

December 31, 1984

MEMO TO: LTER Coordinating Committee

FROM: Jerry F. Franklin

SUBJECT: Proposal for January Discussion

Enclosed please find a copy of a proposal, entitled "Workshop for Ecologists and Systematists to Identify Priorities for Collaborative Research on Soil Organisms". Please read the proposal, as it will be one of the items discussed at our January meeting at Channel Islands.

Also enclosed is some information about the Channel Islands, and the guidelines for the operation of the National Park Service boats.

jb
enclosure

PROPOSAL

- I. Title: Workshop for Ecologists and Systematists to Identify
Priorities for Collaborative Research on Soil Organisms
- II. Conveners: Dr. John D. Lattin
Systematic Entomology Laboratory
Department of Entomology
Oregon State University
Corvallis, Oregon 97331
- Dr. Nancy L. Stanton
Department Head
Department of Zoology and Physiology
University of Wyoming
Laramie, Wyoming 82071

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Introduction

At the recent meeting of LTER scientists at Lake Itasca, Minnesota, Dr. David Schindler pointed out that while basic ecosystem processes may remain fairly stable over time, species composition may change substantially during the same period. The processes are apparently more robust than the "processors." He stated that "lumping" species may mask changes in species composition and that individual species or species assemblages are more sensitive biological indicators than the summed numbers of organisms whose identity remains unknown.

There is increased concern over the gap that frequently exists between ecology and systematics although it is widely recognized that each discipline has much to offer the other. Efforts are being made to meld these disciplines in appropriate areas. The construct of the LTER Program provides a natural and appropriate setting in which to develop and enhance collaborative studies.

In response to interest expressed at the LTER meeting at Lake Itasca, two special sessions on ecology and systematics were convened there by Drs. Nancy L. Stanton and Lloyd Knutson (then of the National Science Foundation,) and John D. Lattin. The first dealt with soil organisms and the second with the conceptual bases for collaborative work between ecologists and systematists. Both were well attended and the participants gave us strong encouragement to follow up these brief gatherings with a more substantial meeting to identify priorities for collaborative work and to develop methods for implementing such work.

This present proposal requests funding from the LTER Coordinating Committee to convene a small group of ecologists and systematists at Oregon State University with the expressed purpose of identifying

priorities for collaborative work on soil organisms and identifying means by which these goals can be achieved.

Soil organisms were selected as the theme for this proposal because of their importance in critical ecosystem processes such as nutrient cycling, the incomplete ecological and systematic knowledge of soil organisms, the commonality of the habitat to the terrestrial LTER sites, and the interest of several individuals in this subject from the various sites. It is not possible to include all taxonomic groups because of financial limitations but an effort is being made to assemble a representative group of specialists.

A meeting was convened at Oregon State University in the spring of 1983 by Lattin to discuss litter-humus invertebrates. Particular emphasis was placed upon the status of the taxonomy of several litter inhabiting taxa and how ecological studies were affected. All but one of the LTER sites were represented. Several non-LTER systematists of litter arthropods were invited to participate in the discussions. The presently proposed workshop expands the area of interest to include most organisms and to include the soil habitat rather than just the litter layer.

Objectives of Proposed Workshop

1. To enhance the knowledge of soil organisms through collaborative research between ecologists and systematists,
2. To convene a group of ecologists and systematists specializing in soil organisms to facilitate cooperative work on these organisms on LTER sites,
3. To establish priorities for collaborative work on soil

organisms based upon needs identified by representatives from the LTER sites,

4. To develop action programs to address the goals identified including the development of appropriate cooperative research programs between ecologists and systematists on several LTER sites, including the establishment of permanent systematic collections on the sites and
5. To examine the possibility of establishing a postdoctoral program to provide cross educational opportunities in ecology and systematics (of soil organisms).

Justification

The proposed workshop will concentrate on soil organisms, emphasizing collaborative work between ecologists and systematists. These organisms were selected because of the importance of soil as a major component of virtually all terrestrial ecosystems. The catholic distribution of the major groups (e.g., nematodes, microarthropods, microflora) make them ideal for comparative studies across ecosystems. However, limited LTER funding precludes intensive investigation of selected components of soil systems. Therefore, it seems desirable to encourage individual investigators to pursue sources of external funding for ecological/systematic investigations. Certainly there is a need to develop better information on soil organisms from both an ecological and systematic standpoint. Unfortunately many ecologists fail to see the importance of complementary systematic work. Likewise, systematists often do not develop their ideas within a solid ecological framework.

A number of recent publications have emphasized the lack of adequate information on soil organisms in spite of the effort of some very dedicated scientists. There are far more organisms than scientists. A few selected examples will suffice to document this point. A recent brief prepared by Marshall, Kevan, Matthews and Tomlin (1982) for the Biological Survey of Canada stated that approximately 8,900 soil arthropod species were known from Canada and they estimate that 9,100 remain to be discovered. The same report stated that about 1000 species of soil Acari were known, but that 5000 remain to be described and only 60 species were known in the immature stage. Four hundred species of Collembola are known, about 150 remain to be described and no immature stages have yet been described. According to Marshall, a square meter in a forest site in Quebec yielded 168,000 soil Acari and 17,500 Collembola.

However, most work on ecology and systematics of soil invertebrates has been done in temperate regions, particularly in temperate forests, so if tropical and semi-tropical systems are considered, the number of undescribed species is certainly considerably higher. In a comparative temperate versus tropical study, Stanton (1979) found beta and gamma species diversity of litter mites to be twice as high in tropical forests as in temperate forests.

Wallwork (1976) reviews many of the soil animals, adding further documentation for the need for more work. For example, he says "the uniformity of appearance of nematodes as a group, creates taxonomic problems for the ecologist." Nicholas (1984) provides a thorough discussion of the biology of free-living nematodes, but Chapter Nine entitled Taxonomy, clearly demonstrates that much remains to be done

with this difficult, but very important taxon. Evidence is accumulating from some LTER sites that phytophagous nematodes may be a major consumer of NPP (Stanton 1981, 1983) and that microherbivores may be important mediators in soil nutrient availability (Coleman et al. 1984a,b). Freckman (1982) documents the need for more ecological work in the book she edited. Finally, the six hundred page volume edited by Lohm and Persson (1977) provides ample documentation of the importance of soil organisms in ecosystem studies. Thus the topic selected for this workshop is appropriate for consideration by LTER and cooperating scientists.

Planned Products

A. Development of common and collaborative research objectives between ecologists and systematists utilizing selected groups of soil organisms as models and the LTER sites as the pilot locations.

B. Identify priorities for collaborative research between ecologists and systematists chiefly involving LTER sites, based upon recommendations of workshop participants. Make these priorities known to LTER scientists, cooperating scientists and the ecological/systematic audience at large by means of a journal article by Lattin and Stanton.

C. Outline ways of encouraging the establishment of cooperative research programs between the two disciplines and among LTER sites based upon identified priorities.

D. Develop initiative for ecology and systematics identifying specific needs for work on the LTER sites.

Proposed Participants

The invited participants represent individuals with specific experience in the ecology and systematics of soil organisms. It is recognized that not all taxa are represented but an effort was made to select diverse groups where representation of both ecologists and systematists are available. Seven of the invited participants are not presently on LTER sites per se, but four of these (Stanton, Freckman, Norton and Snider) are cooperators or advisers on LTER sites. Four of the seven invited participants are systematists. Not surprisingly, ecologists are well represented on the LTER sites. We plan to extend invitations to several individuals for participation as non-supported observers. These are individuals with a strong interest in this area. These include Dr. Lloyd Knutson, USDA and recent Program Director of Systematic Biology for the National Science Foundation, and Dr. John Spence, University of Alberta, recent convenor of an International Symposium (June 1984) on Faunal Influences on Soil Structure held at the University of Alberta. Further, it is our intent to extend similar invitations to representatives of the National Science Foundation programs in Ecosystems, Ecology and Systematics.

We would expect that most, if not all, LTER sites would participate in this workshop. Participation is expected to be as one of the invited participants (and perhaps an additional individual as well) or as a representative sent by the site. Several individuals associated with the H.J. Andrews are expected to participate as well. (Cromack, Sollins, Schowalter, Moldenke, etc.).

Participants

Ecology

1. Dr. Nancy L. Stanton, University of Wyoming. Invertebrate community ecology, soil invertebrates.
2. Dr. Diana W. Freckman, University of California, Riverside. Ecology of free-living, soil nematodes.
3. Dr. Carolyn Bledsoe, University of Washington. Ecology of mycorrhizae.
4. Dr. John Zak, New Mexico State University. Ecology of soil fungi, nutrient cycling. (Jornada).
5. Dr. Ron Benner or Dr. Lex Maccubbin, University of Georgia. Soil microbiologist. (Okefenokee).
6. Dr. D.A.K. Crossley, University of Georgia. Soil invertebrate ecology. (Coweeta).

Systematics

1. Dr. John D. Lattin, Oregon State University. Soil arthropods-insects. (H.J. Andrews).
2. Dr. R.A. Norton, Syracuse University. Systematic studies of Cryptostigmata mites.
3. Dr. Ottie J. Dickerson, Clemson University. Systematics of nematodes.
4. Dr. Richard J. Snider, Michigan State University. Systematics and ecology of Collembola.
5. Dr. Martin Alexander, Cornell University. Soil bacteria.

Literature Cited

- Coleman, D.C., R.E. Ingham, J.F. McClellan, and J.A. Trofymow. 1984a. Soil nutrient transformations in the rhizosphere via animal-microbial interactions. Pp. 35-58 in: J.M. Anderson, A.D.M. Rayner, and D.W.H. Walton (Eds.), *Invertebrate-microbial interactions*. Cambridge Univ. Press.
- Coleman, D.C., R.V. Anderson, C.V. Cole, J.F. McClellan, L.E. Woods, J.A. Trofymow, and E.T. Elliott. 1984b. Roles of Protozoa and Nematodes in Nutrient Cycling. Pp. 17-28 in: *Microbial-Plant Interactions*. Soil Science Society of America.
- Freckman, Diana W. (Ed.) 1982. *Nematodes in soil ecosystems*. University of Texas Press, Austin. 206pp.
- Lohm, V. and T. Persson (Eds.). 1977. Soil organisms as components of ecosystems. *Ecological Bulletins (Stockholm)* 25:1-614.
- Marshall, V.G., D.K. McE-Kevan, J.V. Matthews, Jr. and A.D. Tomlin. 1982. Status and research needs of Canadian soil arthropods. *Bulletin of the Entomological Society of Canada* 14(1): 5 page insert.
- Nicholas, Warwick L. 1984. *The biology of free-living nematodes*. 2nd ed. Clarendon Press, Oxford. 251pp.
- Stanton, N.L. 1979. Patterns of species diversity in temperate and tropical litter mites. *Ecology* 60:295-304.
- Stanton, N.L., M. Allen, and M. Campion. 1981. The effect of the pesticide Carbofuran on soil organisms and root and shoot production in a shortgrass prairie. *J. Appl. Ecol.* 18: 417-431.

Stanton, N.L. 1983. The effect of clipping and phytophagous nematodes on net primary production of blue grama, Bouteloua gracilis. *Oikos* 40:249-257.

Wallwork, John A. 1976. The distribution and diversity of soil fauna. Academic Press, London. 355pp.

Budget

Travel

1 RT Laramie-Eugene	240	
1 RT Riverside, CA	300	
1 RT Las Cruces, NM LTER	370 - 200	
1 RT Athens, GA LTER	860 - 200	
1 RT Athens, GA LTER	860 - 200	
1 RT Syracuse, NY	894	
1 RT East Lansing, MI	812	
1 RT Clemson	866	
	<u>5204 - 600 =</u>	4602

Others

1 RT Ithaca, NY	900	
1 RT Seattle, WA	100	<u>1000</u>
		5602

LTER sites not covered

1 RT Niwot Ridge	235 - 200	35
1 RT North Central	235 - 200	35
1 RT Minneapolis	360 - 200	160
1 RT North Inlet	1000 - 200	800
1 RT IL Riv.	796 - 200	596
1 RT Northern Lakes, WI	400 - 200	200
1 RT Ronza	440 - 200	<u>240</u>
		<u>2066</u>
		<u>5602</u>
		7668

	Meals	Lodging	
Sunday	15	10	
Monday	20	10	
Tuesday	20	10	
Wednesday	20	10	
Thursday-depart	<u>15</u>		
	90	<u>40 = 130 x 17 =</u>	2210

17 RT air coach to Corvallis	7668
17 R&B for 5 days	2210
17 Limo @ \$30	510
	<u>10388</u>
Local trans	200
Misc	<u>150</u>
	10738

IV. Budget summary

17 RT air coach to Corvallis (200/LTER site deducted)	7668
17 R&B & Limo (5 days)	2720
Local trans	200
Misc	<u>150</u>
	10738