrence as determined by environmental variables.

Principal component analysis (PCA) is perhaps the most popular and widely used ordination technique. The method was developed by Pearson (1901) and refined by Hotelling (1933). It was first used to analyze ecological data by Goodall (1954) and has been used extensively

since. Entomologists have successfully used PCA for a wide range of studies including analysis of forest canopy-arthropod community structure (e.g., Schowalter et al. 1988, Schowalter 1995).

In PCA, distance measures on component axes are Euclidean and the reduced space is no more than the original variable space with new coordinate axes. The maximum amount of variation is accounted for after minimizing distance distortions. The positions of the sampling units on the axes are determined from the data alone and hence, PCA is an objective rendition of the intrinsic ecological relationships in the data.

The method is most efficient when the data have a normal distribution although the method is robust to departures from the ideal structure (Hotelling 1933, Greig-Smith 1980, Gauch 1982). However, the results of PCA are strongly influenced by non-linear relationships between sampling units (Gauch 1982). When habitat diversity is large and environmental gradients complex, the true ecological proximity between sampling units often lies along a curved response. In this situation, PCA ordination distorts ecological distances between sampling units, with some appearing much more closely related than they really are (Digby and Kempton1987).

Principal Coordinate Analysis (ORD) is another ordination method. The method was developed by Gower (1966) and is a generalization of Principal Component Analysis ordination (PCA). A sampling unit similarity matrix is the starting basis of comparison. The result of the method is a representation of sampling unit on axes that approximate

total relationships between sampling units and that yields the "best" overall solution (Pimentel 1993). The method is useful in exploring gradients and ecological communities, and is less influenced by non-linear relationships than PCA (Gauch 1982, Pimentel 1993).

The H.J. Andrews Lepidoptera community data were analyzed using ORD. Final configurations of three axes combinations showing plant habitat zones sites were plotted. The plant habitat zone ORD scores for the first ten axes were output further analysis. The Final configuration was further evaluated using Nonmetric Multidimensional Scaling (NMDS).

NMDS is ordination technique that uses rank order information from a similarity matrix, rather than the metric information, to evaluate ordinal relationships between sampling units. The intention is to eliminate the strong and problematic assumption of linearity of species responses to underlying environmental gradients made by other ordination methods. NMDS relies on a weaker assumption of monotonicity (i.e., $f(x_1) < f(x_2)$ for all $x_1 < x_2$). The goal of NMDS is to locate sampling units in a low-dimensional ordination space in such a manner that the interpoint distances in the ordination have the same rank order as do the interpoint similarities in the similarity matrix. NMDS is more robust when the input trial vectors are derived from another robust ordination method such as ORD. Use of randomly generated coordinates is not recommended because of the possibility of arriving at an invalid solution. Input trial vectors from ORD provide greater assurance of obtaining a global minimum solution. Random trial vectors are more likely to result

in local minimum solutions (Pimentel 1993). Random trial vector results are also more susceptible to non-linear relationships between sampling units (like PCA results) and final configurations can suffer from “arch” distortion (Gauch 1982).

Trial vectors from ORD were analyzed using NMDS. Final NMDS configurations of three axes combinations showing sampling sites were plotted.

Classification

Classification is the grouping or clustering of sampling units based on some measure of their resemblance. The purpose is to summarize large data sets and aid in interpretation of community structure.

Two-Way Indicator Species Analysis (TWINSPAN) is a classification procedure designed for ecological studies (Hill 1979, Gauch and Whittaker 1981, Jongman et al., 1995). The procedure simultaneously forms groups of sites with similar species composition and groups of species with similar site distributions. The classification is accomplished by transforming each species abundance data into one or more pseudo-species presence/absence. The more abundant a species, the more pseudo-species are created. Dichotomies are created by ordinating the samples with correspondence analysis (Hill 1973), making the first division at the centroid. The result is a dendogram that illustrates the hierarchical relationships between the groups. The higher the order grouping, the more dissimilar are the groups. Only dendograms of the

site groups are shown for the analysis of the H.J. Andrews Lepidoptera community data.

Multigroup Discriminant Analysis (MDA) is another of the multivariate classification methods. The technique evaluates the within and between variation of *a priori* groups. MDA forms linear combinations of the variables (species) that have the greatest between-group variation relative to their within-group variation (Digby and Kempton 1987). The resulting canonical axes represent combinations of variables, the first canonical axis comprised of variables that maximize group differences.

The accuracy of community analysis using MDA relies on the validity of assumptions made about the distributional properties of the data. The assumptions are the same as those of ANOVA, and include 1) random sampling; 2) normality; 3) independence of errors; and 4) equality of population dispersions (homoscedasticity). Species-by-site abundance data rarely satisfy these assumptions, however, a failure of one or more of the assumptions does not necessarily invalidate the analysis (Pimentel 1993, Manly 1986, Digby and Kempton 1987). The axes that result from ORD have standardized normal distributions and are therefore ideal for use in MDA.

Vectors from the first five principal coordinate axes from ORD were analyzed using MDA. Euclidean and Generalized (Standard Deviation) distances and 95% confidence radii about the group centroids were calculated. The plant habitat zones were classified by Geisser Classification into predicted groups and the results were compared to a

priori group assignments Final configurations showing sampling sites and group centroids were plotted where appropriate.

V. RESULTS

A. ANALYTICAL GROUP 1 - ALL SPECIES

Species List

Table V-A.1. ALL SPECIES Species List. A list of the species in the ALL SPECIES analytical group 1 in alphabetical order. List includes analysis LEPCODE, Taxonomic name (LEPNAME), Feeding group (HSTGRP), and the total counts of individuals.

LEPCODE	LEPNAME	HSTGRP	COUNTS
ABAG APPO	Abagrotis apposita	hardwood	13
ABAG NEFA	Abagrotis nefascia	hardwood	20
ACER NORM	Acerra normalis	hardwood	28
ACHY EPIP	Achytonix epipaschia	gymno	111
ACHY PRAE	Achytonix praeacuta	gymno	33
ACRO HESP	Acronicta hesperida	hardwood	43
ACRO IMPL	Acronicta impleta	hardwood	26
ADEL INDE	Adelphagrotis indeterminata	hardwood	15
ADEL STEL	Adelphagrotis stellaris	hardwood	21
AGRO DUBI	Agroperina dubitans	herb	13
AGRO OBLQ	Agrotis obliqua	herb	39
AGRO PULC	Agrochola pulchella	hardwood	14
AMPH AMER	Amphipoea americana	herb	22
AMPH PYRA	Amphipyra pyramidoides	hardwood	14
ANAG OCCI	Anagoga occiduaria	hardwood	82
ANAP PRAS	Anaplectoides prasina	hardwood	73
ANAP PRES	Anaplectoides pressus	hardwood	18
ANAV PAMP	Anavitrinella pampinaria	hardwood	38
ANDR AEDO	Andropolia aedon	hardwood	23
ANOM MUST	Xestia mustelina	mixed	27
ANOM VERN	Anomogyna vernilis	gymno	21
ANTH POLY	Antheraea polyphemus	hardwood	13
ANTI VASI	Anticlea vasiliata	hardwood	20
APAM AMPU	Apamea amputatrix	herb	15
APAM ANTE	Apamea antennata	herb	39

LEPCODE	LEPNAME	HSTGRP	COUNTS
APAM CAST	Apamea castanea	herb	48
APAM LIGN	Apamea lignicolora	herb	32
APLE COND	Aplectoides condita	gymno	75
ASEP ADNI	Aseptis adnixa	hardwood	39
ASEP BINO	Aseptis binotata	hardwood	209
ASEP ETHN	Aseptis ethnica	hardwood	55
ASTI VICT	Asticta victoria	hardwood	33
AUTO CALI	Autographa californica	herb	25
BEHR CONC	Behrensia conchiformis	hardwood	13
BIST BETU	Biston betularia	hardwood	15
BLEP CARA	Bleptina caradrinalis	herb	24
BOMO PALP	Bomolocha palparia	hardwood	15
CABE ERYT	Cabera erythemaria	hardwood	14
CALL AMOR	Callizzia amorata	hardwood	45
CAMP PERL	Campaea perlata	hardwood	209
CARI AEQU	Caripeta aequaliaria	gymno	25
CARI DIVI	Caripeta divisata	gymno	737
CERA ENIG	Cerastis enigmatica	hardwood	81
CERA GUEN	Ceratodalia gueneata	unknown	200
CERA TEAR	Ceranemota tearlei	hardwood	23
CLEM ALBA	Clemensia albata	hardwood	964
COLO PAND	Coloradia pandora	gymno	1398
CORY MEAD	Coryphista meadii	hardwood	41
CRYP CUER	Cryphia cuerva	unknown	21
CYCL DATA	Cyclophora dataria	hardwood	52
CYCL PEND	Cyclophora pendulinaria	hardwood	41
DARG PROC	Dargida procincta	herb	26
DASY GRIS	Dasychira grisefacta	gymno	19
DIAR ESUR	Diarsia esurialis	hardwood	335
DREP ARCU	Drepana arcuata	hardwood	23
DREP CARN	Drepanulatrix carnearia	hardwood	35
DREP FALC	Drepanulatrix falcataria	hardwood	24
DREP FOEM	Drepanulatrix foeminaria	hardwood	112
DREP MONI	Drepanulatrix monicaria	hardwood	29
DREP QUAD	Drepanulatrix quadraria	hardwood	144
DREP SECU	Drepanulatrix secundaria	hardwood	67

LEPCODE	LEPNAME	HSTGRP	COUNTS
DREP UNIC	Drepanulatrix unicalcararia	hardwood	127
DYSS CITR	Dysstroma citrata	hardwood	108
DYSS FORM	Dysstroma formosa	hardwood	32
DYSS OCHR	Dysstroma ochrofuscaria	hardwood	45
DYSS SOBR	Dysstroma sobria	hardwood	107
DYSS TRUN	Dysstroma truncata	hardwood	85
ECLI SILA	Ecliptopera silaceata	herb	128
ECTR CREP	Ectropis crepuscularia	mixed	33
EGIR CRUC	Egira crucialis	hardwood	41
EGIR PERL	Egira perlubens	hardwood	75
EGIR RUBR	Egira rubrica	hardwood	110
EGIR SIMP	Egira simplex	hardwood	156
ENNO MAGN	Ennomos magnaria	hardwood	14
ENYP PACK	Enypia packardata	gymno	747
ENYP VENA	Enypia venata	gymno	64
EPIR ALTE	Epirrhoe alternata	herb	196
EUCH JOHN	Euchlaena johnsonaria	hardwood	27
EUCH TIGR	Euchlaena tigrinaria	hardwood	254
EUDR RECT	Eudrepanulatrix rectifascia	hardwood	68
EULI DEST	Eulithis destinata	hardwood	32
EULI XYLI	Eulithis xylina	hardwood	206
EUPH UNAN	Euphyia unangulata	herb	32
EUPI CLMR	Eupithecia columbrata	mixed	20
EUPI CRTC	Eupithecia cretaceata	unknown	14
EUPI GRAE	Eupithecia graefii	hardwood	269
EUPI HARV	Eupithecia harveyata	hardwood	24
EUPI MIST	Eupithecia misturata	hardwood	244
EUPI PERF	Eupithecia perfusca	hardwood	53
EUPI SABU	Eupithecia sabulosata	gymno	24
EUPI SUBC	Eupithecia subcolorata	hardwood	254
EUPL BENE	Euplexia benesimilis	hardwood	27
EURO ASTR	Eurois astricta	hardwood	262
EUST FASC	Eustroma fasciata	gymno	99
EUST SEMI	Eustroma semiatrata	herb	72
EUTH SEMI	Euthyatira semicircularis	hardwood	100
EUXO DIVE	Euxoa divergens	herb	39

LEPCODE	LEPNAME	HSTGRP	COUNTS
EUXO INFA	Euxoa infausta	herb	16
EUXO SIMO	Euxoa simona	herb	17
EUXO STS-	Euxoa satis	herb	37
EUXO TRRN	Euxoa terrena	herb	16
EUXO VETU	Euxoa vetusta	herb	23
FELT HERI	Feltia herilis	herb	32
FERA COMS	Feralia comstocki	gymno	15
FERA DECE	Feralia deceptiva	gymno	110
GABR DYAR	Gabriola dyari	gymno	114
GRAM ORNA	Grammia ornata	herb	37
HABR SCRI	Habrosyne scripta	hardwood	30
HEME FINI	Hemeroplanis finitima	unknown	218
HESP LATI	Hesperumia latipennis	hardwood	36
HESP SULP	Hesperumia sulphuraria	hardwood	188
HOMO COMM	Homorthodes communis	hardwood	153
HOMO FURF	Homorthodes furfurata	hardwood	106
HOMO HANH	Homorthodes hanhami	unknown	108
HYAL EURY	Hyalophora euryalus	hardwood	33
HYDR FRCT	Hydriomena furcata	hardwood	26
HYDR IRAT	Hydriomena irata	mixed	17
HYDR MARI	Hydriomena marinata	gymno	26
HYDR PERF	Hydriomena perfracta	mixed	14
HYDR RENU	Hydriomena renunciata	hardwood	66
HYPA UNIP	Hypagyrtis unipunctata	hardwood	24
HYPP INDI	Hyppa indistincta	hardwood	14
HYPP XYLI	Hyppa xylinoides	hardwood	22
IDIA AEMU	Idia aemula	herb	21
IDIA AMER	Idia americalis	herb	30
IRID EMAS	Iridopsis emasculata	hardwood	77
LACA LIQU	Lacanobia liquida	herb	30
LACA TACO	Lacanobia tacoma	hardwood	30
LACI CUNE	Lacinipolia cuneata	hardwood	383
LACI DAVE	Lacinipolia davena	herb	189
LACI ILLA	Lacinipolia illaudabilis	herb	28
LACI PATA	Lacinipolia patalis	hardwood	49
LACI PENS	Lacinipolia pensilis	hardwood	15

LEPCODE	LEPNAME	HSTGRP	COUNTS
LACI RECT	Lacinipolia rectilinea	herb	133
LAMB FISC	Lambdina fiscellaria	hardwood	15
LASI PERP	Lasionycta perplexa	hardwood	57
LEUC FARC	Leucania farcta	herb	38
LEUC INSU	Leucania insueta	herb	69
LITH ALBI	Lithacodia albidula	herb	24
LOPH ARGE	Lophocampa argentata	gymno	590
LOPH MACU	Lophocampa maculata	hardwood	64
MELA IMIT	Melanolophia imitata	gymno	31
MESO RUBR	Mesogona rubra	hardwood	13
MNIO DUCT	Mniotype ducta	unknown	13
NADA GIBB	Nadata gibbosa	hardwood	124
NEMA RESI	Nematocampa resistaria	hardwood	73
NEMO DARW	Nemoria darwiniata	hardwood	26
NEOA CALI	Neoalcis californiaria	mixed	43
NEPY UMBR	Nepytia umbrosaria	gymno	888
NYCT CINE	Nycteola cinereana	hardwood	19
OLIG ILLO	Oligia illocata	hardwood	14
OLIG PALL	Oligocentria pallida	hardwood	18
OLIG SMRF	Oligocentria semirufescens	hardwood	53
ORTH HIBI	Orthosia hibisci	hardwood	37
ORTH REVI	Orthosia revicta	hardwood	26
ORTH TRAN	Orthosia transparens	hardwood	320
PANT PORT	Panthea portlandia	gymno	369
PERI ANGT	Perigonica angulata	hardwood	175
PERI COST	Perizoma costiguttata	hardwood	26
PERI CURV	Perizoma curvilinea	hardwood	71
PERI GRAN	Perizoma grandis	unknown	762
PERI PECT	Perigonica pectinata	hardwood	40
PERO MIZO	Pero mizon	hardwood	703
PERO MORR	Pero morrisonaria	gymno	27
PERO OCCI	Pero occidentalis	gymno	620
PHLO PERI	Phlogophora periculosa	hardwood	57
PHYL AMER	Phyllodesma americana	hardwood	80
PLAG PHLO	Plagodis phlogosaria	hardwood	31
PLAT MONT	Platyperigea montana	herb	29

LEPCODE	LEPNAME	HSTGRP	COUNTS
PLEM GEOR	Plemyria georgii	hardwood	19
PLER OPTE	Pleromella opter	hardwood	24
POLI DISC	Polia discalis	hardwood	62
POLI NIMB	Polia nimbosa	hardwood	52
POLI PURP	Polia purpurissata	hardwood	219
PROB ALIE	Probole alienaria	hardwood	30
PROP ALBI	Properigea albimacula	unknown	31
PROP NIVE	Properigea niveirena	unknown	50
PSEU CYMA	Pseudothyatira cymatophoroides	hardwood	37
PSEU IRRO	Pseudorthodes irrorata	hardwood	339
PSEU MUSC	Pseudobryomima muscosa	unknown	14
RHYA QUAD	Rhyacia quadrangula	unknown	16
RHYN EXER	Rhynchagrotis exertistigma	herb	213
RHYN INSU	Rhynchagrotis insularis	herb	52
SCHI IPOM	Schizura ipomoeae	hardwood	92
SCHI UNIC	Schizura unicornis	hardwood	27
SCOP JUNC	Scopula junctaria	herb	67
SELE ALCI	Selenia alciphearia	hardwood	90
SEMI SIGN	Semiothisa signaria	gymno	7490
SERI JUTU	Sericosema juturnaria	hardwood	57
SICY CROC	Sicya crocearia	hardwood	46
SPAE HAVI	Spaelotis havilae	herb	358
SPAR MAGN	Spargania magnoliata	herb	30
SPIL PTER	Spilosoma pteridis	hardwood	15
STAM BLAC	Stamnodes blackmorei	unknown	69
STAM PEAR	Stamnoctenis pearsalli	unknown	85
STEN PULM	Stenoporpia pulmonaria	gymno	59
STRE MURI	Stretchia muricina	hardwood	65
SYNA CERV	Synaxis cervinaria	hardwood	180
SYNA JUBA	Synaxis jubararia	hardwood	16
SYNE ADUM	Synedoida adumbrata	hardwood	36
SYNE DIVE	Synedoida divergens	hardwood	31
SYNE OCHR	Synedoida ochracea	hardwood	13
SYNG CELS	Syngrapha celsa	gymno	18
THAL TAYL	Thallophaga taylorata	herb	21
TOLY DIST	Tolype distincta	gymno	165

LEPCODE	LEPNAME	HSTGRP	COUNTS
TORT TEST	Tortricidia testacea	hardwood	15
TRIP HAES	Triphosa haesitata	hardwood	78
VENU CAMB	Venusia cambrica	hardwood	70
VENU PEAR	Venusia pearsalli	hardwood	77
XANT DEFE	Xanthorhoe defensaria	unknown	13
XANT MACD	Xanthorhoe macdunnoughi	hardwood	42
XANT PONT	Xanthorhoe pontiaria	unknown	53
XEST OBLA	Xestia oblata	hardwood	105
ZENO LIGN	Zenophleps lignicolorata	unknown	53
ZOST HIRT	Zosteropoda hirtipes	herb	79
ZOTH TRAN	Zotheca tranquilla	hardwood	33

Similarity Indices

Percentage Similarity

Table V-A.2. ALL SPECIES Percentage Similarity Index. Site-by-site matrix of Percentage Similarity association coefficients calculated from Lepidoptera data collected on the H.J. Andrews Experimental Forest, Oregon for Analytical Group 1 – ALL SPECIES (216 species in 12 plant habitat zones).

SITES	A	B	D	E	F	H	I	J	K	L	N	P
A	100.00	58.10	72.78	62.37	50.63	29.29	35.78	18.78	18.49	29.78	54.74	46.07
B	58.10	100.00	61.31	72.44	54.05	29.46	42.86	21.10	20.89	34.67	49.56	56.31
D	72.78	61.31	100.00	68.20	59.49	28.65	41.30	20.01	20.21	35.26	53.76	56.49
E	62.37	72.44	68.20	100.00	58.61	34.26	42.06	26.76	26.15	37.19	54.84	59.61
F	50.63	54.05	59.49	58.61	100.00	25.31	38.35	23.64	20.56	41.25	45.65	62.60
H	29.29	29.46	28.65	34.26	25.31	100.00	24.81	42.78	45.19	48.50	41.32	30.76
I	35.78	42.86	41.30	42.06	38.35	24.81	100.00	16.17	15.29	29.73	36.61	50.01
J	18.78	21.10	20.01	26.76	23.64	42.78	16.17	100.00	53.10	52.64	20.66	27.39
K	18.49	20.89	20.21	26.15	20.56	45.19	15.29	53.10	100.00	47.30	23.29	23.50
L	29.78	34.67	35.26	37.19	41.25	48.50	29.73	52.64	47.30	100.00	41.21	49.90
N	54.74	49.56	53.76	54.84	45.65	41.32	36.61	20.66	23.29	41.21	100.00	47.01
P	46.07	56.31	56.49	59.61	62.60	30.76	50.01	27.39	23.50	49.90	47.01	100.00

Table V-A.3. ALL SPECIES Percentage Dissimilarity Index. Site-by-site matrix of Percentage Dissimilarity association coefficients calculated from Lepidoptera data collected on the H.J. Andrews Experimental Forest, Oregon for Analytical Group 1 – ALL SPECIES (216 species in 12 plant habitat zones)

SITES	A	B	D	E	F	H	I	J	K	L	N	P
A	0.00	41.90	27.22	37.64	49.37	70.71	64.22	81.22	81.51	70.22	45.26	53.93
B	41.90	0.00	38.69	27.56	45.95	70.54	57.15	78.90	79.11	65.33	50.44	43.70
D	27.22	38.69	0.00	31.80	40.51	71.35	58.70	79.99	79.79	64.74	46.24	43.51
E	37.64	27.56	31.80	0.00	41.39	65.74	57.94	73.24	73.85	62.81	45.17	40.39
F	49.37	45.95	40.51	41.39	0.00	74.69	61.65	76.36	79.44	58.75	54.35	37.40
H	70.71	70.54	71.35	65.74	74.69	0.00	75.19	57.22	54.81	51.50	58.68	69.24
I	64.22	57.15	58.70	57.94	61.65	75.19	0.00	83.83	84.71	70.27	63.39	49.99
J	81.22	78.90	79.99	73.24	76.36	57.22	83.83	0.00	46.90	47.37	79.34	72.61
K	81.51	79.11	79.79	73.85	79.44	54.81	84.71	46.90	0.00	52.71	76.71	76.50
L	70.22	65.33	64.74	62.81	58.75	51.50	70.27	47.37	52.71	0.00	58.79	50.10
N	45.26	50.44	46.24	45.17	54.35	58.68	63.39	79.34	76.71	58.79	0.00	52.99
P	53.93	43.70	43.51	40.39	37.40	69.24	49.99	72.61	76.50	50.10	52.99	0.00

The association information in Table V-A.3 was used in the ORD ordination analysis.

Ordination

Principal Coordinate Analysis (ORD)

<u>Principal Coordinate Correlations</u>

Correlations of the 216 species with the Principal Coordinate Axes were obtained using Principal Component Analysis (PCA) (Table V-A.4). The strength of the association of a species with a Principal Coordinate is represented by the magnitude of the correlation (absolute value). In Tables V-A.5 through V-A.14 the species are sorted by the strength of their correlation with Principal Components 1 through 10. The species

with the highest associations appear at the top of the tables, along with their Principal Component axis correlation.

Table V-A.4. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the 10 Principal Component axes obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS 10
ABAG APPO	0.000	0.706	0.229	0.536	-0.179	-0.173	0.029	0.061	-0.026	0.093
ABAG NEFA	-0.343	0.080	0.312	-0.064	0.008	-0.410	0.227	-0.020	-0.580	-0.076
ACER NORM	0.638	0.186	0.263	-0.091	0.118	-0.238	0.283	-0.232	0.489	-0.185
ACHY EPIP	0.057	0.123	-0.850	0.154	-0.371	-0.274	0.030	-0.072	-0.072	-0.104
ACHY PRAE	-0.049	0.593	0.049	0.396	0.194	0.002	-0.100	0.269	0.153	-0.129
ACRO HESP	0.103	-0.141	-0.779	-0.140	-0.112	-0.116	0.159	0.148	0.054	0.505
ACRO IMPL	0.053	-0.152	-0.503	0.503	0.034	-0.153	0.194	-0.075	-0.028	0.624
ADEL INDE	-0.299	-0.202	0.443	0.108	0.507	-0.247	0.327	-0.041	-0.416	0.178
ADEL STEL	-0.051	-0.029	-0.590	0.710	0.177	-0.242	0.142	-0.125	-0.048	0.049
AGRO DUBI	-0.417	0.575	0.222	-0.325	-0.292	-0.086	0.169	-0.247	0.397	0.012
AGRO OBLQ	-0.443	-0.228	0.306	-0.357	0.374	-0.163	-0.376	-0.279	-0.342	0.160
AGRO PULC	-0.206	-0.197	0.219	-0.275	0.352	-0.212	0.121	-0.390	-0.653	0.168
AMPH AMER	0.069	-0.137	0.286	0.113	-0.167	-0.461	0.371	-0.033	0.657	-0.262
AMPH PYRA	0.035	-0.104	-0.666	0.630	0.035	-0.331	0.071	-0.088	-0.049	0.102
ANAG OCCI	0.099	-0.033	-0.699	-0.142	-0.314	0.319	-0.072	-0.260	-0.142	-0.428
ANAP PRAS	-0.502	-0.254	0.333	-0.177	0.079	-0.497	0.392	0.035	-0.358	-0.046
ANAP PRES	0.538	0.417	-0.263	-0.122	0.211	0.083	0.252	0.122	0.053	0.322
ANAV PAMP	0.008	-0.145	-0.557	-0.207	-0.199	-0.119	0.213	0.180	0.055	0.700
ANDR AEDO	-0.117	0.168	0.030	0.121	-0.854	-0.314	0.177	-0.042	0.003	-0.014
ANOM MUST	0.391	0.728	0.029	0.312	-0.361	-0.063	-0.198	-0.011	-0.130	0.027
ANOM VERN	-0.383	-0.343	0.360	0.011	0.519	-0.116	-0.089	0.216	0.085	-0.115
ANTH POLY	0.186	-0.076	-0.852	0.148	-0.228	-0.308	-0.007	-0.125	-0.106	-0.084
ANTI VASI	0.341	-0.112	0.160	-0.255	-0.380	0.135	0.162	-0.319	0.458	-0.502
APAM AMPU	-0.322	-0.101	0.399	-0.302	-0.138	-0.443	0.347	-0.538	-0.080	-0.030
APAM ANTE	-0.274	-0.130	0.196	-0.065	0.408	-0.328	0.238	-0.320	-0.657	0.032
APAM CAST	-0.512	0.022	0.304	-0.123	-0.136	-0.557	0.461	0.100	-0.117	-0.008
APAM LIGN	-0.426	0.065	0.427	-0.216	0.086	-0.212	0.532	-0.064	0.077	-0.286
APLE COND	-0.013	0.610	-0.438	0.248	0.317	0.162	0.161	0.048	0.173	0.417
ASEP ADNI	0.005	0.014	-0.819	-0.221	-0.290	-0.149	-0.132	-0.085	-0.119	-0.364
ASEP BINO	0.038	0.349	0.615	0.211	-0.375	-0.355	0.186	0.235	-0.207	-0.028
ASEP ETHN	-0.046	0.799	0.048	0.102	0.324	0.024	0.134	0.242	0.316	-0.143
ASTI VICT	-0.106	0.894	0.320	0.098	-0.026	-0.136	0.075	-0.203	0.097	0.026
AUTO CALI	-0.438	0.160	0.244	-0.301	0.376	-0.195	0.351	0.270	-0.330	-0.143
BEHR CONC	-0.204	-0.007	0.506	-0.045	-0.193	-0.393	0.489	0.025	0.427	-0.291
BIST BETU	0.024	-0.095	-0.203	0.844	0.429	-0.173	0.041	0.000	0.030	-0.041

LEPCODE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS 10
BLEP CARA	0.024	0.790	-0.447	-0.304	-0.048	-0.041	-0.111	-0.142	0.151	-0.047
BOMO PALP	0.120	0.046	-0.883	-0.261	-0.108	0.088	-0.009	0.149	-0.039	-0.066
CABE ERYT	0.062	0.240	-0.635	0.275	-0.445	-0.052	-0.195	-0.046	-0.304	-0.346
CALL AMOR	-0.059	0.027	-0.804	-0.273	-0.227	-0.099	0.025	0.118	0.076	0.432
CAMP PERL	0.221	0.667	0.265	0.169	-0.567	-0.067	-0.135	0.153	-0.189	0.059
CARI AEQU	0.090	-0.207	-0.014	0.071	-0.165	0.870	0.160	-0.357	0.032	0.074
CARI DIVI	0.501	0.427	0.052	0.341	-0.644	-0.004	-0.018	0.007	-0.181	-0.006
CERA ENIG	0.680	0.108	-0.235	-0.356	0.085	0.037	-0.221	0.070	0.179	-0.445
CERA GUEN	-0.030	0.208	-0.842	0.121	-0.177	0.212	-0.043	-0.245	-0.077	-0.285
CERA TEAR	-0.303	-0.231	0.190	-0.321	0.196	-0.080	0.140	0.575	-0.007	0.019
CLEM ALBA	-0.008	0.338	-0.900	-0.228	-0.120	-0.094	-0.010	-0.015	0.014	0.001
COLO PAND	-0.115	0.967	0.126	-0.115	0.148	0.013	0.000	0.012	-0.015	0.001
CORY MEAD	-0.133	0.038	-0.864	-0.180	-0.249	0.101	0.089	-0.250	-0.179	-0.141
CRYP CUER	0.034	0.029	0.644	-0.234	0.123	0.078	-0.198	-0.140	0.549	-0.021
CYCL DATA	0.065	0.087	-0.054	0.902	-0.008	0.207	-0.202	0.067	-0.159	-0.088
CYCL PEND	-0.010	0.130	-0.777	-0.197	-0.182	-0.009	0.167	0.029	0.078	0.510
DARG PROC	-0.415	-0.112	0.330	-0.308	0.329	-0.318	0.208	-0.112	-0.578	-0.101
DASY GRIS	0.045	0.796	-0.461	-0.212	0.105	0.072	-0.081	-0.129	0.032	0.241
DIAR ESUR	0.639	0.049	0.452	-0.145	-0.329	-0.339	0.204	-0.177	0.085	-0.162
DREP ARCU	-0.041	-0.082	-0.434	-0.142	-0.244	0.717	0.274	-0.246	0.069	0.258
DREP CARN	-0.005	0.844	0.176	-0.310	0.131	-0.104	-0.156	-0.237	0.029	-0.149
DREP FALC	0.355	0.477	0.030	0.053	-0.032	0.043	0.270	-0.622	0.310	-0.276
DREP FOEM	-0.077	0.104	0.411	-0.122	-0.319	-0.098	0.424	-0.214	0.587	-0.276
DREP MONI	0.219	0.874	-0.102	-0.050	0.245	-0.010	-0.074	-0.183	0.217	-0.051
DREP QUAD	0.153	0.462	0.471	-0.244	-0.096	-0.026	-0.370	-0.280	0.494	0.075
DREP SECU	0.207	0.685	0.204	-0.213	0.250	0.463	-0.113	-0.268	0.189	0.036
DREP UNIC	0.233	0.877	0.192	-0.090	0.148	0.043	0.039	-0.121	0.244	0.096
DYSS CITR	-0.191	-0.008	0.033	0.018	-0.596	0.562	0.064	-0.478	0.177	-0.123
DYSS FORM	-0.072	-0.020	0.572	-0.037	-0.529	-0.381	0.295	-0.140	0.239	-0.235
DYSS OCHR	0.061	0.376	0.360	0.317	-0.723	-0.254	-0.014	0.088	-0.152	0.004
DYSS SOBR	0.002	0.113	-0.806	-0.100	-0.533	-0.053	0.008	0.083	-0.148	0.085
DYSS TRUN	0.924	0.091	-0.053	0.049	-0.307	0.034	0.054	0.109	-0.139	-0.008
ECLI SILA	-0.005	0.731	-0.425	0.342	0.031	0.265	-0.084	-0.249	0.058	-0.128
ECTR CREP	0.234	-0.072	-0.544	-0.049	-0.209	0.488	0.359	-0.247	0.102	0.358
EGIR CRUC	0.574	-0.131	0.013	0.197	0.375	-0.387	0.201	0.033	-0.531	-0.022
EGIR PERL	0.018	0.454	0.074	-0.109	0.429	0.002	0.239	0.512	0.135	-0.120
EGIR RUBR	-0.098	0.148	-0.679	-0.277	-0.574	-0.037	0.167	-0.080	0.193	0.169
EGIR SIMP	-0.066	-0.130	-0.413	-0.151	-0.276	-0.195	0.336	0.136	0.183	0.699
ENNO MAGN	-0.018	-0.113	-0.739	-0.280	-0.254	-0.134	0.170	0.127	0.016	0.484
ENYP PACK	-0.003	0.695	0.437	0.206	-0.495	-0.174	0.013	0.026	0.066	0.041
ENYP VENA	0.336	0.574	0.352	0.159	-0.487	0.238	-0.079	0.074	-0.254	0.098
EPIR ALTE	0.318	-0.004	0.682	-0.203	-0.361	-0.378	-0.333	-0.010	-0.048	0.006
EUCH JOHN	0.053	0.206	-0.810	0.352	0.086	-0.296	-0.091	-0.041	0.085	-0.245

LEPCODE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS 10
EUCH TIGR	0.241	0.587	-0.638	-0.048	0.012	0.024	-0.144	0.208	-0.054	-0.185
EUDR RECT	0.282	0.356	0.068	0.872	0.092	0.046	-0.041	-0.048	0.035	0.112
EULI DEST	-0.430	0.501	0.236	0.114	0.330	0.469	0.270	-0.280	0.011	-0.124
EULI XYLI	0.329	0.266	0.475	-0.089	-0.475	-0.046	0.288	-0.141	0.446	-0.178
EUPH UNAN	-0.194	-0.308	0.203	-0.497	0.141	-0.170	-0.062	-0.472	-0.523	-0.111
EUPI CLMR	0.193	-0.244	0.054	-0.018	0.271	-0.020	0.554	0.638	0.111	0.103
EUPI CRTC	-0.490	0.071	0.202	-0.164	-0.050	-0.567	0.068	-0.303	-0.143	-0.431
EUPI GRAE	-0.014	0.261	0.141	0.208	-0.343	0.838	0.066	-0.140	-0.124	0.060
EUPI HARV	0.090	0.052	-0.103	-0.447	-0.061	0.246	-0.584	-0.284	0.174	-0.342
EUPI MIST	0.258	0.557	-0.209	0.605	-0.308	-0.110	0.000	-0.101	-0.224	-0.187
EUPI PERF	-0.014	-0.374	0.203	-0.050	-0.026	0.751	-0.288	-0.368	0.162	0.083
EUPI SABU	-0.003	-0.205	-0.684	0.154	-0.021	0.545	0.291	-0.026	0.030	0.274
EUPI SUBC	0.176	-0.182	0.108	-0.097	-0.101	0.808	-0.191	-0.414	0.111	-0.040
EUPL BENE	-0.385	0.236	-0.042	0.112	-0.513	-0.438	0.359	-0.083	0.403	-0.074
EURO ASTR	-0.386	-0.278	0.575	-0.406	0.154	-0.374	0.229	-0.006	-0.140	-0.164
EUST FASC	0.057	0.596	0.423	0.052	-0.269	0.560	0.115	-0.224	0.091	0.041
EUST SEMI	-0.149	0.368	-0.481	0.234	-0.046	0.525	0.073	0.037	-0.042	0.342
EUTH SEMI	0.001	-0.242	-0.462	0.081	-0.161	0.613	0.304	-0.190	0.052	0.432
EUXO DIVE	-0.456	-0.213	0.458	-0.373	0.274	-0.379	0.166	-0.099	-0.344	-0.139
EUXO INFA	0.756	-0.165	0.047	-0.019	0.320	-0.274	0.300	-0.088	0.136	-0.092
EUXO SIMO	-0.329	0.057	0.554	-0.053	-0.268	-0.493	0.188	-0.370	-0.124	-0.031
EUXO STS-	-0.140	0.006	0.282	-0.160	0.344	-0.312	0.153	-0.358	-0.706	0.088
EUXO TRRN	-0.169	0.269	0.703	-0.014	0.089	-0.328	-0.232	0.172	-0.419	0.052
EUXO VETU	-0.261	-0.187	0.135	-0.044	0.255	0.048	0.248	0.708	0.083	-0.312
FELT HERI	-0.053	0.711	-0.543	-0.240	0.016	-0.057	-0.095	-0.190	0.050	-0.277
FERA COMS	0.814	0.271	-0.231	-0.336	0.211	0.009	-0.017	-0.002	0.098	-0.193
FERA DECE	0.923	-0.190	0.145	-0.105	0.227	-0.068	0.080	-0.066	0.086	-0.058
GABR DYAR	0.126	0.626	-0.452	0.229	-0.392	-0.055	-0.278	0.191	-0.196	-0.093
GRAM ORNA	-0.218	0.067	-0.032	0.388	0.339	-0.299	-0.064	-0.153	0.143	-0.236
HABR SCRI	-0.001	0.013	-0.808	-0.247	-0.268	-0.116	-0.140	-0.085	-0.112	-0.401
HEME FINI	0.627	0.348	-0.108	0.370	0.532	-0.096	0.059	-0.108	0.169	-0.024
HESP LATI	-0.045	0.531	-0.558	-0.045	0.018	0.135	0.189	0.070	0.120	0.572
HESP SULP	-0.143	0.771	-0.334	0.350	0.097	0.006	0.216	-0.094	0.037	0.243
HOMO COMM	0.215	0.173	-0.595	0.392	0.148	-0.255	0.173	0.158	0.104	0.509
HOMO FURF	0.364	-0.019	-0.111	0.650	0.340	-0.364	0.192	-0.248	0.005	0.078
HOMO HANH	0.039	-0.106	-0.196	0.829	0.262	-0.287	0.100	-0.213	0.033	0.083
HYAL EURY	0.175	-0.353	0.060	0.622	0.290	-0.259	-0.082	0.034	0.444	-0.145
HYDR FRCT	-0.014	0.099	0.322	0.204	-0.637	0.616	0.041	-0.218	-0.052	-0.045
HYDR IRAT	0.563	-0.526	0.139	-0.139	0.112	0.424	-0.339	-0.164	-0.003	0.085
HYDR MARI	0.337	0.013	-0.030	0.192	-0.807	0.167	-0.179	-0.047	-0.293	-0.220
HYDR PERF	-0.221	0.699	-0.506	-0.088	-0.092	-0.003	-0.227	-0.322	-0.015	-0.179
HYDR RENU	0.044	0.061	-0.096	0.165	-0.836	-0.142	-0.019	0.173	-0.216	0.400
HYPA UNIP	-0.012	-0.126	-0.605	-0.184	-0.228	-0.131	0.223	0.174	0.027	0.658

LEPCODE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS 10
HYPP INDI	0.206	-0.350	0.311	-0.554	0.115	-0.448	0.242	-0.209	0.023	-0.154
HYPP XYLI	0.211	-0.381	0.109	-0.313	-0.039	-0.206	-0.342	0.000	0.560	0.375
IDIA AEMU	0.103	0.740	0.190	0.339	-0.378	-0.039	-0.169	0.163	-0.263	0.095
IDIA AMER	0.423	0.649	0.148	0.281	-0.481	-0.222	-0.053	0.031	-0.097	-0.028
IRID EMAS	0.216	0.010	-0.424	-0.118	-0.333	0.677	0.025	-0.344	-0.129	-0.226
LACA LIQU	-0.078	-0.432	-0.008	-0.076	0.365	-0.010	0.319	-0.300	-0.656	0.113
LACA TACO	-0.575	-0.325	0.522	-0.291	0.201	-0.253	-0.205	-0.055	0.204	-0.069
LACI CUNE	0.380	-0.074	-0.362	-0.250	0.165	0.227	0.399	-0.343	-0.171	0.506
LACI DAVE	-0.338	-0.221	0.554	-0.352	-0.064	-0.421	0.164	-0.356	0.126	-0.166
LACI ILLA	0.450	0.136	-0.018	0.663	0.491	-0.231	0.117	-0.152	0.091	-0.005
LACI PATA	0.039	0.026	-0.203	0.885	0.354	-0.188	0.021	0.021	-0.010	-0.008
LACI PENS	-0.397	-0.150	0.158	0.053	0.383	-0.271	0.450	0.285	-0.076	-0.100
LACI RECT	-0.269	0.620	0.434	-0.314	0.080	-0.215	0.254	-0.334	-0.082	0.092
LAMB FISC	-0.052	0.338	-0.831	-0.282	-0.179	0.194	-0.031	-0.129	-0.013	-0.158
LASI PERP	-0.435	-0.315	0.387	-0.366	0.329	-0.221	-0.374	-0.075	-0.289	0.092
LEUC FARC	-0.125	0.036	-0.515	0.439	0.363	-0.274	0.038	-0.387	-0.180	-0.368
LEUC INSU	-0.389	-0.233	0.337	-0.319	0.357	-0.245	-0.077	-0.305	-0.534	0.085
LITH ALBI	-0.040	-0.053	-0.833	-0.272	-0.356	0.009	-0.030	-0.161	-0.062	-0.262
LOPH ARGE	0.008	0.185	-0.429	0.800	0.335	-0.146	0.042	-0.054	0.009	-0.015
LOPH MACU	-0.064	-0.192	-0.612	-0.104	-0.404	-0.101	0.296	-0.004	0.114	0.537
MELA IMIT	0.061	-0.240	-0.293	0.085	-0.119	0.746	0.029	-0.444	0.055	-0.234
MESO RUBR	-0.014	0.941	-0.146	0.035	0.230	0.082	-0.034	0.054	0.119	0.116
MNIO DUCT	-0.210	-0.251	0.129	-0.024	-0.025	0.778	0.117	-0.451	-0.226	0.046
NADA GIBB	0.521	-0.209	-0.728	0.126	-0.094	-0.021	0.193	-0.125	-0.008	0.270
NEMA RESI	0.017	-0.007	-0.930	-0.067	-0.198	-0.205	0.085	-0.037	-0.013	0.183
NEMO DARW	0.300	0.308	0.495	0.136	-0.618	0.147	-0.304	-0.166	-0.022	0.161
NEOA CALI	-0.002	0.143	-0.747	-0.100	-0.267	-0.120	-0.216	-0.119	-0.117	-0.500
NEPY UMBR	0.388	0.658	-0.316	0.529	0.070	0.009	-0.138	-0.053	-0.039	-0.003
NYCT CINE	0.003	0.059	-0.172	0.203	0.337	0.156	-0.098	0.465	-0.027	-0.164
OLIG ILLO	-0.394	0.521	-0.109	-0.458	0.239	-0.116	-0.359	0.215	-0.194	-0.038
OLIG PALL	-0.009	0.084	-0.599	0.370	0.125	-0.102	-0.005	0.334	0.009	-0.070
OLIG SMRF	0.033	-0.019	-0.783	0.110	0.023	0.060	-0.078	0.240	-0.149	-0.218
ORTH HIBI	0.216	-0.146	-0.373	-0.295	-0.199	-0.165	-0.085	-0.032	-0.200	-0.682
ORTH REVI	0.258	0.112	-0.367	0.670	0.464	-0.189	0.109	-0.216	0.072	-0.136
ORTH TRAN	0.019	0.477	-0.610	0.253	0.073	0.486	0.050	0.057	-0.009	0.075
PANT PORT	0.708	0.077	-0.227	0.356	0.157	0.098	-0.328	0.016	-0.056	-0.371
PERI ANGT	0.038	0.113	-0.281	0.860	0.314	0.167	0.030	-0.023	-0.039	-0.134
PERI COST	-0.334	-0.185	-0.218	0.485	0.274	-0.429	0.329	-0.166	-0.105	0.305
PERI CURV	0.497	-0.113	-0.373	0.419	-0.162	-0.151	0.281	-0.273	0.000	-0.247
PERI GRAN	0.245	0.832	-0.063	-0.058	-0.413	0.145	0.049	-0.190	0.016	-0.073
PERI PECT	0.382	-0.024	-0.460	0.597	0.070	-0.118	-0.168	-0.069	-0.099	-0.455
PERO MIZO	0.082	0.941	0.123	0.287	-0.027	0.027	-0.005	-0.006	0.093	0.001
PERO MORR	-0.004	-0.017	-0.388	0.085	-0.320	0.782	-0.294	-0.135	-0.083	0.077

LEPCODE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS 10
PERO OCCI	-0.199	-0.266	-0.019	-0.145	0.027	-0.040	-1.083	-0.054	0.167	-0.161
PHLO PERI	0.050	0.044	-0.752	0.367	0.121	0.144	0.194	-0.026	0.087	0.453
PHYL AMER	0.086	-0.296	-0.596	-0.247	-0.133	0.161	-0.274	-0.418	0.298	-0.313
PLAG PHLO	0.251	-0.173	-0.825	-0.268	-0.351	0.074	0.114	-0.100	-0.028	0.037
PLAT MONT	0.043	0.086	0.001	0.872	0.153	-0.339	0.076	-0.178	0.116	0.039
PLEM GEOR	0.041	-0.018	-0.845	-0.220	-0.325	0.099	0.050	-0.262	0.004	-0.207
PLER OPTE	-0.335	-0.086	0.505	-0.120	-0.126	-0.115	-0.286	0.303	0.302	-0.170
POLI DISC	-0.297	0.188	0.451	-0.248	0.063	-0.339	0.183	-0.343	-0.560	0.022
POLI NIMB	0.148	-0.006	-0.844	-0.258	-0.343	-0.173	-0.090	0.074	-0.098	-0.163
POLI PURP	-0.457	-0.211	0.476	-0.380	0.172	-0.398	0.050	-0.330	-0.235	-0.018
PROB ALIE	0.040	0.079	-0.957	-0.080	-0.104	0.081	0.116	-0.016	0.017	0.180
PROP ALBI	0.034	-0.069	-0.283	0.800	0.195	-0.370	0.152	-0.218	0.162	-0.043
PROP NIVE	-0.307	-0.205	0.218	0.084	0.161	-0.202	0.403	0.410	0.194	-0.322
PSEU CYMA	0.005	0.010	-0.086	0.193	0.326	0.174	-0.106	0.472	-0.037	-0.185
PSEU IRRO	0.770	0.179	0.206	-0.346	0.213	-0.191	0.205	-0.296	-0.009	0.003
PSEU MUSC	-0.091	-0.023	0.132	0.091	0.265	-0.025	0.005	0.786	0.211	-0.477
RHYA QUAD	-0.335	-0.411	0.408	-0.264	0.187	0.024	-0.128	0.399	0.325	-0.203
RHYN EXER	-0.270	-0.177	0.272	0.553	-0.082	-0.628	0.232	-0.180	-0.157	0.004
RHYN INSU	-0.349	-0.219	0.415	-0.146	0.163	-0.201	0.235	0.434	-0.304	-0.205
SCHI IPOM	0.025	-0.050	-0.754	0.080	-0.005	0.055	-0.015	0.359	-0.090	0.023
SCHI UNIC	0.079	-0.037	-0.263	0.878	-0.039	-0.167	0.030	0.165	-0.186	0.216
SCOP JUNC	0.718	0.605	0.119	-0.086	0.017	0.028	-0.040	-0.024	-0.047	0.271
SELE ALCI	0.010	-0.015	-0.963	-0.064	-0.181	-0.132	-0.040	-0.033	-0.060	-0.109
SEMI SIGN	1.000	0.001	0.003	-0.004	0.003	-0.001	0.000	0.001	0.000	0.000
SERI JUTU	0.067	0.592	-0.471	0.356	0.328	-0.002	-0.266	0.072	0.055	-0.291
SICY CROC	-0.280	0.176	0.536	-0.029	-0.525	-0.159	-0.231	-0.185	0.436	0.076
SPAE HAVI	-0.290	-0.311	0.474	-0.221	0.051	-0.262	-0.632	-0.222	0.062	0.140
SPAR MAGN	-0.156	0.315	-0.054	-0.163	-0.515	-0.220	-0.339	0.273	-0.479	0.081
SPIL PTER	-0.092	0.149	-0.603	-0.183	-0.476	-0.017	-0.269	0.016	-0.089	-0.511
STAM BLAC	0.169	-0.139	0.344	0.391	-0.600	0.458	0.165	-0.237	0.005	-0.133
STAM PEAR	0.307	0.047	0.062	0.094	0.107	0.866	0.181	-0.297	0.067	-0.017
STEN PULM	0.026	0.444	-0.202	0.303	-0.642	0.100	-0.129	-0.252	-0.141	-0.366
STRE MURI	-0.359	-0.245	0.301	-0.148	0.027	0.099	0.335	0.437	0.199	-0.318
SYNA CERV	0.106	-0.185	-0.043	0.755	0.023	0.522	0.055	-0.186	-0.131	-0.125
SYNA JUBA	0.842	-0.311	0.134	-0.263	0.147	-0.063	-0.040	-0.239	0.131	0.015
SYNE ADUM	-0.392	-0.352	0.405	0.172	0.099	-0.393	-0.251	-0.207	0.500	0.046
SYNE DIVE	-0.211	-0.087	0.331	-0.277	0.307	-0.248	0.135	-0.309	-0.692	0.050
SYNE OCHR	0.833	-0.162	0.206	-0.197	0.301	0.010	0.089	-0.217	0.167	0.123
SYNG CELS	-0.439	-0.061	0.425	-0.099	0.289	-0.420	0.376	-0.137	-0.420	-0.122
THAL TAYL	0.042	-0.407	0.343	-0.098	0.020	0.586	0.097	-0.132	0.556	-0.027
TOLY DIST	0.293	0.284	-0.527	0.612	0.145	-0.285	0.113	-0.056	0.037	0.217
TORT TEST	-0.106	-0.224	-0.134	0.025	-0.196	0.848	0.212	-0.305	-0.023	0.152
TRIP HAES	-0.372	0.201	0.304	-0.307	-0.199	-0.126	0.565	-0.003	0.471	-0.194

LEPCODE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS 10
VENU CAMB	-0.061	0.747	-0.508	-0.229	-0.011	0.242	0.031	-0.175	0.107	0.081
VENU PEAR	-0.141	-0.007	-0.630	-0.193	-0.380	0.525	0.199	-0.261	0.032	-0.131
XANT DEFE	-0.055	-0.051	-0.720	-0.313	0.080	-0.070	-0.094	-0.253	0.076	-0.534
XANT MACD	-0.102	-0.189	0.326	0.102	-0.422	0.405	0.221	-0.470	0.403	-0.139
XANT PONT	-0.334	-0.228	0.549	-0.281	-0.337	-0.401	-0.320	-0.137	0.030	0.204
XEST OBLA	-0.243	0.116	0.599	-0.365	0.094	-0.399	0.172	-0.303	-0.373	-0.026
ZENO LIGN	-0.252	-0.220	0.447	-0.217	-0.120	-0.246	0.310	0.245	0.524	-0.316
ZOST HIRT	-0.274	-0.105	0.264	-0.319	0.292	-0.283	0.154	-0.344	-0.645	0.037
ZOTH TRAN	0.796	-0.167	0.401	-0.059	0.145	-0.223	0.148	-0.155	-0.052	-0.171

Table V-A.5. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 1 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 1
SEMI SIGN	gymno	1.000
DYSS TRUN	hardwood	0.924
FERA DECE	gymno	0.923
SYNA JUBA	hardwood	0.842
SYNE OCHR	hardwood	0.833
FERA COMS	gymno	0.814
ZOTH TRAN	hardwood	0.796
PSEU IRRO	hardwood	0.770
EUXO INFA	herb	0.756
SCOP JUNC	herb	0.718
PANT PORT	gymno	0.708
CERA ENIG	hardwood	0.680
DIAR ESUR	hardwood	0.639
ACER NORM	hardwood	0.638
HEME FINI	unknown	0.627
LACA TACO	hardwood	-0.575
EGIR CRUC	hardwood	0.574
HYDR IRAT	mixed	0.563
ANAP PRES	hardwood	0.538
NADA GIBB	hardwood	0.521
APAM CAST	herb	-0.512
ANAP PRAS	hardwood	-0.502
CARI DIVI	gymno	0.501
PERI CURV	hardwood	0.497
EUPI CRTC	unknown	-0.490
POLI PURP	hardwood	-0.457
EUXO DIVE	herb	-0.456
LACI ILLA	herb	0.450
AGRO OBLQ	herb	-0.443
SYNG CELS	gymno	-0.439
AUTO CALI	herb	-0.438
LASI PERP	hardwood	-0.435
EULI DEST	hardwood	-0.430
APAM LIGN	herb	-0.426
IDIA AMER	herb	0.423
AGRO DUBI	herb	-0.417
DARG PROC	herb	-0.415

LEPCODE	HISTGRP	AXIS 1
LACI PENS	hardwood	-0.397
OLIG ILLO	hardwood	-0.394
SYNE ADUM	hardwood	-0.392
ANOM MUST	mixed	0.391
LEUC INSU	herb	-0.389
NEPY UMBR	gymno	0.388
EURO ASTR	hardwood	-0.386
EUPL BENE	hardwood	-0.385
ANOM VERN	gymno	-0.383
PERI PECT	hardwood	0.382
LACI CUNE	hardwood	0.380
TRIP HAES	hardwood	-0.372
HOMO FURF	hardwood	0.364
STRE MURI	hardwood	-0.359
DREP FALC	hardwood	0.355
RHYN INSU	herb	-0.349
ABAG NEFA	hardwood	-0.343
ANTI VASI	hardwood	0.341
LACI DAVE	herb	-0.338
HYDR MARI	gymno	0.337
ENYP VENA	gymno	0.336
PLER OPTE	hardwood	-0.335
RHYA QUAD	unknown	-0.335
PERI COST	hardwood	-0.334
XANT PONT	unknown	-0.334
EULI XYLI	hardwood	0.329
EUXO SIMO	herb	-0.329
APAM AMPU	herb	-0.322
EPIR ALTE	herb	0.318
PROP NIVE	unknown	-0.307
STAM PEAR	unknown	0.307
CERA TEAR	hardwood	-0.303
NEMO DARW	hardwood	0.300
ADEL INDE	hardwood	-0.299
POLI DISC	hardwood	-0.297
TOLY DIST	gymno	0.293
SPAE HAVI	herb	-0.290
EUDR RECT	hardwood	0.282
SICY CROC	hardwood	-0.280
APAM ANTE	herb	-0.274
ZOST HIRT	herb	-0.274

LEPCODE	HISTGRP	AXIS 1
RHYN EXER	herb	-0.270
LACI RECT	herb	-0.269
EUXO VETU	herb	-0.261
EUPI MIST	hardwood	0.258
ORTH REVI	hardwood	0.258
ZENO LIGN	unknown	-0.252
PLAG PHLO	hardwood	0.251
PERI GRAN	unknown	0.245
XEST OBLA	hardwood	-0.243
EUCH TIGR	hardwood	0.241
ECTR CREP	mixed	0.234
DREP UNIC	hardwood	0.233
CAMP PERL	hardwood	0.221
HYDR PERF	mixed	-0.221
DREP MONI	hardwood	0.219
GRAM ORNA	herb	-0.218
IRID EMAS	hardwood	0.216
ORTH HIBI	hardwood	0.216
HOMO COMM	hardwood	0.215
HYPP XYLI	hardwood	0.211
SYNE DIVE	hardwood	-0.211
MNIO DUCT	unknown	-0.210
DREP SECU	hardwood	0.207
AGRO PULC	hardwood	-0.206
HYPP INDI	hardwood	0.206
BEHR CONC	hardwood	-0.204
PERO OCCI	gymno	-0.199
EUPH UNAN	herb	-0.194
EUPI CLMR	mixed	0.193
DYSS CITR	hardwood	-0.191
ANTH POLY	hardwood	0.186
EUPI SUBC	hardwood	0.176
HYAL EURY	hardwood	0.175
EUXO TRRN	herb	-0.169
STAM BLAC	unknown	0.169
SPAR MAGN	herb	-0.156
DREP QUAD	hardwood	0.153
EUST SEMI	herb	-0.149
POLI NIMB	hardwood	0.148
HESP SULP	hardwood	-0.143
VENU PEAR	hardwood	-0.141

LEPCODE	HISTGRP	AXIS 1
EUXO STS-	herb	-0.140
CORY MEAD	hardwood	-0.133
GABR DYAR	gymno	0.126
LEUC FARC	herb	-0.125
BOMO PALP	hardwood	0.120
ANDR AEDO	hardwood	-0.117
COLO PAND	gymno	-0.115
ASTI VICT	hardwood	-0.106
SYNA CERV	hardwood	0.106
TORT TEST	hardwood	-0.106
ACRO HESP	hardwood	0.103
IDIA AEMU	herb	0.103
XANT MACD	hardwood	-0.102
ANAG OCCI	hardwood	0.099
EGIR RUBR	hardwood	-0.098
SPIL PTER	hardwood	-0.092
PSEU MUSC	unknown	-0.091
CARI AEQU	gymno	0.090
EUPI HARV	hardwood	0.090
PHYL AMER	hardwood	0.086
PERO MIZO	hardwood	0.082
SCHI UNIC	hardwood	0.079
LACA LIQU	herb	-0.078
DREP FOEM	hardwood	-0.077
DYSS FORM	hardwood	-0.072
AMPH AMER	herb	0.069
SERI JUTU	hardwood	0.067
EGIR SIMP	hardwood	-0.066
CYCL DATA	hardwood	0.065
LOPH MACU	hardwood	-0.064
CABE ERYT	hardwood	0.062
DYSS OCHR	hardwood	0.061
MELA IMIT	gymno	0.061
VENU CAMB	hardwood	-0.061
CALL AMOR	hardwood	-0.059
ACHY EPIP	gymno	0.057
EUST FASC	gymno	0.057
XANT DEFE	unknown	-0.055
ACRO IMPL	hardwood	0.053
EUCH JOHN	hardwood	0.053
FELT HERI	herb	-0.053

LEPCODE	HISTGRP	AXIS 1
LAMB FISC	hardwood	-0.052
ADEL STEL	hardwood	-0.051
PHLO PERI	hardwood	0.050
ACHY PRAE	gymno	-0.049
ASEP ETHN	hardwood	-0.046
DASY GRIS	gymno	0.045
HESP LATI	hardwood	-0.045
HYDR RENU	hardwood	0.044
PLAT MONT	herb	0.043
THAL TAYL	herb	0.042
DREP ARCU	hardwood	-0.041
PLEM GEOR	hardwood	0.041
LITH ALBI	herb	-0.040
PROB ALIE	hardwood	0.040
HOMO HANH	unknown	0.039
LACI PATA	hardwood	0.039
ASEP BINO	hardwood	0.038
PERI ANGT	hardwood	0.038
AMPH PYRA	hardwood	0.035
CRYP CUER	unknown	0.034
PROP ALBI	unknown	0.034
OLIG SMRF	hardwood	0.033
CERA GUEN	unknown	-0.030
STEN PULM	gymno	0.026
SCHI IPOM	hardwood	0.025
BIST BETU	hardwood	0.024
BLEP CARA	herb	0.024
ORTH TRAN	hardwood	0.019
EGIR PERL	hardwood	0.018
ENNO MAGN	hardwood	-0.018
NEMA RESI	hardwood	0.017
EUPI GRAE	hardwood	-0.014
EUPI PERF	hardwood	-0.014
HYDR FRCT	hardwood	-0.014
MESO RUBR	hardwood	-0.014
APLE COND	gymno	-0.013
HYPA UNIP	hardwood	-0.012
CYCL PEND	hardwood	-0.010
SELE ALCI	hardwood	0.010
OLIG PALL	hardwood	-0.009
ANAV PAMP	hardwood	0.008

LEPCODE	HISTGRP	AXIS 1
CLEM ALBA	hardwood	-0.008
LOPH ARGE	gymno	0.008
ASEP ADNI	hardwood	0.005
DREP CARN	hardwood	-0.005
ECLI SILA	herb	-0.005
PSEU CYMA	hardwood	0.005
PERO MORR	gymno	-0.004
ENYP PACK	gymno	-0.003
EUPI SABU	gymno	-0.003
NYCT CINE	hardwood	0.003
DYSS SOBR	hardwood	0.002
NEOA CALI	mixed	-0.002
EUTH SEMI	hardwood	0.001
HABR SCRI	hardwood	-0.001
ABAG APPO	hardwood	0.000

Table V-A.6. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 2 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 2
COLO PAND	gymno	0.967
MESO RUBR	hardwood	0.941
PERO MIZO	hardwood	0.941
ASTI VICT	hardwood	0.894
DREP UNIC	hardwood	0.877
DREP MONI	hardwood	0.874
DREP CARN	hardwood	0.844
PERI GRAN	unknown	0.832
ASEP ETHN	hardwood	0.799
DASY GRIS	gymno	0.796
BLEP CARA	herb	0.790
HESP SULP	hardwood	0.771
VENU CAMB	hardwood	0.747
IDIA AEMU	herb	0.740
ECLI SILA	herb	0.731
ANOM MUST	mixed	0.728
FELT HERI	herb	0.711
ABAG APPO	hardwood	0.706
HYDR PERF	mixed	0.699
ENYP PACK	gymno	0.695
DREP SECU	hardwood	0.685
CAMP PERL	hardwood	0.667
NEPY UMBR	gymno	0.658
IDIA AMER	herb	0.649
GABR DYAR	gymno	0.626
LACI RECT	herb	0.620
APLE COND	gymno	0.610
SCOP JUNC	herb	0.605
EUST FASC	gymno	0.596
ACHY PRAE	gymno	0.593
SERI JUTU	hardwood	0.592
EUCH TIGR	hardwood	0.587
AGRO DUBI	herb	0.575
ENYP VENA	gymno	0.574
EUPI MIST	hardwood	0.557
HESP LATI	hardwood	0.531
HYDR IRAT	mixed	-0.526

LEPCODE	HISTGRP	AXIS 2
OLIG ILLO	hardwood	0.521
EULI DEST	hardwood	0.501
DREP FALC	hardwood	0.477
ORTH TRAN	hardwood	0.477
DREP QUAD	hardwood	0.462
EGIR PERL	hardwood	0.454
STEN PULM	gymno	0.444
LACA LIQU	herb	-0.432
CARI DIVI	gymno	0.427
ANAP PRES	hardwood	0.417
RHYA QUAD	unknown	-0.411
THAL TAYL	herb	-0.407
HYPP XYLI	hardwood	-0.381
DYSS OCHR	hardwood	0.376
EUPI PERF	hardwood	-0.374
EUST SEMI	herb	0.368
EUDR RECT	hardwood	0.356
HYAL EURY	hardwood	-0.353
SYNE ADUM	hardwood	-0.352
HYPP INDI	hardwood	-0.350
ASEP BINO	hardwood	0.349
HEME FINI	unknown	0.348
ANOM VERN	gymno	-0.343
CLEM ALBA	hardwood	0.338
LAMB FISC	hardwood	0.338
LACA TACO	hardwood	-0.325
LASI PERP	hardwood	-0.315
SPAR MAGN	herb	0.315
SPAE HAVI	herb	-0.311
SYNA JUBA	hardwood	-0.311
EUPH UNAN	herb	-0.308
NEMO DARW	hardwood	0.308
PHYL AMER	hardwood	-0.296
TOLY DIST	gymno	0.284
EURO ASTR	hardwood	-0.278
FERA COMS	gymno	0.271
EUXO TRRN	herb	0.269
EULI XYLI	hardwood	0.266
PERO OCCI	gymno	-0.266
EUPI GRAE	hardwood	0.261
ANAP PRAS	hardwood	-0.254

LEPCODE	HISTGRP	AXIS 2
MNIO DUCT	unknown	-0.251
STRE MURI	hardwood	-0.245
EUPI CLMR	mixed	-0.244
EUTH SEMI	hardwood	-0.242
CABE ERYT	hardwood	0.240
MELA IMIT	gymno	-0.240
EUPL BENE	hardwood	0.236
LEUC INSU	herb	-0.233
CERA TEAR	hardwood	-0.231
AGRO OBLQ	herb	-0.228
XANT PONT	unknown	-0.228
TORT TEST	hardwood	-0.224
LACI DAVE	herb	-0.221
ZENO LIGN	unknown	-0.220
RHYN INSU	herb	-0.219
EUXO DIVE	herb	-0.213
POLI PURP	hardwood	-0.211
NADA GIBB	hardwood	-0.209
CERA GUEN	unknown	0.208
CARI AEQU	gymno	-0.207
EUCH JOHN	hardwood	0.206
EUPI SABU	gymno	-0.205
PROP NIVE	unknown	-0.205
ADEL INDE	hardwood	-0.202
TRIP HAES	hardwood	0.201
AGRO PULC	hardwood	-0.197
LOPH MACU	hardwood	-0.192
FERA DECE	gymno	-0.190
XANT MACD	hardwood	-0.189
POLI DISC	hardwood	0.188
EUXO VETU	herb	-0.187
ACER NORM	hardwood	0.186
LOPH ARGE	gymno	0.185
PERI COST	hardwood	-0.185
SYNA CERV	hardwood	-0.185
EUPI SUBC	hardwood	-0.182
PSEU IRRO	hardwood	0.179
RHYN EXER	herb	-0.177
SICY CROC	hardwood	0.176
HOMO COMM	hardwood	0.173
PLAG PHLO	hardwood	-0.173

ALL SPECIES	HISTGRP	AXIS 2
ANDR AEDO	hardwood	0.168
ZOTH TRAN	hardwood	-0.167
EUXO INFA	herb	-0.165
SYNE OCHR	hardwood	-0.162
AUTO CALI	herb	0.160
ACRO IMPL	hardwood	-0.152
LACI PENS	hardwood	-0.150
SPIL PTER	hardwood	0.149
EGIR RUBR	hardwood	0.148
ORTH HIBI	hardwood	-0.146
ANAV PAMP	hardwood	-0.145
NEOA CALI	mixed	0.143
ACRO HESP	hardwood	-0.141
STAM BLAC	unknown	-0.139
AMPH AMER	herb	-0.137
LACI ILLA	herb	0.136
EGIR CRUC	hardwood	-0.131
APAM ANTE	herb	-0.130
CYCL PEND	hardwood	0.130
EGIR SIMP	hardwood	-0.130
HYPA UNIP	hardwood	-0.126
ACHY EPIP	gymno	0.123
XEST OBLA	hardwood	0.116
DYSS SOBR	hardwood	0.113
ENNO MAGN	hardwood	-0.113
PERI ANGT	hardwood	0.113
PERI CURV	hardwood	-0.113
ANTI VASI	hardwood	-0.112
DARG PROC	herb	-0.112
ORTH REVI	hardwood	0.112
CERA ENIG	hardwood	0.108
HOMO HANH	unknown	-0.106
ZOST HIRT	herb	-0.105
AMPH PYRA	hardwood	-0.104
DREP FOEM	hardwood	0.104
APAM AMPU	herb	-0.101
HYDR FRCT	hardwood	0.099
BIST BETU	hardwood	-0.095
DYSS TRUN	hardwood	0.091
CYCL DATA	hardwood	0.087
SYNE DIVE	hardwood	-0.087

LEPCODE	HISTGRP	AXIS 2
PLAT MONT	herb	0.086
PLER OPTE	hardwood	-0.086
OLIG PALL	hardwood	0.084
DREP ARCU	hardwood	-0.082
ABAG NEFA	hardwood	0.080
PROB ALIE	hardwood	0.079
PANT PORT	gymno	0.077
ANTH POLY	hardwood	-0.076
LACI CUNE	hardwood	-0.074
ECTR CREP	mixed	-0.072
EUPI CRTC	unknown	0.071
PROP ALBI	unknown	-0.069
GRAM ORNA	herb	0.067
APAM LIGN	herb	0.065
HYDR RENU	hardwood	0.061
SYNG CELS	gymno	-0.061
NYCT CINE	hardwood	0.059
EUXO SIMO	herb	0.057
LITH ALBI	herb	-0.053
EUPI HARV	hardwood	0.052
XANT DEFE	unknown	-0.051
SCHI IPOM	hardwood	-0.050
DIAR ESUR	hardwood	0.049
STAM PEAR	unknown	0.047
BOMO PALP	hardwood	0.046
PHLO PERI	hardwood	0.044
CORY MEAD	hardwood	0.038
SCHI UNIC	hardwood	-0.037
LEUC FARC	herb	0.036
ANAG OCCI	hardwood	-0.033
ADEL STEL	hardwood	-0.029
CRYP CUER	unknown	0.029
CALL AMOR	hardwood	0.027
LACI PATA	hardwood	0.026
PERI PECT	hardwood	-0.024
PSEU MUSC	unknown	-0.023
APAM CAST	herb	0.022
DYSS FORM	hardwood	-0.020
HOMO FURF	hardwood	-0.019
OLIG SMRF	hardwood	-0.019
PLEM GEOR	hardwood	-0.018

LEPCODE	HISTGRP	AXIS 2
PERO MORR	gymno	-0.017
SELE ALCI	hardwood	-0.015
ASEP ADNI	hardwood	0.014
HABR SCRI	hardwood	0.013
HYDR MARI	gymno	0.013
IRID EMAS	hardwood	0.010
PSEU CYMA	hardwood	0.010
DYSS CITR	hardwood	-0.008
BEHR CONC	hardwood	-0.007
NEMA RESI	hardwood	-0.007
VENU PEAR	hardwood	-0.007
EUXO STS-	herb	0.006
POLI NIMB	hardwood	-0.006
EPIR ALTE	herb	-0.004
SEMI SIGN	gymno	0.001

Table V-A.7. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 3 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 3
SELE ALCI	hardwood	-0.963
PROB ALIE	hardwood	-0.957
NEMA RESI	hardwood	-0.930
CLEM ALBA	hardwood	-0.900
BOMO PALP	hardwood	-0.883
CORY MEAD	hardwood	-0.864
ANTH POLY	hardwood	-0.852
ACHY EPIP	gymno	-0.850
PLEM GEOR	hardwood	-0.845
POLI NIMB	hardwood	-0.844
CERA GUEN	unknown	-0.842
LITH ALBI	herb	-0.833
LAMB FISC	hardwood	-0.831
PLAG PHLO	hardwood	-0.825
ASEP ADNI	hardwood	-0.819
EUCH JOHN	hardwood	-0.810
HABR SCRI	hardwood	-0.808
DYSS SOBR	hardwood	-0.806
CALL AMOR	hardwood	-0.804
OLIG SMRF	hardwood	-0.783
ACRO HESP	hardwood	-0.779
CYCL PEND	hardwood	-0.777
SCHI IPOM	hardwood	-0.754
PHLO PERI	hardwood	-0.752
NEOA CALI	mixed	-0.747
ENNO MAGN	hardwood	-0.739
NADA GIBB	hardwood	-0.728
XANT DEFE	unknown	-0.720
EUXO TRRN	herb	0.703
ANAG OCCI	hardwood	-0.699
EUPI SABU	gymno	-0.684
EPIR ALTE	herb	0.682
EGIR RUBR	hardwood	-0.679
AMPH PYRA	hardwood	-0.666
CRYP CUER	unknown	0.644
EUCH TIGR	hardwood	-0.638
CABE ERYT	hardwood	-0.635

LEPCODE	HISTGRP	AXIS 3
VENU PEAR	hardwood	-0.630
ASEP BINO	hardwood	0.615
LOPH MACU	hardwood	-0.612
ORTH TRAN	hardwood	-0.610
HYPA UNIP	hardwood	-0.605
SPIL PTER	hardwood	-0.603
OLIG PALL	hardwood	-0.599
XEST OBLA	hardwood	0.599
PHYL AMER	hardwood	-0.596
HOMO COMM	hardwood	-0.595
ADEL STEL	hardwood	-0.590
EURO ASTR	hardwood	0.575
DYSS FORM	hardwood	0.572
HESP LATI	hardwood	-0.558
ANAV PAMP	hardwood	-0.557
EUXO SIMO	herb	0.554
LACI DAVE	herb	0.554
XANT PONT	unknown	0.549
ECTR CREP	mixed	-0.544
FELT HERI	herb	-0.543
SICY CROC	hardwood	0.536
TOLY DIST	gymno	-0.527
LACA TACO	hardwood	0.522
LEUC FARC	herb	-0.515
VENU CAMB	hardwood	-0.508
BEHR CONC	hardwood	0.506
HYDR PERF	mixed	-0.506
PLER OPTE	hardwood	0.505
ACRO IMPL	hardwood	-0.503
NEMO DARW	hardwood	0.495
EUST SEMI	herb	-0.481
POLI PURP	hardwood	0.476
EULI XYLI	hardwood	0.475
SPAE HAVI	herb	0.474
DREP QUAD	hardwood	0.471
SERI JUTU	hardwood	-0.471
EUTH SEMI	hardwood	-0.462
DASY GRIS	gymno	-0.461
PERI PECT	hardwood	-0.460
EUXO DIVE	herb	0.458
DIAR ESUR	hardwood	0.452

LEPCODE	HISTGRP	AXIS 3
GABR DYAR	gymno	-0.452
POLI DISC	hardwood	0.451
BLEP CARA	herb	-0.447
ZENO LIGN	unknown	0.447
ADEL INDE	hardwood	0.443
APLE COND	gymno	-0.438
ENYP PACK	gymno	0.437
DREP ARCU	hardwood	-0.434
LACI RECT	herb	0.434
LOPH ARGE	gymno	-0.429
APAM LIGN	herb	0.427
ECLI SILA	herb	-0.425
SYNG CELS	gymno	0.425
IRID EMAS	hardwood	-0.424
EUST FASC	gymno	0.423
RHYN INSU	herb	0.415
EGIR SIMP	hardwood	-0.413
DREP FOEM	hardwood	0.411
RHYA QUAD	unknown	0.408
SYNE ADUM	hardwood	0.405
ZOTH TRAN	hardwood	0.401
APAM AMPU	herb	0.399
PERO MORR	gymno	-0.388
LASI PERP	hardwood	0.387
ORTH HIBI	hardwood	-0.373
PERI CURV	hardwood	-0.373
ORTH REVI	hardwood	-0.367
LACI CUNE	hardwood	-0.362
ANOM VERN	gymno	0.360
DYSS OCHR	hardwood	0.360
ENYP VENA	gymno	0.352
STAM BLAC	unknown	0.344
THAL TAYL	herb	0.343
LEUC INSU	herb	0.337
HESP SULP	hardwood	-0.334
ANAP PRAS	hardwood	0.333
SYNE DIVE	hardwood	0.331
DARG PROC	herb	0.330
XANT MACD	hardwood	0.326
HYDR FRCT	hardwood	0.322
ASTI VICT	hardwood	0.320

LEPCODE	HISTGRP	AXIS 3
NEPY UMBR	gymno	-0.316
ABAG NEFA	hardwood	0.312
HYPP INDI	hardwood	0.311
AGRO OBLQ	herb	0.306
APAM CAST	herb	0.304
TRIP HAES	hardwood	0.304
STRE MURI	hardwood	0.301
MELA IMIT	gymno	-0.293
AMPH AMER	herb	0.286
PROP ALBI	unknown	-0.283
EUXO STS-	herb	0.282
PERI ANGT	hardwood	-0.281
RHYN EXER	herb	0.272
CAMP PERL	hardwood	0.265
ZOST HIRT	herb	0.264
ACER NORM	hardwood	0.263
ANAP PRES	hardwood	-0.263
SCHI UNIC	hardwood	-0.263
AUTO CALI	herb	0.244
EULI DEST	hardwood	0.236
CERA ENIG	hardwood	-0.235
FERA COMS	gymno	-0.231
ABAG APPO	hardwood	0.229
PANT PORT	gymno	-0.227
AGRO DUBI	herb	0.222
AGRO PULC	hardwood	0.219
PERI COST	hardwood	-0.218
PROP NIVE	unknown	0.218
EUPI MIST	hardwood	-0.209
PSEU IRRO	hardwood	0.206
SYNE OCHR	hardwood	0.206
DREP SECU	hardwood	0.204
BIST BETU	hardwood	-0.203
EUPH UNAN	herb	0.203
EUPI PERF	hardwood	0.203
LACI PATA	hardwood	-0.203
EUPI CRTC	unknown	0.202
STEN PULM	gymno	-0.202
APAM ANTE	herb	0.196
HOMO HANH	unknown	-0.196
DREP UNIC	hardwood	0.192

LEPCODE	HISTGRP	AXIS 3
CERA TEAR	hardwood	0.190
IDIA AEMU	herb	0.190
DREP CARN	hardwood	0.176
NYCT CINE	hardwood	-0.172
ANTI VASI	hardwood	0.160
LACI PENS	hardwood	0.158
IDIA AMER	herb	0.148
MESO RUBR	hardwood	-0.146
FERA DECE	gymno	0.145
EUPI GRAE	hardwood	0.141
HYDR IRAT	mixed	0.139
EUXO VETU	herb	0.135
SYNA JUBA	hardwood	0.134
TORT TEST	hardwood	-0.134
PSEU MUSC	unknown	0.132
MNIO DUCT	unknown	0.129
COLO PAND	gymno	0.126
PERO MIZO	hardwood	0.123
SCOP JUNC	herb	0.119
HOMO FURF	hardwood	-0.111
HYPP XYLI	hardwood	0.109
OLIG ILLO	hardwood	-0.109
EUPI SUBC	hardwood	0.108
HEME FINI	unknown	-0.108
EUPI HARV	hardwood	-0.103
DREP MONI	hardwood	-0.102
HYDR RENU	hardwood	-0.096
PSEU CYMA	hardwood	-0.086
EGIR PERL	hardwood	0.074
EUDR RECT	hardwood	0.068
PERI GRAN	unknown	-0.063
STAM PEAR	unknown	0.062
HYAL EURY	hardwood	0.060
CYCL DATA	hardwood	-0.054
EUPI CLMR	mixed	0.054
SPAR MAGN	herb	-0.054
DYSS TRUN	hardwood	-0.053
CARI DIVI	gymno	0.052
ACHY PRAE	gymno	0.049
ASEP ETHN	hardwood	0.048
EUXO INFA	herb	0.047

LEPCODE	HISTGRP	AXIS 3
SYNA CERV	hardwood	-0.043
EUPL BENE	hardwood	-0.042
DYSS CITR	hardwood	0.033
GRAM ORNA	herb	-0.032
ANDR AEDO	hardwood	0.030
DREP FALC	hardwood	0.030
HYDR MARI	gymno	-0.030
ANOM MUST	mixed	0.029
PERO OCCI	gymno	-0.019
LACI ILLA	herb	-0.018
CARI AEQU	gymno	-0.014
EGIR CRUC	hardwood	0.013
LACA LIQU	herb	-0.008
SEMI SIGN	gymno	0.003
PLAT MONT	herb	0.001

Table V-A.8. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 4 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 4
CYCL DATA	hardwood	0.902
LACI PATA	hardwood	0.885
SCHI UNIC	hardwood	0.878
EUDR RECT	hardwood	0.872
PLAT MONT	herb	0.872
PERI ANGT	hardwood	0.860
BIST BETU	hardwood	0.844
HOMO HANH	unknown	0.829
LOPH ARGE	gymno	0.800
PROP ALBI	unknown	0.800
SYNA CERV	hardwood	0.755
ADEL STEL	hardwood	0.710
ORTH REVI	hardwood	0.670
LACI ILLA	herb	0.663
HOMO FURF	hardwood	0.650
AMPH PYRA	hardwood	0.630
HYAL EURY	hardwood	0.622
TOLY DIST	gymno	0.612
EUPI MIST	hardwood	0.605
PERI PECT	hardwood	0.597
HYPP INDI	hardwood	-0.554
RHYN EXER	herb	0.553
ABAG APPO	hardwood	0.536
NEPY UMBR	gymno	0.529
ACRO IMPL	hardwood	0.503
EUPH UNAN	herb	-0.497
PERI COST	hardwood	0.485
OLIG ILLO	hardwood	-0.458
EUPI HARV	hardwood	-0.447
LEUC FARC	herb	0.439
PERI CURV	hardwood	0.419
EURO ASTR	hardwood	-0.406
ACHY PRAE	gymno	0.396
HOMO COMM	hardwood	0.392
STAM BLAC	unknown	0.391
GRAM ORNA	herb	0.388
POLI PURP	hardwood	-0.380

LEPCODE	HISTGRP	AXIS 4
EUXO DIVE	herb	-0.373
HEME FINI	unknown	0.370
OLIG PALL	hardwood	0.370
PHLO PERI	hardwood	0.367
LASI PERP	hardwood	-0.366
XEST OBLA	hardwood	-0.365
AGRO OBLQ	herb	-0.357
CERA ENIG	hardwood	-0.356
PANT PORT	gymno	0.356
SERI JUTU	hardwood	0.356
EUCH JOHN	hardwood	0.352
LACI DAVE	herb	-0.352
HESP SULP	hardwood	0.350
PSEU IRRO	hardwood	-0.346
ECLI SILA	herb	0.342
CARI DIVI	gymno	0.341
IDIA AEMU	herb	0.339
FERA COMS	gymno	-0.336
AGRO DUBI	herb	-0.325
CERA TEAR	hardwood	-0.321
LEUC INSU	herb	-0.319
ZOST HIRT	herb	-0.319
DYSS OCHR	hardwood	0.317
LACI RECT	herb	-0.314
HYPP XYLI	hardwood	-0.313
XANT DEFE	unknown	-0.313
ANOM MUST	mixed	0.312
DREP CARN	hardwood	-0.310
DARG PROC	herb	-0.308
TRIP HAES	hardwood	-0.307
BLEP CARA	herb	-0.304
STEN PULM	gymno	0.303
APAM AMPU	herb	-0.302
AUTO CALI	herb	-0.301
ORTH HIBI	hardwood	-0.295
LACA TACO	hardwood	-0.291
PERO MIZO	hardwood	0.287
LAMB FISC	hardwood	-0.282
IDIA AMER	herb	0.281
XANT PONT	unknown	-0.281
ENNO MAGN	hardwood	-0.280

LEPCODE	HISTGRP	AXIS 4
EGIR RUBR	hardwood	-0.277
SYNE DIVE	hardwood	-0.277
AGRO PULC	hardwood	-0.275
CABE ERYT	hardwood	0.275
CALL AMOR	hardwood	-0.273
LITH ALBI	herb	-0.272
PLAG PHLO	hardwood	-0.268
RHYA QUAD	unknown	-0.264
SYNA JUBA	hardwood	-0.263
BOMO PALP	hardwood	-0.261
POLI NIMB	hardwood	-0.258
ANTI VASI	hardwood	-0.255
ORTH TRAN	hardwood	0.253
LACI CUNE	hardwood	-0.250
APLE COND	gymno	0.248
POLI DISC	hardwood	-0.248
HABR SCRI	hardwood	-0.247
PHYL AMER	hardwood	-0.247
DREP QUAD	hardwood	-0.244
FELT HERI	herb	-0.240
CRYP CUER	unknown	-0.234
EUST SEMI	herb	0.234
GABR DYAR	gymno	0.229
VENU CAMB	hardwood	-0.229
CLEM ALBA	hardwood	-0.228
ASEP ADNI	hardwood	-0.221
SPAE HAVI	herb	-0.221
PLEM GEOR	hardwood	-0.220
ZENO LIGN	unknown	-0.217
APAM LIGN	herb	-0.216
DREP SECU	hardwood	-0.213
DASY GRIS	gymno	-0.212
ASEP BINO	hardwood	0.211
EUPI GRAE	hardwood	0.208
ANAV PAMP	hardwood	-0.207
ENYP PACK	gymno	0.206
HYDR FRCT	hardwood	0.204
EPIR ALTE	herb	-0.203
NYCT CINE	hardwood	0.203
CYCL PEND	hardwood	-0.197
EGIR CRUC	hardwood	0.197

LEPCODE	HISTGRP	AXIS 4
SYNE OCHR	hardwood	-0.197
PSEU CYMA	hardwood	0.193
VENU PEAR	hardwood	-0.193
HYDR MARI	gymno	0.192
HYPA UNIP	hardwood	-0.184
SPIL PTER	hardwood	-0.183
CORY MEAD	hardwood	-0.180
ANAP PRAS	hardwood	-0.177
SYNE ADUM	hardwood	0.172
CAMP PERL	hardwood	0.169
HYDR RENU	hardwood	0.165
EUPI CRTC	unknown	-0.164
SPAR MAGN	herb	-0.163
EUXO STS-	herb	-0.160
ENYP VENA	gymno	0.159
ACHY EPIP	gymno	0.154
EUPI SABU	gymno	0.154
EGIR SIMP	hardwood	-0.151
ANTH POLY	hardwood	0.148
STRE MURI	hardwood	-0.148
RHYN INSU	herb	-0.146
DIAR ESUR	hardwood	-0.145
PERO OCCI	gymno	-0.145
ANAG OCCI	hardwood	-0.142
DREP ARCU	hardwood	-0.142
ACRO HESP	hardwood	-0.140
HYDR IRAT	mixed	-0.139
NEMO DARW	hardwood	0.136
NADA GIBB	hardwood	0.126
APAM CAST	herb	-0.123
ANAP PRES	hardwood	-0.122
DREP FOEM	hardwood	-0.122
ANDR AEDO	hardwood	0.121
CERA GUEN	unknown	0.121
PLER OPTE	hardwood	-0.120
IRID EMAS	hardwood	-0.118
COLO PAND	gymno	-0.115
EULI DEST	hardwood	0.114
AMPH AMER	herb	0.113
EUPL BENE	hardwood	0.112
OLIG SMRF	hardwood	0.110

LEPCODE	HISTGRP	AXIS 4
EGIR PERL	hardwood	-0.109
ADEL INDE	hardwood	0.108
FERA DECE	gymno	-0.105
LOPH MACU	hardwood	-0.104
ASEP ETHN	hardwood	0.102
XANT MACD	hardwood	0.102
DYSS SOBR	hardwood	-0.100
NEOA CALI	mixed	-0.100
SYNG CELS	gymno	-0.099
ASTI VICT	hardwood	0.098
THAL TAYL	herb	-0.098
EUPI SUBC	hardwood	-0.097
STAM PEAR	unknown	0.094
ACER NORM	hardwood	-0.091
PSEU MUSC	unknown	0.091
DREP UNIC	hardwood	-0.090
EULI XYLI	hardwood	-0.089
HYDR PERF	mixed	-0.088
SCOP JUNC	herb	-0.086
MELA IMIT	gymno	0.085
PERO MORR	gymno	0.085
PROP NIVE	unknown	0.084
EUTH SEMI	hardwood	0.081
PROB ALIE	hardwood	-0.080
SCHI IPOM	hardwood	0.080
LACA LIQU	herb	-0.076
CARI AEQU	gymno	0.071
NEMA RESI	hardwood	-0.067
APAM ANTE	herb	-0.065
ABAG NEFA	hardwood	-0.064
SELE ALCI	hardwood	-0.064
ZOTH TRAN	hardwood	-0.059
PERI GRAN	unknown	-0.058
DREP FALC	hardwood	0.053
EUXO SIMO	herb	-0.053
LACI PENS	hardwood	0.053
EUST FASC	gymno	0.052
DREP MONI	hardwood	-0.050
EUPI PERF	hardwood	-0.050
DYSS TRUN	hardwood	0.049
ECTR CREP	mixed	-0.049

LEPCODE	HISTGRP	AXIS 4
EUCH TIGR	hardwood	-0.048
BEHR CONC	hardwood	-0.045
HESP LATI	hardwood	-0.045
EUXO VETU	herb	-0.044
DYSS FORM	hardwood	-0.037
MESO RUBR	hardwood	0.035
SICY CROC	hardwood	-0.029
TORT TEST	hardwood	0.025
MNIO DUCT	unknown	-0.024
EUXO INFA	herb	-0.019
DYSS CITR	hardwood	0.018
EUPI CLMR	mixed	-0.018
EUXO TRRN	herb	-0.014
ANOM VERN	gymno	0.011
SEMI SIGN	gymno	-0.004

Table V-A.9. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 5 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 5
ANDR AEDO	hardwood	-0.854
HYDR RENU	hardwood	-0.836
HYDR MARI	gymno	-0.807
DYSS OCHR	hardwood	-0.723
CARI DIVI	gymno	-0.644
STEN PULM	gymno	-0.642
HYDR FRCT	hardwood	-0.637
NEMO DARW	hardwood	-0.618
STAM BLAC	unknown	-0.600
DYSS CITR	hardwood	-0.596
EGIR RUBR	hardwood	-0.574
CAMP PERL	hardwood	-0.567
DYSS SOBR	hardwood	-0.533
HEME FINI	unknown	0.532
DYSS FORM	hardwood	-0.529
SICY CROC	hardwood	-0.525
ANOM VERN	gymno	0.519
SPAR MAGN	herb	-0.515
EUPL BENE	hardwood	-0.513
ADEL INDE	hardwood	0.507
ENYP PACK	gymno	-0.495
LACI ILLA	herb	0.491
ENYP VENA	gymno	-0.487
IDIA AMER	herb	-0.481
SPIL PTER	hardwood	-0.476
EULI XYLI	hardwood	-0.475
ORTH REVI	hardwood	0.464
CABE ERYT	hardwood	-0.445
BIST BETU	hardwood	0.429
EGIR PERL	hardwood	0.429
XANT MACD	hardwood	-0.422
PERI GRAN	unknown	-0.413
APAM ANTE	herb	0.408
LOPH MACU	hardwood	-0.404
GABR DYAR	gymno	-0.392
LACI PENS	hardwood	0.383
ANTI VASI	hardwood	-0.380

LEPCODE	HISTGRP	AXIS 5
VENU PEAR	hardwood	-0.380
IDIA AEMU	herb	-0.378
AUTO CALI	herb	0.376
ASEP BINO	hardwood	-0.375
EGIR CRUC	hardwood	0.375
AGRO OBLQ	herb	0.374
ACHY EPIP	gymno	-0.371
LACA LIQU	herb	0.365
LEUC FARC	herb	0.363
ANOM MUST	mixed	-0.361
EPIR ALTE	herb	-0.361
LEUC INSU	herb	0.357
LITH ALBI	herb	-0.356
LACI PATA	hardwood	0.354
AGRO PULC	hardwood	0.352
PLAG PHLO	hardwood	-0.351
EUXO STS-	herb	0.344
EUPI GRAE	hardwood	-0.343
POLI NIMB	hardwood	-0.343
HOMO FURF	hardwood	0.340
GRAM ORNA	herb	0.339
NYCT CINE	hardwood	0.337
XANT PONT	unknown	-0.337
LOPH ARGE	gymno	0.335
IRID EMAS	hardwood	-0.333
EULI DEST	hardwood	0.330
DARG PROC	herb	0.329
DIAR ESUR	hardwood	-0.329
LASI PERP	hardwood	0.329
SERI JUTU	hardwood	0.328
PSEU CYMA	hardwood	0.326
PLEM GEOR	hardwood	-0.325
ASEP ETHN	hardwood	0.324
EUXO INFA	herb	0.320
PERO MORR	gymno	-0.320
DREP FOEM	hardwood	-0.319
APLE COND	gymno	0.317
ANAG OCCI	hardwood	-0.314
PERI ANGT	hardwood	0.314
EUPI MIST	hardwood	-0.308
DYSS TRUN	hardwood	-0.307

LEPCODE	HISTGRP	AXIS 5
SYNE DIVE	hardwood	0.307
SYNE OCHR	hardwood	0.301
AGRO DUBI	herb	-0.292
ZOST HIRT	herb	0.292
ASEP ADNI	hardwood	-0.290
HYAL EURY	hardwood	0.290
SYNG CELS	gymno	0.289
EGIR SIMP	hardwood	-0.276
EUXO DIVE	herb	0.274
PERI COST	hardwood	0.274
EUPI CLMR	mixed	0.271
EUST FASC	gymno	-0.269
EUXO SIMO	herb	-0.268
HABR SCRI	hardwood	-0.268
NEOA CALI	mixed	-0.267
PSEU MUSC	unknown	0.265
HOMO HANH	unknown	0.262
EUXO VETU	herb	0.255
ENNO MAGN	hardwood	-0.254
DREP SECU	hardwood	0.250
CORY MEAD	hardwood	-0.249
DREP MONI	hardwood	0.245
DREP ARCU	hardwood	-0.244
OLIG ILLO	hardwood	0.239
MESO RUBR	hardwood	0.230
ANTH POLY	hardwood	-0.228
HYPA UNIP	hardwood	-0.228
CALL AMOR	hardwood	-0.227
FERA DECE	gymno	0.227
PSEU IRRO	hardwood	0.213
ANAP PRES	hardwood	0.211
FERA COMS	gymno	0.211
ECTR CREP	mixed	-0.209
LACA TACO	hardwood	0.201
ANAV PAMP	hardwood	-0.199
ORTH HIBI	hardwood	-0.199
TRIP HAES	hardwood	-0.199
NEMA RESI	hardwood	-0.198
CERA TEAR	hardwood	0.196
TORT TEST	hardwood	-0.196
PROP ALBI	unknown	0.195

LEPCODE	HISTGRP	AXIS 5
ACHY PRAE	gymno	0.194
BEHR CONC	hardwood	-0.193
RHYA QUAD	unknown	0.187
CYCL PEND	hardwood	-0.182
SELE ALCI	hardwood	-0.181
ABAG APPO	hardwood	-0.179
LAMB FISC	hardwood	-0.179
ADEL STEL	hardwood	0.177
CERA GUEN	unknown	-0.177
POLI PURP	hardwood	0.172
AMPH AMER	herb	-0.167
CARI AEQU	gymno	-0.165
LACI CUNE	hardwood	0.165
RHYN INSU	herb	0.163
PERI CURV	hardwood	-0.162
EUTH SEMI	hardwood	-0.161
PROP NIVE	unknown	0.161
PANT PORT	gymno	0.157
EURO ASTR	hardwood	0.154
PLAT MONT	herb	0.153
COLO PAND	gymno	0.148
DREP UNIC	hardwood	0.148
HOMO COMM	hardwood	0.148
SYNA JUBA	hardwood	0.147
TOLY DIST	gymno	0.145
ZOTH TRAN	hardwood	0.145
EUPH UNAN	herb	0.141
APAM AMPU	herb	-0.138
APAM CAST	herb	-0.136
PHYL AMER	hardwood	-0.133
DREP CARN	hardwood	0.131
PLER OPTE	hardwood	-0.126
OLIG PALL	hardwood	0.125
CRYP CUER	unknown	0.123
PHLO PERI	hardwood	0.121
CLEM ALBA	hardwood	-0.120
ZENO LIGN	unknown	-0.120
MELA IMIT	gymno	-0.119
ACER NORM	hardwood	0.118
HYPP INDI	hardwood	0.115
ACRO HESP	hardwood	-0.112

LEPCODE	HISTGRP	AXIS 5
HYDR IRAT	mixed	0.112
BOMO PALP	hardwood	-0.108
STAM PEAR	unknown	0.107
DASY GRIS	gymno	0.105
PROB ALIE	hardwood	-0.104
EUPI SUBC	hardwood	-0.101
SYNE ADUM	hardwood	0.099
HESP SULP	hardwood	0.097
DREP QUAD	hardwood	-0.096
NADA GIBB	hardwood	-0.094
XEST OBLA	hardwood	0.094
EUDR RECT	hardwood	0.092
HYDR PERF	mixed	-0.092
EUXO TRRN	herb	0.089
APAM LIGN	herb	0.086
EUCH JOHN	hardwood	0.086
CERA ENIG	hardwood	0.085
RHYN EXER	herb	-0.082
LACI RECT	herb	0.080
XANT DEFE	unknown	0.080
ANAP PRAS	hardwood	0.079
ORTH TRAN	hardwood	0.073
NEPY UMBR	gymno	0.070
PERI PECT	hardwood	0.070
LACI DAVE	herb	-0.064
POLI DISC	hardwood	0.063
EUPI HARV	hardwood	-0.061
SPAE HAVI	herb	0.051
EUPI CRTC	unknown	-0.050
BLEP CARA	herb	-0.048
EUST SEMI	herb	-0.046
HYPP XYLI	hardwood	-0.039
SCHI UNIC	hardwood	-0.039
AMPH PYRA	hardwood	0.035
ACRO IMPL	hardwood	0.034
DREP FALC	hardwood	-0.032
ECLI SILA	herb	0.031
PERO MIZO	hardwood	-0.027
PERO OCCI	gymno	0.027
STRE MURI	hardwood	0.027
ASTI VICT	hardwood	-0.026

LEPCODE	HISTGRP	AXIS 5
EUPI PERF	hardwood	-0.026
MNIO DUCT	unknown	-0.025
OLIG SMRF	hardwood	0.023
SYNA CERV	hardwood	0.023
EUPI SABU	gymno	-0.021
THAL TAYL	herb	0.020
HESP LATI	hardwood	0.018
SCOP JUNC	herb	0.017
FELT HERI	herb	0.016
EUCH TIGR	hardwood	0.012
VENU CAMB	hardwood	-0.011
ABAG NEFA	hardwood	0.008
CYCL DATA	hardwood	-0.008
SCHI IPOM	hardwood	-0.005
SEMI SIGN	gymno	0.003

Table V-A.10. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 6 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 6
CARI AEQU	gymno	0.870
STAM PEAR	unknown	0.866
TORT TEST	hardwood	0.848
EUPI GRAE	hardwood	0.838
EUPI SUBC	hardwood	0.808
PERO MORR	gymno	0.782
MNIO DUCT	unknown	0.778
EUPI PERF	hardwood	0.751
MELA IMIT	gymno	0.746
DREP ARCU	hardwood	0.717
IRID EMAS	hardwood	0.677
RHYN EXER	herb	-0.628
HYDR FRCT	hardwood	0.616
EUTH SEMI	hardwood	0.613
THAL TAYL	herb	0.586
EUPI CRTC	unknown	-0.567
DYSS CITR	hardwood	0.562
EUST FASC	gymno	0.560
APAM CAST	herb	-0.557
EUPI SABU	gymno	0.545
EUST SEMI	herb	0.525
VENU PEAR	hardwood	0.525
SYNA CERV	hardwood	0.522
ANAP PRAS	hardwood	-0.497
EUXO SIMO	herb	-0.493
ECTR CREP	mixed	0.488
ORTH TRAN	hardwood	0.486
EULI DEST	hardwood	0.469
DREP SECU	hardwood	0.463
AMPH AMER	herb	-0.461
STAM BLAC	unknown	0.458
HYPP INDI	hardwood	-0.448
APAM AMPU	herb	-0.443
EUPL BENE	hardwood	-0.438
PERI COST	hardwood	-0.429
HYDR IRAT	mixed	0.424
LACI DAVE	herb	-0.421

LEPCODE	HISTGRP	AXIS 6
SYNG CELS	gymno	-0.420
ABAG NEFA	hardwood	-0.410
XANT MACD	hardwood	0.405
XANT PONT	unknown	-0.401
XEST OBLA	hardwood	-0.399
POLI PURP	hardwood	-0.398
BEHR CONC	hardwood	-0.393
SYNE ADUM	hardwood	-0.393
EGIR CRUC	hardwood	-0.387
DYSS FORM	hardwood	-0.381
EUXO DIVE	herb	-0.379
EPIR ALTE	herb	-0.378
EURO ASTR	hardwood	-0.374
PROP ALBI	unknown	-0.370
HOMO FURF	hardwood	-0.364
ASEP BINO	hardwood	-0.355
DIAR ESUR	hardwood	-0.339
PLAT MONT	herb	-0.339
POLI DISC	hardwood	-0.339
AMPH PYRA	hardwood	-0.331
APAM ANTE	herb	-0.328
EUXO TRRN	herb	-0.328
ANAG OCCI	hardwood	0.319
DARG PROC	herb	-0.318
ANDR AEDO	hardwood	-0.314
EUXO STS-	herb	-0.312
ANTH POLY	hardwood	-0.308
GRAM ORNA	herb	-0.299
EUCH JOHN	hardwood	-0.296
HOMO HANH	unknown	-0.287
TOLY DIST	gymno	-0.285
ZOST HIRT	herb	-0.283
ACHY EPIP	gymno	-0.274
EUXO INFA	herb	-0.274
LEUC FARC	herb	-0.274
LACI PENS	hardwood	-0.271
ECLI SILA	herb	0.265
SPAE HAVI	herb	-0.262
HYAL EURY	hardwood	-0.259
HOMO COMM	hardwood	-0.255
DYSS OCHR	hardwood	-0.254

LEPCODE	HISTGRP	AXIS 6
LACA TACO	hardwood	-0.253
SYNE DIVE	hardwood	-0.248
ADEL INDE	hardwood	-0.247
EUPI HARV	hardwood	0.246
ZENO LIGN	unknown	-0.246
LEUC INSU	herb	-0.245
ADEL STEL	hardwood	-0.242
VENU CAMB	hardwood	0.242
ACER NORM	hardwood	-0.238
ENYP VENA	gymno	0.238
LACI ILLA	herb	-0.231
LACI CUNE	hardwood	0.227
ZOTH TRAN	hardwood	-0.223
IDIA AMER	herb	-0.222
LASI PERP	hardwood	-0.221
SPAR MAGN	herb	-0.220
LACI RECT	herb	-0.215
AGRO PULC	hardwood	-0.212
APAM LIGN	herb	-0.212
CERA GUEN	unknown	0.212
CYCL DATA	hardwood	0.207
HYPP XYLI	hardwood	-0.206
NEMA RESI	hardwood	-0.205
PROP NIVE	unknown	-0.202
RHYN INSU	herb	-0.201
AUTO CALI	herb	-0.195
EGIR SIMP	hardwood	-0.195
LAMB FISC	hardwood	0.194
PSEU IRRO	hardwood	-0.191
ORTH REVI	hardwood	-0.189
LACI PATA	hardwood	-0.188
ENYP PACK	gymno	-0.174
PSEU CYMA	hardwood	0.174
ABAG APPO	hardwood	-0.173
BIST BETU	hardwood	-0.173
POLI NIMB	hardwood	-0.173
EUPH UNAN	herb	-0.170
HYDR MARI	gymno	0.167
PERI ANGT	hardwood	0.167
SCHI UNIC	hardwood	-0.167
ORTH HIBI	hardwood	-0.165

LEPCODE	HISTGRP	AXIS 6
AGRO OBLQ	herb	-0.163
APLE COND	gymno	0.162
PHYL AMER	hardwood	0.161
SICY CROC	hardwood	-0.159
NYCT CINE	hardwood	0.156
ACRO IMPL	hardwood	-0.153
PERI CURV	hardwood	-0.151
ASEP ADNI	hardwood	-0.149
NEMO DARW	hardwood	0.147
LOPH ARGE	gymno	-0.146
PERI GRAN	unknown	0.145
PHLO PERI	hardwood	0.144
HYDR RENU	hardwood	-0.142
ASTI VICT	hardwood	-0.136
ANTI VASI	hardwood	0.135
HESP LATI	hardwood	0.135
ENNO MAGN	hardwood	-0.134
SELE ALCI	hardwood	-0.132
HYPA UNIP	hardwood	-0.131
TRIP HAES	hardwood	-0.126
NEOA CALI	mixed	-0.120
ANAV PAMP	hardwood	-0.119
PERI PECT	hardwood	-0.118
ACRO HESP	hardwood	-0.116
ANOM VERN	gymno	-0.116
HABR SCRI	hardwood	-0.116
OLIG ILLO	hardwood	-0.116
PLER OPTE	hardwood	-0.115
EUPI MIST	hardwood	-0.110
DREP CARN	hardwood	-0.104
OLIG PALL	hardwood	-0.102
CORY MEAD	hardwood	0.101
LOPH MACU	hardwood	-0.101
STEN PULM	gymno	0.100
CALL AMOR	hardwood	-0.099
PLEM GEOR	hardwood	0.099
STRE MURI	hardwood	0.099
DREP FOEM	hardwood	-0.098
PANT PORT	gymno	0.098
HEME FINI	unknown	-0.096
CLEM ALBA	hardwood	-0.094

LEPCODE	HISTGRP	AXIS 6
BOMO PALP	hardwood	0.088
AGRO DUBI	herb	-0.086
ANAP PRES	hardwood	0.083
MESO RUBR	hardwood	0.082
PROB ALIE	hardwood	0.081
CERA TEAR	hardwood	-0.080
CRYP CUER	unknown	0.078
PLAG PHLO	hardwood	0.074
DASY GRIS	gymno	0.072
XANT DEFE	unknown	-0.070
FERA DECE	gymno	-0.068
CAMP PERL	hardwood	-0.067
ANOM MUST	mixed	-0.063
SYNA JUBA	hardwood	-0.063
OLIG SMRF	hardwood	0.060
FELT HERI	herb	-0.057
GABR DYAR	gymno	-0.055
SCHI IPOM	hardwood	0.055
DYSS SOBR	hardwood	-0.053
CABE ERYT	hardwood	-0.052
EUXO VETU	herb	0.048
EUDR RECT	hardwood	0.046
EULI XYLI	hardwood	-0.046
DREP FALC	hardwood	0.043
DREP UNIC	hardwood	0.043
BLEP CARA	herb	-0.041
PERO OCCI	gymno	-0.040
IDIA AEMU	herb	-0.039
CERA ENIG	hardwood	0.037
EGIR RUBR	hardwood	-0.037
DYSS TRUN	hardwood	0.034
SCOP JUNC	herb	0.028
PERO MIZO	hardwood	0.027
DREP QUAD	hardwood	-0.026
PSEU MUSC	unknown	-0.025
ASEP ETHN	hardwood	0.024
EUCH TIGR	hardwood	0.024
RHYA QUAD	unknown	0.024
NADA GIBB	hardwood	-0.021
EUPI CLMR	mixed	-0.020
SPIL PTER	hardwood	-0.017

LEPCODE	HISTGRP	AXIS 6
COLO PAND	gymno	0.013
DREP MONI	hardwood	-0.010
LACA LIQU	herb	-0.010
SYNE OCHR	hardwood	0.010
CYCL PEND	hardwood	-0.009
FERA COMS	gymno	0.009
LITH ALBI	herb	0.009
NEPY UMBR	gymno	0.009
HESP SULP	hardwood	0.006
CARI DIVI	gymno	-0.004
HYDR PERF	mixed	-0.003
ACHY PRAE	gymno	0.002
EGIR PERL	hardwood	0.002
SERI JUTU	hardwood	-0.002
SEMI SIGN	gymno	-0.001

Table V-A.11. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 7 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 7
PERO OCCI	gymno	-1.083
SPAE HAVI	herb	-0.632
EUPI HARV	hardwood	-0.584
TRIP HAES	hardwood	0.565
EUPI CLMR	mixed	0.554
APAM LIGN	herb	0.532
BEHR CONC	hardwood	0.489
APAM CAST	herb	0.461
LACI PENS	hardwood	0.450
DREP FOEM	hardwood	0.424
PROP NIVE	unknown	0.403
LACI CUNE	hardwood	0.399
ANAP PRAS	hardwood	0.392
AGRO OBLQ	herb	-0.376
SYNG CELS	gymno	0.376
LASI PERP	hardwood	-0.374
AMPH AMER	herb	0.371
DREP QUAD	hardwood	-0.370
ECTR CREP	mixed	0.359
EUPL BENE	hardwood	0.359
OLIG ILLO	hardwood	-0.359
AUTO CALI	herb	0.351
APAM AMPU	herb	0.347
HYPP XYLI	hardwood	-0.342
HYDR IRAT	mixed	-0.339
SPAR MAGN	herb	-0.339
EGIR SIMP	hardwood	0.336
STRE MURI	hardwood	0.335
EPIR ALTE	herb	-0.333
PERI COST	hardwood	0.329
PANT PORT	gymno	-0.328
ADEL INDE	hardwood	0.327
XANT PONT	unknown	-0.320
LACA LIQU	herb	0.319
ZENO LIGN	unknown	0.310
EUTH SEMI	hardwood	0.304
NEMO DARW	hardwood	-0.304

LEPCODE	HISTGRP	AXIS 7
EUXO INFA	herb	0.300
LOPH MACU	hardwood	0.296
DYSS FORM	hardwood	0.295
PERO MORR	gymno	-0.294
EUPI SABU	gymno	0.291
EULI XYLI	hardwood	0.288
EUPI PERF	hardwood	-0.288
PLER OPTE	hardwood	-0.286
ACER NORM	hardwood	0.283
PERI CURV	hardwood	0.281
GABR DYAR	gymno	-0.278
DREP ARCU	hardwood	0.274
PHYL AMER	hardwood	-0.274
DREP FALC	hardwood	0.270
EULI DEST	hardwood	0.270
SPIL PTER	hardwood	-0.269
SERI JUTU	hardwood	-0.266
LACI RECT	herb	0.254
ANAP PRES	hardwood	0.252
SYNE ADUM	hardwood	-0.251
EUXO VETU	herb	0.248
HYPP INDI	hardwood	0.242
EGIR PERL	hardwood	0.239
APAM ANTE	herb	0.238
RHYN INSU	herb	0.235
EUXO TRRN	herb	-0.232
RHYN EXER	herb	0.232
SICY CROC	hardwood	-0.231
EURO ASTR	hardwood	0.229
ABAG NEFA	hardwood	0.227
HYDR PERF	mixed	-0.227
HYPA UNIP	hardwood	0.223
CERA ENIG	hardwood	-0.221
XANT MACD	hardwood	0.221
HESP SULP	hardwood	0.216
NEOA CALI	mixed	-0.216
ANAV PAMP	hardwood	0.213
TORT TEST	hardwood	0.212
DARG PROC	herb	0.208
LACA TACO	hardwood	-0.205
PSEU IRRO	hardwood	0.205

LEPCODE	HISTGRP	AXIS 7
DIAR ESUR	hardwood	0.204
CYCL DATA	hardwood	-0.202
EGIR CRUC	hardwood	0.201
VENU PEAR	hardwood	0.199
ANOM MUST	mixed	-0.198
CRYP CUER	unknown	-0.198
CABE ERYT	hardwood	-0.195
ACRO IMPL	hardwood	0.194
PHLO PERI	hardwood	0.194
NADA GIBB	hardwood	0.193
HOMO FURF	hardwood	0.192
EUPI SUBC	hardwood	-0.191
HESP LATI	hardwood	0.189
EUXO SIMO	herb	0.188
ASEP BINO	hardwood	0.186
POLI DISC	hardwood	0.183
STAM PEAR	unknown	0.181
HYDR MARI	gymno	-0.179
ANDR AEDO	hardwood	0.177
HOMO COMM	hardwood	0.173
XEST OBLA	hardwood	0.172
ENNO MAGN	hardwood	0.170
AGRO DUBI	herb	0.169
IDIA AEMU	herb	-0.169
PERI PECT	hardwood	-0.168
CYCL PEND	hardwood	0.167
EGIR RUBR	hardwood	0.167
EUXO DIVE	herb	0.166
STAM BLAC	unknown	0.165
LACI DAVE	herb	0.164
ANTI VASI	hardwood	0.162
APLE COND	gymno	0.161
CARI AEQU	gymno	0.160
ACRO HESP	hardwood	0.159
DREP CARN	hardwood	-0.156
ZOST HIRT	herb	0.154
EUXO STS-	herb	0.153
PROP ALBI	unknown	0.152
ZOTH TRAN	hardwood	0.148
EUCH TIGR	hardwood	-0.144
ADEL STEL	hardwood	0.142

LEPCODE	HISTGRP	AXIS 7
CERA TEAR	hardwood	0.140
HABR SCRI	hardwood	-0.140
NEPY UMBR	gymno	-0.138
CAMP PERL	hardwood	-0.135
SYNE DIVE	hardwood	0.135
ASEP ETHN	hardwood	0.134
ASEP ADNI	hardwood	-0.132
STEN PULM	gymno	-0.129
RHYA QUAD	unknown	-0.128
AGRO PULC	hardwood	0.121
LACI ILLA	herb	0.117
MNIO DUCT	unknown	0.117
PROB ALIE	hardwood	0.116
EUST FASC	gymno	0.115
PLAG PHLO	hardwood	0.114
DREP SECU	hardwood	-0.113
TOLY DIST	gymno	0.113
BLEP CARA	herb	-0.111
ORTH REVI	hardwood	0.109
PSEU CYMA	hardwood	-0.106
ACHY PRAE	gymno	-0.100
HOMO HANH	unknown	0.100
NYCT CINE	hardwood	-0.098
THAL TAYL	herb	0.097
FELT HERI	herb	-0.095
XANT DEFE	unknown	-0.094
EUCH JOHN	hardwood	-0.091
POLI NIMB	hardwood	-0.090
ANOM VERN	gymno	-0.089
CORY MEAD	hardwood	0.089
SYNE OCHR	hardwood	0.089
NEMA RESI	hardwood	0.085
ORTH HIBI	hardwood	-0.085
ECLI SILA	herb	-0.084
HYAL EURY	hardwood	-0.082
DASY GRIS	gymno	-0.081
FERA DECE	gymno	0.080
ENYP VENA	gymno	-0.079
OLIG SMRF	hardwood	-0.078
LEUC INSU	herb	-0.077
PLAT MONT	herb	0.076

LEPCODE	HISTGRP	AXIS 7
ASTI VICT	hardwood	0.075
DREP MONI	hardwood	-0.074
EUST SEMI	herb	0.073
ANAG OCCI	hardwood	-0.072
AMPH PYRA	hardwood	0.071
EUPI CRTC	unknown	0.068
EUPI GRAE	hardwood	0.066
DYSS CITR	hardwood	0.064
GRAM ORNA	herb	-0.064
EUPH UNAN	herb	-0.062
HEME FINI	unknown	0.059
SYNA CERV	hardwood	0.055
DYSS TRUN	hardwood	0.054
IDIA AMER	herb	-0.053
ORTH TRAN	hardwood	0.050
PLEM GEOR	hardwood	0.050
POLI PURP	hardwood	0.050
PERI GRAN	unknown	0.049
CERA GUEN	unknown	-0.043
LOPH ARGE	gymno	0.042
BIST BETU	hardwood	0.041
EUDR RECT	hardwood	-0.041
HYDR FRCT	hardwood	0.041
SCOP JUNC	herb	-0.040
SELE ALCI	hardwood	-0.040
SYNA JUBA	hardwood	-0.040
DREP UNIC	hardwood	0.039
LEUC FARC	herb	0.038
MESO RUBR	hardwood	-0.034
LAMB FISC	hardwood	-0.031
VENU CAMB	hardwood	0.031
ACHY EPIP	gymno	0.030
LITH ALBI	herb	-0.030
PERI ANGT	hardwood	0.030
SCHI UNIC	hardwood	0.030
ABAG APPO	hardwood	0.029
MELA IMIT	gymno	0.029
CALL AMOR	hardwood	0.025
IRID EMAS	hardwood	0.025
LACI PATA	hardwood	0.021
HYDR RENU	hardwood	-0.019

LEPCODE	HISTGRP	AXIS 7
CARI DIVI	gymno	-0.018
FERA COMS	gymno	-0.017
SCHI IPOM	hardwood	-0.015
DYSS OCHR	hardwood	-0.014
ENYP PACK	gymno	0.013
CLEM ALBA	hardwood	-0.010
BOMO PALP	hardwood	-0.009
DYSS SOBR	hardwood	0.008
ANTH POLY	hardwood	-0.007
OLIG PALL	hardwood	-0.005
PERO MIZO	hardwood	-0.005
PSEU MUSC	unknown	0.005
COLO PAND	gymno	0.000
EUPI MIST	hardwood	0.000
SEMI SIGN	gymno	0.000

Table V-A.12. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 8 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 8
PSEU MUSC	unknown	0.786
EUXO VETU	herb	0.708
EUPI CLMR	mixed	0.638
DREP FALC	hardwood	-0.622
CERA TEAR	hardwood	0.575
APAM AMPU	herb	-0.538
EGIR PERL	hardwood	0.512
DYSS CITR	hardwood	-0.478
EUPH UNAN	herb	-0.472
PSEU CYMA	hardwood	0.472
XANT MACD	hardwood	-0.470
NYCT CINE	hardwood	0.465
MNIO DUCT	unknown	-0.451
MELA IMIT	gymno	-0.444
STRE MURI	hardwood	0.437
RHYN INSU	herb	0.434
PHYL AMER	hardwood	-0.418
EUPI SUBC	hardwood	-0.414
PROP NIVE	unknown	0.410
RHYA QUAD	unknown	0.399
AGRO PULC	hardwood	-0.390
LEUC FARC	herb	-0.387
EUXO SIMO	herb	-0.370
EUPI PERF	hardwood	-0.368
SCHI IPOM	hardwood	0.359
EUXO STS-	herb	-0.358
CARI AEQU	gymno	-0.357
LACI DAVE	herb	-0.356
IRID EMAS	hardwood	-0.344
ZOST HIRT	herb	-0.344
LACI CUNE	hardwood	-0.343
POLI DISC	hardwood	-0.343
LACI RECT	herb	-0.334
OLIG PALL	hardwood	0.334
POLI PURP	hardwood	-0.330
HYDR PERF	mixed	-0.322
APAM ANTE	herb	-0.320

LEPCODE	HISTGRP	AXIS 8
ANTI VASI	hardwood	-0.319
SYNE DIVE	hardwood	-0.309
LEUC INSU	herb	-0.305
TORT TEST	hardwood	-0.305
EUPI CRTC	unknown	-0.303
PLER OPTE	hardwood	0.303
XEST OBLA	hardwood	-0.303
LACA LIQU	herb	-0.300
STAM PEAR	unknown	-0.297
PSEU IRRO	hardwood	-0.296
LACI PENS	hardwood	0.285
EUPI HARV	hardwood	-0.284
DREP QUAD	hardwood	-0.280
EULI DEST	hardwood	-0.280
AGRO OBLQ	herb	-0.279
PERI CURV	hardwood	-0.273
SPAR MAGN	herb	0.273
AUTO CALI	herb	0.270
ACHY PRAE	gymno	0.269
DREP SECU	hardwood	-0.268
PLEM GEOR	hardwood	-0.262
VENU PEAR	hardwood	-0.261
ANAG OCCI	hardwood	-0.260
XANT DEFE	unknown	-0.253
STEN PULM	gymno	-0.252
CORY MEAD	hardwood	-0.250
ECLI SILA	herb	-0.249
HOMO FURF	hardwood	-0.248
AGRO DUBI	herb	-0.247
ECTR CREP	mixed	-0.247
DREP ARCU	hardwood	-0.246
CERA GUEN	unknown	-0.245
ZENO LIGN	unknown	0.245
ASEP ETHN	hardwood	0.242
OLIG SMRF	hardwood	0.240
SYNA JUBA	hardwood	-0.239
DREP CARN	hardwood	-0.237
STAM BLAC	unknown	-0.237
ASEP BINO	hardwood	0.235
ACER NORM	hardwood	-0.232
EUST FASC	gymno	-0.224

LEPCODE	HISTGRP	AXIS 8
SPAE HAVI	herb	-0.222
HYDR FRCT	hardwood	-0.218
PROP ALBI	unknown	-0.218
SYNE OCHR	hardwood	-0.217
ANOM VERN	gymno	0.216
ORTH REVI	hardwood	-0.216
OLIG ILLO	hardwood	0.215
DREP FOEM	hardwood	-0.214
HOMO HANH	unknown	-0.213
HYPP INDI	hardwood	-0.209
EUCH TIGR	hardwood	0.208
SYNE ADUM	hardwood	-0.207
ASTI VICT	hardwood	-0.203
GABR DYAR	gymno	0.191
EUTH SEMI	hardwood	-0.190
FELT HERI	herb	-0.190
PERI GRAN	unknown	-0.190
SYNA CERV	hardwood	-0.186
SICY CROC	hardwood	-0.185
DREP MONI	hardwood	-0.183
ANAV PAMP	hardwood	0.180
RHYN EXER	herb	-0.180
PLAT MONT	herb	-0.178
DIAR ESUR	hardwood	-0.177
VENU CAMB	hardwood	-0.175
HYPA UNIP	hardwood	0.174
HYDR RENU	hardwood	0.173
EUXO TRRN	herb	0.172
NEMO DARW	hardwood	-0.166
PERI COST	hardwood	-0.166
SCHI UNIC	hardwood	0.165
HYDR IRAT	mixed	-0.164
IDIA AEMU	herb	0.163
LITH ALBI	herb	-0.161
HOMO COMM	hardwood	0.158
ZOTH TRAN	hardwood	-0.155
CAMP PERL	hardwood	0.153
GRAM ORNA	herb	-0.153
LACI ILLA	herb	-0.152
BOMO PALP	hardwood	0.149
ACRO HESP	hardwood	0.148

LEPCODE	HISTGRP	AXIS 8
BLEP CARA	herb	-0.142
EULI XYLI	hardwood	-0.141
CRYP CUER	unknown	-0.140
DYSS FORM	hardwood	-0.140
EUPI GRAE	hardwood	-0.140
SYNG CELS	gymno	-0.137
XANT PONT	unknown	-0.137
EGIR SIMP	hardwood	0.136
PERO MORR	gymno	-0.135
THAL TAYL	herb	-0.132
DASY GRIS	gymno	-0.129
LAMB FISC	hardwood	-0.129
ENNO MAGN	hardwood	0.127
ADEL STEL	hardwood	-0.125
ANTH POLY	hardwood	-0.125
NADA GIBB	hardwood	-0.125
ANAP PRES	hardwood	0.122
DREP UNIC	hardwood	-0.121
NEOA CALI	mixed	-0.119
CALL AMOR	hardwood	0.118
DARG PROC	herb	-0.112
DYSS TRUN	hardwood	0.109
HEME FINI	unknown	-0.108
EUPI MIST	hardwood	-0.101
APAM CAST	herb	0.100
PLAG PHLO	hardwood	-0.100
EUXO DIVE	herb	-0.099
HESP SULP	hardwood	-0.094
AMPH PYRA	hardwood	-0.088
DYSS OCHR	hardwood	0.088
EUXO INFA	herb	-0.088
ASEP ADNI	hardwood	-0.085
HABR SCRI	hardwood	-0.085
DYSS SOBR	hardwood	0.083
EUPL BENE	hardwood	-0.083
EGIR RUBR	hardwood	-0.080
ACRO IMPL	hardwood	-0.075
LASI PERP	hardwood	-0.075
ENYP VENA	gymno	0.074
POLI NIMB	hardwood	0.074
ACHY EPIP	gymno	-0.072

LEPCODE	HISTGRP	AXIS 8
SERI JUTU	hardwood	0.072
CERA ENIG	hardwood	0.070
HESP LATI	hardwood	0.070
PERI PECT	hardwood	-0.069
CYCL DATA	hardwood	0.067
FERA DECE	gymno	-0.066
APAM LIGN	herb	-0.064
ABAG APPO	hardwood	0.061
ORTH TRAN	hardwood	0.057
TOLY DIST	gymno	-0.056
LACA TACO	hardwood	-0.055
LOPH ARGE	gymno	-0.054
MESO RUBR	hardwood	0.054
PERO OCCI	gymno	-0.054
NEPY UMBR	gymno	-0.053
APLE COND	gymno	0.048
EUDR RECT	hardwood	-0.048
HYDR MARI	gymno	-0.047
CABE ERYT	hardwood	-0.046
ANDR AEDO	hardwood	-0.042
ADEL INDE	hardwood	-0.041
EUCH JOHN	hardwood	-0.041
EUST SEMI	herb	0.037
NEMA RESI	hardwood	-0.037
ANAP PRAS	hardwood	0.035
HYAL EURY	hardwood	0.034
AMPH AMER	herb	-0.033
EGIR CRUC	hardwood	0.033
SELE ALCI	hardwood	-0.033
ORTH HIBI	hardwood	-0.032
IDIA AMER	herb	0.031
CYCL PEND	hardwood	0.029
ENYP PACK	gymno	0.026
EUPI SABU	gymno	-0.026
PHLO PERI	hardwood	-0.026
BEHR CONC	hardwood	0.025
SCOP JUNC	herb	-0.024
PERI ANGT	hardwood	-0.023
LACI PATA	hardwood	0.021
ABAG NEFA	hardwood	-0.020
PANT PORT	gymno	0.016

LEPCODE	HISTGRP	AXIS 8
PROB ALIE	hardwood	-0.016
SPIL PTER	hardwood	0.016
CLEM ALBA	hardwood	-0.015
COLO PAND	gymno	0.012
ANOM MUST	mixed	-0.011
EPIR ALTE	herb	-0.010
CARI DIVI	gymno	0.007
EURO ASTR	hardwood	-0.006
PERO MIZO	hardwood	-0.006
LOPH MACU	hardwood	-0.004
TRIP HAES	hardwood	-0.003
FERA COMS	gymno	-0.002
SEMI SIGN	gymno	0.001
BIST BETU	hardwood	0.000
HYPP XYLI	hardwood	0.000

Table V-A.13. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 9 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 9
EUXO STS-	herb	-0.706
SYNE DIVE	hardwood	-0.692
AMPH AMER	herb	0.657
APAM ANTE	herb	-0.657
LACA LIQU	herb	-0.656
AGRO PULC	hardwood	-0.653
ZOST HIRT	herb	-0.645
DREP FOEM	hardwood	0.587
ABAG NEFA	hardwood	-0.580
DARG PROC	herb	-0.578
HYPP XYLI	hardwood	0.560
POLI DISC	hardwood	-0.560
THAL TAYL	herb	0.556
CRYP CUER	unknown	0.549
LEUC INSU	herb	-0.534
EGIR CRUC	hardwood	-0.531
ZENO LIGN	unknown	0.524
EUPH UNAN	herb	-0.523
SYNE ADUM	hardwood	0.500
DREP QUAD	hardwood	0.494
ACER NORM	hardwood	0.489
SPAR MAGN	herb	-0.479
TRIP HAES	hardwood	0.471
ANTI VASI	hardwood	0.458
EULI XYLI	hardwood	0.446
HYAL EURY	hardwood	0.444
SICY CROC	hardwood	0.436
BEHR CONC	hardwood	0.427
SYNG CELS	gymno	-0.420
EUXO TRRN	herb	-0.419
ADEL INDE	hardwood	-0.416
EUPL BENE	hardwood	0.403
XANT MACD	hardwood	0.403
AGRO DUBI	herb	0.397
XEST OBLA	hardwood	-0.373
ANAP PRAS	hardwood	-0.358
EUXO DIVE	herb	-0.344

LEPCODE	HISTGRP	AXIS 9
AGRO OBLQ	herb	-0.342
AUTO CALI	herb	-0.330
RHYA QUAD	unknown	0.325
ASEP ETHN	hardwood	0.316
DREP FALC	hardwood	0.310
CABE ERYT	hardwood	-0.304
RHYN INSU	herb	-0.304
PLER OPTE	hardwood	0.302
PHYL AMER	hardwood	0.298
HYDR MARI	gymno	-0.293
LASI PERP	hardwood	-0.289
IDIA AEMU	herb	-0.263
ENYP VENA	gymno	-0.254
DREP UNIC	hardwood	0.244
DYSS FORM	hardwood	0.239
POLI PURP	hardwood	-0.235
MNIO DUCT	unknown	-0.226
EUPI MIST	hardwood	-0.224
DREP MONI	hardwood	0.217
HYDR RENU	hardwood	-0.216
PSEU MUSC	unknown	0.211
ASEP BINO	hardwood	-0.207
LACA TACO	hardwood	0.204
ORTH HIBI	hardwood	-0.200
STRE MURI	hardwood	0.199
GABR DYAR	gymno	-0.196
OLIG ILLO	hardwood	-0.194
PROP NIVE	unknown	0.194
EGIR RUBR	hardwood	0.193
CAMP PERL	hardwood	-0.189
DREP SECU	hardwood	0.189
SCHI UNIC	hardwood	-0.186
EGIR SIMP	hardwood	0.183
CARI DIVI	gymno	-0.181
LEUC FARC	herb	-0.180
CERA ENIG	hardwood	0.179
CORY MEAD	hardwood	-0.179
DYSS CITR	hardwood	0.177
EUPI HARV	hardwood	0.174
APLE COND	gymno	0.173
LACI CUNE	hardwood	-0.171

LEPCODE	HISTGRP	AXIS 9
HEME FINI	unknown	0.169
PERO OCCI	gymno	0.167
SYNE OCHR	hardwood	0.167
EUPI PERF	hardwood	0.162
PROP ALBI	unknown	0.162
CYCL DATA	hardwood	-0.159
RHYN EXER	herb	-0.157
ACHY PRAE	gymno	0.153
DYSS OCHR	hardwood	-0.152
BLEP CARA	herb	0.151
OLIG SMRF	hardwood	-0.149
DYSS SOBR	hardwood	-0.148
EUPI CRTC	unknown	-0.143
GRAM ORNA	herb	0.143
ANAG OCCI	hardwood	-0.142
STEN PULM	gymno	-0.141
EURO ASTR	hardwood	-0.140
DYSS TRUN	hardwood	-0.139
EUXO INFA	herb	0.136
EGIR PERL	hardwood	0.135
SYNA CERV	hardwood	-0.131
SYNA JUBA	hardwood	0.131
ANOM MUST	mixed	-0.130
IRID EMAS	hardwood	-0.129
LACI DAVE	herb	0.126
EUPI GRAE	hardwood	-0.124
EUXO SIMO	herb	-0.124
HESP LATI	hardwood	0.120
ASEP ADNI	hardwood	-0.119
MESO RUBR	hardwood	0.119
APAM CAST	herb	-0.117
NEOA CALI	mixed	-0.117
PLAT MONT	herb	0.116
LOPH MACU	hardwood	0.114
HABR SCRI	hardwood	-0.112
EUPI CLMR	mixed	0.111
EUPI SUBC	hardwood	0.111
VENU CAMB	hardwood	0.107
ANTH POLY	hardwood	-0.106
PERI COST	hardwood	-0.105
HOMO COMM	hardwood	0.104

LEPCODE	HISTGRP	AXIS 9
ECTR CREP	mixed	0.102
PERI PECT	hardwood	-0.099
FERA COMS	gymno	0.098
POLI NIMB	hardwood	-0.098
ASTI VICT	hardwood	0.097
IDIA AMER	herb	-0.097
PERO MIZO	hardwood	0.093
EUST FASC	gymno	0.091
LACI ILLA	herb	0.091
SCHI IPOM	hardwood	-0.090
SPIL PTER	hardwood	-0.089
PHLO PERI	hardwood	0.087
FERA DECE	gymno	0.086
ANOM VERN	gymno	0.085
DIAR ESUR	hardwood	0.085
EUCH JOHN	hardwood	0.085
EUXO VETU	herb	0.083
PERO MORR	gymno	-0.083
LACI RECT	herb	-0.082
APAM AMPU	herb	-0.080
CYCL PEND	hardwood	0.078
APAM LIGN	herb	0.077
CERA GUEN	unknown	-0.077
CALL AMOR	hardwood	0.076
LACI PENS	hardwood	-0.076
XANT DEFE	unknown	0.076
ACHY EPIP	gymno	-0.072
ORTH REVI	hardwood	0.072
DREP ARCU	hardwood	0.069
STAM PEAR	unknown	0.067
ENYP PACK	gymno	0.066
LITH ALBI	herb	-0.062
SPAE HAVI	herb	0.062
SELE ALCI	hardwood	-0.060
ECLI SILA	herb	0.058
PANT PORT	gymno	-0.056
ANAV PAMP	hardwood	0.055
MELA IMIT	gymno	0.055
SERI JUTU	hardwood	0.055
ACRO HESP	hardwood	0.054
EUCH TIGR	hardwood	-0.054

LEPCODE	HISTGRP	AXIS 9
ANAP PRES	hardwood	0.053
EUTH SEMI	hardwood	0.052
HYDR FRCT	hardwood	-0.052
ZOTH TRAN	hardwood	-0.052
FELT HERI	herb	0.050
AMPH PYRA	hardwood	-0.049
ADEL STEL	hardwood	-0.048
EPIR ALTE	herb	-0.048
SCOP JUNC	herb	-0.047
EUST SEMI	herb	-0.042
BOMO PALP	hardwood	-0.039
NEPY UMBR	gymno	-0.039
PERI ANGT	hardwood	-0.039
HESP SULP	hardwood	0.037
PSEU CYMA	hardwood	-0.037
TOLY DIST	gymno	0.037
EUDR RECT	hardwood	0.035
HOMO HANH	unknown	0.033
CARI AEQU	gymno	0.032
DASY GRIS	gymno	0.032
VENU PEAR	hardwood	0.032
BIST BETU	hardwood	0.030
EUPI SABU	gymno	0.030
XANT PONT	unknown	0.030
DREP CARN	hardwood	0.029
ACRO IMPL	hardwood	-0.028
PLAG PHLO	hardwood	-0.028
HYPA UNIP	hardwood	0.027
NYCT CINE	hardwood	-0.027
ABAG APPO	hardwood	-0.026
HYPP INDI	hardwood	0.023
TORT TEST	hardwood	-0.023
NEMO DARW	hardwood	-0.022
PROB ALIE	hardwood	0.017
ENNO MAGN	hardwood	0.016
PERI GRAN	unknown	0.016
COLO PAND	gymno	-0.015
HYDR PERF	mixed	-0.015
CLEM ALBA	hardwood	0.014
LAMB FISC	hardwood	-0.013
NEMA RESI	hardwood	-0.013

LEPCODE	HISTGRP	AXIS 9
EULI DEST	hardwood	0.011
LACI PATA	hardwood	-0.010
LOPH ARGE	gymno	0.009
OLIG PALL	hardwood	0.009
ORTH TRAN	hardwood	-0.009
PSEU IRRO	hardwood	-0.009
NADA GIBB	hardwood	-0.008
CERA TEAR	hardwood	-0.007
HOMO FURF	hardwood	0.005
STAM BLAC	unknown	0.005
PLEM GEOR	hardwood	0.004
ANDR AEDO	hardwood	0.003
HYDR IRAT	mixed	-0.003
PERI CURV	hardwood	0.000
SEMI SIGN	gymno	0.000

Table V-A.14. ALL SPECIES Principal Component Correlations. The correlations of the 216 species with the Principal Component Axis 10 obtained from PCA analysis of H.J. Andrews Lepidoptera community data.

LEPCODE	HISTGRP	AXIS 10
ANAV PAMP	hardwood	0.700
EGIR SIMP	hardwood	0.699
ORTH HIBI	hardwood	-0.682
HYPA UNIP	hardwood	0.658
ACRO IMPL	hardwood	0.624
HESP LATI	hardwood	0.572
LOPH MACU	hardwood	0.537
XANT DEFE	unknown	-0.534
SPIL PTER	hardwood	-0.511
CYCL PEND	hardwood	0.510
HOMO COMM	hardwood	0.509
LACI CUNE	hardwood	0.506
ACRO HESP	hardwood	0.505
ANTI VASI	hardwood	-0.502
NEOA CALI	mixed	-0.500
ENNO MAGN	hardwood	0.484
PSEU MUSC	unknown	-0.477
PERI PECT	hardwood	-0.455
PHLO PERI	hardwood	0.453
CERA ENIG	hardwood	-0.445
CALL AMOR	hardwood	0.432
EUTH SEMI	hardwood	0.432
EUPI CRTC	unknown	-0.431
ANAG OCCI	hardwood	-0.428
APLE COND	gymno	0.417
HABR SCRI	hardwood	-0.401
HYDR RENU	hardwood	0.400
HYPP XYLI	hardwood	0.375
PANT PORT	gymno	-0.371
LEUC FARC	herb	-0.368
STEN PULM	gymno	-0.366
ASEP ADNI	hardwood	-0.364
ECTR CREP	mixed	0.358
CABE ERYT	hardwood	-0.346
EUPI HARV	hardwood	-0.342
EUST SEMI	herb	0.342
ANAP PRES	hardwood	0.322

LEPCODE	HISTGRP	AXIS 10
PROP NIVE	unknown	-0.322
STRE MURI	hardwood	-0.318
ZENO LIGN	unknown	-0.316
PHYL AMER	hardwood	-0.313
EUXO VETU	herb	-0.312
PERI COST	hardwood	0.305
BEHR CONC	hardwood	-0.291
SERI JUTU	hardwood	-0.291
APAM LIGN	herb	-0.286
CERA GUEN	unknown	-0.285
FELT HERI	herb	-0.277
DREP FALC	hardwood	-0.276
DREP FOEM	hardwood	-0.276
EUPI SABU	gymno	0.274
SCOP JUNC	herb	0.271
NADA GIBB	hardwood	0.270
AMPH AMER	herb	-0.262
LITH ALBI	herb	-0.262
DREP ARCU	hardwood	0.258
PERI CURV	hardwood	-0.247
EUCH JOHN	hardwood	-0.245
HESP SULP	hardwood	0.243
DASY GRIS	gymno	0.241
GRAM ORNA	herb	-0.236
DYSS FORM	hardwood	-0.235
MELA IMIT	gymno	-0.234
IRID EMAS	hardwood	-0.226
HYDR MARI	gymno	-0.220
OLIG SMRF	hardwood	-0.218
TOLY DIST	gymno	0.217
SCHI UNIC	hardwood	0.216
PLEM GEOR	hardwood	-0.207
RHYN INSU	herb	-0.205
XANT PONT	unknown	0.204
RHYA QUAD	unknown	-0.203
TRIP HAES	hardwood	-0.194
FERA COMS	gymno	-0.193
EUPI MIST	hardwood	-0.187
ACER NORM	hardwood	-0.185
EUCH TIGR	hardwood	-0.185
PSEU CYMA	hardwood	-0.185

LEPCODE	HISTGRP	AXIS 10
NEMA RESI	hardwood	0.183
PROB ALIE	hardwood	0.180
HYDR PERF	mixed	-0.179
ADEL INDE	hardwood	0.178
EULI XYLI	hardwood	-0.178
ZOTH TRAN	hardwood	-0.171
PLER OPTE	hardwood	-0.170
EGIR RUBR	hardwood	0.169
AGRO PULC	hardwood	0.168
LACI DAVE	herb	-0.166
EURO ASTR	hardwood	-0.164
NYCT CINE	hardwood	-0.164
POLI NIMB	hardwood	-0.163
DIAR ESUR	hardwood	-0.162
NEMO DARW	hardwood	0.161
PERO OCCI	gymno	-0.161
AGRO OBLQ	herb	0.160
LAMB FISC	hardwood	-0.158
HYPP INDI	hardwood	-0.154
TORT TEST	hardwood	0.152
DREP CARN	hardwood	-0.149
HYAL EURY	hardwood	-0.145
ASEP ETHN	hardwood	-0.143
AUTO CALI	herb	-0.143
CORY MEAD	hardwood	-0.141
SPAE HAVI	herb	0.140
EUXO DIVE	herb	-0.139
XANT MACD	hardwood	-0.139
ORTH REVI	hardwood	-0.136
PERI ANGT	hardwood	-0.134
STAM BLAC	unknown	-0.133
VENU PEAR	hardwood	-0.131
ACHY PRAE	gymno	-0.129
ECLI SILA	herb	-0.128
SYNA CERV	hardwood	-0.125
EULI DEST	hardwood	-0.124
DYSS CITR	hardwood	-0.123
SYNE OCHR	hardwood	0.123
SYNG CELS	gymno	-0.122
EGIR PERL	hardwood	-0.120
MESO RUBR	hardwood	0.116

LEPCODE	HISTGRP	AXIS 10
ANOM VERN	gymno	-0.115
LACA LIQU	herb	0.113
EUDR RECT	hardwood	0.112
EUPH UNAN	herb	-0.111
SELE ALCI	hardwood	-0.109
ACHY EPIP	gymno	-0.104
EUPI CLMR	mixed	0.103
AMPH PYRA	hardwood	0.102
DARG PROC	herb	-0.101
LACI PENS	hardwood	-0.100
ENYP VENA	gymno	0.098
DREP UNIC	hardwood	0.096
IDIA AEMU	herb	0.095
ABAG APPO	hardwood	0.093
GABR DYAR	gymno	-0.093
EUXO INFA	herb	-0.092
LACI RECT	herb	0.092
LASI PERP	hardwood	0.092
CYCL DATA	hardwood	-0.088
EUXO STS-	herb	0.088
DYSS SOBR	hardwood	0.085
HYDR IRAT	mixed	0.085
LEUC INSU	herb	0.085
ANTH POLY	hardwood	-0.084
EUPI PERF	hardwood	0.083
HOMO HANH	unknown	0.083
SPAR MAGN	herb	0.081
VENU CAMB	hardwood	0.081
HOMO FURF	hardwood	0.078
PERO MORR	gymno	0.077
ABAG NEFA	hardwood	-0.076
SICY CROC	hardwood	0.076
DREP QUAD	hardwood	0.075
ORTH TRAN	hardwood	0.075
CARI AEQU	gymno	0.074
EUPL BENE	hardwood	-0.074
PERI GRAN	unknown	-0.073
OLIG PALL	hardwood	-0.070
LACA TACO	hardwood	-0.069
BOMO PALP	hardwood	-0.066
EUPI GRAE	hardwood	0.060

LEPCODE	HISTGRP	AXIS 10
CAMP PERL	hardwood	0.059
FERA DECE	gymno	-0.058
EUXO TRRN	herb	0.052
DREP MONI	hardwood	-0.051
SYNE DIVE	hardwood	0.050
ADEL STEL	hardwood	0.049
BLEP CARA	herb	-0.047
ANAP PRAS	hardwood	-0.046
MNIO DUCT	unknown	0.046
SYNE ADUM	hardwood	0.046
HYDR FRCT	hardwood	-0.045
PROP ALBI	unknown	-0.043
BIST BETU	hardwood	-0.041
ENYP PACK	gymno	0.041
EUST FASC	gymno	0.041
EUPI SUBC	hardwood	-0.040
PLAT MONT	herb	0.039
OLIG ILLO	hardwood	-0.038
PLAG PHLO	hardwood	0.037
ZOST HIRT	herb	0.037
DREP SECU	hardwood	0.036
APAM ANTE	herb	0.032
EUXO SIMO	herb	-0.031
APAM AMPU	herb	-0.030
ASEP BINO	hardwood	-0.028
IDIA AMER	herb	-0.028
ANOM MUST	mixed	0.027
THAL TAYL	herb	-0.027
ASTI VICT	hardwood	0.026
XEST OBLA	hardwood	-0.026
HEME FINI	unknown	-0.024
SCHI IPOM	hardwood	0.023
EGIR CRUC	hardwood	-0.022
POLI DISC	hardwood	0.022
CRYP CUER	unknown	-0.021
CERA TEAR	hardwood	0.019
POLI PURP	hardwood	-0.018
STAM PEAR	unknown	-0.017
LOPH ARGE	gymno	-0.015
SYNA JUBA	hardwood	0.015
ANDR AEDO	hardwood	-0.014

LEPCODE	HISTGRP	AXIS 10
AGRO DUBI	herb	0.012
APAM CAST	herb	-0.008
DYSS TRUN	hardwood	-0.008
LACI PATA	hardwood	-0.008
CARI DIVI	gymno	-0.006
EPIR ALTE	herb	0.006
LACI ILLA	herb	-0.005
DYSS OCHR	hardwood	0.004
RHYN EXER	herb	0.004
NEPY UMBR	gymno	-0.003
PSEU IRRO	hardwood	0.003
CLEM ALBA	hardwood	0.001
COLO PAND	gymno	0.001
PERO MIZO	hardwood	0.001
SEMI SIGN	gymno	0.000

Percentage Variance

The importance of the Principal Coordinate axes is measured by the amount of total variance accounted for by those axes. By definition, the first axis accounts for the most variation, and the proportion of the total variance decreases with succeeding axes. It is important to report the amount of total variance accounted for in the axes that are discussed in a scientific paper.

The amount of total variance accounted for, in a way, alludes to the strength of the analysis, somewhat similar to an R^2 value in a regression analysis. For example, reporting that the first three axes account for 69.729 percent of the total variance, equivalent to saying the R^2 value of the analysis is 0.69729. It is up to the reader to determine whether enough of the of the variance was accounted for, and therefore estimate the strength of the conclusions.

Table V-A.15. ALL SPECIES Percentage Variance and Cumulative Variance for Principal Coordinate Axes. The percentage of the total variance and the cumulative variance for the Principal Coordinate Axes resulting from PCA analysis of the H.J. Andrews Lepidoptera community data.

Axes	1	2	3	4	5	6	7	8	9	10
EIGENVALUE	9246.037	2854.099	2398.936	1783.613	1072.168	1062.951	799.648	644.214	458.722	289.757
% VARIANCE	44.466	13.726	11.537	8.578	5.156	5.112	3.846	3.098	2.206	1.393
CUM. %	44.466	58.192	69.729	78.306	83.463	88.574	92.42	95.518	97.724	99.118

Site Principal Coordinate Axes Scores

Included in the results of ORD are the scores (position) of the sampling sites on the Principal Coordinate Axes. These scores are used to produce graphs (Figures V-A.1, V-A.2, and V-A.3), to explore the structure of the data, and to form hypotheses about group associations for the sampling sites.

Table V-A.16. ALL SPECIES Principal Coordinate Axes Scores. The scores (positions) of the plant community zone sampling sites on the Principal Coordinate Axes obtained from ORD analysis of the H.J. Andrews Lepidoptera community data.

ZONE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS10
A	0.257	-0.386	-0.043	0.194	-0.24	-0.405	-0.011	0.224	-0.18	0.516
B	0.236	-0.059	-0.086	0.237	0.503	0.346	0.248	0.067	-0.511	0.062
D	0.264	-0.173	-0.136	0.091	-0.244	-0.197	-0.131	0.353	0.157	-0.59
E	0.194	-0.135	-0.13	0.195	0.312	0.198	0.06	-0.144	0.437	-0.286
F	0.196	0.161	-0.395	-0.263	-0.149	0.052	-0.525	-0.508	-0.261	0.007
H	-0.325	-0.282	0.501	-0.156	0.367	-0.025	-0.556	0.104	0	0.006
I	0.172	0.62	0.558	0.329	-0.167	-0.136	0.015	-0.106	-0.098	-0.086
J	-0.488	0.101	-0.289	0.184	0.25	-0.56	0.222	-0.283	0.107	0.013
K	-0.495	-0.093	-0.087	0.367	-0.474	0.529	-0.025	0.014	0.051	0.103
L	-0.278	0.197	-0.104	-0.496	-0.071	-0.006	0.259	0.396	-0.345	-0.241
N	0.124	-0.33	0.343	-0.418	-0.205	0.063	0.465	-0.43	0.13	0.022
P	0.143	0.379	-0.131	-0.263	0.118	0.14	-0.021	0.313	0.513	0.473

Principal Coordinate Axes Ordinations

Ordinations derived from ORD analysis of the Lepidoptera community data are plotted in three axes combinations. It is standard to report Axis 1 vs. Axis 2, Axis 1 vs. Axis 3, and Axis 2 vs. Axis 3. Other plots can be constructed using the information in Table V-A.16.

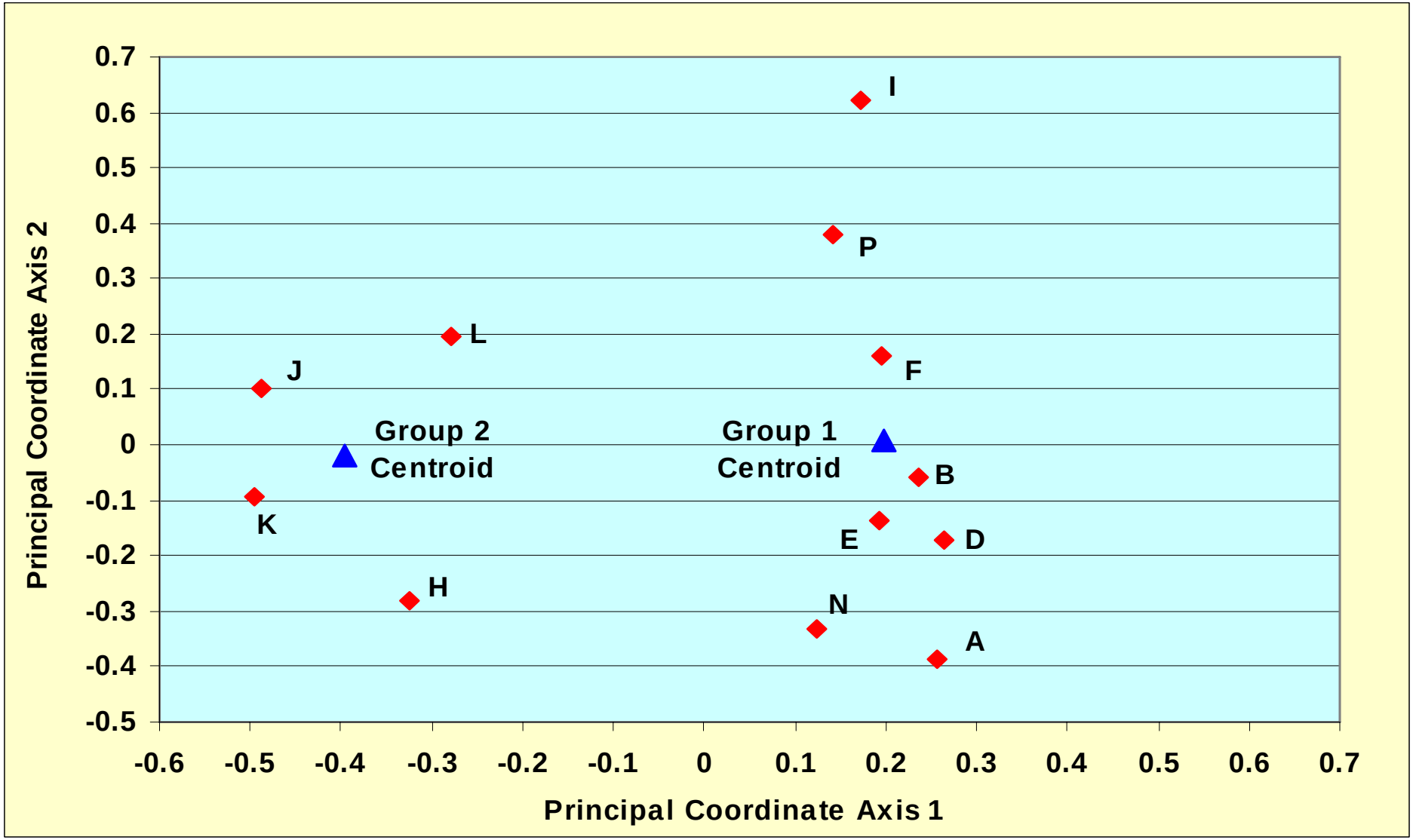

Figure V-A.1. ALL SPECIES Principal Coordinate Analysis Ordination, Axis 1 vs. Axis 2.

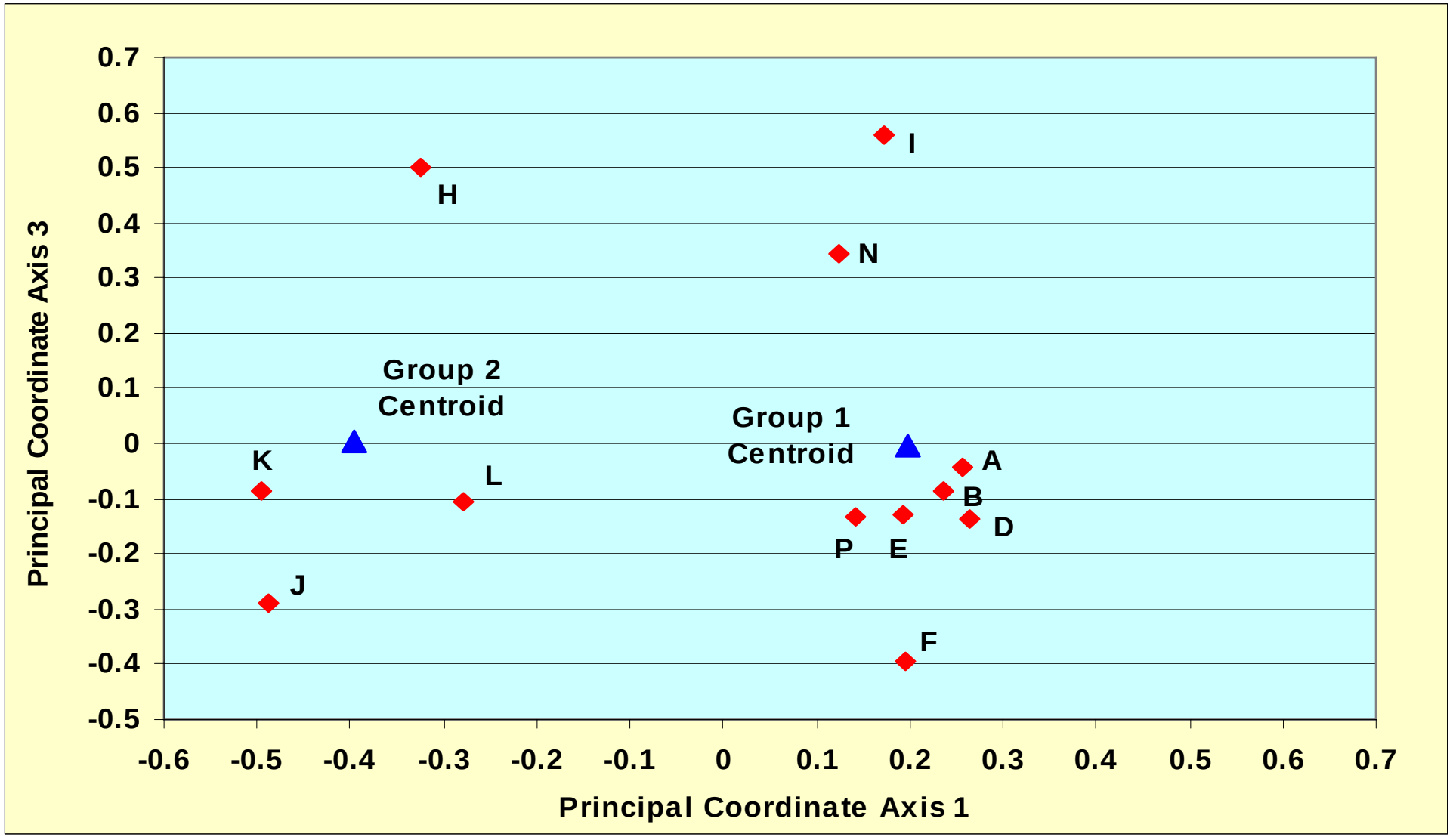

Figure V-A.2. ALL SPECIES Principal Coordinate Analysis Ordination, Axis 1 vs. Axis 3.

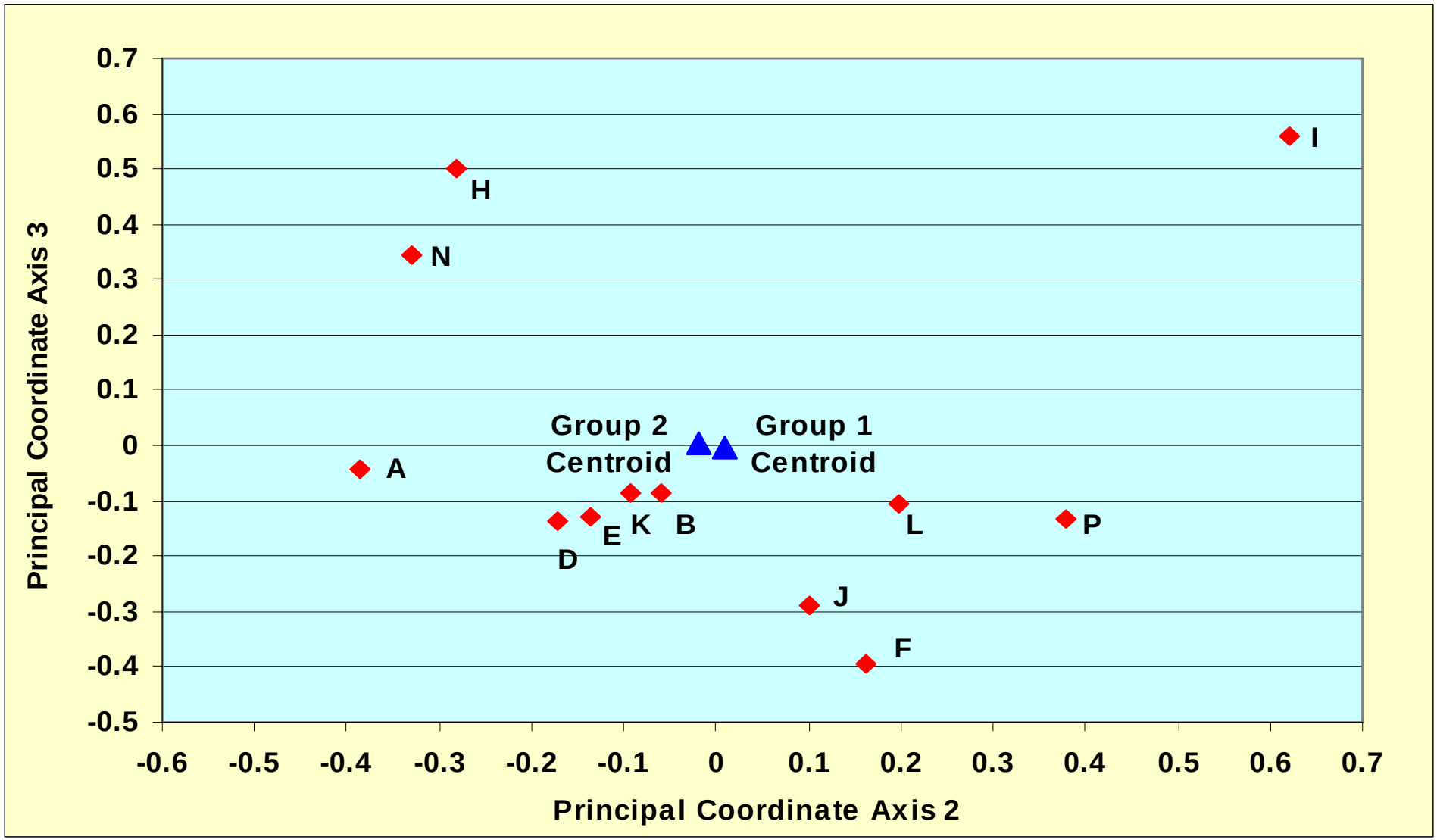

Figure V-A.3. ALL SPECIES Principal Coordinate Analysis Ordination, Axis 2 vs. Axis 3.

TWINSPAN

Groupings

Two-**W**ay **In**dicator **Sp**ecies **An**alysis (TWINSPAN) was used to form groups of the plant habitat zone sites based on species abundance. TWINSPAN provides a relatively unbiased method for forming groups.

The results of TWINSPAN are usually presented as a dendogram. Sites with similar community composition appear in groups. The differences between groups can be determined from the point of departure on the dendogram scale. The higher up the departure, the greater the differences. This information in not presented in this report because the magnitude of group differences were investigated using Multigroup Discriminant Analysis (MDA). TWINSPAN resulted in the following groupings for the sampling sites (color-coded for viewing convenience).

Table V-A.17. ALL SPECIES TWINSPAN Groups. The groups of sampling sites resulting from TWINSPAN of the H.J. Andrews Lepidoptera community data.

Sampling Site	1st Order group	2nd Order Group	3rd Order Group
A	0	0	
D	0	0	
E	0	1	0
N	0	1	0
B	0	1	1
F	0	1	1
I	0	1	1
P	0	1	1
H	1		
J	1		
K	1		
L	1		

Nonmetric Multidimensional Scaling (NMDS)

The vectors from the first ten ORD axes were evaluated using NMDS. The results are presented as ordination plots of three axes configurations (Figures V-A.4, V-A.5, and V-A.6). These plots should be viewed to confirm ordination results obtained from ORD (Figures V-A.1, V-A.2, and V-A.3).

Table V-A.18. ALL SPECIES Nonmetric Multidimensional Scaling Axes Scores. The scores (positions) of the plant community zone sampling sites on the rescaled axes obtained from NMDS analysis of the H.J. Andrews Lepidoptera community data.

ZONE	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	AXIS 6	AXIS 7	AXIS 8	AXIS 9	AXIS10
A	0.382	-0.425	-0.059	0.206	-0.334	-0.448	-0.046	0.354	-0.199	0.273
B	0.329	-0.091	-0.109	0.281	0.596	0.397	0.260	-0.024	-0.335	0.062
D	0.422	-0.321	-0.178	0.181	-0.214	-0.261	-0.127	0.298	0.273	-0.391
E	0.339	-0.156	-0.193	0.249	0.357	0.261	0.084	0.018	0.249	-0.495
F	0.235	0.212	-0.411	-0.304	-0.154	0.059	-0.533	-0.514	-0.257	0.024
H	-0.460	-0.287	0.554	-0.183	0.364	-0.027	-0.563	0.083	-0.012	0.045
I	0.200	0.695	0.617	0.324	-0.186	-0.139	0.019	-0.116	-0.134	-0.076
J	-0.674	0.131	-0.296	0.177	0.252	-0.590	0.220	-0.322	0.124	0.086
K	-0.689	-0.085	-0.079	0.375	-0.498	0.544	-0.024	-0.001	0.045	0.138
L	-0.369	0.240	-0.115	-0.537	-0.080	0.023	0.279	0.433	-0.412	-0.313
N	0.130	-0.343	0.403	-0.466	-0.221	0.051	0.470	-0.472	0.135	0.101
P	0.156	0.430	-0.133	-0.302	0.118	0.129	-0.038	0.263	0.523	0.546

After consultation with the client, it was decided that group configurations revealed by ORD, TWINSPAN, and NMDS had biological meaningful and therefore, the first 5 Principal Coordinate (ORD) Axes were analyzed using Multigroup Discriminant Analysis.

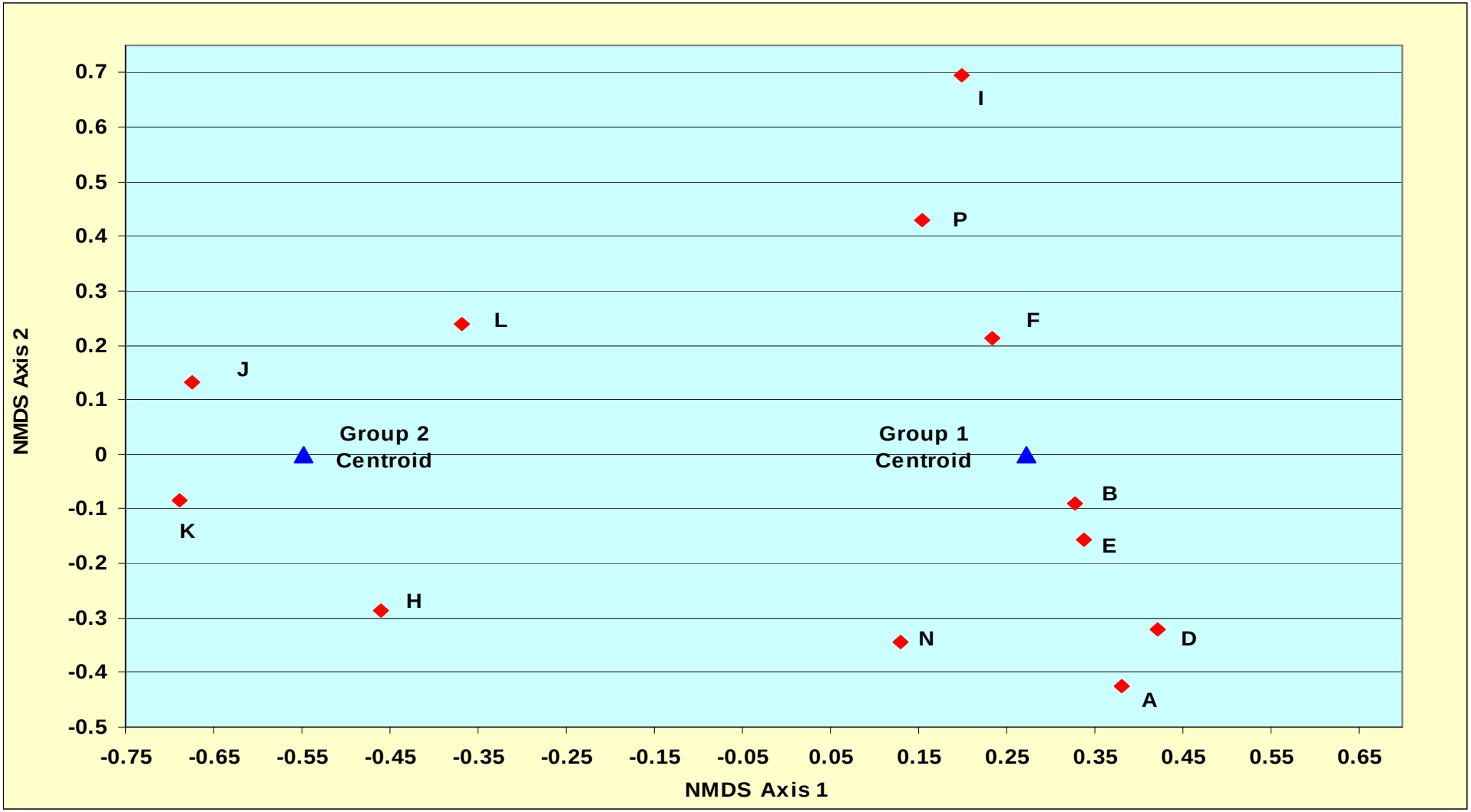

Figure V-A.4. ALL SPECIES NMDS Ordination Axis 1 vs. Axis 2.

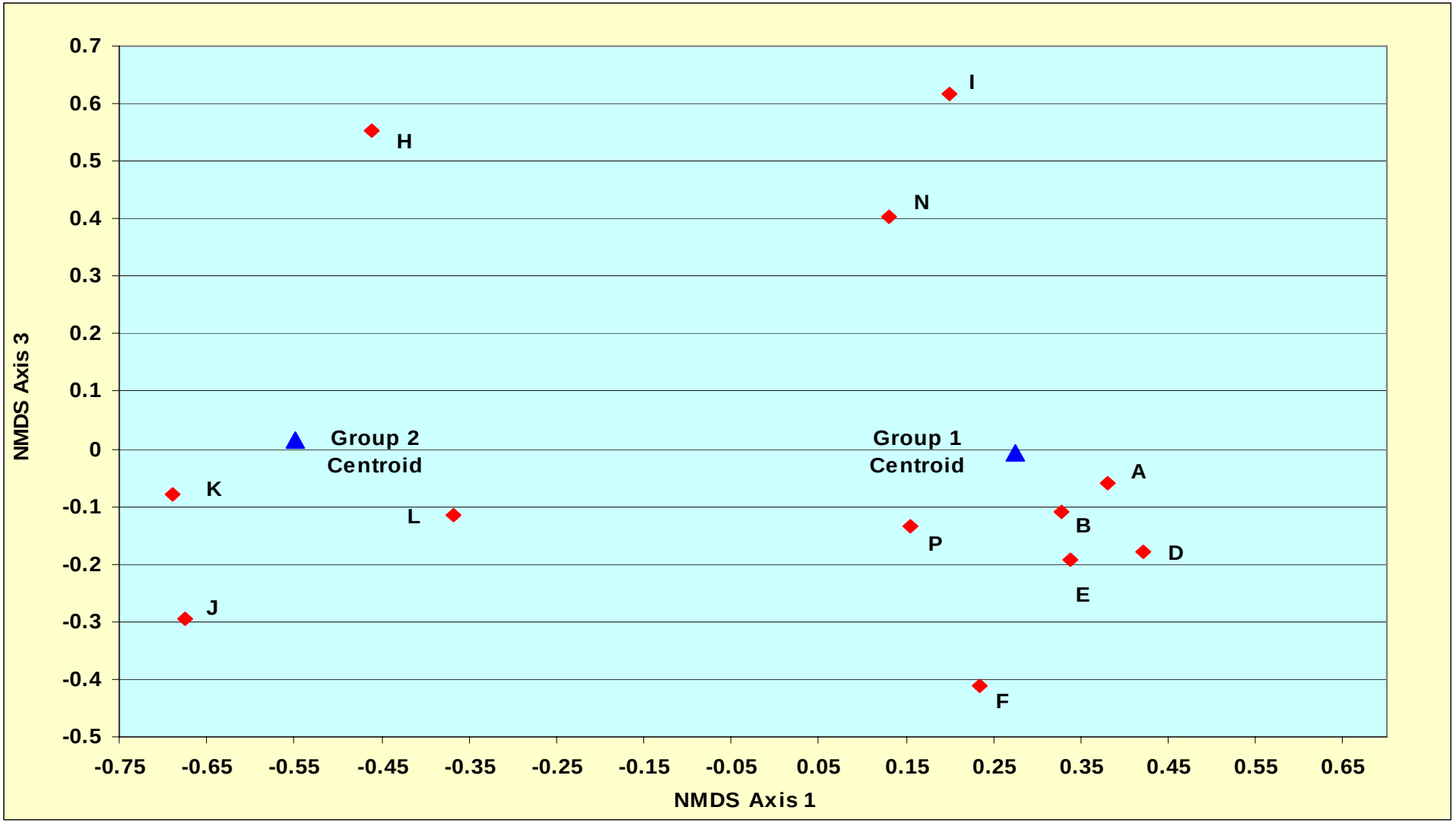

Figure V-A.5. ALL SPECIES NMDS Ordination Axis 1 vs. Axis 3.

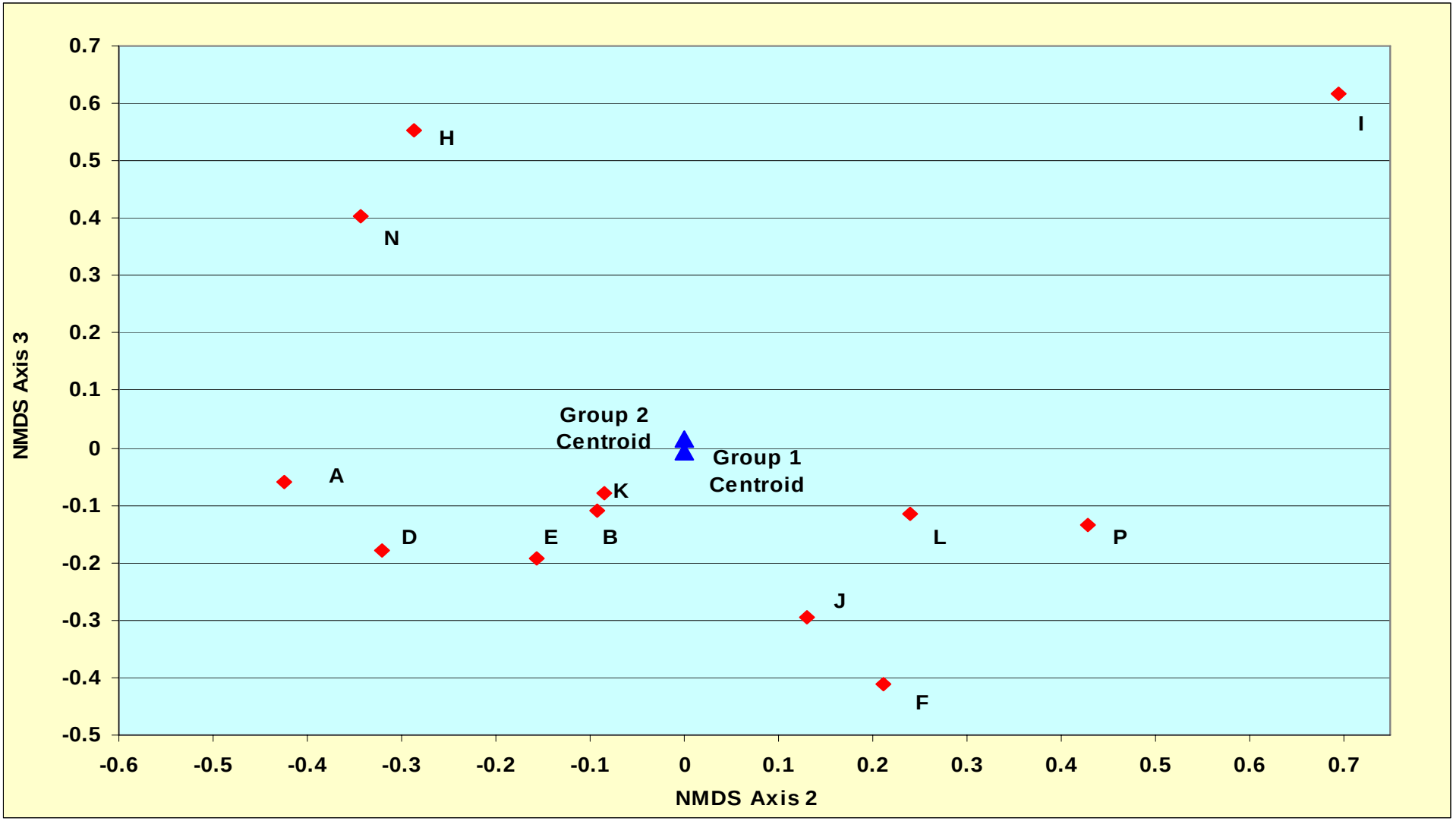

Figure V-A.6. ALL SPECIES NMDS Ordination Axis 2 vs. Axis 3.

Multigroup Discriminant Analysis (MDA)

The first five Principal Coordinate Axes were analyzed using Multigroup Discriminant Analysis (MDA). The purpose of MDA is to obtain information about the magnitude of the differences in a priori selected groups. Four groups were analyzed in this analysis. Group 1 consisted of Plant Community Sampling Sites A, B, D, E, F, I, N, and P. Group 2 consisted of Plant Community Sampling Sites H, J, K, and L.

MANOVA

The analysis began with a univariate test of each of the variables (ORD axes). There was strong evidence of Group differences only on Axis 1 and Axis 2. The test for overall discrimination between groups showed that there was strong evidence of group differences on the ORD axes (Tables V-A.19 and V-A.20).

Table V-A.19. ALL SPECIES MDA MANOVA Table. Univariate testing for Group differences along each of the five Principal Coordinate axes.

Coordinate Axis	Among Mean Sq.	Within Mean Sq.	F-Ratio	Probability	Adjusted Probability
1	0.943	0.006	169.33	0.0000	0.0000
2	0.002	0.100	0.02	0.8791	1.0000
3	0.000	0.100	0.00	0.9676	1.0000
4	0.004	0.100	0.04	0.8421	0.9999
5	0.002	0.100	0.02	0.8869	1.0000

Table V-A.20. ALL SPECIES Discriminant Analysis Test Of Overall Discrimination (=Equality Of Centroids) Table. Test of overall discrimination between groups.

LAMBDA	F-RATIO	D.F. 1	D.F. 2	PROB.
0.0476613	23.978	5	6	0.0011

Geisser Classification

The integrity of the groups is measured by the fit of the sampling sites to their respective groups. In this analysis, all sites were classified into their a priori selected groups, i.e., 100% hits.

Distance Analysis

The distance between group centroids is measured by two metrics, Euclidean (Taxonomic) Distance (Table V-A.21) and Generalized (Standard Deviation) Distance (Table V-A.22). The information is useful to determine the magnitude of the differences between the groups.

Euclidean Distance is used to assess the between group centroid differences in reference to the original variable coordinate axes.

Table V-A.21. ALL SPECIES Euclidean Distances between Group Centroids.

AXIS	1	2
1	0.000	0.597
2	0.597	0.000

Generalized Distances (also known as Mahalanobius Distances) are the distances between centroids in discriminant space expressed in units of standard deviations.

Table V-A.22. ALL SPECIES Generalized Distances between Group Centroids.

AXIS	1	2
1	0.000	8.656
2	8.656	0.000

95% Confidence Radii

The fit around each of the group centroids is measured by their 95% confidence radii (Table V-A.23). The smaller the number, the more similar each of the members of a group are to each other, relative to their similarity to members of the other groups. The confidence radii, like familiar confidence intervals expressed in regression and normal Gaussian statistical analysis, are highly influenced by sample size. It should be noted here that the sample sizes for each of the groups were small, and greatly influenced this MDA analysis. While, the general results are valid, but value may only be useful as comparative information.

Table V-A.23. ALL SPECIES Group 95% Confidence Radii. The 95% confidence radii for the two groups of sites analyzed using MDA.

AXIS	Confidence Radii
1	0.84
2	1.59

VI. DISCUSSION

Not included in Chapter V. RESULTS were the results of testing assumptions and proper conditioning of the input data matrix for MDA. As discussed in IV. STATISTICAL PROCEDURES, the assumptions of MDA are random sampling, normality, independence of errors, equality of population dispersions (homoscedasticity), and additivity of treatment and error effects. The consequences of unsatisfied assumptions (proper conditioning of the input data matrix) can lead to several problems with interpretation of the results of MDA. Each assumption and the consequences of a lack of proper conditioning are addressed below.

Random sampling is required for any analytical procedure to ensure that the sample is representative of the population of interest. Because Pacific Analytics was not involved in the planning and design of this study, we rely on the client to make this determination. Scientists often use collecting techniques that introduce bias in their sampling. This can be especially true when collecting invertebrates. All trapping methods have bias. In scientific publications it is up to the author(s) to explain how the samples were collected and discuss trapping bias.

The influence of nonnormality of the data to be analyzed on statistical analysis can be relatively minor. The Central Limit Theorem asserts that averages based on large sample sizes have an approximately normal sampling distribution. Thus, the assumption of underlying normality need not be a serious issue, as long as sample sizes are large. In the case of the H.J. Andrews Lepidoptera community data, the size of the

groups formed from ORD was relatively small. Groups had only three to 8 members. Even when distributions follow normality, sample sizes this small are problematic. However, Burnaby (1966) and Olson (1977) found that nonnormality has only minor influence on the results of MDA (Pimentel 1993).

Dependence of errors and nonadditivity can cause inequality of group dispersions (heteroscedasticity). This can lead to serious problems when using standard statistical techniques such as t-tests and regression. When the pooled estimate of standard deviation does not accurately reflect the population parameter the t-ratio no longer has a t-distribution. The result is inaccurate estimates of the significance of the p-values obtained in such cases. For MDA, the lack homoscedasticity can lead to imprecise values for Generalized Distances and unreliable Geisser Classifications (Geisser 1977). However, heteroscedasticity does not invalidate the biological interpretation of the results (Pimentel 1993).

MDA is more appropriately applied to data in which sample sizes are equal or sample sizes are large. Problems that result from a lack of homoscedasticity are minimal when sample sizes are large, but there are no sure-cures for small sample sizes. When the results of several analytical procedures are similar, one may conclude that biological inferences are robust. In the case of the H.J. Andrews Lepidoptera community data, similar results were obtained from ORD, TWINSPAN, and NMDS. MDA gives accurate information about the relative similarities of the groups, although Generalized Distances should not be reported because of the lack of proper conditioning of the data matrix.

Information regarding the conditioning of the data matrix may be found in the MDA output file provided on the CD accompanying this report. After review of these results, the client should discuss them with the statistician for better understanding.

In the analysis of Special Species, there were two groups configurations analyzed with Discriminant Analysis. The first was the group configuration resulting from TWINSPAN. The second was a group configuration derived from visual inspection of the ORD/NMDS ordination graphs. The two configurations were analyzed separately because there was biological meaning to the ORD/NMDS configuration that was different from the interpretation of the TWINSPAN configuration.

VII. BIBLIOGRAPHY

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