AN ABSTRACTOF THE THESIS OF

Verónica Núñez Terán for the degree of Master of Science in Entomology presented on August 25, 1999. Tittle: Ecuadorean Soil Arthropod Distribution in Native Vegetation, Pasture and Cropland; and a Potato Field with and without Pesticides.

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Dr. Andrew R. Moldenke / Dr. Andrew Brower

In the past 10 years we have witnessed the beginnings of the study of soil ecology as a unified science, and the general realization by soil scientists, farmers, and land managers that many of the most important economic aspects of soil health are controlled by biological factors.

This research focuses on alterations in a tropical soil microarthropod community under differing intensive agricultural protocols: native vegetation, pastures and cropland, during June, July and August 1998. The effect of pesticides in potato cultivation was also studied.

In the Ecuadorean montane forest, 361 morphospecies of soil arthropods, were classified during the three sampling months. August was the month with highest abundance and diversity. Acari, Coleoptera, Collembola, Diptera and Homoptera were the most abundant orders present in all the three types of land management.

The native vegetation had the most abundant and diverse representation of all soil arthropod taxa compared to the pastures and croplands. Coleoptera, Diptera, Diplopoda, Diplura and Hemiptera were significantly more diverse in native

vegetation than in pastures and croplands. The most abundant functional groups were the fungivores, herbivores and predators. The abundance of functional groups was significantly higher in the native vegetation for predators, herbivores and detritivores.

115 morphospecies of soil arthropods were identified in the study of arthropod response to pesticides in a complete randomized potato plot. Seasonal effects were documented for Acari, Collembola, Diptera, and Homoptera. Predators were most abundant in July and fungivores decreased in September. Neither arthropod orders nor functional groups showed a significant change in abundance between different treatments. Only Homoptera showed an increase in its abundance in the third sampling date and only in the Antracol plots. The potato plants in the whole block showed poor productivity, suggesting that the whole system was stressed by the fungal pest.

Ecuadorean Soil Arthropod Distribution in Native Vegetation, Pasture and Cropland; and a Potato Field with and without Pesticides.

by

Verónica Núñez Terán

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Con amor y gratitud:
Para mis padres, familia y amigos,
quienes confiaron en la culminación
y éxito de la presente disertación.

Ecuadorean Soil Arthropod Distribution in Native Vegetation, Pasture and Cropland; and a Potato Field with and without Pesticides.

CHAPTER 1

Introduction

The study of soil arthropods is a fascinating discipline that has captured the attention of several scientists many years ago. Most of the fauna that has been formally studied taxonomically or as functional groups belongs to Europe or North America (Anderson, 1977; Krantz, 1978; Moldenke, 1988; Balogh and Balogh, 1988; Borror et. al, 1989; Daly, *et al.* 1998; Balogh and Balogh; 1990; Dindal, 1990; Palacios Vargas, 1990; Palacios Vargas and Gomez Anaya, 1993; Coleman, 1996). Little is know about the uncatalogued fauna from the tropics, especially from Ecuador. There have been several recognized contributions (Balogh, 1988; Balogh, 1990 and Silva del Pozo, 1991) to it. The present study contributes to it by describing the abundance of the soil fauna groups in different land management systems and under specific conditions of potato agriculture.

The abundance and composition of soil invertebrates differ according to the ecosystem (Petersen and Luxton, 1982) and the season (Wallwork, 1976). Higher density and diversity of soil arthropods is expected in forest ecosystems as compared to pastures and croplands. The overall density and diversity of the soil fauna is basically determined by the amount of plant biomass available to support the food web. In croplands the presence of the arthropods is critical for the fertility maintanance of fertility. The second chapter of this disertation describes the diversity of soil arthropods (abundance and

composition) for three different types of anthropogenic land management practices: native vegetation, pasture and cropland.

Within the agroecosystem the diversity and abundance of the soil arthropods is less than other systems because of the nature of the disturbances that the cropland implies, but still, it supports an important soil arthropod fauna (Vreeken-Buijs, *et.al.*, 1998; Neher and Barbercheck, 1999). Some of these disturbances are plowing the land, inputs of fertilizers, pesticide application, and harvesting root products. The third chapter quantifies how four management protocols (Antracol, Javelin WG, neither pesticides, and both Javelin and Antracol together) for potato cultivation affect the diversity of the edaphic fauna.

CHAPTER 2

COMPARISON OF THREE TYPES OF LAND MANAGEMENT SYSTEMS ON SOIL ARTHROPOD DISTRIBUTION IN A NORTHWEST ECUADOREAN MONTANE FOREST

Introduction

Soil arthropod communities differ in abundance and composition in different ecosystems (reviewed in: Petersen and Luxton, 1982). Several studies have described communitiy differences for various land use practices within the same natural ecosystem in different parts of the world (Vreeken-Buijs *et al.*, 1998; Coleman, 1996). Lack of comprehensive information about soil fauna taxonomy makes any descriptive study difficult at best.

The objective of this study was to inventory soil arthropods (abundance and composition) for three different types of anthropogenic land management practice: native vegetation, pasture and cropland. The area for this study was a montane forest in the Cordillera Occidental area north of Quito, Ecuador.

Description of the Study Area

Ecuador contains many diverse ecosystems. Equatorial areas receive an abundance of direct sunlight, and the Andes Mountains influence weather patterns. The study area is classified as the Montane Biogeographic Zone (Cañadas, 1983). The montane biogeographic zone of the west range of the Andes consists of many hills which experience high humidity not only because of the high annual rainfall (2000–4000 mm), but also because of the amount of daily fog.

Traditionally, the land of the Cordillera Occidental area north of Quito is used for cattle grazing or agriculture. It is typical for most landowners to leave medium to large patches of native vegetation (after extracting three species for charcoal) on their land. Land practices are changing, however, with the need for more crop cultivation to support the growing human population in all three Ecuadorian regions (coast, highlands and valleys).

The present study was done on a 100 ha farm (the Pelagallo farm) 2880 m above sea level, 13 Km northwest of Calacalí Town in Pichincha Province (with the exception of one cropland quadrat which was located at the adjacent farm to the south). The soils of the area are characteristically nutrient-rich, high in decaying vegetative matter, and volcanic residue. The organic matter layer at the Pelagallo farm is 30 cm deep; below this the soil consists of a sand-ash mixture originating from the Pululahua Volcano to the east of the farm. The Pelagallo farm consists of three gentle hills from 2880 to 3000 m high, each approximately 500 m wide and each separated by a narrow valley. The hill on the other farm to the south which was used for part of the study, was comparable in height, slope, and soil type to the Pelagallo farm.

Methodology

The study was conducted from June to August 1998, which corresponds with the dry growing season in a normal year in the High-Andean region. This study, however, was done during an El Niño year, in which it rained throughout June, delaying the summer planting season by a month.

Three types of land management practices were compared: native vegetation, pasture and cropland. On each of two hills, a quadrat was established in each of the three

types of land management. The third hill had only native vegetation and pasture quadrats, with the remaining quadrat of cropland on the adjacent farm.

Description of the Study Sites

The study sites were selected based on the homogeneity of land use mangagement, each hill contained native vegetation, pastures and potato or oat croplands.

The native vegetation is generally characterized as a shrub flora containing plants in the families Melastomataceae, Piperaceae, Coriareaceae, Rosaceae, and Polygonaceae. Representatives of the families Bromeliaceae and Orchidaceae are also present, as well as lichens and mosses. Native vegetation usually contains individuals of the tree genera *Cedrella* (false cedar) and *Alnus,* as well as arboreal ferns; although present on the hills, these canopy species were not present within the actual study plots. As described before, the landowners had been traditionally managing this region for many decades; there are only few patches were canopy species can be found (next to streams). Most of the native vegetation is found as scrub in islands that were probably disturbed many years ago (at least 10 years) but since left unmanaged. In the present study these islands are refered as native vegetation remnants.

Pastures and grassy areas are characterized by the dominance of a grass introduced from Africa known as "kikuyo" (*Pennisetum clandestinum* Hochrt. ex Chiov.). Croplands are cleared and plowed annually prior to planting. Of the three crop quadrats, two were planted with potatoes and one with oats. The oat quadrat was chosen in order to minimize soil and microclimate variability; a third potato plot was not available within a reasonable distance of the other study plots. The difference in soil fauna due to cultivation was assumed to transcend any differences due to specific crop

type. All of the quadrats were south-facing and were between 2,900 to 2,960 m above sea level. The average slope for the native vegetation remnant sites was 29.7%, for pasture sites 24.3%, and for the cropland sites 29.7% (Table 2.1).

Table 2.1. Description of the management, slope, altitude, in the study sites by blocks.

Block	Study Site	Orientation	Altitude (meters)	% Slope
1	Native Plant Remnants	South	2,900	31.7
2	Native Plant Remnants	South	2,950	29.1
3	Native Plant Remnants	South	2,900	28.3
1	Pastures	South	2,900	23
2	Pastures	South	2,960	25.3
3	Pastures	South	2,900	24.7
1	Cropland Oat	South	2,960	30
2	Cropland Potatoes	South	2,960	30.2
3	Cropland Potatoes	South	2,900	29

Study Design

Three independent quadrats (20 m by 20 m) were located in each management type. Four soil samples 20 cm by 20 cm by 5 cm deep were taken at random within the borders of each quadrat (a meter wide for each plot was established, within which sampling was proscribed). Samples were taken on June 16, July 18, and August 23,

1998. The soil samples were placed in Berlese funnels for seven days and the soil microarthropods (mesofauna) were extracted into alcohol.

The soil sample specimens were sorted by morphotypes, assigned a functional group, and classified taxonomically to the family level through the use of several general keys (Krantz, 1978; Borror and White, 1984; Stehr, 1987; Moldenke, 1988; Balogh and Balogh, 1988; Borror et. al, 1989; Daly, *et al.* 1998; Balogh and Balogh; 1990). For the purpose of the present thesis, the discussion of the groups will be at the level of the orders and functional groups. The Acari, which were the most abundant group found in the study, was analyzed at the morphospecies level.

Analysis was based on ANOVA by SAS, with tests for block, season, and treatment effects. A probability level of $p<0.05$ is used throughout the study as the level of significance (Vreeken-Buijs,1998).

Results

During the three months of the study, a total of 16,740 individual soil arthropods were obtained. Three hundred and fifty-one morphospecies were sorted amongst 26 orders (Table 2.2) and eight functional groups. A listing of each morphospecies collected in each management type is presented in Appendices 1 and 2. All morphospecies will be archived accompanied by the designations in the Appendices in the Museo Nacional in Quito. A second less-complete set of taxa will be archived at Oregon State University.

The results were analyzed for block, season, and treatment effects. A block effect was significant for Acari ($p=0.033$) in July and for Hymenoptera ($p= 0.009$) in August.

Examination of the results show a higher abundance of Hymenoptera in block 1 because of the high number of Formicidae collected at that site. Prostigmata mites (Nanorchestidae) were represented in high numbers in block 1.

Table 2.2. Average density of orders and number of morphospecies of invertebrates found during June, July and August

Order	Number of morphospecies
Acari	115
Coleoptera	85
Diptera	26
Collembola	26
Hymenoptera	22
Homoptera	12
Thysanoptera	11
Hemiptera	10
Nematoda	9
Oligochaeta	5
Aranea	4
Diplopoda	4
Protura	4
Orthoptera	3
Diplura	2
Lepidoptera	2
Pseudoscorpionida	2
Psocoptera	2
Gastropoda	1
Geophilomorpha	1
Isopoda	1
Lithobiomorpha	1
Mecoptera	1
Pauropoda	1
Symphyla	1
TOTAL	**351**

Seasonal Effect

Seasonal effect far exceeded land management treatment effect. Abundance (density) of arthropods increased as the season progressed, more than doubling between June and August (Figure 2.1). Total species richness was equivalent during June and July, but increased significantly during August (Figure 2.2). This seasonal pattern was driven by increases in the numbers (density) of Acari and the Homoptera, and to a lesser extent by the Diptera, Diplura and Hemiptera (Table 2.3). Most taxonomic groups maintained relatively stable populations throughout the year, except that Diplopoda decreased through the summer. Analyzed in terms of functional groups, all four major functional groups increased significantly through the summer (Table 2.4).

Figure 2. 1 Total number of individuals by season.

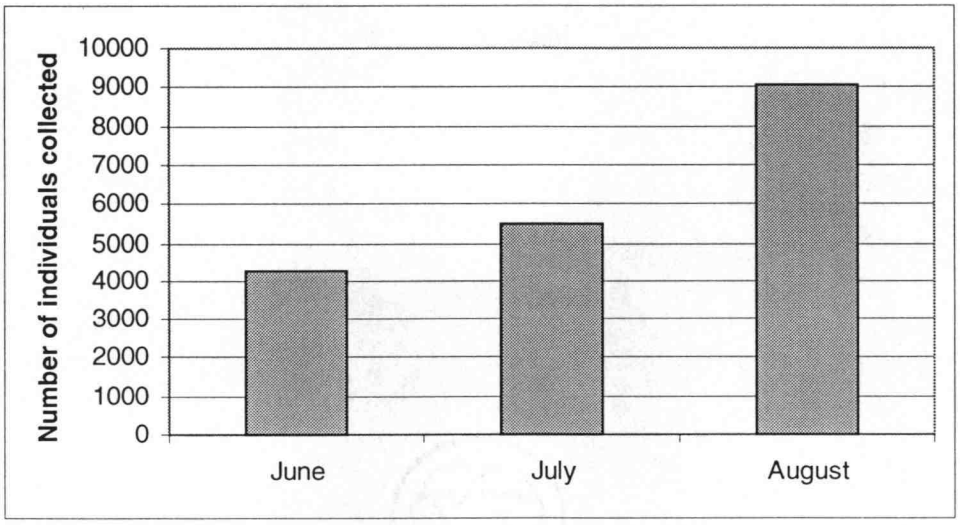


Figure 2.2. Total richness.

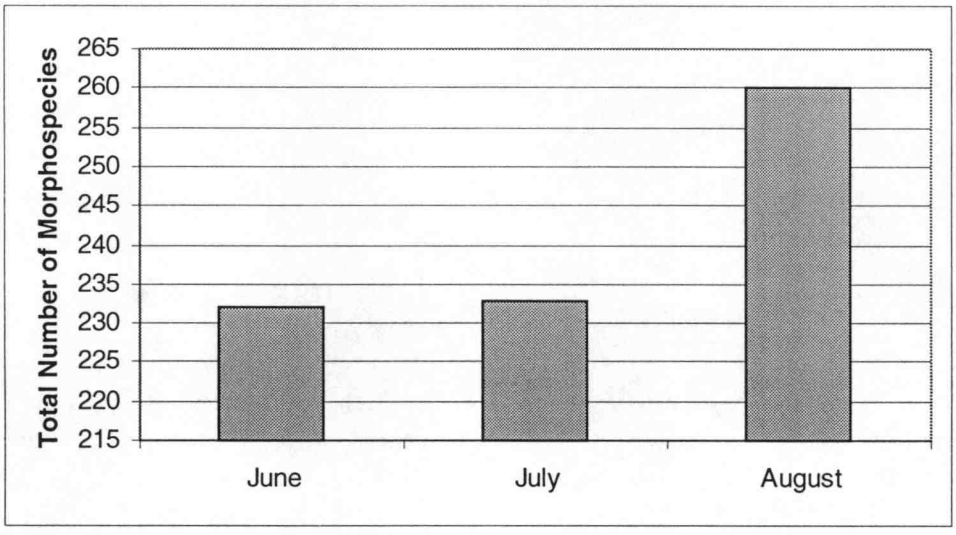


Figure 2.3. Total number of individuals by management.

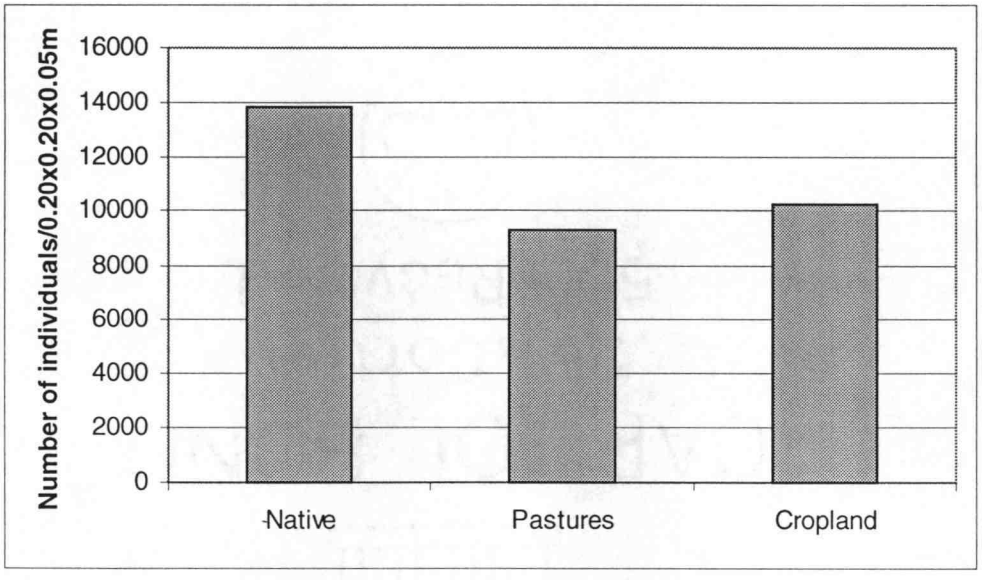


Table 2.3 Means for the orders (abundance) present in the three months. * = signficant p value at 5% level.

ORDERS	JUNE	JULY	AUGUST
Acari	51.89	88.08	*132.1
Aranea	0.17	0.19	0.28
Coleoptera	10.06	11.31	11.31
Collembola	31.28	27.89	35.36
Diplopoda	0.36	0.33	0.14
Diplura	0.36	1.53	1.83
Diptera	4.31	4.69	8.06
Gastropoda	0.00	0.03	0.00
Geophiliomorpha	0.19	0.44	0.25
Hemiptera	0.44	0.64	1.97
Homoptera	7.81	11.64	*47.2
Hymenoptera	1.03	0.53	4.61
Isopoda	0.06	0.14	0.00
Lepidoptera	0.36	0.14	0.33
Lithiobiomorpha	0.08	0.03	0.14
Mecoptera	0.00	0.03	0.00
Oligochaeta	1.06	0.47	2.08
Orthoptera	0.08	0.11	0.00
Pauropoda	0.00	0.08	0.03
Plesiopora	0.03	0.00	0.00
Protura	0.36	0.00	0.25
Pseudoscorpionida	0.08	0.14	0.42
Psocoptera	0.14	0.33	0.44
Thysanoptera	0.44	2.22	0.44
Symphyla	0.00	0.03	0.11
Total	**110.58**	**151.03**	**247.40**

Table 2.4 Seasonal means for the four most abundant functional groups.

	June	July	August
Fungivores	70.6	86.5	110.5
Herbivores	10.4	16.2	31.5
Predators	27.6	39.3	53.1
Bacteria Feeders	0.4	1.5	9.3

Management Effect

The land management system with the highest density of arthropods (Figure 2.3), number of orders (Figure 2.4), functional groups, and consequently, the highest number of species, was the native vegetation. The totals for the native vegetation were consistently higher in comparison to pasture and croplands in each season. (Figure 2.5).

Native vegetation was characterized by the highest densities of nearly all (19 of 25) the taxonomic groups (Table 2.5). Land management effects were found in the following orders: Coleoptera were most abundant in native vegetation during July (p value= 0.042) and August (p value= 0.058). Diptera was most abundant in July (p value= 0.015). Diplopoda most abundant in July (p value = 0.044). Diplura most abundant in July (p value = 0.0006) and August (p value=0.016). Hemiptera most abundant in August (p value= 0.01).

The density of the arthropods functional groups in native vegetation equaled or exceeded that of pasture and/or cropland for nearly all functional groups at all times (Table 2.6). Predators were most abundant in July (p value= 0.062). Herbivores were most abundant in July (p value= 0.012) and detrivivores were most abundant in July (p value= 0.027).

Throughout the study, the pastures had slightly higher abundances of Oligochaeta (earthworms), Protura, Hymenoptera, Lithobiomorpha, and Homoptera. Croplands were characterized by a slightly higher abundances of Psocoptera, and Diplura than the pastures (Table 2.5).

Only the order Acari was analyzed at the species-level, because it was the most abundant group. Acari had 115 total morphospecies. Total species richness (S) of Acari

was greatest in native vegetation, at an average of 67 morphospecies, pasture had an average of 59 morphospecies, and cropland had an average of 51 morphospecies of Acari during the three sampling months (Figure1.6).

Figure 2.4 Total orders of invertebrates present by management during all three times.

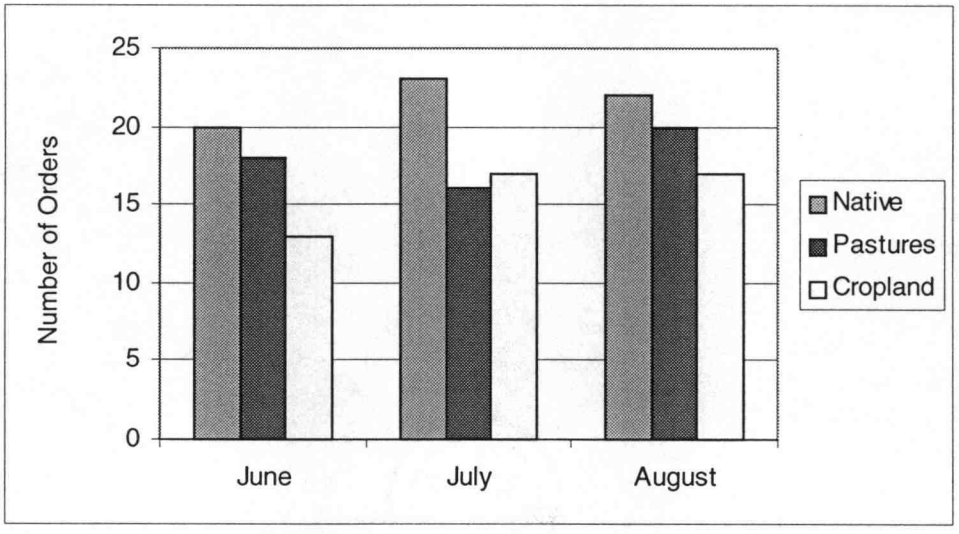


Table 2.5 Average of individuals by taxonomic groups per management

Orders	Native	Pastures	Cropland
Isopoda	0.19	0.00	0.00
Acari	121.92	89.39	60.75
Aranea	0.42	0.08	0.14
Coleoptera	*20.94	6.83	4.89
Collembola	45.81	31.22	17.50
Diplopoda	*0.75	0.06	0.03
Diplura	*3.30	0.00	0.42
Diptera	*10.80	2.50	3.75
Gastropoda	0.03	0.00	0.00
Geophiliomorpha	0.75	0.08	0.06
Hemiptera	*2.5	0.31	0.25
Homoptera	6.19	8.42	52.06
Hymenoptera	1.33	3.14	1.69
Lepidoptera	0.42	0.17	0.25
Lithiobiomorpha	0.03	0.17	0.06
Mecoptera	0.03	0.00	0.00
Oligochaeta	0.86	2.64	0.11
Orthoptera	0.14	0.06	0.00
Pauropoda	0.08	0.03	0.00
Plesiopora	0.00	0.03	0.00
Protura	0.06	0.53	0.03
Pseudoscorpionida	0.56	0.06	0.03
Psocoptera	0.44	0.22	0.25
Thysanoptera	2.31	0.69	0.11
Symphyla	0.06	0.06	0.03
TOTAL	181.61	146.67	142.39

Table 2.6. Average of individuals for the functional groups per management at all three times. *= significant p value at 5% level.

	JUNE			JULY			AUGUST		
	Native	Pasture	Cropland	Native	Pasture	Cropland	Native	Pasture	Cropland
Algivores	0.2	0.3	0.3	0.4	0.3	0.3	0.8	0.8	0.3
Bacteria feeders	0.5	0.2	0.7	0.4	2.5	1.6	13.8	3.7	10.3
Fungivores	91.4	69.7	50.7	115.3	75.4	68.9	159.8	105.8	65.9
Herbivores	13.3	13.4	5.0	*16	3.5	*29.5	18.2	14.0	126.0
Parasites	1.0	1.3	0.1	0.1	0.3	0.0	0.3	0.4	0.7
Predators	40.4	25.7	16.7	*75.9	29.8	12.1	78.0	53.5	27.8
Detritivores	1.7	0.4	0.6	*3.9	0.3	0.3	0.6	0.3	0.3

Figure 2.5 Means of numebers of individuals in four orders in the three types of land management.

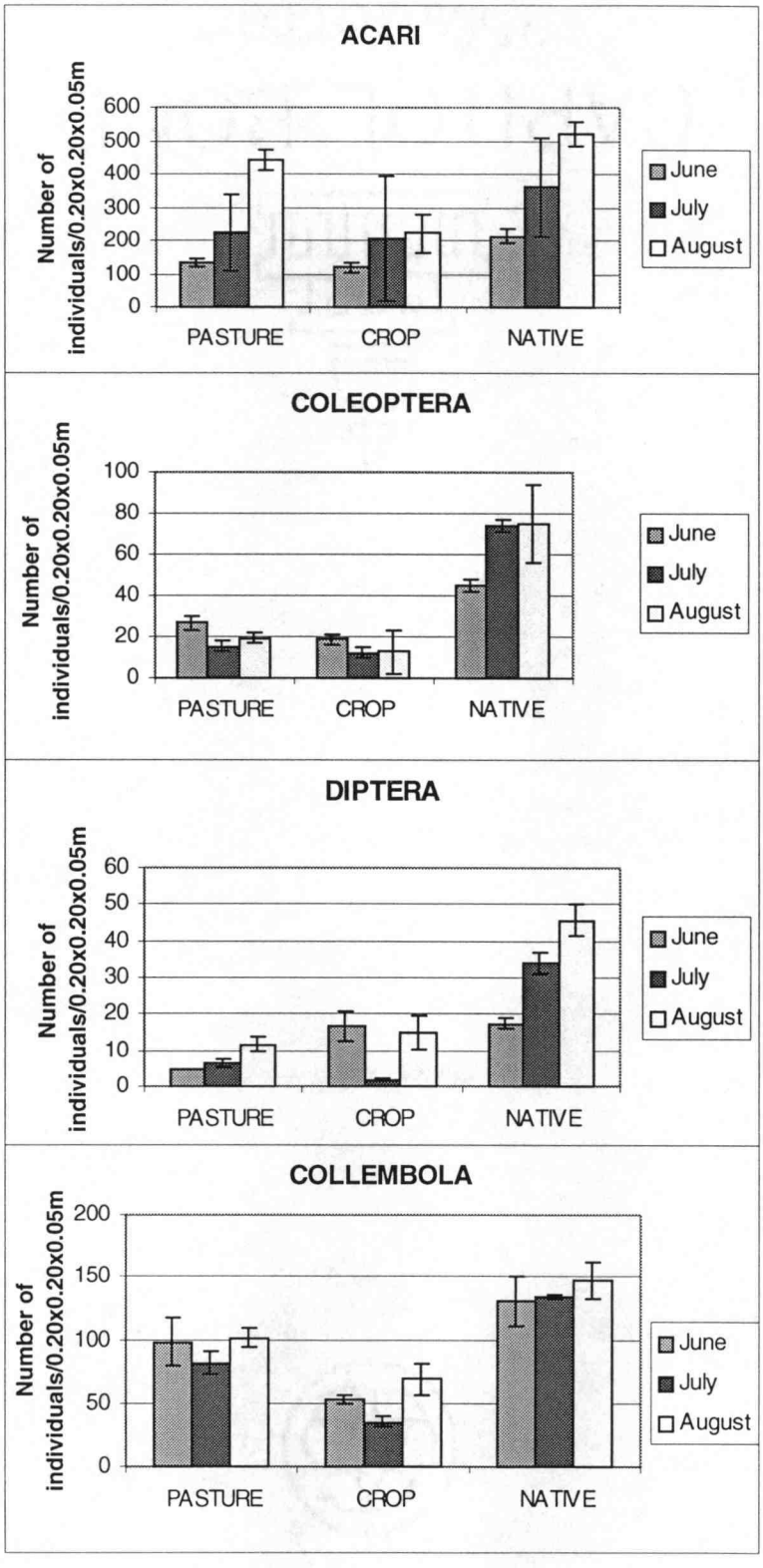
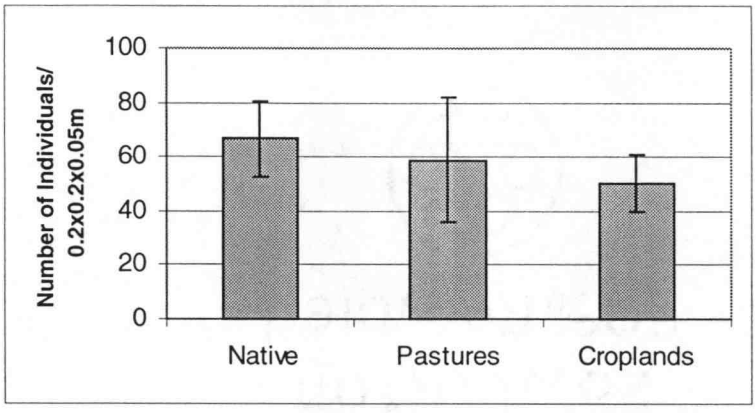


Figure 2.6 Number of morphospecies of Acari at all three sampling months.



Discussion

Seasonal Effect

Typical of arthropod studies worldwide, timing of sequential seasonal samples usually has a greater effect than any sort of microhabitat or management variable (Anderson, 1977; Silva del Pozo, 1991; Bamforth, 1997; Didden and Fründ, 1997; Ekschmitt and Wolters, 1997; Zunke, *et al.* 1997). This observation reinforces the necessity for multiple season sampling and the necessity to match seasons when comparing data from the same locality. Of the five most abundant taxonomic groups, three (Acari, Diptera, Homoptera) increased through the summer season, while two remained at similiar densities (Coleoptera, Collembola) (Talbe 2.3). In the absence of any published data of abundance patterns from equivalent sites it is difficult to interpret these results. The two mesoarthropod groups (Acari and Collembola) would be expected to increase equally to the gradual drying of the soil, and then respond equally to increased plant growth. This was observed for Acari. The Diptera and Coleoptera, both contain a vast diversity of functional types, and again were expected to respond equivalently, but they didn't. Coleoptera decreased through the summer in pasture and crops, but increased in the native vegetation. Diptera increased through the summer in pasture and native vegetation but decreased sharply midsummer in the croplands.

Within the cropland samples, we *a priori* expected to see an increase in all groups synchronous with increasing plant biomass, Table 2.7 indicates a steady progression of increasing density for total arthropod abundance. However, analysis from a functional group perspective shows this trend to be true only for herbivores, bacterivores and parasites; fungivores remain relatively constant and predators decreased in July but

recover in August. The Detritivores and parasites decreased throughout the summer as would be expected correlated with an increase in exposure caused by drier conditions

Table 2.7. Means of the functional groups in croplands along June, July and August.

	JUNE	JULY	AUGUST
Algivores	0.3	0.3	0.3
Bacteria feeders	0.7	1.6	10.3
Fungivores	50.7	68.9	65.9
Herbivores	5.0	29.5	126.1
Parasites	0.1	0.0	0.7
Predators	16.7	12.1	27.8
Detritivores	0.6	0.3	0.3
Total	73.9	112.7	231.4

Table 2.8. Total number of Acari in three functional groups per management

Bacteria feeders	175	76	151
Fungivores	2709	1687	1559
Predators	1468	974	434

Management Effect

The diversity and density of the soil fauna in northwest Ecuador was expected to be maximal in the native vegetation (Petersen and Luxton, 1982; Wallwork, 1976). I hypothesized that in the absence of major disturbances within the native vegetation remnants that a high percentage of the original biodiversity would be maintained (Anderson, 1977; Palacios Vargas, 1990). Fragmentation of the habitat would have led to a diminution of species richness (but not total density) within any individual fragment, as predicted by island biogeography theory. Similarly, I expected a difference at the level the occurrence of individual species between the currently isolated remnant stands. To understand the results of the management effect on soil fauna, it is important to remember that the changes would have occurred in both the quality (species of dominant plants) and quantity (net primary production) of food supply (Usher, 1985; Lal, 1987).

Any forest/shrub ecosystem provides many microhabitats for the soil fauna and keeps the soil buffered with respect to temperature and moisture (Wallwork, 1976). By nearly any measure presented in this paper, the native vegetation contained higher densities and diversity than either the pasture or cropland (Table 2.5).

I expected that pastures would be intermediate in diversity between native vegetation and croplands. Pastures, in comparison to croplands, offer more suitable conditions to microarthropods since they are not subject to tillage, rotation of crops, or chemical pesticides (Vreeken-Buijs *et al.*, 1998). The three pasture quadrats were not subjected to intense grazing (an average of only one cow/ha). Grazing at this intensity would not be expected to compact the soil, the major factor known to decrease diversity

and density of microarthropods in pasture soils (Wallwork, 1976). Pastures were higher in density and diversity than croplands.

In general, cultivation has the effect of decreasing the soil species diversity as a consequence of mechanical disturbance by plowing (Miranda and Palacios Vargas, 1992). Plant pests, or species that require drier habitats for development, may increase their populations in croplands, which, with lower amounts of protective cover, tend to be drier in the surface layers. Despite the differences in crop and pesticide regimen among the cropland quadrats, in sum the croplands showed the lowest numbers of morphospecies of all groups as expected.

The quadrat with oats showed a significantly higher abundance and diversity of morphospecies than the two potato quadrats. The oat block effect is likely the result of one or more of the following reasons: (1) Lagerlof and André (1987) report that the soils under root and tuber crops exhibit more intense perturbation than other types of crops, resulting in a low microarthropod population. (2) The previous year the oat quadrat was occupied by *Vicia faba*, a legume that is known to fix nitrogen; this could have left higher amounts of nutrients available in the soil, and (3) no pesticides were used during the current year on the oats, whereas the potatoes received both repeated fungicide (Anthracol) and insecticide (*Bacillus thuringiensis*) treatments.

The most prevalent orders found in this study correlated well with the conclusions in most soil textbooks that the orders with highest abundance are typically Acari, Coleoptera, and Collembola (Lal, 1987; Dindal, 1990; Miranda and Palacios Vargas, 1992; Christiansen, 1992). The orders Diptera and Homoptera were also important in this particular study. Populations of these orders vary in abundance between habitats

depending on their abiotic requirments; Acari and Collembola are limited by moisture levels and soil mineral layer (Anderson, 1977; Miranda and Palacios Vargas, 1992).

The Acari are usually the dominant group in the soil worldwide (Petersen and Luxton, 1982); they are the most abundant in this study as well. The Collembola predominate in arctic/boreal habitats, but decrease in overall number and diversity in tropical soils (Christiansen, 1992); though they are by no means infrequent in this study they generally fell to third rank behind the Coleoptera in total diversity. One of the most generally observed phenomena in soil community structure is a switch in emphasis between the generally r-strategist Collembola to the K-strategist Oribatida (Acari) in more stable communities (Christiansen, 1992; Coleman and Crossley, 1996; Moldenke, pers. comm.). In this study, however, the ratio of individuals of Acari:Collembola was approximately 3:1 in both the native vegetation patches and the pasture, increasing to 4:1 in the cropland. That all three ratios are so close to 1:1, and that the ratio is highest in cropland, are both surprising and suggest that none of the three land managements are stable ecosystems.

A second management trend common to many ecosystems worldwide is an increase in the ratio of tiny Prostigmata (Nanorchestidae in particular) to oribatid mites as the level of disturbance increases. In these samples 97% of the Nanorchestidae (4 species) occurred in the cultivated soil, according to prediction (Lal, 21987; Vreeken-Buijs *et al.*, 1998). There are two possible reasons why nanorchestids and other related prostigmatid mites prefer highly disturbed soils: (1) a broader physiological tolerance of less humid soils; and (2) a feeding preference for soil algae, likely to thrive in the absence of a vegetative canopy (especially in moist soils like those in Ecuador).

A third composite trend evident in the mite data concerns the relative abundance of fungivores and predators. Bacterial-feeding specialists were very uncommon in all three plant community types (Table 1.8). The ratio of fungivorous mites to predaceous mites was approximately 2:1 in both the native vegetation and the pasture. This ratio is much lower than the worldwide averages reported by Petersen and Luxton (1982). The ratio of fungivores to predators doubles to 4:1 in the cropland. As pointed out by Benckiser (1997), this is a common observation in many types of agricultural systems worldwide.

Trophic Foodweb Considerations

I expected that the woody remnant forest vegetation would support the highest level of fungivores. In general forest vegetation throughout the world supports the highest levels of soil fungal biomass (Dr. Elaine Ingham, pers. comm.). This level is highest in the temperate *Pinus, Pseudotsuga, Quercus* and *Eucalyptus* forests due to the prevalence of ectomycorrhizal fungal symbioses with the dominant vegetation (A. Modenke, pers. comm.). Moist tropical forests tend to be arbuscular mycorrhiza-dominated (and hence with less biomass of soil fungal biomass), but the ratio of fungal biomass to bacterial biomass still far exceeds 1.0. The ectomycorrhizal relations of the Ecuadorian montane cloud forest have not been studied, but are more likely to be arbuscular mycorrhizal than ectomycorrhizal. Since the deep soil horizons have not been visibly disturbed in the native vegetation stands, it is likely that there is also a large biovolume of saprophytic fungi, in all three vegetation types, but clearly with the least in the cropland.

Though pasture lands usually are bacterial-dominated in theory, perhaps tropical pastures and croplands are fungal dominated, as was the case in the study done in Costa Rica by D. Perry and E. Ingham (Dr. E. Ingham, pers. comm.). The lack of overgrazing and deep soil humus horizon has likely maintained a healthy saprophytic fungal biomass since it was deforested several decades ago. Fungal biomass in the crop soil should be lower than under the other two conditions, since plowing and residue burying took place several months before the study was initiated, and the fields were allowed to remain fallow in the meantime. The population of fungivores is most dense and diverse in the remnant woody vegetation, but not significantly so. Crops maintain the lowest population of fungivores.

Ground-dwelling herbivores (root-feeders, principally) would be expected to be most abundant in native vegetation, followed by pasture, with cropland being the least. Root biomass (not measured) is liable to follow this decreasing sequence. If there were populations of pest root-feeders in the disturbed cropland soil (in the absence of potential predators) then the cropland response might vary from this prediction. In fact, native vegetation did have the highest population and diversity of root-feeding herbivores (Hemiptera: Cydnidae) in June and cropland (Pseudococcidae) in July (Table 1.6).

Following the fungivores for highest densities were predators in the natural vegetation remnants. Ground-dwelling predators would be expected to track total edaphic soil fauna density, likely to be driven by fungivores and hence be much higher in remnant vegetation followed by pasture and disturbed cropland (Usher, 1985). Predators were present in the expected relative frequencies at the beginning of the study, they decreased (not significantly) in July and had high abundances in August (but not

statistically significant) (Table 2.6). Predators seem to be abundant where herbivores abundance was higher in the croplands (Table 2.7).

Bacterial-feeders were represented by oribatid mites (Acari) of the genera *Suctobelbella*, *Quadroppia* and *Pelops*. One would expect bacterial populations to be highest in the pastures and the cropland. Densities were too low to allow for an adequate comparison. Vreeken-Buijs *et al.* (1998) suggest that the presence of bacterial-feeders is related to the early stages of organic matter decomposition (note presence of cow feces), rather than to any kind of land-use management; they also document that their abundances are very localized. The algivorous Psocoptera were most abundant in pasture; the continually moistened grass leaves and thick insulation of the vegetation may allow considerable algae to grow on the surfaces of the grass leaves.

Conclusions

1. The soil arthropod fauna of the remnants of native vegetation are the most dense and diverse, followed by pasture. Cropland maintains the lowest densities and diversities. The most dominant soil fauna groups were Acari, Coleoptera, Collembola, Diptera and Homoptera (respectively).
2. Land management (vegetative community, i.e., native vegetation, pasture or cropland) affects the soil community, but was not revealed as significant in this study for most taxonomic and functional groups. Seasonal changes were far more important than management effects.
3. Fungivores were the dominant soil trophic grouping in all management types. Predators were most abundant and diverse in the remnant vegetation. Herbivores, algivores and bacterial-feeders were most abundant in August.

4. The diversity of soil microarthropods in the northwest Montane Forest in Ecuador was high, with 351 morphospecies identified in a total of three sampling months from a total of only 4.3m^2 of soil (mean of 240 species/1.4m^2 mo). There were 30 new morphospecies that appeared in the last sampling month, it would be reasonable to expect that with continued sampling through the year, a large number of additional morphospecies would be discovered.
5. As with all ecological studies, the resultant pattern observed in faunal communities depends upon the scale at which they are examined. Functional group or order-level resolution of analysis portrays a stability that belies the individual population dynamics at the extremely diverse species-level. Diversity is so great in these soils that the majority of species encountered were too infrequent to include in the samples for statistical analysis. Farms in the Ecuadorian Montane ecosystem are undoubtedly much more species-rich than the majority of cropland soils in areas of extensive monocultures. Mountain farms represent a series of small islands of cropland surrounded by large expanses of semi-natural plant communities. On a landscape basis even in these soils are already so impacted by fungal and arthropod pests, that they cannot yield commercial crops without heavy fumigation. More descriptive analyses of the current populations of soil biota are necessary unless they too are to be lost and further contribute to the negative feedback of region-wide soil health problems.

CHAPTER 3

RESPONSE OF SOIL ARTHROPODS TO THE APPLICATION OF BIOLOGICAL AND CHEMICAL PESTICIDES

Introduction

For many centuries the predominant land use in the inter-Andean valley of Ecuador has been cattle grazing and agriculture. Most of the terrain is either hilly or mountainous. Potato (*Solanum tuberosum*), a native Andean tuber, is the staple crop, and is grown at altitudes of 2,000–4,000 m. The growing season begins in April or May when the intense rainy season ends. Precise management varies with different landowners, but overall management is similar throughout the region. On these mountain slopes the soil is plowed by hand or by livestock before planting. The fertilizer utilized is NPK (Kristalon-Hydro Agri) in a ratio of 13:40:13. In Ecuador there are 28 major crop diseases and pests affecting potatoes (FUNDAGRO, 1991; FUNDAGRO, 1993; CESA, 1995; and CESA, 1993). The most commonly used pesticides are Antracol 70 PM (Bayer) dithiocarbamate that is both a fungicide and insecticide, and more recently Javelin WG (Sandoz Agro), *Bacillus thuringiensis*, a bacterial insecticide. The applications take place when the plant is growing most rapidly (2^{nd} month) and when the plant is blooming (3^{rd} and/or 4^{th} month). All potato cultivation is currently dependent upon fumigation with Antracol 70 PM to control the omnipresent *Pythium*, *Phytophthora*, and *Alternaria* root-rots and wilts. The abundance of these diseases implies an already severely altered food web and decreased soil biodiversity in anthropogenic areas. The

potato insect pests are primarily the lepidopteran (Noctuidae) *Agrotis ypsilon* and the coleopteran (Scarabaeidae) *Barotheus* sp. (FUNDAGRO, 1991).

Antracol (Propineb) persists in the system for 10 days and is labelled for toxicity to fish and rats but not bees (Ware, 1983). The *Bacillus thuringiensis* toxins are presumably persistent for months in the soil (Tapp and Stotzky, 1998). The information about the direct effect of these factors on soil fauna in the field is not conclusive.

The objective of this study was to quantify how four management protocols for potato cultivation (presence or absence of pesticides and fungicides) affect the diversity of the edaphic fauna.

Materials and Methods

Description of the Study Site

The study took place on a farm (which included adjacent natural vegetation) in Pichincha Province (78°33'30''W; 0°05'30''N), 2899-3000 m above sea level. The life zone corresponds to humid mountain forest (Cañadas, 1983), although most of the land has probably been used for agriculture for centuries. The average annual temperature is 12-18°C with an average annual rainfall of 2,000– 4,000 mm. The soil consists of deep black silt derived from pyroclastics known as Dystrandept/Cryptandepts, and has a base saturation of <50% with a high capacity for water retention (about 50%). Regional soil survey maps which are available for the region have a relatively high resolution of 1:200,000. Lab analyses were done to determine the physical characteristics for this particular soil. The texture was 30% sand with high quantities of Mg/K (3.3 meq/100 g); sufficient quantities of NO_3, Ca, Mn, S, and Zn (11.07 meq/100 g); an excess of Fe/Mn (5.91 meq/100 g); and average quantities of Fe, Cu, NH_4, Na, K and P (meq/100 g).

This particular study site was in its second year of potato cultivation, having been converted directly from native woody vegetation. The land was fallow for five months before being prepared for the growing year. The preparation consisted of furrowing the soil and applying the organic fertilizer several days before the potato eyes were planted. Planting occurred in mid-May, using INIAP (Instituto Nacional para Investigaciones Agro-Pecuarias) certified potato eyes, in a plot 30 m by 52 m with an average slope of 35%. Three or four of the eyes were placed in the furrow with fertilizer, then covered with soil. The distance between the plants was 30 cm with 50 cm between rows. The plantation was not irrigated; rain provided all necessary water.

Since the study site was located on a slope, there was the possibility of water moving the chemical treatments between research sample locations. As the hill was more gently inclined vertically than horizontally, a transversely-sited randomized complete block design was utilized (Table 3.1) to eliminate the effects of slope variation and chemical movement within the experimental site. Once the plants were established, the research field was divided into 4 blocks, each block consisting of 4 plots that were 7.5 m by 13 m. Within a block each plot was randomly assigned one of the four treatment types. The treatment was dissolved in water with an appropriate amount of foliar fertilizer (Vitafol-Marman) as directed on the product label. The treatments were applied directly to the plant. One person was in charge of spraying all plots to ensure that the quantity of spray and the application technique were constant. Control plots were sprayed with foliar fertilizer dissolved in water.

Experimental Treatments

1. Control (foliar fertilizer dissolved in water)

2. Javelin WG (*Bacillus thuringiensis* ssp. *kurstacki*)

3. Javelin WG + Antracol 70 PM (Propineb)

4. Antracol 70 PM (Propineb)

There were 4 different treatments by 4 replicate blocks by 4 samples/plot; N = 64 total soil samples/sampling period. Samples were taken every six weeks during the 18-week study: pre-spray (July 5th), after 1st spray (August 1st) and, after 2nd spray (September 6th). N= 3 sampling periods (Table 3.1).

Table 3.1. Randomized complete block design

Block	Overall Hillside Up-slope				Transverse Slope %
1	2	4	3	1	44.4
2	2	4	1	3	40.9
3	1	3	4	2	30.2
4	1	2	3	4	24.5

Overall Hillside Down-Slope

Sampling Microarthropods

Soil samples (20 cm by 20 cm by 5 cm) were taken between the potato plants and placed in Berlese funnels at the Catholic University in Quito for seven days to extract arthropods from the sample cores. In order to minimize the number of Berlese funnels constructed, as well as to mitigate the correspondingly high demand for electricity, one half of each set of samples from each treatment was placed in Berlese funnels for

extraction the first day and the other half on the 7th day. The samples that weren't in the funnels, were stored in a cool dark place until the funnels were available.

Harvest Yield

After the second spray application, six live plants within each experimental plot were randomly selected, uprooted and weighed (wet and dry) to get productivity data for the whole plant (roots and top) minus potatoes, and then the potatoes from each plant were weighed separately for wet weights only.

Arthropod Processing

The samples were classified by counting the numbers of different morphospecies and identifying each to functional group (feeding habits). The specimens in the reference collection were preserved in alcohol. The primary reference collection is deposited at the Museo Nacional in Quito, with additional reference specimens at Oregon State University. The reference collection corresponds to the species designations found in the Appendix 3 and 4.

For the statistical analysis the mean of the four samples per assigned plot was used. Data were log transformed to meet normal distribution requirements for the ANOVA. The presented means in all of the tables and graphs are from the untransformed data. The significance level utilized was $p<0.05$.

Results

A total of 115 morphospecies distributed among 18 orders and 7 functional groups were identified. The orders with the highest abundances of individuals and number of species were Acari, Coleoptera, Diptera, Collembola, and Homoptera (Table 3.2).

Table 3.2. Number of species and total number of individuals through the study season for 18 orders of soil invertebrates.

Orders	Number of Species	Abundance
Acari	36	2782
Collembola	8	745
Diptera	11	445
Coleoptera	33	439
Homoptera	6	34
Psocoptera	2	28
Diplura	2	20
Annelida	1	18
Lepidoptera	3	17
Nematoda	1	16
Hemiptera	1	11
Geophiliomorpha	1	9
Aranea	3	8
Lithiobiomorpha	1	6
Thysanoptera	1	3
Hymenoptera	3	3
Mollusca	1	2
Diplopoda	1	1
Total	115	4587

Functional groups showed considerable seasonal differences (Table 3.4). Predators were more abundant during July, before any chemicals were applied (ANOVA, df=2, p=0.0001). Fungivores showed a precipitous decrease during September, algivores show a 5-fold (but statistically insignificant) increase in September compared to August (Table 3.4).

Seasonal Effect

Seasonal variability (study was done in an El Niño year with rain extending abnormally through June) independent of a treatment effect was recorded for five orders. Acari increased by the end of the season (ANOVA, df = 2, p = 0.029), Collembola and Diptera had higher abundances in July, which decreased in August and recovered in September (ANOVA, df = 2, p = 0.016 and 0.005 respectively). Homoptera had a high population in July which precipitously decreased by the second sampling in August (ANOVA, df= 2, p = 0.00002). Coleoptera had a stable abundance (Table 3.3).

Table 3.3. Seasonal variability in the mean number of soil insects in five orders during three sampling times.

	July. 5	August. 1	September. 6
Acari	9.83	12.37	21.15
Coleptera	2.11	2.56	2.06
Collembola	6.62	2.31	2.67
Diptera	4.62	1.48	2.37
Homoptera	0.36	0.08	0.06
TOTAL	23.54	18.81	28.32

Table 3.4. Seasonal variability in the mean number of soil insects in seven functional groups during three sampling times. * = p value < 0.05.

	July. 5	August. 1	September. 6
Algivores	0.12	0.84	3.79
Bacteria Feeders	0.29	0.09	0.43
Detritivores	0.02	0.00	0.02
Fungivores*	14.27	15.22	0.88
Herbivores	5.15	2.36	3.64
Parasites	0.00	0.02	0.02
Predators*	*4.08	0.62	1.06

Treatment Effect

There were no treatment effects on total arthropod density either in the yearly results, or analyzed by either of the two post-treatment samples independently (Table 3.5). Analyzed by separate taxonomic orders, only the Homoptera showed a treatment effect (Figure 3.1): during September they were significantly ($p<0.05$) more abundant in both the Antracol and joint treatments. The major functional groups were fungivores, herbivores, predators, parasites, algivores, and bacterial feeders. The only functional group that presented a statistically significant difference due to treatments was algivores (Fig. 3.2). Algivores (Psocoptera) were more abundant in the control plots in August than in either of the other two treatments (Table 3.6). The herbivores showed a strong increase in numbers in both the Antracol and joint applications, but the results were not significant.

ANOVA analysis was conducted on the six most abundant species of mites. *Tectocepheus* increased significantly during September in both the control and Javelin treatments (df = 3, p = 0.014; Table 3.6), no other difference were significant.

Table 3.5 Arthropod orders means for each sampling season and treatment

COLEOPTERA			
	July. 5	August. 1	September. 6
Control	1.9	3.8	2.4
Javelin	3.1	2.0	1.3
J + A	1.5	2.1	1.7
Antracol	1.9	2.3	2.9
ACARI			
	July. 5	August. 1	September. 6
Control	8.5	16.9	23.2
Javelin	15.4	15.0	13.8
J + A	4.8	11.1	21.7
Antracol	10.6	6.6	25.9
COLLEMBOLA			
	July. 5	August. 1	September. 6
Control	3.8	1.6	2.8
Javelin	15.1	3.2	1.9
J + A	1.9	1.3	2.1
Antracol	5.6	3.2	3.9
DIPTERA			
	July. 5	August. 1	September. 6
Control	8.1	2.4	1.9
Javelin	3.6	0.9	1.4
J + A	5.6	1.6	4.1
Antracol	1.2	1.1	2.0
HOMOPTERA			
	July. 5	August. 1	September. 6
Control	0.2	0.0	0.0
Javelin	0.0	0.1	0.0
J + A	0.6	0.0	0.1
Antracol	0.6	0.2	0.2

Figure 3.1 Abundance of the five taxonomic orders of soil arthropods in the different treatments

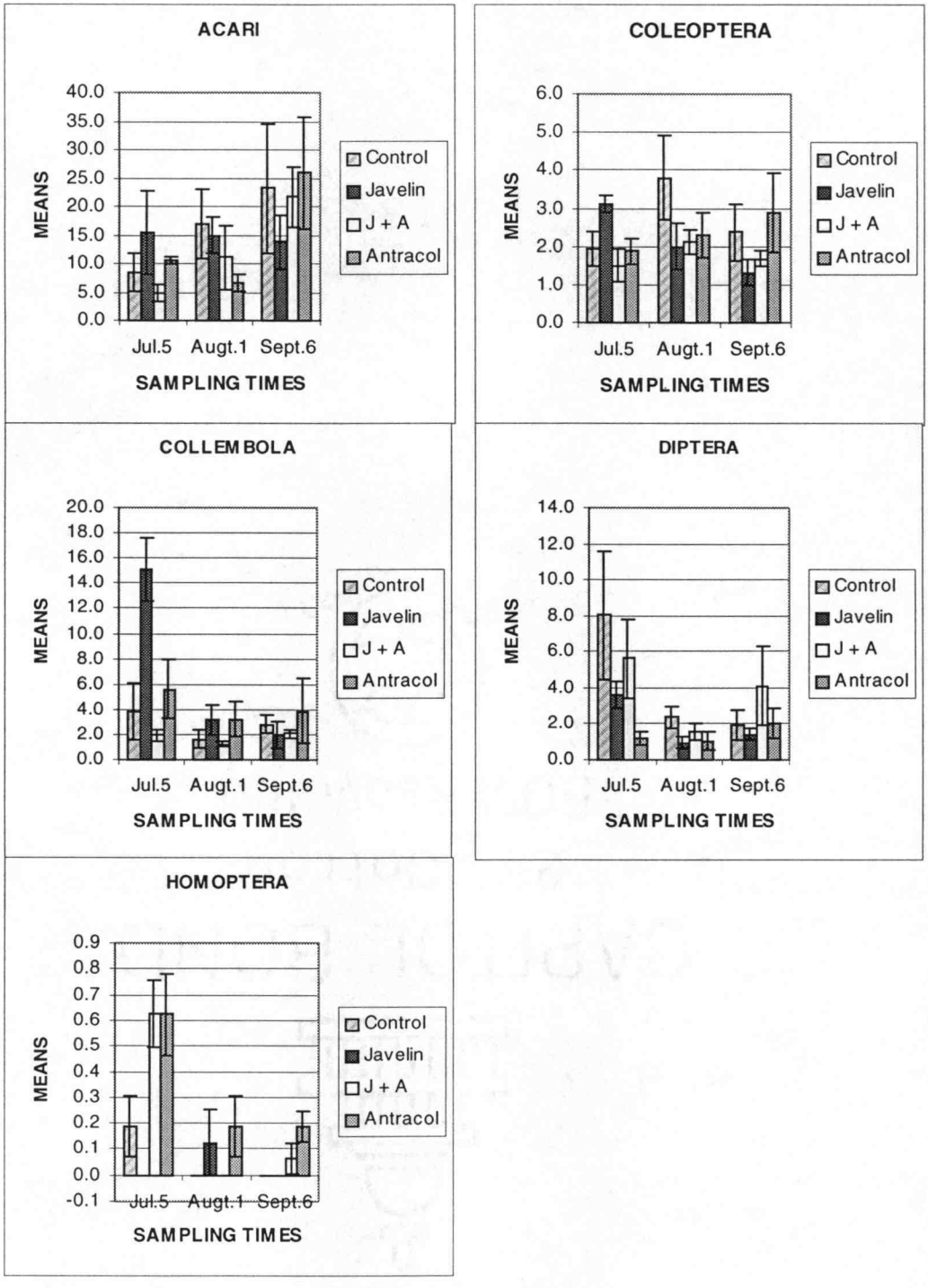


Figure 3.2 Abundance of the four functional groups of soil arthropods in the different treatments

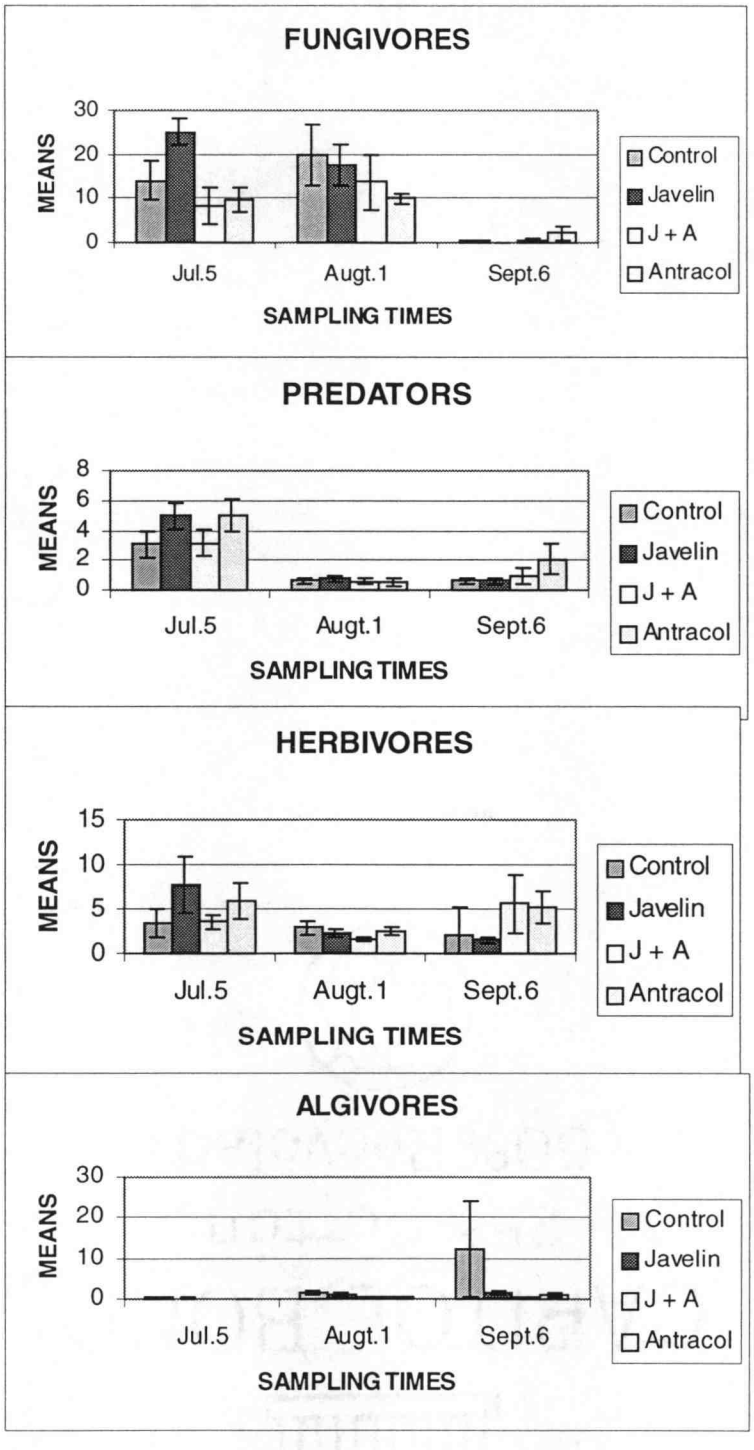


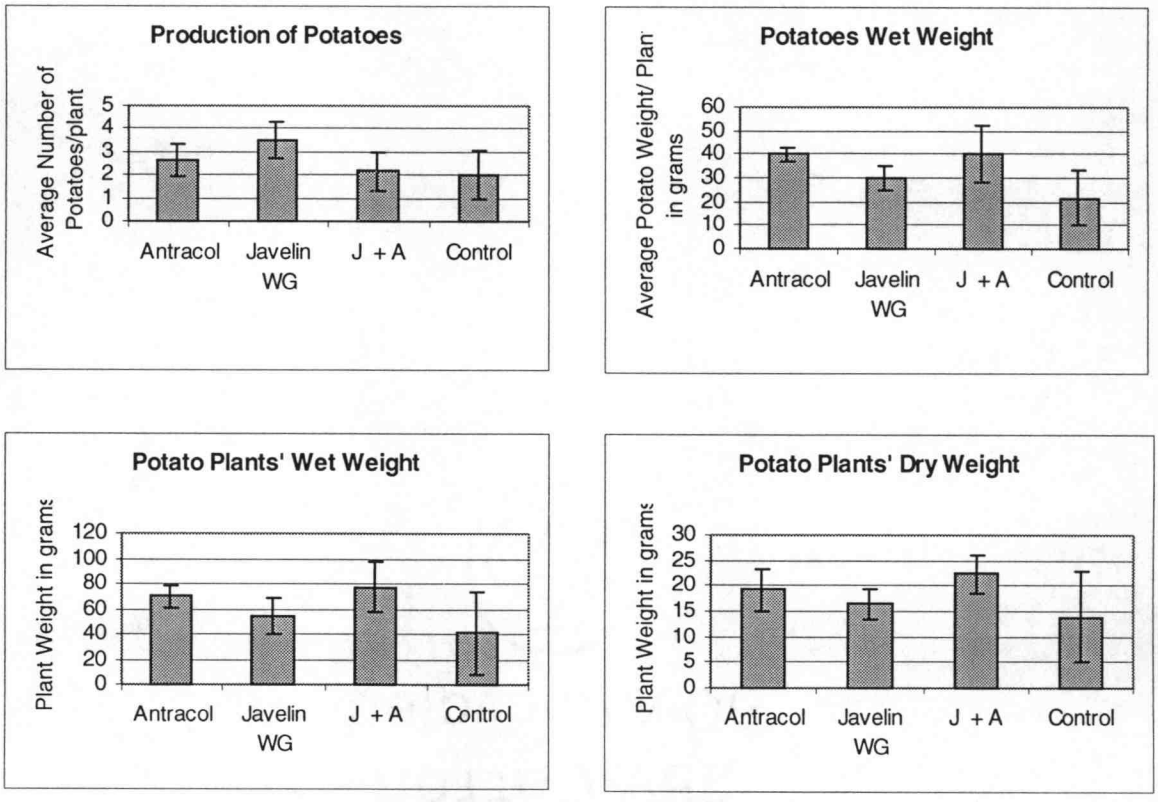
Table 3.6. Means and standard errors per treatment for six species of Acari in the three sampling times.

Acari Species		Control	Javelin WG	J + A	Antracol
Acaridae A	July	1.812 (1.730)	5.562 (3.260)	0	2.375 (2.045)
	August	0.187 (0.119)	0.875 (0.544)	0	0.185 (0.119)
	September	0.375 (0.239)	0.187 (0.119)	1.250 (1.089)	3.000 (1.365)
***Nanorchestes* A**	July	0	0.625 (0.062)	0	0
	August	1.312 (0.514)	0.812 (0.213)	0.062 (0.062)	0.375 (0.239)
	September	12.187 (11.687)	1.250 (0.530)	0.187 (0.119)	0.875 (0.462)
Gamasidae A	July	0.125 (0.072)	0.125 (0.072)	0.125 (0.071)	0
	August	0	0	0.125 (0.072)	0.062 (0.062)
	September	0	0	0	0.750 (0.750)
Gamasidae B	July	0	0	0.062 (0.0625)	1.25 (0.306)
	August	0	0	0	0
	September	0	0	0	0
***Scheloribates* A**	July	0.562 (0.328)	1.437 (0.868)	0.687 (0.277)	0.562 (0.187)
	August	0.812 (0.731)	0.937 (0.386)	1.500 (0.797)	0.500 (0.144)
	September	1.875 (0.892)	1.812 (0.991)	3.000 (1.350)	4.062 (3.314)
***Tectocephallus* A**	July	1.062 (0.980)	2.437 (1.515)	0.125 (0.125)	0.687 (0.187)
	August	2.437 (0.731)	1.000 (0.444)	0.0375 (0.297)	0.375 (0.161)
	September*	0.687 (0.257)	0.625 (0.297)	2.062 (0.679)	4.812 (2.745)
	( ) =Standard Errors ; * p value 5% = 0.014				

Yield of Potatoes

Production measurements (wet/dry weights in grams) were taken in September. None of the treatments showed a significant difference in the ANOVA analysis (Figure 3.3).

Figure 3.3. Productivity of the potato plants for the four treatments in the three sampling times.



Discussion

The diversity of soil fauna in agricultural systems depends on the different crop types, pesticide and fertilizer inputs, and degree of mechanical disturbance (Hansson *et al*, 1989; Neher and Barbercheck, 1999; Zunke and Perry, 1997; Bamforth, 1997; Didden and Fründ, 1997; Ekschmitt and Wolters, 1997).

In this particular experimental study, the factors affecting the soil fauna were the land preparation by plowing, and the input of fertilizers and pesticides. The immediate effect after the physical disturbance by plowing was not measured because the land was prepared in February, prior to the beginning of the study. Fertilizers were applied one time directly into the soil and three more times as foliar fertilizers. The experimental soils are extremely well-drained and under the conditions of considerable daily condensation (cloud forest conditions) no detrimental concentrations are liable to accumulate. Foliar application would circumvent large build-ups of bacterial populations in the soil. Therefore, this fertilizer input should increase the overall abundance and diversity of many taxa that are able to live in agricultural systems.

In the long-term study done by Hansson *et al.* (1989), 200 species were found in Swedish croplands. A total of 115 morphospecies were encountered in this study (relatively more diverse than that used by Hansson *et al.*).

I hypothesize that the lack of treatment effects on any of the orders (except the Homoptera) is due to the small scale (7.5 x 13.0m) of the experimental plots and the relatively underestimated abilities of soil fauna to move through the soil. The densities of most species were quite low, and I expect that random chance played a large role in their perceived treatment responses. (Most of the potential treatment effects are not

significant, but the responses of one species of algivorous Psocoptera and one fungivorous *Tectocepheus* were significant, presumably due to Type I error).

The Homoptera (significant) and the herbivores (nearly significant) show a treatment response to the fungicide. Though the fungicide was unable to affect total potato yield significantly, there were a few relatively large plants in both treatments with Antracol. Since nearly all the plants in all the treatments died from the fungus, I expect that the few plants to retain any vegetative growth in September served as regional attractions, temporarily concentrating any individuals within the region, until the plants finally succumbed.

Many pesticide manuals give general information about the half-life and toxicity of the fungicides (Ware, 1983; Rohn and Haas, 1983). Unfortunately there are no references on the indirect effects of the fungicide Antrocol on soil fauna. Antracol is one of the strongest controls for late blight available in the local markets. Potato yield results reveal that not even the plots that were treated with Antrocol were commercially productive. This suggests that the whole plot was affected by the late blight and that the treatment did not have the desired effect of eradicating the fungal disease. Probably this inability to control the fungi was the largest factor in determining the lack of any treatment response of the soil fauna to the chemical treatment.

Several studies about the persistence in soil and effects on soil fauna of *Bacillus thuringiensis* ssp. *kurstaki* present contradictory results due to other factors (Addison, 1993). There is more concern in the potential risk of the release to the environment of transgenic plants than the effect of inactive toxin present in the commercial insecticides like Javelin (Crecchio and Stotzky, 1998; Tapp and Stotsky, 1998).

It is generally accepted in Ecuador that growing potatoes without the use of Antracol is hopeless economically. Farmers had hoped that Javelin would give them an extra margin of profit, by controlling the herbivorous caterpillars on Antracol-protected plants. There is no indication in these results that potato production is possible without Antracol. Comparison of these results with Chapter 2 shows a consistent and dramatic pattern. In the natural system (Chapter 2) it is clear that the only group of soil fauna to show a seasonal decline are the millipedes. In this experiment the fungivores, herbivores, and predators (the most abundant and species-rich groups) all show strong declines after application of chemicals. Since the declines always include the control treatment, it is clear that the most important driver is plant production (since soil fauna populations remaining in the soil at the time of planting were healthy). Antracol application appears to ameliorate the loss of soil fauna because plant above-ground biomass is greater. Javelin (*Bacillus thuringiensis*) efficacy is not detectable in the below-ground system, but remains to be evaluated for any indirect non-target effects under circumstances where Antracol has fumigated the soil effectively.

Conclusion

Although seasonal changes within individual orders and functional feeding groups of soil fauna are apparent, significant treatment effects (Antracol – fungicide; Javelin – insecticide) are not detectable. Decrease in total fauna (most notably the predators) throughout all treatments between the pre-application and first post-application samples is probably due to the application of pesticide; most of these predators are very mobile and the decrease in the control sites was probably due to a direct decrease in the 3

pesticide-treated areas with subsequent indirect effects to the control through emigration dilution.

The possibility of detection of treatment effects was seriously jeopardized by the omnipresent outbreak of *Phytophthora* throughout the plot, regardless of Antracol application. Since nearly all the plants died, except some that did not produce a commercial crop in the Antracol treatments, I hypothesize that the few remaining plants served as migration sinks attracting whatever soil fauna were present (especially the herbivores). Since a large root biomass was never attained, the soil fungivore density decreased by 50%. Since there was no resulting manner in which to document an Antracol response, the additional non-target effects of the Javelin were not analyzable. Although the treatments did not display the differential responses expected, a notable (and now documented) diversity of soil fauna inhabited the experimental plots

CHAPTER 4

SUMMARY

From the comparison of three types of land management systems on soil arthropod distribution, the results show that the soil arthropod fauna of the native vegetation are the most dense and diverse. Pastures have an intermediate density and diversity and the croplands have the least density and diversity of edaphic arthropods. The croplands reveal a differences according to the type of crop that was planted and the ammount of pesticides applied. In all three types of land management, the most abundant taxonomic groups were Acari, Coleoptera, Diptera and Homoptera. From the functional group perspective fungivores, predators and herbivores were the most abundant. Between season changes were more important than the land management to determine the density of most of the taxonomic and functionl groups.

From the study of the response of soil arthropods to the application of biological and chemical pesticides, the seaonal changes of density and diversity of functional groups were documented. The effects of the chemical fungicide or the biological insecticide were not detected clearly. Even though one quarter of the plants of the quadrat were treated with fungicide, the yield data revealed that the whole experimetal plot was infested with the *Phytophthora* fungi, which became a confounding variable overwhelming the treatment effect.

The diversity of soil microarthropods in the northwest Montane Forest in Ecuador was high, with 351 morphospecies identified in a total of three sampling months for the distribution study and 115 morphospecies for the potato plot study. This is a high

number taking into account that the soil fauna from the tropics is traditionally regarded as less diverse that the soil fauna from the temperate forest regions. Even though that all the specimens were classified to morphospecies, they are preserved in alcohol to become part of a reference collection that can be access for further studies from the region

BIBLIOGRAPHY

Addison, J. A., 1993. Persistence and nontarget effects of *Bacillus thuringiensis*. *In*: Soil: a review. Can. J. For. Res. 23: 2329-2342.

Alvarez Castillo, H. A., López, A. N., Vincini, A. M., Carmona, D., and Manetti, P.I. 1993. Relevamiento de papa del sudeste bonarense. Boletín Técnico, 118. Argentina.

Anderson, J. M., 1977. The organization of soil animal communities. Ecol. Bull. (Stockholm). 25: 15-23.

Balogh, J., and Balogh, P. 1988. The Soil Mites of the World 2. Oribatid Mites of the Neotropical Region I. Elsevier, Amsterdam.

Balogh, J. and Balogh, P. 1990. The Soil Mites of the World 3. Oribatid Mites of the Neotropical Region II. Elsevier, Amsterdam.

Bamforth, S. S. 1997. Protozoa: recyclers and indicators of agroecosystem Quality. *In*: Fauna in Soil Ecosystems, Recycling Processes, Nutrient Fluxes, and Agricultural Production., Benckiser, G. *(Ed.),* Marcel Dekker. Inc. New York, NY.

Benckiser, G. 1997. Fauna in Soil Ecosystems, Recycling Processes, Nutrient Fluxes, and Agricultural Production. Marcel Dekker, Inc. New York, NY.

Borror, D. J., and White, R. E.,1984. Peterson Field Guides: Insects. Houghton Mifflin. Boston, Massachusetts.

Borror, D. J., Triplehorn, C. S., and Johnson N. F., 1989. An Introduction to the Study of Insects. Saunders College Publications. Philadelphia.

Cañadas, L., 1983. El Mapa Bioclimático del Ecuador. Banco Central del Ecuador. Quito.

Casarini, P., and Camerini, G., 1993. Biological Indicators or Agricultural Influences on Poplar Groves, Vineyard, and Sugar Beets. *In*: Soil Biota, Nutrient Cycling and Farming Systems. Paoletti, M. G., Foisner, W., and Coleman D.C. , *(Eds.),* Lewis, Boca Raton, FL.

CESA, 1993. El cultivo de la papa en las comunidades altas de Pilahuín. CESA. Ecuador.

CESA, 1995. El cultivo de la papa en las comunidades de Cebadas. CESA, Ecuador.

Christiansen, K. A., 1990. Insecta: Collembola. In: Soil Biology Guide. D. L. Dindal, *(Ed.),* John Wiley & Sons Ltd., London.

Christiansen, K. A., 1992. Springtails. The Kansas School Naturalist, 39: 1-16.

Coleman D.C. and Crossley D. A., 1996. Fundamentals of Soil Ecology. Academic Press, San Diego, CA.

Crecchio, C., and Stotzky, G., 1998. Insecticidal Activity and Biodegradation of the Toxin from *Bacillus thuringiensis* sbsp. *kurstaki* bound to Humid Acids from Soils. Soil Biol. Biochem. 30: 463-470.

Daly, H. V., Doyen, J. T., and A. H. Purcell III, 1998. Introduction to Insect Biology and Diversity. Oxford University Press. New York. NY.

Didden, W. A., Fründ, H. C., 1997. Enchytraeids. *In*: Fauna in Soil Ecosystems, Recycling Processes, Nutrient Fluxes, and Agricultural Production. Benckiser, G., *(Ed.)*, Marcel Dekker, Inc. New York, NY.

Dindal, D. L. (*Ed.*), 1990. Soil Biology Guide. John Wiley & Sons, New York, NY.

Ekschmitt, W. and Wolters, V., 1997. Spiders, Carabids, and Staphylinids: The Ecological Predatory Macroarthropods. *In*: Fauna in Soil Ecosystems, Recycling Processes, Nutrient Fluxes, and Agricultural Production, Benckiser, G., *(Ed.)*, Marcel Dekker, Inc. New York, NY.

FUNDAGRO, 1991. Aspectos tecnológicos del cultivo de la papa en el Ecuador. FUNDAGRO, Quito.

FUNDAGRO, 1993. Aspectos tecnológicos del cultivo de la papa en el Ecuador, II parte (Control Fitosanitario y Manejo Postcosecha). FUNDAGRO, Quito.

Hansson, A. C., Andrén O., Bostöm, S., Bostöm, U., Clarholm, M., Lagerlöf, J., Lindberg, T., Paustian, K., Pettersson, R., and Sohlenius B., 1990. Structure of the Agroecosystem. *In*: Ecology of Arable Land – organisms, carbon and nitrogen cycling, Lindberg, O., Paustian, T., and Rosswall, T. *(Eds.)*, Ecol. Bull. (Copenhagen) 40:41-83.

Krantz, G. W., 1978. A Manual of Acarology (Second Edition). Oregon State University Book Stores. Corvallis, OR.

Lal R., 1987. Tropical Ecology and Physical Edaphology. John Wiley & Sons Ltd., London.

Lagerlöf, J., and Andrén, O., 1987. Abundance and Activity of Soil Mites (Acari) under Four Arable Crops. *In*: Ecology of soil Fauna in Arable land – Dynamics and Activity of Microarthropods and Enchytraeids in four Cropping Systems. Lagerlöf, J., *(Ed.)*, Sweden.

Larink, O., 1997. Springtails and Mites: Important Knots in the Food Web of Soils. *In*: Fauna in Soil Ecosystems, Recycling Processes, Nutrient Fluxes, and Agricultural Production. Benckiser, G., *(Ed.)*, Marcel Dekker, Inc. New York, NY.

Miranda Rangel, A., and Palacios Vargas, J. G., 1992. Estudio comparativo de Collembolas edáficos de bosque de Abeis religiosa y cultivo de haba (*Vicia faba*). Agrociencia, Serie Protección Vegetal. 3: 7-28.

Moldenke, A. R., and Fichter, B.L., 1988. Invertebrates of the H. J. Andrews Experimental Forest, Western Cascade Mountains, Oregon: IV. The Oribatid Mites (Acari: Cryptostigmata) – General Technical Report. PNW –GTR-217. Portland, OR.

Neher, D.A. and Barbercheck, M.E., 1999. Diversity and Function of Soil Mesofauna. *In*: Biodiversity in Agroecosystems. W. W. Collings and C.O. Qualset, *(Eds.)*, CRP Press LLC, Boca Raton, FL.

Palacios Vargas, J. G., 1990. Diagnosis y clave para determinar las familias de los Collembola de la Región Neotropical, Manuales y Guías para el Estudio de Microartrópodos. México, D. F.

Palacios Vargas, J. G., and Gomez Anaya, J., 1993. Los Collembola (Hexapoda: Apterygota de Chamela, Jalisco, México (Distribución, Ecología y Claves). Folia Entomol. Mex. 89: 1-34.

Paoletti, M. G., and Bressan M., 1996. Soil Invertebrates as Bioindicators of Human Disturbance. Critical Reviews in Plant Sciences 15: 21-62.

Peterson, H. and Luxton, M. 1982. A Comparative Analysis of Soil Fauna Populations and their Role in Decomposition Processes. Oikos 39: 288-388.

Rohm and Haas, 1983. Dithane M-45 Fungicide, The low cost way to unsurpassed Potato Disease Protection. Philadelphia, PA.

Silva del Pozo, X., and Blandin, P., 1991. Les Macroarthropods édaphiques d' une forêt mésotermique primarie de l'Ecuateur occidental: Abondances saisonnières et distribution spatiale. Rev. Ecol. Biol. Sol. 4:421-433.

Silva del Pozo, X., and Blandin, P., 1991. Les peuplements de Macroarthropodes édaphiques à différentes étapes de la reconstitution de la forét mésothermique en Equateur occidental. Rev. Ecol. Biol. Sol. 4:435-442.

Stehr, F. W., 1987. Immature Insects. Kendall/ Hunt Publishing Company. Dubuque, Iowa.

Tapp, H., and Stotzky, G., 1998. Persistence of the Insecticidal Toxin from *Bacillus thuringiensis* subsp. *kurstak.* in Soil. Soil Biol. Biochem. 30: 471-476.

Vreeken-Buijs, M. J.,Hassink, J., and L. Brussaard, 1998. Relationships of Soil Microarthropod Biomass with Organic Matter and Pore size Distribution in Soils Under Different Land Use. Soil Biol. Biochem. 30: 97-106.

Wallwork, J. A., 1976. The Distribution and Diversity of Soil Fauna. Academic Press. London.

Waren, G., 1983. The Pesticide Book. Third Edition. Thompson Publications.

Zunke, U., and Perry R. N., 1997. Nematodes: Harmful and Beneficial Organisms. *In*: Fauna in Soil Ecosystems, Recycling Processes, Nutrient Fluxes, and Agricultural Production. Benckiser, G., *(Ed.),* Marcel Dekker, Inc. New York, NY.

APPENDICES

Appendix 1. - List of morphospecies and functional groups found in the three types of land management (native, pasture and cropland)

Code	Class	Order	Group	State	Family	Genus	Morpho species	Functional Group
A2(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	A	Fungivore
A10(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	B	Fungivore
A1(1)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore
A10(2)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore
A10(3)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore
A4(1)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore
A8(3)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore
A3(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator
B10(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator
C6(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator
A3(1)	Arachnida	Acari	Gamasida		Oligamaside	Unknown		Predator
C4(2)	Arachnida	Acari	Gamasida		Polyaspidide	Unknown		Predator
A11(2)	Arachnida	Acari	Gamasida	I	Unknown	Unknown		Predator
A12(2)	Arachnida	Acari	Gamasida	I	Unknown	Unknown		Predator
A6(3)	Arachnida	Acari	Gamasida		Unknown	Unknown		Predator
A7(3)	Arachnida	Acari	Gamasida		Unknown	Unknown		Predator
C1(3)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator
B4(2)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator
C12(2)	Arachnida	Acari	Gamasida		Zerconidae	Zercon		Predator
C3(1)	Arachnida	Acari	Gamasina		Chelydidae	Unknown		Predator
A8(1)	Arachnida	Acari	Gamasina		Eupodidae	Unknown		Predator
C7(2)	Arachnida	Acari	Gamasina		Gamasidae	Unknown		Unknown
A12(1)	Arachnida	Acari	Gamasina		Oligamaside	Unknown		Predator
C10(1)	Arachnida	Acari	Gamasina	I	Oligamaside	Unknown		Predator
C2(1)	Arachnida	Acari	Gamasina		Oligamaside	Unknown		Predator
C4(1)	Arachnida	Acari	Gamasina		Oligamaside	Unknown		Predator
C7(1)	Arachnida	Acari	Gamasina	I	Oligamaside	Unknown		Predator
C8(1)	Arachnida	Acari	Gamasina		Oligamaside	Unknown		Predator
A4(2)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator
A5(2)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator
A6(2)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator
A8(2)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator
C1(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator
C5(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Fungivore
C9(1)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator
B11(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator
B8(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator
B9(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator
B6(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	B	Fungivore
B10(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	C	Fungivore
B7(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	D	Fungivore
C5(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	E	Fungivore
B5(4)	Arachnida	Acari	Oribatida		Belbidae	Belba	F	Fungivore
C7(4)	Arachnida	Acari	Oribatida		Belbidae	Belba	G	Fungivore
B11(2)	Arachnida	Acari	Oribatida		Eremuloidae	Eremaus	A	Fungivore
B1(4)	Arachnida	Acari	Oribatida		Euphthiradae	Peruthritia	A	Fungivore
B5(2)	Arachnida	Acari	Oribatida		Galumnidae	Galumna	A	Fungivore
C12(1)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	A	Fungivore
C1(4)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	B	Fungivore
B12(2)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	C	Fungivore
B9(2)	Arachnida	Acari	Oribatida		Mesoplophoe	Mesoplopa	A	Fungivore

Code	Class	Order	Group	State	Family	Genus	Morpho species	Functional Group
C2(3)	Arachnida	Acari	Oribatida		Metrippiidae	Ceratoppia	A	Fungivore
B3(3)	Arachnida	Acari	Oribatida		Microzetidae	Microzetes	A	Fungivore
A11(1)	Arachnida	Acari	Oribatida		Nanhermane	Nanhermania	A	Fungivore
A9(3)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	A	Fungivore
B7(3)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	B	Fungivore
B4(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	A	Fungivore
B8(2)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	B	Fungivore
C3(5)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	C	Fungivore
B4(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	A	Fungivore
B2(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	B	Fungivore
A7(1)	Arachnida	Acari	Oribatida	I	Oppiidae	Oppiella	C	Fungivore
B9(3)	Arachnida	Acari	Oribatida		Oribatellidae	Oribatella	A	Fungivore
A1(2)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore
A5(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore
A6(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore
A9(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore
B10(1)	Arachnida	Acari	Oribatida		Oribatulidae	Zygoribatua	A	Fungivore
B2(2)	Arachnida	Acari	Oribatida		Otocepheide	Dolicharaes	A	Fungivore
B5(3)	Arachnida	Acari	Oribatida		Otocepheide	Dolichereas	B	Fungivore
C4(3)	Arachnida	Acari	Oribatida		Otocepheide	Dolichereas	C	Fungivore
B11(3)	Arachnida	Acari	Oribatida		Phenopelope	Eupelops	A	Fungivore
B1(2)	Arachnida	Acari	Oribatida		Phenopelopi	Pelopsis	A	Fungivore
B4(3)	Arachnida	Acari	Oribatida		Phthiracarida	Phthiracarus	A	Fungivore
B8(3)	Arachnida	Acari	Oribatida		Rhynchoribe	Rhynchoris	A	Bacteria feeder
B1(1)	Arachnida	Acari	Oribatida		Scheloribatie	Scheloribas	A	Fungivore
B10(4)	Arachnida	Acari	Oribatida		Scheloribatie	Scheloribas	B	Fungivore
B7(1)	Arachnida	Acari	Oribatida		Scheloribatie	Scheloribas	C	Fungivore
C6(4)	Arachnida	Acari	Oribatida		Scheloribatie	Scheloribates	D	Fungivore
B3(4)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	E	Fungivore
C9(3)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	F	Fungivore
C11(3)	Arachnida	Acari	Oribatida		Suctobelbaidae	Sectobelba	A	Bacteria feeder
B3(1)	Arachnida	Acari	Oribatida		Tectocepheidae	Tectocepheus	A	Fungivore
A2(4)	Arachnida	Acari	Oribatida		Unknown	Immature		Fungivore
A2(2)	Arachnida	Acari	Oribatida		Unknown	Unknown		Predator
B1(3)	Arachnida	Acari	Oribatidae		Phenopelopidae	Pelopsis	A	Bacteria feeder
C6(3)	Arachnida	Acari	Oribatidae		Unknown	Unknown	primitive	Unknown
B12(1)	Arachnida	Acari	Oribatidae			Perutrydia		Unknown
C11(1)	Arachnida	Acari	Prostigmata	I	Crotonoidea	Plaquetes		Predator
C2(2)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown	A	Fungivore
C2(4)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown		Fungivore
C9(4)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown		Fungivore
A1(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	A	Fungivore
A2(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	B	Fungivore
A3(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	C	Fungivore
G6(5)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes		Fungivore
C11(2)	Arachnida	Acari	Prostigmata		Rhagiidae	Unknown		Predator
A1(4)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown
A11(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Fungivore
A4(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown
A5(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown
B6(1)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Predator
A12(3)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown
C2(5)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown
C7(3)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown
C3(4)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown	A	Predator
A9(2)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown		Predator
B12(4)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown		Predator
C8(2)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown		Predator
B6(3)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator
B9(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator

Code	Class	Order	Group	State	Family	Genus	Morpho species	Functional Group
C10(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator
C5(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator
B2(3)	Arachnida	Acari	Uropodidae		Polyaspididae	Unknown	A	Predator
A7(2)	Arachnida	Acari			Unknown	Unknown		Predator
D3(5)	Arachnida	Aranea			Micryphantidae	Unknown	A	Predator
H2(3)	Arachnida	Aranea			Micryphantidae	Unknown	B	Predator
H2(4)	Arachnida	Araneae			Theraphosidae	Unknown		Predator
H3(2)	Arachnida	Aranea			Salticidae	Unknown	A	Predator
H4(3)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	B	Predator
C9(2)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	A	Predator
H4(3)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	B	Predator
H12(1)	Chilopoda	Lithobiomorpha			Lethobidae	Unknown	A	Predator
H8(1)	Chilopoda	Geophilomorpha			Geophilidae	Unknown	A	Predator
G11(3)	Diplopoda	Diplopoda			Unknown	Unknown		Detritivore
G7(3)	Diplopoda	Diplopoda			Polydesmidae	Harpaphe	A	Detritivore
G8(2)	Diplopoda	Diplopoda			Polydesmidae	Unknown	B	Detritivore
H10(3)	Diplopoda	Diplopoda			Julidae	Unknown		Detritivore
A7(5)	Entognata	Protura			Unknown	Unknown	B	Algivore
G2(2)	Entognata	Protura			Unknown	Unknown	A	Algivore
H12(5)	Entognata	Protura			Unknown	Unknown	C	Algivore
H11(3)	Gastropoda	Gastropoda			Unknown	Unknown		Herbivore
H6(1)	Homoptera	Homoptera			Pseudococcidae	Unknown	C	Herbivore
E4(1)	Insecta	Coleoptera		I	Cantharidae	Unknown	A	Predator
F1(3)	Insecta	Coleoptera		I	Cantharidae	Unknown	B	Predator
F1(2)	Insecta	Coleoptera		I	Carabidae	Unknown	B	Predator
F2(2)	Insecta	Coleoptera		I	Carabidae	Unknown	C	Predator
F3(2)	Insecta	Coleoptera		I	Carabidae	Unknown	D	Predator
F4(2)	Insecta	Coleoptera		I	Carabidae	Unknown	E	Predator
F10(2)	Insecta	Coleoptera		I	Carabidae	Unknown	F	Predator
E8(1)	Insecta	Coleoptera			Carabidae	Bembidiinidae	A	Predator
E6(1)	Insecta	Coleoptera		I	Carabidae	Unknown	G	Predator
F7(1)	Insecta	Coleoptera		I	Chrysomelidae	Alticinae	A	Herbivore
E9(1)	Insecta	Coleoptera			Chrysomelidae	Alticinae	B	Herbivore
E9(3)	Insecta	Coleoptera			Chrysomelidae	Alticinae	C	Herbivore
E9(4)	Insecta	Coleoptera		I	Chrysomelidae	Unknown	A	Herbivore
F3(4)	Insecta	Coleoptera			Chrysomelidae	Unknown	D	Herbivore
E2(1)	Insecta	Coleoptera		I	Cleridae	Unknown	A	Predator
F10(3)	Insecta	Coleoptera			Coccinellidae	Unknown	A	Predator
E6(4)	Insecta	Coleoptera			Curculionidae	Apion	A	Herbivore
E2(2)	Insecta	Coleoptera			Curculionidae	Unknown	A	Herbivore
E3(2)	Insecta	Coleoptera		I	Curculionidae	Unknown	B	Herbivore
E3(3)	Insecta	Coleoptera			Curculionidae	Unknown	C	Herbivore
F8(3)	Insecta	Coleoptera			Curculionidae	Unknown	D	Herbivore
E9(2)	Insecta	Coleoptera			Elateridae	Unknown	A	Detritivore
F2(5)	Insecta	Coleoptera		I	Elateridae	Unknown	B	Detritivore
E1(1)	Insecta	Coleoptera		I	Elateridae	Unknown	C	Detritivore
E7(4)	Insecta	Coleoptera		I	Elateridae	Unknown	D	Detritivore
E7(5)	Insecta	Coleoptera		I	Elateridae	Unknown	E	Detritivore
F1(5)	Insecta	Coleoptera		I	Elateridae	Unknown	F	Detritivore
E1(4)	Insecta	Coleoptera			Histeridae	Unknown	A	Predator
D4(2)	Insecta	Coleoptera		I	Lampyridae	Unknown	A	Predator
F11(3)	Insecta	Coleoptera			Leiodidae	Unknown	A	Scavenger
E4(3)	Insecta	Coleoptera			Limuliodidae	Unknown	A	Unknown
E7(1)	Insecta	Coleoptera			Nitidulidae	Unknown	A	Fungivore
F10(1)	Insecta	Coleoptera			Nitidulidae	Unknown	B	Fungivore
F12(2)	Insecta	Coleoptera			Pselaphidae	Unknown	A	Predator
E12(3)	Insecta	Coleoptera			Pselaphidae	Unknown	B	Predator
F9(2)	Insecta	Coleoptera			Ptilidae	Unknown	A	Fungivore
E1(2)	Insecta	Coleoptera			Ptilidae	Unknown	B	Fungivore
E10(3)	Insecta	Coleoptera			Ptillidae	Unknown	C	Fungivore

Code	Class	Order	Group	State	Family	Genus	Morpho species	Functional Group
E11(3)	Insecta	Coleoptera			Ptillidae	Unknown	D	Fungivore
F7(4)	Insecta	Coleoptera			Ptillidae	Unknown	E	Fungivore
E4(2)	Insecta	Coleoptera			Scaphidiidanae	Scaphidiidanae	A	Fungivore
F11(1)	Insecta	Coleoptera		I	Scarabaeidae	Unknown	A	Herbivore
E10(4)	Insecta	Coleoptera		I	Scarabaeidae	Unknown	C	Herbivore
E5(3)	Insecta	Coleoptera			Scolytidae	Unknown	A	Herbivore
E7(3)	Insecta	Coleoptera			Scydmaenidae	Unknown	A	Predator
E2(5)	Insecta	Coleoptera			Scydmaenidae	Unknown	B	Predator
E3(1)	Insecta	Coleoptera		I	Staphylinidae	Aleocharinae	A	Predator
E6(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae	B	Parasite
E7(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae	C	Parasite
E1(5)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite
E6(5)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite
F4(4)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite
F5(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite
F5(3)	Insecta	Coleoptera			Staphylinidae	Omaliinae	A	Predator
E10(5)	Insecta	Coleoptera			Staphylinidae	Osoriinae	A	Herbivore
E1(3)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	A	Predator
F6(2)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	B	Predator
F7(2)	Insecta	Coleoptera			Staphylinidae	Stenus	A	Predator
E5(2)	Insecta	Coleoptera			Staphylinidae	Tachiporus	A	Predator
E10(2)	Insecta	Coleoptera			Staphylinidae	Unknown	A	Predator
E12(4)	Insecta	Coleoptera			Staphylinidae	Unknown	B	Predator
E8(2)	Insecta	Coleoptera		I	Staphylinidae	Unknown	B	Predator
F7(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	C	Predator
F11(2)	Insecta	Coleoptera			Staphylinidae	Unknown	D	Predator
F12(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	E	Predator
E2(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	F	Predator
E4(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	G	Predator
E8(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	H	Predator
F9(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	I	Predator
F10(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	J	Predator
F11(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	K	Predator
F12(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	L	Predator
E9(5)	Insecta	Coleoptera		I	Staphylinidae	Unknown	M	Predator
F8(4)	Insecta	Coleoptera			Staphylinidae	Unknown	N	Predator
F1(4)	Insecta	Coleoptera			Staphylinidae	Unknown	O	Predator
E2(3)	Insecta	Coleoptera			Tenebrionidae	Unknown	A	Detritivore
E11(5)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
E12(5)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
E3(4)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
E5(5)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
E6(3)	Insecta	Coleoptera			Unknown	Unknown		Fungivore
E8(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
F2(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
F3(3)	Insecta	Coleoptera			Unknown	Unknown		Unknown
F4(3)	Insecta	Coleoptera			Unknown	Unknown		Fungivore
F9(1)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown
G10(1)	Insecta	Collembola			Entomobryidae	Entomobrya	A	Fungivore
A6(5)	Insecta	Collembola			Entomobryidae	Entomobrya	B	Fungivore
B6(5)	Insecta	Collembola			Entomobryidae	Entomobrya	C	Fungivore
G7(5)	Insecta	Collembola			Entomobryidae	Entomobrya	D	Fungivore
G2(1)	Insecta	Collembola			Entomobryidae	Entomobrya	F	Fungivore
G9(1)	Insecta	Collembola			Entomobryidae	Entomobrya	G	Fungivore
G11(1)	Insecta	Collembola			Entomobryidae	Entomobrya		Fungivore
H10(4)	Insecta	Collembola			Entomobryidae	Entomobrya	H	Fungivore
A4(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrura	A	Fungivore
A12(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrura	D	Predator
B1(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrura	E	Fungivore
G10(3)	Insecta	Collembola			Hypogastruridae	Neanura	F	Fungivore

Code	Class	Order	Group	State	Family	Genus	Morpho species	Functional Group
G4(2)	Insecta	Collembola			Hypogastruridae	Unknown	A	Fungivore
G3(1)	Insecta	Collembola			Hypogastruridae	Unknown	B	Predator
G7(1)	Insecta	Collembola			Hypogastruridae	Unknown	C	Fungivore
G4(1)	Insecta	Collembola			Isotomidae	Folsomia	B	Fungivore
G4(5)	Insecta	Collembola			Isotomidae	Isotoma	A	Fungivore
G4(4)	Insecta	Collembola			Isotomidae	Isotoma	B	Fungivore
A5(5)	Insecta	Collembola			Isotomidae	Isotoma	C	Fungivore
G3(5)	Insecta	Collembola			Isotomidae	Isotoma	D	Fungivore
G1(1)	Insecta	Collembola			Onychiuridae	Onychiurus	A	Fungivore
B4(5)	Insecta	Collembola			Sminthuridae	Sminthurus	A	Fungivore
G3(2)	Insecta	Collembola			Sminthuridae	Sminthurus	C	Fungivore
G5(3)	Insecta	Collembola			Sminthuridae	Unknown	B	Fungivore
G7(2)	Insecta	Diplura			Campodeidae	Unknown	A	Fungivore
B2(5)	Insecta	Diplura			Japigidae	Japyx	A	Predator
D4(3)	Insecta	Diptera	Brachycera	I	Stratiomyiidae	Anthomiide	A	Herbivore
D6(1)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	A	Unknown
D2(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	A	Fungivore
D5(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	B	Fungivore
D12(1)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	C	Unknown
D7(2)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	D	Unknown
D12(2)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	E	Unknown
D11(2)	Insecta	Diptera	Cyclorrhapha	I	Higher Diptera	Unknown	F	Unknown
D2(3)	Insecta	Diptera	Cyclorrhapha	I	Higher Diptera	Unknown	G	Unknown
E12(2)	Insecta	Diptera	Nematocera		Bibionidae	Unknown	A	Fungivore
D10(3)	Insecta	Diptera	Nematocera		Cecidomyiidae	Unknown	A	Fungivore
D6(2)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	A	Unknown
D7(1)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	B	Unknown
D9(1)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	C	Unknown
D10(1)	Insecta	Diptera	Nematocera		Chironomidae	Unknown	A	Fungivore
D8(3)	Insecta	Diptera	Nematocera	I	Mycetophilidae	Unknown	A	Fungivore
E5(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	A	Fungivore
D10(2)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	B	Fungivore
D11(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	C	Fungivore
D8(2)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	D	Fungivore
D2(1)	Insecta	Diptera	Nematocera		Tipulidae	Unknown	A	Fungivore
D1(1)	Insecta	Diptera	Nematocera		Unknown	Unknown	A	Unknown
D4(1)	Insecta	Diptera	Nematocera		Unknown	Unknown	B	Unknown
D6(3)	Insecta	Diptera	Nematocera		Unknown	Unknown	C	Unknown
F12(1)	Insecta	Diptera	Nematocera		Unknown	Unknown		Unknown
D3(3)	Insecta	Diptera		I	Higher Diptera	Coleoptera?		Unknown
H12(3)	Insecta	Hemiptera			Cydnidae	Unknown		Herbivore
G2(4)	Insecta	Hemiptera			Enicocephalidae	Unknown	A	Predator
H1(4)	Insecta	Hemiptera			Gelastocoridae	Unknown		Predator
H5(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder
H6(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder
H6(3)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder
H7(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder
H3(4)	Insecta	Hemiptera			Miridae	Unknown		Herbivore
H10(2)	Insecta	Hemiptera			Pentatomidae	Unknown		Herbivore
G10(4)	Insecta	Hemiptera			Unknown	Unknown		Unknown
H9(2)	Insecta	Homoptera			Aphidae	Unknown	A	Herbivore
B8(5)	Insecta	Homoptera			Aphidae	Unknown	B	Herbivore
H2(5)	Insecta	Homoptera			Aphidae	Unknown	C	Herbivore
H10(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	A	Herbivore
H11(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	B	Herbivore
H12(2)	Insecta	Homoptera			Fulgoridae	Unknown		Herbivore
C10(2)	Insecta	Homoptera			Ortheziidae	Orthezia	A	Herbivore
H7(3)	Insecta	Homoptera			Ortheziidae	Orthezia	B	Herbivore
H1(1)	Insecta	Homoptera			Pseudococcidae	Unknown	A	Herbivore
H2(1)	Insecta	Homoptera			Pseudococcidae	Unknown	B	Herbivore

Code	Class	Order	Group	State	Family	Genus	Morpho species	Functional Group
H6(1)	Insecta	Homoptera			Pseudococcidae	Unknown	C	Herbivore
A10(5)	Insecta	Hymenoptera			Formicidae	Unknown	D	Predator
D4(5)	Insecta	Hymenoptera			Braconidae	Unknown		Unknown
G8(3)	Insecta	Hymenoptera			Diapriidae	Unknown	A	Parasite
B3(5)	Insecta	Hymenoptera			Diapriidae	Unknown	B	Parasite
B10(5)	Insecta	Hymenoptera			Diapriidae	Unknown	C	Parasite
H11(2)	Insecta	Hymenoptera			Diapriidae	Unknown	D	Parasite
D1(5)	Insecta	Hymenoptera			Diapriidae	Unknown	E	Parasite
D6(5)	Insecta	Hymenoptera			Diapriidae	Unknown	F	Parasite
G5(5)	Insecta	Hymenoptera			Diapriidae	Unknown	G	Parasite
G11(5)	Insecta	Hymenoptera			Diapriidae	Unknown	H	Parasite
G10(2)	Insecta	Hymenoptera			Diapriidae	Unknown	I	Parasite
H8(4)	Insecta	Hymenoptera			Diapriidae	Unknown	J	Parasite
B9(5)	Insecta	Hymenoptera			Diapriidae	Unknown	K	Parasite
H2(2)	Insecta	Hymenoptera			Formicidae	Unknown	A	Predator
H8(2)	Insecta	Hymenoptera			Formicidae	Unknown	B	Predator
G3(3)	Insecta	Hymenoptera			Formicidae	Unknown	C	Predator
A11(5)	Insecta	Hymenoptera			Formicidae	Unknown	E	Predator
D5(5)	Insecta	Hymenoptera			Formicidae	Unknown	F	Predator
H4(5)	Insecta	Hymenoptera			Formicidae	Unknown	G	Predator
H10(5)	Insecta	Hymenoptera			Formicidae	Unknown	H	Predator
H11(5)	Insecta	Hymenoptera			Formicidae	Unknown	I	Predator
A9(5)	Insecta	Hymenoptera			Unknown	Unknown	A	Unknown
H7(1)	Insecta	Lepidoptera		I	Noctuidae	Unknown	A	Herbivore
H9(3)	Insecta	Lepidoptera		I	Noctuidae	Unknown	B	Herbivore
H1(2)	Insecta	Orthoptera			Blattidae	Unknown		Omnivorous
H8(3)	Insecta	Orthoptera			Gryllidae	Unknown	A	Herbivore
G9(4)	Insecta	Orthoptera			Gryllidae	Unknown	B	Herbivore
G12(1)	Insecta	Protura			Unknown	Unknown	D	Fungivore
H9(1)	Insecta	Psocoptera			Liposcelidae	Liposcelis	A	Algivore
G2(3)	Insecta	Psocoptera			Unknown	Unknown	B	Algivore
H4(2)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	A	Predator
G12(2)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	F	Predator
H11(4)	Insecta	Thysanoptera			Unknown	Unknown	B	Fungivore
G1(2)	Insecta	Thysanoptera			Unknown	Unknown	D	Fungivore
G6(2)	Insecta	Thysanoptera			Unknown	Unknown	E	Fungivore
G11(4)	Insecta	Thysanoptera			Unknown	Unknown	G	Fungivore
H4(4)	Insecta	Thysanoptera			Unknown	Unknown	I	Fungivore
H12(4)	Insecta	Thysanoptera			Unknown	Unknown	J	Fungivore
D2(5)	Insecta	Thysanoptera			Unknown	Unknown	K	Fungivore
H6(5)	Insecta	Thysanoptera			Unknown	Unknown	L	Fungivore
H9(5)	Insecta	Thysanoptera			Unknown	Unknown	M	Fungivore
G9(2)	Malacostraca	Isopoda			Unknown	Unknown		Detritivore
H3(3)	Mecoptera	Mecoptera			Unknown	Unknown		Predator
A1(5)	Nematoda	Nematoda			Unknown	Unknown		Unknown
F1(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown
F2(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown
F3(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown
F4(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown
F5(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown
F6(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown
G1(4)	Nematoda	Nematoda			Unknown	Unknown		Unknown
G9(3)	Nematoda	Nematoda			Unknown	Unknown		Unknown
lombriz	Oligochaeta	Anellida			Unknown	Unknown		Fungivore
D12(5)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore
D5(1)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore
G6(3)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore
G7(4)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore
H5(4)	Pauropoda	Pauropoda			Unknown	Unknown		Unknown
A8(5)	Symphyla	Symphyla			Unknown	Unknown		Herbivore

Appendix 2. Average of the four subsamples taken in the three types of land management (native, pasture and cropland) for June.

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	June Totals
A1(1)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	16
A10(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	B	Fungivore	7
A2(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	A	Fungivore	21
A4(1)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	2
A8(3)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	4
B10(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator	11
C6(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator	1
C4(2)	Arachnida	Acari	Gamasida		Polyaspididae	Unknown		Predator	2
A11(2)	Arachnida	Acari	Gamasida	I	Unknown	Unknown		Predator	2
A6(3)	Arachnida	Acari	Gamasida		Unknown	Unknown		Predator	1
B4(2)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator	1
C12(2)	Arachnida	Acari	Gamasida		Zerconidae	Zercon		Predator	1
A8(1)	Arachnida	Acari	Gamasina		Eupodidae	Unknown		Predator	3
C7(2)	Arachnida	Acari	Gamasina		Gamasidae	Unknown		Unknown	1
A12(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	7
C10(1)	Arachnida	Acari	Gamasina	I	Oligamasidae	Unknown		Predator	44
C2(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	104
C4(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	37
C7(1)	Arachnida	Acari	Gamasina	I	Oligamasidae	Unknown		Predator	80
C8(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	22
A3(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	26
C1(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	87
C5(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Fungivore	65
C9(1)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	1
A4(2)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	6
B11(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	24
B8(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	72
B9(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	83
B6(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	B	Fungivore	1
C5(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	E	Fungivore	8
B10(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	C	Fungivore	4
B12(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	D	Fungivore	1
C7(4)	Arachnida	Acari	Oribatida		Belbidae	Belba	G	Fungivore	2
B7(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	D	Fungivore	6
B11(2)	Arachnida	Acari	Oribatida		Eremuloidae	Eremaus	A	Fungivore	17
B5(2)	Arachnida	Acari	Oribatida		Galumnidae	Galumna	A	Fungivore	6
C12(1)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	A	Fungivore	1
B12(2)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	C	Fungivore	57
B9(2)	Arachnida	Acari	Oribatida		Mesoplophoridae	Mesoplophoa	A	Fungivore	5
C2(3)	Arachnida	Acari	Oribatida		Metrippiidae	Ceratoppia	A	Fungivore	13
B3(3)	Arachnida	Acari	Oribatida		Microzetidae	Microzetes	A	Fungivore	5
A11(1)	Arachnida	Acari	Oribatida		Nanhermanniidae	Nanhermana	A	Fungivore	4
C6(1)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	A	Fungivore	59
B7(3)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	B	Fungivore	3
B2(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	B	Fungivore	149
B4(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	A	Fungivore	20
A7(1)	Arachnida	Acari	Oribatida	I	Oppiidae	Oppiella	C	Fungivore	35
B8(2)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	B	Fungivore	6
C8(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	C	Fungivore	3
B9(3)	Arachnida	Acari	Oribatida		Oribatellidae	Oribatella	A	Fungivore	1
A6(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	6
A1(2)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	20
A9(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore	31
B10(1)	Arachnida	Acari	Oribatida		Oribatulidae	Zygoribatula	A	Fungivore	198
B2(2)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicharames	A	Fungivore	34
B5(3)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicheremas	B	Fungivore	2
B1(2)	Arachnida	Acari	Oribatida		Phenopelopidae	Pelopsis	A	Fungivore	21
B4(3)	Arachnida	Acari	Oribatida		Phthiracaridae	Phthiracarus	A	Fungivore	13
A2(2)	Arachnida	Acari	Oribatida		Prostig	Unknown		Predator	37
B8(3)	Arachnida	Acari	Oribatida		Rhynchoribatidae	Rhynchoribas	A	Bacteria feeder	5
B1(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	A	Fungivore	145
C9(3)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	F	Fungivore	2
B5(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	B	Fungivore	80
C6(4)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	D	Fungivore	7
C11(3)	Arachnida	Acari	Oribatida		Suctobelbaidae	Sectobelba	A	Bacteria feeder	10
B3(1)	Arachnida	Acari	Oribatida		Tectocepheidae	Tectocepheus	A	Fungivore	25
B12(1)	Arachnida	Acari	Oribatidae		Euphthiracaridae	Peruthritia	A	Fungivore	39
C11(1)	Arachnida	Acari	Prostigmata	I	Crotonoidea	Plaquetes		Predator	3
C9(4)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown		Fungivore	1
A1(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	A	Fungivore	4
A2(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	B	Fungivore	21
C11(2)	Arachnida	Acari	Prostigmata		Rhagiidae	Unknown		Predator	4
A11(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Fungivore	3
A4(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown	2
A5(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown	4
A12(3)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown	1
B6(3)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	6
C10(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	1
C5(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	2
B2(3)	Arachnida	Acari	Uropodidae		Polyaspididae	Unknown	A	Predator	2
C8(2)	Arachnida	Acari	Uropodidae		Polyaspididae	Unknown		Predator	2
A7(2)	Arachnida	Acari	unknown		Unknown	Unknown		Predator	1
E4(1)	Insecta	Coleoptera		I	Cantharidae	Unknown	A	Predator	9
F1(3)	Insecta	Coleoptera		I	Cantharidae	Unknown	B	Predator	1

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	June Totals
F1(2)	Insecta	Coleoptera		I	Carabidae	Unknown	B	Predator	2
F2(2)	Insecta	Coleoptera		I	Carabidae	Unknown	C	Predator	2
F3(2)	Insecta	Coleoptera		I	Carabidae	Unknown	D	Predator	3
F4(2)	Insecta	Coleoptera		I	Carabidae	Unknown	E	Predator	1
F10(2)	Insecta	Coleoptera		I	Carabidae	Unknown	F	Predator	2
E8(1)	Insecta	Coleoptera			Carabidae	Bemdibiinidae	?	Predator	8
E6(1)	Insecta	Coleoptera		I	Carabidae	Unknown	G	Predator	2
F7(1)	Insecta	Coleoptera		I	Chrysomelidae	Alticinae	A	Herbivore	4
E9(3)	Insecta	Coleoptera			Chrysomelidae	Alticinae	C	Herbivore	1
E2(1)	Insecta	Coleoptera		I	Cleridae	Unknown	A	Predator	11
E2(2)	Insecta	Coleoptera			Curculionidae	Unknown	A	Herbivore	5
E3(2)	Insecta	Coleoptera		I	Curculionidae	Unknown	B	Herbivore	15
E3(3)	Insecta	Coleoptera			Curculionidae	Unknown	C	Herbivore	1
E9(2)	Insecta	Coleoptera			Elateridae	Unknown	A	Shredder	4
E1(1)	Insecta	Coleoptera		I	Elateridae	Unknown	C	Shredder	2
E7(5)	Insecta	Coleoptera		I	Elateridae	Unknown	E	Shredder	7
D4(2)	Insecta	Coleoptera		I	Lampyridae	Unknown	A	Predator	3
E4(3)	Insecta	Coleoptera			Limuliodidae	Unknown	A	Unknown	1
F12(2)	Insecta	Coleoptera			Pselaphidae	Unknown	A	Predator	2
E12(3)	Insecta	Coleoptera			Pselaphidae	Unknown	B	Predator	2
F9(2)	Insecta	Coleoptera			Ptilidae	Unknown	A	Fungivore	41
E1(2)	Insecta	Coleoptera			Ptilidae	Unknown	B	Fungivore	8
E10(3)	Insecta	Coleoptera			Ptillidae	Unknown	C	Fungivore	1
E11(3)	Insecta	Coleoptera			Ptillidae	Unknown	D	Fungivore	12
E4(2)	Insecta	Coleoptera			Scaphidiidanae	Scaphidiidane	A	Fungivore	2
F11(1)	Insecta	Coleoptera		I	Scarabaeidae	Unknown	A	Herbivore	29
E5(3)	Insecta	Coleoptera			Scolytidae	Unknown	A	Herbivore	1
E7(3)	Insecta	Coleoptera			Scydmaenidae	Unknown	A	Predator	3
E3(1)	Insecta	Coleoptera		I	Staphylinidae	Aleocharinae	A	Predator	88
E6(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae	B	Parasite	15
E7(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae	C	Parasite	3
F5(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite	5
F5(3)	Insecta	Coleoptera			Staphylinidae	Omaliinae	A	Predator	1
E10(5)	Insecta	Coleoptera			Staphylinidae	Osoriinae	A	Herbivore	2
E1(3)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	A	Predator	13
F6(2)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	B	Predator	1
F7(2)	Insecta	Coleoptera			Staphylinidae	Stenus	A	Predator	1
E5(2)	Insecta	Coleoptera			Staphylinidae	Tachiporus	A	Predator	2
E10(2)	Insecta	Coleoptera			Staphylinidae	Unknown	A	Predator	7
E8(2)	Insecta	Coleoptera		I	Staphylinidae	Unknown	B	Predator	7
F7(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	C	Predator	1
F11(2)	Insecta	Coleoptera			Staphylinidae	Unknown	D	Predator	13
E9(5)	Insecta	Coleoptera		I	Staphylinidae	Unknown	M	Predator	7
E2(3)	Insecta	Coleoptera			Tenebrionidae	Unknown	A	Shredder	3
E6(3)	Insecta	Coleoptera			Unknown	Unknown		Fungivore	1
E8(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	1
F2(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	1
F3(3)	Insecta	Coleoptera			Unknown	Unknown		Unknown	1
F4(3)	Insecta	Coleoptera			Unknown	Unknown		Fungivore	2
E3(4)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	2
G10(1)	Insecta	Collembola			Entomobryidae	Entomobrya	A	Fungivore	37
A6(5)	Insecta	Collembola			Entomobryidae	Entomobrya	B	Fungivore	2
G2(1)	Insecta	Collembola			Entomobryidae	Entomobrya	F	Fungivore	19
G9(1)	Insecta	Collembola			Entomobryidae	Entomobrya	G	Fungivore	144
G11(1)	Insecta	Collembola			Entomobryidae	Entomobrya		Fungivore	24
A12(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrua	D	Predator	2
B1(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrua	E	Fungivore	4
G10(3)	Insecta	Collembola			Hypogastruridae	Neanura	F	Fungivore	5
G4(2)	Insecta	Collembola			Hypogastruridae	Unknown	A	Fungivore	15
G3(1)	Insecta	Collembola			Hypogastruridae	Unknown	B	Predator	63
G7(1)	Insecta	Collembola			Hypogastruridae	Unknown	C	Fungivore	12
G4(1)	Insecta	Collembola			Isotomidae	Folsomia	B	Fungivore	77
G4(4)	Insecta	Collembola			Isotomidae	Isotoma	B	Fungivore	39
G1(1)	Insecta	Collembola			Onychiuridae	Onychiurus	A	Fungivore	671
B4(5)	Insecta	Collembola			Sminthuridae	Sminthurus	A	Fungivore	3
G3(2)	Insecta	Collembola			Sminthuridae	Sminthurus	C	Fungivore	9
E12(2)	Insecta	Diptera	Nematocera		Bibionidae	Unknown	A	Fungivore	2
D10(3)	Insecta	Diptera	Nematocera		Cecidomyiidae	Unknown	A	Fungivore	1
D6(2)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	A	Unknown	1
D7(1)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	B	Unknown	2
D10(1)	Insecta	Diptera	Nematocera		Chironomidae	Unknown	A	Fungivore	16
D6(1)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	A	Unknown	2
D12(1)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	C	Unknown	1
D7(2)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	D	Unknown	1
D8(3)	Insecta	Diptera	Nematocera		Mycetophilidae	Unknown	A	Fungivore	3
D2(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	A	Fungivore	15
D5(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	B	Fungivore	1
E5(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	A	Fungivore	8
D8(2)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	D	Fungivore	1
D2(1)	Insecta	Diptera	Nematocera		Tipulidae	Unknown	A	Fungivore	61
D1(1)	Insecta	Diptera	Nematocera		Unknown	Unknown	A	Unknown	35
D4(1)	Insecta	Diptera	Nematocera		Unknown	Unknown	B	Unknown	1
F12(1)	Insecta	Diptera	Nematocera		Unknown	Unknown		Unknown	3
H2(3)	Arachnida	Aranea			Micryphantidae	Unknown	B	Predator	2
H3(2)	Arachnida	Aranea			Salticidae	Unknown	A	Predator	4
H4(3)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	B	Predator	3
H8(1)	Chilopoda	Geophilomorpha			Geophilidae	Unknown	A	Predator	7
H12(1)	Chilopoda	Lithobiomorpha			Lethobidae	Unknown	A	Predator	3
G8(2)	Diplopoda	Diplopoda			Polydesmidae	Unknown	B	Shredder	4
G11(3)	Diplopoda	Diplopoda			Unknown	Unknown		Shredder	8
G7(3)	Diplopoda	Diplopoda			Polydesmidae	Harpaphe	A	Shredder	1
H10(3)	Diplopoda	Diplopoda			Julidae	Unknown		Shredder	1

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	June Totals
G2(2)	Entognata	Protura			Unknown	Unknown	A	Algivore	4
H11(3)	Gastropoda	Gastropoda			Unknown	Unknown		Herbivore	1
G7(2)	Insecta	Diplura			Campodeidae	Unknown	A	Fungivore	7
B2(5)	Insecta	Diplura			Japigidae	Japyx	A	Predator	6
H12(3)	Insecta	Hemiptera			Cydnidae	Unknown		Herbivore	5
G2(4)	Insecta	Hemiptera			Enicocephalidae	Unknown	A	Predator	3
H5(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder	4
H6(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder	1
H7(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder	1
H6(3)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder	1
H10(2)	Insecta	Hemiptera			Pentatomidae	Unknown		Herbivore	1
H9(2)	Insecta	Homoptera			Aphidae	Unknown	A	Herbivore	3
H10(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	A	Herbivore	2
H11(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	B	Herbivore	20
H12(2)	Insecta	Homoptera			Fulgoridae	Unknown		Herbivore	1
H7(3)	Insecta	Homoptera			Ortheziidae	Orthezia	B	Herbivore	5
H1(1)	Insecta	Homoptera			Pseudococcidae	Unknown	A	Herbivore	119
H2(1)	Insecta	Homoptera			Pseudococcidae	Unknown	B	Herbivore	131
H6(1)	Insecta	Homoptera			Pseudococcidae	Unknown	C	Herbivore	12
G8(3)	Insecta	Hymenoptera			Diapriidae	Unknown	A	Parasite	1
B3(5)	Insecta	Hymenoptera			Diapriidae	Unknown	B	Parasite	1
H11(2)	Insecta	Hymenoptera			Diapriidae	Unknown	D	Parasite	2
G10(2)	Insecta	Hymenoptera			Diapriidae	Unknown	I	Parasite	1
H2(2)	Insecta	Hymenoptera			Formicidae	Unknown	A	Predator	18
H8(2)	Insecta	Hymenoptera			Formicidae	Unknown	B	Predator	2
G3(3)	Insecta	Hymenoptera			Formicidae	Unknown	C	Predator	3
A10(5)	Insecta	Hymenoptera			Formicidae	Unknown	D	Predator	3
A11(5)	Insecta	Hymenoptera			Formicidae	Unknown	E	Predator	4
G1(3)	Insecta	Hymenoptera			Unknown	Unknown	A	Unknown	2
H7(1)	Insecta	Lepidoptera		I	Noctuidae	Unknown	A	Herbivore	11
H9(3)	Insecta	Lepidoptera		I	Noctuidae	Unknown	B	Herbivore	2
H1(2)	Insecta	Orthoptera			Blattidae	Unknown		Omnivorous	2
H8(3)	Insecta	Orthoptera			Gryllidae	Unknown	A	Herbivore	1
G12(1)	Insecta	Protura			Unknown	Unknown	D	Fungivore	9
G2(3)	Insecta	Psocoptera			Unknown	Unknown	B	Algivore	5
G1(2)	Insecta	Thysanoptera			Unknown	Unknown	D	Fungivore	4
G12(2)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	F	Predator	3
G6(2)	Insecta	Thysanoptera			Unknown	Unknown	E	Fungivore	8
H4(2)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	A	Predator	1
G9(2)	Malacostraca	Isopoda			Unknown	Unknown		Shredder	2
H3(3)	Mecoptera	Mecoptera			Unknown	Unknown		Predator	1
F1(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	3
F3(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	1
F4(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	2
F5(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	5
F6(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	111
G9(3)	Nematoda	Nematoda			Unknown	Unknown		Unknown	1
G1(4)	Nematoda	Nematoda			Unknown	Unknown		Unknown	1
D5(1)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	1
G6(3)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	2
G7(4)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	3
Lombriz	Oligochaeta	Anellida			Unknown	Unknown		Fungivore	33
A8(5)	Symphyla	Symphyla			Unknown	Unknown		Herbivore	1

I = Inmature

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
A1(1)	0.25	0	0	0.25	0	0	3.25	0	0.25
A10(1)	0	0	0.5	0	0.25	0	0	0	1
A2(1)	0.75	0	0	1	0	0.75	1.25	0.25	1.25
A4(1)	0	0	0	0	0	0.5	0	0	0
A8(3)	0	0	0	0	0	0	0	0.75	0.25
B10(2)	1.75	0	1	0	0	0	0	0	0
C6(2)	0	0	0.25	0	0	0	0	0	0
C4(2)	0	0	0.5	0	0	0	0	0	0
A11(2)	0	0	0	0	0	0	0	0.5	0
A6(3)	0	0	0	0	0	0	0.25	0	0
B4(2)	0	0	0	0.25	0	0	0	0	0
C12(2)	0	0	0	0	0	0	0.25	0	0
A8(1)	0.25	0	0	0.5	0	0	0	0	0
C7(2)	0	0	0.25	0	0	0	0	0	0
A12(1)	0	0	0.75	0	0	1	0	0	0
C10(1)	1.5	0.25	5.5	0	0	3	0.5	0	0.25
C2(1)	6.75	1.5	4.75	2.75	8.5	0.25	0.5	1	0
C4(1)	5	3	0.75	0	0.5	0	0	0	0
C7(1)	0.75	2.75	0.25	2.75	1.5	2.5	4	3.75	1.75
C8(1)	4.75	0	0	0	0	0.5	0.25	0	0
A3(1)	3.25	0	0	0.75	1	1	0	0.5	0
C1(1)	7.5	1	2.25	3.25	1.25	2.25	1	2.25	1
C5(1)	0.5	0.75	3.25	2.75	7.5	0.25	1.25	0	0
C9(1)	0	0	0	0	0	0.25	0	0	0
A4(2)	0	0	0	0	0	0	0	1.5	0
B11(1)	3.5	0.25	2.25	0	0	0	0	0	0
B8(1)	1.5	0	1.75	4.75	1.5	6	1	0.25	1.25
B9(1)	3.75	1.5	7.5	2.5	5.5	0	0	0	0
B6(2)	0	0	0	0	0.25	0	0	0	0
C5(2)	0	0	2	0	0	0	0	0	0
B10(3)	0	0	1	0	0	0	0	0	0
B12(3)	0	0	0	0	0	0	0	0.25	0
C7(4)	0	0	0	0	0	0	0.5	0	0
B7(2)	0.75	0	0.25	0	0.25	0.25	0	0	0
B11(2)	3	0	1.25	0	0	0	0	0	0
B5(2)	0.25	0.25	0.5	0	0.25	0.25	0	0	0
C12(1)	0	0	0	0	0	0.25	0	0	0
B12(2)	13.75	0	0.25	0	0	0	0	0	0.25
B9(2)	0	0	1	0	0	0.25	0	0	0
C2(3)	0	0	0	0	0.5	0	0.75	0.25	1.75
B3(3)	0	1.25	0	0	0	0	0	0	0
A11(1)	0.25	0.25	0	0	0.5	0	0	0	0
C6(1)	0.5	0.25	8.5	0.25	3.75	0.25	1.25	0	0
B7(3)	0	0	0.75	0	0	0	0	0	0
B2(1)	2	1.5	5	1.25	4	0	20.5	2.75	0.25
B4(1)	2.25	1	0.75	0	0	0	0.5	0	0.5
A7(1)	1.75	1.5	0	0	1.75	1.25	1.5	1	0
B8(2)	0.25	0.25	0.5	0	0.5	0	0	0	0
C8(4)	0	0	0	0	0	0	0.5	0.25	0
B9(3)	0	0	0.25	0	0	0	0	0	0
A6(1)	0.75	0.25	0	0	0	0.5	0	0	0
A1(2)	2.5	1	1	0	0	0.5	0	0	0
A9(1)	0.25	0	5.5	0	0.75	0	1.25	0	0
B10(1)	17	6.5	0	4.25	6.25	8.25	4.75	1.25	1.25
B2(2)	3.75	2	0.5	0.5	1	0.75	0	0	0
B5(3)	0	0	0.25	0	0	0	0	0.25	0
B1(2)	1	0.25	0	1.5	1.5	0.25	0.5	0	0.25
B4(3)	0	1	2.25	0	0	0	0	0	0
A2(2)	0	3	0	0	0	0	0.5	1.5	4.25
B8(3)	0	0	1.25	0	0	0	0	0	0
B1(1)	13	0.5	1	0.25	2	0	13.5	6	0
C9(3)	0	0	0	0	0.25	0	0	0	0.25
B5(1)	0	0	1.25	5.75	9.5	0	1.75	1	0.75
C6(4)	0	0	0	0	1.75	0	0	0	0
C11(3)	0	0	0	0	0	0.5	0.75	1.25	0
B3(1)	2.75	0.25	0	0	0	0.25	2.75	0.25	0
B12(1)	2.75	1.75	0.5	2.75	0.75	0.25	0.75	0.25	0
C11(1)	0.25	0	0	0	0	0.25	0.25	0	0
C9(4)	0	0	0	0	0	0	0	0.25	0
A1(3)	0	0	0	0	0	0	0.75	0.25	0
A2(3)	0	0	0	0	0	0	1.25	3.25	0.75
C11(2)	0	0	0	0	0	0	0.5	0.5	0
A11(3)	0	0	0	0	0	0	0.75	0	0
A4(3)	0	0	0	0	0	0	0	0	0.5
A5(3)	0	0	0	0	0	0	1	0	0
A12(3)	0	0	0	0	0	0	0	0.25	0
B6(3)	0	0	1.5	0	0	0	0	0	0
C10(4)	0	0	0	0	0	0	0	0.25	0
C5(4)	0	0	0	0	0	0	0.25	0.25	0
B2(3)	0	0.25	0.25	0	0	0	0	0	0
C8(2)	0	0	0.5	0	0	0	0	0	0
A7(2)	0	0	0	0	0	0	0	0.25	0
E4(1)	0	1.75	0	0.25	0	0	0	0.25	0
F1(3)	0	0	0.25	0	0	0	0	0	0
F1(2)	0	0	0	0	0.5	0	0	0	0
F2(2)	0.25	0	0	0	0.25	0	0	0	0
F3(2)	0	0	0	0	0.25	0.25	0.25	0	0
F4(2)	0	0	0	0	0.25	0	0	0	0
F10(2)	0.25	0	0	0	0	0.25	0	0	0

Code	Native 1	Native 2	Native 3	Pasture 1	Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
E8(1)	0.25	1	0	0	0.75	0	0	0	0
E6(1)	0	0	0	0	0	0	0	0.5	0
F7(1)	0	0	0	0.25	0	0.25	0	0.25	0.25
E9(3)	0	0.25	0	0	0	0	0	0	0
E2(1)	0	0	0	1	0.75	0	0	1	0
E2(2)	1	0	0	0.25	0	0	0	0	0
E3(2)	0	0	0.5	0.5	2	0.75	0	0	0
E3(3)	0	0.25	0	0	0	0	0	0	0
E9(2)	0	0	0	0	0.25	0.75	0	0	0
E1(1)	0.5	0	0	0	0	0	0	0	0
E7(5)	0	0	0	0	0	0	1.75	0	0
D4(2)	0.25	0	0	0	0.5	0	0	0	0
E4(3)	0	0.25	0	0	0	0	0	0	0
F12(2)	0.5	0	0	0	0	0	0	0	0
E12(3)	0	0	0.5	0	0	0	0	0	0
F9(2)	9	0.25	0.75	0	0	0.25	0	0	0
E1(2)	0.5	0	0	0.75	0	0.25	0	0.5	0
E10(3)	0	0	0.25	0	0	0	0	0	0
E11(3)	0	0	0.5	0	0	0	0	2.5	0
E4(2)	0	0	0	0	0.5	0	0	0	0
F11(1)	0.25	0	6.75	0	0	0.25	0	0	0
E5(3)	0	0.25	0	0	0	0	0	0	0
E7(3)	0	0.5	0	0	0	0	0.25	0	0
E3(1)	2	0.25	4	4.5	3.5	0.25	5.25	1.5	0.75
E6(2)	0	0.75	1	0	2	0	0	0	0
E7(2)	0	0	0	0	0.75	0	0	0	0
F5(2)	0.5	0.5	0	0	0.25	0	0	0	0
F5(3)	0	0	0.25	0	0	0	0	0	0
E10(5)	0	0	0	0	0	0	0	0.5	0
E1(3)	0.5	2.25	0.25	0	0	0	0	0.25	0
F6(2)	0	0	0	0	0	0.25	0	0	0
F7(2)	0	0	0	0	0	0.25	0	0	0
E5(2)	0	0.25	0	0	0.25	0	0	0	0
E10(2)	0	0	0	0	1.75	0	0	0	0
E8(2)	0	0	0.25	0	1	0	0.25	0.25	0
F7(3)	0	0	0	0	0	0	0	0	0.25
F11(2)	0.25	0.25	2.75	0	0	0	0	0	0
E9(5)	0	0	0	0	0	0	0	1.75	0
E2(3)	0.75	0	0	0	0	0	0	0	0
E6(3)	0	0.25	0	0	0	0	0	0	0
E8(3)	0	0.25	0	0	0	0	0	0	0
F2(3)	0	0	0.25	0	0	0	0	0	0
F3(3)	0	0	0.25	0	0	0	0	0	0
F4(3)	0	0	0.5	0	0	0	0	0	0
E3(4)	0	0	0	0	0	0	0	0	0.5
G10(1)	0.25	0	2.5	1.5	0.5	3.75	0.75	0	0
A6(5)	0	0	0	0	0	0	0	0.5	0
G2(1)	0	0	0	0.5	1.25	1.25	1.25	0.5	0
G9(1)	0	0	0	0.25	0	35.75	0	0	0
G11(1)	0	0	0	0	0.75	5	0.25	0	0
A12(5)	0	0	0	0	0	0	0	0.5	0
B1(5)	0	0	0	0	0	0	0	1	0
G10(3)	0	0	0	0	0	0	0	1.25	0
G4(2)	0	0	2.5	0	0.25	1	0	0	0
G3(1)	5.5	4.25	0	0	0	2.5	0.25	1.75	1.5
G7(1)	0	0	0	1.75	0	0	0	1.25	0
G4(1)	0	1.5	0.5	8	0.25	1.5	0.25	6	1.25
G4(4)	0	0	9.75	0	0	0	0	0	0
G1(1)	18.25	77	8.75	4.5	7.5	18	11	10.75	12
B4(5)	0	0	0	0	0	0.5	0	0	0.25
G3(2)	0	0	0	0	0.5	1	0	0.25	0.5
E12(2)	0	0	0	0	0.5	0	0	0	0
D10(3)	0	0	0	0	0	0	0	0.25	0
D6(2)	0	0.25	0	0	0	0	0	0	0
D7(1)	0	0	0	0	0	0.5	0	0	0
D10(1)	0	0.5	0	0	0.5	0.25	0	2.75	0
D6(1)	0	0	0	0	0	0.25	0	0.25	0
D12(1)	0	0	0	0	0	0.25	0	0	0
D7(2)	0	0	0.25	0	0	0	0	0	0
D8(3)	0.25	0	0	0	0	0	0.5	0	0
D2(2)	0.5	2.25	0.75	0	0	0	0	0.25	0
D5(2)	0	0.25	0	0	0	0	0	0	0
E5(1)	0.25	0.25	1.25	0	0	0	0.25	0	0
D8(2)	0	0	0.25	0	0	0	0	0	0
D2(1)	1	1	2.25	0	0.25	0	2	8.5	0.25
D1(1)	1.25	2.5	1.75	1.5	0	0.25	0.5	0.75	0.25
D4(1)	0	0.25	0	0	0	0	0	0	0
F12(1)	0	0	0.5	0.25	0	0	0	0	0
H2(3)	0.25	0	0	0	0	0	0	0.25	0
H3(2)	0.25	0	0	0.25	0.25	0.25	0	0	0
H4(3)	0.25	0.5	0	0	0	0	0	0	0
H8(1)	0	0.25	1	0.25	0.25	0	0	0	0
H12(1)	0	0	0	0.25	0	0	0.5	0	0
G8(2)	0.25	0	0.75	0	0	0	0	0	0
G11(3)	0	0	2	0	0	0	0	0	0
G7(3)	0	0	0	0	0.25	0	0	0	0
H10(3)	0	0.25	0	0	0	0	0	0	0
G2(2)	0	0	0	0	1	0	0	0	0
H11(3)	0	0.25	0	0	0	0	0	0	0
G7(2)	1.25	0	0.5	0	0	0	0	0	0
B2(5)	0	0	1	0	0	0	0.25	0.25	0

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
H12(3)	0	0.25	0.75	0	0	0	0.25	0	0
G2(4)	0	0	0.75	0	0	0	0	0	0
H5(2)	0.25	0	0.25	0	0.5	0	0	0	0
H6(2)	0	0	0	0	0.25	0	0	0	0
H7(2)	0	0	0	0	0.25	0	0	0	0
H6(3)	0.25	0	0	0	0	0	0	0	0
H10(2)	0	0	0	0	0.25	0	0	0	0
H9(2)	0	0	0	0	0.25	0	0	0	0.5
H10(1)	0	0	0.25	0.25	0	0	0	0	0
H11(1)	2.25	0.5	0	1	0	0.5	0.25	0.25	0.25
H12(2)	0	0	0	0	0.25	0	0	0	0
H7(3)	1.25	0	0	0	0	0	0	0	0
H1(1)	12.25	5	0.75	2.25	5.75	2.5	1	0	0.25
H2(1)	2.5	0.25	0	4.5	17	0	5.25	1.5	1.75
H6(1)	0	1.75	0	0	0	0	1.25	0	0
G8(3)	0	0.25	0	0	0	0	0	0	0
B3(5)	0	0	0	0	0	0	0	0.25	0
H11(2)	0	0	0	0	0.5	0	0	0	0
G10(2)	0	0	0	0	0	0.25	0	0	0
H2(2)	2	1.25	0	0.5	0.5	0.25	0	0	0
H8(2)	0	0	0	0	0.25	0	0.25	0	0
G3(3)	0	0.75	0	0	0	0	0	0	0
A10(5)	0	0	0	0	0	0	0.5	0.25	0
A11(5)	0	0	0	0	0	0	1	0	0
G1(3)	0.25	0	0	0	0	0	0.25	0	0
H7(1)	0.75	0.25	0	0.5	0	0	0	1.25	0
H9(3)	0	0.5	0	0	0	0	0	0	0
H1(2)	0	0	0	0.25	0.25	0	0	0	0
H8(3)	0	0.25	0	0	0	0	0	0	0
G12(1)	0	0	0	0.25	0	2	0	0	0
G2(3)	0.25	0	0.25	0	0	0	0.5	0.25	0
G1(2)	0.25	0	0	0	0.25	0.5	0	0	0
G12(2)	0.5	0	0	0	0.25	0	0	0	0
G6(2)	0	0.25	1.5	0	0	0.25	0	0	0
H4(2)	0	0	0	0	0.25	0	0	0	0
G9(2)	0.5	0	0	0	0	0	0	0	0
H3(3)	0.25	0	0	0	0	0	0	0	0
F1(1)	0.25	0	0	0.5	0	0	0	0	0
F3(1)	0.25	0	0	0	0	0	0	0	0
F4(1)	0	0.25	0.25	0	0	0	0	0	0
F5(1)	0	0.5	0.25	0	0.25	0	0.25	0	0
F6(1)	0	1.75	0	0	1.25	0	0	3	21.75
G9(3)	0	0.25	0	0	0	0	0	0	0
G1(4)	0	0	0.25	0	0	0	0	0	0
D5(1)	0	0	0	0	0.25	0	0	0	0
G6(3)	0	0.25	0.25	0	0	0	0	0	0
G7(4)	0	0	0.75	0	0	0	0	0	0
lombriz	1.75	0.25	0	2.25	0.25	3.75	0	0	0
A8(5)	0	0	0	0	0	0	0.25	0	0

Appendix 3. Average of the four subsamples taken in the three types of land management (native, pasture and cropland) for July.

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	July Totals
A2(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	A	Fungivore	14
A10(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	B	Fungivore	36
A1(1)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	43
A10(2)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	1
A8(3)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	12
A8(1)	Arachnida	Acari	Gamasina		Eupodidae	Unknown		Predator	18
A3(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator	2
B10(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator	0
C7(2)	Arachnida	Acari	Gamasina		Gamasidae	Unknown		Unknown	10
C4(2)	Arachnida	Acari	Gamasida		Polyaspididae	Unknown		Predator	17
A12(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	4
C10(1)	Arachnida	Acari	Gamasina	I	Oligamasidae	Unknown		Predator	30
C2(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	104
C4(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	38
C7(1)	Arachnida	Acari	Gamasina	I	Oligamasidae	Unknown		Predator	87
C8(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	5
C5(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Fungivore	81
A11(2)	Arachnida	Acari	Gamasida	I	Unknown	Unknown		Predator	18
A7(3)	Arachnida	Acari	Gamasida		Unknown	Unknown		Predator	2
C1(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	87
C9(1)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	13
A5(2)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	4
A6(2)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	4
A8(2)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	5
C1(3)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator	40
B11(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	11
B8(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	54
B9(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	228
B4(2)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator	1
C12(2)	Arachnida	Acari	Gamasida		Zerconidae	Zercon		Predator	13
A3(1)	Arachnida	Acari	Gamasida		Oligamasidae	Unknown		Predator	24
B6(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	B	Fungivore	7
B10(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	C	Fungivore	5
B12(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	D	Fungivore	7
C5(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	E	Fungivore	4
C3(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	F	Fungivore	1
B11(2)	Arachnida	Acari	Oribatida		Eremuloidae	Eremaus	A	Fungivore	67
B12(1)	Arachnida	Acari	Oribatidae		Euphthiracaridae	Peruthritia	A	Fungivore	43
B5(2)	Arachnida	Acari	Oribatida		Galumnidae	Galumna	A	Fungivore	5
C12(1)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	A	Fungivore	2
B12(2)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	C	Fungivore	3
B9(2)	Arachnida	Acari	Oribatida		Mesoplophoridae	Mesoplophoa	A	Fungivore	16
C2(3)	Arachnida	Acari	Oribatida		Metrippiidae	Ceratoppia	A	Fungivore	30
B3(3)	Arachnida	Acari	Oribatida		Microzetidae	Microzetes	A	Fungivore	1
A11(1)	Arachnida	Acari	Oribatida		Nanhermanniidae	Nanhermana	A	Fungivore	4
C6(1)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	A	Fungivore	28
B4(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	A	Fungivore	144
B2(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	B	Fungivore	458
A7(1)	Arachnida	Acari	Oribatida	I	Oppiidae	Oppiella	C	Fungivore	105
B8(2)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	B	Fungivore	79
C8(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	C	Fungivore	1
B9(3)	Arachnida	Acari	Oribatida		Oribatellidae	Oribatella	A	Fungivore	1
A5(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	43
A6(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	62
A1(2)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	25
A9(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore	58
B10(1)	Arachnida	Acari	Oribatida		Oribatulidae	Zygoribatula	A	Fungivore	159
B2(2)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicharames	A	Fungivore	9
B5(3)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicheremas	B	Fungivore	7
C4(3)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicheremas	C	Fungivore	2
B11(3)	Arachnida	Acari	Oribatida		Phenopelopidae	Eupelops	A	Fungivore	16
B1(2)	Arachnida	Acari	Oribatida		Phenopelopidae	Pelopsis	A	Fungivore	27
B4(3)	Arachnida	Acari	Oribatida		Phthiracaridae	Phthiracarus	A	Fungivore	7
B8(3)	Arachnida	Acari	Oribatida		Rhynchoribatidae	Rhynchoribas	A	Bacteria feeder	5
B1(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	A	Fungivore	102
B5(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	B	Fungivore	58
B7(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	C	Fungivore	1
C9(3)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	F	Fungivore	57
C11(3)	Arachnida	Acari	Oribatida		Suctobelbaidae	Sectobelba	A	Bacteria feeder	49
B3(1)	Arachnida	Acari	Oribatida		Tectocepheidae	Tectocepheus	A	Fungivore	53
C6(3)	Arachnida	Acari	Oribatidae		Unknown	Unknown	primitive	Unknown	1
C11(1)	Arachnida	Acari	Prostigmata	I	Crotonoidea	Plaquetes		Predator	5
C2(2)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown	A	Fungivore	16
A1(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	A	Fungivore	32
A2(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	B	Fungivore	20
A3(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	C	Fungivore	222
C11(2)	Arachnida	Acari	Prostigmata		Rhagiidae	Unknown		Predator	12
A5(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown	6
B6(1)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Predator	1
A2(2)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Predator	7
B12(4)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown		Predator	40
B2(3)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown	A	Predator	16
A9(2)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown		Predator	2
C8(2)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown		Predator	1

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	July Totals
B6(3)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	1
C5(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	1
A7(2)	Arachnida	Acari	unknown		Unknown	Unknown		Predator	17
A12(3)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown	5
C7(3)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown	9
E4(1)	Insecta	Coleoptera		I	Cantharidae	Unknown	A	Predator	9
F1(3)	Insecta	Coleoptera		I	Cantharidae	Unknown	B	Predator	4
F10(2)	Insecta	Coleoptera		I	Carabidae	Unknown	F	Predator	1
E6(1)	Insecta	Coleoptera		I	Carabidae	Unknown	G	Predator	1
F7(1)	Insecta	Coleoptera		I	Chrysomelidae	Alticinae	A	Herbivore	6
E9(3)	Insecta	Coleoptera			Chrysomelidae	Alticinae	C	Herbivore	1
E2(1)	Insecta	Coleoptera		I	Cleridae	Unknown	A	Predator	10
F10(3)	Insecta	Coleoptera			Coccinelidae	Unknown	A	Predator	2
E6(4)	Insecta	Coleoptera			Curculionidae	Apion		Herbivore	1
E3(2)	Insecta	Coleoptera		I	Curculionidae	Unknown	B	Herbivore	11
E3(3)	Insecta	Coleoptera			Curculionidae	Unknown	C	Herbivore	17
F8(3)	Insecta	Coleoptera			Curculionidae	Unknown	D	Herbivore	4
E9(2)	Insecta	Coleoptera			Elateridae	Unknown	A	Shredder	30
E1(1)	Insecta	Coleoptera		I	Elateridae	Unknown	C	Shredder	5
E7(4)	Insecta	Coleoptera		I	Elateridae	Unknown	D	Shredder	1
E7(5)	Insecta	Coleoptera		I	Elateridae	Unknown	E	Shredder	1
E1(4)	Insecta	Coleoptera			Histeridae	Unknown	A	Predator	1
F11(3)	Insecta	Coleoptera			Leiodidae	Unknown	A	Scavenger	1
F12(2)	Insecta	Coleoptera			Pselaphidae	Unknown	A	Predator	2
E12(3)	Insecta	Coleoptera			Pselaphidae	Unknown	B	Predator	1
F9(2)	Insecta	Coleoptera			Ptilidae	Unknown	A	Fungivore	17
E1(2)	Insecta	Coleoptera			Ptilidae	Unknown	B	Fungivore	2
E10(3)	Insecta	Coleoptera			Ptillidae	Unknown	C	Fungivore	10
E11(3)	Insecta	Coleoptera			Ptillidae	Unknown	D	Fungivore	2
F11(1)	Insecta	Coleoptera		I	Scarabaeidae	Unknown	A	Herbivore	101
E3(1)	Insecta	Coleoptera		I	Staphylinidae	Aleocharinae	A	Predator	25
E6(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae	B	Parasite	5
F5(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite	3
E1(5)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite	2
E1(3)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	A	Predator	18
F6(2)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	B	Predator	4
E5(2)	Insecta	Coleoptera			Staphylinidae	Tachiporus	A	Predator	2
E10(2)	Insecta	Coleoptera			Staphylinidae	Unknown	A	Predator	53
E8(2)	Insecta	Coleoptera		I	Staphylinidae	Unknown	B	Predator	5
F7(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	C	Predator	9
F11(2)	Insecta	Coleoptera			Staphylinidae	Unknown	D	Predator	7
F9(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	D	Predator	1
F12(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	E	Predator	3
E2(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	F	Predator	1
E4(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	G	Predator	1
E8(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	H	Predator	4
F9(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	I	Predator	1
F10(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	J	Predator	1
F11(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	K	Predator	1
F12(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	L	Predator	1
E9(5)	Insecta	Coleoptera		I	Staphylinidae	Unknown	M	Predator	1
F8(4)	Insecta	Coleoptera			Staphylinidae	Unknown	N	Predator	1
F1(4)	Insecta	Coleoptera			Staphylinidae	Unknown	O	Predator	1
E8(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	7
F2(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	2
E3(4)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	6
E11(5)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	1
G10(1)	Insecta	Collembola			Entomobryidae	Entomobrya	A	Fungivore	31
A6(5)	Insecta	Collembola			Entomobryidae	Entomobrya	B	Fungivore	2
B6(5)	Insecta	Collembola			Entomobryidae	Entomobrya	C	Fungivore	1
G12(5)	Insecta	Collembola		I	Entomobryidae	Entomobrya	F	Fungivore	2
G11(1)	Insecta	Collembola			Entomobryidae	Entomobrya		Fungivore	2
A12(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrua	D	Predator	1
G10(3)	Insecta	Collembola			Hypogastruridae	Neanura	F	Fungivore	1
G4(2)	Insecta	Collembola			Hypogastruridae	Unknown	A	Fungivore	1
G3(1)	Insecta	Collembola			Hypogastruridae	Unknown	B	Predator	208
G7(1)	Insecta	Collembola			Hypogastruridae	Unknown	C	Fungivore	3
G4(1)	Insecta	Collembola			Isotomidae	Folsomia	B	Fungivore	64
G4(5)	Insecta	Collembola			Isotomidae	Isotoma	A	Fungivore	74
G4(4)	Insecta	Collembola			Isotomidae	Isotoma	B	Fungivore	2
G1(1)	Insecta	Collembola			Onychiuridae	Onychiurus	A	Fungivore	573
G3(2)	Insecta	Collembola			Sminthuridae	Sminthurus	C	Fungivore	25
G5(3)	Insecta	Collembola			Sminthuridae	Unknown	B	Fungivore	11
D10(3)	Insecta	Diptera	Nematocera		Cecidomyiidae	Unknown	A	Fungivore	1
D10(1)	Insecta	Diptera	Nematocera		Chironomidae	Unknown	A	Fungivore	43
D3(3)	Insecta	Diptera		I	Higher Diptera	Coleoptera?		Unknown	1
D12(2)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	E	Unknown	1
D11(2)	Insecta	Diptera	Cyclorrhapha	I	Higher Diptera	Unknown	F	Unknown	1
D2(3)	Insecta	Diptera	Cyclorrhapha	I	Higher Diptera	Unknown	G	Unknown	1
D2(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	A	Fungivore	9
E5(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	A	Fungivore	2
D10(2)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	B	Fungivore	2
D11(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	C	Fungivore	1
D8(2)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	D	Fungivore	1
D2(1)	Insecta	Diptera	Nematocera		Tipulidae	Unknown	A	Fungivore	25
D1(1)	Insecta	Diptera	Nematocera		Unknown	Unknown	A	Unknown	74
F12(1)	Insecta	Diptera	Nematocera	I	Unknown	Unknown		Unknown	6
H2(3)	Arachnida	Aranea			Micryphantidae	Unknown	B	Predator	1
H3(2)	Arachnida	Aranea			Salticidae	Unknown	A	Predator	2
H2(4)	Arachnida	Araneae			Theraphosidae	Unknown		Predator	4
C9(2)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	A	Predator	1
H4(3)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	B	Predator	4

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	July Totals
H8(1)	Chilopoda	Geophilomorpha			Geophilidae	Unknown	A	Predator	16
H12(1)	Chilopoda	Lithobiomorpha			Lethobidae	Unknown	A	Predator	1
G8(2)	Diplopoda	Diplopoda			Polydesmidae	Unknown	B	Shredder	11
G11(3)	Diplopoda	Diplopoda			Unknown	Unknown		Shredder	1
H11(3)	Gastropoda				Unknown	Unknown		Herbivore	1
G7(2)	Insecta	Diplura			Campodeidae	Unknown	A	Fungivore	46
B2(5)	Insecta	Diplura			Japigidae	Japyx	A	Predator	9
H12(3)	Insecta	Hemiptera			Cydnidae	Unknown		Herbivore	10
G2(4)	Insecta	Hemiptera			Enicocephalidae	Unknown	A	Predator	3
H1(4)	Insecta	Hemiptera			Gelastocoridae	Unknown		Predator	2
H5(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder	5
H3(4)	Insecta	Hemiptera			Miridae	Unknown		Herbivore	2
G10(4)	Insecta	Hemiptera			Unknown	Unknown		Unknown	1
H9(2)	Insecta	Homoptera			Aphidae	Unknown	A	Herbivore	2
H2(5)	Insecta	Homoptera			Aphidae	Unknown	C	Herbivore	1
H10(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	A	Herbivore	6
H11(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	B	Herbivore	22
C10(2)	Insecta	Homoptera			Ortheziidae	Orthezia	A	Herbivore	1
H1(1)	Insecta	Homoptera			Pseudococcidae	Unknown	A	Herbivore	306
H2(1)	Insecta	Homoptera			Pseudococcidae	Unknown	B	Herbivore	81
G11(5)	Insecta	Hymenoptera			Diapriidae	Unknown	H	Parasite	1
H2(2)	Insecta	Hymenoptera			Formicidae	Unknown	A	Predator	5
H8(2)	Insecta	Hymenoptera			Formicidae	Unknown	B	Predator	2
G3(3)	Insecta	Hymenoptera			Formicidae	Unknown	C	Predator	2
H4(5)	Insecta	Hymenoptera			Formicidae	Unknown	G	Predator	1
G1(3)	Insecta	Hymenoptera			Unknown	Unknown	A	Unknown	8
H7(1)	Insecta	Lepidoptera		I	Noctuidae	Unknown	A	Herbivore	3
H9(3)	Insecta	Lepidoptera		I	Noctuidae	Unknown	B	Herbivore	2
G9(4)	Insecta	Orthoptera			Gryllidae	Unknown	B	Herbivore	4
G2(3)	Insecta	Psocoptera			Unknown	Unknown	B	Algivore	12
H4(2)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	A	Predator	2
G12(4)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	H	Predator	65
H11(4)	Insecta	Thysanoptera			Unknown	Unknown	B	Fungivore	4
G1(2)	Insecta	Thysanoptera			Unknown	Unknown	D	Fungivore	1
G11(4)	Insecta	Thysanoptera			Unknown	Unknown	G	Fungivore	2
H4(4)	Insecta	Thysanoptera			Unknown	Unknown	I	Fungivore	2
H6(5)	Insecta	Thysanoptera			Unknown	Unknown	L	Fungivore	3
H9(5)	Insecta	Thysanoptera			Unknown	Unknown	M	Fungivore	1
G9(2)	Malacostraca	Isopoda			Unknown	Unknown		Shredder	5
H3(3)	Mecoptera	Mecoptera			Unknown	Unknown		Predator	1
F1(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	2
F2(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	11
F3(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	1
F4(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	8
F5(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	9
F6(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	8
G9(3)	Nematoda	Nematoda			Unknown	Unknown		Unknown	2
G1(4)	Nematoda	Nematoda			Unknown	Unknown		Unknown	1
A1(5)	Nematoda	Nematoda			Unknown	Unknown		Unknown	5
G6(3)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	2
G7(4)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	4
lombriz	Oligochaeta	Anellida			Unknown	Unknown		Fungivore	11
H5(4)	Pauropoda	Pauropoda			Unknown	Unknown		Unknown	3
A8(5)	Symphyla	Symphyla			Unknown	Unknown		Herbivore	1

I = Inmature

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
A2(1)	0	0	0	0.75	1.5	0	1	0	0.25
A10(1)	0.25	2.25	0	2	2	0	2.5	0	0
A1(1)	0.25	0	0	1.25	6.25	0.5	1.5	1	0
A10(2)	0	0	0	0	0.25	0	0	0	0
A8(3)	0	0	0	0	0	0	3	0	0
A8(1)	0	0.75	0	0	0	0	3.75	0	0
A3(2)	0	0.25	0.25	0	0	0	0	0	0
B10(2)	0	0	0	0	0	0	0	0	0
C7(2)	0	0.25	0.25	0	0	0	0	2	0
C4(2)	2.75	1.5	0	0	0	0	0	0	0
A12(1)	0	0.5	0.5	0	0	0	0	0	0
C10(1)	1	4	0.75	0	1.5	0.25	0	0	0
C2(1)	7.5	7.5	1.25	2.25	4.75	1.75	0.75	0.25	0
C4(1)	3.75	3	0.5	0	2.25	0	0	0	0
C7(1)	5.5	6	1	2.5	2	0	3.75	1	0
C8(1)	0	0.75	0	0	0	0.5	0	0	0
C5(1)	2.25	1.75	0	2	13.25	0	1	0	0
A11(2)	0	0	0	0	3.25	0.75	0	0.5	0
A7(3)	0	0	0	0	0	0	0.5	0	0
C1(1)	6.25	8.5	1.75	3.5	1.25	0	0.25	0.25	0
C9(1)	0.75	0	0	0.75	1.75	0	0	0	0
A5(2)	0	0	0	0	0	0	0	1	0
A6(2)	0	0	0	0	0	0	0	1	0
A8(2)	0	0	0	0.75	0.5	0	0	0	0
C1(3)	1	7.25	0	1.75	0	0	0	0	0
B11(1)	1.5	0	1.25	0	0	0	0	0	0
B8(1)	3.5	2	0.75	2.25	4.5	0	0.5	0	0
B9(1)	17.75	17	1.25	13	8	0	0	0	0
B4(2)	0.25	0	0	0	0	0	0	0	0
C12(2)	0	2.5	0.25	0	0.5	0	0	0	0
A3(1)	2.75	2.25	0.5	0.5	0	0	0	0	0
B6(2)	0	0	0	0	0	0	1.75	0	0
B10(3)	0.75	0.25	0.25	0	0	0	0	0	0
B12(3)	1	0.5	0	0	0.25	0	0	0	0
C5(2)	0	0.5	0.5	0	0	0	0	0	0
C3(3)	0.25	0	0	0	0	0	0	0	0
B11(2)	13.75	1	0.5	0	1.5	0	0	0	0
B12(1)	3.75	4.25	0	2	0.25	0.25	0.25	0	0
B5(2)	0	0.75	0.25	0	0.25	0	0	0	0
C12(1)	0.25	0	0	0	0	0.25	0	0	0
B12(2)	0	0	0	0.75	0	0	0	0	0
B9(2)	0	0	3.75	0.25	0	0	0	0	0
C2(3)	6.75	0.25	0	0	0.5	0	0	0	0
B3(3)	0.25	0	0	0	0	0	0	0	0
A11(1)	0.25	0	0.5	0	0.25	0	0	0	0
C6(1)	2.75	1.75	0.25	1	1	0	0	0	0.25
B4(1)	8.25	3.5	0.25	7.5	0	0	16	0.5	0
B2(1)	17.25	43.5	1	11	8.25	0.25	32.5	0.75	0
A7(1)	0.5	0	1	0	8.25	2.5	13.25	0.25	0.5
B8(2)	4	8.75	1.5	5	0.5	0	0	0	0
C8(4)	0	0	0	0	0	0	0	0.25	0
B9(3)	0	0	0.25	0	0	0	0	0	0
A5(1)	0.5	0	0	8	2.25	0	0	0	0
A6(1)	8.75	3.5	0	1.5	0.25	0.25	1.25	0	0
A1(2)	3	2.5	0.5	0.25	0	0	0	0	0
A9(1)	2.5	1	0.25	0.75	9	0.5	0.5	0	0
B10(1)	26.75	1.25	0	4	4.25	2	1.5	0	0
B2(2)	0	1.5	0.25	0.5	0	0	0	0	0
B5(3)	0.25	0.75	0	0.75	0	0	0	0	0
C4(3)	0	0.5	0	0	0	0	0	0	0
B11(3)	0.25	1.5	0.25	0	2	0	0	0	0
B1(2)	1.25	0.25	0	1.75	2	0	1.25	0.25	0
B4(3)	0	1.75	0	0	0	0	0	0	0
B8(3)	0.5	0.5	0.25	0	0	0	0	0	0
B1(1)	3.25	8.5	1	0	0.5	0	11.5	0.75	0
B5(1)	0.25	0	0	0.5	7.75	0	5.5	0.5	0
B7(1)	0.25	0	0	0	0	0	0	0	0
C9(3)	0	0	0.25	8	5.5	0	0.25	0.25	0
C11(3)	0	0	0	4.25	3.25	0	4.75	0	0
B3(1)	4	0	0	0	1.25	0	8	0	0
C6(3)	0	0.25	0	0	0	0	0	0	0
C11(1)	0	0.25	0	0	0.5	0	0.5	0	0
C2(2)	0.25	2	1.25	0	0	0	0	0.5	0
A1(3)	0	0	0	0	0	0	5.5	2.5	0
A2(3)	0	0	0	0	0	0	4.25	0.75	0
A3(3)	0	0	0	0	0	0	54.25	0.75	0.5
C11(2)	0	0.75	0.75	0.25	0	0	1.25	0	0
A5(3)	0	0	0	0	0	0	1.5	0	0
B6(1)	0	0.25	0	0	0	0	0	0	0
A2(2)	0.75	0.5	0.25	0	0	0	0	0.25	0
B12(4)	0	0	0	0	10	0	0	0	0
B2(3)	3	1	0	0	0	0	0	0	0
A9(2)	0	0	0	0	0.5	0	0	0	0
C8(2)	0.25	0	0	0	0	0	0	0	0
B6(3)	0	0	0.25	0	0	0	0	0	0
C5(4)	0	0	0	0	0	0	0	0.25	0
A7(2)	0	0	0	0	1.25	0.5	2.5	0	0
A12(3)	0	0	0	0	0	0	1.25	0	0
C7(3)	0	2	0	0	0	0	0	0.25	0

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
E4(1)	0.5	0	0	1.75	0	0	0	0	0
F1(3)	0.25	0.25	0.5	0	0	0	0	0	0
F10(2)	0	0.25	0	0	0	0	0	0	0
E6(1)	0	0	0	0	0	0	0.25	0	0
F7(1)	0	0	0.5	0	0	0	0	1	0
E9(3)	0	0	0	0	0.25	0	0	0	0
E2(1)	0	0	0	0.25	0	0	1.75	0.5	0
F10(3)	0	0.5	0	0	0	0	0	0	0
E6(4)	0	0	0.25	0	0	0	0	0	0
E3(2)	0	0.5	0.25	1	0.75	0.25	0	0	0
E3(3)	1.25	0.5	2.5	0	0	0	0	0	0
F8(3)	0.5	0	0.25	0	0	0	0	0.25	0
E9(2)	0	1.5	6	0	0	0	0	0	0
E1(1)	0	0	0	0.5	0	0.25	0	0.5	0
E7(4)	0	0	0.25	0	0	0	0	0	0
E7(5)	0	0	0	0	0	0	0.25	0	0
E1(4)	0	0	0.25	0	0	0	0	0	0
F11(3)	0	0.25	0	0	0	0	0	0	0
F12(2)	0.5	0	0	0	0	0	0	0	0
E12(3)	0	0	0.25	0	0	0	0	0	0
F9(2)	1.75	0.75	1.25	0	0	0	0	0.5	0
E1(2)	0	0	0	0	0.25	0	0	0.25	0
E10(3)	0.5	1.25	0.75	0	0	0	0	0	0
E11(3)	0.5	0	0	0	0	0	0	0	0
F11(1)	20.25	3	1	0	0.75	0	0.25	0	0
E3(1)	0.75	0	0	1.25	1.25	0	2.75	0.25	0
E6(2)	0.25	1	0	0	0	0	0	0	0
F5(2)	0.25	0	0	0.25	0.25	0	0	0	0
E1(5)	0	0	0	0	0.5	0	0	0	0
E1(3)	0.25	2.25	1.75	0	0	0	0.25	0	0
F6(2)	0	0.25	0.75	0	0	0	0	0	0
E5(2)	0	0.25	0	0	0.25	0	0	0	0
E10(2)	1.25	3.5	5	0	3.5	0	0	0	0
E8(2)	0.25	0.75	0	0	0.25	0	0	0	0
F7(3)	0.25	1.5	0.25	0	0.25	0	0	0	0
F11(2)	0	0	1.5	0	0	0	0	0.25	0
F9(3)	0.25	0	0	0	0	0	0	0	0
F12(3)	0.25	0.25	0	0	0.25	0	0	0	0
E2(4)	0	0	0.25	0	0	0	0	0	0
E4(4)	0	0	0.25	0	0	0	0	0	0
E8(4)	0	0	0	0	0	0	0	1	0
F9(4)	0	0	0	0.25	0	0	0	0	0
F10(4)	0	0	0	0.25	0	0	0	0	0
F11(4)	0	0	0	0	0.25	0	0	0	0
F12(4)	0	0	0	0	0.25	0	0	0	0
E9(5)	0	0	0	0	0	0	0	0.25	0
F8(4)	0	0	0	0.25	0	0	0	0	0
F1(4)	0	0.25	0	0	0	0	0	0	0
E8(3)	0	0.75	0.25	0	0	0	0.75	0	0
F2(3)	0.5	0	0	0	0	0	0	0	0
E3(4)	0	0	0.25	0	0	0	1.25	0	0
E11(5)	0	0	0	0	0	0	0.25	0	0
G10(1)	2	0	1.75	1.25	2	0.5	0	0	0.25
A6(5)	0	0	0	0	0	0	0.5	0	0
B6(5)	0	0	0	0	0	0	0	0.25	0
G12(5)	0	0	0	0.5	0	0	0	0	0
G11(1)	0	0	0	0	0	0	0.5	0	0
A12(5)	0	0	0	0	0	0	0	0.25	0
G10(3)	0	0	0	0	0	0	0.25	0	0
G4(2)	0	0	0	0	0.25	0	0	0	0
G3(1)	1	8.25	32	0.75	1.25	0.75	1	6.75	0.25
G7(1)	0	0	0.25	0	0	0	0	0	0.5
G4(1)	2	6.75	2.75	2.25	1.25	0	1	0	0
G4(5)	0	0	0	0	0	18.5	0	0	0
G4(4)	0	0	0	0	0	0	0	0	0.5
G1(1)	40.5	30	3.5	5.75	15.25	25	13.5	8	1.75
G3(2)	0	0	0	1.25	4.75	0.25	0	0	0
G5(3)	0.75	1.75	0	0	0.25	0	0	0	0
D10(3)	0	0	0	0	0	0	0	0.25	0
D10(1)	5.75	2.5	1.75	0	0.75	0	0	0	0
D3(3)	0	0.25	0	0	0	0	0	0	0
D12(2)	0	0.25	0	0	0	0	0	0	0
D11(2)	0.25	0	0	0	0	0	0	0	0
D2(3)	0	0.25	0	0	0	0	0	0	0
D2(2)	0.75	1	0.25	0.25	0	0	0	0	0
E5(1)	0.5	0	0	0	0	0	0	0	0
D10(2)	0.25	0.25	0	0	0	0	0	0	0
D11(1)	0.25	0	0	0	0	0	0	0	0
D8(2)	0.25	0	0	0	0	0	0	0	0
D2(1)	1.25	2.5	0.5	0.5	0	0.25	0.75	0.25	0.25
D1(1)	5.75	8	0	0.5	3.75	0	0.25	0	0.25
F12(1)	0	0.5	1	0	0	0	0	0	0
H2(3)	0.25	0	0	0	0	0	0	0	0
H3(2)	0.25	0	0	0	0	0	0	0	0.25
H2(4)	0.75	0.25	0	0	0	0	0	0	0
C9(2)	0	0	0	0	0	0	0	0.25	0
H4(3)	0.5	0.5	0	0	0	0	0	0	0
H8(1)	0.5	0.5	2.25	0.25	0	0	0.25	0.25	0
H12(1)	0	0	0	0.25	0	0	0	0	0
G8(2)	1.75	0.25	0.75	0	0	0	0	0	0
G11(3)	0	0	0	0	0	0	0.25	0	0

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
H11(3)	0	0.25	0	0	0	0	0	0	0
G7(2)	5	2.5	4	0	0	0	0	0	0
B2(5)	0.5	0.75	0.25	0	0	0	0.75	0	0
H12(3)	0.5	1.75	0	0	0	0	0.25	0	0
G2(4)	0	0.5	0.25	0	0	0	0	0	0
H1(4)	0.5	0	0	0	0	0	0	0	0
H5(2)	0	0	0	0	1.25	0	0	0	0
H3(4)	0	0.5	0	0	0	0	0	0	0
G10(4)	0.25	0	0	0	0	0	0	0	0
H9(2)	0.5	0	0	0	0	0	0	0	0
H2(5)	0	0	0	0.25	0	0	0	0	0
H10(1)	0	0.5	0	1	0	0	0	0	0
H11(1)	2.25	1.25	1.75	0.25	0	0	0	0	0
C10(2)	0.25	0	0	0	0	0	0	0	0
H1(1)	1.25	2.5	2	0	3.75	0.25	66.75	0	0
H2(1)	0.25	0.25	0	0	0	0	19	0.75	0
G11(5)	0	0	0	0.25	0	0	0	0	0
H2(2)	0.75	0	0	0	0.25	0	0.25	0	0
H8(2)	0	0	0	0	0	0	0.5	0	0
G3(3)	0	0	0.5	0	0	0	0	0	0
H4(5)	0	0	0	0.25	0	0	0	0	0
G1(3)	1.5	0	0	0	0	0	0	0	0.5
H7(1)	0	0	0	0	0.5	0.25	0	0	0
H9(3)	0.25	0.25	0	0	0	0	0	0	0
G9(4)	0.5	0.5	0	0	0	0	0	0	0
G2(3)	0.75	0.5	0	0	1	0	0.5	0.25	0
H4(2)	0	0	0	0.5	0	0	0	0	0
G12(4)	15.25	0	0	0.5	0.5	0	0	0	0
H11(4)	0	0	0	0	0.5	0	0.5	0	0
G1(2)	0.25	0	0	0	0	0	0	0	0
G11(4)	0.5	0	0	0	0	0	0	0	0
H4(4)	0	0.5	0	0	0	0	0	0	0
H6(5)	0	0	0	0	0.5	0.25	0	0	0
H9(5)	0	0	0	0	0	0.25	0	0	0
G9(2)	1.25	0	0	0	0	0	0	0	0
H3(3)	0.25	0	0	0	0	0	0	0	0
F1(1)	0	0.25	0	0	0.25	0	0	0	0
F2(1)	0	0	0	0	0	0	0	0	2.75
F3(1)	0	0	0	0	0.25	0	0	0	0
F4(1)	1	0	0.25	0.25	0.5	0	0	0	0
F5(1)	0	0.25	0	1.25	0.75	0	0	0	0
F6(1)	0	0	0	0	0.5	0.5	0.25	0	0.75
G9(3)	0	0.5	0	0	0	0	0	0	0
G1(4)	0	0.25	0	0	0	0	0	0	0
A1(5)	0	0	0	0	1.25	0	0	0	0
G6(3)	0	0	0	0	0.25	0	0	0.25	0
G7(4)	0.5	0	0	0	0.5	0	0	0	0
lombriz	1.5	0.75	0.25	0	0.25	0	0	0	0
H5(4)	0	0.75	0	0	0	0	0	0	0
A8(5)	0	0	0	0	0	0	0.25	0	0

Appendix 4. Average of the four subsamples taken in the three types of land management (native, pasture and cropland) for August.

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	August Totals
A1(1)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	109
A10(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	B	Fungivore	15
A2(1)	Arachnida	Acari	Acarida		Acaridae	Unknown	A	Fungivore	348
A10(3)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	1
A8(3)	Arachnida	Acari	Acarida		Acaridae	Unknown		Fungivore	24
A11(2)	Arachnida	Acari	Gamasida	I	Unknown	Unknown		Predator	27
A12(2)	Arachnida	Acari	Gamasida	I	Unknown	Unknown		Predator	1
A3(2)	Arachnida	Acari	Gamasida		Gamasidae	Unknown		Predator	5
B4(2)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator	23
C12(2)	Arachnida	Acari	Gamasida		Zerconidae	Zercon		Predator	42
C4(2)	Arachnida	Acari	Gamasida		Polyaspididae	Unknown		Predator	1
A6(3)	Arachnida	Acari	Gamasida		Unknown	Unknown		Predator	2
A7(3)	Arachnida	Acari	Gamasida		Unknown	Unknown		Predator	1
C1(3)	Arachnida	Acari	Gamasida		Uropodidae	Unknown		Predator	4
A8(1)	Arachnida	Acari	Gamasina		Eupodidae	Unknown		Predator	3
B11(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	28
B8(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	98
B9(1)	Arachnida	Acari	Gamasina		Uropodidae	Unknown		Predator	167
C1(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	131
C10(1)	Arachnida	Acari	Gamasina	I	Oligamasidae	Unknown		Predator	28
C2(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	140
C3(1)	Arachnida	Acari	Gamasina		Chelydidae	Unknown		Predator	7
C4(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	15
C5(1)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Fungivore	128
C7(1)	Arachnida	Acari	Gamasina	I	Oligamasidae	Unknown		Predator	236
C8(1)	Arachnida	Acari	Gamasina		Oligamasidae	Unknown		Predator	14
C9(1)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	23
A4(2)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	42
A5(2)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	2
A6(2)	Arachnida	Acari	Gamasina	I	Unknown	Unknown		Predator	4
A8(2)	Arachnida	Acari	Gamasina		Unknown	Unknown		Predator	1
A11(1)	Arachnida	Acari	Oribatida		Nanhermanniidae	Nanhermana	A	Fungivore	5
A5(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	10
A6(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	25
A7(1)	Arachnida	Acari	Oribatida	I	Oppiidae	Oppiella	C	Fungivore	206
A9(1)	Arachnida	Acari	Oribatida	I	Oribatidae	Unknown		Fungivore	53
B1(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	A	Fungivore	150
B10(1)	Arachnida	Acari	Oribatida		Oribatulidae	Zygoribatula	A	Fungivore	95
B2(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	B	Fungivore	395
B3(1)	Arachnida	Acari	Oribatida		Tectocepheidae	Tectocepheus	A	Fungivore	105
B4(1)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	A	Fungivore	68
B5(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	B	Fungivore	28
B7(1)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	C	Fungivore	4
C12(1)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	A	Fungivore	6
C6(1)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	A	Fungivore	63
A1(2)	Arachnida	Acari	Oribatida	I	Oribatidae	Inmature		Fungivore	6
A2(2)	Arachnida	Acari	Oribatida		Prostig	Unknown		Predator	30
B1(2)	Arachnida	Acari	Oribatida		Phenopelopidae	Pelopsis	A	Fungivore	6
B11(2)	Arachnida	Acari	Oribatida		Eremuloidae	Eremaus	A	Fungivore	15
B12(2)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	C	Fungivore	5
B2(2)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicharames	A	Fungivore	22
B3(2)	Arachnida	Acari	Oribatida		Phenopelopidae	Pelopsis	A	Fungivore	42
B5(2)	Arachnida	Acari	Oribatida		Galumnidae	Galumna	A	Fungivore	9
B6(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	B	Fungivore	5
B7(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	D	Fungivore	1
B8(2)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	B	Fungivore	79
B9(2)	Arachnida	Acari	Oribatida		Mesoplophoridae	Mesoplophoa	A	Fungivore	1
C1(2)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	A	Fungivore	36
C3(2)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	A	Fungivore	11
C5(2)	Arachnida	Acari	Oribatida		Belbidae	Belba	E	Fungivore	1
A9(3)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	A	Fungivore	1
B11(3)	Arachnida	Acari	Oribatida		Phenopelopidae	Eupelops	A	Fungivore	26
B12(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	D	Fungivore	1
B4(3)	Arachnida	Acari	Oribatida		Phthiracaridae	Phthiracarus	A	Fungivore	7
B5(3)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicheremas	B	Fungivore	9
B7(3)	Arachnida	Acari	Oribatida		Nothridae	Nothrus	B	Fungivore	24
C10(3)	Arachnida	Acari	Oribatida		Belbidae	Belba	C	Fungivore	2
C11(3)	Arachnida	Acari	Oribatida		Suctobelbaidae	Sectobelba	A	Bacteria feeder	142
C12(3)	Arachnida	Acari	Oribatida		Suctobelbaidae	Sectobelba	A	Bacteria feeder	189
C2(3)	Arachnida	Acari	Oribatida		Metrippiidae	Ceratoppia	A	Fungivore	23
C3(3)	Arachnida	Acari	Oribatida		Jeco-Caenobleba	Belba	F	Fungivore	6
C4(3)	Arachnida	Acari	Oribatida		Otocepheidae	Dolicheremas	C	Fungivore	2
C9(3)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	F	Fungivore	111
A2(4)	Arachnida	Acari	Oribatida		Unknown	Immature		Fungivore	1
B1(4)	Arachnida	Acari	Oribatida		Euphthiracaridae	Peruthritia	A	Fungivore	13
B10(4)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	B	Fungivore	41
B2(4)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	B	Fungivore	35
B3(4)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	E	Fungivore	34
B4(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	A	Fungivore	4
B5(4)	Arachnida	Acari	Oribatida		Belbidae	Belba	F	Fungivore	2
B6(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	A	Fungivore	1
B7(4)	Arachnida	Acari	Oribatida		Erumuloidae	Eremaus	A	Fungivore	2
B8(4)	Arachnida	Acari	Oribatida		Oribatulidae	Zygoribatula	A	Fungivore	26

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	August Totals
C1(4)	Arachnida	Acari	Oribatida		Liacaridae	Liacarus	B	Fungivore	3
C12(4)	Arachnida	Acari	Oribatida		Suctobelbaidae	Sectobelba	A	Bacteria feeder	1
C4(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppiella	C	Fungivore	4
C6(4)	Arachnida	Acari	Oribatida		Scheloribatidae	Scheloribates	D	Fungivore	1
C7(4)	Arachnida	Acari	Oribatida		Belbidae	Belba	G	Fungivore	7
C8(4)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	C	Fungivore	3
C3(5)	Arachnida	Acari	Oribatida		Oppiidae	Oppia	C	Fungivore	2
B12(1)	Arachnida	Acari	Oribatidae		Euphthiracaridae	Peruthritia		Unknown	49
B1(3)	Arachnida	Acari	Oribatidae		Phenopelopidae	Pelopsis	A	Bacteria feeder	1
C6(3)	Arachnida	Acari	Oribatidae		Unknown	Unknown	primitive	Unknown	8
C11(1)	Arachnida	Acari	Prostigmata	I	Crotonoidea	Plaquetes		Predator	49
C11(2)	Arachnida	Acari	Prostigmata		Rhagiidae	Unknown		Predator	40
C2(2)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown	A	Fungivore	73
A1(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	A	Fungivore	6
A2(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	B	Fungivore	24
A3(3)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes	C	Fungivore	30
A4(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown	350
A5(3)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown	2
A1(4)	Arachnida	Acari	Prostigmata		Unknown	Unknown		Unknown	84
C2(4)	Arachnida	Acari	Prostigmata		Erythraeidae	Unknown		Fungivore	2
G6(5)	Arachnida	Acari	Prostigmata		Nanorchestidae	Nanorchestes		Fungivore	5
A12(3)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown	29
C2(5)	Arachnida	Acari	unknown		Unknown	Unknown		Unknown	1
B6(3)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	1
B12(4)	Arachnida	Acari	uropodida		Polyaspididae	Unknown		Predator	26
B9(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	1
C3(4)	Arachnida	Acari	Uropodida		Polyaspididae	Unknown	A	Predator	1
C5(4)	Arachnida	Acari	Uropodida		Uropodidae	Unknown		Predator	13
A3(1)	Arachnida	Acari			Oligamasidae	Unknown		Predator	38
A7(2)	Arachnida	Acari			Unknown	Unknown		Predator	46
C8(2)	Arachnida	Acari			Polyaspididae	Unknown		Predator	1
E1(1)	Insecta	Coleoptera		I	Elateridae	Unknown	C	Shredder	3
E2(1)	Insecta	Coleoptera		I	Cleridae	Unknown	A	Predator	22
E3(1)	Insecta	Coleoptera		I	Staphylinidae	Aleocharinae	A	Predator	29
E4(1)	Insecta	Coleoptera		I	Cantharidae	Unknown	A	Predator	5
E6(1)	Insecta	Coleoptera		I	Carabidae	Unknown	G	Predator	3
E7(1)	Insecta	Coleoptera			Nitidulidae	Unknown	A	Fungivore	5
E8(1)	Insecta	Coleoptera			Carabidae	Bemdibiinidae	?	Predator	3
E9(1)	Insecta	Coleoptera			Chrysomelidae	Alticinae	B	Herbivore	9
F10(1)	Insecta	Coleoptera			Nitidulidae	Unknown	B	Fungivore	1
F11(1)	Insecta	Coleoptera		I	Scarabaeidae	Unknown	A	Herbivore	23
F7(1)	Insecta	Coleoptera		I	Chrysomelidae	Alticinae	A	Herbivore	24
F9(1)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	4
E1(2)	Insecta	Coleoptera			Ptilidae	Unknown	B	Fungivore	5
E10(2)	Insecta	Coleoptera			Staphylinidae	Unknown	A	Predator	29
E3(2)	Insecta	Coleoptera		I	Curculionidae	Unknown	B	Herbivore	35
E5(2)	Insecta	Coleoptera			Staphylinidae	Tachiporus	A	Predator	3
E6(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae	B	Parasite	7
E8(2)	Insecta	Coleoptera		I	Staphylinidae	Unknown	B	Predator	8
F1(2)	Insecta	Coleoptera		I	Carabidae	Unknown	B	Predator	1
F10(2)	Insecta	Coleoptera		I	Carabidae	Unknown	F	Predator	4
F11(2)	Insecta	Coleoptera			Staphylinidae	Unknown	D	Predator	2
F3(2)	Insecta	Coleoptera		I	Carabidae	Unknown	D	Predator	4
F5(2)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite	6
F7(2)	Insecta	Coleoptera			Staphylinidae	Stenus	A	Predator	2
F9(2)	Insecta	Coleoptera			Ptilidae	Unknown	A	Fungivore	81
E1(3)	Insecta	Coleoptera			Staphylinidae	Phyllanthus	A	Predator	18
E10(3)	Insecta	Coleoptera			Ptillidae	Unknown	C	Fungivore	13
E11(3)	Insecta	Coleoptera			Ptillidae	Unknown	D	Fungivore	2
E12(3)	Insecta	Coleoptera			Pselaphidae	Unknown	B	Predator	1
E3(3)	Insecta	Coleoptera			Curculionidae	Unknown	C	Herbivore	11
E7(3)	Insecta	Coleoptera			Scydmaenidae	Unknown	A	Predator	2
E8(3)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	4
F1(3)	Insecta	Coleoptera		I	Cantharidae	Unknown	B	Predator	1
F10(3)	Insecta	Coleoptera			Coccinelidae	Unknown	A	Predator	0
F11(3)	Insecta	Coleoptera			Leiodidae	Unknown	A	Scavenger	2
F7(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	C	Predator	1
F8(3)	Insecta	Coleoptera			Curculionidae	Unknown	D	Herbivore	3
F9(3)	Insecta	Coleoptera		I	Staphylinidae	Unknown	D	Predator	1
E1(4)	Insecta	Coleoptera			Histeridae	Unknown	A	Predator	1
E10(4)	Insecta	Coleoptera		I	Scarabaeidae	Unknown	C	Herbivore	1
E12(4)	Insecta	Coleoptera			Staphylinidae	Unknown	B	Predator	2
E3(4)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	1
E7(4)	Insecta	Coleoptera		I	Elateridae	Unknown	D	Shredder	3
E8(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	H	Predator	1
E9(4)	Insecta	Coleoptera		I	Chrysomelidae	Unknown	A	Herbivore	3
F12(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	L	Predator	2
F3(4)	Insecta	Coleoptera			Chrysomelidae	Unknown	D	Herbivore	1
F4(4)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite	1
F7(4)	Insecta	Coleoptera			Ptillidae	Unknown	E	Fungivore	4
F9(4)	Insecta	Coleoptera		I	Staphylinidae	Unknown	I	Predator	1
E12(5)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	2
E2(5)	Insecta	Coleoptera			Scydmaenidae	Unknown	B	Predator	1
E5(5)	Insecta	Coleoptera		I	Unknown	Unknown		Unknown	1
E6(5)	Insecta	Coleoptera			Staphylinidae	Aleocharinae		Parasite	3
F1(5)	Insecta	Coleoptera		I	Elateridae	Unknown	F	Shredder	1
F2(5)	Insecta	Coleoptera		I	Elateridae	Unknown	B	Shredder	1
G1(1)	Insecta	Collembola			Onychiuridae	Onychiurus	A	Fungivore	575
G10(1)	Insecta	Collembola			Entomobryidae	Entomobrya	A	Fungivore	31
G11(1)	Insecta	Collembola			Entomobryidae	Entomobrya		Fungivore	1
G3(1)	Insecta	Collembola			Hypogastruridae	Unknown	B	Predator	241

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	August Totals
G4(1)	Insecta	Collembola			Isotomidae	Folsomia	B	Fungivore	181
G9(1)	Insecta	Collembola			Entomobryidae	Entomobrya	G	Fungivore	36
G3(2)	Insecta	Collembola			Sminthuridae	Sminthurus	C	Fungivore	14
G4(2)	Insecta	Collembola			Hypogastruridae	Unknown	A	Fungivore	31
G5(3)	Insecta	Collembola			Sminthuridae	Unknown	B	Fungivore	7
G4(4)	Insecta	Collembola			Isotomidae	Isotoma	B	Fungivore	4
H10(4)	Insecta	Collembola			Entomobryidiae	Entomobrya	H	Fungivore	5
A12(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrua	D	Predator	23
A4(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrua	A	Fungivore	14
A5(5)	Insecta	Collembola			Isotomidae	Isotoma	C	Fungivore	10
A6(5)	Insecta	Collembola			Entomobryidae	Entomobrya	B	Fungivore	31
B4(5)	Insecta	Collembola			Sminthuridae	Sminthurus	A	Fungivore	1
D11(5)	Insecta	Collembola			Hypogastruridae	Hyppogastrua	A	Fungivore	1
G3(5)	Insecta	Collembola			Isotomidae	Isotoma	D	Fungivore	14
G4(5)	Insecta	Collembola			Isotomidae	Isotoma	A	Fungivore	45
G7(5)	Insecta	Collembola			Entomobryidae	Entomobrya	D	Fungivore	3
D4(3)	Insecta	Diptera	Brachycera	I	Stratiomyiidae	Anthomiidae	A	Herbivore	11
D6(1)	Insecta	Diptera	Cyclorrhapha		Higher Diptera	Unknown	A	Unknown	1
D2(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	A	Fungivore	13
D5(2)	Insecta	Diptera	Cyclorrhapha		Phoridae	Phora	B	Fungivore	1
D1(1)	Insecta	Diptera	Nematocera		Unknown	Unknown	A	Unknown	161
D10(1)	Insecta	Diptera	Nematocera		Chironomidae	Unknown	A	Fungivore	34
D11(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	C	Fungivore	2
D2(1)	Insecta	Diptera	Nematocera		Tipulidae	Unknown	A	Fungivore	41
D7(1)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	B	Unknown	4
D9(1)	Insecta	Diptera	Nematocera		Ceratopogonidae	Unknown	C	Unknown	1
E5(1)	Insecta	Diptera	Nematocera		Sciaridae	Unknown	A	Fungivore	8
F12(1)	Insecta	Diptera	Nematocera	I	Unknown	Unknown		Unknown	5
E12(2)	Insecta	Diptera	Nematocera	I	Bibionidae	Unknown	A	Fungivore	3
D6(3)	Insecta	Diptera	Nematocera		Unknown	Unknown	C	Unknown	2
D8(3)	Insecta	Diptera	Nematocera	I	Mycetophilidae	Unknown	A	Fungivore	2
D3(3)	Insecta	Diptera		I	Higher Diptera	Coleoptera?		Unknown	1
D3(5)	Arachnida	Aranea			Micryphantidae	Unknown	A	Predator	2
H2(3)	Arachnida	Aranea			Micryphantidae	Unknown	B	Predator	6
H2(4)	Arachnida	Araneae			Theraphosidae	Unknown		Predator	2
C9(2)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	A	Predator	6
H4(3)	Arachnida	Pseudoscorpiona			Pseudoscorpiona	Unknown	B	Predator	9
H8(1)	Chilopoda	Geophilomorpha			Geophilidae	Unknown	A	Predator	9
H12(1)	Chilopoda	Lithobiomorpha			Lethobidae	Unknown	A	Predator	5
G8(2)	Diplopoda	Diplopoda			Polydesmidae	Unknown	B	Shredder	5
G2(2)	Entognata	Protura			Unknown	Unknown	A	Algivore	1
A7(5)	Entognata	Protura			Unknown	Unknown	B	Algivore	5
H12(5)	Entognata	Protura			Unknown	Unknown	C	Algivore	2
H12(3)	Insecta	Hemiptera			Cydnidae	Unknown		Herbivore	46
G2(4)	Insecta	Hemiptera			Enicocephalidae	Unknown	A	Predator	6
H1(4)	Insecta	Hemiptera			Gelastocoridae	Unknown		Predator	1
H7(2)	Insecta	Hemiptera			Lygaeidae	Unknown		Seed feeder	14
H3(4)	Insecta	Hemiptera			Miridae	Unknown		Herbivore	2
H10(2)	Insecta	Hemiptera			Pentatomidae	Unknown		Herbivore	1
H9(2)	Insecta	Homoptera			Aphidae	Unknown	A	Herbivore	54
B8(5)	Insecta	Homoptera			Aphidae	Unknown	B	Herbivore	1
H10(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	A	Herbivore	7
H11(1)	Insecta	Homoptera		I	Cicadellidae	Unknown	B	Herbivore	26
H12(2)	Insecta	Homoptera			Fulgoridae	Unknown		Herbivore	1
H7(3)	Insecta	Homoptera			Ortheziidae	Orthezia	B	Herbivore	10
H1(1)	Insecta	Homoptera			Pseudococcidae	Unknown	A	Herbivore	1285
H2(1)	Insecta	Homoptera			Pseudococcidae	Unknown	B	Herbivore	316
H6(1)	Homoptera	Homoptera			Pseudococcidae	Unknown	C	Herbivore	3
D4(5)	Insecta	Hymenoptera			Braconidae	Unknown		Unknown	1
B10(5)	Insecta	Hymenoptera			Diapriidae	Unknown	C	Parasite	1
D1(5)	Insecta	Hymenoptera			Diapriidae	Unknown	E	Parasite	1
D6(5)	Insecta	Hymenoptera			Diapriidae	Unknown	F	Parasite	1
G5(5)	Insecta	Hymenoptera			Diapriidae	Unknown	G	Parasite	2
H8(4)	Insecta	Hymenoptera			Diapriidae	Unknown	J	Parasite	1
B9(5)	Insecta	Hymenoptera			Diapriidae	Unknown	K	Parasite	1
H2(2)	Insecta	Hymenoptera			Formicidae	Unknown	A	Predator	95
A10(5)	Insecta	Hymenoptera			Formicidae	Unknown	D	Predator	1
A11(5)	Insecta	Hymenoptera			Formicidae	Unknown	E	Predator	41
D5(5)	Insecta	Hymenoptera			Formicidae	Unknown	F	Predator	8
H10(5)	Insecta	Hymenoptera			Formicidae	Unknown	H	Predator	2
H11(5)	Insecta	Hymenoptera			Formicidae	Unknown	I	Predator	9
A9(5)	Insecta	Hymenoptera			Unknown	Unknown	A	Unknown	1
B11(5)	Insecta	Hymenoptera			Unknown	Unknown	A	Unknown	1
H7(1)	Insecta	Lepidoptera		I	Noctuidae	Unknown	A	Herbivore	11
G12(1)	Insecta	Protura			Unknown	Unknown	D	Fungivore	1
H9(1)	Insecta	Psocoptera			Liposcelidae	Liposcelis	A	Algivore	5
G2(3)	Insecta	Psocoptera			Unknown	Unknown	B	Algivore	11
H4(2)	Insecta	Thysanoptera			Phlaeotripidae	Unknown	A	Predator	2
H11(4)	Insecta	Thysanoptera			Unknown	Unknown	B	Fungivore	3
G1(2)	Insecta	Thysanoptera			Unknown	Unknown	D	Fungivore	1
G6(2)	Insecta	Thysanoptera			Unknown	Unknown	E	Fungivore	3
H12(4)	Insecta	Thysanoptera			Unknown	Unknown	J	Fungivore	4
D2(5)	Insecta	Thysanoptera			Unknown	Unknown	K	Fungivore	1
H6(5)	Insecta	Thysanoptera			Unknown	Unknown	L	Fungivore	1
H9(5)	Insecta	Thysanoptera			Unknown	Unknown	M	Fungivore	1
F1(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	3
F2(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	3
F4(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	28
F5(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	3
F6(1)	Nematoda	Nematoda			Unknown	Unknown		Unknown	144
G1(4)	Nematoda	Nematoda			Unknown	Unknown		Unknown	2

Code	Class	Order	Group	State	Family	Genus	morphospecies	Functional Group	August Totals
A1(5)	Nematoda	Nematoda			Unknown	Unknown		Unknown	6
G6(3)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	3
G7(4)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	66
D12(5)	Oligochaeta	Plesiopora			Enchytraeidae	Unknown		Fungivore	1
H5(4)	Pauropoda	Pauropoda			Unknown	Unknown		Unknown	1
lombriz	Oligochaeta	Anellida			Unknown	Unknown		Fungivore	5
A8(5)	Symphyla	Symphyla			Unknown	Unknown		Herbivore	1
					I = Inmature				

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
A1(1)	0	0.25	0	18.25	1.75	5.25	1.25	0	0.5
A10(1)	0	0	0.5	0.75	1.75	0.75	0	0	0
A2(1)	0	0	75	2	4.5	0	4.5	1	0
A10(3)	0	0	0	0	0	0.25	0	0	0
A8(3)	0	0	0	0	0	0.75	2.5	2.75	0
A11(2)	0	0	0	0.5	0.5	2.5	3	0	0.25
A12(2)	0	0	0	0.25	0	0	0	0	0
A3(2)	0	0	0	1.25	0	0	0	0	0
B4(2)	5.75	0	0	0	0	0	0	0	0
C12(2)	3	2.75	0.75	0.5	2.75	0	0.75	0	0
C4(2)	0	0.25	0	0	0	0	0	0	0
A6(3)	0	0	0	0	0.5	0	0	0	0
A7(3)	0	0	0	0	0	0.25	0	0	0
C1(3)	0.25	0	0	0	0	0.75	0	0	0
A8(1)	0.5	0	0.25	0	0	0	0	0	0
B11(1)	1.5	2	2	1	0	0.25	0.25	0	0
B8(1)	3.5	2.75	1.5	2.25	7	3.75	3.75	0	0
B9(1)	18	3.5	0.25	8.5	6.75	4.25	0.5	0	0
C1(1)	7.25	10.75	1.25	0	5	3.5	2.75	2.25	0
C10(1)	0.5	0	0	0.25	2	3.75	0.5	0	0
C2(1)	5	5	5.25	1	6	6.75	6	0	0
C3(1)	0.25	1.5	0	0	0	0	0	0	0
C4(1)	2	0	0	1.75	0	0	0	0	0
C5(1)	5.5	4	6.25	3	3.25	0.5	9.5	0	0
C7(1)	6	8.75	12.5	7.25	4.5	1.25	18.25	0	0.5
C8(1)	0.5	0.25	0	1.5	0	1.25	0	0	0
C9(1)	1.5	1	0.75	1.75	0	0.75	0	0	0
A4(2)	0	4.25	0	0	0	0.25	2	4	0
A5(2)	0	0	0.5	0	0	0	0	0	0
A6(2)	0	0	0.5	0	0	0.5	0	0	0
A8(2)	0	0	0	0	0	0.25	0	0	0
A11(1)	0	0	0	0	0.5	0.25	0.5	0	0
A5(1)	1.5	0	0.5	0	0	0.5	0	0	0
A6(1)	0	0	0.25	1.5	3.25	0	1.25	0	0
A7(1)	0.75	3.75	31.25	2.75	2.25	7	2.5	0.75	0.5
A9(1)	9.5	0.5	1.5	0	0.75	0.5	0.5	0	0
B1(1)	6.75	4	1.25	1.5	5.25	0	18	0.75	0
B10(1)	0.25	0.25	0	2.5	5	9.75	6	0	0
B2(1)	15.5	10.25	20.5	1.25	9.25	22	19.75	0.25	0
B3(1)	3	4	8	3	2.5	0	1.75	4	0
B4(1)	6.75	1.25	3.75	2.5	1.5	0	1.25	0	0
B5(1)	0.25	0	1.5	2	2.25	1	0	0	0
B7(1)	0	0	0.25	0	0	0	0.75	0	0
C12(1)	0	0.25	0.25	0	0	1	0	0	0
C6(1)	5.25	2.5	2.25	0.75	0	0.25	4.75	0	0
A1(2)	1	0	0	0.5	0	0	0	0	0
A2(2)	1.5	0.75	1.25	2.5	0	0	0.75	0	0.75
B1(2)	0	0	0.25	0	0	1.25	0	0	0
B11(2)	1.25	0.25	0	0	0.25	0	2	0	0
B12(2)	0	0	0	0	0	1.25	0	0	0
B2(2)	0.25	2.25	0	0	0	0	3	0	0
B3(2)	0.25	0.25	0.5	0.75	2.75	4	2	0	0
B5(2)	0.75	0	0.75	0	0	0.75	0	0	0
B6(2)	0	0	0.75	0.5	0	0	0	0	0
B7(2)	0	0	0	0	0	0.25	0	0	0
B8(2)	8.5	1.25	3	2.5	1.5	1	2	0	0
B9(2)	0	0.25	0	0	0	0	0	0	0
C1(2)	3	0.25	2.75	0.75	0	0.25	2	0	0
C3(2)	0	0	0	0.25	0.25	2.25	0	0	0
C5(2)	0	0.25	0	0	0	0	0	0	0
A9(3)	0	0	0	0	0	0.25	0	0	0
B11(3)	3	2.5	0.75	0	0.25	0	0	0	0
B12(3)	0	0	0	0	0	0	0.25	0	0
B4(3)	0	1.5	0.25	0	0	0	0	0	0
B5(3)	0.5	1.75	0	0	0	0	0	0	0
B7(3)	5.25	0.5	0.25	0	0	0	0	0	0
C10(3)	0.25	0	0	0	0	0	0.25	0	0
C11(3)	14.5	4.5	3.75	4	2	2	4.25	0.5	0
C12(3)	10	3	5.5	2.5	0.25	0	26	0	0
C2(3)	0.5	0.75	2.5	0	1	0	0.75	0.25	0
C3(3)	0.75	0	0	0	0	0.25	0.5	0	0
C4(3)	0.5	0	0	0	0	0	0	0	0
C9(3)	3.25	1	3.5	1.75	3.75	10.75	3.5	0.25	0
A2(4)	0	0	0	0	0	0	0	0.25	0
B1(4)	2.75	0.25	0	0.25	0	0	0	0	0
B10(4)	0	0	0	0	0	0.75	9.5	0	0
B2(4)	1.25	0.5	0	1	6	0	0	0	0

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
B3(4)	3.5	0.75	1	0.25	1	1	1	0	0
B4(4)	1	0	0	0	0	0	0	0	0
B5(4)	0.5	0	0	0	0	0	0	0	0
B6(4)	0	0.25	0	0	0	0	0	0	0
B7(4)	0	0	0.25	0	0	0.25	0	0	0
B8(4)	0	0	0	0	3	2.5	1	0	0
C1(4)	0.25	0	0	0	0	0	0.5	0	0
C12(4)	0	0	0	0	0	0	0.25	0	0
C4(4)	0	0	0	0	0	1	0	0	0
C6(4)	0	0	0	0	0	0	0.25	0	0
C7(4)	0	0	0	0	0	0	1.75	0	0
C8(4)	0	0	0	0	0	0	0.75	0	0
C3(5)	0	0	0	0	0	0	0.5	0	0
B12(1)	5	1	0.5	1.5	1.5	0.5	2.25	0	0
B1(3)	0	0	0	0	0	0.25	0	0	0
C6(3)	0	0	0	0	1.75	0.25	0	0	0
C11(1)	2	3.25	0	0.75	0.75	1	2	2.5	0
C11(2)	2.25	1.75	0	0.75	0.25	2.75	2	0.25	0
C2(2)	0.75	0.75	16.25	0.25	0	0	0.25	0	0
A1(3)	0	0	0	0	0	0	1.25	0.25	0
A2(3)	0	0	0	0	0	1.25	2.75	2	0
A3(3)	0	0	0	0	5	0	0.75	1.75	0
A4(3)	0	0	0	0	87.5	0	0	0	0
A5(3)	0	0	0	0	0.5	0	0	0	0
A1(4)	0	0	0	0	0	21	0	0	0
C2(4)	0	0	0	0.5	0	0	0	0	0
G6(5)	0	0	1.25	0	0	0	0	0	0
A12(3)	0	0	0	0	0	5.75	1.5	0	0
C2(5)	0	0	0	0	0	0	0.25	0	0
B6(3)	0	0.25	0	0	0	0	0	0	0
B12(4)	3.75	0	0	0.25	0	2.25	0.25	0	0
B9(4)	0	0	0.25	0	0	0	0	0	0
C3(4)	0	0.25	0	0	0	0	0	0	0
C5(4)	0	0	0	0	0	3	0.25	0	0
A3(1)	1.75	0	3.75	2.5	0.75	0	0	0.75	0
A7(2)	0	0	0.5	1.75	2.25	1.25	4	1.75	0
C8(2)	0	0	0.25	0	0	0	0	0	0
E1(1)	0	0	0	0	0.25	0.25	0	0.25	0
E2(1)	0	0	1.75	1.75	0.75	0	1	0.25	0
E3(1)	0	0.75	0.5	0.5	2.75	1.25	1.5	0	0
E4(1)	1	0	0.25	0	0	0	0	0	0
E6(1)	0.5	0.25	0	0	0	0	0	0	0
E7(1)	0	0	0.25	0.25	0.25	0.5	0	0	0
E8(1)	0.25	0	0.5	0	0	0	0	0	0
E9(1)	0	0.75	1.5	0	0	0	0	0	0
F10(1)	0	0	0	0	0	0	0	0.25	0
F11(1)	0.25	2.25	0	0	0	0	3.25	0	0
F7(1)	2.5	1.25	2	0.25	0	0	0	0	0
F9(1)	0.5	0.25	0	0	0	0.25	0	0	0
E1(2)	0	0	0	0	0.25	0.75	0	0.25	0
E10(2)	1.75	3	0	1	0	1.25	0.25	0	0
E3(2)	3	1.25	0.25	0	1.75	1.75	0.75	0	0
E5(2)	0.5	0.25	0	0	0	0	0	0	0
E6(2)	0.25	0.75	0.75	0	0	0	0	0	0
E8(2)	1.25	0.25	0.25	0.25	0	0	0	0	0
F1(2)	0.25	0	0	0	0	0	0	0	0
F10(2)	0.25	0.5	0.25	0	0	0	0	0	0
F11(2)	0.25	0.25	0	0	0	0	0	0	0
F3(2)	0.25	0.75	0	0	0	0	0	0	0
F5(2)	0.5	0	0	0.25	0	0.25	0	0.5	0
F7(2)	0.5	0	0	0	0	0	0	0	0
F9(2)	7.5	7.75	2	0	0	0.25	2.75	0	0
E1(3)	3.25	0.75	0.5	0	0	0	0	0	0
E10(3)	1.5	1.5	0	0.25	0	0	0	0	0
E11(3)	0	0	0.5	0	0	0	0	0	0
E12(3)	0	0	0.25	0	0	0	0	0	0
E3(3)	2.25	0	0	0	0.25	0	0.25	0	0
E7(3)	0.5	0	0	0	0	0	0	0	0
E8(3)	0.75	0.25	0	0	0	0	0	0	0
F1(3)	0	0.25	0	0	0	0	0	0	0
F10(3)	0	0	0	0	0	0	0	0	0
F11(3)	0.25	0	0	0	0	0	0	0.25	0
F7(3)	0	0	0	0	0	0	0.25	0	0
F8(3)	0.5	0	0.25	0	0	0	0	0	0
F9(3)	0.25	0	0	0	0	0	0	0	0
E1(4)	0.25	0	0	0	0	0	0	0	0
E10(4)	0	0	0	0.25	0	0	0	0	0
E12(4)	0	0.5	0	0	0	0	0	0	0
E3(4)	0	0.25	0	0	0	0	0	0	0
E7(4)	0.25	0.25	0.25	0	0	0	0	0	0
E8(4)	0.25	0	0	0	0	0	0	0	0
E9(4)	0	0	0	0.25	0.5	0	0	0	0
F12(4)	0	0	0	0	0	0.5	0	0	0
F3(4)	0	0.25	0	0	0	0	0	0	0
F4(4)	0	0	0.25	0	0	0	0	0	0
F7(4)	0.25	0	0.75	0	0	0	0	0	0
F9(4)	0	0.25	0	0	0	0	0	0	0
E12(5)	0	0	0	0	0	0	0.5	0	0
E2(5)	0.25	0	0	0	0	0	0	0	0
E5(5)	0.25	0	0	0	0	0	0	0	0
E6(5)	0	0	0	0	0.75	0	0	0	0

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
F1(5)	0	0	0	0	0	0	0.25	0	0
F2(5)	0	0	0	0	0	0	0	0	0.25
G1(1)	22.5	21.75	15.5	11.75	9.75	15.75	24	22	0.75
G10(1)	2.5	1	0.5	0	1	0	2.75	0	0
G11(1)	0	0	0	0	0	0	0.25	0	0
G3(1)	11.75	35	3.5	0.75	3.25	4.25	0.75	1	0
G4(1)	13.75	6.25	1.5	2	7.25	5.5	9	0	0
G9(1)	1	0	0	7.75	0	0	0	0	0.25
G3(2)	0.25	0	0.25	0	0.75	1	1.25	0	0
G4(2)	0.25	7.5	0	0	0	0	0	0	0
G5(3)	0	0	0	1.5	0.25	0	0	0	0
G4(4)	0	0	0	0.25	0	0	0.5	0.25	0
H10(4)	1	0	0	0	0	0	0.25	0	0
A12(5)	0	0	0	0	0	0	5.5	0.25	0
A4(5)	0	0	0	0	0	3.5	0	0	0
A5(5)	0	0	0	0	0	2.5	0	0	0
A6(5)	0	0	0	0	0	7.75	0	0	0
B4(5)	0	0.25	0	0	0	0	0	0	0
D11(5)	0	0	0	0	0.25	0	0	0	0
G3(5)	0	0	0	0	0.5	3	0	0	0
G4(5)	0	0	0	0	5	6.25	0	0	0
G7(5)	0	0.25	0	0	0	0	0	0.25	0.25
D4(3)	2	0.25	0	0.25	0	0	0.25	0	0
D6(1)	0.25	0	0	0	0	0	0	0	0
D2(2)	2	0.75	0.25	0	0	0	0.25	0	0
D5(2)	0	0	0	0	0	0	0.25	0	0
D1(1)	7.5	1.5	15.5	0.75	4	0.75	9.25	0.75	0.25
D10(1)	3.25	1	1	0.25	1.5	0.25	1.25	0	0
D11(1)	0.25	0	0	0	0	0.25	0	0	0
D2(1)	2	2.5	0.75	0	2.5	0.5	1.75	0.25	0
D7(1)	1	0	0	0	0	0	0	0	0
D9(1)	0	0	0	0	0	0.25	0	0	0
E5(1)	1.75	0	0	0	0.25	0	0	0	0
F12(1)	0	0.5	0.25	0	0	0	0.5	0	0
E12(2)	0.25	0	0.5	0	0	0	0	0	0
D6(3)	0	0.25	0	0	0	0	0.25	0	0
D8(3)	0.5	0	0	0	0	0	0	0	0
D3(3)	0	0	0	0	0	0.25	0	0	0
D3(5)	0.5	0	0	0	0	0	0	0	0
H2(3)	0.75	0	0	0	0	0	0.75	0	0
H2(4)	0.25	0	0.25	0	0	0	0	0	0
C9(2)	0	1	0	0	0.5	0	0	0	0
H4(3)	1.75	0.5	0	0	0	0	0	0	0
H8(1)	1.5	0.25	0.5	0	0	0	0	0	0
H12(1)	0.25	0	0	0.25	0.5	0.25	0	0	0
G8(2)	0.75	0	0.25	0	0.25	0	0	0	0
G2(2)	0	0	0	0.25	0	0	0	0	0
A7(5)	0	0	0	0	0	1.25	0	0	0
H12(5)	0.25	0	0	0	0	0	0.25	0	0
H12(3)	3	5.75	1.5	0.25	0	0	1	0	0
G2(4)	0.5	0.5	0.25	0	0	0	0.25	0	0
H1(4)	0.25	0	0	0	0	0	0	0	0
H7(2)	3.5	0	0	0	0	0	0	0	0
H3(4)	0	0	0	0	0	0	0.5	0	0
H10(2)	0.25	0	0	0	0	0	0	0	0
H9(2)	0	0.75	3.5	6.25	0	0	3	0	0
B8(5)	0	0	0	0	0	0	0.25	0	0
H10(1)	0.5	0.25	0	0	1	0	0	0	0
H11(1)	3.75	1.25	1.25	0	0.25	0	0	0	0
H12(2)	0	0	0	0	0	0.25	0	0	0
H7(3)	1.75	0	0	0	0	0	0.75	0	0
H1(1)	2	1.75	0.75	3.5	18	1	294.25	0	0
H2(1)	0.25	0.25	0	0	3.5	2.25	72.75	0	0
H6(1)	0	0	0.5	0	0	0	0.25	0	0
D4(5)	0	0	0	0.25	0	0	0	0	0
B10(5)	0	0	0	0	0	0	0.25	0	0
D1(5)	0.25	0	0	0	0	0	0	0	0
D6(5)	0	0.25	0	0	0	0	0	0	0
G5(5)	0	0.25	0	0	0	0	0.25	0	0
H8(4)	0.25	0	0	0	0	0	0	0	0
B9(5)	0	0	0	0	0	0	0.25	0	0
H2(2)	3.5	0	0	17.5	2.75	0	0	0	0
A10(5)	0	0	0	0	0	0	0.25	0	0
A11(5)	0	0	0	0	0	0	10.25	0	0
D5(5)	0	0.25	0	1.75	0	0	0	0	0
H10(5)	0	0	0	0.5	0	0	0	0	0
H11(5)	0	0	0	2.25	0	0	0	0	0
A9(5)	0	0	0	0	0	0.25	0	0	0
B11(5)	0	0	0	0	0	0	0	0	0.25
H7(1)	0	0	1.5	0	0.25	0	0.25	0.75	0
G12(1)	0	0	0.25	0	0	0	0	0	0
H9(1)	0.5	0	0	0	0.25	0.25	0.25	0	0
G2(3)	0.5	0.25	1	0	0.5	0	0.5	0	0
H4(2)	0	0	0	0.5	0	0	0	0	0
H11(4)	0.5	0	0.25	0	0	0	0	0	0
G1(2)	0	0	0	0	0.25	0	0	0	0
G6(2)	0	0	0	0	0.5	0	0.25	0	0
H12(4)	0	0.75	0	0	0	0.25	0	0	0
D2(5)	0.25	0	0	0	0	0	0	0	0
H6(5)	0	0	0	0	0	0.25	0	0	0
H9(5)	0	0	0	0	0	0	0.25	0	0

Code	Native 1	Native 2	Native 3	Pasture 1	x Pasture 2	Pasture 3	Oats	Potato 1	Potato 2
F1(1)	0	0	0	0	0	0	0	0	0.75
F2(1)	0	0	0	0	0	0.25	0	0.5	0
F4(1)	0.75	0.5	1	0	4.75	0	0	0	0
F5(1)	0	0	0.5	0	0	0	0	0.25	0
F6(1)	6.5	7.5	0.5	6.75	0.25	10.75	0.75	1.75	1.25
G1(4)	0	0	0	0	0	0.5	0	0	0
A1(5)	0	0	0	0	0	0	1.5	0	0
G6(3)	0	0	0.25	0	0	0	0.25	0.25	0
G7(4)	0	0.5	0.75	15	0	0	0.25	0	0
D12(5)	0	0	0	0	0.25	0	0	0	0
H5(4)	0	0	0	0.25	0	0	0	0	0
lombriz	0	0	0	0	0.25	1	0	0	0
A8(5)	0	0	0	0	0	0.25	0	0	0

Appendix 5. List of morphospecies, functional groups and totals found in the potato experimental block in the three sampling times.

Code	Order	Group	Family	Genus	Morpho species	Functional Group	Total I, II, III
1	Acari	Acarida	Acaridae	Unknown	A	Herbivore	253
2	Acari	Acarida	Tetranechydae	Unknown	A	Herbivore	2
3	Acari	Acarida	Nanorchestidae	Nanorchestes	A	Algivore	274
4	Acari	Acarida	Nanorchestidae	Speleorchestes	A	Algivore	3
5	Acari	Acarida	Trombiididae	Unknown	A	Predator	3
6	Acari	Acarida	Unknown	Unknown	A	Fungivore	81
7	Acari	Acarida	Unknown	Unknown	C	Fungivore	5
8	Acari	Gamasida	Unknown	Unknown	D	Predator	21
9	Acari	Gamasida	Unknown	Unknown	B	Predator	1
10	Acari	Gamasida	Unknown	Unknown	C	Predator	21
11	Acari	Gamasida	Unknown	Unknown	G	Predator	171
12	Acari	Gamasida	Uropodidae	Unknown	A	Predator	7
13	Acari	Gamasida	Uropodidae	Unknown	B	Predator	7
14	Acari	Gamasida	Uropodidae	Unknown	C	Predator	1
15	Acari	Oribatida	Carabodidae	Carabodes	A	Fungivore	1
16	Acari	Oribatida	Ceratozetidae	Ceratozetes	A	Fungivore	1
17	Acari	Oribatida	Dameidae	Unknown	A	Fungivore	1
18	Acari	Oribatida	Euphthiacaridae	Unknown	A	Detritivore	1
19	Acari	Oribatida	Nothridae	Nothrus	A	Fungivore	10
20	Acari	Oribatida	Oppiidae	Oppia	A	Fungivore	19
21	Acari	Oribatida	Oppiidae	Oppia	B	Fungivore	3
22	Acari	Oribatida	Oppiidae	Oppiella	A	Fungivore	163
23	Acari	Oribatida	Otocepheidae	Dolicheremaus	A	Fungivore	4
24	Acari	Oribatida	Phenopelopidae	Pelops	A	Bacteria Feeder	2
25	Acari	Oribatida	Scheloribatidae	Scheloribates	A	Fungivore	3
26	Acari	Oribatida	Scheloribatidae	Scheloribates	B	Fungivore	69
27	Acari	Oribatida	Scheloribatidae	Scheloribates	C	Fungivore	284
28	Acari	Oribatida	Suctobelbidae	Suctobelbella	A	Bacteria Feeder	33
29	Acari	Oribatida	Tectocepheidae	Tectocepheus	A	Fungivore	267
30	Acari	Oribatida	Unknown	Unknown	A	Fungivore	1026
31	Acari	Oribatida	Unknown	Unknown	B	Fungivore	1
32	Acari	Oribatida	Unknown	Unknown	C	Fungivore	1
33	Acari	Oribatida	Unknown	Unknown	D	Fungivore	1
34	Acari	Oribatida	Unknown	Unknown	E	Fungivore	1
35	Acari	Oribatida	Unknown	Unknown	F	Fungivore	3
36	Acari	Oribatida	Unknown	Unknown	G	Fungivore	1
37	Acari	Oribatida	Unknown	Unknown	H	Fungivore	1
38	Aranea		Gnaphosida	Unknown		Predator	1
39	Aranea		Micryphantidae	Unknown		Predator	1
40	Aranea		Salticidae	Unknown		Predator	6
41	Chilopoda		Geophilidae	Unknown		Predator	9
42	Chilopoda		Lithobidae	Unknown		Predator	6
43	Coleoptera		Chrysomelidae	Alticinae		Herbivore	10
44	Coleoptera		Carabidae	Unknown	B	Predator	1
45	Coleoptera		Curculionidae			Herbivore	1
46	Coleoptera		Curculionidae			Herbivore	2

Code	Order	Group	Family	Genus	Morpho species	Functional Group	Total I, II, III
47	Coleoptera		Curculionidae			Herbivore	1
48	Coleoptera		Unknown			Fungivore	85
49	Coleoptera		Cantharidae			Predator	7
50	Coleoptera		Carabidae	Unknown	A	Predator	6
51	Coleoptera		Elateridae			Herbivore	73
52	Coleoptera		Elateridae			Herbivore	113
53	Coleoptera		Scarabaeidae		A	Herbivore	8
54	Coleoptera		Staphylinidae		A	Predator	44
55	Coleoptera		Leiodadae			Fungivore	1
56	Coleoptera		Nitidulidae		A	Fungivore	1
57	Coleoptera		Nitidulidae		B	Fungivore	3
58	Coleoptera		Nitidulidae		C	Fungivore	29
59	Coleoptera		Nitidulidae		D	Fungivore	5
60	Coleoptera		Platypodidae			Herbivore	1
61	Coleoptera		Ptiliidae			Fungivore	1
62	Coleoptera		Staphylinidae		B	Predator	1
63	Coleoptera		Staphylinidae		C	Predator	1
64	Coleoptera		Staphylinidae		D	Predator	1
65	Coleoptera		Staphylinidae		E	Predator	1
66	Coleoptera		Staphylinidae		F	Predator	1
67	Coleoptera		Staphylinidae		G	Predator	14
68	Coleoptera		Staphylinidae		H	Predator	3
69	Coleoptera		Staphylinidae		I	Predator	1
70	Coleoptera		Staphylinidae		J	Predator	2
71	Coleoptera		Staphylinidae		K	Predator	3
72	Coleoptera		Staphylinidae		L	Predator	5
73	Coleoptera		Staphylinidae		M	Predator	1
74	Coleoptera		Staphylinidae		N	Predator	2
75	Coleoptera		Staphylinidae		O	Predator	2
76	Coleoptera		Staphylinidae		P	Predator	1
77	Collembola		Entomobryidae	Entomobrya	A	Fungivore	3
78	Collembola		Isotomidae	Folsomia	A	Fungivore	44
79	Collembola		Hypogastruridae	Hypogastrura	A	Fungivore	150
80	Collembola		Isotomidae	Isotoma		Fungivore	9
81	Collembola		Onychiuridae	Onychiurus		Fungivore	534
82	Collembola		Sminthuridae	Sminthurus		Fungivore	1
83	Collembola		Entomobryidae	Entomobrya	B	Fungivore	1
84	Collembola		Hypogastruridae	Hypogastrura	C	Fungivore	1
85	Diplopoda		Julidae			Detritivore	1
86	Diplura		Japigidae	Japyx		Predator	16
87	Diptera		Bibionidae			Herbivore	3
88	Diptera		Ceratopogonidae			Fungivore	27
89	Diptera		Chironomidae			Fungivore	17
90	Diptera		Cecidomyiidae			Fungivore	251
91	Diptera		Unknown			Herbivore	123
92	Diptera		Sciaridae			Fungivore	35
93	Diptera		Tipulidae			Herbivore	58
94	Diptera		Muscoidae			Herbivore	1
95	Diptera		Phoridae		A	Fungivore	1
96	Diptera		Phoridae		B	Fungivore	4

Code	Order	Group	Family	Genus	Morpho species	Functional Group	Total I, II, III
97	Diptera		Sciaridae			Fungivore	2
98	Enchytraeidae		Enchytraeidae			Bacteria Feeder	18
99	Hemiptera		Cydnidae			Herbivore	11
100	Homoptera		Aphidae			Herbivore	5
101	Homoptera		Cicadellidae		A	Herbivore	1
102	Homoptera		Cicadellidae		B	Herbivore	1
103	Homoptera		Cicadellidae		C	Herbivore	1
104	Homoptera		Pseudococcidae		A	Herbivore	15
105	Homoptera		Pseudococcidae		B	Herbivore	9
106	Hymenoptera		Formicidae			Predator	1
107	Hymenoptera		Unknown			Parasitic	1
108	Hymenoptera		Unknown			Parasitic	1
109	Lepidoptera		Noctuidae		A	Herbivore	1
110	Lepidoptera		Noctuidae		B	Herbivore	1
111	Lepidoptera		Noctuidae		C	Herbivore	15
112	Mollusca		Unknown			Herbivore	2
113	Psocoptera		Liposcelidae	Liposcelis		Algivore	3
114	Psocoptera		Unknown			Algivore	25
115	Thysanoptera		Unknown			Herbivore	3

Appendix 6. Average of the four subsamples taken in each block for each of the four treatments (Antracol, Control, Javelin and J + A).

Code	Order	Group	Family	Genus	Season / Morpho species	I Sum	II Sum	III Sum	Total
						1625	1226	1846	4699
1	Acari	Acarida	Acaridae	Unknown	A	156	20	77	253
2	Acari	Acarida	Tetranechydae	Unknown	A	0	0	0	2
3	Acari	Acarida	Nanorchestidae	Nanorchestes	A	1	41	232	274
4	Acari	Acarida	Nanorchestidae	Speleorchestes	A	0	0	3	3
5	Acari	Acarida	Trombiididae	Unknown	A	0	1	2	3
6	Acari	Acarida	Unknown	Unknown	A	0	30	51	81
7	Acari	Acarida	Unknown	Unknown	C	0	0	5	5
8	Acari	Gamasida	Unknown	Unknown	D	6	3	12	21
9	Acari	Gamasida	Unknown	Unknown	B	0	0	1	1
10	Acari	Gamasida	Unknown	Unknown	C	21	0	0	21
11	Acari	Gamasida	Unknown	Unknown	G	143	16	12	171
12	Acari	Gamasida	Uropodidae	Unknown	A	4	1	2	7
13	Acari	Gamasida	Uropodidae	Unknown	B	3	0	4	7
14	Acari	Gamasida	Uropodidae	Unknown	C	0	1	0	1
15	Acari	Oribatida	Carabodidae	Carabodes	A	0	0	1	1
16	Acari	Oribatida	Ceratozetidae	Ceratozetes	A	0	0	1	1
17	Acari	Oribatida	Dameidae	Unknown	A	0	0	0	1
18	Acari	Oribatida	Euphthiacaridae	Unknown	A	0	0	0	1
19	Acari	Oribatida	Nothridae	Nothrus	A	6	4	0	10
20	Acari	Oribatida	Oppiidae	Oppia	A	11	2	6	19
21	Acari	Oribatida	Oppiidae	Oppia	B	1	1	1	3
22	Acari	Oribatida	Oppiidae	Oppiella	A	36	62	65	163
23	Acari	Oribatida	Otocepheidae	Dolicheremaus	A	2	0	2	4
24	Acari	Oribatida	Phenopelopidae	Pelops	A	2	0	0	2
25	Acari	Oribatida	Scheloribatidae	Scheloribates	A	0	0	3	3
26	Acari	Oribatida	Scheloribatidae	Scheloribates	B	16	22	31	69
27	Acari	Oribatida	Scheloribatidae	Scheloribates	C	52	60	172	284
28	Acari	Oribatida	Suctobelbidae	Suctobelbella	A	2	6	25	33
29	Acari	Oribatida	Tectocepheidae	Tectocepheus	A	69	67	131	267
30	Acari	Oribatida	Unknown	Unknown	A	68	452	506	1026
31	Acari	Oribatida	Unknown	Unknown	B	0	1	0	1
32	Acari	Oribatida	Unknown	Unknown	C	0	1	0	1
33	Acari	Oribatida	Unknown	Unknown	D	0	0	1	1
34	Acari	Oribatida	Unknown	Unknown	E	0	0	1	1
35	Acari	Oribatida	Unknown	Unknown	F	2	0	1	3
36	Acari	Oribatida	Unknown	Unknown	G	0	0	1	1
37	Acari	Oribatida	Unknown	Unknown	H	0	0	1	1
38	Aranea		Gnaphosida	Unknown		1	0	0	1
39	Aranea		Micryphantidae	Unknown		0	0	1	1
40	Aranea		Salticidae	Unknown		1	2	3	6
41	Chilopoda		Geophilidae	Unknown		6	0	3	9
42	Chilopoda		Lithobidae	Unknown		3	2	1	6
43	Coleoptera		Chrysomelidae	Alticinae		3	1	6	10
44	Coleoptera		Carabidae	Unknown	B	1	0	0	1
45	Coleoptera		Curculionidae			0	0	1	1
46	Coleoptera		Curculionidae			0	0	2	2
47	Coleoptera		Curculionidae			0	1	0	1
48	Coleoptera		Unknown			2	51	32	85
49	Coleoptera		Cantharidae			6	0	1	7
50	Coleoptera		Carabidae	Unknown	A	3	2	1	6
51	Coleoptera		Elateridae			26	28	19	73
52	Coleoptera		Elateridae			19	58	36	113
53	Coleoptera		Scarabaeidae		A	5	1	2	8
54	Coleoptera		Staphylinidae		A	37	3	4	44
55	Coleoptera		Leiodadae			0	0	1	1
56	Coleoptera		Nitidulidae		A	0	0	1	1
57	Coleoptera		Nitidulidae		B	2	0	1	3
58	Coleoptera		Nitidulidae		C	11	9	9	29
59	Coleoptera		Nitidulidae		D	1	2	2	5
60	Coleoptera		Platypodidae			0	1	0	1

Code	Order	Group	Family	Genus	Season Morpho species	I Sum	II Sum	III Sum	Total
61	Coleoptera		Ptiliidae			1	0	0	1
62	Coleoptera		Staphylinidae		B	0	0	1	1
63	Coleoptera		Staphylinidae		C	1	0	0	1
64	Coleoptera		Staphylinidae		D	1	0	0	1
65	Coleoptera		Staphylinidae		E	0	0	1	1
66	Coleoptera		Staphylinidae		F	0	0	1	1
67	Coleoptera		Staphylinidae		G	10	3	1	14
68	Coleoptera		Staphylinidae		H	0	0	3	3
69	Coleoptera		Staphylinidae		I	0	0	1	1
70	Coleoptera		Staphylinidae		J	1	1	0	2
71	Coleoptera		Staphylinidae		K	0	0	3	3
72	Coleoptera		Staphylinidae		L	0	3	2	5
73	Coleoptera		Staphylinidae		M	1	0	0	1
74	Coleoptera		Staphylinidae		N	2	0	0	2
75	Coleoptera		Staphylinidae		O	2	0	0	2
76	Coleoptera		Staphylinidae		P	0	0	1	1
77	Collembola		Entomobryidae	Entomobrya	A	0	0	3	3
78	Collembola		Isotomidae	Folsomia	A	40	2	2	44
79	Collembola		Hypogastruridae	Hypogastrura	A	76	54	20	150
80	Collembola		Isotomidae	Isotoma		7	0	2	9
81	Collembola		Onychiuridae	Onychiurus		301	91	142	534
82	Collembola		Sminthuridae	Sminthurus		0	0	1	1
83	Collembola		Entomobryidae	Entomobrya	B	0	0	1	1
84	Collembola		Hypogastruridae	Hypogastrura	C	0	1	0	1
85	Diplopoda		Julidae			1	0	0	1
86	Diplura		Japigidae	Japyx		7	2	7	16
87	Diptera		Bibionidae			0	0	3	3
88	Diptera		Ceratopogonidae			2	8	17	27
89	Diptera		Chironomidae			9	3	5	17
90	Diptera		Cecidomyiidae			162	43	46	251
91	Diptera		Unknown			47	14	62	123
92	Diptera		Sciaridae			33	1	1	35
93	Diptera		Tipulidae			32	17	9	58
94	Diptera		Muscoidae			1	0	0	1
95	Diptera		Phoridae		A	0	0	1	1
96	Diptera		Phoridae		B	0	4	0	4
97	Diptera		Sciaridae			1	0	1	2
98	Enchytraeidae		Enchytraeidae			15	0	3	18
99	Hemiptera		Cydnidae			3	0	8	11
100	Homoptera		Aphidae			3	2	0	5
101	Homoptera		Cicadellidae		A	0	0	1	1
102	Homoptera		Cicadellidae		B	1	0	0	1
103	Homoptera		Cicadellidae		C	0	0	1	1
104	Homoptera		Pseudococcidae		A	10	3	2	15
105	Homoptera		Pseudococcidae		B	9	0	0	9
106	Hymenoptera		Formicidae			1	0	0	1
107	Hymenoptera		Unknown			0	0	1	1
108	Hymenoptera		Unknown			0	1	0	1
109	Lepidoptera		Noctuidae		A	0	0	1	1
110	Lepidoptera		Noctuidae		B	0	0	1	1
111	Lepidoptera		Noctuidae		C	13	1	1	15
112	Mollusca		Unknown			1	1	0	2
113	Psocoptera		Liposcelidae	Liposcelis		2	0	1	3
114	Psocoptera		Unknown			5	13	7	25
115	Thysanoptera		Unknown			1	2	0	3

Treatment	Antracol	Antracol	Antracol	Antracol	Control	Control	Control	Control	Javelin	Javelin	Javelin	Javelin
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	I	I	I	I	I	I	I	I	I	I	I	I
	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
Code	22.75	23	31.25	28.75	5	36.5	25.75	18.25	35.5	33	51.75	33.25
1	8.5	0	0.5	0.5	0	7	0	0.25	12.5	0	9.75	0
2	0	0	0	0	0	0	0	0	0	0.25	0	0
3	0	0	0	0	0	0	0	0	0	0	0.25	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0.25	0.25	0.25	0	0	0.25
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0.75	2	0.75	1.5	0	0	0	0	0	0	0	0
11	1.25	3.5	3.75	3.75	0.5	2	0.25	3.25	2.75	2.5	4.5	1
12	0	0	0.25	0.75	0	0	0	0	0	0	0	0
13	0	0	0.25	0	0	0	0.5	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0.25	0.75	0	0	0	0	0.25	0	0	0.25
20	0	0	0	0	0	0.5	0	0	0.25	0.25	0.25	0
21	0	0	0	0	0	0	0	0	0	0	0	0.25
22	0.5	0.5	1.75	0.75	0	0	0	0.5	0.75	0	1.5	0.25
23	0	0	0	0	0	0.25	0	0.25	0	0	0	0
24	0	0	0	0	0	0	0	0.5	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0.25	0.25	0	0	0.25	0	1.5	0	0.25	0	0.5
27	0.75	0.75	0	0.75	0	1.25	0	1	0.5	0.25	4	1
28	0	0	0.25	0	0	0	0	0	0	0	0	0.25
29	0.25	1	0.5	1	0	0	0.25	4	0	0.25	6.5	3
30	0	1.5	1.25	1.25	0	0.25	0	0.25	0	1	2.25	5.75
31	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0.25	0	0	0	0	0	0	0	0.25	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0.25	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0.25	0.25	0	0	0.25	0	0	0	0	0.25
42	0	0	0	0	0	0	0.25	0.25	0	0	0	0
43	0.25	0.25	0.25	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0.25	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0.25	0	0.5	0	0	0	0	0	0	0.25	0
50	0	0.25	0	0	0	0	0	0	0	0	0.25	0
51	1.25	0.75	0.25	0.25	0.25	0.5	0.25	0.5	0.5	0	0.5	0.5
52	0.5	0.5	0.25	0.5	0.25	0	0.5	0	0.5	0.25	0.25	0.5
53	0	0	0	0.25	0	0.25	0	0	0.25	0	0.25	0.25
54	0	0	0	0.25	0	0	1.5	0.25	1.25	1.25	1.25	1.25
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0.25	0	0	0	0	0	0	0.25
58	0.25	0.5	0.25	0	0	0	0.5	0.5	0.25	0	0.5	0
59	0	0	0	0	0.25	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0.25	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0

Treatment	Antracol	Antracol	Antracol	Antracol	Control	Control	Control	Control	Javelin	Javelin	Javelin	Javelin
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	I	I	I	I	I	I	I	I	I	I	I	I
Code												
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	1	0.5	0	0.25	0.5	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0.25	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0.25
74	0	0	0	0	0	0	0	0	0	0	0.5	0
75	0	0	0	0	0	0	0	0	0	0.5	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0.25	1	1.75	0.25	0	1	0	0.5	2.75	0.75	0.75
79	0	0	0.5	0	0.5	0	1	0.5	0.75	12	2	0
80	0	0	0	0	0.25	0.25	0.25	0	0.5	0	0	0.25
81	1.25	2.5	10.25	5	0.25	3	8	0	11	7.75	11	10.5
82	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0.5	0	0.25	0.25	0	0.25	0
87	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0.25	0	0	0	0	0.25
89	0	0.25	0	0.25	0	0	0.5	0	0	0	0.25	0
90	0	0	0	0	1.25	15	6.25	3	1.5	1	1.5	0
91	0	0	0	0	0	0	0.75	0.5	0.25	1.75	1	0.25
92	0	0.5	0.25	0	0	2	0.5	0	0	0	0	5
93	0.5	1.5	0.75	0.75	0.25	0	1	0	0	0.25	1	0
94	0	0	0	0	0	0	0.25	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	1.5	0.25	0.25	0.25	0.25	0	0
99	0	0	0	0	0	0.25	0	0	0	0	0	0
100	0	0	0	0	0.25	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0.25	0.25	0.5	0	0	0	0.5	0	0	0	0	0
105	0.5	0	0.5	0.5	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0.25	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	1.75	0	1	0	0	0.25	0	0	0	0	0.25
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0.25	0	0	0	0	0.25	0	0	0	0
114	0	0	0	0	0.25	0.25	0	0.25	0.25	0	0.25	0
115	0	0	0	0	0	0	0	0	0	0	0	0.25

Treatment	J + A	J + A	J + A	J + A	Antracol	Antracol	Antracol	Antracol	Control	Control	Control	Control
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	I	I	I	I	II	II	II	II	II	II	II	II
Code	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	28.25	6.25	13.5	13.5	10.5	15.5	17.75	10.5	42.75	9.25	18	30
1	0	0	0	0	0	0	0.5	0.25	0.25	0	0.5	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0.5	0	1	0	0	2.5	1.25	1.5
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0.25	0	0	0.25	0	0	1.75
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0.25	0.25	0	0	0.25	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0.25	0	0	0	0	0	0	0	0	0	0	0
11	1	0.5	3.75	1.5	0	0.5	0.5	0	0	0	0	1
12	0	0	0	0	0	0	0.25	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0.25	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	1.5	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	2	0.25	0.25	0	0.5	0	1.75	1	4.75	0	0	0.75
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0.75	0	0	0.25	1.25	0.5	0.25	0	0.5	0	0	0.25
27	1.25	0	0.5	1	0.25	0.75	0.25	0.75	3	0	0	0.25
28	0	0	0	0	0	0	0	0	0	0	0	0.25
29	0.5	0	0	0	0.25	0	0.5	0.75	2.75	0.5	1	5.5
30	2	0.5	0	1	3.75	0.25	4.5	4.5	19.75	2.25	6	10.75
31	0	0	0	0	0	0	0	0	0.25	0	0	0
32	0	0	0	0	0	0	0.25	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0.25	0	0.25	0	0	0	0	0	0	0
41	0	0.25	0.25	0	0	0	0	0	0	0	0	0
42	0	0.25	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0.25	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0.5	0.25	1.5	0.25	0.25	2.25	0	0	2.5
49	0.25	0.25	0	0	0	0	0	0	0	0	0	0
50	0.25	0	0	0	0	0.25	0	0	0	0	0.25	0
51	0.5	0	0	0.5	0.25	0	0	0.25	0.75	0.25	1.5	1
52	0.25	0.25	0.25	0	1.5	1.25	2.25	0.25	2.25	0.5	1.25	0.5
53	0	0	0	0	0	0	0	0	0	0	0	0
54	1.25	0.25	0.5	0.25	0	0	0	0	0.25	0	0	0.25
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0.25	0.25	0	0.5	0	0.25	0.25
59	0	0	0	0	0.25	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0.25	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0.25	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0

Treatment	J + A	J + A	J + A	J + A	Antracol	Antracol	Antracol	Antracol	Control	Control	Control	Control
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	I	I	I	I	II	II	II	II	II	II	II	II
Code												
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0.25	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0.25	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0.25	0.25	0
73	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0.75	0.25	0	0	0	0	0.25	0	0	0
79	1	0.25	0.25	0.25	0	5.5	0.5	0.25	0	0.25	0.5	0.75
80	0	0	0.25	0	0	0	0	0	0	0	0	0
81	1.5	0.5	0.25	2.5	0.25	1.25	3.25	1.75	0.5	0	3.25	0.75
82	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0.25	0	0
85	0	0	0.25	0	0	0	0	0	0	0	0	0
86	0.25	0	0	0.25	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0.25	0	0	0.25	0.25	0
89	1	0	0	0	0	0	0	0	0	0.25	0.5	0
90	7.25	0.25	0	3.5	0.5	0.75	0.25	0	2.75	1.75	0	0.25
91	2.25	0.5	3.75	0.75	0.75	0.25	0	0	1	0	0	0.5
92	0	0	0	0	0	0	0	0	0	0	0	0.25
93	0.5	1	0.25	0.25	0	1.25	0.25	0	0.25	0.25	0.75	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0.5
97	0	0	0	0.25	0	0	0	0	0	0	0	0
98	1.25	0	0	0	0	0	0	0	0	0	0	0
99	0.25	0.25	0	0	0	0	0	0	0	0	0	0
100	0.25	0.25	0	0	0	0	0.25	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0.25	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	1	0	0	0	0.25	0.25	0	0	0	0
105	0.25	0.25	0	0.25	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0.25
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0.25	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0.5	0	0	0.25	0	0.5	0.25
115	0	0	0	0	0	0	0	0.25	0	0	0	0

Treatment	Javelin	Javelin	Javelin	Javelin	J + A	J + A	J + A	J + A	Antracol	Antracol	Antracol	Antracol
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	II	II	II	II	II	II	II	II	III	III	III	III
Code	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	34.25	18.25	18.5	15.75	35	12.5	7.25	10.75	21	59.5	8.25	53.25
1	0	0	2.25	1.25	0	0	0	0	4.25	1	0.5	6.25
2	0	0	0	0	0	0	0	0	0	0	0.25	0
3	0.25	1.25	0.75	1	0	0	0.25	0	0.25	0	2	1.25
4	0	0	0	0	0	0	0	0	0	0	0	0.5
5	0	0	0	0	0	0	0	0.25	0	0	0	0
6	3	0	2.25	0	0	0	0	0	0	1.75	0	7
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0.25	0.25	3	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0.25	0.25	0.5	0	0.25	0.75	0	0	0	0.25	0.25	0.25
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	1	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	1	0	0	0	0	0	0	0	0
20	0	0	0	0.25	0.25	0	0	0	0	0	0	0
21	0	0	0	0	0.25	0	0	0	0	0	0	0
22	0.5	0.25	3	0.5	1.25	0.5	0.5	0.25	0.25	1.75	0	0.75
23	0	0	0	0	0	0	0	0	0.25	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0.25	0.5	0	0	1.5	0	0.5	0	0	0.5	0	1
27	1	0.5	0.25	2	3.75	1	0	1.25	1	14	0.5	0.75
28	0	0	0.5	0	0.5	0	0	0.25	0	0	0	1
29	1.75	0	0.5	1.75	0	0.25	0	1.25	0.5	5	1.25	12.5
30	17	7.25	5	3	19.75	5.5	2	1.75	2.75	14	1	15
31	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0.25	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0.25	0	0
40	0	0	0	0	0	0	0	0.25	0	0	0	0.25
41	0	0	0	0	0	0	0	0	0.5	0	0	0
42	0.25	0	0	0	0	0.25	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	1	0	0.25
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0.25	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0.25	0	0	0	0	0	0	0	0
48	1.5	1.5	0	0.25	1	0.5	0	1	1	1.25	0	0.25
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0.25	0.25	0	0	0.5	1.25	0.75	0	0	0	0.5
52	1	0.75	0.5	0	2	0.5	0	0	0	1.5	0.25	2
53	0	0	0	0	0	0	0	0.25	0	0	0	0
54	0.25	0	0	0	0	0	0	0	0	0.5	0	0
55	0	0	0	0	0	0	0	0	0.25	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0.25	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0.25	0	0.25	0	0	0	0.25	0	0.25	0	0	0
59	0	0	0	0	0	0.25	0	0	0.25	0	0	0
60	0	0	0	0	0	0.25	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0

Treatment	Javelin	Javelin	Javelin	Javelin	J + A	J + A	J + A	J + A	Antracol	Antracol	Antracol	Antracol
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	II	II	II	II	II	II	II	II	III	III	III	III
Code												
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0.25	0	0	0
66	0	0	0	0	0	0	0	0	0	0.25	0	0
67	0.25	0	0	0.5	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0.5	0	0
69	0	0	0	0	0	0	0	0	0	0.25	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0.25	0.25	0	0
72	0.25	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0.25	0	0	0	0	0.25	0.25	0
79	3.5	0.25	0	0.25	0	0.5	0.25	1	0.5	1.5	0.25	0.75
80	0	0	0	0	0	0	0	0	0	0.25	0	0
81	1.75	4.75	0.75	1.5	1	0.25	1	0.75	0.25	9.5	1	1
82	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0.5	0	0	0	0	0.25	0	0	0
87	0	0	0	0	0	0	0	0	0	0.25	0	0
88	0	0	0	0	0	0.5	0.5	0.25	0.5	0.25	0.25	0.25
89	0	0	0	0	0	0	0	0	0.75	0	0	0
90	0	0.25	0.25	0.5	2.75	0.25	0.25	0.25	2.5	0.5	0.25	0.25
91	0	0.25	0	0.25	0	0	0	0.5	0.25	0.5	0	0.5
92	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0.5	0.25	0.25	0	0.25	0.25	0	0.75	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0.25	0	0	0.25	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0.25	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0.25	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0.25	0	0	0	0	0	0	0	0.25	0	0	0.25
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0.25	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0.25
111	0.25	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0.25	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0.25	0	0	0
114	0	0	0.25	0.5	0.25	0.5	0	0.25	0	0.25	0	0
115	0.25	0	0	0	0	0	0	0	0	0	0	0

Treatment	Control	Control	Control	Control	Javelin	Javelin	Javelin	Javelin	J + A	J + A	J + A	J + A
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	III	III	III	III	III	III	III	III	III	III	III	III
Code	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	19.75	30.25	8.25	65	25	28.5	5.25	16	46.5	26.75	13.5	34.75
1	0	1	0	0.5	0	0.25	0	0.5	4.5	0.5	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0.5	0.25	0.75	47.25	1.75	0.5	0.25	2.5	0	0	0.5	0.25
4	0	0	0	0.25	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0.25	0	0	0	0.25	0
6	0.5	0.75	0	0	0	0	0	0	0	1.75	0	1
7	0	0.5	0.25	0	0.25	0.25	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0.25	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0.5	0	0	0.5	0	0	0.25	0	1	0	0	0
12	0	0	0	0	0	0.5	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0.25
16	0	0.25	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0.25
18	0	0	0	0	0	0	0	0	0	0	0	0.25
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0.25	0	0	0	0	0	0	0	0	0.75	0	0.5
21	0	0	0	0	0.25	0	0	0	0	0	0	0
22	2	3.75	0.25	0.25	0.75	0	0	1.75	3	0.5	0.5	0.75
23	0	0	0	0	0	0	0	0	0.25	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0.25	0	0	0	0	0	0	0.5	0	0	0
26	0.75	1	0	0	0.25	0.75	0	0	2	0.5	0	1
27	1.25	4.5	0.5	1.25	1.25	4.75	0.75	0.5	7	1.5	2.25	1.25
28	0	0.75	0	0	0.75	0	0	0	0	0.25	0	3.5
29	0.25	1.25	0.25	1	0	1	0.25	1.25	4	1	2	1.25
30	6	8.75	0.75	3.5	14.5	15.5	1.5	1.75	8.5	12.75	2.25	18
31	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0.25	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0.25	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0.25	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0.25	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0.25	0	0	0	0	0	0	0	0	0	0	0.25
41	0	0	0	0	0	0	0	0	0.25	0	0	0
42	0	0	0.25	0	0	0	0	0	0	0	0	0
43	0	0.25	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0.25	0	0	0	0	0.25	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	3.25	0.25	0.25	0	0.5	0	0	0.25	0.25	0.75	0	0
49	0	0	0	0	0.25	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0.25	0
51	0	0.25	1	0.5	0.25	0.25	0.25	0.75	0	0	0.25	0.75
52	0.75	0.75	0.5	0	0	1	0.25	0.25	0.75	0.25	0.25	0.5
53	0	0	0	0	0	0	0	0	0	0	0.5	0
54	0	0	0	0.25	0	0	0	0	0	0	0.25	0
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0.25	0	0	0	0
58	0.5	0	0	0	0	0.25	0	0.25	0.25	0.25	0.25	0.25
59	0	0	0	0.25	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0.25	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0

Treatment	Control	Control	Control	Control	Javelin	Javelin	Javelin	Javelin	J + A	J + A	J + A	J + A
Block	1	2	3	4	1	2	3	4	1	2	3	4
Season	III	III	III	III	III	III	III	III	III	III	III	III
Code												
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0.25	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0.25	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0.25	0	0	0	0	0	0
72	0	0	0.25	0	0	0	0	0	0.25	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0.25	0	0	0	0	0	0
77	0	0	0.25	0.25	0.25	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0.25	0.25	0.5	0	0	0	0	0.25	0	0.5	0.25
80	0	0.25	0	0	0	0	0	0	0	0	0	0
81	1.5	2.75	1.25	3.5	0.75	1.5	0.25	5	0.75	2.5	1.75	2.25
82	0	0	0	0.25	0	0	0	0	0	0	0	0
83	0	0.25	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86	0.25	0	0	0	0	0	0.25	0.25	0.5	0	0.25	0
87	0	0	0	0	0	0	0	0	0	0.5	0	0
88	0.25	0	0.25	0	0	0	0.5	0	1.5	0.25	0.25	0
89	0	0	0	0.25	0	0	0	0.25	0	0	0	0
90	0.25	0	0.5	3.25	0.75	0.5	0.5	0	0.75	0.5	0.75	0.25
91	0.5	0.25	0	1	1	0.5	0	0.5	7.75	1	0	1.75
92	0	0.25	0	0	0	0	0	0	0	0	0	0
93	0	0.5	0	0	0.5	0	0	0	0.25	0.25	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0.25	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0.25	0	0	0	0	0	0	0	0	0	0	0
98	0	0.25	0.5	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	1.5	0.25	0.25	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0.25
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0.25	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0.25	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0.25	0	0.25	0.25	0.5	0	0	0	0.25	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0