

APPENDIX A: EXTENDED LABORATORY REPORT FORMAT

General instructions. All pages should be numbered (bottom centered) and the text should be Times New Roman font, 12 pts, and double-spaced. Be concise. Use active voice rather than passive voice, as active voice tends to be more concise and easier to understand.

All tables, figures, and references included in the report should be cited in the text of the report. For example, we might describe the data shown in Figure 1.

See J. A. Pechenik's "A Short Guide to Writing about Biology" (2010, Longman) for further advice for writing about biology as well as an example laboratory report.

To submit your work, please email a PDF file of your report to the instructor. Hard copies will not be accepted. Before submission, please save your files as "BIOL366_name_assignment.pdf" where *name* is replaced by your group name (team) or your last name (individual assignments) and *assignment* is replaced the laboratory number. For example, the blueberry team would name their short report for the sampling sedentary organisms laboratory as "BIOL366_blueberries_lab2.pdf".

Your extended laboratory reports should include each of the following sections:

1. **Title.** Your title should be concise description of the work.
2. **Author and Affiliation.** Your full name (e.g. Stuart R. Borrett) and your institution, which is University of North Carolina Wilmington. You should also list you laboratory section (e.g., BIOL 366-201).
3. **Abstract.** A 300 word or less summary of your paper including the purpose, hypotheses, and major findings.
4. **Introduction.** The introduction should tell the reader why the study was conducted and provide necessary background information to understand the ecological system (e.g., Longleaf pine – wire grass ecosystem) and the relevance and *ecological rational* of your hypotheses. This will likely take 2-4 paragraphs. In the final paragraph of this section, you need to summarize the scientific objectives of the laboratory work you are reporting and clearly state the null hypotheses you tested.
5. **Materials and Methods.** This section describes what you did so that you or someone else could repeat the study. Your initial sampling plan serves as a first rough draft of this section. In this section:
 - Describe the methods so that anyone could read them and *repeat* your experiment.
 - Use SI units for your data measurements.
 - State how the data will be analyzed, e.g., which statistical tests will be used and at what probability (*p*) value will you use to determine significance.

Employ at least two different statistical tests in your analyses (e.g., t-test and χ^2 -test), as well as a test for normality for those data assumed to be normally distributed (parametric).

6. Results. This is a description of your data, written in the past tense. Please state them concisely and without interpretation. All data tables and figures should be referenced and you should describe the general trend of their data in text. Use SI units.

When reporting statistical descriptions of a population, you should include a measure of the central tendency and the variation. For example, you might report the mean and standard deviation as $\bar{X} \pm SD$. Reports of statistical tests must include the name of the test, the statistical value calculated (e.g., t-value or chi square value given as χ^2), degrees of freedom (df), sample size (N), and probability value (P). For example,

“The number of mature pines in Forest A was significantly greater than the number in Forest B ($\chi^2 = 4.23$, df = 1, p = 0.032).”

Do **not** give interpretations of the results in this section.

7. Discussion. This is where you should interpret your results and consider their significance. You should state whether or not the data support or refute your hypotheses, and explain any potential sources of error. In addition, this is where you should address the discussion questions that follow each laboratory.

8. Acknowledgments. You will work in groups to collect your data. You should acknowledge your collaborators by name here. You should also acknowledge anyone who critiques drafts of your laboratory report.

Example. “I would like to acknowledge Joe Facendola, Nina Griffith, and Lindsay Haus for their help with the experimental design and data collection efforts. Dr. Chapman provided useful comments on early drafts of this report.”

9. Literature Cited. A list of the full bibliographic information for works you cite in your paper. In this extended laboratory report, you must cite at least 5 articles from the peer reviewed literature (e.g. journal articles published indexed in the ISI Web of Science, a database available through our library). Your references should be listed using the journal of Ecology format as in the following examples:

Example of a Journal Article

Borrett, S. R. and O. O. Osidele. 2007. Environ indicator sensitivity to flux uncertainty in a phosphorus model of Lake Sidney Lanier, USA. *Ecological Modelling* **200**:371-383.

Example of a Book

Earley, L. S. 2004. Looking for longleaf: the fall and rise of an American forest. University of North Carolina Press, Chapel Hill, NC.

Jørgensen, S. E. and G. Bendoricchio. 2001. *Fundamentals of Ecological Modelling*. 3rd ed. Elsevier, New York.

Example of a chapter from an Edited Book

Post, W. M., C. C. Travis, and D. L. DeAngelis. 1985. Mutualism, limited competition, and positive feedback. Pages 305-325 in D. H. Boucher, editor. *The Biology of Mutualism*. Oxford University Press, New York.

Example of the lab Manual

Borrett, S.R. (editor). General Ecology Laboratory Manual. University of North Carolina Wilmington, Wilmington, NC. <http://people.uncw.edu/borretts/teaching.html> (accessed Jan. 22, 2010).

All literature listed in this section must be cited in the body of your text using an “author-date” format. For example, we might mention that Borrett and Osidele (2007) used the coefficient of variation to describe the ecosystem indicator uncertainties. We might also note that adult longleaf pine trees (*Pinus palustris*) have adaptations to survive low intensity ground fires (Earley 2004).

9. Tables. Your report should include at least one table. Again, tables should appear *after* your works cited in your report, *one per page*. The table legend should describe the information in the table and be placed *above* the table itself.

The legend has 5 main points: 1) the number and title; 2) the vertical heading(s) (column) called boxhead; 3) the horizontal headings (row headings) called the stub; 4) the fields that have the data; 5) 4 horizontal lines across the table with 2 placed below table legend (title), 1 below the boxhead; and 1 at the bottom of the table (see the examples). Tables should be numbered in the order cited in the text. Note that tables should supplement but not duplicate the text. Never repeat information in a figure and a table. When either is equally clear, a figure is preferable.

Example Tables

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BIOGEOCHEMISTRY OF BROWN FOOD WEBS

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TABLE 2. Abundance (number/m²) of 10 common litter taxa compared regionally between Panama and Peru and between clay and sandy soils in Peru.

Taxon	Regional comparison			Soil comparison		
	Panama (<i>n</i> = 10)	Peru (<i>n</i> = 16)	χ^2	Clay (<i>n</i> = 8)	Sand (<i>n</i> = 8)	χ^2
Microbivores						
Collembola	1800	859	7.0*	680	1000	0.1
Oribatids	5600	4500	1.2	3900	5000	0.2
Isopods	70	27	7.8**	26	27	0.1
Diplopods	118	169	0.3	192	145	0.0
Predators						
Mesostigmatids	1000	1400	0.2	1500	1300	0.2
Pseudoscorpions	54	195	6.3*	142	248	0.5
Spiders	101	96	0.1	94	98	0.3
Chilopods	36	57	9.5**	45	69	0.8
Staphylinids	50	495	16.6**	371	619	4.0*
Ants	707	2000	10**	1400	2500	7.3**

Note: For comparisons, χ^2 is the two-tailed Kruskal-Wallis statistic.

* $P < 0.05$; ** $P < 0.01$.

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CLIMATE VARIABILITY AND COEXISTENCE

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TABLE 2. Multiple regressions of yearly intrinsic growth rates on climate variables show differences in species responses to the environment.

Variable	Estimate	SE	<i>t</i>	<i>P</i>
<i>Pseudoroegneria spicata</i> ($R^2 = 0.46$, $F = 2.53$, $df = 5, 15$, $P = 0.075$)				
Intercept	-1.85	2.11	-0.877	0.39
Fall precipitation ($t = 0$)	-0.014	0.004	-3.427	<0.01
Annual precipitation ($t = -1$)	0.002	0.001	1.608	0.13
Mean winter temperature ($t = 0$)	0.057	0.038	1.518	0.15
Mean fall temperature ($t = 0$)	-0.125	0.062	-2.004	0.063
Mean summer temperature ($t = 0$)	0.176	0.111	1.573	0.14
<i>Poa secunda</i> ($R^2 = 0.82$, $F = 6.94$; $df = 8, 12$, $P = 0.002$)				
Intercept	-4.081	1.340	-3.045	0.010
Winter precipitation ($t = 0$)	0.004	0.002	2.052	0.063
Spring precipitation ($t = 0$)	0.002	0.002	1.557	0.15
Fall precipitation ($t = 0$)	-0.008	0.003	-2.855	0.014
Annual precipitation ($t = -1$)	0.004	0.001	4.967	<0.001
Mean winter temperature ($t = 0$)	0.096	0.030	3.168	<0.01
Mean spring temperature ($t = 0$)	-0.202	0.051	-3.966	<0.01
Mean fall temperature ($t = 0$)	-0.152	0.040	-3.805	<0.01
Mean summer temperature ($t = 0$)	0.335	0.075	4.466	<0.001
<i>Hesperostipa comata</i> ($R^2 = 0.29$, $F = 7.81$, $df = 1, 19$, $P = 0.011$)				
Intercept	-0.04754	0.15735	-0.302	0.7659
Mean winter temperature ($t = 0$)	-0.075	0.027	-2.795	0.012
<i>Artemisia tripartita</i> ($R^2 = 0.48$, $F = 2.17$, $df = 6, 14$, $P = 0.11$)				
Intercept	-5.70	3.865	-1.474	0.16
Winter precipitation ($t = 0$)	0.005	0.004	1.275	0.22
Spring precipitation ($t = 0$)	-0.006	0.004	-1.494	0.16
Summer precipitation ($t = 0$)	0.007	0.003	2.063	0.058
Annual precipitation ($t = -1$)	0.002	0.002	1.225	0.24
Mean summer temperature ($t = 0$)	0.257	0.176	1.464	0.17
Mean annual temperature ($t = -1$)	0.172	0.098	1.745	0.103

Notes: Climate variables can exert effects in the present year ($t = 0$) or as lag effects from the preceding year ($t = -1$). Model selection was based on a stepwise AIC procedure, which may result in inclusion of variables with $P > 0.05$.

10. Figures. Figures should appear next, again one per page. Your extended report must include at least one figure.

The figure caption is listed *below* the figure and it should describe the information presented. Horizontal and vertical axes should be clearly labeled and the measurement units identified. Again, figures should be numbered in the order cited in the text.

Good figures should facilitate the cognitive task expected of the reader (e.g., trend analysis, comparison, etc.). Further, your figures should be free of what E. Tufte calls “chart junk”. This includes minimizing non-data ink, eliminating decoration, and not using unnecessary dimensions (e.g., a 3-D bar graph is almost never appropriate).

Here are four examples of figures from articles published in Ecology or Ecology Letters.

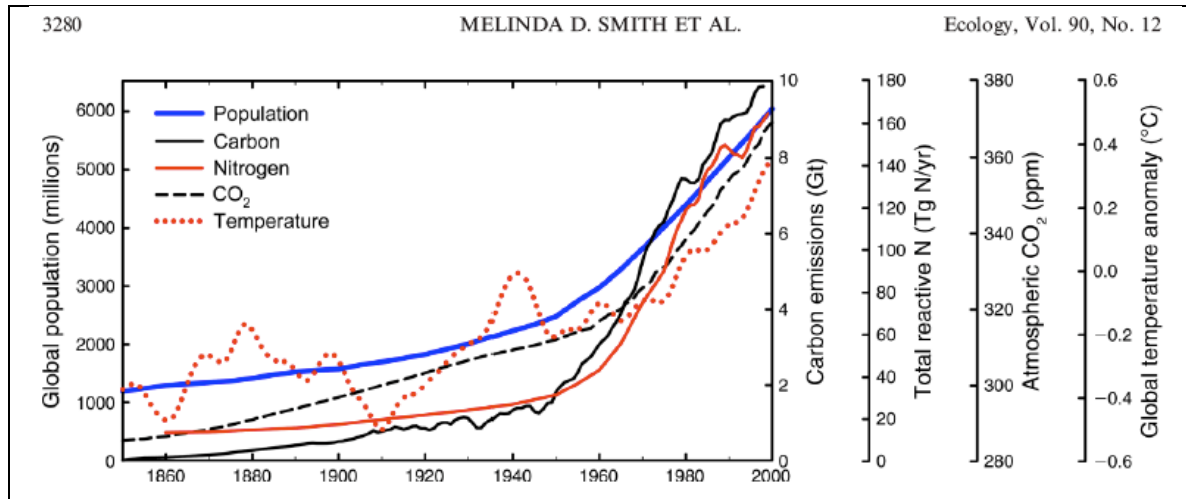


FIG. 1. Long-term trends in the global human population, CO₂ emissions, reactive N produced by humans, CO₂ concentration of the atmosphere, and the global temperature anomaly. Note the directional and cumulative increase in these metrics of global human impacts over the past 50 years. Population data are from the U.S. Census Bureau (<http://www.census.gov/>); energy consumption, from the U.S. Department of Energy Information Administration (<http://www.eia.doe.gov/>); total reactive N from Galloway et al. (2003); atmospheric CO₂ concentrations from the Carbon Dioxide Information Analysis Center (CIDAC; <http://cdiac.esd.ornl.gov/>); and global average temperature anomaly data (Brohan et al. 2006) from the Met Office Hadley Centre for Climate Change (<http://www.hadobs.metoffice.com/>).

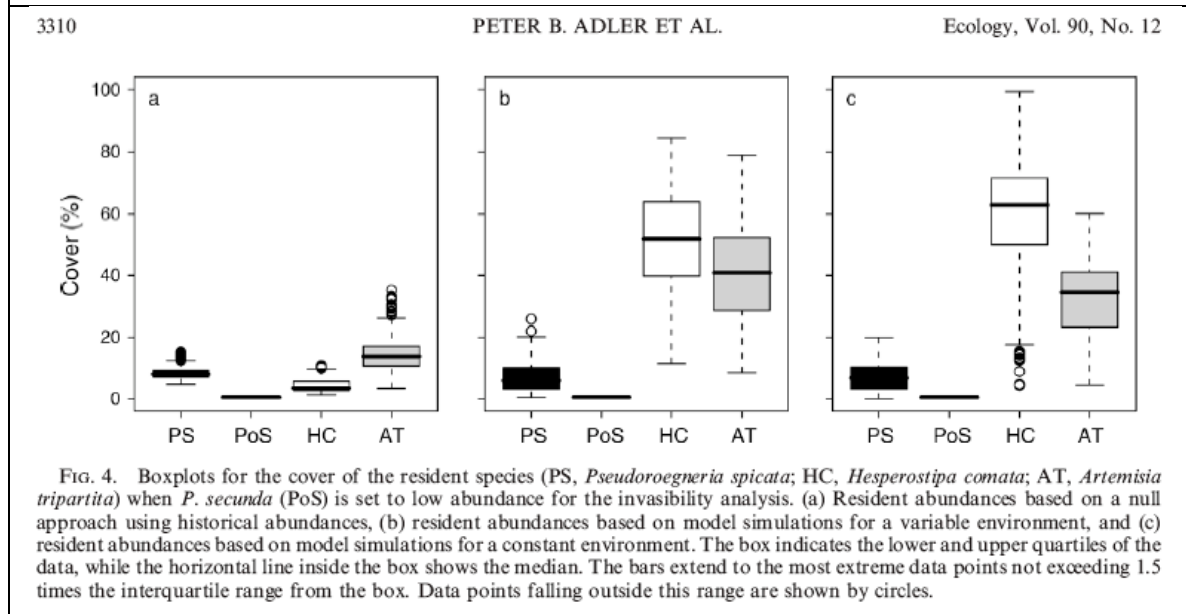


FIG. 4. Boxplots for the cover of the resident species (PS, *Pseudoroegneria spicata*; HC, *Hesperostipa comata*; AT, *Artemisia tripartita*) when *P. secunda* (PoS) is set to low abundance for the invasibility analysis. (a) Resident abundances based on a null approach using historical abundances, (b) resident abundances based on model simulations for a variable environment, and (c) resident abundances based on model simulations for a constant environment. The box indicates the lower and upper quartiles of the data, while the horizontal line inside the box shows the median. The bars extend to the most extreme data points not exceeding 1.5 times the interquartile range from the box. Data points falling outside this range are shown by circles.

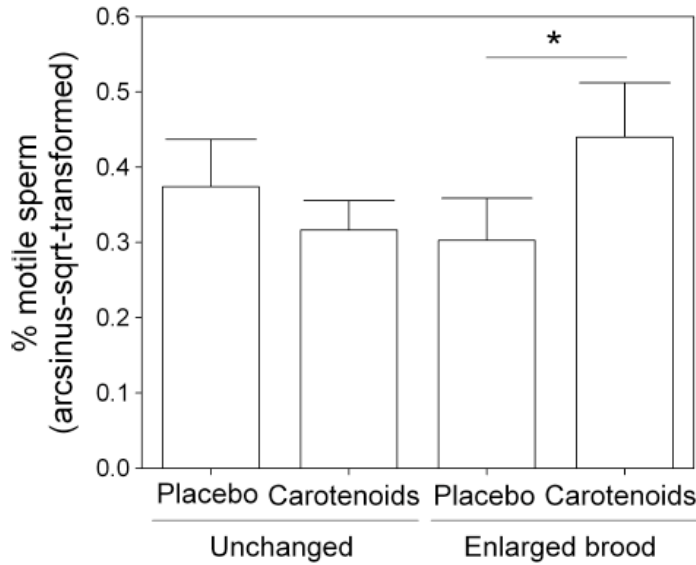


Figure 3 Percentage of motile sperm in relation to brood enlargement and carotenoid supplementation (means \pm SE). Among males subjected to oxidative stress (enlarged brood), carotenoid-supplemented males produced sperm of greater motility than males that received a placebo (Scheffe *post hoc* test: $P = 0.038$, indicated by an asterisk in the figure).

Helfenstein, F., S. Losdat, A.P. Moller, J.D. Blount, H. Richner. 2010. Sperm of colorful males are better protected against oxidative stress. *Ecology Letters* 13: 213-222.

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COMMUNITY NICHE DRIVES FUNCTIONING

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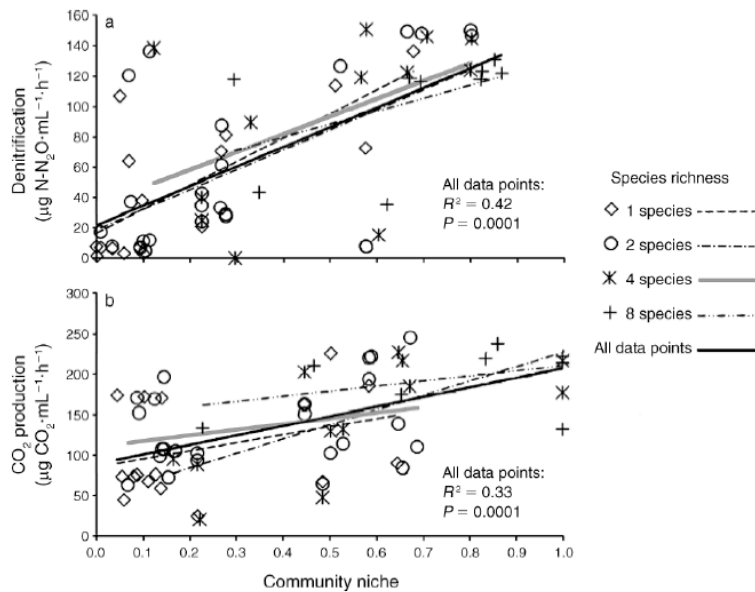


FIG. 3. Relationship between community functioning and community niche. Community niche was rescaled by dividing by the maximum value observed for all communities: (a) denitrification as a function of community niche defined according to monoculture ability to perform denitrification on each individual carbon source; (b) anaerobic CO₂ production as a function of community niche defined according to monoculture ability to produce CO₂ on each individual carbon source. Different symbols correspond to different levels of species richness. Each symbol corresponds to a single community, except for the monocultures, which are represented by their average performances ($n = 2$). The graph shows that communities with low richness but large community niche perform better than communities with high richness but small community niche.