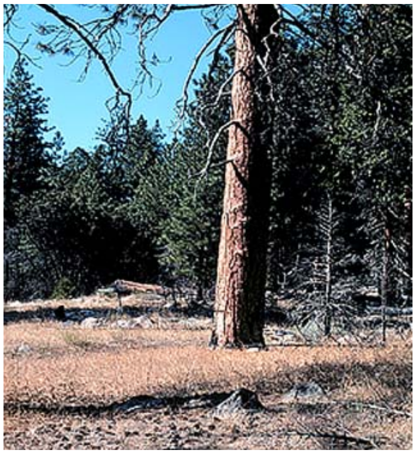

DEPARTMENTS

Technological Tools

Note: Dr. David Inouye is the editor of the **Technological Tools** section. Anyone wishing to contribute articles or reviews to this section should contact him at the Department of Zoology, University of Maryland, College Park, MD 20742. E-mail: di5@umail.umd.edu.

ENDNOTE 6.0

EndNote version 6.0.
ISI ResearchSoft,
2141 Palomar Airport Road,
Suite 350, Carlsbad, CA 92009.
Web site <www.endnote.com>.
Available for Mac or Windows.
List price $299.95; upgrade
$89.95. (There is a discount for
orders downloaded from their
web site, and students can
purchase it for $109.95.)

I have used EndNote for several years, since version 2.0, and now have over 13,000 entries in my main bibliographic database. The program handles this large database with ease, and I use it almost every day. In the time since I started using it, EndNote has added many useful features, and version 6.0 adds a few more to its capabilities.

One addition in EndNote version 6.0 is the ability to organize images or application files, as well as text files. Images in BMP, TIFF, or JPG formats, and files from Excel, PhotoShop, or other programs can be stored with key words and inserted into manuscripts just as bibliographic citations can be. If you use the Cite While You Write feature of EndNote 6.0 with Microsoft Word, you will end up with not only a list of references (formatted correctly for the specified journal), but also a list of your figures and copies of the figures at the end of the manuscript. (Unfortunately, this feature is only available in MS Word, although there is also some integration of EndNote 6.0 with WordPerfect.)

Another new feature of the program in version 6.0 is the addition of manuscript templates. The EndNote programmers have taken a little of the work out of preparing a manuscript for submission by looking up the requirements for many different journals. For example, if you specify the *Ecology* template, you'll find an 11-page document with instructions such as [Insert Running Title <40 characters] and [Insert Abstract here <350 words]. Perhaps some day in the future this feature will be integrated with the "Publish" button that computers will have, to analyze your data files automatically, generate figures, and create the first draft of a completed manuscript.

An increasing number of scientific journals now have developed electronic versions, and have made available Portable Document Format (PDF) versions of articles. I think one consequence of this practice is that mailing paper reprints of scientific papers is declining. One alternative to filing cabinets full of paper reprints is a computer folder full of PDF files, and another is to access the papers through web sites where they are stored (e.g., JSTOR). One way to manage and to retrieve these electronic reprints is to insert links to the pdf files or web sites in the corresponding EndNote entries. The "URL" field can be used to point to either a URL or a file on your local computer.

EndNote is one of three bibliographic database programs that are available through ISI ResearchSoft (the others are Reference Manager and ProCite). These three applications have many overlapping capabilities, which you can compare online <http://www.isiresearchsoft.com/rscompare.asp.> I have been pleased with the job that EndNote has done in filling my needs for a bibliographic database program, and plan to continue to use it.

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POTENTIAL INCONSISTENCIES WHEN COMPUTING AKAIKE'S INFORMATION CRITERION

Background

Information-theoretic modeling is an increasingly common technique for analyzing and presenting ecological data. To standardize the presentation of results when using an information-theoretic approach to model selection, we wish to clarify the calculation of the number of parameters (K) as suggested by Burnham and Anderson (1998:17). It is our opinion that many researchers use Anderson et al. (2000) as their primary source for the information-theoretic approach, as well as subsequent calculations of Akaike's Information Criterion (AIC) and variations thereof (AIC_c, QAIC, $QAIC_c$). Although Burnham and Anderson (1998) presented AIC formulae in detail, the components of K (the number of estimated model parameters used in AIC calculation) were not as lucid in Anderson et al. (2000). The incorrect computation of K was briefly reported in Anderson and Burnham (2002:916), but in our opinion requires additional clarification. Further, many researchers may simply report the AIC value provided with statistical software packages such as the Statistical Analysis System (SAS), which may not be consistent with Burnham and Anderson (1998).

The problem

In some cases (e.g., multiple linear regression, MLR), the AIC value provided by SAS is not consistent with that derived using Burnham and Anderson's (1998) methodology, due to the computation of K. In other cases, however (e.g., logistic regression, LR), the AIC value is consistent. Additionally, the mixed models procedure (PROC MIXED) in SAS computes AIC and AIC_c values based on Akaike (1974) and Burnham and Anderson (1998), respectively; however, these values are typically used to evaluate competing covariance structures (not for model selection and inference), and depend on the specified underlying estimation method for the covariance parameters, i.e., restricted maximum likelihood (REML) or maximum likelihood (ML). Our objective is to clarify potential discrepancies in the computation of K so that researchers can standardize data presented from the information theoretic approach to model selection.

Burnham and Anderson (1998) described AIC as

$$\text{AIC} = -2\log(L(\hat{\theta} \mid y)) + 2K$$

where $-2\log(L(\hat{\theta} \mid y))$ is the value of the maximized log-likelihood function and K is the total number of estimable parameters in the model. In SAS, AIC for LR models was described as

$$\text{AIC} = -2\log L + 2(K + s)$$

where $-2\log L$ is the value of the maximized log-likelihood function, K is the total number of response levels minus 1, and s is the number of explanatory variables. Notice that the SAS formulation of AIC is in agreement with Burnham and Anderson (1998) because the sum of $K + s$ represents all of the estimable parameters in LR (intercept[s] and explanatory variable[s]).

The formulation of AIC for MLR models using least squares was described by Burnham and Anderson (1998:48) as:

$$\text{AIC} = n\log(\hat{\sigma}^2) + 2K$$

where

$$\hat{\sigma}^2 = \frac{\sum \hat{\varepsilon}_i^2}{n}$$

and K represents the number of slope parameters $\beta_1 \ldots \beta_p$ + the intercept β_0 + the residual variance $\hat{\sigma}^2$. However, the SAS formulation of AIC is:

$$\text{AIC} = n\log\left(\frac{\text{SSE}}{n}\right) + 2p$$

where SSE is the sum of squares error; p is the number of slope parameters + intercept; and n is the number of observations (SAS Institute 1999). Notice that the parameter for residual variance is not accounted for in this formula.

Intuitively, addition of one parameter to K (in the case of MLR), representing residual variance (σ^2), should not change the respective order of model ranking (ΔAIC) or corresponding Akaike weights (ω_i). In fact, converting AIC values as calculated by SAS (in MLR) to values based on Burnham and Anderson (1998) simply requires adding 2 to each AIC value. Often, though, an information-theoretic approach to model selection requires use of second-order AIC (AIC_c; appropriate when $n/K<40$), quasi-likelihood AIC (QAIC; used when count data are overdispersed), and quasi-likelihood AIC corrected for small sample size ($QAIC_c$). Burnham and Anderson (1998) defined AIC_c as:

$$\text{AIC}_c = -2\log(L(\hat{\theta})) + 2K + \frac{2K(K+1)}{n-K-1} = \text{AIC} + \frac{2K(K+1)}{n-K-1}.$$

Similarly, $QAIC_c$ follows:

$$\text{QAIC}_c = \frac{-2\log(L(\hat{\theta}))}{\hat{c}} + 2K + \frac{2K(K+1)}{n-K-1}$$

where

$$\text{QAIC} = \frac{-2\log(L(\hat{\theta}))}{\hat{c}} + 2K, \text{ thus}$$

$$\text{QAIC}_c = \text{QAIC} + \frac{2K(K+1)}{n-K-1}.$$

Thus, calculations of QAIC include $\hat{c}$, a variance inflation factor estimated from the global model (Burnham and Anderson 1998:52-53), but both corrections for small sample size necessitate the addition of

$$\frac{2K(K+1)}{n-K-1}.$$

From these equations, it is clear that the effects of including one parameter that accounts for residual variance when formulating *K* may result in cascading effects when small sample size corrections are made (conversion to AIC_c and $QAIC_c$). For example, when *K* increases from 5 to 6, AIC_c increases by 0.590 and 1.509 when $n = 50$ and 25, respectively. Such changes should not be considered trivial. Ranked models using AIC_c calculated without adding 1 to *K* to account for residual variance could potentially be included in candidate sets (i.e., $\Delta AIC_c < 2$; Burnham and Anderson 1998:128), but subsequently excluded when making this correction. Certainly, this increased penalty for decreasing parsimony is as intended, but researchers need to be aware of these potential changes and how they may affect consistency when reporting results of ecological research.

Conclusions

The impetus for this paper was to provide practitioners of the information-theoretic approach to model selection with a cautionary note about discrepancies between AIC computation as described by Burnham and Anderson (1998) and a frequently used statistical software package (e.g., SAS). Values for AIC and all subsequent second-order AIC calculations (e.g., AIC_c, QAIC, and $QAIC_c$) are affected by this potential discrepancy. Further, classifying which models are included in the Kullback-Leibler "best" set (Burnham and Anderson 1998:128) may by affected by the number of variables represented with the *K* parameter. These discrepancies may well exist for other commonly used statistical software packages (e.g., SPSS). We recommend that researchers verify results provided by their statistical software of choice before reporting results and drawing conclusions from the information-theoretic method.

Acknowledgments

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CANOCO 4.5 AND SOME COMPARISONS WITH PC-ORD AND SYN-TAX

Software for Canonical Community Ordination (version 4.5).
Cajo J. F. ter Braak and Petr Šmilauer. Available from Microcomputer Power.
Attn: Dr. Richard E. Furnas,
111 Clover Lane, Dept. I6,
Ithaca, NY 14850.
Phone: (607) 272-2188;
Fax: (607) 722-0782; e-mail: FurnasR@microcomputerpower.com.
Information and tutorial introduction: <http://www.canoco.com>.
Retail license $678, educational license $368, upgrade retail license $429, upgrade educational license $249. Complete pricing can be obtained at <http://www.microcomputerpower.com>

Current use of multivariate methods in ecology extends from descriptive studies of biotic communities, analyses of remote-sensing images, and single-trophic-level experiments, to research on bottom-up vs. top-down regulations in ecosystems (Legendre and Legendre 1998, Brook and Kenkel 2002, Muylaert et al. 2002, Lepš and Šmilauer 2003). Rapid development of new techniques has been, to a large extent, stimulated by the increasingly complex questions posed by ecologists. At the same time, the utilization of recently developed multivariate procedures has been facilitated by the development of user-friendly software.

1) The most widespread program package in the United States is probably PC-ORD (McCune and Mefford 1999). Versions 2, 3, and 4 have been reviewed in the *ESA Bulletin* already, most recently by Aaron Ellison in the April 2000 issue. We may expect that, after the recent publication of McCune and Grace's (2002) textbook, this package will become even more popular.

2) Another user-friendly multivariate package developed primarily for community ecologists is SYN-TAX (Podani 1994, 1995, 1998, 2001). Recent versions are available for both PC and Mac computers. This package is especially strong in agglomerative and divisive classification methods. The distributor in the USA is Exter Software, Setauket, New York <http://

www.extersoftware.com>. The price is US$350. Surprisingly, SYN-TAX has never been reviewed in the *ESA Bulletin*. Podani's (2000) textbook puts SYN-TAX into a broader perspective.

3) In 1986, Cajo ter Braak extended Hill's (1979) ordination program DECORANA to CANOCO (ter Braak 1986*a*). CANOCO formerly stood for "canonical correspondence analysis" and included correspondence analysis, detrended correspondence analysis, and (detrended) canonical correspondence analysis. The program has since been extended to also cover principal component analysis (PCA) and the canonical form of PCA, called redundancy analysis (RDA). Up to version 3.1, it was available for both PC and Mac computers. The book by Jongman et al. (1995) helped users to understand the basic theory behind CANOCO, and the annotated bibliography by Birks et al. (1996) was a rich source for finding interesting applications. The versions of CANOCO starting from 4.0 (reviewed by Estelle Russek-Cohen in the April 1999 issue of *ESA Bulletin*) have a Windows user interface and have been distributed together with Petr Šmilauer's program CanoDraw for drawing ordination diagrams. The latest version is CANOCO 4.5 (ter Braak and Šmilauer 2002). A textbook, which has been developed from teaching materials for international CANOCO courses taught for 5 years in České Budějovice, Czech Republic, is being published this year (Lepš and Šmilauer 2003).

Here, we review the most important features of CANOCO 4.5 and compare them with the latest versions of PC-ORD and SYN-TAX.

CANOCO 4.5 requires Microsoft Windows 98, NT 4.0, or later versions. It needs at least 32 MB of internal RAM memory and 64 MB of free disk space for virtual memory. Support for Macs continues in the form of cross-platform file compatibility and Virtual PC as a supported platform. The maximum data size that can be analyzed is 25,000 sampling units (samples), 5000 response variables (species), 2000 covariables, and 1000 environmental variables. The maximum number of nonzero values in species data is 750,000. We tested CANOCO 4.5 on a PC with a 2.53-GHz Pentium 4 processor, 512 MB RAM, and an 80-GB hard drive.

The major drawback of CANOCO 4 was the two-step process needed to produce the graphs. The hybrid nature of the CanoDraw program (essentially a DOS-based program somewhat melded into a Windows format) made manipulating graphical output rather complicated, especially for data sets in which the number of species (or samples) exceeded 500. To the credit of ter Braak and Šmilauer, CANOCO 4.5 goes far to correct these shortcomings and increases the overall utility of the package. CanoDraw can now promptly visualize results from data sets of any size that CANOCO 4.5 can analyze.

CANOCO 4.5 has three main parts: (1) data input, (2) data analysis, and (3) graphical representation. For data input, the WCanoImp program is now accompanied by an additional program, CanoMerge, which allows the "side-to-side" merging of data files when there are more than 255 columns (usually species data). Two (or more) files are imported from spreadsheets with the WCanoImp program, then CanoMerge is used to join them column-to-column, matched by the names given to the individual samples. Rare species can be omitted from the analysis during the merge process by specifying a lower limit of occurrence for inclusion (e.g., species that occurred in < 2 plots could be omitted). A file in CANOCO format can also be transformed into a tab-delimited text file that can be imported into a spreadsheet or database.

The "console" version has been retained for those users who choose not to do their analyses in the Windows environment, and also permits some more experimental and nonstandard analyses not accessible from the Windows front end. However, this will be unnecessary for the vast majority of users. The analysis programs in the Windows version have been modified to handle larger data sets and run faster than in CANOCO 4. The flow and selection options remain essentially the same as those in CANOCO 4. The most important change in the analytical routines has been the addition of a program for metric multidimensional scaling, principal coordinates analysis (PrCoord), that calculates and uses a distance matrix based on any of eight dissimilarity coefficients. It can also use any dissimilarity matrix submitted in TAB-delimited values format. The sample scores obtained by running PrCoord are then used as input for either a principal component analysis or a redundancy analysis, resulting in distance-based redundancy analysis. This is a constrained form of principal coordinates analysis (see Legendre and Anderson 1999). For all multivariate methods in CANOCO 4.5, supplementary variables can be projected a posteriori into the ordination space to facilitate the interpretation of results.

The greatest, most needed change has been overhauling and simplifying CanoDraw. It is no longer necessary to export a graph from CanoDraw into CanoPost and then manipulate the image. Now, after an analysis has been performed in CANOCO for Windows, graph images can be displayed and directly manipulated in CanoDraw. In addition, CanoDraw can also be used to evaluate comprehensively different aspects of the results obtained from the analytical routines. General Linear or General Additive regression models can be used to analyze the responses of individual species along environmental gradients. The regressions can be evaluated by traditional *F* statistics or the Akaike Information Criterion. Summary statistics for samples and several diversity indices can be calculated and exported into spreadsheets, and samples arranged in a spatial or temporal sequence can be represented by arrows linking the samples. Samples and species can be classified into groups, and these classifications can be transported among different project files (as long as the files have the same number and identity of species and samples). Species and samples can be given unique symbols of different sizes and colors, and subgroups of species and samples can be easily designated. A new user of CanoDraw could learn to produce basic graphs in less than an hour. Once a user becomes comfortable with the basic structure of the program, it is relatively simple to start taking advantage of the many options. But because the program is so comprehensive, it does take some investment of time to learn its full capabilities and features.

The manual for CANOCO 4.5 comprises almost 500 pages, and we differed somewhat in our opinions of the utility of such a large and comprehensive manual. One of us felt that, besides being a good user's guide, it was also a textbook of ordination methods that gives users a better understanding of the statistical basis of the methods, the many combinations of scalings and standardizations that can be used, and how different types of analyses can be constructed from data, environmental, and covariable files. The other author felt that the manual was overly detailed, and that the methods could be presented in a simpler and more intuitive way (more like the CANOCO manual for version 2.1). We agreed that it would take a good deal of commitment to go through the manual to gain a full understanding of the capabilities of the package. Fortunately, the defaults in Canoco are very carefully chosen, so initial analyses simply using the defaults will often be useful. Familiarity with deeper aspects of the program can evolve as the user's sophistication with the methods matures. We also agreed that the abundant examples were useful, but that a summary page or chart of how covariable files should be coded for different types of analyses (e.g., repeated-measures, nested, and split-plot designs, tests of interaction effects, etc.) would be extremely useful (a good example is Anderson and Gribble 1998:162). As it is, the user has to do a good deal of digging through the text to get a description of how different analyses are constructed. This is not a trivial point, because one of the real strengths of some of these ordination methods (e.g., dbRDA, CCA) is that they allow hypothesis testing in an ANOVA framework, providing that the correct design is used for coding different factors and covariables. Improper coding could lead to erroneous permutation tests and partitioning of variance components. The examples of the output clearly illustrate how different analyses should be interpreted, but the setup of the analyses is not always so clear from the text. However, all of the examples do have their data, project (.con), and results (.sol) files available in the Samples directory. Here, we can learn not only about the actual coding of factors, but also about the proper choice of options within CANOCO projects.

Comparing CANOCO 4.5 with PC-ORD and SYN-TAX is a bit like comparing apples and oranges. The former is an ordination program, and it has not been developed for data manipulation or to do classifications. SYN-TAX focuses primarily on classification, although it includes several ordination procedures as well. PC-ORD was developed to do ordination, classification, and many other types of analyses. Despite these differences in emphasis, there is also an overlap in functionality among the three packages (Table 1).

There is no doubt that PC-ORD provides the largest variety of multivariate procedures. Besides the routine multivariate procedures, PC-ORD 4 is very useful for calculating summary statistics for groups and for data transformations. It has a great variety of procedures that are not available either in CANOCO or in SYN-TAX, including some very useful ones for comparing groups (Multi-response Permutation Procedures and Mantel tests), classification (TWINSPAN), species–area curves, and a particularly effective, but less used, ordination method, Non-metric Multidimensional Scaling (NMS; this, however, without permutation testing, is included in SYN-TAX). In addition, PC-ORD is not as expensive to purchase as CANOCO or SYN-TAX.

However, PC-ORD does have some limitations in its ordination and classification programs that are not found in CANOCO or SYN-TAX. Compared to SYN-TAX, PC-ORD has fewer classification methods and relatively poor dendrograms. SYN-TAX 2000 can plot minimum spanning trees with true tree length; we know of no other software that does this. The greatest drawback of PC-ORD's ordination programs is the absence of permutation restrictions. This limits the usefulness of permutation tests and virtually eliminates its use when analyzing data from factorial experiments. PC-ORD does not do redundancy or distance-based redundancy analysis, canonical variates analysis, or canonical correlation analysis, and does not use multiple regression to aid in reducing the number of environmental variables used in CCA. All of these analyses, with the exception of canonical correlation analysis (included in SYN-TAX), can be performed by CANOCO (Table 1).

What would we like to see incorporated in future versions of CANOCO?

1) It would be very helpful if data grids with column and row labels could be displayed whenever a particular data file is used. First, that would provide confirmation that the user is using the right data. Second, before excluding individual samples or variables during the analysis, it is often useful to see the data again. Both PC-ORD and SYN-TAX 2000 have such background data windows.

2) In CCA and RDA, not only should the significance of the first axis be tested, but also the significance of the next two axes (as in PC-ORD). However, this could be a challenge in CANOCO, because there may be some statistical problems with simultaneous testing of several constrained axes.

3) It would be helpful to have nonmetric multidimensional scaling (NMS) as an ordination option in this package. NMS is the most robust ordination method that assumes neither linearity nor unimodality of species data. Can NMS be developed into some kind of nonmetric redundancy analysis?

Table 1. Availability of procedures in CANOCO 4.5, PC-ORD 4, SYN-TAX 5.1 (Mac), and SYN-TAX 2000 (Windows).

Procedure	CANOCO 4.5	PC-ORD 4	SYN-TAX 5.1	SYN-TAX 2000
DATA IMPORT AND MANIPULATION				
Spreadsheet data import	X[1]	X[2]	X[3]	X[3]
Cornell condensed data import	X	X[4]	-	-
List (database) import format	-	X	-	-
No. options for data transformation/standardization	3	13	20	20
No. available dissimilarity measures	7	8	35	39
ORDINATION METHODS				
Polar (Bray-Curtis) ordination with modifications	-	X	-	-
Principal Components Analysis (PCA)	X	X	X	X
Principal Coordinates Analysis (PCoA)	X	-	X	X
Weighted averaging	-	X	-	-
Correspondence analysis (CA)	X	X	X	X
Detrended Correspondence Analysis (DCA)	X	X	-	-
Nonmetric Multidimensional Scaling (NMS)	-	X	X	X
Permutation test	-	X	-	-
Varimax rotation	-	X	-	-
Canonical Variates Analysis	X	-	X	X
Canonical Correlation Analysis	-	-	X	X
Redundancy Analysis (RDA)	X	-	X	X
Distance-based RDA (db-RDA)	X	-	-	-
Overall significance (permutation test)	X	-	-	-
Significance of axes (permutation tests)	X[5]	-	-	-
RDA with covariables (partial RDA)	X	-	-	-
Permutation restrictions for special designs	X	-	-	-
Canonical Correspondence Analysis (CCA)	X	X	X	X
Overall significance (permutation test)	X	X	-	-
Significance of axes (permutation tests)	X[5]	X[6]	-	-
CCA with covariables (partial CCA)	X	-	-	-
Permutation restrictions for special designs	X	-	-	-
CLASSIFICATION METHODS				
No. agglomerative clustering methods	-	8	23	24
No. divisive clustering methods	-	-	2	2
No. methods for evaluation of hierarch. clustering results	-	1	9	-
No. methods for nonhierarchical clustering	-	-	6	6
No. methods for block clustering	-	-	6	-
Two-way Indicator Species Analysis (TWINSPAN)	-	X	-	-
GROUP COMPARISONS AND DESCRIPTIVE STATISTICS				
Multi-Response Permutation Procedures (MRPP)	-	X	-	-
Mantel test	-	X	-	-
Indicator Species Analysis	-	X	-	-
Species–area curves (jackknife estimators, distance measure)	-	X	-	-
Outlier analysis	-	X	-	-
No. diversity indices	4	2	-	-
No. evenness indices	2	1	-	-

[1]WCanoImp takes tab-delimited data on the clipboard from any source, with or without column/row headings. [2]Data, including labels, must be imported either as *.wk1 or *.cvs. [3]Only raw p x n data matrices can be read/imported; labels must be provided in a separate file. [4]Caution: DECORANA/TWINSPAN condensed format in PC-ORD differs slightly from the original Cornell format. [5]Only significance of the first ordination axis is automatically tested. [6]Significance of the first three ordination axes is automatically tested.

4) Three-dimensional graphics in CANOCO would be useful in some situations, but are not essential. (There is a 3-D rotating plot option for ordinations in SYN-TAX 2000.)

5) Whether a linear method is based on a covariance or correlation matrix can lead to very different results (note an incorrect statement on this point in Ludwig and Reynolds [1988:240]). This difference could be explicitly announced in the wizard page "Centering and Standardization." The other packages reviewed here make the distinction immediately clear. This would not require the relabeling of items in the user interface, just a short additional clarification.

6) Hill's (1973) index of evenness (N2/N1) should not be used. Try calculating its values for a few different proportions of two or three species and you will see why others (e.g., Peet 1974) had problems with its interpretation!

7) TWINSPAN (Two-way Indicator Species Analysis), combined with some kind of discriminant analysis (ter Braak 1986*b*), would be another welcome extension.

8) Something that is not available in any of the reviewed packages is the ability to handle missing data. Although there is no consensus among statisticians on how missing values should be treated, the only current option in all of the reviewed packages is to delete rows or columns with missing values. Giving users the option of deciding whether they want to delete the incomplete rows/columns, substitute the missing values by mean values, or estimate them from regressions would be useful. It is important to remember that empty cells from spreadsheets are now imported as zeroes by the WCanoImp.

Our criticisms of CANOCO 4.5 do not detract, in any important way, from the overall quality of this package. CANOCO 4.5 is a user-friendly, exceptionally comprehensive system for conducting ordination analyses. We also do not mean to be overly critical of PC-ORD, because we agree, for the most part, with the recent favorable review of it in the *ESA Bulletin*. We use PC-ORD and appreciate its many excellent features. Nevertheless, the advantages that PC-ORD has in breadth compared to CANOCO and SYN-TAX are compensated for, in some respects, by a lack of depth. Many ecologists believe that the best situation would be a single package integrating the best features of all three systems commented on here. However, this is probably unrealistic and, in fact, with easier and easier sharing of data between individual packages, may not even be a desirable goal. Only those of us who started some quarter of a century ago with Orlóci's (1978) simple BASIC programs for classification and ordination can fully appreciate the progress made in the recent years and the comfortable, interactive environment provided by all three packages that we have discussed here. For community ecologists, these are now "musts" for their research and teaching.

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Section and Chapter News

SOUTHEASTERN CHAPTER NEWSLETTER

Issue 2003-1

Chapter officers

Chair: Paul Schmalzer (2002–2004) <schmapa@kscems.ksc.nasa.gov>
Vice-Chair: Pat Parr (2001–2003) <parrpd@ornl.gov>
Secretary/Treasurer: Yetta Jager (2002–2004) <jagerhi@ornl.gov>
Web-Master: Mark Mackenzie <mackenzi@forestry.auburn.edu>
Chapter home page: <http://www.auburn.edu/seesa/>

Message from the Chair

I hope that many of you can attend the Association of Southeastern Biologists Meeting in April. It should be a very interesting meeting in our nation's capitol. Our Chapter is sponsoring a symposium, "Forest Fragmentation and Biodiversity in the Southeastern United States," organized by Scott Franklin of the University of Memphis. We will hold our annual luncheon and business meeting on Friday, where we will elect a new Vice Chair and discuss plans for future meetings. The Chapter has sponsored the Odum Award since 1985 for the best student paper in ecology presented at the ASB meeting. Please consider contributing to the Award Fund. See you in April.

Spring 2003 Chapter meeting in Washington, D.C.

We are looking forward to the next Chapter meeting with the Association of Southeastern Biologists (ASB) 10–13 April 2003 at Howard University in Washington, D.C. *Note that the SE–ESA luncheon will be on Friday* (NOT Thursday as listed on the registration form).

2003 elections

Elections for vice-chair will be held at the Spring 2003 meeting for a 2-year term beginning in August. We have two nominations for ESA Southeastern Chapter Vice Presidential Nominees, and their biographical sketches are below. Interested in running for office? Responsibilities are listed on the Section web page under bylaws.

Joan Walker

Joan L. Walker is a research plant ecologist for the USDA Forest Service Southern Research Station, where she conducts research needed to conserve and recover Southeastern rare plant species and their habitats. Her research focuses on the population biology of selected rare plant species of the longleaf pine savannas in the Apalachicola Lowlands, and on restoring the herbaceous layer of longleaf pine communities. She is committed to translating research findings into practical management and conservation options, and does that by teaching at many technical workshops and working with individual land managers. She has worked most intensively in the fire-maintained longleaf pine ecosystem, but through experiences on public lands throughout the south, has developed an understanding of research needs and conservation issues in many of the region's natural systems.

Joan received her Ph.D in Biology from the University of North Carolina at Chapel Hill in 1985. After a postdoc at Duke, she joined the faculty at Southeastern Louisiana University. She joined the USDA Forest Service in 1988 as the first Plant Ecologist for the National Forests in Florida, and in 1990 became the first Regional Plant Ecologist for the Southern Region. In this position, she contributed to Forest Planning efforts throughout the Southeast, focusing on sensitive plant management and ecological land classification. In 1992, she assumed her current position with the Southern Research Station at Clemson University, where she has adjunct faculty status and advises graduate students in Forest Resources and Biological Sciences. Joan has authored or coauthored publications on plant diversity, rare plant biology, restoration ecology, and forest management.

Nicole Welch

Nicole Turrill Welch is an Assistant Professor of Biology at Middle Tennessee State University (MTSU). She received her B.S. and M.S. in Biological Sciences from Marshall University, and the Ph.D in Ecology from the University of Tennessee. Her postdoctoral research was through the Indiana University (Bloomington) School of Public and Environmental Affairs. Nicole's research interests include the use of prescribed burning to restore and maintain Table Mountain pine communities in the southern Appalachian Mountains, plant–soil interactions, forest succession following disturbance, and ecosystem carbon dynamics.

Nicole joined the MTSU Faculty in January 2002, following three years as a Visiting Assistant Professor of Biology at Indiana University. There she taught general biology courses for both science majors and nonmajors. She is currently teaching an introductory biology course for nonscience majors at MTSU. In addition, she is developing an online version of this course to be offered next fall. Nicole enjoys her role as the Biology Department's Tri Beta Co-Advisor and as a volunteer for the Children's Discovery Center at Murfree Spring in Murfreesboro, Tennessee.

Membership renewal

The good news is that ESA remembered to include the SE Chapter on the membership form this year. Please remember to check the SE Chapter box, check that ESA has your correct e-mail address, and notify us of any changes. Your contribution to the Eugene P. Odum Fund will support next year's best student paper award.

Upcoming meetings and symposia

The 2003 ESA Annual Meeting will be held 3–8 August in Savannah, Georgia (see <http://www.esa.org/savannah/>). The deadline for abstracts was 1 March. The Southeastern Chapter will have an informal brown-bag lunch at the ESA Annual Meeting.

Other meetings of interest to ecologists in the Southeast include:

• The Society of Wetland Scientists' 24th Annual Meeting, 8–13 June 2003, New Orleans, Louisiana.

• USDA Symposium on Natural Resource Management to Offset Greenhouse Gas Emissions, 19–21 November 2003, Raleigh, North Carolina.

• The 2nd International Wildland Fire Ecology and Fire Management Congress, 16–20 November 2003 at the Colorado Springs Resort, Orlando, Florida.

Keeping in touch

To join the Southeastern Chapter of ESA ListServer, send a message to <majordomo@mail.auburn.edu> with the following command in the body of your e-mail message: subscribe scesa. If you use a signature file, it's best to turn it off. If you have news or announcements for the Southeastern Chapter's Home page, please send them to Mark Mackenzie.

Yetta Jager
Newsletter Editor

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Back volumes, copies of Issues in Ecology, Experiments in Ecology, and reprints of Special Features published in the journals are available from ESA headquarters in Washington, DC. See ESA's home page at <esa.org>, e-mail: esahq@esa.org, or call (202) 833-8773 for a list of available titles and prices.

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