ANALYSIS OF
GALICE DATA

FINAL REPORT

Prepared for

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II. EXECUTIVE SUMMARY

This is a report of the results of statistical analysis of Lepidoptera abundance data collected along a transect near Galice, Oregon. The data were received from the Dr. Jeff Miller, OSU Department of Entomology in December 2001. Data to be analyzed were counts of three hundred and ten Lepidoptera species at twelve sites. 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 was at least 12), the data were analyzed using multivariate techniques to discover patterns in species' distributions. Specifically, the data were first analyzed using Principal Coordinate Analysis (PCORD) to find general ordination patterns of the sites in species space. The resulting configuration was inspected using cluster and Two-Way Indicator Species Analysis (TWINSPAN) techniques to find spatial relationships between logical groups of sites. 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 evaluate the effects of plant community structure on Lepidoptera collected in light traps. Sampling was conducted during five sampling periods in 1999.

Questions of Interest

1. What is the pattern of Lepidoptera species distribution along the Galice transect gradient?
2. Do sampled communities 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 components drive differences between groups?
6. Is there an association between Lepidoptera species distribution and plant species presence along the Galice transect?

Populations of Interest

The population of interest is the total counts of adult Lepidoptera species on the five sampling dates that are collected in light traps along the Galice transect.

Report of Statistical Analysis of Galice Data
Introduction

Structure of the Experiment

Experimental Units

Experimental units are sampling sites along the Galice transect.

Response variables

Counts of adult Lepidoptera species in light traps

Explanatory variables

Sampling site positions along the Galice transect.

Vegetation presence at the sampling sites.

IV. STATISTICAL PROCEDURES

Summary Statistics

The total abundance of each species along the transect was tabulated from the data over the five dates for each site and for entire transect (Table V-1). Species were sorted in ascending order according to abundance. Those species with a Total abundance of 12 or more were used for multivariate analysis.

Dataset Reduction

The original data set contained abundance information for 310 species collected at twelve sites along the Galice transect. 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 once per site (i.e., less than 12 specimens in the entire transect collection) as non-abundant and candidates for removal from the multivariate analysis.

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 112 species in each of the 12 sampling units.

There are several ecological indices that perform well for analysis of community data. Two indices were calculated using the Galice community data, Chord Distance and Percentage Similarity. Of the many quantitative similarity indices available, Chord Distance and Percentage Similarity appear to perform very satisfactorily over a diverse set of ecological data sets (Gauch 1982, Ludwig and Reynolds 1988, Krebs 1989). Chord Distance is a measure of the distance between sampling units using directional cosines from a unit radius projection of sampling units. As a result, the index puts greater importance on the relative proportions of species rather than their absolute abundance. The index ranges from 0 to $\sqrt{2}$ (1.414), 0 being maximum dissimilarity and 1.414 being maximum similarity.

Chord Distance (CRD) is calculated by:

$$CRD_{jk} = \sqrt{2\left(1 - \mathrm{ccos}_{jk}\right)}$$

where the chord cosine (ccos) is computed from:

$$\mathrm{ccos}_{jk} = \frac{\sum_{i=1}^{S}\left(X_{ij} X_{ik}\right)}{\sqrt{\sum_{i}^{S} X_{ij}^{2} \sum_{i}^{S} X_{ik}^{2}}}$$

where X_{ij} represents the abundance of the ith species in the jth sampling unit, and X_{ik} represents the abundance of the ith species in the kth sampling unit.

One of the best quantitative indices is Percentage Similarity, first proposed by Renkonen (1938) and 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 of community types. 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 Coordinate Analysis (ORD) is one such 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 Galice community were analyzed using ORD. Final configurations of several axes combinations showing sampling sites were plotted. Species

contributions to the variance along first three principal coordinate axes are reported.

Ten axes were output further analysis. Final configuration was saved and evaluated using Nonmetric Multidimensional Scaling (NMDS). NMDS is another 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. Instead, 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 configurations of several 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. Multigroup Discriminant Analysis (MDA) is one 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 ten 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. Final configurations showing sampling sites and group centroids were plotted.

V. RESULTS

Summary Statistics

The abundance of Lepidoptera species were summed over the 5 sampling dates and sorted in ascending order of Total abundance over the 12 sites.

Table V-1. Species Abundance by Site. The abundance of 310 species for the 12 sampling sites along the Galice transect, and the Total abundance of the species over the twelve sites. All totals are over the 5 sampling dates. Species are sorted in ascending order of abundance.

	Sampling Sites												
LEPCODE	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
XYLECINE	0	1	0	0	0	0	0	0	0	0	0	0	1
XESTC-NI	0	0	0	1	0	0	0	0	0	0	0	0	1
XANTXXXX	0	0	0	1	0	0	0	0	0	0	0	0	1
UDEAITYS	0	1	0	0	0	0	0	0	0	0	0	0	1
SYNGVIRI	0	0	1	0	0	0	0	0	0	0	0	0	1
SYNGEPIG	0	0	0	0	0	1	0	0	0	0	0	0	1
SYNGCELS	0	0	0	1	0	0	0	0	0	0	0	0	1
SEMINEPT	1	0	0	0	0	0	0	0	0	0	0	0	1
SABUAEGR	1	0	0	0	0	0	0	0	0	0	0	0	1
PSEUVARI	1	0	0	0	0	0	0	0	0	0	0	0	1
PROBALIE	0	0	0	0	1	0	0	0	0	0	0	0	1
POLIDISC	0	0	0	0	0	0	0	0	1	0	0	0	1
PLATEXTI	0	0	0	0	0	0	0	0	0	0	0	1	1
PHLOPERI	1	0	0	0	0	0	0	0	0	0	0	0	1
PERISAUC	0	0	0	0	0	0	0	0	0	0	1	0	1
ORTHMACO	0	0	0	0	0	1	0	0	0	0	0	0	1
ORTHHIBI	0	0	0	0	0	0	0	1	0	0	0	0	1
ONCOMEAD	0	0	0	0	1	0	0	0	0	0	0	0	1
OLIGILLO	0	0	0	0	0	0	1	0	0	0	0	0	1
MONOSPP1	0	0	0	0	0	1	0	0	0	0	0	0	1
MONONSP2	0	0	0	1	0	0	0	0	0	0	0	0	1
MISEVARI	0	0	0	0	0	0	0	0	0	0	0	1	1
MALACALI	0	0	1	0	0	0	0	0	0	0	0	0	1
LITHVAND	0	0	0	0	0	0	0	1	0	0	0	0	1
LITHPETU	1	0	0	0	0	0	0	0	0	0	0	0	1

LAMBFISC	0	1	0	0	0	0	0	0	0	0	0	0	1
LACISTRI	0	1	0	0	0	0	0	0	0	0	0	0	1
LACIOLIV	0	0	0	0	0	0	0	1	0	0	0	0	1
ITAMCONF	0	0	1	0	0	0	0	0	0	0	0	0	1
HYDRFURC	0	1	0	0	0	0	0	0	0	0	0	0	1
HOMODIVE	0	0	0	0	0	0	0	0	0	1	0	0	1
HELIPHLO	1	0	0	0	0	0	0	0	0	0	0	0	1
EUXOTESS	1	0	0	0	0	0	0	0	0	0	0	0	1
EUXOTERR	0	0	0	0	0	1	0	0	0	0	0	0	1
EUXOMESS	0	0	0	0	0	0	0	0	0	0	0	1	1
EUTHLORA	0	0	1	0	0	0	0	0	0	0	0	0	1
EUPISABU	0	1	0	0	0	0	0	0	0	0	0	0	1
ENYPVENA	0	0	0	0	0	0	0	0	1	0	0	0	1
ENNOMAGN	0	0	1	0	0	0	0	0	0	0	0	0	1
EGIRRUBR	0	0	1	0	0	0	0	0	0	0	0	0	1
DYSSSOBR	0	0	0	0	0	0	0	1	0	0	0	0	1
DYSSOCHR	0	0	0	0	0	0	0	1	0	0	0	0	1
DYSSCITR	0	0	1	0	0	0	0	0	0	0	0	0	1
DYSSBRUN	0	0	0	0	0	0	0	0	0	0	0	1	1
DREPARCU	0	1	0	0	0	0	0	0	0	0	0	0	1
DASYVAGA	0	0	1	0	0	0	0	0	0	0	0	0	1
CUCUDENT	0	0	0	0	0	0	0	0	1	0	0	0	1
CLADLIMI	0	0	0	0	0	0	0	0	0	0	1	0	1
CHYTDIVE	1	0	0	0	0	0	0	0	0	0	0	0	1
CATOVERR	0	1	0	0	0	0	0	0	0	0	0	0	1
CATOILIA	0	1	0	0	0	0	0	0	0	0	0	0	1
CATALINE	0	0	1	0	0	0	0	0	0	0	0	0	1
CARIDIVI	0	1	0	0	0	0	0	0	0	0	0	0	1
CABEERYT	0	0	0	0	0	0	1	0	0	0	0	0	1
BRACRECT	0	1	0	0	0	0	0	0	0	0	0	0	1
BOMOBIJU	0	1	0	0	0	0	0	0	0	0	0	0	1
APODLITA	0	0	0	1	0	0	0	0	0	0	0	0	1
APAMNSPP	1	0	0	0	0	0	0	0	0	0	0	0	1
APAMATRI	0	0	0	0	1	0	0	0	0	0	0	0	1
ANAGOCCI	0	0	0	0	0	0	0	0	1	0	0	0	1
AMBELAET	0	0	0	0	0	0	0	0	0	0	1	0	1
ACRORADC	0	0	1	0	0	0	0	0	0	0	0	0	1
ACROGRIS	0	0	1	0	0	0	0	0	0	0	0	0	1
ACROFUNE	0	1	0	0	0	0	0	0	0	0	0	0	1
ZENOLIGN	1	0	0	0	0	0	0	0	0	0	1	0	2
PYRRISAB	0	0	2	0	0	0	0	0	0	0	0	0	2
PROCFORF	0	0	0	0	0	0	0	1	0	1	0	0	2
PHRYCALI	0	2	0	0	0	0	0	0	0	0	0	0	2

PARASULI	0	0	0	0	0	0	0	0	0	0	2	0	2
ORTHCENT	1	1	0	0	0	0	0	0	0	0	0	0	2
ONCONWSP	0	0	0	0	2	0	0	0	0	0	0	0	2
ONCODUNB	0	0	0	0	1	1	0	0	0	0	0	0	2
NEDRSTEW	0	0	2	0	0	0	0	0	0	0	0	0	2
LITHGAUS	0	0	0	0	2	0	0	0	0	0	0	0	2
LITHDILA	0	0	0	0	0	0	2	0	0	0	0	0	2
LACIRECT	1	0	1	0	0	0	0	0	0	0	0	0	2
HEMIPLEB	1	1	0	0	0	0	0	0	0	0	0	0	2
GEOMNSP1	0	0	0	0	0	2	0	0	0	0	0	0	2
EUXOVEST	2	0	0	0	0	0	0	0	0	0	0	0	2
EUXOSEPT	0	0	0	0	0	0	0	0	1	0	1	0	2
EUXOINFA	2	0	0	0	0	0	0	0	0	0	0	0	2
EUPIANNU	0	0	0	0	0	1	0	0	0	0	1	0	2
EUMIMINI	2	0	0	0	0	0	0	0	0	0	0	0	2
EPIRALTE	0	2	0	0	0	0	0	0	0	0	0	0	2
ECLISILA	0	0	2	0	0	0	0	0	0	0	0	0	2
DYSSFORM	0	0	1	0	0	0	0	0	0	0	1	0	2
DICHILLU	1	1	0	0	0	0	0	0	0	0	0	0	2
DARGPROC	0	0	0	1	0	1	0	0	0	0	0	0	2
BRACALGE	0	0	2	0	0	0	0	0	0	0	0	0	2
APAMVULT	0	0	2	0	0	0	0	0	0	0	0	0	2
APAMCAST	2	0	0	0	0	0	0	0	0	0	0	0	2
AGROVANC	1	0	0	0	1	0	0	0	0	0	0	0	2
ADELINDE	0	1	0	0	0	0	0	1	0	0	0	0	2
ABAGSCOP	0	0	1	1	0	0	0	0	0	0	0	0	2
ABAGERRA	0	0	0	0	0	0	0	0	0	0	0	2	2
XANTDEFE	0	0	0	0	0	0	1	0	0	1	0	1	3
TRIPCALI	0	0	0	0	2	0	0	0	0	1	0	0	3
SYNGOROP	0	0	0	0	0	0	0	0	3	0	0	0	3
SYNESABU	3	0	0	0	0	0	0	0	0	0	0	0	3
SYNEADUM	0	0	0	0	2	0	0	0	0	0	0	1	3
SEMIRESP	0	0	0	0	1	0	0	0	0	0	0	2	3
PSEUCYMA	0	2	1	0	0	0	0	0	0	0	0	0	3
PLAGPHLO	1	0	1	0	0	0	0	0	0	0	0	1	3
PHOBANFR	3	0	0	0	0	0	0	0	0	0	0	0	3
PEROMORR	1	0	2	0	0	0	0	0	0	0	0	0	3
ORTHARTH	0	0	0	0	0	1	0	0	0	0	2	0	3
ONCOGREY	0	2	0	0	0	0	0	0	0	0	0	1	3
LITHATAR	0	0	0	0	0	0	3	0	0	0	0	0	3
LITHALBI	0	0	3	0	0	0	0	0	0	0	0	0	3
LEUCANTE	3	0	0	0	0	0	0	0	0	0	0	0	3
HYPPXYLI	0	0	0	0	0	0	1	2	0	0	0	0	3

HYALEURY	0	0	0	0	0	0	0	0	1	0	1	1	3
EUXOPUNC	0	0	0	1	0	0	0	0	0	0	1	1	3
EUXOCOMO	0	0	0	0	2	0	0	1	0	0	0	0	3
EUPICRET	0	0	0	0	0	0	0	0	3	0	0	0	3
ELPILORQ	3	0	0	0	0	0	0	0	0	0	0	0	3
ECTRCREP	0	1	2	0	0	0	0	0	0	0	0	0	3
CRYPCUER	1	0	0	0	2	0	0	0	0	0	0	0	3
CLEPPERS	0	1	1	0	0	0	0	0	1	0	0	0	3
ANACCLIV	3	0	0	0	0	0	0	0	0	0	0	0	3
AGROPURP	3	0	0	0	0	0	0	0	0	0	0	0	3
ACROIMPL	0	2	0	0	0	0	0	1	0	0	0	0	3
ZOTHTRAN	0	2	1	0	0	0	0	0	0	0	0	1	4
XANTMACD	0	1	2	1	0	0	0	0	0	0	0	0	4
THALTAYL	0	0	0	0	0	0	0	2	2	0	0	0	4
SYNAFUSC	3	1	0	0	0	0	0	0	0	0	0	0	4
SIDEMARY	0	0	0	0	2	0	0	0	1	1	0	0	4
ORGYPSEU	3	1	0	0	0	0	0	0	0	0	0	0	4
OLIGSEMI	1	2	1	0	0	0	0	0	0	0	0	0	4
OLIGMARI	4	0	0	0	0	0	0	0	0	0	0	0	4
NADAOREG	4	0	0	0	0	0	0	0	0	0	0	0	4
MYCTRUBR	0	0	0	1	0	0	0	0	0	0	2	1	4
MELIJUCU	3	0	0	0	0	0	0	0	0	0	1	0	4
LEUCFARC	1	0	0	0	1	0	0	0	0	0	0	2	4
LACIILLA	4	0	0	0	0	0	0	0	0	0	0	0	4
HYDRMARI	0	1	0	1	0	0	0	0	0	0	2	0	4
GRAMORNA	0	0	1	0	1	1	0	0	0	0	1	0	4
EUXOPLAG	0	0	0	1	3	0	0	0	0	0	0	0	4
CRAMLEAC	1	0	0	0	3	0	0	0	0	0	0	0	4
COCHSONO	0	4	0	0	0	0	0	0	0	0	0	0	4
CHLOBANK	1	0	0	0	0	3	0	0	0	0	0	0	4
AUTOCALI	0	0	0	0	2	1	1	0	0	0	0	0	4
AGROPULC	0	2	0	1	0	0	1	0	0	0	0	0	4
ADELSTEL	1	1	0	0	0	0	0	0	0	0	0	2	4
PYRASEMI	2	3	0	0	0	0	0	0	0	0	0	0	5
PARAINSU	0	1	0	0	2	1	0	0	0	0	0	1	5
MELAIMIT	2	0	0	0	0	0	0	0	0	1	2	0	5
LOPHARGE	1	2	0	0	0	1	0	0	0	0	0	1	5
LEUCINSU	0	1	0	0	2	0	1	0	1	0	0	0	5
HYPAUNIP	0	0	5	0	0	0	0	0	0	0	0	0	5
EUPIPLUM	1	0	0	0	0	1	0	1	0	2	0	0	5
EPIRAUTU	1	1	0	0	0	0	0	0	0	1	2	0	5
DIARESUR	0	0	0	0	0	1	1	0	2	1	0	0	5
COLOPAND	0	0	0	5	0	0	0	0	0	0	0	0	5

APAMCENT	0	0	0	0	5	0	0	0	0	0	0	0	5
XESTMUST	3	2	0	0	0	0	0	0	0	1	0	0	6
XESTFINA	0	2	0	1	1	0	0	1	0	0	1	0	6
UDEAPROF	0	2	3	0	0	0	0	0	0	0	1	0	6
SPARSEXP	0	3	2	0	0	0	0	0	0	0	1	0	6
PROTCURT	0	3	3	0	0	0	0	0	0	0	0	0	6
LACIDAVE	0	0	0	0	0	0	0	0	4	0	0	2	6
EUTHSEMI	0	1	4	0	0	1	0	0	0	0	0	0	6
EUPIXXXX	1	0	0	2	0	1	0	0	0	1	0	1	6
EUCOSISK	0	0	0	0	0	6	0	0	0	0	0	0	6
EUCHJOHN	0	0	0	2	1	1	0	0	0	0	2	0	6
EGIRSIMP	0	0	0	2	0	1	0	0	0	0	3	0	6
DASYGRIS	1	2	2	0	0	1	0	0	0	0	0	0	6
COSMCALA	4	2	0	0	0	0	0	0	0	0	0	0	6
BOMOPALP	0	2	3	0	0	0	0	0	0	0	1	0	6
ANDRAEDO	5	0	1	0	0	0	0	0	0	0	0	0	6
AETHPACK	0	3	0	1	0	2	0	0	0	0	0	0	6
SCHIIPOM	0	4	2	0	0	0	0	0	0	0	1	0	7
PROTALFK	7	0	0	0	0	0	0	0	0	0	0	0	7
PARAEXER	1	0	1	2	3	0	0	0	0	0	0	0	7
ONCOCOLU	0	0	0	1	2	0	0	0	0	4	0	0	7
FISHEVEL	0	3	0	2	0	0	0	0	0	1	1	0	7
APHACALI	0	0	0	1	0	1	0	1	4	0	0	0	7
STAMPEAR	0	2	0	2	1	1	1	0	0	0	1	0	8
EUPINEVA	0	0	0	0	0	5	1	1	0	0	1	0	8
DREPSECU	0	2	1	0	0	0	0	0	0	0	0	5	8
COCHSINU	0	4	0	0	0	0	0	0	0	0	2	2	8
CERATEAR	0	0	0	2	4	0	0	1	0	0	1	0	8
CAMPPERL	1	1	3	0	0	0	3	0	0	0	0	0	8
AMPHAMER	1	1	0	2	0	3	0	0	1	0	0	0	8
TRIPHAES	0	0	0	2	1	0	3	3	0	0	0	0	9
PLERCINE	3	3	0	0	0	0	0	0	0	1	2	0	9
ONCORAGA	8	0	0	0	0	0	0	0	0	0	0	1	9
LACIPENS	2	0	0	1	3	0	0	0	0	0	0	3	9
CALLAMOR	0	1	8	0	0	0	0	0	0	0	0	0	9
STENPULM	0	1	2	0	0	0	0	0	2	0	5	0	10
PERIPECT	0	0	0	2	1	0	1	2	0	3	1	0	10
PARAFORM	1	2	0	5	0	1	1	0	0	0	0	0	10
LACALUTR	0	0	0	0	0	0	1	1	1	1	6	0	10
CERAGUEN	0	1	4	0	0	0	0	0	1	0	1	3	10
SEMICALI	1	0	0	0	0	1	0	0	0	0	1	8	11
HYPHCUNE	0	8	0	0	0	0	0	1	0	0	1	1	11
HEMIEDWA	6	5	0	0	0	0	0	0	0	0	0	0	11

EUCHTIGR	0	6	5	0	0	0	0	0	0	0	0	0	11
SPHIPERE	0	1	0	0	7	0	1	2	0	1	0	0	12
EUXONSP1	0	0	0	0	12	0	0	0	0	0	0	0	12
EUROASTR	0	0	0	0	0	0	0	7	5	0	0	0	12
EUPICOLU	1	0	0	0	0	6	0	5	0	0	0	0	12
EULIXYLI	3	3	1	0	0	0	0	3	2	0	0	0	12
SEMIBURN	0	1	0	0	6	1	0	3	0	0	2	0	13
IRIOEMAS	0	3	0	1	0	3	3	0	1	2	0	0	13
DREPFOEM	0	1	1	0	0	1	1	0	0	1	4	4	13
ABAGAPPO	3	3	0	1	1	3	0	0	0	0	2	0	13
PSEUMUSC	0	0	0	5	8	0	0	0	0	1	0	0	14
PAPEINVA	0	0	0	0	0	0	0	4	7	2	1	0	14
LACICUNE	2	7	5	0	0	0	0	0	0	0	0	0	14
EUSTFASC	0	0	0	0	1	0	1	3	9	0	0	0	14
ACROPERD	0	4	0	0	0	3	0	2	0	2	0	3	14
PLATCONT	0	1	0	0	0	2	2	2	0	7	1	0	15
LACIPATA	0	0	0	0	0	0	0	0	0	0	0	15	15
HYDRRENU	0	0	4	0	0	0	1	3	2	5	0	0	15
ANCYCOLU	0	0	0	0	0	0	0	0	0	0	2	13	15
PERIGRAN	0	1	0	0	0	1	4	3	6	1	0	0	16
HYDRMANZ	0	2	0	5	0	1	0	0	0	0	5	3	16
EVERFUNA	0	8	0	2	1	0	0	0	0	4	1	0	16
EUXONSP2	0	0	0	8	8	0	0	0	0	0	0	0	16
EUSTSEMI	2	3	2	1	0	1	1	0	0	1	3	2	16
ZALEMINE	1	12	3	0	0	0	0	0	0	0	0	1	17
ORTHTRAN	2	6	0	1	0	1	0	1	1	2	3	0	17
ORTHPULC	0	0	0	2	3	4	1	6	0	0	1	0	17
NEOACALI	12	1	0	0	0	1	1	0	1	0	1	0	17
MONONSP1	0	0	0	2	10	0	2	1	0	1	0	1	17
MESOSUBC	13	2	2	0	0	0	0	0	0	0	0	0	17
EUXOIDAH	0	0	0	10	7	0	0	0	0	0	0	0	17
AMPHPYRA	7	8	0	0	0	2	0	0	0	0	0	0	17
SPILVEST	0	1	1	0	0	0	0	0	0	1	1	14	18
SPILVAGA	1	4	13	0	0	0	0	0	0	0	0	0	18
NADAGIBB	5	3	10	0	0	0	0	0	0	0	0	0	18
EUXONOST	0	0	0	10	8	0	0	0	0	0	0	0	18
EUPIHARV	0	2	4	2	0	1	0	6	0	3	0	0	18
CORYMEAD	2	13	3	0	0	0	0	0	0	0	0	0	18
CATOOPHE	4	9	0	0	0	2	0	0	0	0	1	2	18
SICYCROC	2	2	0	1	0	1	2	1	1	3	5	1	19
MALADISS	19	0	0	0	0	0	0	0	0	0	0	0	19
TOLYDIST	5	4	6	1	0	0	0	0	0	0	4	0	20
PROPNIVE	1	0	0	7	10	0	0	0	0	0	2	0	20

PLEROPTE	0	1	0	3	0	2	0	8	2	1	3	0	20
ITAMQUAD	4	2	0	0	0	0	1	0	0	0	2	11	20
GLENNIGR	0	0	0	2	2	5	5	2	0	0	4	0	20
CHORROSA	6	5	5	0	0	3	0	0	0	0	1	0	20
EUPISUBC	0	0	0	0	2	0	4	9	6	0	0	0	21
SYNAJUBA	10	3	1	1	0	0	2	1	0	1	2	1	22
ORTHMYS-	0	6	0	0	6	3	1	3	0	1	1	1	22
GABRDYAR	2	9	7	0	0	0	1	0	0	1	1	1	22
ASTIVICT	2	1	0	3	1	0	0	0	1	0	4	10	22
IDIAAMER	0	21	1	0	1	0	0	0	0	0	0	0	23
ARCHARGY	4	16	0	0	0	0	0	0	0	0	0	4	24
PLATMONT	13	6	0	1	1	3	0	0	0	0	0	1	25
HESPLATI	8	2	5	2	0	1	2	1	0	1	3	0	25
DREPQUAD	0	13	10	0	1	0	1	0	0	0	0	0	25
ZALETERM	1	9	3	0	2	5	0	1	2	1	2	0	26
PERICURV	8	10	8	0	0	0	0	1	0	0	0	0	27
CATOAHOL	4	17	0	0	0	5	0	0	0	1	0	0	27
LOPHMACU	0	17	5	0	1	0	2	0	1	1	1	0	28
SEMIADON	1	1	0	0	9	6	1	2	0	3	5	1	29
ITAMGUEN	0	0	0	1	1	23	0	0	0	0	3	1	29
SYNAPALL	20	7	1	0	0	0	1	0	0	0	1	0	30
PERICOST	21	7	0	0	1	0	0	1	0	0	0	0	30
CLEMALBA	0	20	9	0	0	0	0	0	0	0	1	0	30
ACHYPRAE	0	1	0	1	2	2	5	0	0	1	18	1	31
MESORUBR	0	1	0	5	5	17	0	0	0	0	1	3	32
NEMODARW	2	9	0	0	1	2	0	3	0	1	3	12	33
EUXOBICO	0	0	0	21	12	0	0	0	0	0	0	0	33
DREPUNIC	6	7	3	0	2	2	0	3	1	1	0	8	33
SCOPJUNC	10	11	5	0	0	5	1	0	1	0	1	0	34
MESOOLIV	0	3	0	6	10	4	1	2	3	6	0	1	36
SAUCFUMO	3	4	4	0	0	18	0	3	0	0	7	0	39
ABAGTRIG	0	1	0	0	8	13	0	0	0	1	8	13	44
PYLAFUSC	0	3	0	0	0	0	0	42	0	0	0	0	45
EUXODIFF	1	0	0	17	33	0	0	0	0	0	0	0	51
AMORCUNE	7	38	1	1	1	1	0	0	0	1	1	0	51
PHYLAMER	0	7	16	7	0	1	2	0	4	1	14	0	52
EUPIMIST	6	8	1	0	17	7	0	0	0	0	6	7	52
HOMOFURF	13	12	2	4	4	9	0	0	0	0	4	7	55
DREPCARN	0	3	4	0	0	7	0	0	0	0	5	38	57
PANTPORT	2	16	14	4	4	2	1	1	1	1	11	1	58
SABUEDWA	1	1	0	8	2	14	0	11	5	5	9	3	59
CHOROCCI	1	37	19	0	0	0	0	0	0	0	2	0	59
ACHYEPIP	3	21	6	0	0	0	0	0	0	0	31	1	62

MECYMUST	5	4	0	6	31	11	0	5	0	3	4	0	69
HYDRIRAT	0	32	3	0	0	10	0	8	1	1	14	0	69
NEMARESI	8	36	24	0	0	1	1	0	0	0	0	3	73
ASEPBINO	10	9	1	1	0	6	5	0	1	6	2	32	73
PROPALBI	53	12	2	0	0	0	0	0	0	0	0	11	78
CARIAEQU	0	4	0	17	10	15	2	3	7	13	8	1	80
EULIDEST	0	0	0	5	0	1	9	26	35	10	2	0	88
DREPMONI	1	3	0	3	1	2	1	1	0	0	2	77	91
SYNACERV	5	10	1	0	0	6	7	6	2	8	28	20	93
ACROMARM	11	81	1	0	0	0	0	0	0	0	0	0	93
EUDRRECT	43	18	3	1	4	6	4	0	0	0	5	12	96
SEMISIGN	12	30	7	0	0	5	6	1	2	5	31	0	99
VENUPEAR	0	1	1	25	5	21	8	15	2	8	15	0	101
ENYPPACK	1	8	0	6	2	15	11	9	14	18	18	0	102
HOMOHANH	56	20	0	2	23	3	1	0	0	0	0	0	105
HEMEFINI	3	4	0	0	3	10	0	0	1	3	17	75	116
CYCLDATA	7	71	2	0	1	22	1	9	0	3	8	0	124
HOMOCOMM	24	37	3	4	3	8	0	0	0	0	11	35	125
ASEPETHN	65	11	0	8	11	30	2	1	0	7	4	1	140
NEPYUMBR	1	54	48	0	0	2	0	0	1	0	39	0	145
EUPIGRAE	18	44	4	2	3	21	5	10	8	7	38	2	162
PERIANGU	1	16	3	24	17	56	7	4	5	14	24	3	174
HESPSULP	13	11	10	15	38	38	8	0	2	1	11	28	175
DREPHULS	3	0	0	4	90	50	26	5	0	5	0	1	184
PEROMIZO	16	28	9	17	43	65	13	2	1	8	29	1	232
PEROOCCI	0	8	9	9	13	25	23	80	65	28	39	19	318
SERIJUTU	43	26	21	28	45	36	5	0	0	2	33	811	1050

Similarity Indices

Chord Distance

Table V-2. Chord Distance Similarity Index. Site-by-site matrix of Chord Distance association coefficients calculated from data collected in Galice, Oregon for 112 species in 12 sites.

	1	2	3	4	5	6	7	8	9	10	11	12
1	0.0000	1.0690	1.2290	1.1816	1.1517	1.1080	1.2516	1.3853	1.3939	1.2831	1.1775	1.1448
2	1.0690	0.0000	0.9106	1.2423	1.2635	1.1076	1.2420	1.3042	1.3371	1.2185	0.9502	1.2863
3	1.2290	0.9106	0.0000	1.2121	1.2611	1.2040	1.2461	1.3197	1.3069	1.2844	0.9288	1.1841
4	1.1816	1.2423	1.2121	0.0000	0.8926	0.8108	1.0372	1.2204	1.2250	0.9834	1.0020	1.0604
5	1.1517	1.2635	1.2611	0.8926	0.0000	0.7349	0.8175	1.2970	1.3273	1.1580	1.1516	1.1405
6	1.1080	1.1076	1.2040	0.8108	0.7349	0.0000	0.7667	1.1823	1.2153	0.8984	0.8795	1.1840
7	1.2516	1.2420	1.2461	1.0372	0.8175	0.7667	0.0000	0.9080	0.8713	0.7052	0.9323	1.3114
8	1.3853	1.3042	1.3197	1.2204	1.2970	1.1823	0.9080	0.0000	0.5453	0.7823	1.0712	1.3981
9	1.3939	1.3371	1.3069	1.2250	1.3273	1.2153	0.8713	0.5453	0.0000	0.6898	1.0654	1.3974
10	1.2831	1.2185	1.2844	0.9834	1.1580	0.8984	0.7052	0.7823	0.6898	0.0000	0.8642	1.3592
11	1.1775	0.9502	0.9288	1.0020	1.1516	0.8795	0.9323	1.0712	1.0654	0.8642	0.0000	1.1479
12	1.1448	1.2863	1.1841	1.0604	1.1405	1.1840	1.3114	1.3981	1.3974	1.3592	1.1479	0.0000

Percentage Similarity

Table V-3. Percentage Similarity Index. Site-by-site matrix of Percentage Similarity association coefficients calculated from data collected in Galice, Oregon for 112 species in 12 sites over 5 sampling dates.

	1	2	3	4	5	6	7	8	9	10	11	12
1	100.00	42.34	28.37	22.15	26.07	34.56	18.12	12.11	7.28	16.53	30.84	17.86
2	42.34	100.00	43.78	22.78	24.26	35.66	18.61	15.44	10.99	20.72	47.35	17.14
3	28.37	43.78	100.00	24.55	17.51	22.09	25.14	13.47	14.29	20.61	39.65	9.43
4	22.15	22.78	24.55	100.00	52.00	42.36	35.07	25.08	22.18	41.19	42.27	11.59
5	26.07	24.26	17.51	52.00	100.00	51.44	29.33	16.72	13.11	26.23	33.63	15.18
6	34.56	35.66	22.09	42.36	51.44	100.00	37.43	31.31	21.66	38.63	53.12	19.33
7	18.12	18.61	25.14	35.07	29.33	37.43	100.00	37.95	41.48	59.71	35.49	9.39
8	12.11	15.44	13.47	25.08	16.72	31.31	37.95	100.00	59.63	45.70	32.41	6.43
9	7.28	10.99	14.29	22.18	13.11	21.66	41.48	59.63	100.00	48.94	27.77	5.24
10	16.53	20.72	20.61	41.19	26.23	38.63	59.71	45.70	48.94	100.00	39.65	8.87
11	30.84	47.35	39.65	42.27	33.63	53.12	35.49	32.41	27.77	39.65	100.00	19.65
12	17.86	17.14	9.43	11.59	15.18	19.33	9.39	6.43	5.24	8.87	19.65	100.00

Table V-4. Percentage Dissimilarity Index. Site-by-site matrix of Percentage Dissimilarity association coefficients calculated from data collected in Galice, Oregon for 112 species in 12 sites over 5 sampling dates.

	1	2	3	4	5	6	7	8	9	10	11	12
1	0.00	57.66	71.63	77.85	73.93	65.44	81.88	87.89	92.72	83.47	69.16	82.14
2	57.66	0.00	56.22	77.22	75.74	64.34	81.39	84.56	89.01	79.28	52.65	82.86
3	71.63	56.22	0.00	75.45	82.49	77.91	74.86	86.53	85.71	79.39	60.35	90.57
4	77.85	77.22	75.45	0.00	48.00	57.64	64.93	74.92	77.82	58.81	57.73	88.41
5	73.93	75.74	82.49	48.00	0.00	48.56	70.67	83.28	86.89	73.77	66.37	84.82
6	65.44	64.34	77.91	57.64	48.56	0.00	62.57	68.69	78.34	61.37	46.88	80.67
7	81.88	81.39	74.86	64.93	70.67	62.57	0.00	62.05	58.52	40.29	64.51	90.61
8	87.89	84.56	86.53	74.92	83.28	68.69	62.05	0.00	40.37	54.30	67.59	93.57
9	92.72	89.01	85.71	77.82	86.89	78.34	58.52	40.37	0.00	51.06	72.23	94.76
10	83.47	79.28	79.39	58.81	73.77	61.37	40.29	54.30	51.06	0.00	60.35	91.13
11	69.16	52.65	60.35	57.73	66.37	46.88	64.51	67.59	72.23	60.35	0.00	80.35
12	82.14	82.86	90.57	88.41	84.82	80.67	90.61	93.57	94.76	91.13	80.35	0.00

The association information in Table V-4 was used in the ORD ordination analysis.

Ordination

Principal Coordinate Analysis (ORD)

Principal Coordinate Correlations

Correlations of the 112 species with the Principal Coordinate Axes were obtained using Principal Component Analysis (PCA) (Table V-5). The strength of the association of a species with a Principal Coordinate is represented by the magnitude of the correlation (absolute value). Tables V-6 through V-15 sort the species by the strength of their correlation with Principal Coordinates 1 through 10. The species with the highest associations appear at the top of the tables, along with their Principal Coordinates axis correlation.

Table V-5. Principal Coordinate Correlations. The correlations of the 112 species with the 10 Principal Coordinate axes obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

		Principal Coordinates									
LEPCODE	FXGRP	1	2	3	4	5	6	7	8	9	10
ABAGAPPO	hdwd	0.209	-0.656	-0.510	-0.039	-0.449	0.186	0.021	0.065	0.103	0.105
ABAGTRIG	hdwd	-0.587	0.078	-0.505	0.447	-0.319	0.222	-0.163	-0.080	-0.035	0.056
ACHYEPIP	gymno	0.110	-0.628	0.210	0.312	-0.123	0.385	-0.453	0.287	0.038	0.012
ACHYPRAE	gymno	0.083	-0.032	0.058	0.323	-0.207	0.593	-0.528	0.394	-0.091	-0.144
ACROMARM	hdwd	0.097	-0.906	0.064	0.153	-0.004	-0.333	0.126	0.108	-0.049	0.001
ACROPERD	hdwd	-0.369	-0.448	0.030	0.394	-0.385	-0.286	0.355	-0.179	-0.014	-0.211
AMORCUNE	hdwd	0.113	-0.917	0.031	0.130	-0.009	-0.311	0.125	0.118	-0.039	0.002
AMPHPYRA	hdwd	0.125	-0.854	-0.198	-0.335	-0.241	-0.183	0.102	-0.013	-0.022	0.025
ANCYCOLU	unknown	-0.988	0.012	0.080	0.047	-0.039	0.073	-0.072	0.050	-0.014	-0.012
ARCHARGY	hdwd	-0.146	-0.914	0.045	0.052	-0.037	-0.330	0.117	0.110	-0.050	-0.001
ASEPBINO	hdwd	-0.925	-0.235	-0.031	-0.138	-0.118	0.004	0.126	-0.018	-0.166	-0.108
ASEPETHN	hdwd	0.135	-0.296	-0.546	-0.654	-0.377	0.104	0.058	-0.090	0.041	0.028
ASTIVICT	hdwd	-0.904	-0.052	0.035	-0.037	-0.046	0.194	-0.094	0.308	0.118	0.122
CARIAEQU	gymno	0.288	0.316	-0.347	0.408	-0.125	0.200	0.465	0.384	0.085	0.172
CATOAHOL	hdwd	0.128	-0.891	-0.098	0.160	-0.176	-0.254	0.229	-0.012	-0.078	0.002

CATOOPHE	hdwd	-0.081	-0.941	-0.093	-0.016	-0.214	-0.196	0.105	0.044	-0.044	0.017
CHOROCCI	gymno	0.130	-0.864	0.184	0.240	0.294	-0.148	0.038	-0.179	0.040	0.037
CHORROSA	hdwd	0.186	-0.754	-0.167	-0.334	0.008	0.173	-0.021	-0.456	0.101	0.087
CLEMALBA	hdwd	0.125	-0.867	0.182	0.267	0.269	-0.172	0.052	-0.145	0.028	0.032
CORYMEAD	hdwd	0.117	-0.928	0.102	0.134	0.126	-0.267	0.095	-0.033	-0.007	0.019
CYCLDATA	hdwd	0.152	-0.856	-0.011	0.329	-0.209	-0.255	0.158	-0.016	-0.010	-0.039
DREPCARN	hdwd	-0.977	-0.055	0.015	0.127	-0.060	0.107	0.001	-0.104	-0.007	0.009
DREPFOEM	hdwd	-0.642	-0.158	0.168	0.313	-0.126	0.516	-0.311	0.129	-0.132	-0.150
DREPHULS	hdwd	0.131	0.295	-0.823	0.296	0.079	-0.275	-0.184	-0.060	-0.093	-0.053
DREPMONI	hdwd	-0.998	0.001	0.044	0.024	-0.011	-0.016	0.030	0.013	0.000	-0.014
DREPQUAD	hdwd	0.144	-0.766	0.168	0.231	0.447	-0.127	0.010	-0.305	0.045	0.023
DREPUNIC	hdwd	-0.605	-0.614	-0.043	-0.249	-0.090	-0.327	-0.029	-0.230	0.111	0.008
ENYPPACK	gymno	0.420	0.181	0.254	0.396	-0.496	0.259	0.110	0.228	-0.404	-0.068
EUDRRECT	hdwd	-0.167	-0.395	-0.331	-0.787	-0.237	0.086	-0.138	-0.043	0.011	-0.005
EULIDEST	hdwd	0.254	0.483	0.598	-0.033	-0.271	-0.408	0.044	-0.004	-0.128	0.288
EULIXYLI	hdwd	0.243	-0.467	0.340	-0.405	-0.281	-0.502	-0.098	-0.188	0.204	0.156
EUPICOLU	hdwd	0.149	0.190	-0.168	0.173	-0.683	-0.115	0.161	-0.495	0.329	-0.156
EUPIGRAE	hdwd	0.234	-0.757	0.044	0.255	-0.456	0.169	-0.209	0.154	-0.038	0.011
EUPIHARV	hdwd	0.270	0.045	0.462	0.113	0.074	-0.209	0.168	-0.350	0.540	-0.311
EUPIMIST	hdwd	-0.214	-0.270	-0.751	0.206	-0.004	-0.215	-0.438	0.112	0.016	0.111
EUPISUBC	hdwd	0.228	0.474	0.429	0.011	-0.246	-0.600	-0.182	-0.114	0.053	-0.013
EUROASTR	hdwd	0.176	0.372	0.546	-0.010	-0.375	-0.518	-0.117	-0.148	0.213	0.198
EUSTFASC	gymno	0.178	0.374	0.413	-0.028	-0.173	-0.407	-0.078	-0.038	-0.258	0.604
EUSTSEMI	herb	-0.222	-0.791	0.108	0.005	0.021	0.521	-0.141	0.084	0.004	-0.123
EUXOBICO	herb	0.105	0.251	-0.373	0.063	0.398	-0.041	0.287	0.518	0.479	0.180
EUXODIFF	herb	0.097	0.263	-0.624	0.120	0.416	-0.285	-0.132	0.384	0.272	0.153
EUXOIDAH	herb	0.106	0.261	-0.424	0.078	0.413	-0.083	0.225	0.509	0.457	0.181
EUXONOST	herb	0.106	0.267	-0.457	0.089	0.420	-0.113	0.180	0.500	0.438	0.179
EUXONSP1	herb	0.060	0.210	-0.641	0.171	0.325	-0.406	-0.429	0.170	0.027	0.087
EUXONSP2	herb	0.105	0.273	-0.510	0.106	0.429	-0.162	0.099	0.479	0.402	0.176
EVERFUNA	unknown	0.174	-0.696	0.093	0.279	0.116	-0.223	0.279	0.369	-0.094	-0.109
GABRDYAR	gymno	0.082	-0.842	0.205	0.075	0.389	-0.026	-0.010	-0.285	0.007	-0.025
GLENNIGR	gymno	0.251	0.302	-0.319	0.413	-0.313	0.306	-0.053	0.023	-0.042	-0.350
HEMEFINI	unknown	-0.976	-0.025	0.007	0.096	-0.120	0.118	-0.073	0.035	-0.036	-0.002
HESPLATI	hdwd	0.249	-0.409	-0.046	-0.699	0.076	0.404	-0.160	-0.190	0.184	-0.090
HESPSULP	hdwd	-0.370	0.015	-0.861	0.282	-0.020	0.037	-0.029	-0.114	0.087	0.125
HOMOCOMM	hdwd	-0.588	-0.770	-0.091	-0.107	-0.160	-0.063	0.003	0.094	0.023	0.033
HOMOFURF	hdwd	-0.213	-0.740	-0.485	-0.222	-0.287	0.047	0.086	-0.018	0.129	0.113
HOMOHANH	unknown	0.119	-0.444	-0.488	-0.675	-0.096	-0.198	-0.189	0.079	0.041	0.053
HYDRIRAT	herb	0.183	-0.790	0.139	0.480	-0.272	-0.095	-0.041	0.037	0.072	-0.039
HYDRMANZ	hdwd	-0.288	-0.178	0.063	0.301	-0.064	0.505	0.092	0.584	0.376	0.112
HYDRRENU	hdwd	0.265	0.299	0.545	-0.061	0.258	-0.041	0.072	-0.359	-0.114	-0.189
IDIAAMER	unknown	0.095	-0.867	0.075	0.284	0.064	-0.352	0.116	0.097	-0.047	0.005

IRIOEMAS	hdwd	0.275	-0.257	-0.102	0.340	-0.144	-0.058	0.596	-0.044	-0.509	-0.244
ITAMGUEN	hdwd	0.046	0.067	-0.502	0.387	-0.515	0.303	0.275	-0.391	-0.012	0.074
ITAMQUAD	hdwd	-0.929	-0.222	0.012	-0.222	-0.108	0.048	-0.097	0.074	-0.050	-0.051
LACICUNE	hdwd	0.145	-0.860	0.139	0.009	0.336	-0.099	0.014	-0.296	0.077	0.053
LACIPATA	unknown	-0.997	0.025	0.056	0.008	0.000	-0.021	0.016	-0.007	-0.020	-0.011
LOPHMACU	hdwd	0.151	-0.856	0.161	0.290	0.226	-0.260	0.068	-0.029	-0.099	-0.009
MALADISS	hdwd	0.060	-0.254	-0.256	-0.892	-0.226	0.064	-0.112	-0.022	0.044	0.022
MECYMUST	unknown	0.170	0.163	-0.786	0.219	0.081	-0.324	-0.282	0.152	0.175	0.063
MESOOLIV	hdwd	0.194	0.293	-0.520	0.307	0.216	-0.392	0.216	0.348	0.025	0.116
MESORUBR	hdwd	-0.052	0.116	-0.665	0.416	-0.344	0.178	0.356	-0.244	0.115	0.131
MESOSUBC	hdwd	0.088	-0.405	-0.212	-0.857	-0.129	0.056	-0.112	-0.104	0.064	0.034
MONONSP1	unknown	0.024	0.330	-0.600	0.160	0.391	-0.424	-0.300	0.272	0.050	-0.053
NADAGIBB	hdwd	0.136	-0.446	0.089	-0.348	0.470	0.206	-0.135	-0.573	0.178	0.086
NEMARESI	herb	0.074	-0.870	0.144	0.068	0.329	-0.116	0.037	-0.292	0.055	0.038
NEMODARW	hdwd	-0.763	-0.525	0.089	0.182	-0.206	-0.199	-0.029	0.071	0.047	-0.088
NEOACALI	herb	0.101	-0.301	-0.249	-0.850	-0.289	0.088	-0.118	-0.020	-0.034	0.048
NEPYUMBR	gymno	0.167	-0.737	0.268	0.324	0.264	0.264	-0.276	-0.148	0.096	0.062
ORTHMYS-	hdwd	0.101	-0.353	-0.415	0.515	-0.071	-0.594	-0.180	0.048	0.061	-0.143
ORTHPULC	hdwd	0.226	0.415	-0.211	0.320	-0.405	-0.305	-0.031	-0.153	0.536	-0.230
ORTHTRAN	hdwd	0.249	-0.818	0.173	0.135	-0.281	-0.036	0.036	0.326	-0.039	0.008
PANTPORT	gymno	0.198	-0.737	0.143	0.333	0.355	0.227	-0.244	-0.074	0.189	0.094
PAPEINVA	hdwd	0.214	0.394	0.586	-0.015	-0.307	-0.333	-0.070	0.001	-0.167	0.451
PERIANGU	hdwd	0.207	0.003	-0.522	0.558	-0.382	0.346	0.316	-0.019	0.056	0.060
PERICOST	hdwd	0.096	-0.513	-0.232	-0.779	-0.218	-0.091	-0.091	0.017	0.051	0.010
PERICURV	hdwd	0.162	-0.827	0.064	-0.330	0.217	-0.077	-0.050	-0.318	0.134	0.036
PERIGRAN	unknown	0.265	0.341	0.468	0.026	-0.215	-0.403	0.086	-0.098	-0.455	0.190
PEROMIZO	hdwd	0.252	-0.174	-0.784	0.433	-0.256	0.173	0.002	-0.083	0.013	0.032
PEROOCCI	gymno	0.145	0.486	0.572	0.227	-0.484	-0.279	-0.195	-0.056	0.028	0.099
PHYLAMER	hdwd	0.235	-0.311	0.351	0.263	0.398	0.592	-0.228	-0.063	0.199	0.209
PLATCONT	hdwd	0.229	0.169	0.166	0.116	-0.172	0.044	0.279	0.056	-0.362	-0.542
PLATMONT	herb	0.049	-0.592	-0.361	-0.655	-0.279	-0.059	0.042	-0.024	0.047	0.051
PLEROPTE	hdwd	0.253	0.278	0.427	0.210	-0.504	-0.189	-0.011	0.064	0.575	-0.089
PROPALBI	hdwd	-0.124	-0.449	-0.215	-0.830	-0.199	-0.008	-0.082	-0.021	0.034	0.022
PROPNIVE	hdwd	0.121	0.243	-0.582	0.099	0.375	-0.129	-0.140	0.501	0.348	0.169
PSEUMUSC	unknown	0.112	0.294	-0.582	0.131	0.438	-0.250	-0.039	0.435	0.271	0.126
PYLAFUSC	unknown	0.128	0.199	0.396	0.045	-0.363	-0.485	-0.137	-0.166	0.523	-0.312
SABUEDWA	gymno	0.132	0.351	-0.017	0.395	-0.685	0.206	0.194	0.001	0.371	0.064
SAUCFUMO	unknown	0.171	-0.185	-0.340	0.355	-0.555	0.390	0.076	-0.466	0.100	0.032
SCOPJUNC	herb	0.193	-0.856	-0.173	-0.294	-0.119	-0.011	0.070	-0.292	-0.019	0.083
SEMIADON	gymno	0.122	0.196	-0.686	0.417	-0.193	-0.025	-0.414	0.088	-0.033	-0.095
SEMIBURN	gymno	0.163	0.169	-0.435	0.351	-0.019	-0.428	-0.579	0.142	0.272	-0.056
SEMISIGN	gymno	0.217	-0.770	0.149	0.171	-0.191	0.311	-0.329	0.228	-0.097	-0.066
SERIJUTU	hdwd	-1.000	-0.001	-0.001	0.003	0.000	-0.002	0.000	0.000	0.001	0.001

SICYCROC	hdwd	0.134	-0.222	0.261	0.021	-0.387	0.501	-0.233	0.501	-0.264	-0.275
SPHIPERE	hdwd	0.142	0.211	-0.496	0.207	0.260	-0.584	-0.409	0.164	0.050	-0.124
SPILVAGA	herb	0.121	-0.377	0.203	0.004	0.596	0.190	-0.096	-0.601	0.171	0.082
SPILVEST	hdwd	-0.990	-0.039	0.100	0.042	0.032	0.025	-0.005	-0.007	-0.034	-0.029
SYNACERV	hdwd	-0.463	-0.236	0.238	0.240	-0.378	0.427	-0.388	0.283	-0.120	-0.215
SYNAJUBA	hdwd	0.068	-0.471	-0.121	-0.818	-0.189	0.091	-0.124	0.075	0.026	-0.132
SYNAPALL	gymno	0.103	-0.550	-0.200	-0.775	-0.189	-0.013	-0.094	0.006	0.011	-0.001
TOLYDIST	gymno	0.193	-0.673	0.106	-0.300	0.233	0.408	-0.309	-0.189	0.221	0.090
VENUPEAR	hdwd	0.302	0.372	-0.132	0.365	-0.314	0.324	0.362	0.229	0.444	-0.143
ZALEMINE	hdwd	0.032	-0.914	0.129	0.198	0.155	-0.268	0.102	-0.045	-0.008	0.018
ZALETERM	hdwd	0.248	-0.766	-0.108	0.443	-0.121	-0.157	0.069	-0.236	-0.064	0.181

Table V-6. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 1 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
SERIJUTU	hdwd	-1.000
DREPMONI	hdwd	-0.998
LACIPATA	unknown	-0.997
SPILVEST	hdwd	-0.990
ANCYCOLU	unknown	-0.988
DREPCARN	hdwd	-0.977
HEMEFINI	unknown	-0.976
ITAMQUAD	hdwd	-0.929
ASEPBINO	hdwd	-0.925
ASTIVICT	hdwd	-0.904
NEMODARW	hdwd	-0.763
DREPFOEM	hdwd	-0.642
DREPUNIC	hdwd	-0.605
HOMOCOMM	hdwd	-0.588
ABAGTRIG	hdwd	-0.587
SYNACERV	hdwd	-0.463
ENYPPACK	gymno	0.420
HESPSULP	hdwd	-0.370
ACROPERD	hdwd	-0.369
VENUPEAR	hdwd	0.302
CARIAEQU	gymno	0.288
HYDRMANZ	hdwd	-0.288
IRIOEMAS	hdwd	0.275
EUPIHARV	hdwd	0.270
HYDRRENU	hdwd	0.265
PERIGRAN	unknown	0.265
EULIDEST	hdwd	0.254
PLEROPTE	hdwd	0.253
PEROMIZO	hdwd	0.252
GLENNIGR	gymno	0.251
HESPLATI	hdwd	0.249
ORTHTRAN	hdwd	0.249
ZALETERM	hdwd	0.248
EULIXYLI	hdwd	0.243
PHYLAMER	hdwd	0.235
EUPIGRAE	hdwd	0.234
PLATCONT	hdwd	0.229
EUPISUBC	hdwd	0.228

ORTHPULC	hdwd	0.226
EUSTSEMI	herb	-0.222
SEMISIGN	gymno	0.217
PAPEINVA	hdwd	0.214
EUPIMIST	hdwd	-0.214
HOMOFURF	hdwd	-0.213
ABAGAPPO	hdwd	0.209
PERIANGU	hdwd	0.207
PANTPORT	gymno	0.198
MESOOLIV	hdwd	0.194
SCOPJUNC	herb	0.193
TOLYDIST	gymno	0.193
CHORROSA	hdwd	0.186
HYDRIRAT	herb	0.183
EUSTFASC	gymno	0.178
EUROASTR	hdwd	0.176
EVERFUNA	unknown	0.174
SAUCFUMO	unknown	0.171
MECYMUST	unknown	0.170
NEPYUMBR	gymno	0.167
EUDRRECT	hdwd	-0.167
SEMIBURN	gymno	0.163
PERICURV	hdwd	0.162
CYCLDATA	hdwd	0.152
LOPHMACU	hdwd	0.151
EUPICOLU	hdwd	0.149
ARCHARGY	hdwd	-0.146
LACICUNE	hdwd	0.145
PEROOCCI	gymno	0.145
DREPQUAD	hdwd	0.144
SPHIPERE	hdwd	0.142
NADAGIBB	hdwd	0.136
ASEPETHN	hdwd	0.135
SICYCROC	hdwd	0.134
SABUEDWA	gymno	0.132
DREPHULS	hdwd	0.131
CHOROCCI	gymno	0.130
CATOAHOL	hdwd	0.128
PYLAFUSC	unknown	0.128
AMPHPYRA	hdwd	0.125
CLEMALBA	hdwd	0.125
PROPALBI	hdwd	-0.124
SEMIADON	gymno	0.122

PROPNIVE	hdwd	0.121
SPILVAGA	herb	0.121
HOMOHANH	unknown	0.119
CORYMEAD	hdwd	0.117
AMORCUNE	hdwd	0.113
PSEUMUSC	unknown	0.112
ACHYEPIP	gymno	0.110
EUXOIDAH	herb	0.106
EUXONOST	herb	0.106
EUXOBICO	herb	0.105
EUXONSP2	herb	0.105
SYNAPALL	gymno	0.103
NEOACALI	herb	0.101
ORTHMYS-	hdwd	0.101
ACROMARM	hdwd	0.097
EUXODIFF	herb	0.097
PERICOST	hdwd	0.096
IDIAAMER	unknown	0.095
MESOSUBC	hdwd	0.088
ACHYPRAE	gymno	0.083
GABRDYAR	gymno	0.082
CATOOPHE	hdwd	-0.081
NEMARESI	herb	0.074
SYNAJUBA	hdwd	0.068
EUXONSP1	herb	0.060
MALADISS	hdwd	0.060
MESORUBR	hdwd	-0.052
PLATMONT	herb	0.049
ITAMGUEN	hdwd	0.046
ZALEMINE	hdwd	0.032
MONONSP1	unknown	0.024

Table V-7. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 2 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
CATOOPHE	hdwd	-0.941
CORYMEAD	hdwd	-0.928
AMORCUNE	hdwd	-0.917
ZALEMINE	hdwd	-0.914
ARCHARGY	hdwd	-0.914
ACROMARM	hdwd	-0.906
CATOAHOL	hdwd	-0.891
NEMARESI	herb	-0.870
CLEMALBA	hdwd	-0.867
IDIAAMER	unknown	-0.867
CHOROCCI	gymno	-0.864
LACICUNE	hdwd	-0.860
SCOPJUNC	herb	-0.856
CYCLDATA	hdwd	-0.856
LOPHMACU	hdwd	-0.856
AMPHPYRA	hdwd	-0.854
GABRDYAR	gymno	-0.842
PERICURV	hdwd	-0.827
ORTHTRAN	hdwd	-0.818
EUSTSEMI	herb	-0.791
HYDRIRAT	herb	-0.790
SEMISIGN	gymno	-0.770
HOMOCOMM	hdwd	-0.770
ZALETERM	hdwd	-0.766
DREPQUAD	hdwd	-0.766
EUPIGRAE	hdwd	-0.757
CHORROSA	hdwd	-0.754
HOMOFURF	hdwd	-0.740
PANTPORT	gymno	-0.737
NEPYUMBR	gymno	-0.737
EVERFUNA	unknown	-0.696
TOLYDIST	gymno	-0.673
ABAGAPPO	hdwd	-0.656
ACHYEPIP	gymno	-0.628
DREPUNIC	hdwd	-0.614
PLATMONT	herb	-0.592
SYNAPALL	gymno	-0.550
NEMODARW	hdwd	-0.525

PERICOST	hdwd	-0.513
PEROOCCI	gymno	0.486
EULIDEST	hdwd	0.483
EUPISUBC	hdwd	0.474
SYNAJUBA	hdwd	-0.471
EULIXYLI	hdwd	-0.467
PROPALBI	hdwd	-0.449
ACROPERD	hdwd	-0.448
NADAGIBB	hdwd	-0.446
HOMOHANH	unknown	-0.444
ORTHPULC	hdwd	0.415
HESPLATI	hdwd	-0.409
MESOSUBC	hdwd	-0.405
EUDRRECT	hdwd	-0.395
PAPEINVA	hdwd	0.394
SPILVAGA	herb	-0.377
EUSTFASC	gymno	0.374
VENUPEAR	hdwd	0.372
EUROASTR	hdwd	0.372
ORTHMYS-	hdwd	-0.353
SABUEDWA	gymno	0.351
PERIGRAN	unknown	0.341
MONONSP1	unknown	0.330
CARIAEQU	gymno	0.316
PHYLAMER	hdwd	-0.311
GLENNIGR	gymno	0.302
NEOACALI	herb	-0.301
HYDRRENU	hdwd	0.299
ASEPETHN	hdwd	-0.296
DREPHULS	hdwd	0.295
PSEUMUSC	unknown	0.294
MESOOLIV	hdwd	0.293
PLEROPTE	hdwd	0.278
EUXONSP2	herb	0.273
EUPIMIST	hdwd	-0.270
EUXONOST	herb	0.267
EUXODIFF	herb	0.263
EUXOIDAH	herb	0.261
IRIOEMAS	hdwd	-0.257
MALADISS	hdwd	-0.254
EUXOBICO	herb	0.251
PROPNIVE	hdwd	0.243
SYNACERV	hdwd	-0.236

ASEPBINO	hdwd	-0.235
SICYCROC	hdwd	-0.222
ITAMQUAD	hdwd	-0.222
SPHIPERE	hdwd	0.211
EUXONSP1	herb	0.210
PYLAFUSC	unknown	0.199
SEMIADON	gymno	0.196
EUPICOLU	hdwd	0.190
SAUCFUMO	unknown	-0.185
ENYPPACK	gymno	0.181
HYDRMANZ	hdwd	-0.178
PEROMIZO	hdwd	-0.174
PLATCONT	hdwd	0.169
SEMIBURN	gymno	0.169
MECYMUST	unknown	0.163
DREPFOEM	hdwd	-0.158
MESORUBR	hdwd	0.116
ABAGTRIG	hdwd	0.078
ITAMGUEN	hdwd	0.067
DREPCARN	hdwd	-0.055
ASTIVICT	hdwd	-0.052
EUPIHARV	hdwd	0.045
SPILVEST	hdwd	-0.039
ACHYPRAE	gymno	-0.032
LACIPATA	unknown	0.025
HEMEFINI	unknown	-0.025
HESPSULP	hdwd	0.015
ANCYCOLU	unknown	0.012
PERIANGU	hdwd	0.003
DREPMONI	hdwd	0.001
SERIJUTU	hdwd	-0.001

Table V-8. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 3 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
HESPSULP	hdwd	-0.861
DREPHULS	hdwd	-0.823
MECYMUST	unknown	-0.786
PEROMIZO	hdwd	-0.784
EUPIMIST	hdwd	-0.751
SEMIADON	gymno	-0.686
MESORUBR	hdwd	-0.665
EUXONSP1	herb	-0.641
EUXODIFF	herb	-0.624
MONONSP1	unknown	-0.600
EULIDEST	hdwd	0.598
PAPEINVA	hdwd	0.586
PSEUMUSC	unknown	-0.582
PROPNIVE	hdwd	-0.582
PEROOCCI	gymno	0.572
EUROASTR	hdwd	0.546
ASEPETHN	hdwd	-0.546
HYDRRENU	hdwd	0.545
PERIANGU	hdwd	-0.522
MESOOLIV	hdwd	-0.520
EUXONSP2	herb	-0.510
ABAGAPPO	hdwd	-0.510
ABAGTRIG	hdwd	-0.505
ITAMGUEN	hdwd	-0.502
SPHIPERE	hdwd	-0.496
HOMOHANH	unknown	-0.488
HOMOFURF	hdwd	-0.485
PERIGRAN	unknown	0.468
EUPIHARV	hdwd	0.462
EUXONOST	herb	-0.457
SEMIBURN	gymno	-0.435
EUPISUBC	hdwd	0.429
PLEROPTE	hdwd	0.427
EUXOIDAH	herb	-0.424
ORTHMYS-	hdwd	-0.415
EUSTFASC	gymno	0.413
PYLAFUSC	unknown	0.396
EUXOBICO	herb	-0.373

PLATMONT	herb	-0.361
PHYLAMER	hdwd	0.351
CARIAEQU	gymno	-0.347
EULIXYLI	hdwd	0.340
SAUCFUMO	unknown	-0.340
EUDRRECT	hdwd	-0.331
GLENNIGR	gymno	-0.319
NEPYUMBR	gymno	0.268
SICYCROC	hdwd	0.261
MALADISS	hdwd	-0.256
ENYPPACK	gymno	0.254
NEOACALI	herb	-0.249
SYNACERV	hdwd	0.238
PERICOST	hdwd	-0.232
PROPALBI	hdwd	-0.215
MESOSUBC	hdwd	-0.212
ORTHPULC	hdwd	-0.211
ACHYEPIP	gymno	0.210
GABRDYAR	gymno	0.205
SPILVAGA	herb	0.203
SYNAPALL	gymno	-0.200
AMPHPYRA	hdwd	-0.198
CHOROCCI	gymno	0.184
CLEMALBA	hdwd	0.182
ORTHTRAN	hdwd	0.173
SCOPJUNC	herb	-0.173
DREPFOEM	hdwd	0.168
DREPQUAD	hdwd	0.168
EUPICOLU	hdwd	-0.168
CHORROSA	hdwd	-0.167
PLATCONT	hdwd	0.166
LOPHMACU	hdwd	0.161
SEMISIGN	gymno	0.149
NEMARESI	herb	0.144
PANTPORT	gymno	0.143
HYDRIRAT	herb	0.139
LACICUNE	hdwd	0.139
VENUPEAR	hdwd	-0.132
ZALEMINE	hdwd	0.129
SYNAJUBA	hdwd	-0.121
EUSTSEMI	herb	0.108
ZALETERM	hdwd	-0.108
TOLYDIST	gymno	0.106

CORYMEAD	hdwd	0.102
IRIOEMAS	hdwd	-0.102
SPILVEST	hdwd	0.100
CATOAHOL	hdwd	-0.098
EVERFUNA	unknown	0.093
CATOOPHE	hdwd	-0.093
HOMOCOMM	hdwd	-0.091
NADAGIBB	hdwd	0.089
NEMODARW	hdwd	0.089
ANCYCOLU	unknown	0.080
IDIAAMER	unknown	0.075
PERICURV	hdwd	0.064
ACROMARM	hdwd	0.064
HYDRMANZ	hdwd	0.063
ACHYPRAE	gymno	0.058
LACIPATA	unknown	0.056
HESPLATI	hdwd	-0.046
ARCHARGY	hdwd	0.045
DREPMONI	hdwd	0.044
EUPIGRAE	hdwd	0.044
DREPUNIC	hdwd	-0.043
ASTIVICT	hdwd	0.035
AMORCUNE	hdwd	0.031
ASEPBINO	hdwd	-0.031
ACROPERD	hdwd	0.030
SABUEDWA	gymno	-0.017
DREPCARN	hdwd	0.015
ITAMQUAD	hdwd	0.012
CYCLDATA	hdwd	-0.011
HEMEFINI	unknown	0.007
SERIJUTU	hdwd	-0.001

Table V-9. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 4 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
MALADISS	hdwd	-0.892
MESOSUBC	hdwd	-0.857
NEOACALI	herb	-0.850
PROPALBI	hdwd	-0.830
SYNAJUBA	hdwd	-0.818
EUDRRECT	hdwd	-0.787
PERICOST	hdwd	-0.779
SYNAPALL	gymno	-0.775
HESPLATI	hdwd	-0.699
HOMOHANH	unknown	-0.675
PLATMONT	herb	-0.655
ASEPETHN	hdwd	-0.654
PERIANGU	hdwd	0.558
ORTHMYS-	hdwd	0.515
HYDRIRAT	herb	0.480
ABAGTRIG	hdwd	0.447
ZALETERM	hdwd	0.443
PEROMIZO	hdwd	0.433
SEMIADON	gymno	0.417
MESORUBR	hdwd	0.416
GLENNIGR	gymno	0.413
CARIAEQU	gymno	0.408
EULIXYLI	hdwd	-0.405
ENYPPACK	gymno	0.396
SABUEDWA	gymno	0.395
ACROPERD	hdwd	0.394
ITAMGUEN	hdwd	0.387
VENUPEAR	hdwd	0.365
SAUCFUMO	unknown	0.355
SEMIBURN	gymno	0.351
NADAGIBB	hdwd	-0.348
IRIOEMAS	hdwd	0.340
AMPHPYRA	hdwd	-0.335
CHORROSA	hdwd	-0.334
PANTPORT	gymno	0.333
PERICURV	hdwd	-0.330
CYCLDATA	hdwd	0.329
NEPYUMBR	gymno	0.324

ACHYPRAE	gymno	0.323
ORTHPULC	hdwd	0.320
DREPFOEM	hdwd	0.313
ACHYEPIP	gymno	0.312
MESOOLIV	hdwd	0.307
HYDRMANZ	hdwd	0.301
TOLYDIST	gymno	-0.300
DREPHULS	hdwd	0.296
SCOPJUNC	herb	-0.294
LOPHMACU	hdwd	0.290
IDIAAMER	unknown	0.284
HESPSULP	hdwd	0.282
EVERFUNA	unknown	0.279
CLEMALBA	hdwd	0.267
PHYLAMER	hdwd	0.263
EUPIGRAE	hdwd	0.255
DREPUNIC	hdwd	-0.249
SYNACERV	hdwd	0.240
CHOROCCI	gymno	0.240
DREPQUAD	hdwd	0.231
PEROOCCI	gymno	0.227
ITAMQUAD	hdwd	-0.222
HOMOFURF	hdwd	-0.222
MECYMUST	unknown	0.219
PLEROPTE	hdwd	0.210
SPHIPERE	hdwd	0.207
EUPIMIST	hdwd	0.206
ZALEMINE	hdwd	0.198
NEMODARW	hdwd	0.182
EUPICOLU	hdwd	0.173
SEMISIGN	gymno	0.171
EUXONSP1	herb	0.171
CATOAHOL	hdwd	0.160
MONONSP1	unknown	0.160
ACROMARM	hdwd	0.153
ASEPBINO	hdwd	-0.138
ORTHTRAN	hdwd	0.135
CORYMEAD	hdwd	0.134
PSEUMUSC	unknown	0.131
AMORCUNE	hdwd	0.130
DREPCARN	hdwd	0.127
EUXODIFF	herb	0.120
PLATCONT	hdwd	0.116

EUPIHARV	hdwd	0.113
HOMOCOMM	hdwd	-0.107
EUXONSP2	herb	0.106
PROPNIVE	hdwd	0.099
HEMEFINI	unknown	0.096
EUXONOST	herb	0.089
EUXOIDAH	herb	0.078
GABRDYAR	gymno	0.075
NEMARESI	herb	0.068
EUXOBICO	herb	0.063
HYDRRENU	hdwd	-0.061
ARCHARGY	hdwd	0.052
ANCYCOLU	unknown	0.047
PYLAFUSC	unknown	0.045
SPILVEST	hdwd	0.042
ABAGAPPO	hdwd	-0.039
ASTIVICT	hdwd	-0.037
EULIDEST	hdwd	-0.033
EUSTFASC	gymno	-0.028
PERIGRAN	unknown	0.026
DREPMONI	hdwd	0.024
SICYCROC	hdwd	0.021
CATOOPHE	hdwd	-0.016
PAPEINVA	hdwd	-0.015
EUPISUBC	hdwd	0.011
EUROASTR	hdwd	-0.010
LACICUNE	hdwd	0.009
LACIPATA	unknown	0.008
EUSTSEMI	herb	0.005
SPILVAGA	herb	0.004
SERIJUTU	hdwd	0.003

Table V-10. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 5 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
SABUEDWA	gymno	-0.685
EUPICOLU	hdwd	-0.683
SPILVAGA	herb	0.596
SAUCFUMO	unknown	-0.555
ITAMGUEN	hdwd	-0.515
PLEROPTE	hdwd	-0.504
ENYPPACK	gymno	-0.496
PEROOCCI	gymno	-0.484
NADAGIBB	hdwd	0.470
EUPIGRAE	hdwd	-0.456
ABAGAPPO	hdwd	-0.449
DREPQUAD	hdwd	0.447
PSEUMUSC	unknown	0.438
EUXONSP2	herb	0.429
EUXONOST	herb	0.420
EUXODIFF	herb	0.416
EUXOIDAH	herb	0.413
ORTHPULC	hdwd	-0.405
PHYLAMER	hdwd	0.398
EUXOBICO	herb	0.398
MONONSP1	unknown	0.391
GABRDYAR	gymno	0.389
SICYCROC	hdwd	-0.387
ACROPERD	hdwd	-0.385
PERIANGU	hdwd	-0.382
SYNACERV	hdwd	-0.378
ASEPETHN	hdwd	-0.377
PROPNIVE	hdwd	0.375
EUROASTR	hdwd	-0.375
PYLAFUSC	unknown	-0.363
PANTPORT	gymno	0.355
MESORUBR	hdwd	-0.344
LACICUNE	hdwd	0.336
NEMARESI	herb	0.329
EUXONSP1	herb	0.325
ABAGTRIG	hdwd	-0.319
VENUPEAR	hdwd	-0.314
GLENNIGR	gymno	-0.313

PAPEINVA	hdwd	-0.307
CHOROCCI	gymno	0.294
NEOACALI	herb	-0.289
HOMOFURF	hdwd	-0.287
ORTHTRAN	hdwd	-0.281
EULIXYLI	hdwd	-0.281
PLATMONT	herb	-0.279
HYDRIRAT	herb	-0.272
EULIDEST	hdwd	-0.271
CLEMALBA	hdwd	0.269
NEPYUMBR	gymno	0.264
SPHIPERE	hdwd	0.260
HYDRRENU	hdwd	0.258
PEROMIZO	hdwd	-0.256
EUPISUBC	hdwd	-0.246
AMPHPYRA	hdwd	-0.241
EUDRRECT	hdwd	-0.237
TOLYDIST	gymno	0.233
LOPHMACU	hdwd	0.226
MALADISS	hdwd	-0.226
PERICOST	hdwd	-0.218
PERICURV	hdwd	0.217
MESOOLIV	hdwd	0.216
PERIGRAN	unknown	-0.215
CATOOPHE	hdwd	-0.214
CYCLDATA	hdwd	-0.209
ACHYPRAE	gymno	-0.207
NEMODARW	hdwd	-0.206
PROPALBI	hdwd	-0.199
SEMIADON	gymno	-0.193
SEMISIGN	gymno	-0.191
SYNAPALL	gymno	-0.189
SYNAJUBA	hdwd	-0.189
CATOAHOL	hdwd	-0.176
EUSTFASC	gymno	-0.173
PLATCONT	hdwd	-0.172
HOMOCOMM	hdwd	-0.160
ZALEMINE	hdwd	0.155
IRIOEMAS	hdwd	-0.144
MESOSUBC	hdwd	-0.129
CORYMEAD	hdwd	0.126
DREPFOEM	hdwd	-0.126
CARIAEQU	gymno	-0.125

ACHYEPIP	gymno	-0.123
ZALETERM	hdwd	-0.121
HEMEFINI	unknown	-0.120
SCOPJUNC	herb	-0.119
ASEPBINO	hdwd	-0.118
EVERFUNA	unknown	0.116
ITAMQUAD	hdwd	-0.108
HOMOHANH	unknown	-0.096
DREPUNIC	hdwd	-0.090
MECYMUST	unknown	0.081
DREPHULS	hdwd	0.079
HESPLATI	hdwd	0.076
EUPIHARV	hdwd	0.074
ORTHMYS-	hdwd	-0.071
IDIAAMER	unknown	0.064
HYDRMANZ	hdwd	-0.064
DREPCARN	hdwd	-0.060
ASTIVICT	hdwd	-0.046
ANCYCOLU	unknown	-0.039
ARCHARGY	hdwd	-0.037
SPILVEST	hdwd	0.032
EUSTSEMI	herb	0.021
HESPSULP	hdwd	-0.020
SEMIBURN	gymno	-0.019
DREPMONI	hdwd	-0.011
AMORCUNE	hdwd	-0.009
CHORROSA	hdwd	0.008
EUPIMIST	hdwd	-0.004
ACROMARM	hdwd	-0.004
LACIPATA	unknown	0.000
SERIJUTU	hdwd	0.000

Table V-11. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 6 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
EUPISUBC	hdwd	-0.600
ORTHMYS-	hdwd	-0.594
ACHYPRAE	gymno	0.593
PHYLAMER	hdwd	0.592
SPHIPERE	hdwd	-0.584
EUSTSEMI	herb	0.521
EUROASTR	hdwd	-0.518
DREPFOEM	hdwd	0.516
HYDRMANZ	hdwd	0.505
EULIXYLI	hdwd	-0.502
SICYCROC	hdwd	0.501
PYLAFUSC	unknown	-0.485
SEMIBURN	gymno	-0.428
SYNACERV	hdwd	0.427
MONONSP1	unknown	-0.424
TOLYDIST	gymno	0.408
EULIDEST	hdwd	-0.408
EUSTFASC	gymno	-0.407
EUXONSP1	herb	-0.406
HESPLATI	hdwd	0.404
PERIGRAN	unknown	-0.403
MESOOLIV	hdwd	-0.392
SAUCFUMO	unknown	0.390
ACHYEPIP	gymno	0.385
IDIAAMER	unknown	-0.352
PERIANGU	hdwd	0.346
ACROMARM	hdwd	-0.333
PAPEINVA	hdwd	-0.333
ARCHARGY	hdwd	-0.330
DREPUNIC	hdwd	-0.327
VENUPEAR	hdwd	0.324
MECYMUST	unknown	-0.324
SEMISIGN	gymno	0.311
AMORCUNE	hdwd	-0.311
GLENNIGR	gymno	0.306
ORTHPULC	hdwd	-0.305
ITAMGUEN	hdwd	0.303
ACROPERD	hdwd	-0.286

EUXODIFF	herb	-0.285
PEROOCCI	gymno	-0.279
DREPHULS	hdwd	-0.275
ZALEMINE	hdwd	-0.268
CORYMEAD	hdwd	-0.267
NEPYUMBR	gymno	0.264
LOPHMACU	hdwd	-0.260
ENYPPACK	gymno	0.259
CYCLDATA	hdwd	-0.255
CATOAHOL	hdwd	-0.254
PSEUMUSC	unknown	-0.250
PANTPORT	gymno	0.227
EVERFUNA	unknown	-0.223
ABAGTRIG	hdwd	0.222
EUPIMIST	hdwd	-0.215
EUPIHARV	hdwd	-0.209
NADAGIBB	hdwd	0.206
SABUEDWA	gymno	0.206
CARIAEQU	gymno	0.200
NEMODARW	hdwd	-0.199
HOMOHANH	unknown	-0.198
CATOOPHE	hdwd	-0.196
ASTIVICT	hdwd	0.194
SPILVAGA	herb	0.190
PLEROPTE	hdwd	-0.189
ABAGAPPO	hdwd	0.186
AMPHPYRA	hdwd	-0.183
MESORUBR	hdwd	0.178
CHORROSA	hdwd	0.173
PEROMIZO	hdwd	0.173
CLEMALBA	hdwd	-0.172
EUPIGRAE	hdwd	0.169
EUXONSP2	herb	-0.162
ZALETERM	hdwd	-0.157
CHOROCCI	gymno	-0.148
PROPNIVE	hdwd	-0.129
DREPQUAD	hdwd	-0.127
HEMEFINI	unknown	0.118
NEMARESI	herb	-0.116
EUPICOLU	hdwd	-0.115
EUXONOST	herb	-0.113
DREPCARN	hdwd	0.107
ASEPETHN	hdwd	0.104

LACICUNE	hdwd	-0.099
HYDRIRAT	herb	-0.095
SYNAJUBA	hdwd	0.091
PERICOST	hdwd	-0.091
NEOACALI	herb	0.088
EUDRRECT	hdwd	0.086
EUXOIDAH	herb	-0.083
PERICURV	hdwd	-0.077
ANCYCOLU	unknown	0.073
MALADISS	hdwd	0.064
HOMOCOMM	hdwd	-0.063
PLATMONT	herb	-0.059
IRIOEMAS	hdwd	-0.058
MESOSUBC	hdwd	0.056
ITAMQUAD	hdwd	0.048
HOMOFURF	hdwd	0.047
PLATCONT	hdwd	0.044
EUXOBICO	herb	-0.041
HYDRRENU	hdwd	-0.041
HESPSULP	hdwd	0.037
ORTHTRAN	hdwd	-0.036
GABRDYAR	gymno	-0.026
SPILVEST	hdwd	0.025
SEMIADON	gymno	-0.025
LACIPATA	unknown	-0.021
DREPMONI	hdwd	-0.016
SYNAPALL	gymno	-0.013
SCOPJUNC	herb	-0.011
PROPALBI	hdwd	-0.008
ASEPBINO	hdwd	0.004
SERIJUTU	hdwd	-0.002

Table V-12. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 7 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
IRIOEMAS	hdwd	0.596
SEMIBURN	gymno	-0.579
ACHYPRAE	gymno	-0.528
CARIAEQU	gymno	0.465
ACHYEPIP	gymno	-0.453
EUPIMIST	hdwd	-0.438
EUXONSP1	herb	-0.429
SEMIADON	gymno	-0.414
SPHIPERE	hdwd	-0.409
SYNACERV	hdwd	-0.388
VENUPEAR	hdwd	0.362
MESORUBR	hdwd	0.356
ACROPERD	hdwd	0.355
SEMISIGN	gymno	-0.329
PERIANGU	hdwd	0.316
DREPFOEM	hdwd	-0.311
TOLYDIST	gymno	-0.309
MONONSP1	unknown	-0.300
EUXOBICO	herb	0.287
MECYMUST	unknown	-0.282
PLATCONT	hdwd	0.279
EVERFUNA	unknown	0.279
NEPYUMBR	gymno	-0.276
ITAMGUEN	hdwd	0.275
PANTPORT	gymno	-0.244
SICYCROC	hdwd	-0.233
CATOAHOL	hdwd	0.229
PHYLAMER	hdwd	-0.228
EUXOIDAH	herb	0.225
MESOOLIV	hdwd	0.216
EUPIGRAE	hdwd	-0.209
PEROOCCI	gymno	-0.195
SABUEDWA	gymno	0.194
HOMOHANH	unknown	-0.189
DREPHULS	hdwd	-0.184
EUPISUBC	hdwd	-0.182
EUXONOST	herb	0.180
ORTHMYS-	hdwd	-0.180

EUPIHARV	hdwd	0.168
ABAGTRIG	hdwd	-0.163
EUPICOLU	hdwd	0.161
HESPLATI	hdwd	-0.160
CYCLDATA	hdwd	0.158
EUSTSEMI	herb	-0.141
PROPNIVE	hdwd	-0.140
EUDRRECT	hdwd	-0.138
PYLAFUSC	unknown	-0.137
NADAGIBB	hdwd	-0.135
EUXODIFF	herb	-0.132
ASEPBINO	hdwd	0.126
ACROMARM	hdwd	0.126
AMORCUNE	hdwd	0.125
SYNAJUBA	hdwd	-0.124
NEOACALI	herb	-0.118
ARCHARGY	hdwd	0.117
EUROASTR	hdwd	-0.117
IDIAAMER	unknown	0.116
MALADISS	hdwd	-0.112
MESOSUBC	hdwd	-0.112
ENYPPACK	gymno	0.110
CATOOPHE	hdwd	0.105
AMPHPYRA	hdwd	0.102
ZALEMINE	hdwd	0.102
EUXONSP2	herb	0.099
EULIXYLI	hdwd	-0.098
ITAMQUAD	hdwd	-0.097
SPILVAGA	herb	-0.096
CORYMEAD	hdwd	0.095
ASTIVICT	hdwd	-0.094
SYNAPALL	gymno	-0.094
HYDRMANZ	hdwd	0.092
PERICOST	hdwd	-0.091
HOMOFURF	hdwd	0.086
PERIGRAN	unknown	0.086
PROPALBI	hdwd	-0.082
EUSTFASC	gymno	-0.078
SAUCFUMO	unknown	0.076
HEMEFINI	unknown	-0.073
HYDRRENU	hdwd	0.072
ANCYCOLU	unknown	-0.072
SCOPJUNC	herb	0.070

PAPEINVA	hdwd	-0.070
ZALETERM	hdwd	0.069
LOPHMACU	hdwd	0.068
ASEPETHN	hdwd	0.058
GLENNIGR	gymno	-0.053
CLEMALBA	hdwd	0.052
PERICURV	hdwd	-0.050
EULIDEST	hdwd	0.044
PLATMONT	herb	0.042
HYDRIRAT	herb	-0.041
PSEUMUSC	unknown	-0.039
CHOROCCI	gymno	0.038
NEMARESI	herb	0.037
ORTHTRAN	hdwd	0.036
ORTHPULC	hdwd	-0.031
DREPMONI	hdwd	0.030
HESPSULP	hdwd	-0.029
NEMODARW	hdwd	-0.029
DREPUNIC	hdwd	-0.029
ABAGAPPO	hdwd	0.021
CHORROSA	hdwd	-0.021
LACIPATA	unknown	0.016
LACICUNE	hdwd	0.014
PLEROPTE	hdwd	-0.011
DREPQUAD	hdwd	0.010
GABRDYAR	gymno	-0.010
SPILVEST	hdwd	-0.005
HOMOCOMM	hdwd	0.003
PEROMIZO	hdwd	0.002
DREPCARN	hdwd	0.001
SERIJUTU	hdwd	0.000

Table V-13. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 8 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
SPILVAGA	herb	-0.601
HYDRMANZ	hdwd	0.584
NADAGIBB	hdwd	-0.573
EUXOBICO	herb	0.518
EUXOIDAH	herb	0.509
PROPNIVE	hdwd	0.501
SICYCROC	hdwd	0.501
EUXONOST	herb	0.500
EUPICOLU	hdwd	-0.495
EUXONSP2	herb	0.479
SAUCFUMO	unknown	-0.466
CHORROSA	hdwd	-0.456
PSEUMUSC	unknown	0.435
ACHYPRAE	gymno	0.394
ITAMGUEN	hdwd	-0.391
CARIAEQU	gymno	0.384
EUXODIFF	herb	0.384
EVERFUNA	unknown	0.369
HYDRRENU	hdwd	-0.359
EUPIHARV	hdwd	-0.350
MESOOLIV	hdwd	0.348
ORTHTRAN	hdwd	0.326
PERICURV	hdwd	-0.318
ASTIVICT	hdwd	0.308
DREPQUAD	hdwd	-0.305
LACICUNE	hdwd	-0.296
SCOPJUNC	herb	-0.292
NEMARESI	herb	-0.292
ACHYEPIP	gymno	0.287
GABRDYAR	gymno	-0.285
SYNACERV	hdwd	0.283
MONONSP1	unknown	0.272
MESORUBR	hdwd	-0.244
ZALETERM	hdwd	-0.236
DREPUNIC	hdwd	-0.230
VENUPEAR	hdwd	0.229
ENYPPACK	gymno	0.228
SEMISIGN	gymno	0.228

HESPLATI	hdwd	-0.190
TOLYDIST	gymno	-0.189
EULIXYLI	hdwd	-0.188
ACROPERD	hdwd	-0.179
CHOROCCI	gymno	-0.179
EUXONSP1	herb	0.170
PYLAFUSC	unknown	-0.166
SPHIPERE	hdwd	0.164
EUPIGRAE	hdwd	0.154
ORTHPULC	hdwd	-0.153
MECYMUST	unknown	0.152
EUROASTR	hdwd	-0.148
NEPYUMBR	gymno	-0.148
CLEMALBA	hdwd	-0.145
SEMIBURN	gymno	0.142
DREPFOEM	hdwd	0.129
AMORCUNE	hdwd	0.118
HESPSULP	hdwd	-0.114
EUPISUBC	hdwd	-0.114
EUPIMIST	hdwd	0.112
ARCHARGY	hdwd	0.110
ACROMARM	hdwd	0.108
DREPCARN	hdwd	-0.104
MESOSUBC	hdwd	-0.104
PERIGRAN	unknown	-0.098
IDIAAMER	unknown	0.097
HOMOCOMM	hdwd	0.094
ASEPETHN	hdwd	-0.090
SEMIADON	gymno	0.088
EUSTSEMI	herb	0.084
PEROMIZO	hdwd	-0.083
ABAGTRIG	hdwd	-0.080
HOMOHANH	unknown	0.079
SYNAJUBA	hdwd	0.075
ITAMQUAD	hdwd	0.074
PANTPORT	gymno	-0.074
NEMODARW	hdwd	0.071
ABAGAPPO	hdwd	0.065
PLEROPTE	hdwd	0.064
PHYLAMER	hdwd	-0.063
DREPHULS	hdwd	-0.060
PLATCONT	hdwd	0.056
PEROOCCI	gymno	-0.056

ANCYCOLU	unknown	0.050
ORTHMYS-	hdwd	0.048
ZALEMINE	hdwd	-0.045
CATOOPHE	hdwd	0.044
IRIOEMAS	hdwd	-0.044
EUDRRECT	hdwd	-0.043
EUSTFASC	gymno	-0.038
HYDRIRAT	herb	0.037
HEMEFINI	unknown	0.035
CORYMEAD	hdwd	-0.033
LOPHMACU	hdwd	-0.029
PLATMONT	herb	-0.024
GLENNIGR	gymno	0.023
MALADISS	hdwd	-0.022
PROPALBI	hdwd	-0.021
NEOACALI	herb	-0.020
PERIANGU	hdwd	-0.019
ASEPBINO	hdwd	-0.018
HOMOFURF	hdwd	-0.018
PERICOST	hdwd	0.017
CYCLDATA	hdwd	-0.016
DREPMONI	hdwd	0.013
AMPHPYRA	hdwd	-0.013
CATOAHOL	hdwd	-0.012
LACIPATA	unknown	-0.007
SPILVEST	hdwd	-0.007
SYNAPALL	gymno	0.006
EULIDEST	hdwd	-0.004
SABUEDWA	gymno	0.001
PAPEINVA	hdwd	0.001
SERIJUTU	hdwd	0.000

Table V-14. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 9 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
PLEROPTE	hdwd	0.575
EUPIHARV	hdwd	0.540
ORTHPULC	hdwd	0.536
PYLAFUSC	unknown	0.523
IRIOEMAS	hdwd	-0.509
EUXOBICO	herb	0.479
EUXOIDAH	herb	0.457
PERIGRAN	unknown	-0.455
VENUPEAR	hdwd	0.444
EUXONOST	herb	0.438
ENYPPACK	gymno	-0.404
EUXONSP2	herb	0.402
HYDRMANZ	hdwd	0.376
SABUEDWA	gymno	0.371
PLATCONT	hdwd	-0.362
PROPNIVE	hdwd	0.348
EUPICOLU	hdwd	0.329
EUXODIFF	herb	0.272
SEMIBURN	gymno	0.272
PSEUMUSC	unknown	0.271
SICYCROC	hdwd	-0.264
EUSTFASC	gymno	-0.258
TOLYDIST	gymno	0.221
EUROASTR	hdwd	0.213
EULIXYLI	hdwd	0.204
PHYLAMER	hdwd	0.199
PANTPORT	gymno	0.189
HESPLATI	hdwd	0.184
NADAGIBB	hdwd	0.178
MECYMUST	unknown	0.175
SPILVAGA	herb	0.171
PAPEINVA	hdwd	-0.167
ASEPBINO	hdwd	-0.166
PERICURV	hdwd	0.134
DREPFOEM	hdwd	-0.132
HOMOFURF	hdwd	0.129
EULIDEST	hdwd	-0.128
SYNACERV	hdwd	-0.120

ASTIVICT	hdwd	0.118
MESORUBR	hdwd	0.115
HYDRRENU	hdwd	-0.114
DREPUNIC	hdwd	0.111
ABAGAPPO	hdwd	0.103
CHORROSA	hdwd	0.101
SAUCFUMO	unknown	0.100
LOPHMACU	hdwd	-0.099
SEMISIGN	gymno	-0.097
NEPYUMBR	gymno	0.096
EVERFUNA	unknown	-0.094
DREPHULS	hdwd	-0.093
ACHYPRAE	gymno	-0.091
HESPSULP	hdwd	0.087
CARIAEQU	gymno	0.085
CATOAHOL	hdwd	-0.078
LACICUNE	hdwd	0.077
HYDRIRAT	herb	0.072
MESOSUBC	hdwd	0.064
ZALETERM	hdwd	-0.064
ORTHMYS-	hdwd	0.061
PERIANGU	hdwd	0.056
NEMARESI	herb	0.055
EUPISUBC	hdwd	0.053
PERICOST	hdwd	0.051
MONONSP1	unknown	0.050
SPHIPERE	hdwd	0.050
ARCHARGY	hdwd	-0.050
ITAMQUAD	hdwd	-0.050
ACROMARM	hdwd	-0.049
NEMODARW	hdwd	0.047
PLATMONT	herb	0.047
IDIAAMER	unknown	-0.047
DREPQUAD	hdwd	0.045
MALADISS	hdwd	0.044
CATOOPHE	hdwd	-0.044
GLENNIGR	gymno	-0.042
HOMOHANH	unknown	0.041
ASEPETHN	hdwd	0.041
CHOROCCI	gymno	0.040
ORTHTRAN	hdwd	-0.039
AMORCUNE	hdwd	-0.039
ACHYEPIP	gymno	0.038

EUPIGRAE	hdwd	-0.038
HEMEFINI	unknown	-0.036
ABAGTRIG	hdwd	-0.035
PROPALBI	hdwd	0.034
SPILVEST	hdwd	-0.034
NEOACALI	herb	-0.034
SEMIADON	gymno	-0.033
PEROOCCI	gymno	0.028
CLEMALBA	hdwd	0.028
EUXONSP1	herb	0.027
SYNAJUBA	hdwd	0.026
MESOOLIV	hdwd	0.025
HOMOCOMM	hdwd	0.023
AMPHPYRA	hdwd	-0.022
LACIPATA	unknown	-0.020
SCOPJUNC	herb	-0.019
EUPIMIST	hdwd	0.016
ANCYCOLU	unknown	-0.014
ACROPERD	hdwd	-0.014
PEROMIZO	hdwd	0.013
ITAMGUEN	hdwd	-0.012
SYNAPALL	gymno	0.011
EUDRRECT	hdwd	0.011
CYCLDATA	hdwd	-0.010
ZALEMINE	hdwd	-0.008
GABRDYAR	gymno	0.007
CORYMEAD	hdwd	-0.007
DREPCARN	hdwd	-0.007
EUSTSEMI	herb	0.004
SERIJUTU	hdwd	0.001
DREPMONI	hdwd	0.000

Table V-15. Principal Coordinate Correlations. The correlations of the 112 species with the Principal Coordinate Axis 10 obtained from ORD analysis of Galice, OR transect Lepidoptera community data.

LEPCODE	FXGRP	CORRELATION
EUSTFASC	gymno	0.604
PLATCONT	hdwd	-0.542
PAPEINVA	hdwd	0.451
GLENNIGR	gymno	-0.350
PYLAFUSC	unknown	-0.312
EUPIHARV	hdwd	-0.311
EULIDEST	hdwd	0.288
SICYCROC	hdwd	-0.275
IRIOEMAS	hdwd	-0.244
ORTHPULC	hdwd	-0.230
SYNACERV	hdwd	-0.215
ACROPERD	hdwd	-0.211
PHYLAMER	hdwd	0.209
EUROASTR	hdwd	0.198
PERIGRAN	unknown	0.190
HYDRRENU	hdwd	-0.189
EUXOIDAH	herb	0.181
ZALETERM	hdwd	0.181
EUXOBICO	herb	0.180
EUXONOST	herb	0.179
EUXONSP2	herb	0.176
CARIAEQU	gymno	0.172
PROPNIVE	hdwd	0.169
EUPICOLU	hdwd	-0.156
EULIXYLI	hdwd	0.156
EUXODIFF	herb	0.153
DREPFOEM	hdwd	-0.150
ACHYPRAE	gymno	-0.144
VENUPEAR	hdwd	-0.143
ORTHMYS-	hdwd	-0.143
SYNAJUBA	hdwd	-0.132
MESORUBR	hdwd	0.131
PSEUMUSC	unknown	0.126
HESPSULP	hdwd	0.125
SPHIPERE	hdwd	-0.124
EUSTSEMI	herb	-0.123
ASTIVICT	hdwd	0.122
MESOOLIV	hdwd	0.116

HOMOFURF	hdwd	0.113
HYDRMANZ	hdwd	0.112
EUPIMIST	hdwd	0.111
EVERFUNA	unknown	-0.109
ASEPBINO	hdwd	-0.108
ABAGAPPO	hdwd	0.105
PEROOCCI	gymno	0.099
SEMIADON	gymno	-0.095
PANTPORT	gymno	0.094
HESPLATI	hdwd	-0.090
TOLYDIST	gymno	0.090
PLEROPTE	hdwd	-0.089
NEMODARW	hdwd	-0.088
CHORROSA	hdwd	0.087
EUXONSP1	herb	0.087
NADAGIBB	hdwd	0.086
SCOPJUNC	herb	0.083
SPILVAGA	herb	0.082
ITAMGUEN	hdwd	0.074
ENYPPACK	gymno	-0.068
SEMISIGN	gymno	-0.066
SABUEDWA	gymno	0.064
MECYMUST	unknown	0.063
NEPYUMBR	gymno	0.062
PERIANGU	hdwd	0.060
SEMIBURN	gymno	-0.056
ABAGTRIG	hdwd	0.056
MONONSP1	unknown	-0.053
DREPHULS	hdwd	-0.053
LACICUNE	hdwd	0.053
HOMOHANH	unknown	0.053
ITAMQUAD	hdwd	-0.051
PLATMONT	herb	0.051
NEOACALI	herb	0.048
HYDRIRAT	herb	-0.039
CYCLDATA	hdwd	-0.039
NEMARESI	herb	0.038
CHOROCCI	gymno	0.037
PERICURV	hdwd	0.036
MESOSUBC	hdwd	0.034
HOMOCOMM	hdwd	0.033
SAUCFUMO	unknown	0.032
CLEMALBA	hdwd	0.032

PEROMIZO	hdwd	0.032
SPILVEST	hdwd	-0.029
ASEPETHN	hdwd	0.028
GABRDYAR	gymno	-0.025
AMPHPYRA	hdwd	0.025
DREPQUAD	hdwd	0.023
MALADISS	hdwd	0.022
PROPALBI	hdwd	0.022
CORYMEAD	hdwd	0.019
ZALEMINE	hdwd	0.018
CATOOPHE	hdwd	0.017
DREPMONI	hdwd	-0.014
EUPISUBC	hdwd	-0.013
ANCYCOLU	unknown	-0.012
ACHYEPIP	gymno	0.012
LACIPATA	unknown	-0.011
EUPIGRAE	hdwd	0.011
PERICOST	hdwd	0.010
LOPHMACU	hdwd	-0.009
DREPCARN	hdwd	0.009
DREPUNIC	hdwd	0.008
ORTHTRAN	hdwd	0.008
EUDRRECT	hdwd	-0.005
IDIAAMER	unknown	0.005
HEMEFINI	unknown	-0.002
AMORCUNE	hdwd	0.002
CATOAHOL	hdwd	0.002
SYNAPALL	gymno	-0.001
ARCHARGY	hdwd	-0.001
SERIJUTU	hdwd	0.001
ACROMARM	hdwd	0.001

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 63.754 percent of the total variance, equivalent to saying the R^2 value of the analysis is 0.63754. 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-16. 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 ORD analysis of the Galice transect Lepidoptera community data.

	Principal Coordinates									
	1	2	3	4	5	6	7	8	9	10
% VARIANCE	30.595	17.174	15.985	9.282	7.515	6.229	4.392	3.461	2.393	1.852
CUM. %	30.595	47.769	63.754	73.036	80.551	86.779	91.171	94.632	97.024	98.876

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-1, V-2, and V-3), to explore the structure of the data, and to form hypotheses about group associations for the sampling sites.

Table V-17. Principal Coordinate Axes Scores. The scores (positions) of the Galice, Oregon transect sampling sites on the Principal Coordinate Axes obtained from ORD analysis of the Lepidoptera community data.

	Principal Coordinate Axes									
SITE	1	2	3	4	5	6	7	8	9	10
GASITE01	0.368	0.115	0.043	-0.547	0.557	-0.146	-0.252	0.214	-0.133	-0.029
GASITE02	0.352	0.289	0.211	-0.146	-0.241	0.125	0.005	-0.696	0.161	-0.162
GASITE03	0.231	0.399	0.362	0.511	0.075	-0.228	0.262	0.292	0.121	0.292
GASITE04	-0.020	-0.439	0.141	0.283	-0.044	-0.356	-0.548	0.028	0.146	-0.162
GASITE05	0.126	-0.585	0.021	0.005	0.025	-0.285	0.463	-0.252	-0.135	0.000
GASITE06	0.071	-0.304	0.025	-0.308	-0.226	0.362	0.254	0.285	0.078	0.423
GASITE07	-0.278	-0.035	0.070	0.211	0.475	0.444	0.268	0.029	0.036	-0.515
GASITE08	-0.408	0.186	-0.101	-0.334	-0.245	-0.280	0.105	0.194	0.569	-0.207
GASITE09	-0.473	0.261	-0.116	-0.075	-0.023	-0.315	0.087	-0.176	-0.602	0.144
GASITE10	-0.334	-0.027	0.056	0.092	0.173	0.339	-0.387	-0.254	0.135	0.511
GASITE11	0.080	0.045	0.152	0.041	-0.505	0.283	-0.218	0.323	-0.432	-0.303
GASITE12	0.284	0.095	-0.864	0.268	-0.021	0.057	-0.038	0.013	0.056	0.010

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-17.

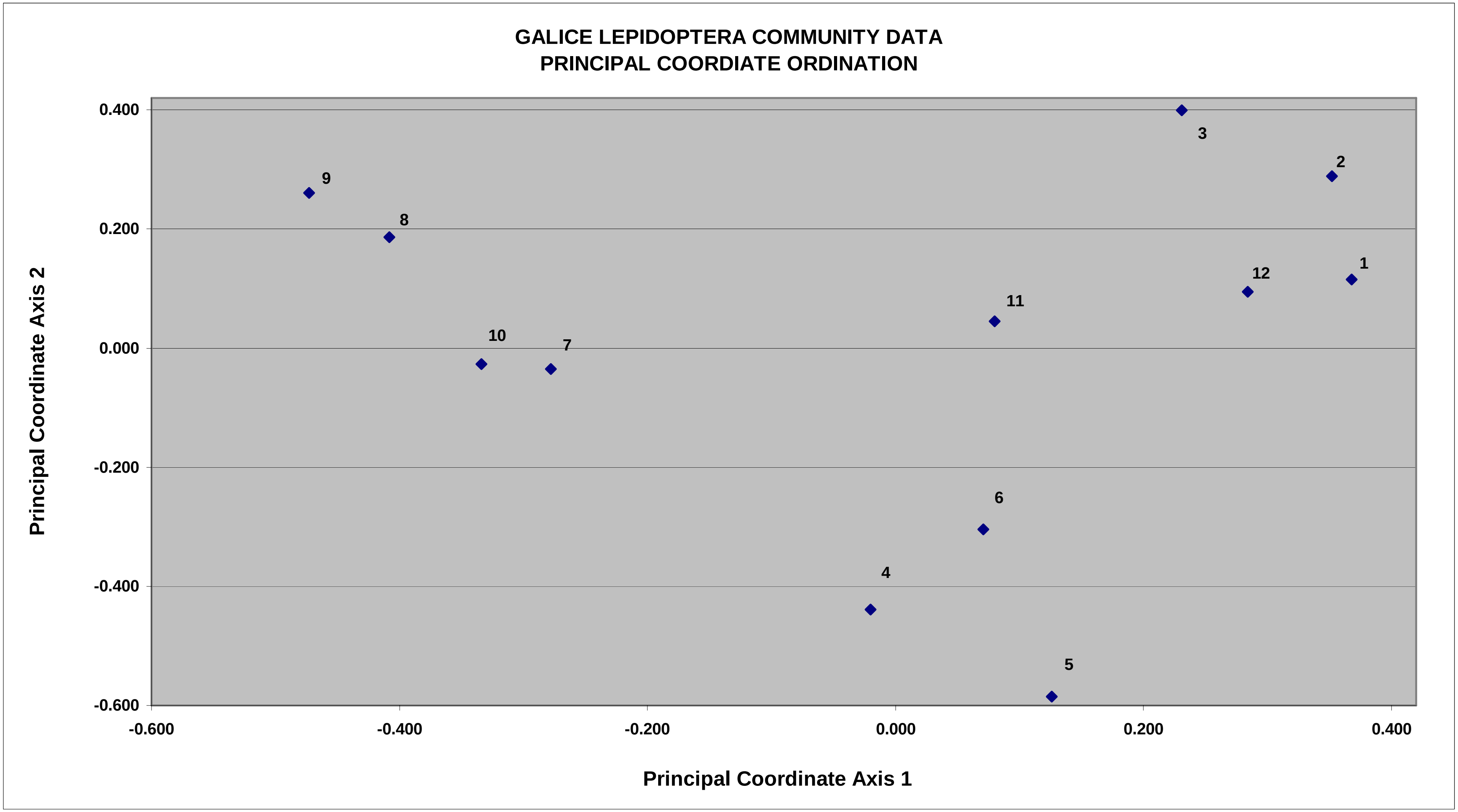

Figure V-1. Principal Coordinate Analysis Ordination, Axis 1 vs. Axis 2.

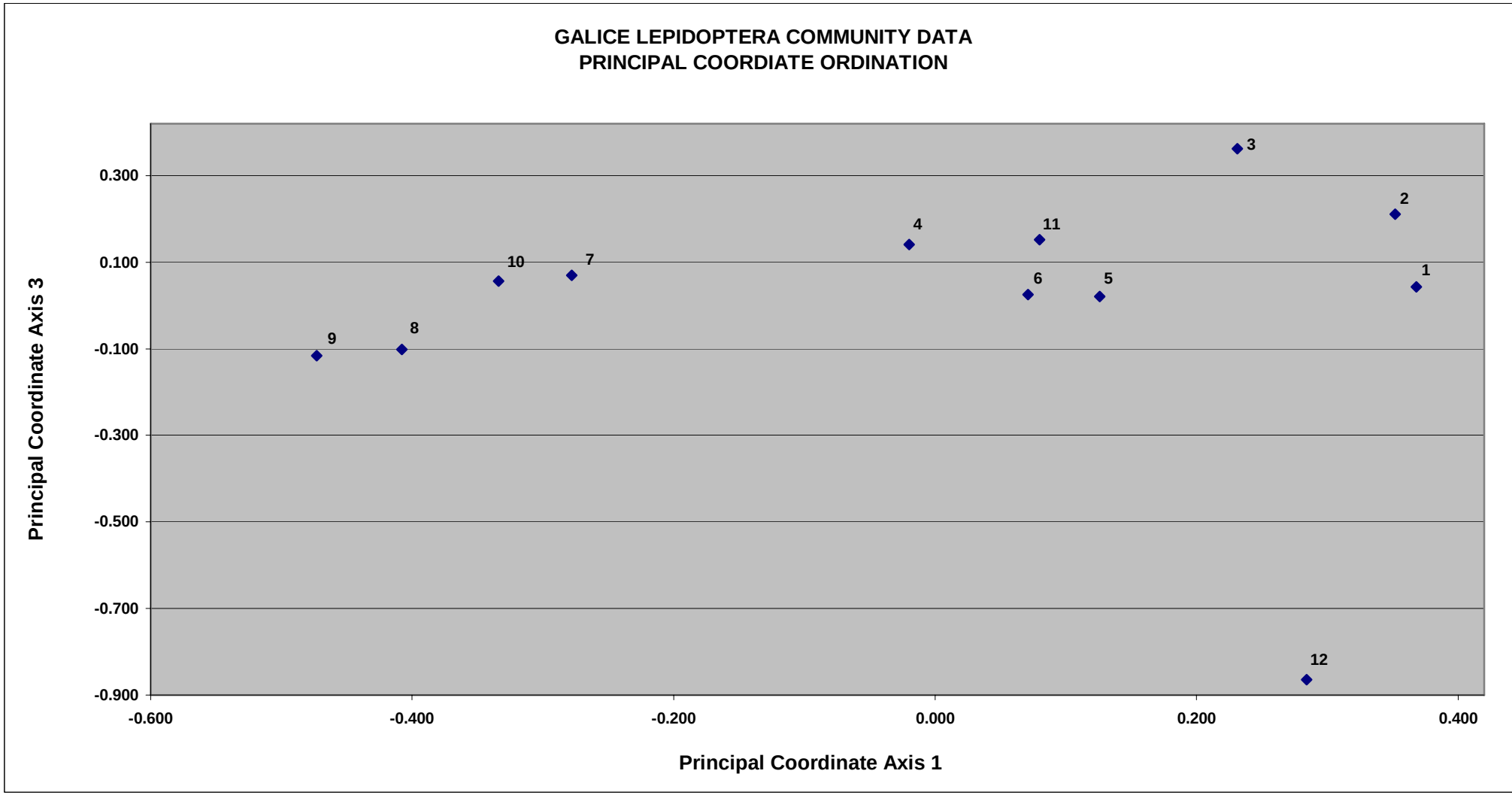

Figure V-2. Principal Coordinate Analysis Ordination, Axis 1 vs. Axis 3.

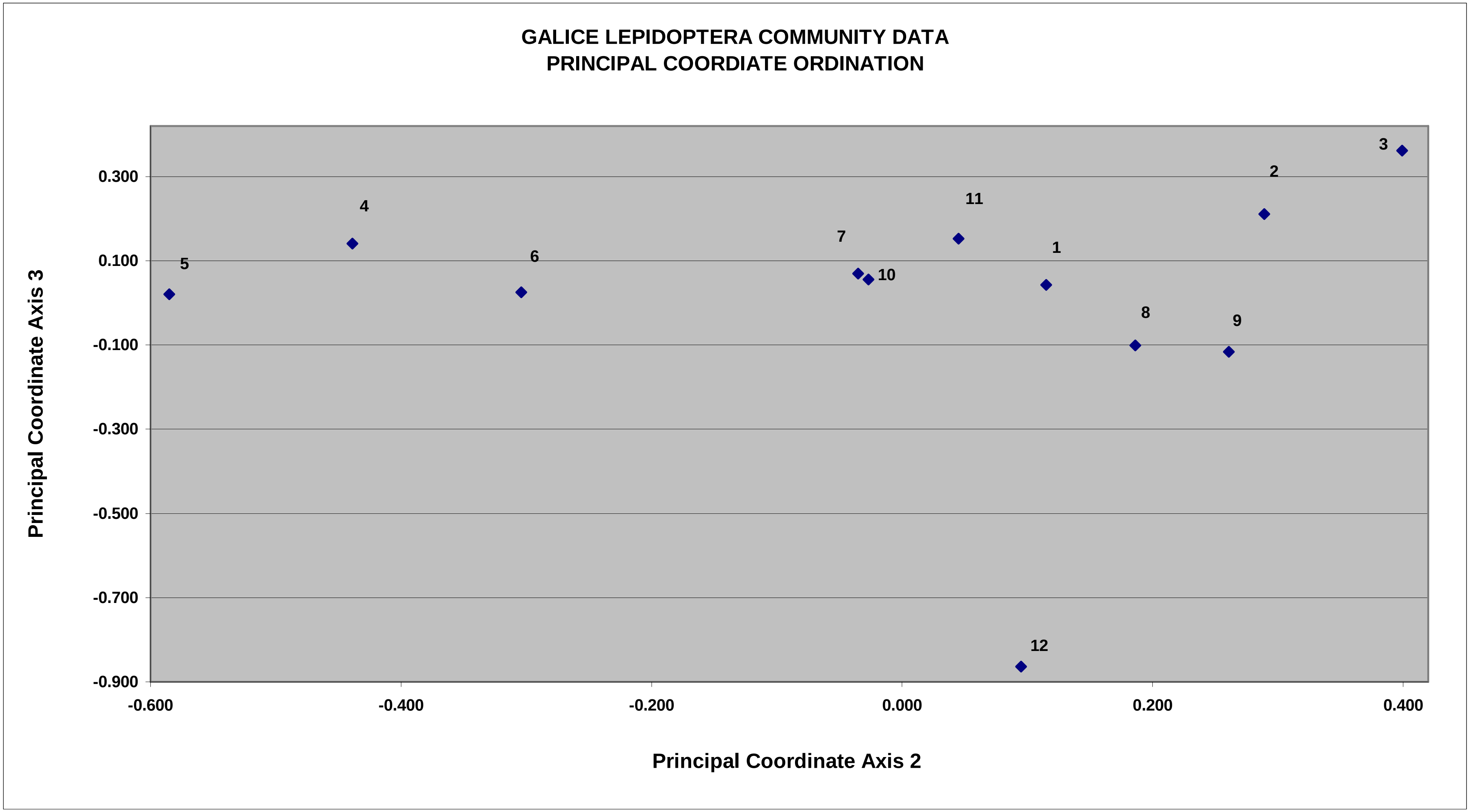

Figure V-3. Principal Coordinate Analysis Ordination, Axis 2 vs. Axis 3.

TWINSPAN

Groupings

After visual inspection of Ordination plots (Figures V-1, V-2, and V-3) with the client, hypotheses were formed about potential groups of sites. Unbiased analysis using **T**wo-**W**ay **In**dicator **Sp**ecies **An**alysis (TWINSPAN), confirmed the hypothesized groupings structure. Another method commonly used to investigate group hypotheses is CLUSTER Analysis. Both methods typically give similar results.

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).

Sampling Site	1st Order group	2nd Order Group	3rd Order Group
GASITE01	0	0	
GASITE02	0	0	
GASITE03	0	0	
GASITE12	0	0	
GASITE11	0	1	
GASITE06	1	3	
GASITE07	1	2	0
GASITE08	1	2	0
GASITE09	1	2	0
GASITE10	1	2	0
GASITE04	1	2	1
GASITE05	1	2	1

Table V-18. TWINSPAN Groups. The groups of sampling sites resulting from TWINSPAN of the Galice Lepidoptera community data.

Nonmetric Multidimensional Scaling (NMDS)

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

After consultation with the client, it was decided that group configurations revealed by ORD, TWINSPAN, and NMDS had biological meaningful and the first 10 Principal Coordinate Axes were analyzed using MDA.

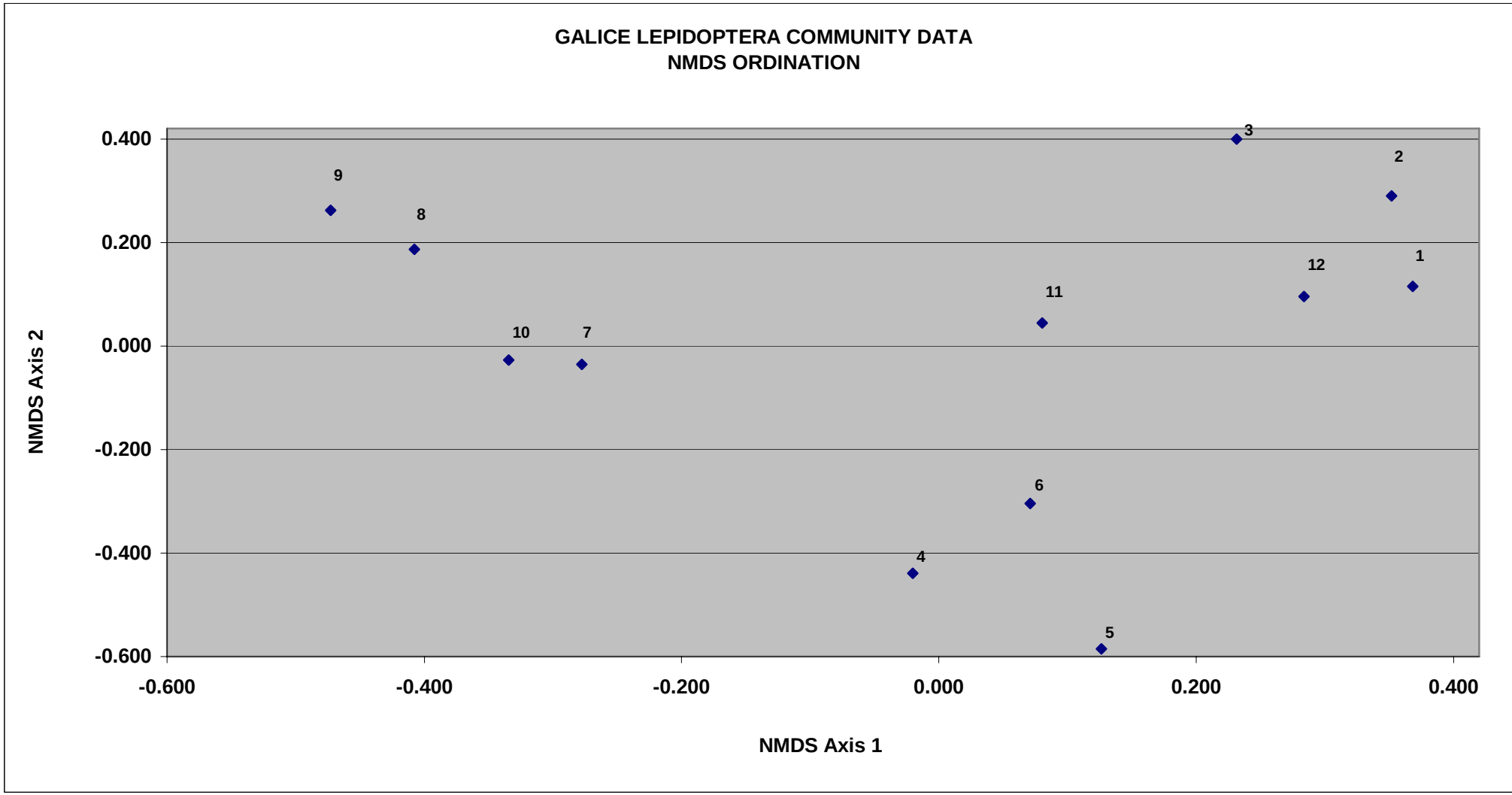

Figure V-4. NMDS Ordination Axis 1 vs. Axis 2.

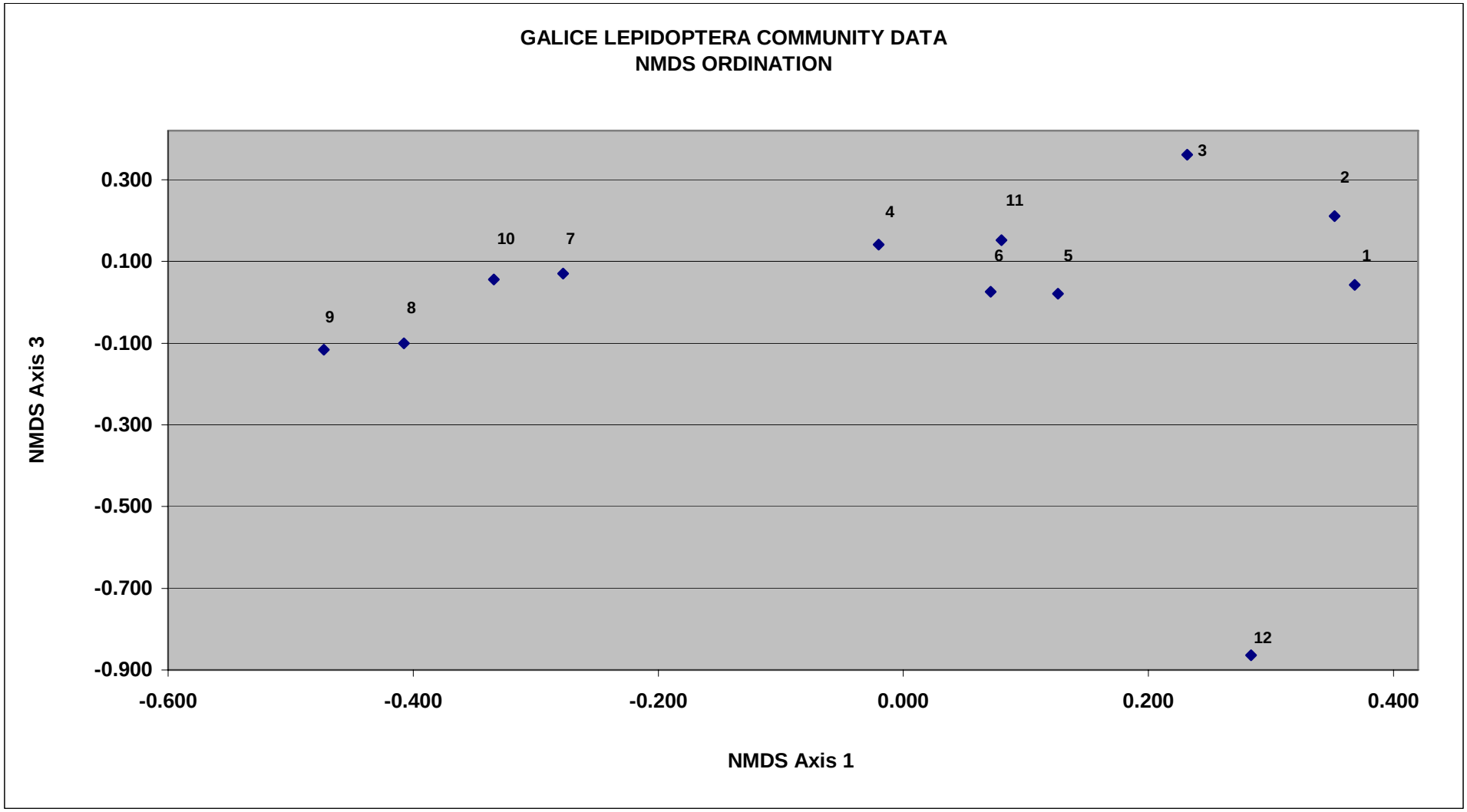

Figure V-5. NMDS Ordination Axis 1 vs. Axis 3.

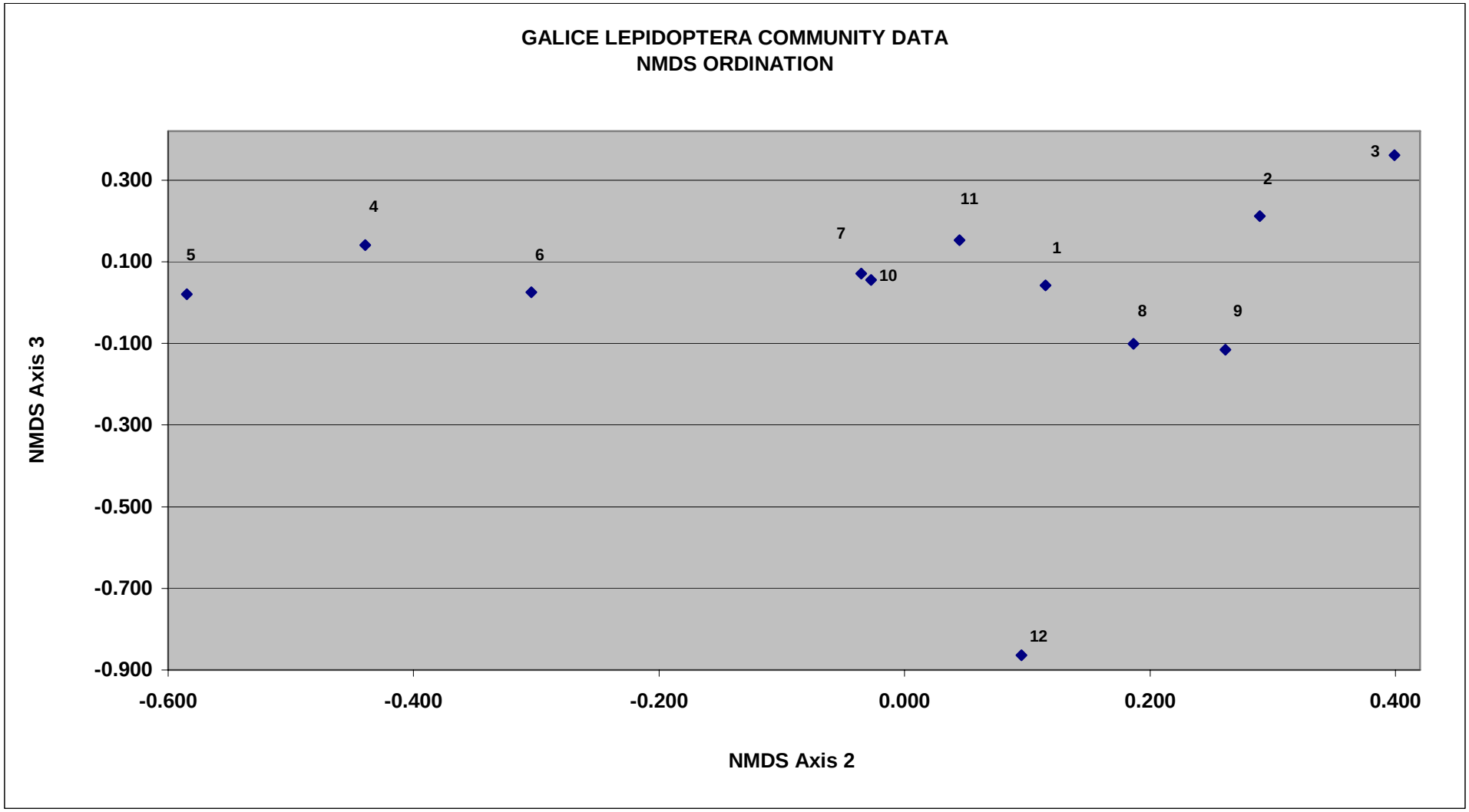

Figure V-6. NMDS Ordination Axis 2 vs. Axis 3.

Multigroup Discriminant Analysis (MDA)

The first ten 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 Sampling Sites 1, 2, 3, and 12. Group 2 consisted of Sampling Sites 4 and 5. Group 3 consisted of Sampling Sites 7, 8, 9, and 10. Group 4 consisted of Sampling Sites 6 and 11.

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 (Table V-19).

Table V-19. MDA MANOVA Table. Univariate testing for Group differences along each of the ten Principal Coordinate axes analyzed in MDA.

Component Axis	Among Mean Sq.	Within Mean Sq.	F-Ratio	Probability	Adjusted Probability
1	0.319	0.006	57.25	0.0000	0.0003
2	0.265	0.025	10.49	0.0041	0.0406
3	0.015	0.119	0.13	0.9393	1.0000
4	0.027	0.115	0.24	0.8682	1.0000
5	0.113	0.083	1.36	0.3225	0.9796
6	0.144	0.071	2.02	0.1892	0.8772
7	0.002	0.124	0.02	0.9972	1.0000
8	0.076	0.096	0.79	0.5345	0.9995
9	0.026	0.115	0.23	0.8761	1.0000
10	0.008	0.122	0.07	0.9753	1.0000

Variable Contributions to Canonical Variates

The variance of each variable (Principal Coordinate Axis) is allocated to each of the canonical variates (Table V-20). The contribution of those variables to each of the canonical variates is measured by the percentage of total variance allocated to those variates. The larger the percentage of variable variance in a particular canonical variate, the more that variable is represented by that variable.

For example, more than 50% of the variance of Principal Coordinate Axes 1, 5, 8, and 9 is allocated to canonical variate 2. Therefore, discrimination along canonical variate 2 is largely due to those variables (1,5,8, and 9). Similarly, more than 50% of the variance of Principal Coordinate Axes 2, 3, 4, 6, 7 and 10 is allocated to canonical variate 1. Discrimination along canonical variate 1 is largely due to those variables (2, 3, 4, 6, 7 and 10). This will be clearer when viewing the vector variable plot (Figure V-7).

Table V-20. Percentage of the variance of each variable(Principal Coordinate Axis) in each canonical variate.

Principal Coordinate Axis	Canonical Variates		
	1	2	3
1	33.821	66.179	0.000
2	93.377	6.623	0.000
3	73.694	26.306	0.000
4	78.381	21.619	0.000
5	30.471	69.529	0.000
6	75.915	24.085	0.000
7	90.145	9.855	0.000
8	11.257	88.742	0.001
9	15.939	84.061	0.000
10	100.000	0.000	0.000

The magnitude of influence of each of the variables (principal Coordinate Axes) towards group discrimination can be viewed graphically (Figure V-7). The 10 variables are plotted and vectors are drawn from the center point (0,0). The larger the magnitude of influence, the longer the vector.

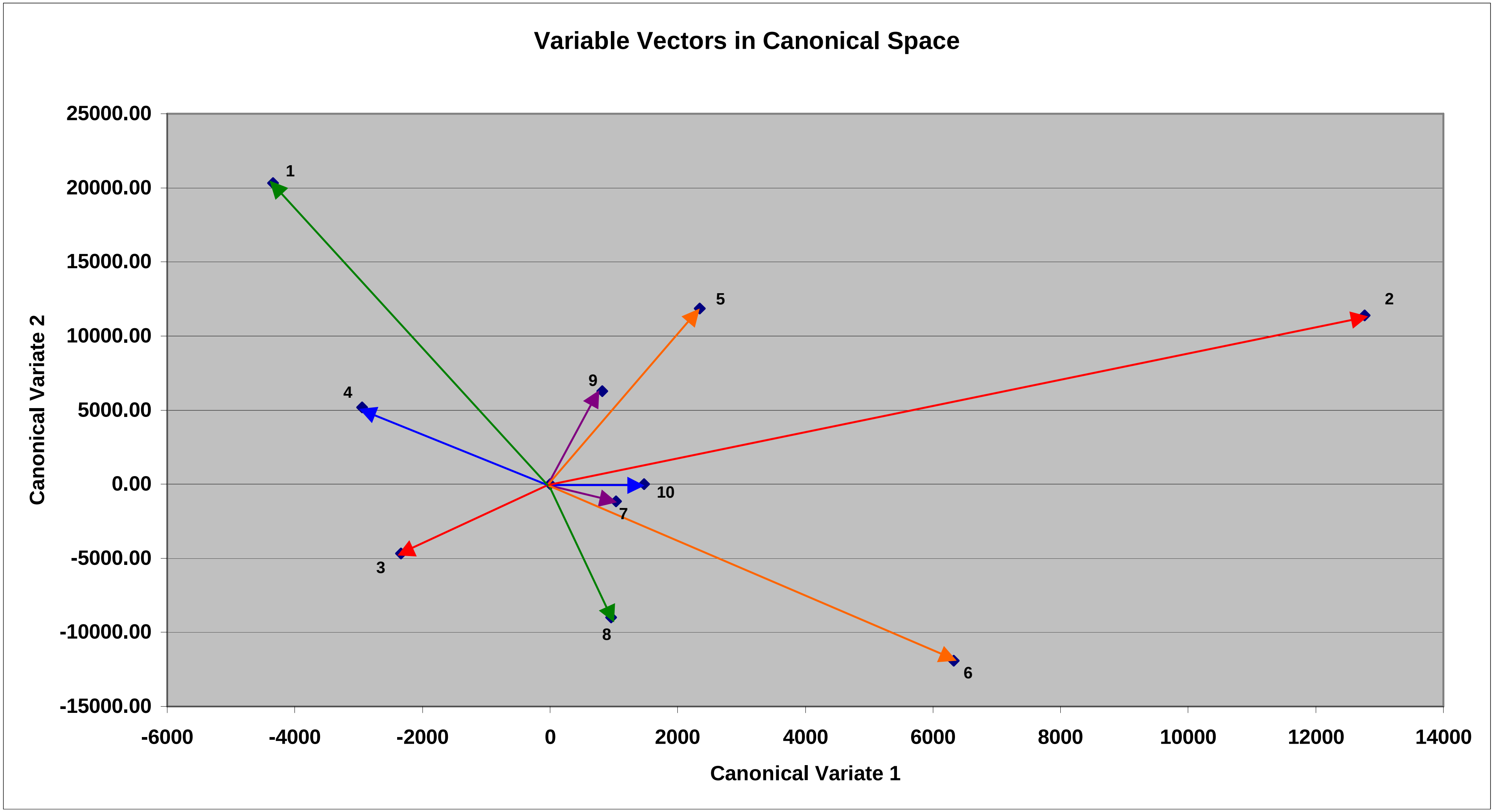

Figure V-7. Variable Vectors in Canonical Space. A plot of variable vectors in canonical space. The length of the vectors represents the magnitude of influence of each variable.

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, 100% hits.

Distance Analysis

The distance between group centroids is measured by two metrics, Euclidean (Taxonomic) Distance (Table V-21) and Generalized (Standard Deviation) Distance (Table V-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-21. Euclidean Distances between Group Centroids.

	1	2	3	4
1	0.00	0.87	0.71	0.87
2	0.87	0.00	0.87	1.00
3	0.71	0.87	0.00	0.86
4	0.87	1.00	0.86	0.00

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

Table V-22. Generalized Distances between Group Centroids.

	1	2	3	4
1	0.00	11962.72	13402.91	17649.73
2	11962.72	0.00	16190.45	16536.24
3	13402.91	16190.45	0.00	5755.68
4	17649.73	16536.24	5755.68	0.00

95% Confidence Radii

The fit around each of the group centroids is measured by their 95% confidence radii (Table V-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-23. Group 95% Confidence Radii. The 95% confidence radii for the four groups of sites analyzed using MDA.

GRP 1	1.59
GRP 2	8.98
GRP 3	1.59
GRP 4	8.98

Plots of Group Centroids

The group centroids are plotted in canonical space (Figure V-8). The plot is useful to visualize the distances between groups and to evaluate group similarities.

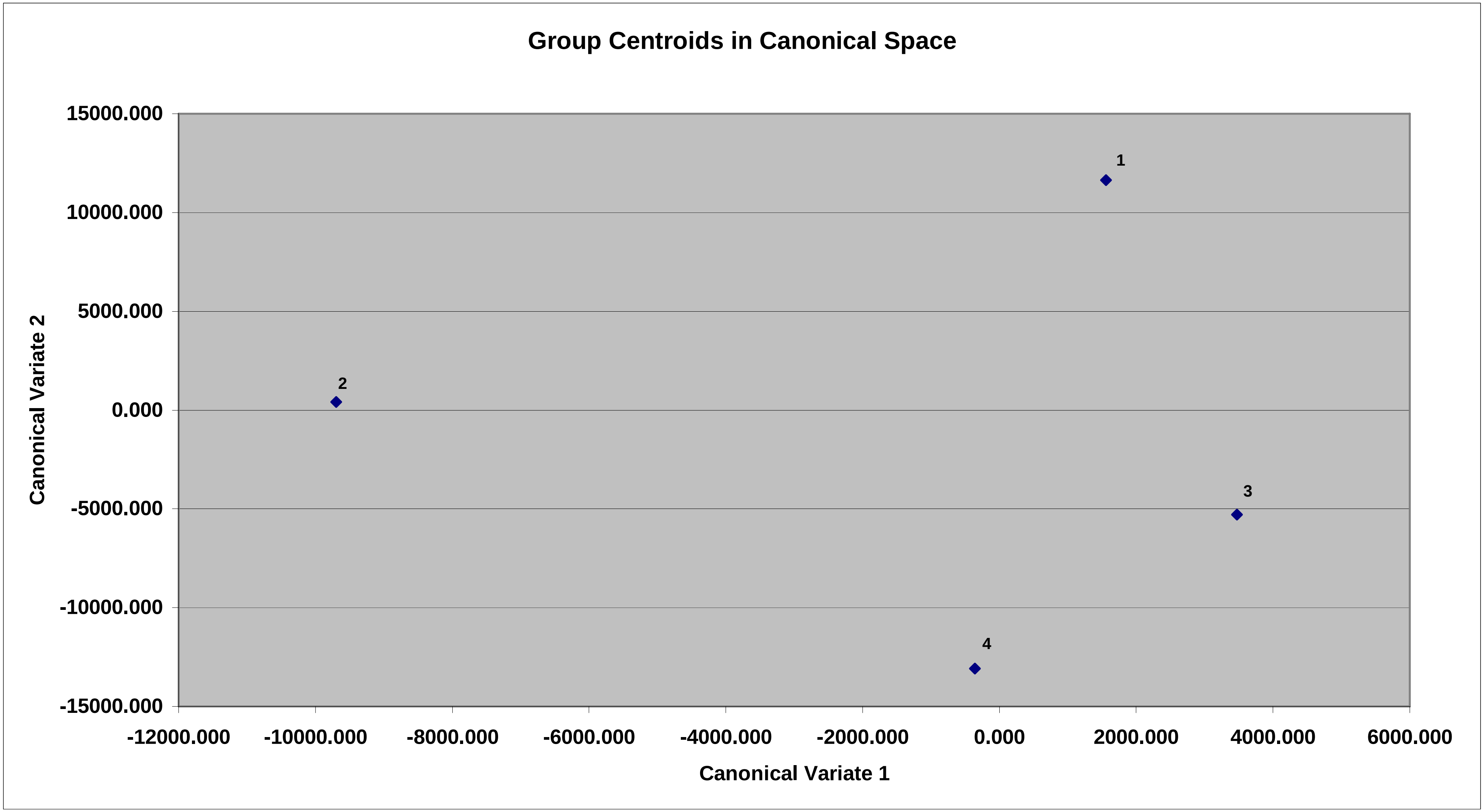

Figure V-8. Plot of Group Centroids in Canonical Space. A plot of the centroids for the four groups of sampling sites analyzed using MDA.

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 Galice data, the size of the groups formed from ORD was

relatively small. Group 1 had only 4 members, Group 2 had 2 members, Group 3 had 4 members, and Group 4 had 2 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 Galice 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.

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