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Impact of a Lead Mining-Smelting Complex on the Forest-Floor Litter Arthropod Fauna in the New Lead Belt Region of Southeast Missouri

A. P. Watson - R. I. Van Hook - D. R. Jackson - D. E. Reichle

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IMPACT OF A LEAD MINING-SMELTING COMPLEX ON THE FOREST-FLOOR LITTER ARTHROPOD FAUNA IN THE NEW LEAD BELT REGION OF SOUTHEAST MISSOURI

A. P. Watson, R. I. Van Hook, D. R. Jackson, and D. E. Reichle

ENVIRONMENTAL SCIENCES DIVISION

Submitted by A. P. Watson as a dissertation to the
Graduate School of the University of Kentucky
in partial fulfillment of the requirement
for the degree of Doctor of Philosophy

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ABSTRACT

WATSON, Annetta P., R. I. VAN HOOK, D. R. JACKSON, and D. E. REICHLE. Impact of a lead mining-smelting complex on the forest-floor litter arthropod fauna in the New Lead Belt region of southeast Missouri. ORNL/NSF/EATC-30. Oak Ridge National Laboratory, Oak Ridge, Tenn. 167 pp.

Studies of biological activity within the litter horizons of a watershed contaminated by emissions from a lead-ore processing complex focused on the litter-arthropod food chain as a means of detecting perturbations in a heavy-metal contaminated ecosystem. Both point sources (smelter stack emissions) and fugitive sources (ore-handling processes, yard dusts, and exposed concentrate piles) contributed to the Pb, Zn, Cu, and Cd levels in the study area (Crooked Creek Watershed, Iron County, Missouri, $37^{o}38'$ N Lat., $91^{o}07'$ Long.). Characterization of arthropod food base and habitat was accomplished by critical examination of litter mass, heavy metal and macronutrient content, cation exchange capacity, and pH. Arthropod trophic level density, biomass, and heavy metal content were determined by analysis of specimens removed from litter by von Tullgren funnel extraction, taxonomically classified, and segregated into the trophic categories of detritivore, fungivore, littergrazer, omnivore, and predator.

The highest concentration of litter Pb, Zn, Cu, and Cd occurred in 02 litter. Mean values of 103000 ppm Pb, 4910 ppm Zn, 6080 ppm Cu, and 179 ppm Cd were found in samples collected 0.4 and 0.8 km from the smelter. These elevated concentrations were strongly correlated ($P<.01$) with an accumulation of undecomposed 02 material. The mean annual 02 mass/m^2 found 21.0 km W of the smelter (control area) was 1030 ± 126 (SE) g/m^2 as compared to 2198 ± 201 (SE) and 1765 ± 142 (SE) g/m^2 for the 0.4 and

0.8 km sites, respectively. The mean annual mass of O1 material did not differ significantly throughout the study area, but varied about a mean of 433±29 (SE) g/m^2 (ranging from 120 to 480 g/m^2). Mean annual O1 mass at the control area was 471±34 (SE) g/m^2.

Changes in litter decomposition were reflected in the dynamics of the litter arthropod community. Reduced values of total arthropod density (no/m^2) and biomass (mg/m^2) occurred simultaneously with elevated concentrations of litter heavy metals. This reduction in total arthropod biomass and density was governed by a decrease in biomass and density of the predator, detritivore and fungivore populations. In addition, measurements of arthropod richness, an estimate of maximum diversity, revealed that litter arthropod populations at heavily contaminated sites were less rich in taxa (family) than were those located elsewhere on the watershed.

Food-chain dilution of Pb, Zn, Cu, and Cd from litter to litter consumer was occurring, as indicated by the mean concentration factors of 0.07±0.02 (Pb), 0.64±0.15 (Zn), 0.38±0.10 (Cu), and 0.34±0.05 (Cd). Accumulation of Pb by litter consumers was much less than that found for the other three heavy metals. In contrast, predatory arthropods on Crooked Creek Watershed either concentrated or equilibrated with respect to Pb, Zn, and Cd from their prey, as indicated by mean total predator concentration factors of 1.16±0.29 (Pb), 1.27±0.14 (Zn), and 1.27±0.02 (Cd). Of all four heavy metals, only Cu appeared to be diluted by food-chain transfer from prey to predator ($\bar{x}$ = 0.67±0.10).

Measurements of fresh foliage and litter macronutrient concentrations and litter macronutrient pools indicated that forest-nutrient dynamics on Crooked Creek Watershed were seriously disturbed. A significant depression ($P<.05$) of the Ca, Mg, and K content of O1 and O2 litter occurred relative to the control within 0.8 km of the stack. Two mechanisms were postulated to explain this result:

(1) Increased leaching of cations through the litter induced by a loss of cation exchange capacity, a decrease in pH, and a decrease in microbial immobilization of macronutrients.

(2) A decreased uptake of macronutrients due to root damage produced by heavy-metal concentrations. The result would be a reduced annual macronutrient input from litterfall.

A loss in litter cation exchange capacity and reduction in fresh-foliage macronutrient content was measured on the Crooked Creek Watershed. An accumulation of macronutrient pools in O2 litter also existed between 1.2 and 2.0 km of the smelter.

TABLE OF CONTENTS

LIST OF TABLES

Table		Page

LIST OF FIGURES

Page

LIST OF APPENDICES

INTRODUCTION

Lead presently occurs as a global pollutant (Committee on Biologic Effects of Atmospheric Pollutants, 1972) but few references are available documenting the effects of Pb sources on litter arthropods. Preliminary evidence exists to suggest possible transfer of elemental Pb through plant-herbivore-carnivore food webs from roadway "line sources" (Giles, et al., 1973; Rolfe et al., 1974). No study yet published has attempted to document such biological transfer within a litter system, although it has been shown that litter-grazing isopods collected from roadside ditchbanks contain significantly elevated concentrations of Pb relative to values found in predaceous spiders or opilionids (Williamson and Evans, 1972). As no heavy metal analysis of the decaying vegetation was made, concentration factors could not be calculated from Williamson and Evans' data. In contrast, no difference could be detected in distribution or abundance of identical taxa found at sites ranging in total soil-lead content from 70 ppm (roadway ditchbank) to 19000 ppm (overgrown lead-mine spoil heaps) (Williamson and Evans, 1973). However, neither tissue-lead nor litter-substrate lead analyses were performed.

It is well known that the seasonal uptake of nutrients in deciduous forests depends upon mineralization of litter by saprovore populations (Ovington, 1960; Witkamp and Ausmus, 1975). It is also known that litter can serve as a heavy metal reservoir by chelation or cation exchange processes (Ruhling and Tyler, 1973; Hirst, et al., 1961). Because disruption of decomposition can affect the forest ecosystem by accelerated nutrient losses and reduced mineralization rates (Tyler, 1972), examination of heavy-metal effects on the litter community is important in fully understanding basic ecosystem processes.

In unperturbed ecosystems, arthropods of the litter community act as "catalysts of microbial metabolism" (Macfadyen, 1963) in the decomposition processes. Passage of litter through the arthropod gut produces a substrate favorable to microbial decomposition via fragmentation and chemical alteration (Nicholson, et al., 1966; van der Drift and Witkamp, 1960; McBrayer and Reichle, 1971). Such substrate modification supports the hypothesis that these animals may act as decomposition rate regulators (McBrayer, 1973).

Dispersal and growth of microorganisms is also aided by the physical presence of arthropods. Inoculation of litter substrate can occur from spores transported on spines, setae and appendages (Szabo, 1974; Witkamp, 1960) or in fecal deposits (Macfadyen, 1968). Microhabitats for bacterial and fungal multiplication are produced by arthropod burrowing activities (Szabo, 1974).

In short, litter arthropods and decomposer microorganisms are inseparably linked in the breakdown of non-living plant material. Any perturbation uncoupling the close associations in the decomposer community will have an effect on the release of nutrients from litter.

The primary objective of the present study was to determine the degree to which lead can be biologically transported by the principal arthropod food chains present in a forest-floor litter community subjected to heavy-metal contamination. To accomplish this goal, it was also necessary to physically and chemically characterize the litter habitat.

The study area chosen was a southeastern Missouri watershed receiving stack emissions and fugitive source dusts originating from an adjacent primary lead smelter operated by the AMAX and Homestake Smelting Companies since 1968. The watershed is unique in that the woodland ecosystem is largely intact, having sustained little damage due to the extensive lumbering, burning, and soil erosion that characterizes many other smelter sites (Jordan, 1971, 1973, 1975; Witkamp et al., 1966). In addition, periodic monitoring of smelter emissions deposited on the watershed has been made since 1971 (Wixson et al., 1972; Wixson, 1974).

Due to the presence of heavy metals other than Pb in source dusts, all samples were analyzed for Zn, Cu, and Cd as well as Pb to examine for possible synergistic or additive effects on biological transport.

MATERIALS AND METHODS

Study Area

The study area is a 466 ha. watershed located in the Clark National Forest, Iron County, Missouri (37°38' N Lat., 91°07' Long.) (Fig. 1). Named for its main drainage, Crooked Creek Watershed (CCW) lies on the now deeply dissected remnants of the Salem Plateau. Local topography (Fig. 2) is characterized by hills alternating with steep valleys (Schwarz and Schwarz, 1959). The second-growth canopy species, black oak (Quercus velutina Lam.), white oak (Q. alba L.), northern red oak (Q. borealis Michx.), post oak (Q. stellata Wang), and black-jack oak (Q. marilandica Muenchh), provided 74±5% (SE) of the total canopy biomass. Shortleaf pine (Pinus echinata Mill.) provided 16±6% of the total canopy biomass (Dixon, 1974).

Watershed soils were thin, stony, limestone-residual, cherty silt loams. Ridgetops possessed a Lebanon soil type with a 5-8 cm fragipan; slope soils were dominated by cherty silt loams of the Wilderness (40%) and Clarksville (25%) series. Valley floors were occupied by alluvial Razort and Ashton soils (Kickbush, 1975).

Soil Conservation Service data from neighboring Dent County indicated a mean annual rainfall of 106.7 cm with 31% of the precipitation received in the spring (March-May), 51% in the summer (June-August) and fall (September-November), and 18% during the winter (December-February). Mean temperatures in Dent County ranged from 0.6°C in January to 25.5°C in July. There were an average of 177 frost-free days per year (Gilbert, 1971).

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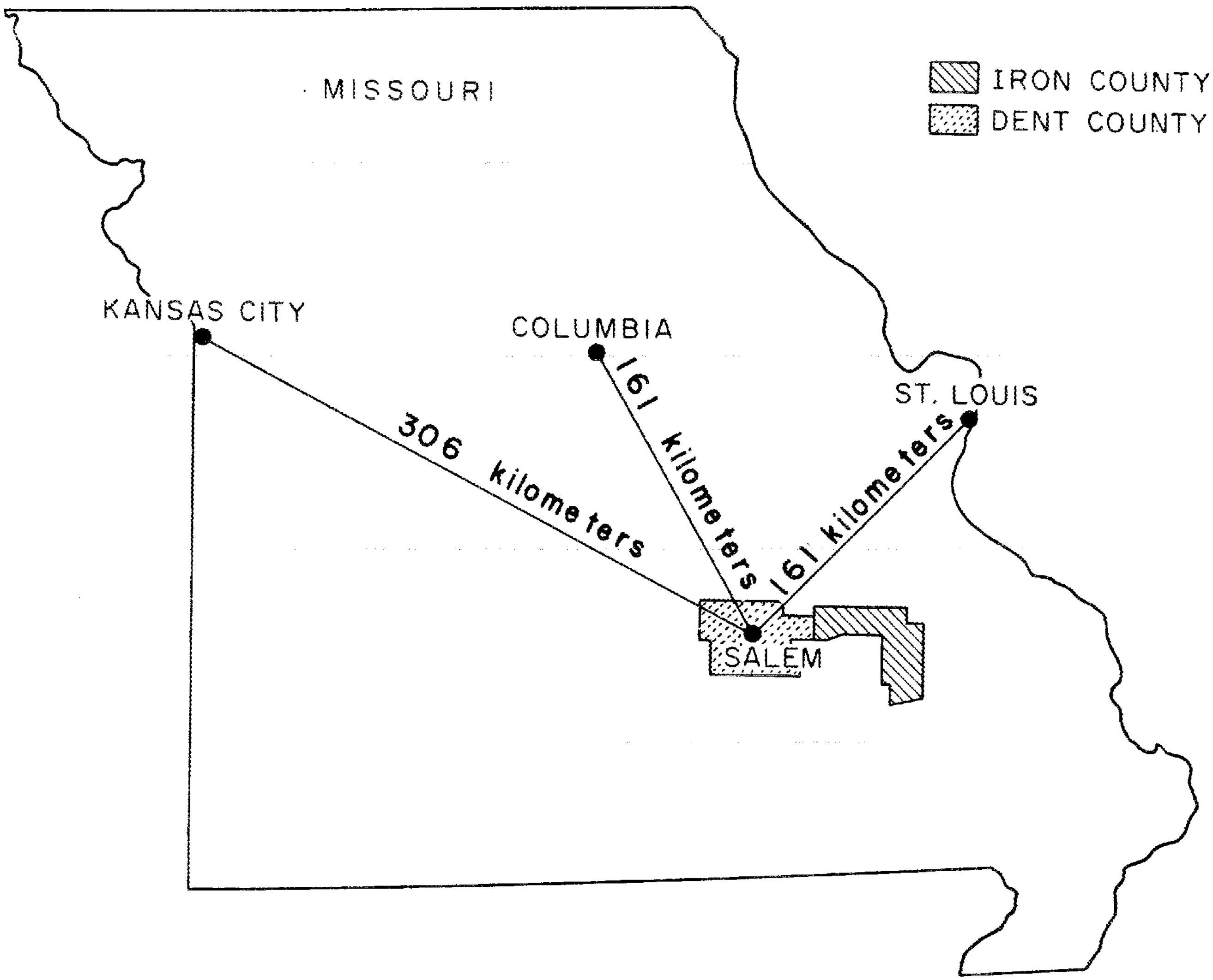

Fig. 1. Location of Dent and Iron Counties in Missouri. Crooked Creek Watershed is in Iron County, 38 km east of Salem.

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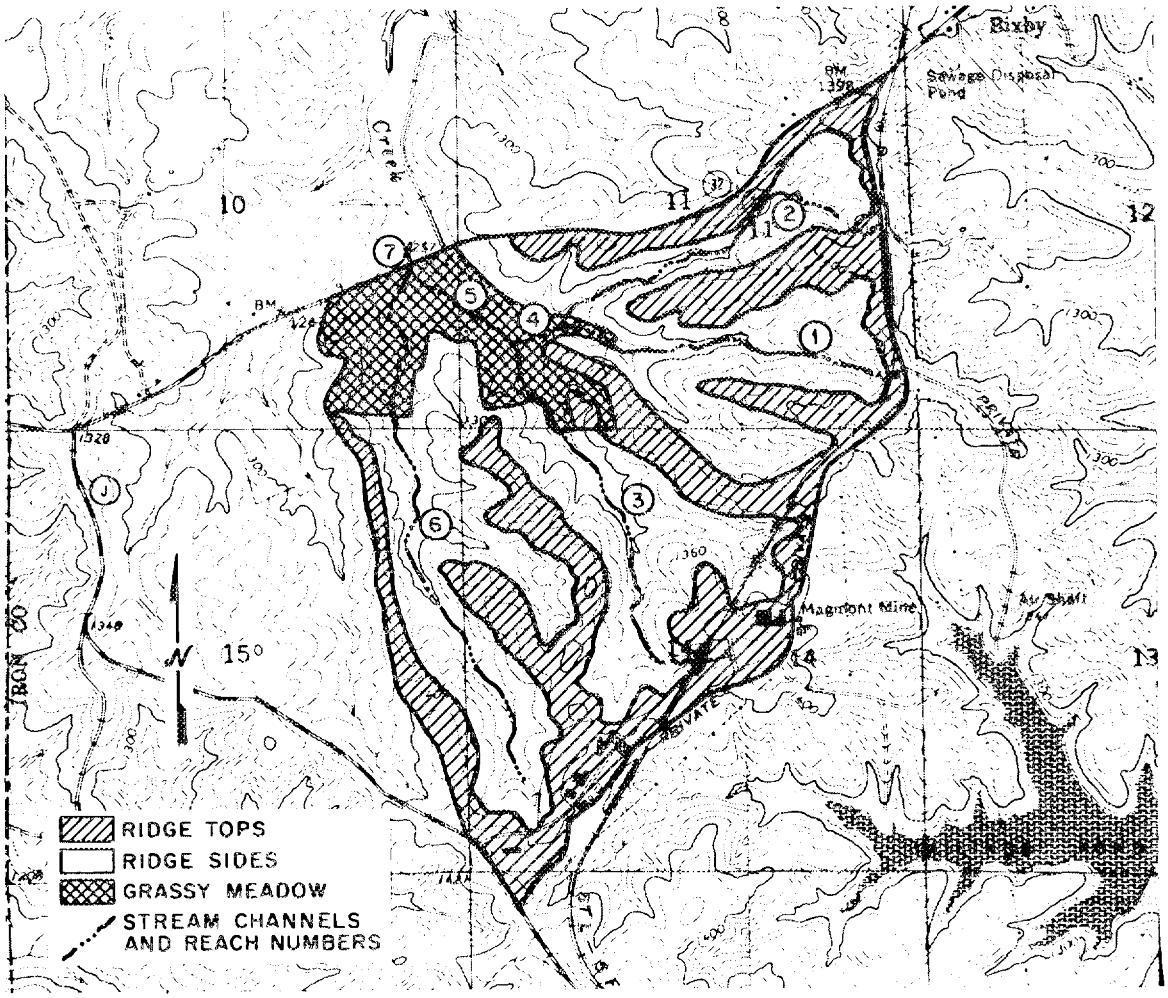

Fig. 2. Topography and vegetation of Crooked Creek Watershed. State roads J, 32, and the St. Louis-San Francisco railway form the W, N, and NE boundaries, respectively.

Crooked Creek Watershed has been subject to intermittent grazing by cattle, sheep, and hogs both prior to, and following, purchase by the U.S. Forest Service for inclusion in the National Forest System in the 1930's (Wright, 1974). Although the original Forest Service management scheme called for multi-purpose use, the area has become the site of lead/zinc mining, milling, and smelting activity since the discovery of rich deposits near Viburnum (8 km N of CCW) in 1955. The "Viburnum Trend" is now acknowledged to be the largest and richest known lead deposit in the world (Missouri Division of Geological Survey and Water Resources, 1971, 1974).

A number of heavy metal sources exist near Crooked Creek Watershed. AMAX Lead Co. of Missouri, in cooperation with Homestake Mining Co., has managed a primary lead smelter at the apex of the triangularly-shaped watershed since 1968. A mine-mill complex operated by COMINCO American transports Pb, Zn and Cu concentrate along the St. Louis-San Francisco railway forming the northeastern boundary of the watershed (Fig. 2). Until 1974, loaded railroad cars were not covered, and their dry contents were readily blown into the study area (Wright, 1974). Exposed piles of Cu concentrate adjacent to the railway also serve as source areas. Thus, both point sources (smelter stack emissions) and fugitive sources (ore-handling processes, yard dusts, and exposed concentrate piles) contributed to the heavy-metal load on the watershed.

Sampling Procedures

Location of Study Plots

Seasonal means of wind-rose patterns were used to develop a field sampling grid on directional transects originating from the base of the smelter stack (Fig. 3). In accordance with United States Forest Service permanent plot inventory procedures, 0.04 ha (0.1 A) study plots (Fig. 4) were established at 0.4 km (0.25 mi) intervals along each transect (Clark National Forest, 1972). The one exception was the placement of the third plot on the NE transect 100 m from the second. The location of the St. Louis-San Francisco railway along the eastern ridgetop boundary prevented the location of this site exactly 1.2 km from the stack base.

A grid incorporating 32 sites on 7 transects was employed during initial sampling in September and December, 1973. Results from these sampling periods indicated that no significant differences in heavy metal content or litter mass exist between not only the 1.6 and 2.0 km sites, but also between the WNW-NW, NNW-N, and NNE-N transects. A refined grid incorporating 15 sites on 4 transects was used for the one-year (1974) field sampling reported in this study (Fig. 4).

A tree, conspicuously marked with flagging tape and an aluminum identification tag, designated the center of each 0.04 ha study plot. The slope and aspect of each plot were measured with a Haga altimeter and surveyor's compass. Elevation measurements were derived from altimeter readings corrected for barometric pressure fluctuations by periodic monitoring at several U.S.G.S. benchmarks in the area. A plot summary of landscape characteristics and dominant overstory species is given in Table 1.

Litter Sampling and Initial Processing

The Soil Science Society of America recognizes two litter horizons, 01 and 02. Plant material of the 01 layer has retained its original

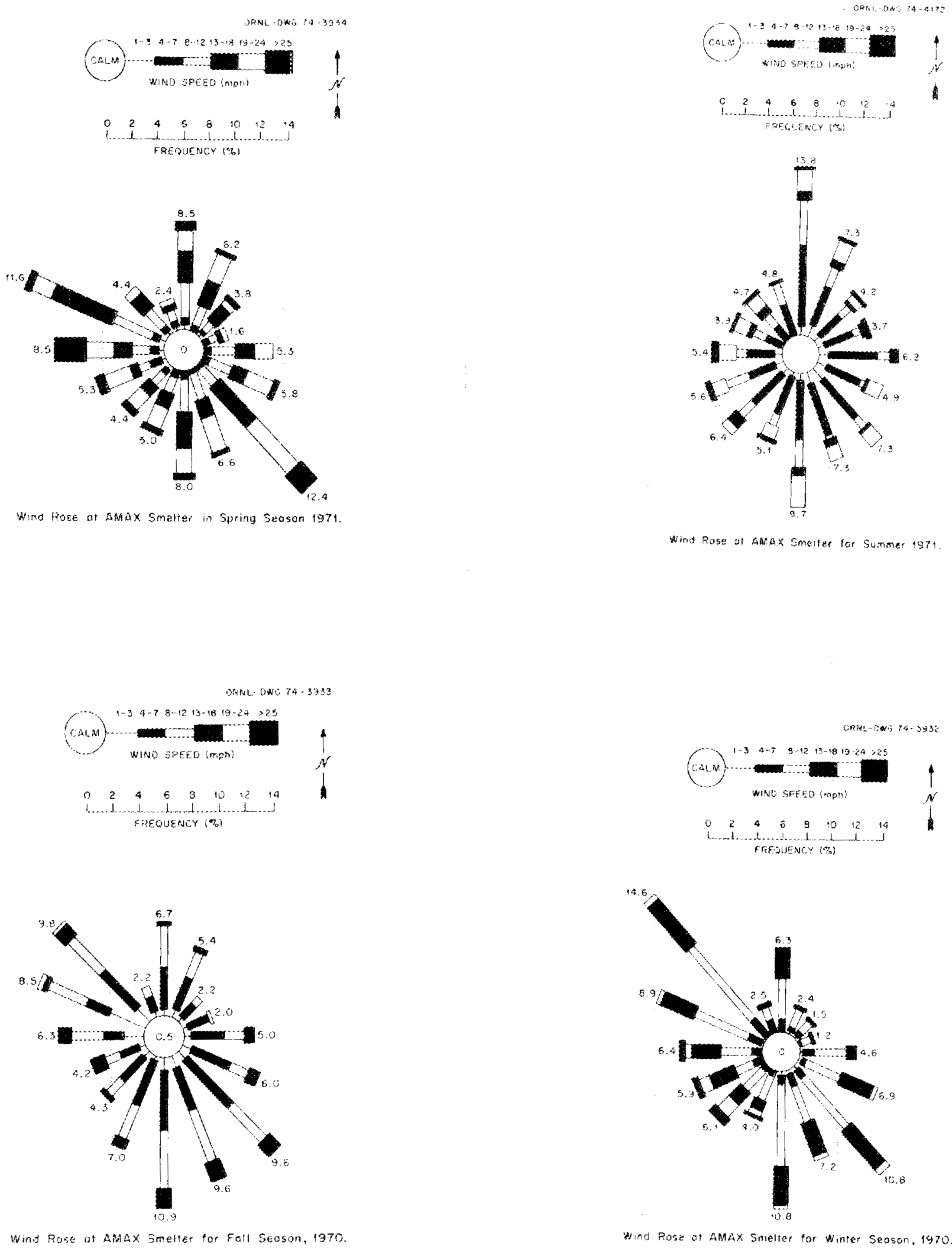

Fig. 3. Wind-rose patterns at the AMAX-Homestake smelter stack for Fall and Winter, 1970 and Spring and Summer, 1971. Data taken from Wixson, et al., 1972.

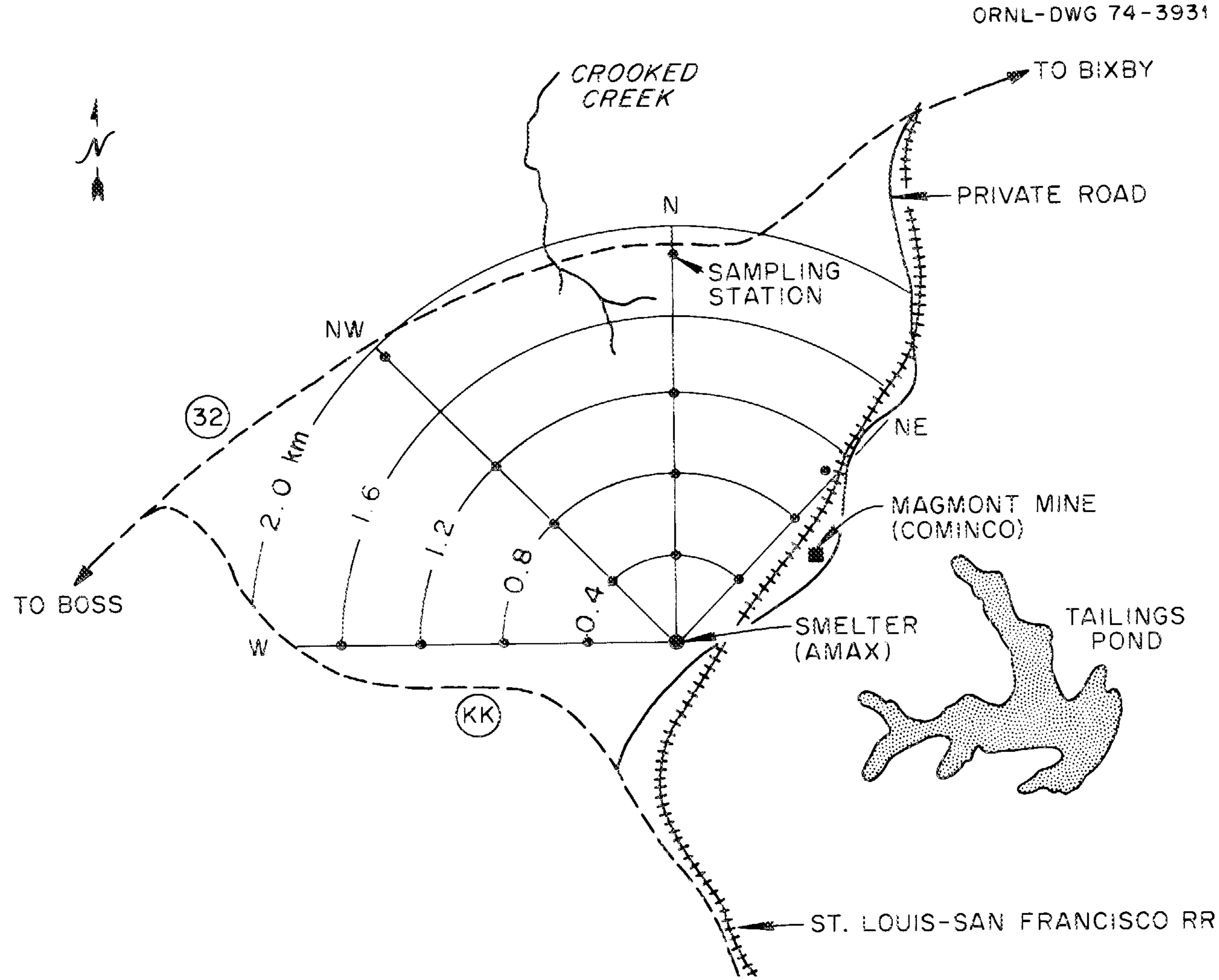

Fig. 4. Sampling grid utilized on Crooked Creek Watershed for collection of litter and arthropods in the present study. Crooked Creek Watershed, a 466 ha. portion of the Clark National Forest, is located in Iron County, Missouri.

Table 1. Landscape Characters and Dominant Vegetation of Crooked Creek Watershed Study Sites.

Site* (km)		Slope (%)	Aspect (°)	Elevation (m)	Dominant Species
W	0.4	12.5	240	422.7	*Quercus stellata* Wang *Q. marilandica* Mueunchh.
W	0.8	11.5	126	418.5	*Q. alba* L. *Pinus echinata* Mill.
W	1.2	5.5	53	403.5	*Q. velutina* Lam. *Q. stellata* *Q. alba*
W	1.6	10.5	266	414.8	*Q. alba* *Q. stellata* *Q. velutina*
NW	0.4	7.5	290	401.7	*Q. alba* *Q. coccinea* *Q. velutina*
NW	0.8	11.5	40	398.9	*Q. borealis* Michx. *Q. stellata* *Q. velutina*
NW	1.2	.5	40	390.1	*Q. stellata* *Q. velutina* *Carya texana* Buckl.
NW	2.0	0	0	382.8	*Q. stellata* *C. tomentosa* (Poir.) *Crataegus* spp. *Juniperus virginiana* *Salix* spp.
N	0.4	18	290	423.0	*Q. alba* *Q. velutina*
N	0.8	9	290	421.5	*Q. velutina*
N	1.2	24	65	392.5	*Q. alba* *Q. borealis*
N	2.0	7	270	401.7	*Q. alba* *Q. stellata* *Q. velutina*

Site* (km)	Slope (%)	Aspect (°)	Elevation (m)	Dominant Species
NE 0.4	11	310	413.0	*Q. alba* *Q. velutina*
NE 0.8	12	270	417.9	*Q. alba* *Q. borealis*
NE 1.2	24	65	392.5	*Q. alba*
W 10.5 (secondary control)	11.5	185	384.7	*Q. marilandica* *Q. stellata* *Q. velutina* *C. tomentosa*
W 16.4 (secondary control)	8.5	330	424.0	*Q. alba* *Q. velutina* *C. texana*
W 21.0 (control)	9.5	120	395.6	*Q. stellata* *Q. velutina* *Carya ovalis* (Wang.)

*See Fig. 4

conformation. Material of the 02 layer is fragmented and no longer recognizable as to species or origin (Black, 1965). In the present study, four replicate samples of both litter horizons were randomly collected at each watershed site and at one control site 21.0 km west of the smelter area during March, June and September of 1974 and January of 1975. Each pair of samples included all litter within a 0.1 m^2 area. To reduce edge effect and facilitate cutting through leaves and stems, a circular frame of stainless steel with a sharpened edge was used (Medwicka-Kornas, 1971; McBrayer *et al.*, 1974). Additional collections were made at 10.5 and 16.4 km west of the smelter area in September and January to establish a measure of the gradient in litter mass/m^2 with distance. The September samples were collected prior to leaffall. In 1974, leaffall occurred in mid-October (Drobney, 1974).

Following transport to the laboratory and extraction of arthropods, the litter was hand-sorted to remove rock, oven-dried at 100^{o}C to constant moisture, and weighed to the nearest 0.1 gm.

Arthropod Sampling and Initial Processing

Field-collected litter was placed into polypropylene bags and transported to Oak Ridge National Laboratory in styrofoam coolers packed with ice to maintain 5^{o}C, a storage temperature suitable for arthropod survival (Edwards and Fletcher, 1971). Samples were held at 5^{o}C in controlled-environment chambers at the laboratory (7-10 da) until arthropods could be removed by 72-hour von Tullgren funnel extraction. Arthropods were collected in an aqueous solution of 70% ETOH and 5% glycerin, identified, and stored in 70% ETOH for further processing (Macfadyen, 1955, 1962).

All preserved arthropods, except Acarina, were classified to family and enumerated by taxon and replicate per site for later analysis. An adequate measure of Acarine population density and biomass in a natural system is a project requiring separate study (McBrayer *et al.*, 1974), and was therefore not attempted in the present research. To prevent difficulties arising from attempting to dry specimens stored in dilute alcohol containing glycerine, specimens were transferred from the von Tullgren vials to holding vials containing 70% ethanol only. Samples were then dried in these latter containers. Average dry weights of each lifestage of every taxon found on Crooked Creek Watershed were calculated from individual determinations of 4-20 specimens dried at $70^{o}C$ for 24 hours and weighed to the nearest 0.00001 g. Literature documentation was used to segregate taxa into the trophic categories detritivore, fungivore, littergrazer, omnivore, and predator (see Appendix A).

Analytical Procedures

Heavy Metals

Subsamples of each litter replicate were ground to #20 mesh fineness in a Wiley mill and wet-digested by treatment with 1:1 HNO_3/ $HClO_4$ (Smith, 1953; Analytical Methods Committee, 1960; Gorsuch, 1962). Upon attaining complete digestion, each sample was suspended in 1 *N* HCl, heated at $100^{o}C$ for 10 minutes, filtered through #40 Whatman[R] paper, and analyzed by atomic absorption spectrophotometry for total Pb, Cd, Zn, and Cu content. Analytical grade reagents were used. All preparation methods and analytical procedures were monitored periodically utilizing coded blanks and a NBS-SRM-1571 standard (orchard leaves).

Analytical results for the standards were accurate to within one standard error of the mean.

Dried arthropods of individual trophic levels from each of two randomly selected replicates were pooled across season and horizon, and dry-ashed for 24 hours at $480^{o}C$ - a temperature which prevents lead volatilization (Gorsuch, 1962). The remaining ash was suspended in 0.1 N HNO_3 and allowed to stand undisturbed for 24 hours at room temperature. The decant was analyzed for total Pb, Cd, Zn, and Cu content by graphite furnace atomic absorption spectrophotometry. Monitoring of preparation and analytical procedures was performed frequently using coded blanks and NBS-SRM-1577 standard (bovine liver) as previously discussed for litter samples.

Chemical Characterization of Litter

Approximately 1.0 g samples of dried, ground litter collected from the NW transect were dry-ashed overnight at $550^{o}C$. Five ml of concentrated HNO_3 were added to the ash and samples were boiled to dryness. Exactly 50.0 ml of 1.0 N HCl were added to the residue, and any undissolved residue was allowed to settle to the bottom of the container. An aliquot of each sample was analyzed by atomic absorption spectrophotometry for total elemental Ca, Mg, and K. Phosphorus was determined by the automated Technicon^{R} method (Lundgren, 1960).

Litter cation exchange capacity (Francis and Grigal, 1971) was determined using 25 ml of 1 N $^{85}SrCl_2$ in a suspension of 1.0 g ground litter. The suspensions were shaken overnight, centrifuged, and decanted. The litter was then sequentially washed with 25 ml each of the following solutions: distilled water, a 50:50 mixture of ETOH and distilled water, and 2 washes in 95% ETOH. The washed litter was subsequently radioassayed for ^{85}Sr using an automated gamma spectrometer. The cation exchange capacity was calculated by the number of ^{85}Sr equivalents retained (adsorbed) per gram of litter.

Litter was prepared for pH analysis by suspending 1 g litter in 10 ml distilled water followed by an overnight equilibration. Determinations of pH were made using a Corning Model 110 meter with a combination electrode (Jackson and Watson, 1976).

Arthropod Diversity Measurement

Community diversity is generally thought to be directly correlated with system stability (Price, 1975; Odum, 1971). To gain some measure of stability in Crooked Creek Watershed, all arthropod data was subjected to diversity analysis.

Diversity of animal or plant taxa within an ecosystem is a measure of its heterogenity. As such, it is composed of two elements: the richness of taxa (total number) and their equitability (evenness of abundance) (Peet, 1974; Price, 1975). A commonly used diversity measure is the Shannon-Weaver Index (H') where

$$H' = \sum_{i=1}^{s} \rho_i \ln \rho_i \qquad (1)$$

for ρ_i the proportion of total individuals of taxon i with s the total number of taxa (Shannon, 1948). Evenness, J', can be estimated from

$$J' = \frac{H'}{H'\ max} = \frac{H'}{\ln S} \qquad (2)$$

for S equaling the total number of taxa present (Pielou, 1966; Price, 1975).

Arthropod data, classified to family (see Appendix B) were used to calculate H', J', and richness for each site. The standard deviation of H' was estimated by Hutcheson's approximation method (Hutcheson, 1970).

Arthropod Population Density and Biomass

Food-web interactions among litter-dwelling arthropods of the forest floor are intricate, and investigators studying this community have made simplifications of the complex processes involved in litter-system function (Szabo, 1974). One often-used simplification is the segregation of organisms according to their feeding habits, or trophic levels. In a previous study of arthropods occupying the mesic deciduous forest floor, ^{137}Cs-tagged litter was successfully used to delineate four trophic levels including littergrazers, fungivores, detritivores, and predators (McBrayer and Reichle, 1971). These 4 categories, with the addition of an omnivore level, were used in segregating Crooked Creek Watershed arthropods following taxonomic classification and enumeration (Appendix A and B). Omnivores are scavengers and include organisms that feed upon plant and animal material that has not yet undergone chemical or physical change through decomposition (Hanson, 1962; Price, 1975). Altered organic material (detritus) serves as an energy base for the group classified as detritivores (Odum, 1971; McBrayer et al., 1974). In the present study, determinations of food preference within each life stage and taxon were made by consulting reference works that incorporated direct observation, gut analysis, and radionuclide tracer analysis as methods of studying trophic relationships. Documentation included Borror and De Long, 1964; Borror and

White, 1970; Comstock, 1940; Chu, 1949; Hoff, 1949, Jaques, 1951; Kaston, 1972; Levi et al., 1968; McBrayer and Reichle, 1971; McBrayer et al., 1974; Peterson, 1956; Price, 1975; Ross, 1965; and Szabo, 1974).

Two additional categories were created to organize groups for which no feeding preference could be found in the literature ("unknown") or no morphological development occurred on the forest floor ("accidentals"). This latter class was not incorporated into any data analysis procedures and included insects that were either foliage, seed, stem, or bole feeders from the canopy or root feeders from the soil. The occurrence of a forest fire in 1969 (Wright, 1974) disrupted the litter arthropod community at 2 sites on the N transect, and data from this transect were deleted from the study.

Statistical Procedures

Litter mass, heavy metal concentrations, and heavy metal pools were analyzed as a 4x3x4x2 factorial analysis of variance (ANOVA) replicated 4 times. Experimental classes included 4 seasons, 3 transects, 4 distances, and 2 horizons. Values from the NE transect (see Figs. 7 to 10) were analyzed separately from the mair design due to the confounding treatment of ore-concentrate dusts blown into CCW from the railway. All main effects and interactions were tested for significance (Snedecor and Cochran, 1967).

Chemical characterization data gathered for the NW transect were subjected to a 4x5x2 factorial ANOVA design replicated 3 times. Classes for this analysis were 4 seasons, 5 distances (0.4, 0.8, 1.2, 2.0, and 21.0 km), and 2 horizons. Again, all main effects and interactions were tested for significance.

Mean comparison testing of litter standing crop, ash, heavy metal concentrations and heavy metal pools by season and horizon was performed using Duncan's New Multiple Range Test (Duncan, 1951; Steel and Torrie, 1960).

Prior to regression analysis, arthropod biomass and density and litter mass data were transformed by the following normalization function (Natrella, 1963):

$$y = \ln (x + .5) \qquad (3)$$

Use of this function also has a variance-stabilizing effect, thus allowing application of linear regression models to the transformed data (Natrella, 1963). Significance testing was accompanied using standard formulae (Draper and Smith, 1966; Steel and Torrie, 1960).

RESULTS AND DISCUSSION

Crooked Creek Watershed Litter

Litter Mass

Values for O1 litter mass on Crooked Creek Watershed ranged from 480 g/m^2 to 120 g/m^2 (Fig. 5) and were comparable to the annual litter production of 349 g/m^2/yr found by Rochow (1974) in a central Missouri oak-hickory forest, and the Warm Temperate Forest mean of 360 g/m^2/yr derived by Bray and Gorham (1964). As data for all seasons studied in 1974 demonstrated trends similar to those in Fig. 5, September was chosen to illustrate litter mass/m^2 following summer decomposition but prior to leaffall. Thus, data from the autumn sampling period should demonstrate conservative estimates of both O1 and O2 litter mass. No significant differences in O1 mass among the 15 watershed sites were detected by Duncan's New Multiple Range Test (Table 2).

An accumulation of O2 litter (fragmented material no longer recognizable as to species or origin) was evident at sites near the smelter complex (W 0.4 km, NW 0.4, N 0.4, NE 0.4) (Fig. 5, Table 3). Maximum O2 litter mass/m^2 for September occurred at the N and NE 0.4 sites, with values of 2980 and 2590 g/m^2, respectively (Table 3). The O2 litter mass from sites on the NE transect was apparently not affected by the same distance-dependent source producing accumulations near the smelter, because O2 mass at NE 0.8 and 1.2 are not significantly different from that found at the 0.4 km sites on the W, NW, and N transects (Table 3).

In general, a decline in O2 litter mass occurred as distance from the smelter complex increased (Fig. 6). Although this relationship was

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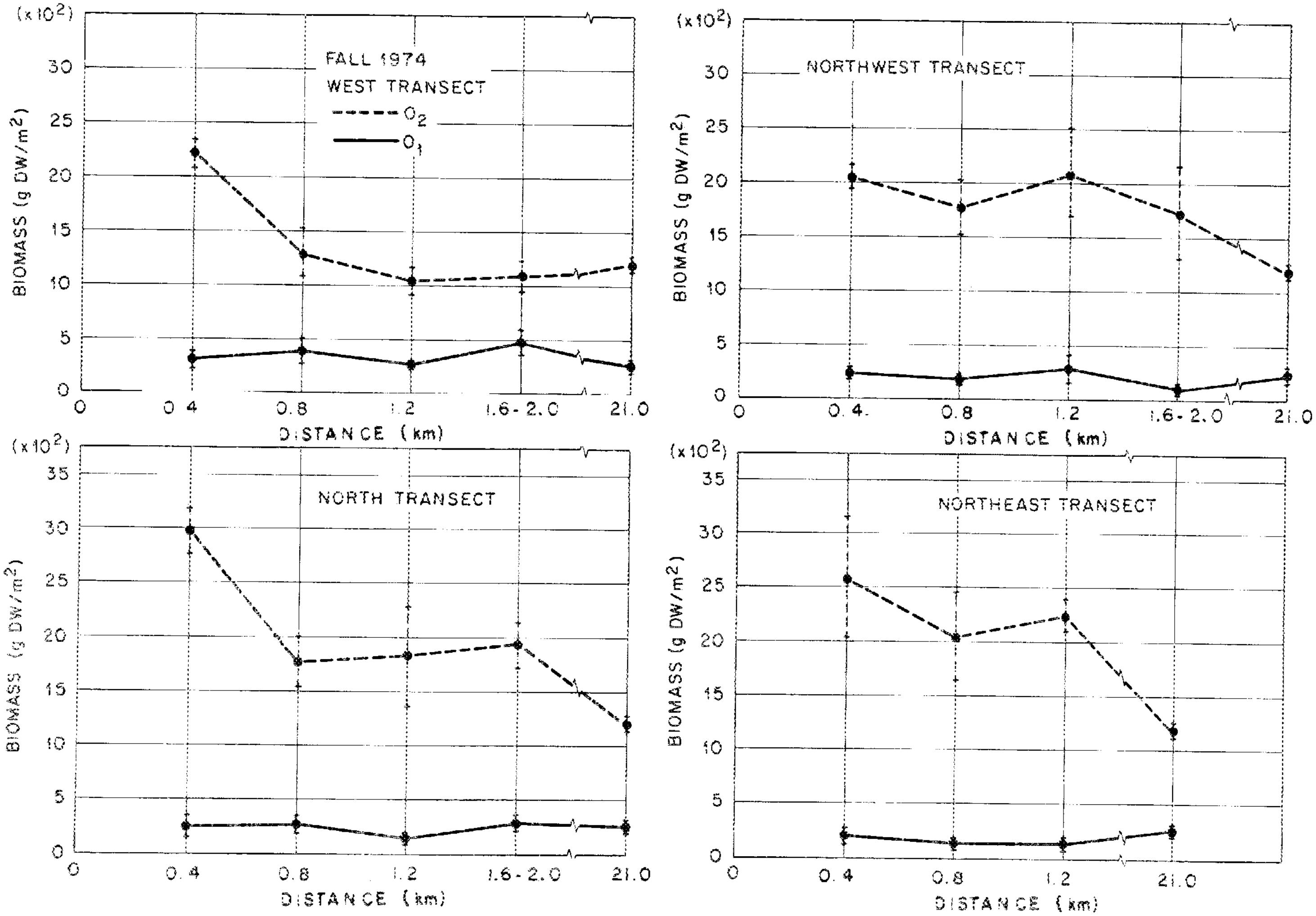

Fig. 5. Mean litter mass (g dry wt/m^2) of 01 and 02 horizons on Crooked Creek Watershed as a function of distance and direction from the AMAX smelter for the September, 1974, sampling period ($\bar{x}$ $\pm$ 1 SE, n=4).

Table 2. Seasonal means of O1 litter mass analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

March, 1974 (g/m^2)			June, 1974 (g/m^2)			September, 1974			January, 1975		
Site (km)	Mean ($x\ 10^2$)	Duncan	Site (km)	Mean ($x\ 10^2$)	Duncan	Site (km)	Mean ($x\ 10^2$)	Duncan	Site (km)	Mean ($x\ 10^2$)	Duncan
NE 0.4	11.8	A	NE 0.4	11.6	A	W 1.6	4.8	A	W 0.4	6.5	A
N 0.4	7.4	AB	W 0.8	10.5	A	W 0.8	3.9	A	NE 0.8	5.5	A
NW 2.0	5.4	AB	N 0.4	9.2	A	W 0.4	3.2	A	W 1.2	5.2	A
NW 1.2	5.0	AB	NW 2.0	9.0	A	NW 1.2	3.1	A	NE 1.2	5.1	A
W 0.8	4.7	AB	W 1.6	7.8	A	N 2.0	2.9	A	W 10.4	4.8	A
W 1.2	4.6	AB	NW 1.2	6.8	A	N 0.8	2.8	A	W 1.6	4.6	A
W 1.6	4.5	AB	NE 1.2	5.9	A	W 1.2	2.7	A	N 0.8	4.5	A
N 2.0	4.3	AB	NE 0.8	5.6	A	W 21.0	2.7	A	W 0.8	4.1	A
W 21.0	4.2	AB	NW 0.8	5.4	A	W 16.3	2.6	A	NE 0.4	3.8	A
NW 0.4	4.1	AB	W 0.4	5.4	A	N 0.4	2.5	A	W 16.3	3.8	A
NW 0.8	4.0	AB	NW 0.4	5.2	A	NW 0.4	2.5	A	N 2.0	3.7	A
N 1.2	3.5	AB	N 0.8	5.1	A	NE 0.4	2.1	A	NW 0.8	3.5	A
NE 1.2	3.4	AB	N 2.0	4.5	A	NW 0.8	2.0	A	W 21.0	3.5	A
NE 0.8	3.1	B	W 21.0	4.4	A	W 10.4	2.0	A	N 0.4	3.2	A
W 0.4	2.5	B	W 1.2	3.8	A	N 1.2	1.4	A	N 1.2	3.2	A
N 0.8	2.2	B	N 1.2	3.1	A	NE 0.8	1.4	A	NW 1.2	3.1	A
						NE 1.2	1.4	A	NW 0.4	2.7	A
						NW 2.0	1.2	A	NW 2.0	2.5	A

Table 3. Seasonal means of O2 litter mass analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

March, 1974 (g/m^2)			June, 1974 (g/m^2)			September, 1974			January, 1975		
Site (km)	Mean ($x 10^2$)	Duncan	Site (km)	Mean ($x 10^2$)	Duncan	Site (km)	Mean ($x 10^2$)	Duncan	Site (km)	Mean ($x 10^2$)	Duncan
N 0.4	27.1	A	NE .8	30.5	A	N 0.4	29.8	A	NE 0.4	43.2	A
NE 0.4	25.0	AB	NE 1.2	22.8	B	NE 0.4	25.9	AB	NE 0.8	34.0	B
NW 0.8	21.4	ABC	N 0.4	22.4	B	NE 1.2	22.6	AB	W 0.4	33.0	B
NE 0.8	20.6	ABC	N 1.2	21.6	B	W 0.4	22.2	AB	N 0.4	28.5	BC
W 0.8	19.9	ABC	N 2.0	20.1	BC	NW 1.2	21.0	BC	NE 1.2	26.6	BCD
N 0.8	19.9	ABC	NE 0.4	18.7	BCD	NE 0.8	20.7	BCD	N 0.8	26.6	BCD
NE 1.2	17.5	BCD	NW 0.8	18.2	BCD	NW 0.4	20.4	BCDE	NW 0.4	24.4	CDE
N 1.2	17.3	BCD	W 1.2	18.1	BCD	N 2.0	19.4	BCDEF	NW 0.8	21.3	CDEF
W 1.6	17.2	BCD	W 1.6	16.5	BCDE	N 1.2	18.3	BCDEFG	NW 2.0	20.8	CDEFG
NW 0.4	16.6	BCD	NW 2.0	15.6	BCDE	NW 0.8	17.9	BCDEFG	NW 1.2	20.0	DEFG
NW 1.2	16.0	CD	W 0.4	14.9	BCDEF	N 0.8	17.7	BCDEFG	W 1.6	19.6	DEFG
N 2.0	14.1	CD	NW 1.2	12.6	CDEF	NW 2.0	17.5	BCDEFG	W 1.2	19.0	DEFG
NW 2.0	13.6	CD	W 0.8	11.4	DEF	W 0.8	13.1	CDEFGH	N 2.0	18.5	DEFG
W 1.2	13.6	CD	NW 0.4	11.1	DEF	W 16.3	12.3	DEFGH	N 1.2	18.1	EFG
W 0.4	13.3	CD	N 0.8	8.4	EF	W 21.0	12.2	EFGH	W 0.8	16.0	EFGH
W 21.0	9.1	D	W 21.0	7.2	EF	W 10.4	11.8	FGH	W 16.3	12.9	FGH
						W 1.6	10.6	GH	W 21.0	12.5	FGH
						W 1.2	10.6	H	W 10.4	12.4	H

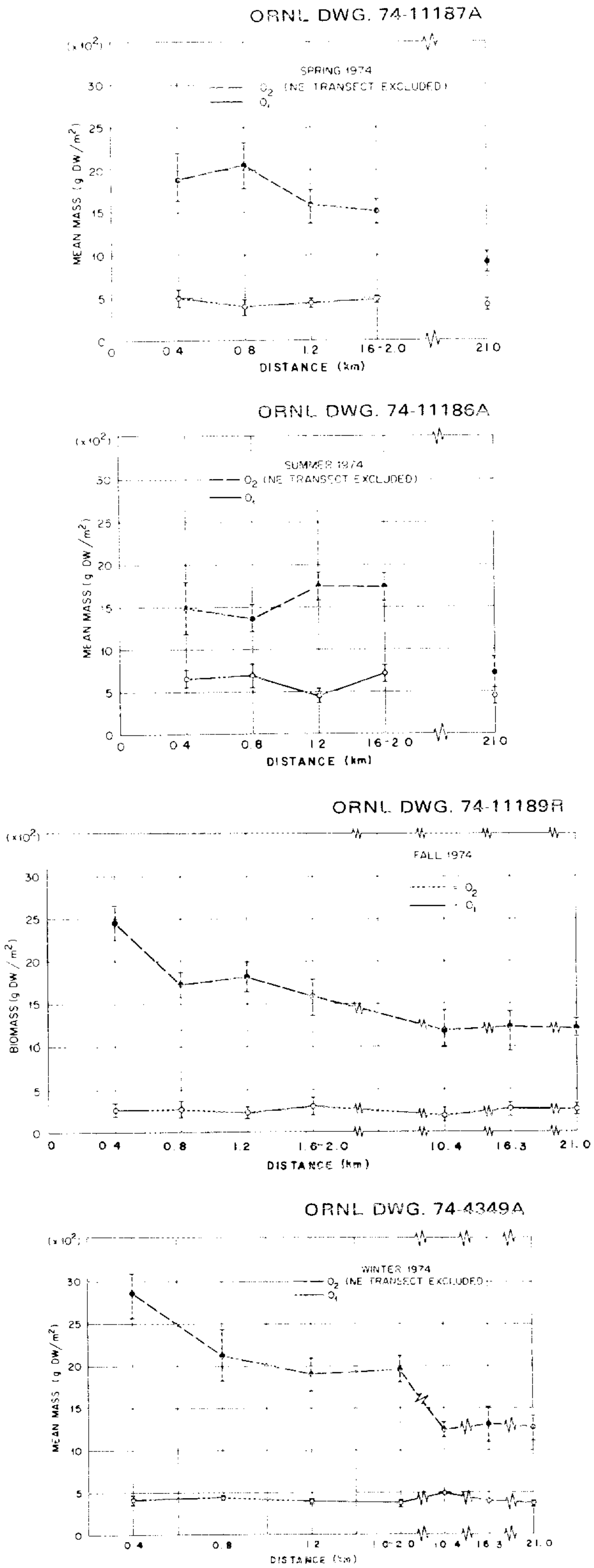

Fig. 6. Pooled means of litter mass (g dry wt/m^2) of 01 and 02 horizons on Crooked Creek Watershed as a function of distance from the AMAX smelter for each sampling period, 1974. Values for the NE transect were excluded from computation of the means ($\bar{x} \pm 1$ SE, n=12).

most apparent for the Fall and Winter sampling periods, there was a consistent and significant accumulation on all watershed sites (1818± 534 (SE) g/m^2) when compared with the primary control sites (1208±328 (SE) g/m^2). No significant differences in mean 02 litter mass existed between the primary and secondary control plots (Table 3). Thus, primary control values were assumed to represent the unperturbed condition for the area.

For the duration of the study, watershed 01 mass/m^2 (433±29 (SE) g/m^2) did not vary significantly with time or distance (Fig. 6). In contrast, control 01 litter mass/m^2 fluctuated about the mean of 350±35 (SE) g/m^2 (Table 2), which compared favorably with literature values for the forest type under study (Rochow, 1974; Bray and Gorham, 1964). However, it should be noted that the mass of 01 litter on Crooked Creek Watershed and the control sites were not found to be significantly different from one another.

To determine if litter mass determinations on the watershed had been biased by deposition of fugitive particulates from the stack, ash determinations were made from subsamples of material collected on the NW transect (Table 4). Duncan's analysis indicated no differences in litter ash content exist for either litter horizon. In addition, the range of ash values (5.3-19.1% for 01 and 20.8-62.5% for 02) compared favorably with those of other deciduous forest studies (Reiners and Reiners, 1970; McBrayer *et al.*, 1974; Henderson, 1971).

Litter Heavy Metal Content

The highest concentrations of all four elements occurred in 02 material, where heavy metal values are 1.5 to 2 times greater than

Table 4. Seasonal Mean ash content (% dry wt) of Crooked Creek Watershed litter. One standard error in parentheses (n=3). The NW transect was chosen as representative of the watershed.

		SPRING	SUMMER	FALL	WINTER
Site (km)	Horizon	Mean Ash Content	Mean Ash Content	Mean Ash Content	Mean Ash Content
NW 0.4	01	15.6 (3.2)	19.1 (3.2)	14.0 (3.9)	9.1 (0.7)
	02	58.6 (4.8)	43.9 (4.5)	35.7 (3.3)	32.0 (6.6)
NW 0.8	01	5.6 (0.2)	6.6 (0.2)	10.3 (1.3)	5.6 (0.6)
	02	36.2 (3.0)	31.6 (4.1)	31.8 (3.7)	42.2 (11.6)
NW 1.2	01	7.5 (0.3)	7.8 (0.4)	10.6 (0.7)	7.3 (1.7)
	02	62.5 (4.5)	54.0 (13.5)	49.2 (1.1)	40.4 (14.6)
NW 2.0	01	18.3 (10.0)	6.8 (0.4)	14.6 (3.3)	5.3 (0.3)
	02	61.4 (5.7)	20.8 (1.1)	36.9 (4.5)	39.3 (8.4)
W 21.0	01	5.3 (0.2)	6.5 (0.5)	7.2 (0.3)	5.2 (0.1)
(control)	02	27.5 (5.5)	33.9 (10.7)	25.7 (4.6)	27.0 (2.2)

those found in 01 litter (Watson, 1976) (Figs. 7-10). Such accumulation in litter and humus is thought to be governed by passive exchange between heavy metal ions occurring in precipitation and foliage leachate and the macronutrient ions normally bound to negatively charged organic groups (Ruhling and Tyler, 1973; Tyler, 1972). Excepting NE transect results, Crooked Creek Watershed lead content of 02 litter can be segregated according to distance: all 0.4 km values were not different from each other but were different from those found on the rest of the watershed. Groups of means for the remaining distances graded into one another through the controls. Control values did not differ from the 1.2 km or watershed boundary sites. Similar distributions occurred for Zn, Cu, and Cd, although equivalent Cd concentrations were dispersed over a larger area (Appendix C).

As data for all sampling periods illustrated trends similar to those in Figs. 7 to 10, September was chosen as a representative season to demonstrate conservative estimates of litter lead, zinc, copper, and cadmium content.

Of the 4 metal contaminants found in Crooked Creek Watershed litter, Pb was the most abundant (Fig. 7). Zinc, the second most abundant heavy metal, was followed by Cu and Cd (Figs. 8-10). Under normal operating conditions, particulate stack emissions from the AMAX smelter followed the same rank order, i.e., Pb (18510 kg/yr) > Zn (1730 kg/yr) > Cu (830 kg/yr) > Cd (50 kg/yr) (Purushothaman, 1974). Over 99% of the total heavy-metal concentration found in the entire litter horizon at the 0.4 km sites was due to Pb. This percentage declined to 93% at the watershed boundary, and was further reduced to

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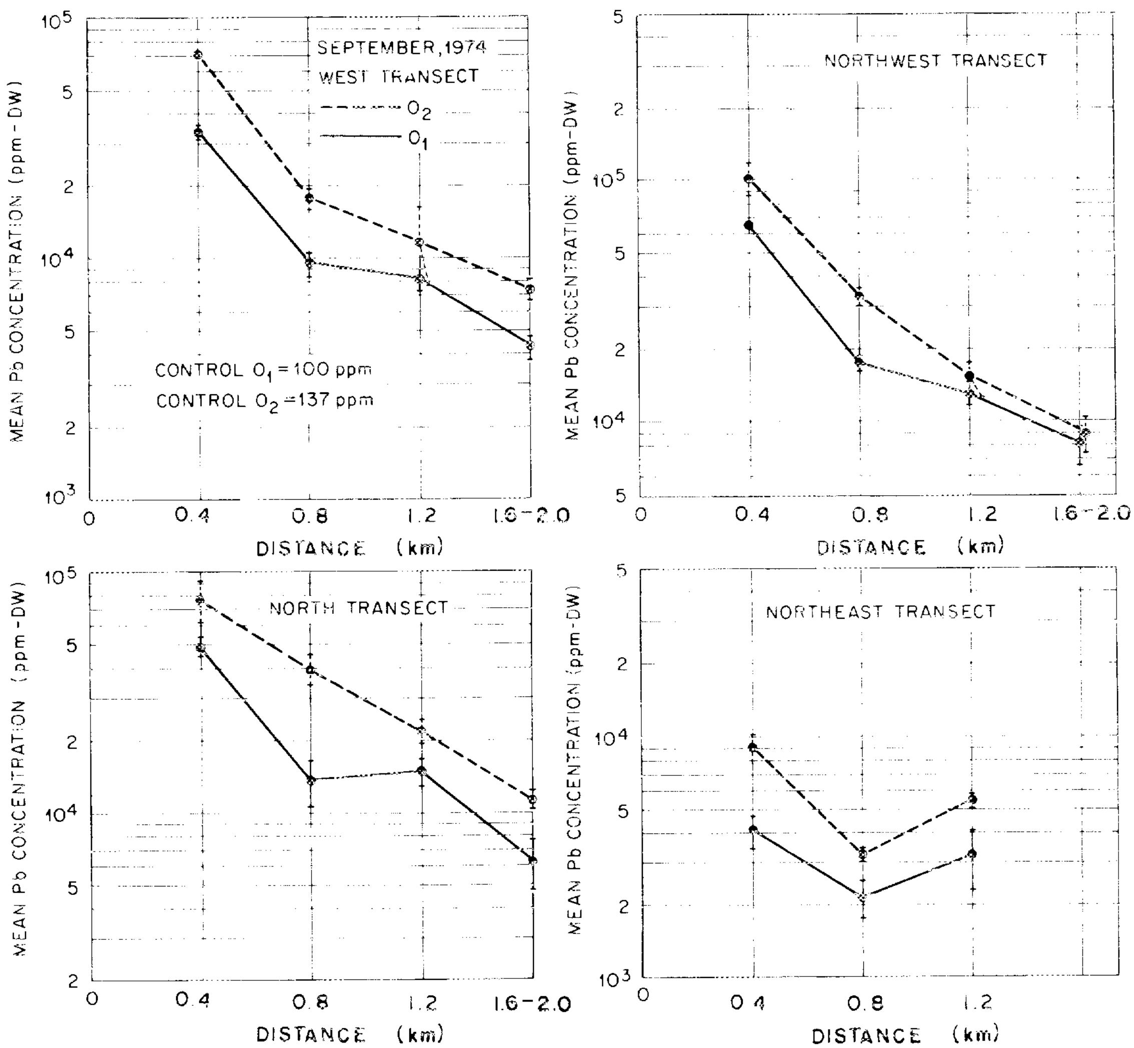

Fig. 7. Means of litter Pb content (μg/g dry wt) in O1 and O2 horizons as a function of distance and direction from the AMAX smelter for the September, 1974, sampling period ($\bar{x} \pm 1$ SE, n=4).

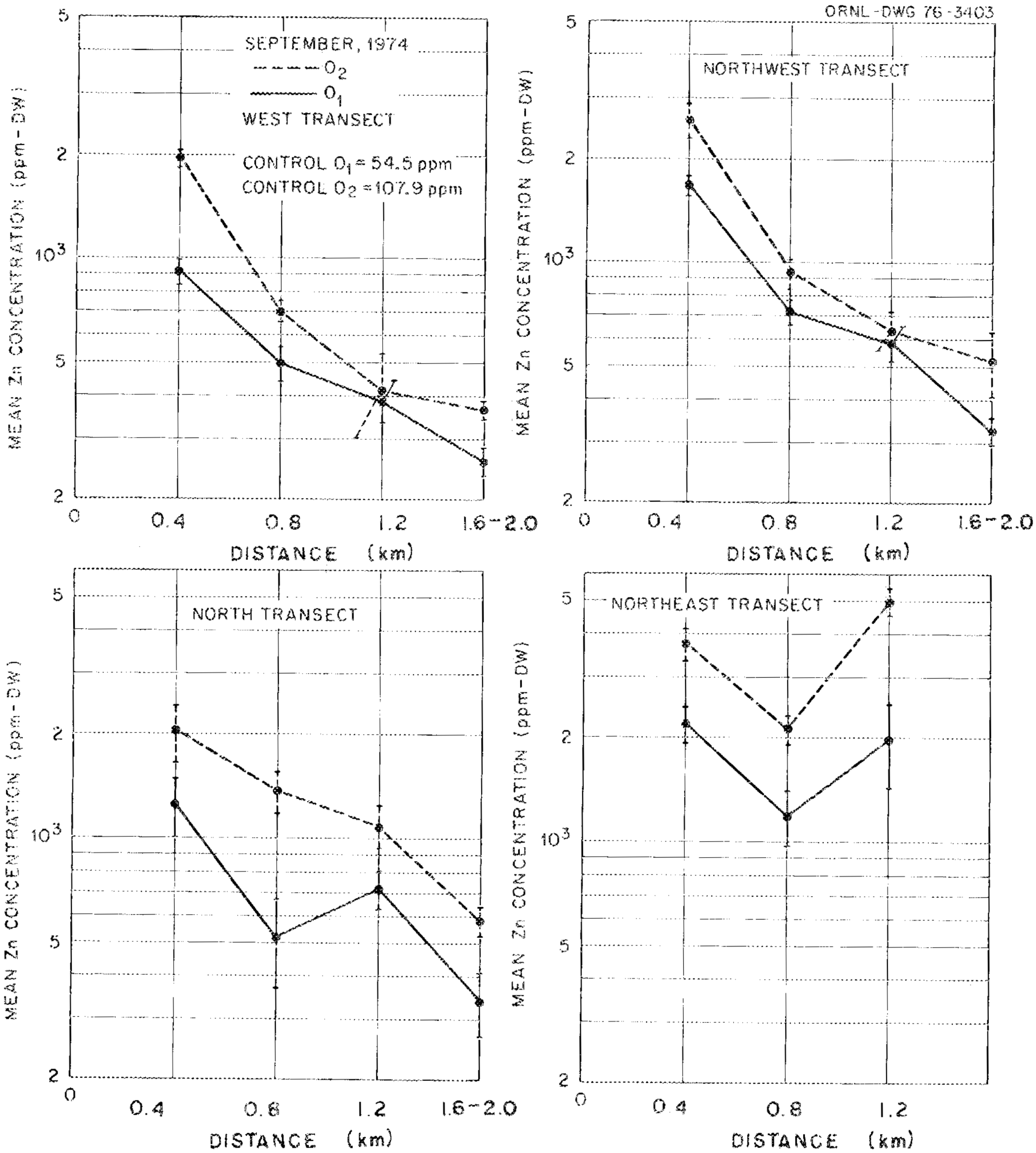

Fig. 8. Means of litter Zn content (μg/g dry wt) in 01 and 02 horizons as a function of distance and direction from the AMAX smelter for the September, 1974, sampling period ($\bar{x}$ ± 1 SE, n=4).

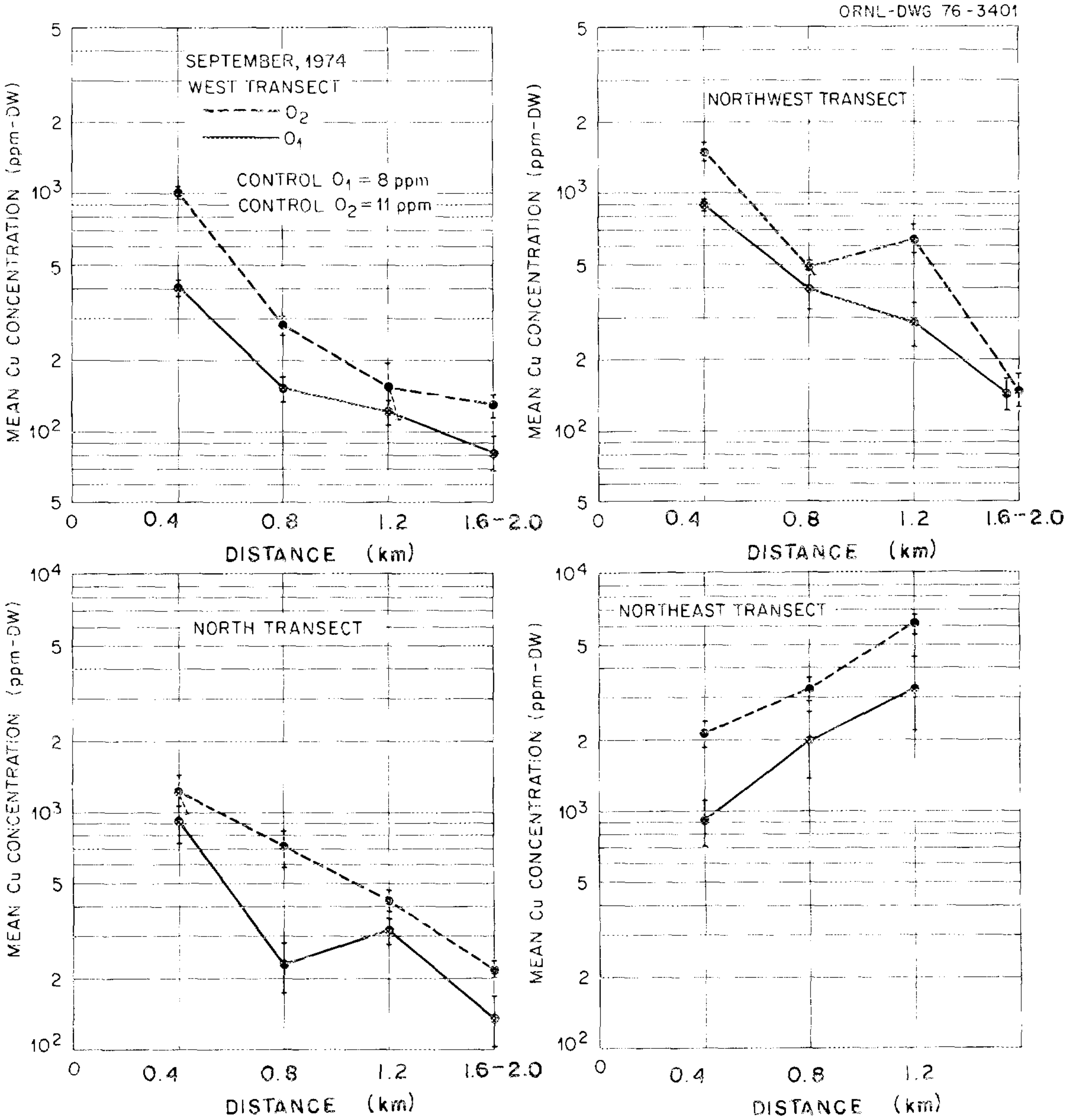

Fig. 9. Means of litter Cu content (μg/g dry wt) in O1 and O2 horizons as a function of distance and direction from the AMAX smelter for the September, 1974, sampling period ($\bar{x} \pm 1$ SE, n=4).

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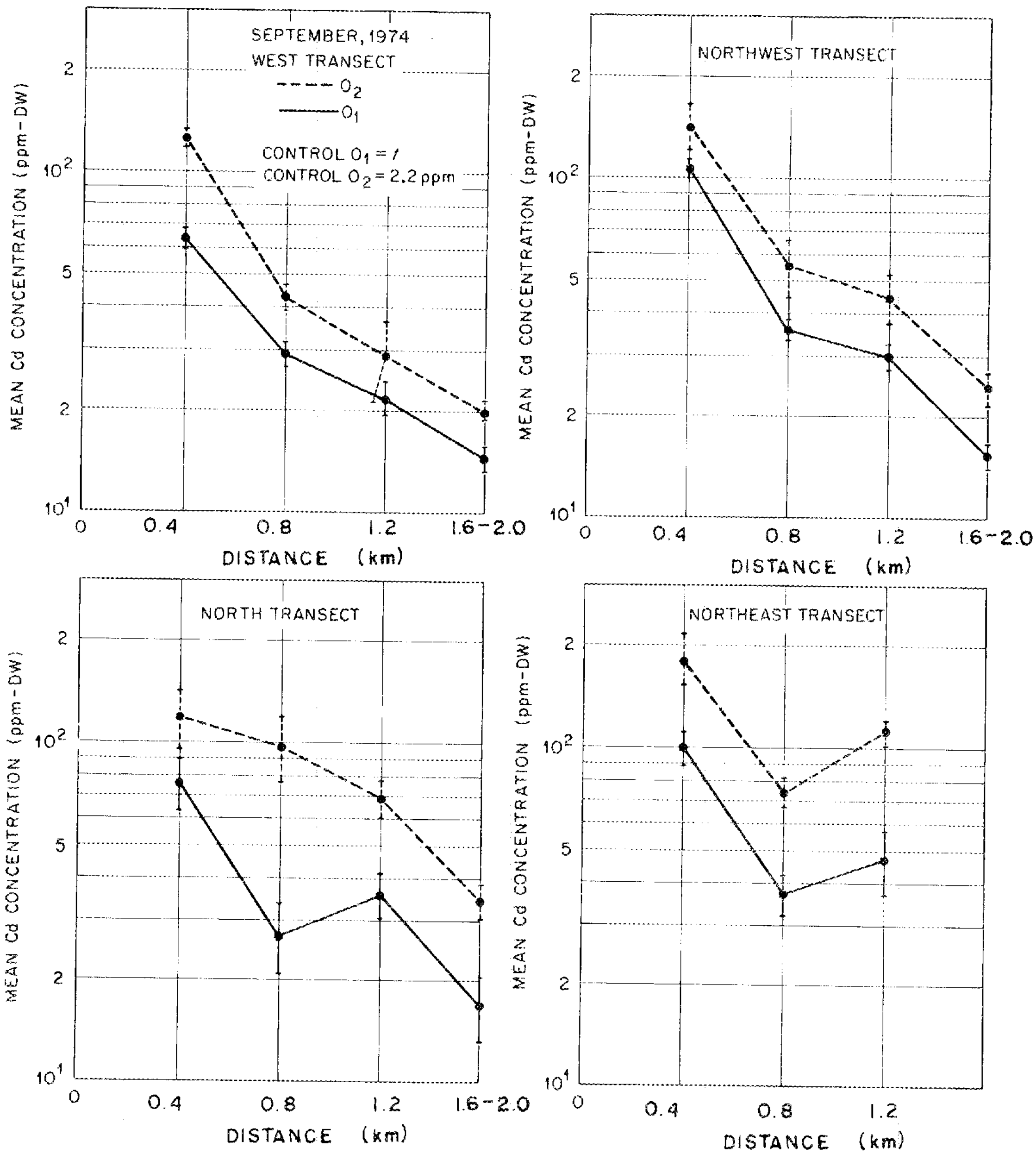


Fig. 10. Means of litter Cd content (μg/g dry wt) in O1 and O2 horizons as a function of distance and direction from the AMAX smelter for the September, 1974, sampling period ($\bar{x} \pm 1$ SE, n=4).

87.3% at the 21.0 km control site (Watson, 1975). The concentration of deposited Pb followed the distribution predicted by wind rose patterns (Fig. 3) in that the greatest concentrations were found on the NW and N transects (103,000 ppm and 76,200 ppm, respectively). Values exceeding 90,000 ppm were exhibited for the NE transect (Fig. 7), but were a result of fugitive dust deposition from the railway line source.

With the exception of the NE transect, a steady logarithmic decrease in concentration with distance from the smelter complex was apparent for all metals and compass directions (Figs. 7-10). These findings were consistent with those of other sampling programs measuring heavy metal deposition with distance from an area source (Roberts, et al., 1974; Ruhling and Tyler, 1973), and were a result of the particle size distribution of particulate stack emissions (Bondietti et al., 1975).

Storage, loading and transport of Pb, Zn, and Cu concentrate from the COMINCO milling process have produced large quantities of metal-rich dusts that are often blown directly into the watershed. Consideration of these fugitive sources is necessary to properly interpret results for the NE transect displayed in Figs. 7 to 10. Deposition from secondary sources was especially apparent in the case of copper (Fig. 9). A steady increase in Cu content of 02 litter occurred with increasing distance from the stack, and can be attributed to the storage of uneconomically recoverable Cu concentrate (4%) in an open bin 20 yards from the NE 0.8 km study plot. As a result of the confounding effect of secondary sources on these data, these values were not included in figures of seasonal pooled values and were analyzed separately.

When distance-pooled means of litter Pb, Zn, Cu, and Cd content are compared, differences in individual metal concentrations of the two litter horizons at each distance increment are not statistically different from one another (Fig. 11, Appendix D). Means of total litter (both horizons) heavy metals at 0.4 km differed from all others on the watershed at the 0.1% level; the 0.8 km values differed from those at 1.2 and 1.6-2.0 km at the 1% level; and 1.2 km values did not differ from those at the watershed boundary. This gradient was common for all 4 metals.

Least squares multiple linear regression procedures were used to further evaluate the relationship between 02 litter mass and litter heavy metal concentrations. The empirically derived regression model included effects due to season, direction and distance from the AMAX smelter, litter heavy metal concentrations, and all interactions due to multiplicative effects.

The model was as follows:

$$\begin{aligned} \ln (Y + .5) = {} & \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \\ & \beta_7 x_7 + \beta_{12} x_1 x_2 + \beta_{13} x_1 x_3 + \beta_{23} x_2 x_3 + \beta_{11} x_1 x_1 + \\ & \beta_{22} x_2 x_2 + \beta_{33} x_3 x_3 + \beta_{45} x_4 x_5 + \beta_{46} x_4 x_6 + \beta_{47} x_4 x_7 + \\ & \beta_{56} x_5 x_6 + \beta_{57} x_5 x_7 + \beta_{67} x_6 x_7 + \beta_{44} x_4 x_4 + \beta_{55} x_5 x_5 + \\ & \beta_{66} x_6 x_6 + \beta_{77} x_7 x_7 + \varepsilon \end{aligned} \qquad (4)$$

where x_1 = season

x_2 = direction (transect)

x_3 = distance

x_4 = Pb concentration of 02 litter

x_5 = Zn concentration of 02 litter

x_6 = Cu concentration of 02 litter

x_7 = Cd concentration of 02 litter

Y = litter mass

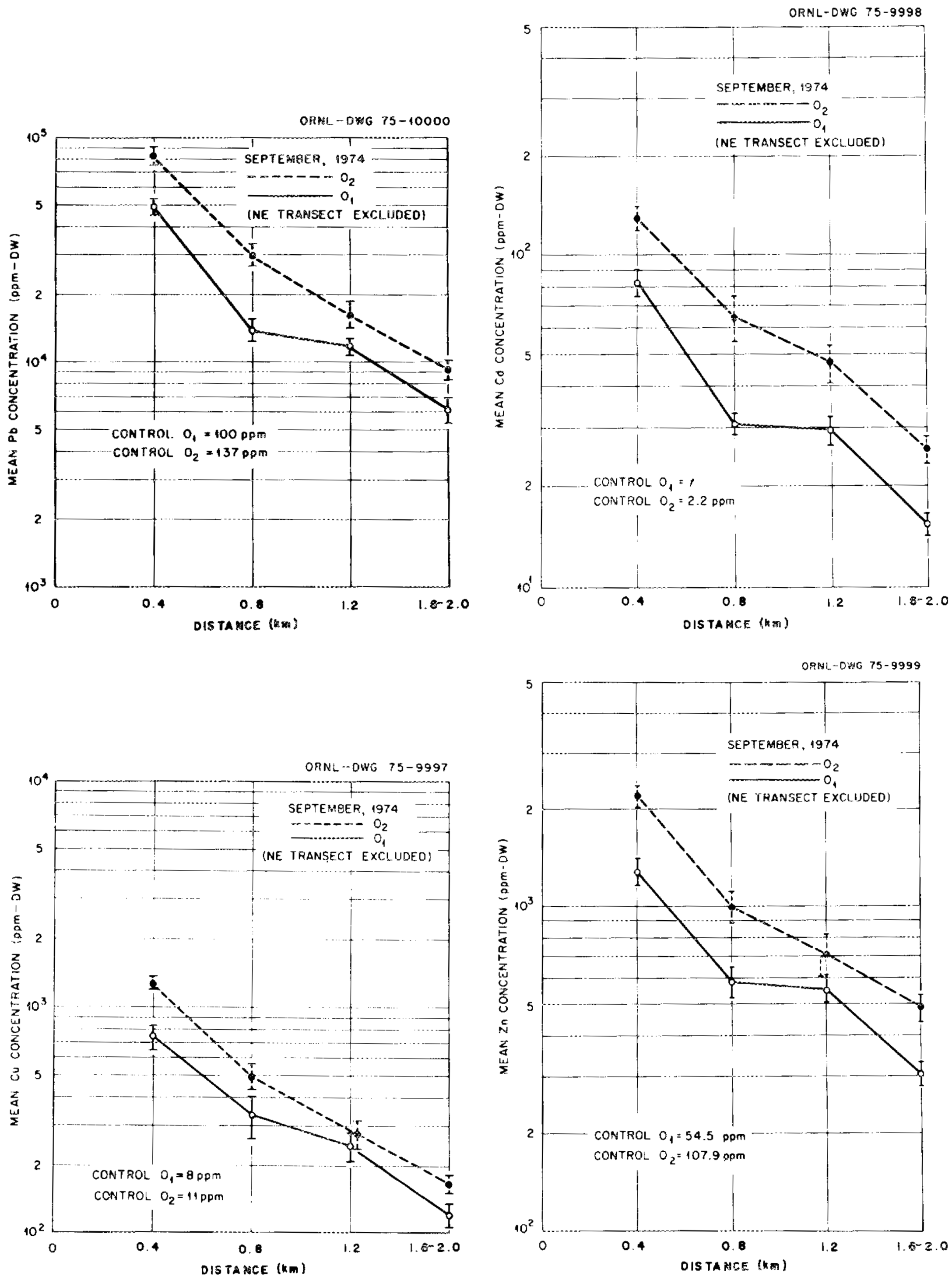


Fig. 11. Pooled means of litter Pb, Zn, Cu, and Cd concentrations (μg/g dry wt) as a function of distance from the AMAX smelter for September, 1974. Values for the NE transect were excluded from computation of these means ($\bar{x} \pm 1$ SE, n=12).

Use of the 23-variable model accounted for 37.1% of the variation observed within the data. The resulting regression and correlation statistics are given in Tables 5 and 6.

Application of the backward elimination procedure at P = 0.25, the significance level for entry, reduced the effective variables to 10; which accounted for 35.8% of the total data variability explained by the model (Draper and Smith, 1966). The resulting regression statistics are given in Table 7.

Significant (P<.01), positive correlation coefficients were obtained for the first-order variables of season, litter Zn, Cu and Cd concentrations, and the multiplicative interactions of litter Pb x Cd, Zn x Cu, and Pb x Cu concentrations (Table 6). Thus, high levels of heavy metals in the 02 litter occurred simultaneously with large values of litter mass. The observed effects of accumulated 02 litter were not due to any single factor, but appeared to be interactions among a complex of variables.

Because numerous heavy metal sources existed in the New Lead Belt area (fugitive source dusts, other mines and smelters) (Wixson et al., 1972; Wixson, 1974), the validity of using selected off-watershed sites as controls was tested. Comparisons of litter and A1 soil horizon heavy metal values were made between Crooked Creek Watershed and Walker Branch Watershed, a relatively undisturbed deciduous forest study area on the Oak Ridge National Laboratory Reservation, Oak Ridge, Tennessee. Analytical procedures similar to those used in the present study have been used to derive Pb, Zn, and Cd content of chestnut oak (Quercus prinus L.) litter and the A1 soil horizon (Jackson, 1976; Van Hook et al., 1976) (see Table 8). When these determinations were compared to those

Table 5. Multiple linear regression statistics for Crooked Creek Watershed 02 litter mass (transformed by Eqn. 3) (n = 174, $F_{23,150} = 3.838$, $R^2 = .370$) (g/m^2).

Independent Variable	$\beta_n \pm SE$
Intercept	8.021 ± 0.379
Season	-0.407 ± 0.164
Direction	0.723 ± 0.917
Distance	-0.335 ± 1.218
Litter Pb Concentration	$-2.78\times10^{-6} \pm 9.5\times10^{-6}$
Litter Zn Concentration	$4.70\times10^{-4} \pm 4.46\times10^{-4}$
Litter Cu Concentration	$-3.51\times10^{-4} \pm 3.42\times10^{-4}$
Litter Cd Concentration	-0.002 ± 0.006
Season x Direction Crossproduct	0.129 ± 0.187
Season x Distance Crossproduct	-0.089 ± 0.210
Direction x Distance Crossproduct	7.383 ± 6.706
Season x Season Crossproduct	0.099 ± 0.0319
Direction x Direction Crossproduct	-3.255 ± 3.340
Distance x Distance Crossproduct	-4.079 ± 3.621
Litter Pb x Zn Concentration Crossproduct	$-1.845\times10^{-9} \pm 1.120\times10^{-8}$
Litter Pb x Cu Concentration Crossproduct	$-3.468\times10^{-9} \pm 2.635\times10^{-9}$
Litter Pb x Cd Concentration Crossproduct	$1.800\times10^{-7} \pm 1.400\times10^{-7}$
Litter Zn x Cu Concentration Crossproduct	$-2.400\times10^{-7} \pm 3.800\times10^{-7}$
Litter Zn x Cd Concentration Crossproduct	$-6.000\times10^{-8} \pm 5.8\times10^{-6}$
Litter Cu x Cd Concentration Crossproduct	$1.190\times10^{-6} \pm 4.220\times10^{-6}$
Litter Pb x Pb Concentration Crossproduct	$-1.219\times10^{-10} \pm 5.022\times10^{-11}$
Litter Cu x Cu Concentration Crossproduct	$1.600\times10^{-7} \pm 1.4\times10^{-7}$

Table 5 (continued)

Independent Variable	$\beta_n \pm$ SE
Litter Cd x Cd Concentration Crossproduct	$-3.794\times10^{-5} \pm 5.901\times10^{-5}$
Litter Zn x Zn Concentration Crossproduct	$9.000\times10^{-8} \pm 2.900\times10^{-7}$

Table 6. Correlation matrix resulting from multiple linear regression analysis of Crooked Creek Watershed 02 litter mass (g/m^2, transformed by Eqn. 3) ($n = 174$, $F_{23,150} = 3.838$, $R^2 = .370$). Values in parentheses are significance levels.

	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Y	1	.196 (.01)	.376 (.0001)	.318 (.0001)	.222 (.0033)	.325 (.0001)	.289 (.0001)	.352 (.0001)
X_1		1	.002 (.979)	.005 (.949)	.002 (.978)	-.011 (.882)	.004 (.955)	.033 (.669)
X_2			1	.955 (.0001)	.556 (.0001)	.852 (.0001)	.847 (.0001)	.646 (.0001)
X_3				1	.585 (.0001)	.768 (.0001)	.727 (.0001)	.640 (.0001)
X_4					1	.692 (.0001)	.394 (.0001)	.902 (.0001)
X_5						1	.893 (.0001)	.777 (.0001)
X_6							1	.494 (.0001)
X_7								1

Table 7. Multiple linear regression statistics for Crooked Creek Watershed 02 litter mass (g/m^2, transformed by Eqn. 3) and independent variables selected by the backward elimination procedure at P = 0.25 (n = 174, $F_{14,159}$ = 6.344, R^2 = 0.358).

Independent Variable	$\beta_n \pm SE$
Intercept	8.021 ± 0.379
Season	-0.442 ± 0.157
Litter Zn Concentration	$5.4\times10^{-4} \pm 2.4\times10^{-4}$
Litter Cu Concentration	$-3.0\times10^{-4} \pm 2.2\times10^{-4}$
Litter Cd Concentration	$-6.2\times10^{-3} \pm 3.5\times10^{-3}$
Season x Season Crossproduct	0.101 ± 0.031
Litter Pb x Cd Concentration Crossproduct	$1.4\times10^{-7} \pm 0.4\times10^{-7}$
Litter Zn x Cu Concentration Crossproduct	$-1.5\times10^{-7} \pm 0.7\times10^{-7}$
Litter Pb x Cu Concentration Crossproduct	$-3.46\times10^{-9} \pm 2.635\times10^{-9}$
Litter Cu x Cu Concentration Crossproduct	$1.2\times10^{-7} \pm 0.5\times10^{-7}$
Litter Pb x Pb Concentration Crossproduct	$-1.219\times10^{-10} \pm 5.022\times10^{-11}$

of the CCW controls, there was no significant difference between values for Cd and Zn in either litter horizon (Table 8). Apparently, particulates responsible for the Zn and Cd values found on Crooked Creek Watershed did not occur in significant quantities at 21.0 km west of the smelter area. In contrast, lead values at Missouri control sites were 8 to 17 times greater than the Tennessee values. When soil comparisons were made, the Zn content of Walker Branch Watershed soil was greater than that of Crooked Creek Watershed soil by a factor of 4. Soil Cd and Pb content did not differ significantly between the two study areas.

Missouri control-site Pb concentrations may be due to either the presence of particulates different from those responsible for Crooked Creek Watershed Pb or the occurrence of a subterranean Pb mineralization beneath the tree roots. Metals are known to accumulate in ground water around ore-bearing deposits and can be detected by chemical analysis of above-ground vegetation. Good correlations between plant and soil Pb content over lead mineralizations have been obtained (Cannon, 1960).

Litter Heavy Metal Pool

The available heavy-metal pool in Crooked Creek Watershed litter was calculated by multiplying measured values of Pb, Zn, Cu, and Cd litter content with the corresponding litter mass/m^2 at each site. Means of September litter heavy metal pools analyzed by Duncan's New Multiple Range Test are given in Tables 9-10. Seasonal variation in amplitude occurred, but trends due to distance and direction were consistent with those in Tables 9-10.

Available metal pools in O1 litter exhibited the same distribution displayed by O1 litter mass for each sampling period, i.e., no

Table 8. Comparison of Pb, Zn and Cd concentrations (ppm) in Walker Branch Watershed (WBW) and Crooked Creek Watershed (CCW) leaf litter and soils.

Site	Horizon	Pb	Zn	Cd
WBW[1]	01 litter	27.0	42.0	.42
	02 litter	51.0	110.0	.81
	A1 soil	13.7	21.7	.10
CCW[2]	01 litter	455.0	68.8	1.65
(21.0 km site)	02 litter	398.0	111.4	2.57
	A1 soil	13.8	5.0	.23

[1]Data taken from Van Hook *et al.*, 1976 (Fullerton soil on WBW) (n_{litter} = 72, n_{soil} = 2).

[2]Data taken from present dissertation (September) and Jackson, 1976 (n_{litter} = 16, n_{soil} = 1).

Table 9. September means of O1 heavy metal pools analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

Pb Pool (g/m^2)			Zn Pool (g/m^2)			Cu Pool (g/m^2)			Cd Pool (g/m^2)		
Site (km)	Mean	Duncan	Site (km)	Mean	Duncan	Site (km)	Mean	Duncan	Site (km)	Mean	Duncan
NW 0.4	16.21	A	NE 0.4	.48	A	NE 0.8	.37	A	NW 0.4	.03	A
N 0.4	12.27	A	NW 0.4	.42	A	NE 1.2	.36	A	N 0.4	.02	A
N 0.4	10.80	A	N 0.4	.37	A	N 0.4	.25	A	W 0.4	.02	A
NE 0.4	9.23	A	W 0.4	.30	A	NW 0.4	.22	A	NE 0.4	.02	A
NW 1.2	3.70	A	NE 1.2	.22	A	NE 0.4	.21	A	W 0.8	.01	A
W 0.8	3.68	A	W 0.8	.19	A	W 0.4	.13	A	NW 1.2	.01	A
N 0.8	3.56	A	NE 0.8	.19	A	NW 1.2	.08	A	N 0.8	.01	A
NW 0.8	3.54	A	NW 1.2	.16	A	NW 0.8	.07	A	NW 0.8	.01	A
NE 1.2	3.52	A	N 0.8	.15	A	N 0.8	.06	A	W 1.6	.01	A
NE 0.8	3.38	A	NW 0.8	.14	A	W 0.8	.06	A	W 1.2	.01	A
W 1.2	2.23	A	W 1.6	.12	A	N 1.2	.04	A	NE 0.8	.01	A
N 1.2	2.01	A	W 1.2	.11	A	N 2.0	.04	A	NE 1.2	.01	A
W 1.6	1.91	A	N 2.0	.10	A	W 1.6	.04	A	N 2.0	.00	A
N 2.0	1.82	A	N 1.2	.10	A	W 1.2	.03	A	N 1.2	.00	A
NW 2.0	1.06	A	NW 2.0	.04	A	NW 2.0	.02	A	NW 2.0	.00	A
W 10.4	.03	A	W 21.0	.01	A	W 10.4	.00	A	W 10.4	.00	A
W 21.0	.02	A	W 16.3	.01	A	W 21.0	.00	A	W 16.3	.00	A
W 16.3	.02	A	W 10.4	.01	A	W 16.3	.00	A	W 21.0	.00	A

Table 10. September means of 02 heavy metal pools analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

Pb Pool (g/m²)			Zn Pool (g/m²)			Cu Pool (g/m²)			Cd Pool (g/m²)		
Site (km)	Mean	Duncan	Site (km)	Mean	Duncan	Site (km)	Mean	Duncan	Site (km)	Mean	Duncan
NE 0.4	237.7	A	NE 1.2	11.08	A	NE 1.2	13.55	A	NE 0.4	.50	A
N 0.4	228.4	A	NE 0.4	9.84	B	NE 0.8	6.88	B	N 0.4	.36	B
NW 0.4	207.9	A	N 0.4	6.15	C	NE 0.4	5.37	C	NW 0.4	.29	BC
W 0.4	155.7	B	NW 0.4	5.27	CD	N 0.4	3.69	D	W 0.4	.28	C
NE 1.2	121.4	B	NE 0.8	4.47	D	NW 0.4	3.06	D	NE 1.2	.25	C
N 0.8	66.1	C	W 0.4	4.34	D	W 0.4	2.26	E	N 0.8	.17	D
NE 0.8	65.4	C	N 0.8	2.33	E	N 0.8	1.19	F	NE 0.8	.15	D
NW 0.8	59.1	CD	N 1.2	1.88	EF	NW 0.8	.87	FG	N 1.2	.12	DE
N 1.2	36.5	CDE	NW 0.8	1.70	EFG	N 1.2	.72	FGH	NW 0.8	.10	DEF
NW 1.2	29.4	CDE	NW 1.2	1.26	EFGH	NW 1.2	.47	GH	NW 1.2	.09	DEFG
W 0.8	24.1	CDE	N 2.0	1.09	EFGH	N 2.0	.41	GH	N 2.0	.06	EFG
N 2.0	20.9	DE	W 0.8	.95	FGH	W 0.8	.38	GH	W 0.8	.06	EFG
NW 2.0	16.5	DE	NW 2.0	.90	FGH	NW 2.0	.27	GH	NW 2.0	.04	EFG
W 1.2	13.0	E	W 1.2	.46	GH	W 1.2	.17	GH	W 1.2	.03	FG
W 1.6	7.9	E	W 1.6	.39	H	W 1.6	.14	GH	W 1.6	.02	FG
W 10.4	.3	E	W 16.3	.18	H	W 10.4	.02	H	W 21.0	.00	G
W 16.3	.2	E	W 21.0	.13	H	W 16.3	.02	H	W 16.3	.00	G
W 21.0	.2	E	W 10.4	.09	H	W 21.0	.01	H	W 10.4	.00	G

significant change occurred throughout the sampling area (Table 9). Despite this lack of significance, it can be seen that pool-size was positively related to source proximity.

The distribution of 02 litter pool values paralleled those of the 02 litter heavy-metal concentrations (Appendix C), with source-distance the dominant factor in establishing ranks of means (Table 10). The rank order of metal-pool sizes also follows the ranking previously established for the concentration data, i.e., Pb>Zn>Cu>Cd. Over 95% of the total metal pool at the 0.4 km sites was due to Pb occurrence, and declined only slightly to 93.2% at the boundary sites. The combination of reduced metal deposition and 02 litter mass at the control site produced a Pb pool equalling 60.5% of the total. However, no significant differences in pool size existed between the control and watershed boundary sites.

Chemical Characterization of Litter

Litter Macronutrients

All macronutrient cation concentrations were significantly depressed relative to the control in both 01 and 02 litter out to 0.8 km from the stack source (Fig. 12). Two mechanisms are postulated to explain these results: 1) increased leaching of cations through the litter caused by a decrease in microbial activity and disruption of cation exchange processes, and 2) decreased uptake of macronutrients due to root damage that resulted in a reduced annual input by litterfall. Both hypotheses were substantiated by litter data collected from Crooked Creek Watershed.

Cation exchange processes in 02 litter were affected by a decrease in exchange capacity and an increase in acidity (Table 11). Humus, the

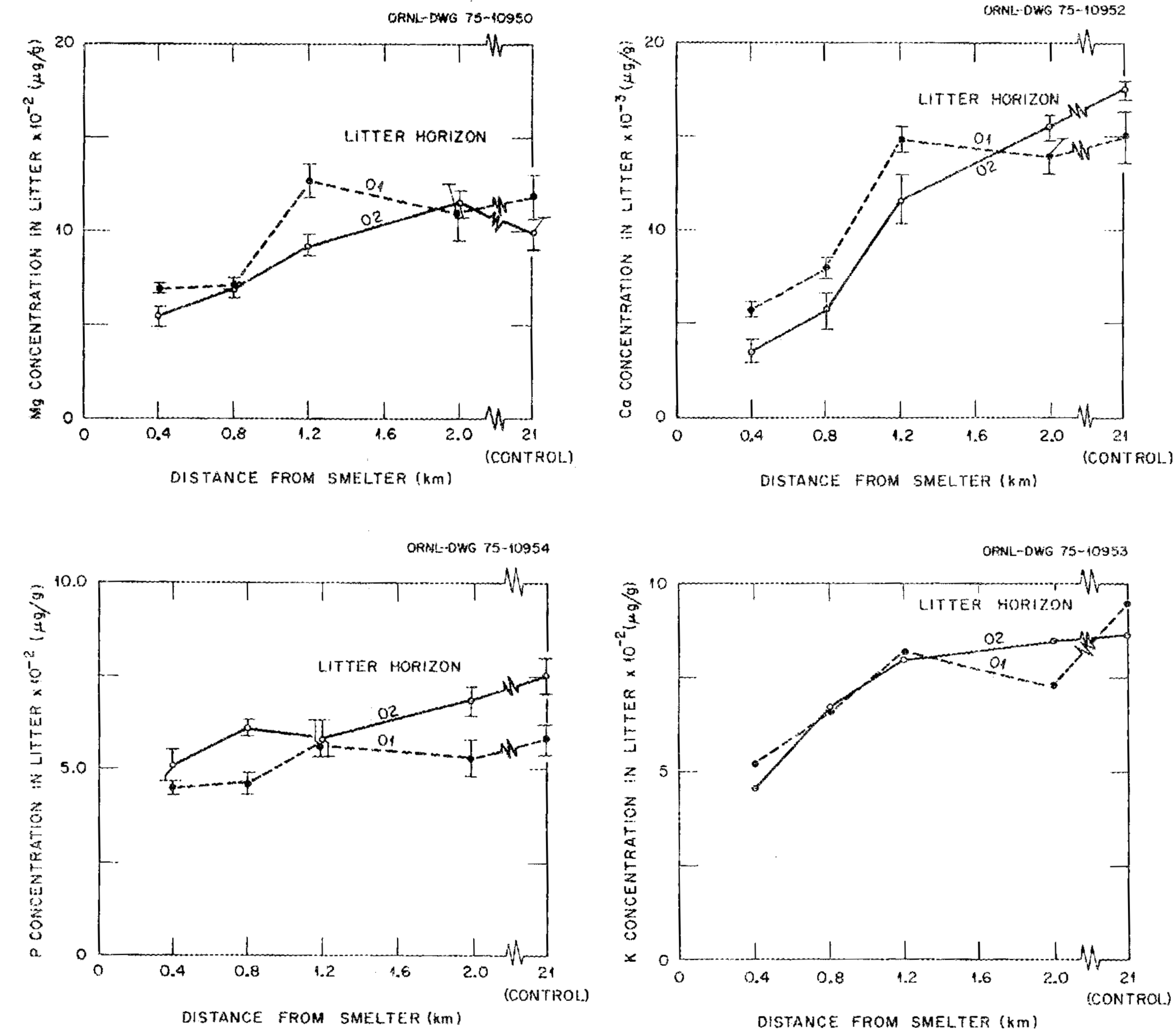


Fig. 12. Mean macronutrient concentrations of Ca, Mg, K, and P (± 1 SE, n=12) in Crooked Creek Watershed litter as a function of distance from the AMAX smelter. Data from Jackson and Watson, 1976.

residue of decomposition processes, acts as a cation exchanger and aids in the conservation of nutrient cations (Lutz and Chandler, 1946). Humus may have a cation exchange capacity as high as 110 meq/100 g and a buffered pH of 4-5. As it is comprised of a rich mixture of phenolic and carboxylic acid groups, it can react strongly with heavy metals (Schnitzer and Khan, 1972). The decrease in exchange capacity found in Crooked Creek Watershed litter (Table 11) may have resulted from depletion of the microbial populations responsible for maintenance of humic reservoirs. Such a reduction in microbial populations was also indicated by a significant decline in litter respiration detected near the smelter (Ausmus and Watson, 1975). Increased litter acidity (the addition of mobile anions) is also known to encourage cation leaching (McColl, 1972). The acidic litter found within 0.8 km of the AMAX stack (Table 11) may have resulted from SO_2 stack emissions and/or dissolution of metal sulfide particulates.

Measurements of macronutrient levels in fresh summer leaves of black and white oak indicated that canopy species on Crooked Creek Watershed may be experiencing nutrient depletion due to reduced uptake (Table 12). Foliage concentrations of Ca, K and P were significantly reduced at the most heavily contaminated site (0.4 km). These results are consistent with O1 litter content of macronutrients, with the exception of Mg (Fig. 12). The reason for greater uptake of Mg was not established.

Analysis of macronutrient pools in O2 litter for Ca indicated a depression near the smelter (0.4 and 0.8 km) (Fig. 13). This decline was produced by the extremely low Ca concentration (Fig. 12) in the litter at these sites. No significant difference in macronutrient pools

Table 11. Cation exchange capacity and pH of O2 litter on Crooked Creek Watershed (NW transect)[1].

Distance (km)	CEC[2] (meq/100 g)	pH[2]
0.4	21.1*	4.0*
0.8	19.1*	4.1*
1.2	34.9	5.5
2.0	33.4	5.2
21 (control)	40.3	5.5

*Significantly different from the control at $P<.05$.

[1]Data from Jackson and Watson, 1976.

[2]Seasonally pooled values (1974, n=12).

Table 12. Mean macronutrient concentration in oak leaves on Crooked Creek Watershed in relation to distance from the smelter (n=6)[1].

Distance (km)	Ca	Mg	K	P
	µg/g			
0.4	7,615*	1,609	5,950*	748*
0.8	9,517*	1,448	7,805	931
1.2	11,569	1,663	9,362	1,173
2.0	10,350	1,767	6,572	977
21.0 (control)	13,016	1,504	8,090	1,043

*Indicates significantly different from the control at the 5% level.

[1]Data from Jackson and Watson, 1976.

for Mg and K was found between the 0.4 and 0.8 km sites and the control. This apparent paradox was explained by a combination of low macronutrient concentrations (Fig. 12) and high biomass accumulation (Table 3, Fig. 6). Biomass accumulation alone accounted for the increase in all macronutrient pools between 1.2 and 2.0 km (Fig. 13).

The P pool in 02 litter was not depressed from that of the control (Fig. 13). However, a significant depression existed for 01 litter (Fig. 13). Phosphorus does not behave as divalent macronutrient cations, for it may become bound in organic material and made unavailable for root uptake. This binding could account for the accumulation of P in 02 litter. With less P available for root uptake, incorporation into new tissue would be decreased. The net result would be a substantial drop in 01 litter P content.

A decline of all macronutrient pools in 01 litter was observed to 0.8 km from the stack (Table 13). This depression was governed by a decrease in macronutrient concentrations in litter near the smelter, and not by litter biomass. No significant differences of macronutrient pool values existed between the 1.2 and 2.0 km sites when compared to the control. This was evidence that macronutrient uptake had not been significantly affected further than 0.8 km from the smelter stack. However, macronutrient accumulation in 02 litter pools was indicative that uptake may be affected in the future. Analysis of variance indicated a highly significant interaction between macronutrient pools in 01 and 02 litter. The significance of this interaction is that the composition of 02 litter was drastically altered from normal within 0.8 km from the stack. Due to incomplete decomposition, the bulk of 02 biomass was a heterogeneous mixture of coarsely to finely fragmented

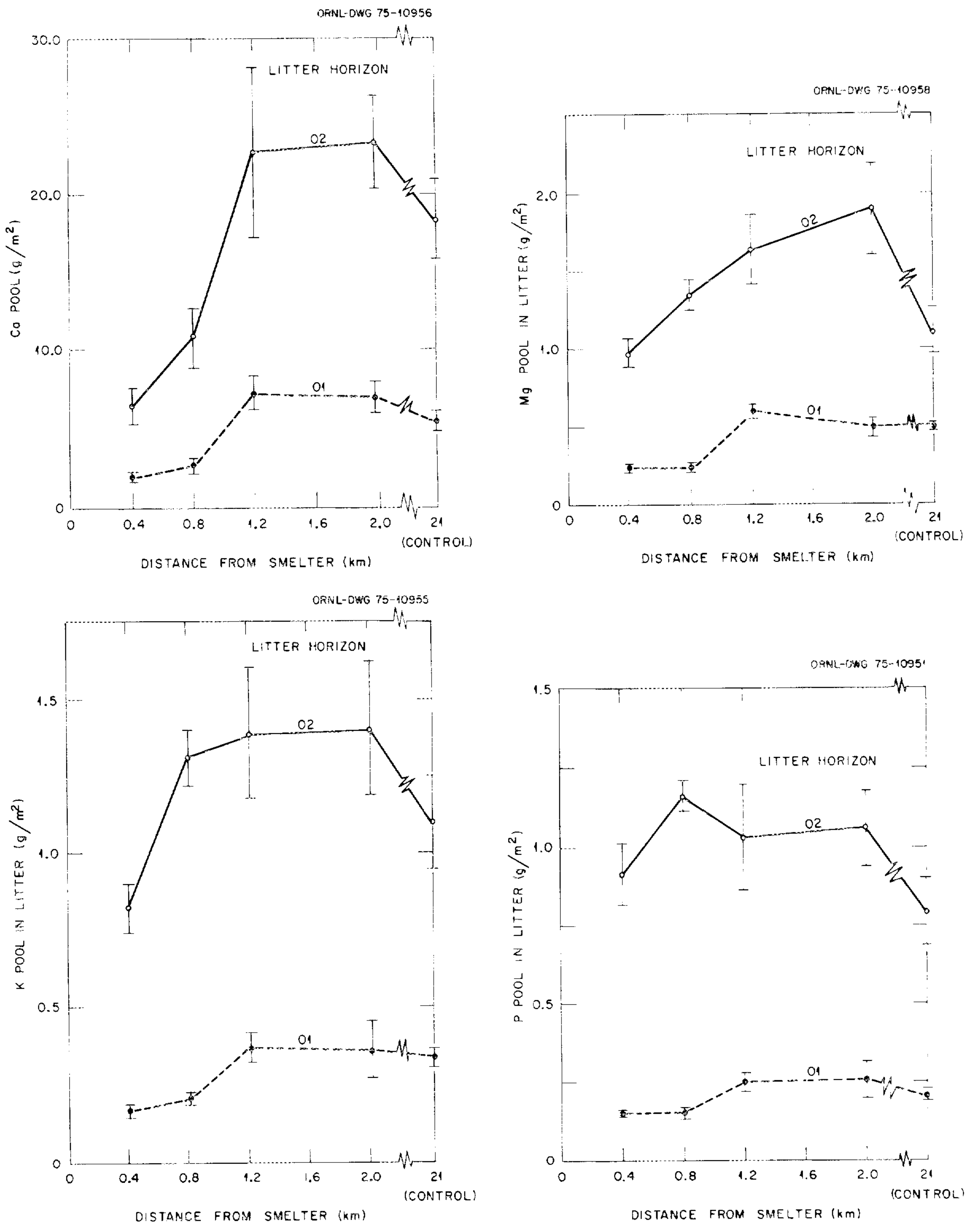


Fig. 13. Mean macronutrient pool sizes of Ca, Mg, K, and P (± 1 SE, n=12) in Crooked Creek Watershed litter as a function of distance from the AMAX smelter. Data from Jackson and Watson, 1976.

Table 13. Macronutrient pools of O2 litter on Crooked Creek Watershed (NW transect)[1].

Ca pool[2] (g/m^2)	Mg pool[2] (g/m^2)	K pool[2] (g/m^2)	P pool[2] (g/m^2)
6.5*	0.98	0.83	0.92
10.9*	1.35	1.31*	0.15*
22.9	1.64*	1.38*	0.25*
23.5	1.90*	1.90*	1.08
18.5	1.09	0.96	0.80

*Significantly different from control at $P<.05$.

[1]Data from Jackson and Watson, 1976.

[2]Seasonally pooled values (1974, n=12).

leaves and twigs with a small amount of humus mixed in. Thus, the nutrient content of O2 litter in this area was similar to that of O1.

Arthropods

Population Density and Biomass

Regression analysis of arthropod density and biomass data collected from the O1 litter horizon disclosed the occurrence of considerable variation that could not be explained by any measured variable. The coefficient of variation (c.v.=100 x $s/\bar{x}$; Snedecor and Cochran, 1967) exceeded 330%. It seems reasonable to assume that physical factors, such as temperature or relative humidity, would be primary controlling agents in the arthropod occupancy of the O1 litter horizon, for it is known that temperature and moisture regimes are responsible for vertical migration within the soil-litter medium (Dowdy, 1944, 1947, and 1951). Regardless of the reason, no measure of interactions between arthropod activity and litter mass or heavy metal content could be discerned in the O1 horizon data from this study. Therefore, only data from the O2 horizon were analyzed (c.v. = 67.2%).

The effects of season or wind direction were not sufficient to explain variation in either total arthropod population biomass and density or population biomass and densities of individual trophic levels. Distance from the smelter, however, was a highly significant ($P<.005$) source of variation for predator, detritivore, fungivore, and total arthropod biomass and density in the O2 litter horizon (see Tables 14, 15 and 16).

Replicate effects were insignificant ($P<.05$) sources of variation in the analysis of variance of both total and trophic level density

Table 14. Seasonal mean arthropod biomass (mg dry wt/m^2) in the litter horizon of Crooked Creek Watershed. One standard error in parentheses (n=4).

Site	SPRING Mean Biomass		SUMMER Mean Biomass		FALL Mean Biomass		WINTER Mean Biomass	
W 0.4 km	5.7*	(4.0)	93.5	(54.4)	11.6*	(3.3)	21.3	(14.8)
W 0.8 km	34.5*	(11.4)	25.4	(4.4)	20.7*	(9. 7)	30.4	(10.2)
W 1.2 km	82.9	(33.1)	122.8	(70.1)	54.5	(17.6)	108.0	(63.3)
W 1.6 km	167.1	(70.9)	109.5	(48.8)	190.7	(130.4)	19.4*	(6.7)
NW 0.4 km	2.6*	(0.9)	4.0*	(2.3)	9.9*	(4.2)	3.2*	(1.5)
NW 0.8 km	55.6	(30.3)	20.0*	(1.9)	121.6	(65.1)	26.7	(13.8)
NW 1.2 km	66.0	(14.2)	28.9	(6.1)	88.8	(50.4)	33.8	(9.2)
NW 2.0 km	573.0	(10.2)	195.7	(20.9)	96.9	(61.3)	140.9	(54.3)
NE 0.4 km	11.3*	(5.7)	21.3	(7.7)	4.7*	(1.0)	80.6	(55.8)
NE 0.8 km	23.9*	(6.0)	15.5*	(5.0)	73.7	(55.4)	25.0*	(6.8)
NE 1.2 km	110.2	(60.1)	56.5	(17.6)	45.1	(22.2)	29.8	(20.6)
W 21.0 km (Control)	187.8	(70.2)	61.5	(22.1)	137.3	(46.3)	63.9	(17.6)

*Significantly reduced from the control (P<.10).

Table 15. Seasonal mean arthropod density (no/m^2) in the litter O_2 horizon of Crooked Creek Watershed. One standard error in parentheses (n=4).

Site	SPRING		SUMMER		FALL		WINTER	
	Mean	Density	Mean	Density	Mean	Density	Mean	Density
W 0.4 km	55.0*	(26.6)	165.0*	(129.4)	110.0	(46.0)	50.0	(21.2)
W 0.8 km	280.0*	(100.4)	212.5	(70.9)	123.0	(44.0)	295.0	(138.8)
W 1.2 km	106.0	(558.1)	447.5	(230.8)	198.0	(104.0)	375.0	(225.9)
W 1.6 km	1917.5	(1175.1)	257.5	(121.5)	885.0	(326.0)	420.0	(176.1)
NW 0.4 km	12.5*	(7.5)	27.5	(24.3)	75.0	(36.0)	12.5*	(7.5)
NW 0.8 km	135.0	(83.0)	130.0	(58.7)	160.0	(77.0)	97.5	(47.1)
NW 1.2 km	452.5	(196.0)	537.5	(207.0)	263.0	(145.0)	270.0	(128.6)
NW 2.0 km	1137.5	(599.5)	1942.5	(727.9)	308.0	(205.0)	500.0	(250.3)
NE 0.4 km	75.0*	(50.7)	127.5	(81.8)	43.0	(24.0)	512.5	(479.0)
NE 0.8 km	127.5*	(87.7)	110.0	(52.3)	90.0	(31.0)	157.5	(67.9)
NE 1.2 km	132.5*	(88.5)	252.5	(88.9)	70.0*	(32.0)	177.5	(138.8)
W 21.0 km (Control)	1217.5	(462.8)	507.5	(317.9)	358.0	(197.0)	373.0	(175.0)

*Significantly reduced from the control (P<.10).

Table 16. Mean annual Crooked Creek Watershed 02 litter arthropod predator, detritivore and fungivore biomass (mg dry wt/m^2) and density (no/m^2). Seasons have been pooled as replicates. Values in parentheses are 1 standard error (n=16).

Site (km)	Biomass (mg/m^2)			Density (no/m^2)		
	Predator	Detritivore	Fungivore	Predator	Detritivore	Fungivore
W 0.4	6.1* (3.6)	22.1* (13.9)	1.2* (0.3)	19.0* (5.5)	36.9* (15.4)	24.4* (4.3)
W 0.8	12.1 (2.5)	6.3* (1.2)	2.7* (1.4)	31.9* (7.5)	206.9 (58.2)	41.3* (16.1)
W 1.2	15.0 (5.0)	33.0 (13.6)	15.1 (7.3)	76.3 (22.0)	240.6 (93.0)	256.3 (164.3)
W 1.6	11.2 (2.9)	42.4 (19.6)	13.3 (6.5)	72.5 (20.6)	550.6 (300.0)	298.1 (145.5)
NW 0.4	2.1* (.4)	2.3* (2.1)	0.8* (0.3)	10.6* (1.9)	6.3* (3.8)	18.13* (11.0)
NW 0.8	6.8* (3.6)	16.6* (4.5)	2.4* (0.4)	30.0* (8.9)	36.3* (9.7)	60.0* (13.7)
NW 1.2	14.0 (4.0)	12.6* (2.9)	5.6 (3.2)	71.9 (38.9)	143.8 (75.7)	129.4 (77.4)
NW 2.0	87.6 (41.5)	92.6 (40.4)	16.1 (12.0)	110.6 (19.7)	1001.9 (429.3)	381.3 (261.0)
NE 0.4	5.7* (2.4)	18.5* (15.4)	3.1* (0.8)	21.9* (2.8)	119.4 (94.4)	57.5* (15.1)
NE 0.8	8.53 (2.1)	20.4 (14.9)	1.1* (0.3)	44.4* (6.6)	79.4* (27.6)	20.0* (7.1)
NE 1.2	17.4 (8.4)	27.6 (17.7)	2.6* (1.1)	45.6* (17.3)	71.3* (16.1)	26.9* (6.2)
W 21.0 (Control)	17.3 (5.4)	61.1 (20.4)	22.1 (10.4)	86.9 (15.1)	294.4 (69.4)	511.9 (243.4)

*Significantly reduced from the control value (P<.10).

and biomass. Thus, it was assumed that the 4-replicate design utilized for arthropod field-sampling on Crooked Creek Watershed in 1974 was sufficient to adequately estimate litter arthropod populations.

Analysis of variance indicated that neither season, distance, nor wind direction had significant effects on omnivore or littergrazer density and biomass. This result may be due to the variability in occurrence of these trophic groups on Crooked Creek Watershed -- omnivores were found in 75% of the samples and littergrazers occurred in only 53%. Members of the other three trophic levels were found in over 90% of the samples.

Least squares multiple linear regression procedures were used to evaluate the variation found in measurements of CCW total arthropod biomass and density (Tables 14 and 15). The empirically derived regression model included effects due to season, direction and distance from the AMAX smelter, litter heavy metal concentration; and all interactions due to multiplicative effects. The linear model presented as Equation #4 was also used to evaluate the dependent variables, total arthropod biomass and density. Use of the 23-variable model accounted for 51.2% of the variation within the total arthropod biomass, but only 15.2% of the total density variation.

The inability of the model to adequately explain variability within the arthropod density data may be due to several factors. First, it is highly probable that the relationships between arthropod density and the measured independent variables may be explained by a non-linear model. Only multiple linear models were evaluated in the present data analysis. Secondly, both historical and current temperature-moisture regimes are known to be important in determining the distribution of arthropods at any one point in time (Dowdy, 1944, 1947, 1951; Andrewartha 1961). These factors, for which no records were available, may be responsible for a large portion of the unexplained variability in the CCW arthropod density measurements.

Examination of regression statistics from analysis of arthropod biomass data revealed that not all 23 variables were necessary to account for a major portion of total variation (Tables 17 and 18). Subsequent analysis by stepwise, and forward and backward elimination regression procedures (Draper and Smith, 1966) indicated that the latter method provided the best evaluation of variability within the data at $P = 0.25$ the significance level for entry.

With the number of effective independent variables reduced to 9, 50.7% of the total variation can be accounted for (Table 19). Significant ($P<.01$) negative correlation coefficients were obtained for the first-order variables litter Zn and litter Cd concentrations and the multiplicative interactions of litter Pb x Zn, Pb x Cu, Zn x Cu, Zn x Cd and Cu x Cd concentrations (Table 18). The second-order variables of litter Cu x Cu and Cd x Cd were also negatively correlated ($P<.01$) with arthropod biomass (Table 18). Thus, high levels of heavy metals in the litter substrate occurred simultaneously with small arthropod biomass values. Since distance from the AMAX smelter was also significantly correlated with litter heavy metal content (see also Figs. 7-10), this heavy metal effect on the arthropod biomass may be responsible for the significant distance effect detected by previous ANOVA analysis.

Interactions between arthropod biomass and litter heavy metal content on the Crooked Creek Watershed forest floor were not simple one-to-one relationships. Results of the present regression analysis

Table 17. Multiple linear regression statistics for Crooked Creek Watershed 02 litter arthropod biomass (mg/m^2, transformed by Eqn. 3) ($n = 176$, $F_{23,152} = 6.931$, $R^2 = 0.512$).

Independent Variable	$\beta_n \pm SE$
Intercept	-0.059 ± 0.694
Season	0.240 ± 0.357
Direction	4.086 ± 1.992
Distance	-10.407 ± 2.401
Litter Pb Concentration	$4.94\times10^{-6} \pm 2.056\times10^{-5}$
Litter Zn Concentration	$1.062\times10^{-3} \pm 9.649\times10^{-4}$
Litter Cu Concentration	$3.187\times10^{-4} \pm 7.262\times10^{-4}$
Litter Cd Concentration	-0.017 ± 0.013
Season x Direction Crossproduct	-0.137 ± 0.407
Season x Distance Crossproduct	0.755 ± 0.457
Direction x Distance Crossproduct	-18.296 ± 14.536
Season x Season Crossproduct	-0.025 ± 0.069
Direction x Direction Crossproduct	9.548 ± 7.212
Distance x Distance Crossproduct	5.972 ± 7.925
Litter Pb x Zn Concentration Crossproduct	$3.0\times10^{-3} \pm 2.0\times10^{-8}$
Litter Pb x Cu Concentration Crossproduct	$-4.0\times10^{-8} \pm 2.0\times10^{-8}$
Litter Pb x Cd Concentration Crossproduct	$-1.8\times10^{-7} \pm 3.0\times10^{-7}$
Litter Zn x Cu Concentration Crossproduct	$8.8\times10^{-7} \pm 8.3\times10^{-7}$
Litter Zn x Cd Concentration Crossproduct	$-1.718\times10^{-5} \pm 1.257\times10^{-5}$
Litter Cu x Cd Concentration Crossproduct	$8.87\times10^{-6} \pm 8.96\times10^{-6}$
Litter Pb x Pb Concentration Crossproduct	$-5.99\times10^{-12} \pm 6.25\times10^{-11}$
Litter Cu x Cu Concentration Crossproduct	$-4.1\times10^{-7} \pm 3.0\times10^{-7}$
Litter Cd x Cd Concentration Crossproduct	$2.002\times10^{-4} \pm 1.293\times10^{-4}$
Litter Zn x Zn Concentration Crossproduct	$-2.9\times10^{-7} \pm 6.4\times10^{-7}$

Table 18. Correlation matrix resulting from multiple linear regression analysis of total arthropod biomass (mg/m^2, transformed by Eqn. 3) found on Crooked Creek Watershed ($n = 176$, $F_{23,152} = 6.931$, $R^2 = 0.512$). Values in parentheses are significance levels.

	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Y	1	-.107 (.158)	-.380 (.0001)	-.459 (.0001)	-.514 (.0001)	-.317 (.0001)	-.205 (.006)	-.476 (.0001)
X_1		1	0.0 (1.0)	0.0 (1.0)	.009 (.906)	-.003 (.965)	.011 (.885)	.042 (.577)
X_2			1	.954 (.0001)	.551 (.0001)	.845 (.0001)	.842 (.0001)	.637 (.0001)
X_3				1	.577 (.0001)	.759 (.0001)	.720 (.0001)	.628 (.0001)
X_4					1	.695 (.0001)	.398 (.0001)	.902 (.0001)
X_5						1	.894 (.0001)	.780 (.0001)
X_6							1	.498 (.0001)
X_7								1

Table 19. Multiple linear regression statistics for Crooked Creek Watershed 02 litter arthropod biomass (mg/m^2, transformed by Eqn. 3) and independent variables selected by the backward elimination procedure at P = 0.25 (n = 176, $F_{14,161}$ = 10.178, R^2 = 0.507).

Independent Variable	$\beta_n \pm SE$
Intercept	-0.059 ± 0.694
02 Litter Zn Concentration	0.001 ± 0.0006
02 Litter Cd Concentration	-0.020 ± 0.010
02 Litter Pb x Zn Concentration Crossproduct	$1.0x10^{-8} \pm 1.0x10^{-8}$
02 Litter Pb x Cu Concentration Crossproduct	$3.0x10^{-8} \pm 1.0x10^{-8}$
02 Litter Zn x Cu Concentration Crossproduct	$4.4x10^{-7} \pm 1.5x10^{-7}$
02 Litter Zn x Cd Concentration Crossproduct	$18.6x10^{-6} \pm 6.0x10^{-6}$
02 Litter Cu x Cd Concentration Crossproduct	$10.3x10^{-6} \pm 5.5x10^{-6}$
02 Litter Cu x Cu Concentration Crossproduct	$-2.5x10^{-7} \pm 1.0x10^{-7}$
02 Litter Cd x Cd Concentration Crossproduct	$15.9x10^{-5} \pm 6.0x10^{-5}$

indicated that no single factor can be isolated as the primary source of variability in watershed arthropod biomass. A complex of variables must be considered. However, it was clearly demonstrated that the heavy metal content of Crooked Creek Watershed litter was not only strongly and negatively correlated with arthropod biomass, but was also responsible for 50% of total data variation.

Heavy Metals

Field-collected arthropods were pooled to provide sufficient material for heavy metal analysis of each trophic level. Specimens categorized by season and replicate, variables known to be insignificant in controlling population density and biomass, were combined across both litter horizons. The resulting pooled samples were composed of 32 individual samples (4 seasons x 4 replicates x 2 horizons) and were assayed for Pb, Zn, Cu, and Cd content.

Lead: Previous documentation of arthropod Pb concentrations associated with trophic classification indicated that the most elevated levels occurred in the detritivore-fungivore groups (Williamson and Evans, 1972). Isopods feeding in decaying vegetation on Yorkshire roadsides contained 682 ppm dry wt Pb (Williamson and Evans, 1972). Littergrazing diplopods and predaceous opilionids and spiders were next in order of decreasing lead content, with values of 82, 45, and 23 ppm respectively. Other published values for roadway-source Pb in arthropods were lower than those found by Williamson and Evans (Giles *et al.*, 1973; Institute of Envir. Studies, 1972).

The Pb content of isopods collected on Yorkshire ditchbanks is comparable to that of Crooked Creek Watershed fungivores. Otherwise, watershed values exceed all previously published information for comparable trophic levels and for the same trophic level at the watershed control site (Table 20). Elevated quantities of Pb were found associated with predaceous arthropods collected from heavily Pb-contaminated sites near the smelter (cf Fig. 7).

Zinc: Zinc is known to be necessary to a number of biologically important enzyme reactions both by acting as a nonspecific cofactor in controlling the rate of reaction and as a constituent of many metalloenzymes (Orten, 1966). Zinc is also necessary for RNA and DNA formation (Schroeder, 1974). Thus, this element is a normal component of biological systems. However, due to the complete absence of comparable data it is not known if the quantities found associated with the Crooked Creek Watershed arthropod population (Table 21) are different from what would be expected in a non-polluted system.

Copper: Copper is contained in the arthropod blood protein, hemocyanin, and is a normal constituent of all arthropod tissue (Wieser, 1961; Wigglesworth, 1965). However, since trophic level Cu concentrations found at the 21.0 km control site were significantly less than any of those found on the watershed, the elevated levels of Cu associated with Crooked Creek Watershed arthropods are real (Table 22).

The highest levels of Cu found in the spider, "other predator", and omnivore populations occurred at those sites located either closest to the smelter or along the NE transect. Exposure to Cu concentrate on this transect appeared to produce elevated Cu levels in litter arthropods comparable to those produced by exposure to stack emissions.

Cadmium: Previous documentation of arthropod Cd concentrations include values for grasshoppers collected at varying distances from

Table 20. Lead concentrations (μg/g dry wt) found associated with arthropod trophic levels on Crooked Creek Watershed. Specimens from both litter horizons and all seasons and all replicates were pooled for chemical analysis (n=32).

	TROPHIC LEVEL					
Site (km)	Predator*	Spider	Detritivore	Fungivore	Litter-grazer	Omnivore
W 0.4	28370.8	1659.5	1000.0	388.9	485.7	2857.1
W 0.8	2430.6	326.1	989.8	407.4	431.8	299.7
W 1.2	528.9	195.0	1027.9	104.8	1930.8	159.7
W 1.6	118.2	536.9	217.6	156.2	500.0	336.5
NW 0.4	15000.0	3514.3	4523.8	886.8	12427.2	3423.4
NW 0.8	150.1	267.3	769.2	2142.9	588.2	214.8
NW 1.2	283.2	288.4	333.3	579.4	346.2	347.9
NW 2.0	162.0	112.5	202.6	1046.0	200.5	326.9
NE 0.4	2316.1	6089.7	1382.1	3100.0	262.5	2368.4
NE 0.8	533.3	1389.3	282.6	103.4	579.3	3295.5
NE 1.2	1964.6	209.4	16637.7	450.0	5479.5	2787.3
W 21.0 (control)	27.9	18.2	33.9	14.9	136.6	102.0

*Other than spiders

Table 21. Zinc concentrations (μg/g dry wt) found associated with arthropod trophic levels on Crooked Creek Watershed. Specimens from both litter horizons and all seasons and all replicates were pooled for chemical analysis (n=32).

Site (km)	TROPHIC LEVEL					
	Predator*	Spider	Detritivore	Fungivore	Litter-grazer	Omnivore
W 0.4	848.3	647.8	1117.7	555.6	1571.4	450.1
W 0.8	726.9	872.4	224.5	1333.3	136.4	388.0
W 1.2	433.7	527.9	238.3	342.9	222.3	345.4
W 1.6	365.9	536.9	102.4	375.0	1785.7	336.5
NW 0.4	359.0	822.9	1428.6	301.9	310.7	405.4
NW 0.8	281.4	709.6	384.6	457.1	294.1	296.9
NW 1.2	727.7	485.7	897.4	355.1	285.7	244.2
NW 2.0	459.0	465.7	253.3	482.8	1649.8	283.0
NE 0.4	340.6	935.9	268.3	400.0	300.0	947.4
NE 0.8	406.7	729.8	304.4	551.7	220.7	590.9
NE 1.2	542.1	1165.7	813.1	1250.0	456.6	632.2
W 21.0 (control)	556.5	532.5	183.7	238.8	273.2	232.1

*Other than spiders

Table 22. Copper concentrations (μg/g dry wt) found associated with arthropod trophic levels on Crooked Creek Watershed. Specimens from both litter horizons and all seasons and all replicates were pooled for chemical analysis (n=32).

Site (km)	TROPHIC LEVEL Predator*	Spider	Detriti-vore	Fungivore	Litter-grazer	Omnivore
W 0.4	547.8	197.4	155.9	200.0	137.1	156.6
W 0.8	138.9	176.6	204.1	555.6	86.4	47.3
W 1.2	32.5	174.1	54.9	47.6	42.5	43.5
W 1.6	28.1	129.8	13.3	75.0	200.0	28.8
NW 0.4	320.5	242.9	476.2	71.7	291.3	84.7
NW 0.8	37.5	181.5	79.2	220.0	72.1	32.8
NW 1.2	98.0	72.9	512.8	140.2	302.2	27.6
NW 2.0	59.4	151.9	50.7	172.4	101.5	31.8
NE 0.4	136.2	448.7	122.0	200.0	63.8	263.2
NE 0.8	83.3	626.0	163.0	137.9	275.9	795.5
NE 1.2	169.1	480.0	1189.2	500.0	479.5	768.4
W 21.0 (control)	48.6	72.9	24.1	149.3	109.3	20.4

*Other than spiders

a Zn smelter in Montana and the results of a ^{109}Cd tagging experiment utilizing a grass–cricket (Pteronemobius sp.)–spider (Lycosa sp.) food chain (Munshower, 1972; Van Hook and Yates, 1975). Grasshoppers feeding on contaminated vegetation containing 1.8 and 1.0 ppm Cd (2.4 and 24 km from the smelter source) incorporated whole-body Cd levels of 7.1 and 1.8 ppm respectively (Munshower, 1972). Omnivorous crickets and predaceous spiders in a trace-contaminated system (.069 ppm Cd in vegetation) incorporated much lower amounts of Cd (0.042 and 0.030 ppm, respectively (Van Hook and Yates, 1975).

Cadmium values for Crooked Creek Watershed arthropods collected at the control site were comparable to those of Munshower's (1972) herbivorous grasshoppers, and ranged from 1.4 ppm for fungivores to 10.2 ppm for omnivores (Table 23). The average Cd content of both litter horizons at the CCW control site was 5.1 ppm (Appendix C). Cadmium is commonly found associated with Zn in geological formations (Schroeder, 1974), and it is expected that Cd values in biota collected near a Zn smelter would represent a highly contaminated condition. Even though different trophic levels were studied at the two sites it was clear that Crooked Creek Watershed arthropod Cd values were either comparable to, or exceeded, those found near other Cd sources (Table 23).

Concentration Factors

The ecological consequences of heavy-metal transport in food chains can be partially evaluated by an analysis of concentration factor data. A concentration factor (C.F.) is defined as the "ratio of element level in consumer to element level in food-chain base" (Reichle *et al.*, 1970). Elements ingested by the consumer may be

Table 23. Cadmium concentrations (μg/g dry wt) found associated with arthropod trophic levels on Crooked Creek Watershed. Specimens from both litter horizons and all seasons and all replicates were pooled for chemical analysis (n=32).

	TROPHIC LEVEL					
Site (km)	Predator*	Spider	Detritivore	Fungivore	Litter-grazer	Omnivore
W 0.4	112.4	76.5	17.6	10.6	125.7	207.4
W 0.8	28.9	95.1	4.2	10.4	7.3	11.4
W 1.2	10.3	53.8	9.5	5.5	15.1	19.3
W 1.6	12.4	41.9	3.6	4.1	20.7	10.8
NW 0.4	33.7	100.0	26.2	10.8	223.3	53.2
NW 0.8	8.1	41.3	9.3	37.1	9.1	24.6
NW 1.2	19.4	9.7	8.2	7.8	17.6	6.7
NW 2.0	11.1	36.1	4.8	20.7	13.7	12.7
NE 0.4	12.5	34.6	8.9	21.0	6.9	68.4
NE 0.8	11.7	53.4	7.6	5.2	3.0	8.2
NE 1.2	11.2	75.9	35.9	31.5	20.1	12.6
W 21.0 (control)	4.7	4.1	2.3	1.4	3.0	10.2

*Other than spiders

diluted (C.F. < 1.0), concentrated (C.F. > 1.0), or undergo no change (C.F. = 1.0) relative to the levels found in the food base. Concentration factors, weighted by the proportion of total biomass provided by each litter horizon or trophic level, have been derived for Pb, Zn, Cu, and Cd in the CCW litter-arthropod food chain (Tables 24-27). Concentration values given in Tables 20-23 were used in the calculations. As an example of Pb concentration factor estimates for the litter fauna:litter food base at the W .4 km site, the following calculation was performed:

$$C.F = \frac{\rho_D\ [Pb_D] + \rho_F\ [Pb_F] + \rho_0\ [Pb_0] + \rho_L\ [Pb_L]}{\rho_{01}\ [Pb_{01}] + \rho_{02}\ [Pb_{02}]}$$

where

ρ_D = proportion of total litter fauna biomass provided by detritivores = 0.671

ρ_F = proportion of total litter fauna biomass provided by fungivores = 0.045

ρ_0 = proportion of total litter fauna biomass provided by omnivores = 0.277

ρ_L = proportion of total litter fauna biomass provided by littergrazers = 0.006

ρ_{01} = proportion of total litter mass provided by 01 litter = 0.180

ρ_{02} = proportion of total litter mass provided by 02 litter = 0.820

$[Pb_D]$ = concentration of Pb (μg/g dry wt) found associated with arthropod detritivores = 1000.0

$[Pb_F]$ = concentration of Pb (μg/g dry wt) found associated with arthropod fungivores = 388.9

$[Pb_0]$ = concentration of Pb (μg/g dry wt) found associated with arthropod omnivores = 2857.1

Table 24. Weighted concentration factors calculated for Pb transport in the Crooked Creek Watershed litter-arthropod food chain.

Site (km)	CONCENTRATION FACTORS			
	Litter Fauna / Litter	Spiders / Litter Fauna	Predators* / Litter Fauna	All Predators / Litter Fauna
W 0.4	0.02	1.12	19.13	10.67
W 0.8	0.04	0.56	4.20	2.49
W 1.2	0.12	0.19	0.52	0.42
W 1.6	0.06	1.95	0.43	1.17
NW 0.4	0.06	0.81	3.44	2.75
NW 0.8	0.02	0.49	0.28	0.31
NW 1.2	0.04	0.77	0.76	0.76
NW 2.0	0.05	0.37	0.53	0.51
NE 0.4	0.02	3.66	1.39	2.39
NE 0.8	0.03	1.76	0.68	1.23
NE 1.2	0.28	0.01	0.13	0.10
W 21.0 (control)	0.10	0.42	0.65	0.60

*Other than spiders

Table 25. Weighted concentration factors calculated for Zn transport in the Crooked Creek Watershed litter-arthropod food chain.

Site (km)	CONCENTRATION FACTORS Litter Fauna / Litter	Spiders / Litter Fauna	Predators* / Litter Fauna	All Predators / Litter Fauna
W 0.4	0.52	0.71	0.93	0.83
W 0.8	0.91	1.55	1.34	1.44
W 1.2	0.76	1.99	1.63	1.74
W 1.6	0.95	1.83	1.25	1.53
NW 0.4	0.43	0.98	0.43	0.57
NW 0.8	0.38	2.15	0.85	1.03
NW 1.2	0.83	1.18	1.76	1.71
NW 2.0	1.80	0.80	0.79	0.79
NE 0.4	0.12	2.90	1.06	1.87
NE 0.8	0.17	2.02	1.13	1.58
NE 1.2	0.20	1.51	0.70	0.90
W 21.0 (control)	2.09	2.57	2.69	2.66

*Other than spiders

Table 26. Weighted concentration factors calculated for Cu transport in the Crooked Creek Watershed litter-arthropod food chain.

Site (km)	CONCENTRATION FACTORS Litter Fauna / Litter	Spiders / Litter Fauna	Predators* / Litter Fauna	All Predators / Litter Fauna
W 0.4	0.17	0.59	1.84	1.25
W 0.8	0.92	0.37	0.32	0.34
W 1.2	0.34	1.07	0.47	0.65
W 1.6	0.28	1.96	0.44	1.18
NW 0.4	0.23	0.22	0.83	0.67
NW 0.8	0.15	0.40	0.51	0.49
NW 1.2	1.10	0.03	0.46	0.42
NW 2.0	0.61	0.32	0.72	0.66
NE 0.4	0.09	1.42	0.55	0.93
NE 0.8	0.08	1.17	0.15	0.67
NE 1.2	0.22	0.12	0.13	0.13
W 21.0 (control)	2.06	0.27	0.68	0.59

*Other than spiders

Table 27. Weighted concentration factors calculated for Cd transport in the Crooked Creek Watershed litter-arthropod food chain.

Site (km)	CONCENTRATION FACTORS Litter Fauna / Litter	Spiders / Litter Fauna	Predators* / Litter Fauna	All Predators / Litter Fauna
W 0.4	0.65	0.51	0.85	0.69
W 0.8	0.22	5.35	1.83	3.48
W 1.2	0.51	1.44	0.64	0.88
W 1.6	0.39	2.74	0.84	1.77
NW 0.4	0.38	0.52	0.50	0.51
NW 0.8	0.33	0.32	0.38	0.37
NW 1.2	0.26	0.10	1.99	1.82
NW 2.0	0.50	0.57	0.99	0.93
NE 0.4	0.10	1.12	0.51	0.78
NE 0.8	0.10	3.77	0.79	2.31
NE 1.2	0.34	0.65	0.29	0.38
W 21.0 (control)	0.64	0.27	1.15	0.97

*Other than spiders

$[Pb_L]$ = concentration of Pb (μg/g dry wt) found associated with arthropod littergrazers = 485.7

$[Pb_{01}]$ = concentration of Pb (μg/g dry wt) in 01 litter = 38.0×10^3

$[Pb_{02}]$ = concentration of Pb (μg/g dry wt) in 02 litter = 70.3×10^3

$$C.F. = \frac{1482.8}{64486.0} = .02$$

Lead: The concentration of Pb decreased from litter to litter fauna on Crooked Creek Watershed (Table 24). A plot of the log of food base Pb concentration (range: 430 to 68770 ppm) vs. corresponding concentration factor values for litter-feeding fauna (range: 0.02 to 0.28) illustrated that a mean concentration factor of 0.07 ± 0.02 (S.E.) would be an adequate estimate of Pb transport in the grazing food chain.

Arthropod predators appeared to be either concentrating or in equilibrium with the Pb content of their litter fauna prey. With the exception of the elevated "other predator" concentration factor found at W 0.4 km, the predator concentration factors ranged between 0.01 to 4.20. The corresponding variation in prey Pb concentration was from 43 to 11516 ppm.

A semilog plot of prey Pb concentration vs. Pb concentration factors indicated that a mean concentration factor would be an adequate representation of Pb biotransfer from prey to predator. The means are:

$C.F._{\text{spider Pb}} = 1.01 \pm 0.29$ (S.E.)

$C.F._{\text{other predator Pb}} = 1.18 \pm 0.41$ (S.E.)

$C.F._{\text{total predator Pb}} = 1.16 \pm 0.29$ (S.E.)

These means are conservative in that the one elevated concentration factor at the W 0.4 km site has been deleted.

Zinc: Zinc was being accumulated in Crooked Creek Watershed litter fauna to a much greater extent than was Pb, although concentration (CF>1.0) does not yet appear to be occurring (Table 25). Zinc is required by living systems (Orten, 1966; Schroeder, 1974), and the concentration factors found for Crooked Creek Watershed arthropods may reflect physiological requirements. The largest litter fauna:litter concentration factors existed where the smallest litter-Zn values occurred - W 1.6 km ($[Zn_{litter}]$ = 100 ppm). Litter Zn varied from 100 to 3894 ppm while the litter fauna concentration factor estimations varied from 0.12 to 2.09. Plotting of the data as previously discussed indicated that a mean of 0.64 $\pm$ 0.15 (S.E.) adequately represented the biological transfer of Zn presently occurring in this food chain.

It is not clear if arthropod predators concentrated or equilibrated Zn in relation to their food base. As predator concentration factors varied between 0.4 and 2.7, prey Zn varied between 206.8 and 909.1 ppm. Mean concentration factors were:

$C.F._{spider\ Zn} = 1.60 \pm 0.20$ (S.E.)

$C.F._{other\ predator\ Zn} = 1.08 \pm 0.12$ (S.E.)

$C.F._{total\ predator\ Zn} = 1.27 \pm 0.14$ (S.E.).

Copper: Concentration (C.F.>1.0) of Cu through the litter fauna: litter food chain does not appear to occur on Crooked Creek Watershed (Table 26). Copper was being accumulated in litter fauna to a much greater extent than was Pb, but this phenomenon may be a result of copper's presence in the arthropod circulatory system as hemocyanin (Wieser, 1961; Wigglesworth, 1965). As litter copper concentrations varied between 27 and 4590 ppm, concentration factor values varied between 27 and 4590 ppm, concentration factor values varied between 0.8 and 2.06. The mean Cu litter fauna C.F. was 0.38 $\pm$ 0.10 (S.E.). The highest litter concentration factor occurred where the smallest litter Cu value existed -- W 21.0 km.

In contrast to results for Pb and Zn, Cu appeared to be diluted by food-chain transfer from prey to predator on Crooked Creek Watershed. Mean concentration factors were:

$$C.F._{\text{spider Cu}} = 0.70 \pm 0.19 \text{ (S.E.)}$$

$$C.F._{\text{other predator Cu}} = 0.58 \pm 0.14 \text{ (S.E.)}$$

$$C.F._{\text{total predator Cu}} = 0.67 \pm 0.10 \text{ (S.E.)}$$

Cadmium: Concentration factors for Crooked Creek Watershed litter fauna (Table 27) were comparable to those found for omnivorous crickets (*Pteronemobius* spp., C.F. = 0.6) fed on ^{109}Cd-tagged vegetation ([Cd] = 0.069 ppm) (Van Hook and Yates, 1975). Cadmium was not concentrated in the Crooked Creek Watershed litter-litter fauna food chain, although Cd was accumulated to a greater degree than Pb (Table 24). The range of predator concentration factors (0.10 to 3.48) included the value calculated for Lycosid spiders preying upon ^{109}Cd-tagged *Pteronemobius* (Van Hook and Yates, 1975). After 30 days' feeding, *Lycosa* had accumulated 70% of the total Cd available in the prey substrate (i.e., C.F. = 0.7) (Van Hook and Yates, 1975). The only other arthropod food-chain data available deal with herbivorous grasshoppers that fed on Cd-contaminated vegetation near a Montana Zn smelter (Munshower, 1972). The overall grass-herbivore concentration factor was 1.3.

Concentration (C.F.>1.0) of Cd occurred among the predator populations exposed to prey containing $\leq$ 9 ppm Cd (W 0.8 and 1.6 km; NW 1.2 km;

NE 0.8 km; and W 21.0 km). At prey concentrations exceeding 9 ppm, all predator concentration factors < 1.

Diversity

An indicator of biological changes within the Crooked Creek Watershed forest floor community is arthropod diversity. Use of Equations 1 and 2 and data included in Appendix B produced the diversity, evenness and richness indices given in Table 28. Significance testing of Pielou's evenness 'J' and the Shannon-Weaver Diversity Index H' pointed out the extreme variability within the data, and no consistent trends could be observed for these two parameters (Hutcheson, 1970; O'Neill *et al*., 1976). However, richness, S, was shown to be a significant indicator of heavy metal effects on Crooked Creek Watershed arthropod diversity (ANOVA). Values of S (total number of taxa=families), equivalent to H' max and necessary for the computation of evenness 'J' (Equation 2), varied significantly with distance, direction and distance x direction interaction effects ($P<.01$). Thus, the richness component of total arthropod diversity was shown to be more sensitive to perturbations on CCW than either the evenness of abundance component or total arthropod diversity.

Table 28

Crooked Creek Watershed litter arthropod diversity indices for each site, horizon and season.

a. Shannon-Weaver Index, H' (calculated by Equation #1).

b. Pielou's evenness index J' (calculated by Equation #2).

c. Richness index S (total number of families).

a. Shannon-Weaver Index H'.

Site (km)	Hor	March 1974	June 1974	Sept. 1974	Jan. 1975
W 0.4	01	0.693	1.192	1.396	2.119
	02	2.083	2.124	2.143	2.157
W 0.8	01	2.479	1.939	1.911	1.475
	02	1.708	1.768*	2.367	1.167*
W 1.2	01	1.906	2.193	1.939	2.055
	02	1.769	2.479	2.684	1.669
W 1.6	01	1.359	1.981	1.745	1.330
	02	1.382	2.367	1.809*	1.031*
NW 0.4	01	2.946	2.233	1.790	1.228
	02	1.557	2.152	1.801	1.427
NW 0.8	01	2.151	2.568	1.779	1.540
	02	1.887	2.789	2.790	2.204
NW 1.2	01	2.212	1.425	1.494	1.877
	02	1.995	1.917*	1.967	1.919
NW 2.0	01	1.555	0.999	2.797	2.261
	02	1.378	1.339*	2.491	2.037
NE 0.4	01	1.099	2.150	1.486	0.500
	02	1.126	2.295	1.747	1.117*
NE 0.8	01	2.020	1.818	1.524	.628
	02	2.596*	2.340	2.356	1.763
NE 1.2	01	2.095	2.005	1.988	1.733
	02	2.518*	2.372	2.633	2.136
W 21.0 (Control)	01	2.176	1.767	1.852	1.935
	02	1.625	2.475	2.316	2.060

*Significantly different from the control at $P<.05$.

b. Evenness 'J'.

Site (km)	Hor	March 1974	June 1974	Sept. 1974	Jan. 1975
W 0.4	01	1.000	.518	.717	.853
	02	.838	.722	.812	.899
W 0.8	01	.875	.735	.769	1.064
	02	.570	.590	.835	.455
W 1.2	01	.743	.855	.756	.893
	02	.537	.770	.882	.567
W 1.6	01	.845	.773	.629	1.210
	02	.419	.745	.577	.350
NW 0.4	01	1.086	.931	.861	1.117
	02	1.123	.980	.725	.887
NW 0.8	01	.815	.907	.914	.957
	02	.697	.947	.890	.814
NW 1.2	01	.765	.556	.483	.903
	02	.655	.677	.668	.692
NW 2.0	01	.511	.455	1.060	1.029
	02	.418	.390	.747	.659
NE 0.4	01	1.585	1.105	.764	.722
	02	.829	.847	.898	.413
NE 0.8	01	1.038	.790	.851	.906
	02	.916	.864	.870	.610
NE 1.2	01	1.076	.871	.956	.967
	02	.792	.757	.911	.739
W 21.0 (Control)	01	.825	.624	.772	1.080
	02	.499	.769	.711	.625

c. Richness S.

Site (km)	Hor	March 1974	June 1974	Sept. 1974	Jan. 1975
W 0.4	01	2	10	7	12
	02	12	19	14	11
W 0.8	01	17	14	12	4
	02	20	20	17	13
W 1.2	01	13	13	13	10
	02	27	25	21	19
W 1.6	01	5	15	16	3
	02	27	24	23	19
NW 0.4	01	6	11	8	3
	02	4	9	12	5
NW 0.8	01	14	17	7	5
	02	15	19	23	15
NW 1.2	01	18	13	22	8
	02	21	17	19	16
NW 2.0	01	21	9	14	9
	02	27	31	28	22
NE 0.4	01	2	7	7	2
	02	13	15	7	15
NE 0.8	01	7	10	6	2
	02	17	15	15	18
NE 1.2	01	7	10	8	6
	02	24	23	18	18
W 21.0	01	14	17	11	6
	02	26	25	26	27

GENERAL DISCUSSION

Heavy Metal Effects on Biota

Measures of biological activity in Crooked Creek Watershed litter horizons performed during the present study included litter mass; total and trophic level arthropod density and biomass; total arthropod diversity, evenness and richness; and preliminary measurements of litter respiration. Additional supportive data were collected by E. A. Bondietti (1976) and include determinations of litter urease and amino sugar content. Trends disclosed by analyses of these data indicated that Crooked Creek Watershed forest-floor biota were undergoing significant changes as a result of exposure to the heavy-metal concentrations found in the litter horizons.

It had been demonstrated that accumulations of 02 litter occur at Crooked Creek Watershed sites that had received large inputs of Pb, Zn, Cu, and Cd. Similar accumulations of undecomposed organic material have been found under apple trees subjected to heavy applications of Bordeaux mixture ($CuSO_4$) near Rothamsted, beneath spruce-fir forests near heavy-metal industrial activity in southern Sweden, and in the oak-litter horizon within 1 km of a Pennsylvania zinc smelter (Hirst, *et al.*, 1961; Tyler, 1972; Ruhling and Tyler, 1973; Strojan, 1975). The fungicidal activity of heavy-metal ions is well documented (Somers, 1961) and the lack of litter decomposition in the apple orchard was directly attributed to copper poisoning of litter-inhabiting microorganisms (Hirst *et al.*, 1961). Decomposition rates of spruce litter, measured by CO_2 evolution, were depressed by Pb, Zn, Cu, and Cd concentrations similar to those found on Crooked Creek Watershed (Ruhling and

Tyler, 1973). A similar depression of CO_2 evolution was found in litter samples collected along one transect of Crooked Creek Watershed (Ausmus and Watson, 1975) and in Zn-contaminated litter collected within 6 km of the source (Strojan, 1975). These results all indicated a negative relationship to exist between litter decomposition and litter heavy metal content, regardless of the geographical location of the study area.

Further documentation of a heavy metal effect on litter decomposition was provided by analysis of litter amino sugar and urease content (Bondietti, 1976). Amino sugars in litter primarily exist as chitin, which is resistant to degradation and is not synthesized by green plants. Thus, analysis of amino sugars is a specific test for the historical presence of decomposer organisms (fungi and arthropods). The results of this test on Crooked Creek Watershed litter indicated a marked decrease in amino sugars occurred to a distance of 0.8 km from the stack.

Urease enzyme activity in litter was measured to further indicate loss of biological activity on the watershed. This test is more sensitive than the amino sugar assay since the production of urease enzyme is adversely influenced by heavy metal contamination. Laboratory experiments on uncontaminated litter showed that the addition of 10,000 ppm Pb or 800 ppm Zn caused a 15% reduction in urease enzyme activity. Both metal concentrations and enzyme activity in these laboratory studies were much higher than those found on the watershed. Thus, it was concluded that the greater observed loss of enzyme activity on the watershed was not simple inhibition but may be partially due to a depression in microbial activity. A reduction of enzyme activity was found to occur to a distance of 2.0 km from the smelter, which was further than the observed effect on amino sugars. This may indicate that the 2.0 km site is presently being slightly affected by the heavy metal emissions.

The observed decline in fungal and bacterial activity would be reflected in arthropod community dynamics because of reduced substrate quality. A depression in the fungal populations required to maintain fungivores and their predators can be expected to result in a reduction of density and biomass for these two arthropod groups. A parallel decline may be observed in coprophagous populations dependent upon microbial enrichment of their egested litter substrate (McBrayer, 1973; Wieser, 1966). Depressed values of density and biomass in predator, detritivore, and fungivore populations occurred at heavily contaminated sites regardless of distance from the smelter (Tables 14-16). Reduced fungivore and detritivore populations were probably due to lack of suitable substrate -- few mycelial mats or fruiting bodies were observed during field sampling at the affected plots and detritus production appeared to be negligible. A similar reduction in density of micro- and macroarthropods of litter and soil was observed at study areas located 1 and 6 km upwind from a Pennsylvania zinc smelter (Strojan, 1972). Strojan attributed the population decline to the presence of heavy-metal smelter emissions (Zn, Cd, Cu, Pb, and Fe) in forest-floor organic horizons. Sulfur dioxide emissions were discounted as causative factors due to the neutralizing influence of ZnO (normal litter pH for this area is 4.0 to 5.0, litter at the 1 km site was pH 6.1) and the efficiency of the smelter's acid plant (Strojan, 1972). The sparse predator populations observed at heavily contaminated sites on Crooked Creek Watershed may be due to the lack of suitable prey or the results of toxicity due to biomagnification. Both hypotheses are supported by the data (Tables 16 and 24-27).

The occurrence of measurable disruptions in population density and biomass suggested that a corresponding disruption could be occurring in arthropod population diversity. It was thought that such a measure would give some insight into the stability of the Crooked Creek Watershed litter system. Calculation and subsequent statistical testing of a Shannon-Weaver index applied to each site indicated little change in arthropod diversity on Crooked Creek Watershed, regardless of litter heavy metal load or season (Table 28a) (Shannon, 1948; Hutcheson, 1970). When segregated into its two components of richness and evenness of abundance (Pielou, 1966; Price, 1975), diversity on the watershed was shown to be governed by an even population distribution (Table 28b). In contrast, the richness component was shown to be a sensitive indicator of the effects due to distance and direction (Table 28c). System parameters of O2 litter mass (Figs. 5 and 6) and macronutrient pools (Fig. 13) have already demonstrated that disruptions in ecosystem integrity are occurring on Crooked Creek Watershed. The inability of the Shannon-Weaver index procedure to detect similar disruptions on the population level revealed a serious lack of sensitivity of this method to ecosystem-level perturbations.

Concentration factor data indicated that neither Pb, Zn, Cu, or Cd are presently being concentrated in the litter-litter feeder food chain on Crooked Creek Watershed (Tables 24-27). Although lead was the most abundant heavy-metal element found on the watershed, it was accumulated in the litter fauna to a much smaller extent than either Zn, Cu, or Cd. This phenomenon may be due to differences in insect physiological response to each element.

Copper is a component of the arthropod blood protein hemocyanin, which can be found in most insects and isopods and in some amphipod and decapod species (Wieser, 1961, 1965; Wigglesworth, 1965). Marine arthropods are bathed in copper-containing media and do not possess well-developed mechanisms for storage and maintenance of Cu reserves (Wieser, 1965). In contrast, terrestrial species must depend upon their substrate to fulfill their Cu requirements. One purpose of coprophagy in isopods is thought to be maintenance of a critical Cu concentration in their substrate, which had been previously thought to consist entirely of Cu-poor litter (Wieser, 1966). The greater variation and larger values of Cu concentration factors between litter fauna: litter found on Crooked Creek Watershed relative to those for Pb may be reflecting the variability in Cu requirements of the fauna (Table 26). Zinc is required both as a mediator and as a constituent of enzyme reactions (Orten, 1966). Physiological requirements for Zn by the Crooked Creek Watershed litter fauna appeared to be reflected in the litter fauna:litter concentration factors, particularly when compared to the much smaller values calculated for Pb (Tables 24 and 25). Available literature does not document arthropod physiological requirements for Cd. Other than displaying greater accumulation of Cd relative to Pb, the significance of Cd concentration factors for litter fauna: litter in Table 27 is not known. Lead is not known to be necessary for plant or animal growth and development.

Except for Cu, it has not been possible to substantiate a similar food chain dilution of heavy metals from prey to predator on Crooked

Creek Watershed. Concentration factor data indicated that, in relation to their prey, arthropod predators may be either concentrating or equilibrating with respect to Pb, Zn, and Cd. Cadmium is of special interest, for possible biomagnification occurred only in those predator populations exposed to prey containing $\leq$ 9 ppm Cd. At prey levels greater than 9 ppm, all predator concentration factors were less than 1. While cadmium can displace Zn in enzyme reactions, it is not physiologically required by arthropods (Underwood, 1971). It is possible that high levels of prey Cd may be toxic to their arthropod predators. If the lethal dose to spiders and other predators is greater than the amount of biologically available Cd in prey containing 9 ppm total Cd, then death would result before biomagnification could occur.

Mineral Cycling

Remineralization of nutrient ions in litter is a normal component of the mineral cycling processes of deciduous forests (Ovington, 1960). Earlier discussion has pointed out the role of arthropods in decomposition. It has been suggested that disruption of coupled arthropod and microorganism life cycles by heavy metal toxicity may completely disrupt forest mineral cycling (Tyler, 1972; Witkamp and Ausmus, 1975; Ausmus *et al.*, 1975; Jackson and Watson, 1976). Tyler hypothesizes that such toxicity would first result in an increase in the amount of incompletely decomposed litter material on the forest floor. Reduced decomposition rates would allow mineral nutrients to remain bound in a form unavailable for plant uptake and may result in an eventual productivity decline.

The first stage of Tyler's hypothesis has been substantiated by Crooked Creek Watershed data -- O2 litter accumulations have already occurred at a number of sites (Figs. 5-6, Appendix C). The subsequent decline in nutrient availability suggested by Tyler was corroborated by preliminary measurements of fresh summer leaves collected from Crooked Creek Watershed black and white oak (Table 12). Foliage concentrations of Ca, K, and P were significantly reduced when compared to the control only at the site with the greatest heavy metal load and litter accumulation. These data suggest a reduction in root uptake.

During litter sampling, it was observed that secondary roots of trees did not occur within and beneath the O2 litter horizon at sites near the smelter. At the control sites, considerable difficulty was involved in separating litter material from the thick mat of fine roots growing throughout the O2 horizon. Greenhouse pot experiments utilizing healthy black oak seedlings transplanted to Crooked Creek Watershed soil verified the field-observed effects on lateral root growth (Jackson and Watson, 1976).

Further indications of a disruption in nutrient cycling mechanisms are the changes in cation exchange capacity and pH from the normal state (Table 11). The decline in total litter cation exchange capacity on Crooked Creek Watershed could lead to a reduced capacity of litter to hold nutrient cations, resulting in leaching losses. Thus, after initial nutrient binding due to reduced remineralization (cf. Table 13 - Ca and Mg pools at 1.2 and 2.0 km, K pool 0.8, 1.2, and 2.0 km), nutrients may be lost entirely from the system (cf. Table 13 - Ca pool at 0.4 and 0.8 km). This effect goes beyond the two-stage hypothesis of Tyler (1972), where primary production, limited by the lack of essential nutrients bound up in undecomposing litter, declines.

Phosphorus may become tenaciously bound in organic material and thus does not behave in the same manner as divalent macronutrient cations. The P pool at 0.4 km was not different from that of the control (Table 13), but the P content of fresh foliage at the same site was significantly reduced from that of the control. The capacity of P to bind to organic material may be responsible for foliage P depletion.

In general, forest-nutrient dynamics on Crooked Creek Watershed are displaying significant signs of perturbation - excessive root mortality, depleted macronutrient concentrations in fresh foliage, a decline in cation exchange capacity and litter Ca pools near the smelter, and an accumulation of litter Mg and K between 0.8 and 2.0 km of the smelter. A major disruption in nutrient resource allocation due to heavy metal effects on litter decomposition was indicated. Eventually, it can be expected that productivity will be most depressed in trees which are not tolerant of heavy metals or a reduced supply of available nutrients. It is not unrealistic to envision widespread deforestation of non-tolerant species over an area adjoining the smelter, if the smelter emissions continue at the present level for a number of years.

It can be further hypothesized that the area affected by the smelter may be increasing in size due to the continual loading of heavy metal particulates on the watershed. The area 1.2 - 2.0 km from the stack could eventually be affected to the same degree as the existing area within 0.8 km from the stack.

SUMMARY AND CONCLUSIONS

A number of measures of biological activity within the Crooked Creek Watershed litter system have been made. Studies have focused on the litter-arthropod food chain as a means of detecting perturbations in a heavy-metal contaminated terrestrial ecosystem. To adequately characterize the arthropod food base and habitat, litter mass, heavy metal content, cation exchange capacity, pH, urease activity, and amino sugar content were critically examined. Litter horizons on the watershed can be characterized as follows:

1) 01 litter mass has not differed throughout the watershed during the period of study, but varied about a mean of 433 $\pm$ 29 (SE) g/m^2. Mean annual 01 mass at the control site varied about a mean of 471 $\pm$ 34 (SE) g/m^2.

2) An accumulation of undecomposed 02 litter on CCW was positively correlated with litter heavy-metal content ($P<.01$).

3) The highest concentrations of litter Pb, Zn, Cu, and Cd occurred in 02 litter. The mean annual range of values for heavy metals (ppm) on the watershed were 4600 to 103000, 230 to 4910, 80 to 6080, and 14 to 179 for Pb, Zn, Cu, and Cd, respectively. Although litter gradually became enriched in Zn, Cu, and Cd relative to Pb as distance from the smelter increased, the rank order of concentration paralleled that displayed by stack emissions, i.e., Pb>Zn>Cu>Cd.

4) Measurements of 02 litter urease activity, amino sugar content (Bondietti, 1976), and CO_2 evolution revealed a depression of normal decomposer activity in litter collected near heavy metal sources.

From these data, it appeared that annual production of fresh litter on Crooked Creek Watershed, as estimated by forest-floor 01 litter mass, had not yet been adversely affected by exposure to smelter emissions. In contrast, significant 02 litter accumulations have occurred as a result of reduced decomposition. Both historical and current microbial activity (measured by amino sugar analysis and CO_2 evolution) have been depressed at sites located near the AMAX smelter, the primary heavy metal source on CCW. Since litter arthropods act as "catalysts of microbial metabolism", in decomposition processes by substrate alteration and inoculation, any gross changes in litter decomposition should be reflected in the dynamics of the arthropod community (Macfadyen, 1963). Documented effects on the CCW litter arthropod populations were as follows:

1) When compared to the control site, reduced values of total arthropod biomass (mg dry wt/m^2) and density (no./m^2) occurred simultaneously with elevated levels of litter heavy metals.

2) This reduction in total arthropod biomass and density was governed by a decrease in biomass and density of the predator, detritivore and fungivore populations.

3) Measurements of arthropod richness, an estimate of maximum diversity, revealed that litter arthropod populations at heavily contaminated sites were less rich in taxa (family) than were those located elsewhere on the watershed.

These effects may be induced by changes in substrate quality or actual heavy metal toxicity. The latter hypothesis was supported by analytical results of heavy metal concentrations found associated with arthropod trophic levels.

Food-chain dilution of Pb, Zn, Cu, and Cd from litter to litter consumer occurred as indicated by the mean concentration of 0.7 $\pm$ 0.02 (SE) (Pb), 0.64 $\pm$ 0.15 (SE) (Zn), 0.38 $\pm$ 0.10 (SE) (Cu), and 0.34 $\pm$ 0.05 (SE (Cd). Biotransfer of Pb to litter consumers was much less than that found for the other three heavy metals. In contrast, predatory arthropods on Crooked Creek Watershed were either concentrating or equilibrating Pb, Zn, and Cd from their prey, as indicated by mean total predator concentration factors of 1.16 ± 0.29 (SE) (Pb), 1.27 ± 0.14 (SE) (Zn), and 1.27 ± 0.02 (SE) (Cd). Of all four heavy metals, only Cu appeared to be diluted by food-chain transfer from prey to predator ($\bar{x}$ = 0.67 ± 0.10 (SE)) (Tables 24-27).

All biological data collected from Crooked Creek Watershed showed that food-chain transfer of heavy metals occurred within the litter-arthropod community. In addition, a disruption in normal litter decomposition processes occurred as a result of exposure to heavy metal smelter emissions.

Measurements of fresh foliage and litter macronutrient concentrations and litter macronutrient pools indicated that forest-nutrient dynamics on Crooked Creek Watershed were already seriously disturbed (Tables 12 and 13, Figs. 12 and 13). A significant depression ($P<.05$), relative to the control, of the Ca, Mg, and K content of 01 and 02 litter existed within 0.8 km of the stack (Table 12). Two mechanisms postulated to explain this result were:

(1) Increased leaching of cations through the litter induced by a loss of CEC, a decrease in pH, and a decrease in microbial immobilization of macronutrients.

(2) A decreased uptake of macronutrients due to root damage produced by heavy-metal concentrations. The result would be reduced annual macronutrient input from litterfall.

A loss in litter cation exchange capacity and reduction in fresh-foliage macronutrient content has been measured on Crooked Creek Watershed. An accumulation of macronutrient pools in 02 litter has also been observed to exist between 1.2 and 2.0 km of the smelter. This observation corresponds to the initial binding of forest macronutrients in undecomposing litter hypothesized by Tyler (1972) as the first stage of heavy-metal induced nutrient-cycling disruption.

If the present levels of atmospheric deposition continue unchecked, the result could be a decline in productivity of tree species intolerant of heavy metals or a depleted nutrient supply (Tyler, 1972; Jackson and Watson, 1976). It is not unrealistic to envision eventual deforestation of non-tolerant species with replacement by pioneer communities. Continued heavy metal input beyond this point may result in ecosystem destruction (Witkamp *et al.*, 1966).

APPENDICES

APPENDIX A

Trophic-level assemblage and abundance of arthropod taxa (excluding Acarina) found on Crooked Creek Watershed during the study year (1974). Literature citations used as taxonomic keys and/or documentation of feeding habits include Borror and DeLong, 1964; Borror and White, 1970; Hoff, 1949; Jaques, 1951; McBrayer et al., 1974; Peterson, 1956; Ross, 1965; Szabo, 1974. Taxa followed by "A", "L", "N", "P", or "I" respectively refer to adult, larval, nymphal, pupal, and immature forms.

TROPHIC LEVEL AND TAXA		ABUNDANCE (total no.)
DETRITIVORES		
INSECTA		
Coleoptera		
Nitidulidae	A	84
Scarabeidae		
Acanthocerinae	A	1
Silphidae	A	1
Staphylinidae (also PREDATOR)	A & L	89A, 13L
Elateridae (also PREDATOR)	L	171
Lagriidae	L	24
Orthoperidae (also FUNGIVORE)	L	24
Tenebrionidae	L	6
(*Meracantha* spp.)		13
Collembola		
Poduridae	A	4287
Diplura		
Campodeidae	A	3
Japygidae	A	60
Diptera		
Phoridae	A	93
Sarcophagidae	A	2
Tipulidae	A	13
Muscidae	L	2
Stratiomyidae (also PREDATOR)	L	235
Syrphidae (also PREDATOR)	L	5
Tipulidae	L	12
Trichoceridae	L	3
Isoptera		11
Protura		19
Psocoptera		83
SYMPHYLA		6

TROPHIC LEVEL AND TAXA		ABUNDANCE (total no.)
ARACHNIDA		
Phalangida		
Phalangididae (also PREDATOR)	I	39
FUNGIVORES		
INSECTA		
Coleoptera		
Derodontidae	A	2
Pselaphidae	A	192
Ptiliidae	A	118
Orthoperidae (also DETRITIVORE)	L	24
Collembola		
Entomobryidae	A	2783
Diptera		
Drosophilidae	L	2
Sciaridae	L	186
Scatopsidae	L	17
Hemiptera		
Aradidae	A	1
Thysanoptera		
Phloeothripidae	A	303
LITTERGRAZERS		
INSECTA		
Diptera		
Bibionidae	L	83
Cecidomyidae	L	692
DIPLOPODA		
Chordeumida	A	4

TROPHIC LEVEL AND TAXA		ABUNDANCE (total no.)
OMNIVORES		
INSECTA		
Hymenoptera		
Formicidae		
Dolichoderinae		10
Formicinae		167
Myrmicinae		699
Orthoptera		
Blattidae		25
Coleoptera		
Tenebrionidae	A	4
PREDATORS		
INSECTA		
Coleoptera		
Carabidae	A	6
Coccinellidae	A	1
Lampyridae	A	3
Staphylinidae (also DETRITIVORE)	A & L	89A, 13L
Cantharidae	L	184
Carabidae	L	16
Elateridae (also DETRITIVORE)	L	171
Diptera		
Ceratopogonidae	A	5
Dolichopodidae	A & L	4A, 31L
Rhagionidae	L	2
Stratiomyidae (also DETRITIVORE)	L	235
Syrphidae (also DETRITIVORE)	L	5
Hemiptera		
Reduviidae	A & N	7
Hymenoptera		
Ampulicidae	A	1
Braconidae	A	1

TROPHIC LEVEL AND TAXA		ABUNDANCE (total no.)
Chalcidoidea	A	19
Eulophidae	A	3
Eupelmidae	A	8
Formicidae		
Dorylinae	A	36
Ponerinae	A	184
Ichneumonidae	A	6
Proctotrupoidea	A	3
Unknown parasitic family	A	36
Neuroptera		
Ascalaphidae	L	3
Chrysopidae	A	2
Hemerobiidae	A	1
ARACHNIDA		
Araneae	A & I	
Agelenidae		2
Anyphaenidae		1
Clubionidae		17
Dysderidae		5
Gnaphosidae		45
Hahniidae		9
Linyphiidae		
Micryphantiinae		154
Linyphiinae		58
Lycosidae		4
Oecobiidae		3
Oonopidae		1
Salticidae		16
Thomisidae (*Misumenops*)		22
Zoridae		2
Phalangida		
Phalangididae (also DETRITIVORE)	I	39
Pseudoscorpionida	A	313
CHILOPODA		
Geophilomorpha	A	20
Lithobiomorpha	A	
Henicopidae	A	9
Lithobiidae	A	4

TROPHIC LEVEL AND TAXA		ABUNDANCE (total no.)
Scolopendromorpha	A	
Cryptopidae	A	64
UNKNOWN		
INSECTA		
Coleoptera		
Scydmaenidae	A	3
Unknown	L	124
Diptera		
Cecidomyidae	A	242
Chironomidae	A	34
Sciaridae	A	11
Mycetophilidae	A	40
Psychodidae	A	31
Tipulidae	A	13
Unknown	A, L & P	17A, 143L, 4P
Hymenoptera		
Unknown	L	1

"ACCIDENTALS" - Foliage, seed, stem, or bole feeders from the canopy or root feeders from the soil. Do not carry out a portion of their life cycle in the litter.

INSECTA		
Coleoptera		
Anobiidae	A	
Byrrhoidea	A	
Curculionidae	A	
Apion		
Panscopus		
Pantomerus		
Phyxelis		
Brachyrhininae	A	
Pedilidae	A	
Scarabeidae		
Dynastinae	A	
Melolonthinae	A	
Scolytidae	A	
Curculionidae	L	
Collembola		
Sminthuridae		

TROPHIC LEVEL AND TAXA	
Diptera	
Chironomidae	
Spaniotoma spp.	L
Trupaneidae	L
Hemiptera	
Lygaeidae	A
Miridae	A
Pyrrhocoridae	A
Tingidae	A
Homoptera	
Aphididae	A
Cicadellidae	A
Cicadidae	A
Hymenoptera	
Cynipidae	A
Formicidae	
Leptalinae	A
Lepidoptera	
Tortricidae	L
Phalaenidae	L
Adults	
Thysanoptera	
Thripidae	A
Trichoptera	
Hydroptilidae	A

APPENDIX B

Listing of all arthropod data collected from Crooked Creek Watershed by taxon, season, site, horizon, and lifestage. Trophic level designations were referenced in Appendix A.

"CLASS", "ORDER", "FAMILY" = Taxonomic designations.

"SSN" = Season
1 = Collected March, 1974
2 = Collected June, 1974
3 = Collected September, 1974
4 = Collected January, 1975

"DIR" = Direction
1 = West
2 = Northwest
3 = North
4 = Northeast

"DIST" = Distance from AMAX smelter in km.

"HOR" = Litter horizon
1 = 01
2 = 02

"REPONE", "REPTWO", "REPTHREE", "REPFOUR" = Number of individual specimens found in each replicate sample.

"LIFESTG" = Lifestage of specimen.

"MGWT" = Mean oven-dry weight in mg of individual specimens.

"TROFLEVL" = Trophic level designation as referenced in Appendix A.

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROPLEVL
1	INSECTA	DIPLURA	JAPYGIDAE	1	2	1.2	2	0	1	0	0	ADULT	.023	DETRITIV
2	INSECTA	DIPLURA	JAPYGIDAE	2	1	0.4	1	0	2	0	0	ADULT	.023	DETRITIV
3	INSECTA	DIPLURA	JAPYGIDAE	2	1	0.4	2	2	0	2	3	ADULT	.023	DETRITIV
4	INSECTA	DIPLURA	JAPYGIDAE	2	1	0.8	2	0	3	0	0	ADULT	.023	DETRITIV
5	INSECTA	DIPLURA	JAPYGIDAE	2	1	1.2	2	0	0	2	2	ADULT	.023	DETRITIV
6	INSECTA	DIPLURA	JAPYGIDAE	2	1	1.6	2	2	6	3	0	ADULT	.023	DETRITIV
7	INSECTA	DIPLURA	JAPYGIDAE	2	2	0.8	1	0	0	1	0	ADULT	.023	DETRITIV
8	INSECTA	DIPLURA	JAPYGIDAE	2	2	0.8	2	2	2	0	0	ADULT	.023	DETRITIV
9	INSECTA	DIPLURA	JAPYGIDAE	2	2	1.2	2	0	1	0	2	ADULT	.023	DETRITIV
10	INSECTA	DIPLURA	JAPYGIDAE	2	4	0.4	2	2	0	0	0	ADULT	.023	DETRITIV
11	INSECTA	DIPLURA	JAPYGIDAE	2	4	0.8	2	1	1	2	1	ADULT	.023	DETRITIV
12	INSECTA	DIPLURA	JAPYGIDAE	2	4	1.2	2	3	0	2	3	ADULT	.023	DETRITIV
13	INSECTA	DIPLURA	JAPYGIDAE	3	1	0.4	2	1	0	1	1	ADULT	.023	DETRITIV
14	INSECTA	DIPLURA	JAPYGIDAE	3	1	21.0	2	1	0	0	0	ADULT	.023	DETRITIV
15	INSECTA	DIPLURA	JAPYGIDAE	3	4	0.8	2	3	0	0	1	ADULT	.023	DETRITIV
16	INSECTA	DIPLURA	JAPYGIDAE	4	1	21.0	2	0	1	0	0	ADULT	.023	DETRITIV
17	INSECTA	DIPLURA	CAMPODEIDAE	1	2	1.2	2	0	1	0	0	ADULT	.010	DETRITIV
18	INSECTA	DIPLURA	CAMPODEIDAE	2	1	0.4	2	0	0	1	0	ADULT	.010	DETRITIV
19	INSECTA	DIPLURA	CAMPODEIDAE	3	1	21.0	2	1	0	0	0	ADULT	.010	DETRITIV
20	INSECTA	DIPTERA	UNKNOWN	1	1	1.6	1	0	0	1	0	ADULT	.060	UNKNOWN
21	INSECTA	DIPTERA	UNKNOWN	1	1	21.0	1	0	0	0	3	LARVA	.008	UNKNOWN
22	INSECTA	DIPTERA	UNKNOWN	1	1	21.0	2	0	3	3	17	LARVA	.008	UNKNOWN
23	INSECTA	DIPTERA	UNKNOWN	1	2	0.8	2	0	1	0	0	ADULT	.060	UNKNOWN
24	INSECTA	DIPTERA	UNKNOWN	1	2	2.0	1	0	3	1	0	LARVA	.008	UNKNOWN
25	INSECTA	DIPTERA	UNKNOWN	1	2	2.0	2	1	0	0	0	ADULT	.060	UNKNOWN
26	INSECTA	DIPTERA	UNKNOWN	1	2	2.0	2	2	0	13	0	LARVA	.008	UNKNOWN
27	INSECTA	DIPTERA	UNKNOWN	2	1	0.4	1	1	0	0	0	ADULT	.060	UNKNOWN
28	INSECTA	DIPTERA	UNKNOWN	2	1	1.2	2	1	0	0	0	PUPA	.105	UNKNOWN
29	INSECTA	DIPTERA	UNKNOWN	2	1	21.0	1	1	0	0	0	ADULT	.060	UNKNOWN
30	INSECTA	DIPTERA	UNKNOWN	2	1	21.0	1	2	1	0	0	LARVA	.008	UNKNOWN
31	INSECTA	DIPTERA	UNKNOWN	2	1	21.0	2	3	10	0	0	LARVA	.008	UNKNOWN
32	INSECTA	DIPTERA	UNKNOWN	2	2	0.4	1	0	0	1	1	ADULT	.060	UNKNOWN
33	INSECTA	DIPTERA	UNKNOWN	2	2	0.4	1	0	0	5	0	LARVA	.008	UNKNOWN
34	INSECTA	DIPTERA	UNKNOWN	2	2	0.4	2	0	1	0	0	ADULT	.060	UNKNOWN
35	INSECTA	DIPTERA	UNKNOWN	2	2	0.8	1	1	0	0	0	ADULT	.060	UNKNOWN
36	INSECTA	DIPTERA	UNKNOWN	2	2	0.8	2	1	0	0	0	PUPA	.105	UNKNOWN
37	INSECTA	DIPTERA	UNKNOWN	2	2	1.2	1	0	0	1	0	LARVA	.008	UNKNOWN
38	INSECTA	DIPTERA	UNKNOWN	2	2	2.0	2	11	6	6	0	LARVA	.008	UNKNOWN
39	INSECTA	DIPTERA	UNKNOWN	3	1	1.2	2	1	0	0	0	PUPA	.105	UNKNOWN
40	INSECTA	DIPTERA	UNKNOWN	3	1	21.0	2	0	0	0	1	LARVA	.008	UNKNOWN
41	INSECTA	DIPTERA	UNKNOWN	3	2	0.4	1	0	0	0	1	ADULT	.060	UNKNOWN
42	INSECTA	DIPTERA	UNKNOWN	3	2	1.2	1	0	0	1	0	LARVA	.008	UNKNOWN
43	INSECTA	DIPTERA	UNKNOWN	3	2	1.2	2	1	0	0	0	LARVA	.008	UNKNOWN
44	INSECTA	DIPTERA	UNKNOWN	3	2	2.0	1	0	0	0	1	ADULT	.060	UNKNOWN
45	INSECTA	DIPTERA	UNKNOWN	3	2	2.0	2	0	2	1	0	ADULT	.060	UNKNOWN
46	INSECTA	DIPTERA	UNKNOWN	3	2	2.0	2	0	0	2	0	LARVA	.008	UNKNOWN
47	INSECTA	DIPTERA	UNKNOWN	4	1	0.4	1	1	0	0	0	ADULT	.060	UNKNOWN
48	INSECTA	DIPTERA	UNKNOWN	4	1	1.2	2	1	0	0	0	LARVA	.008	UNKNOWN
49	INSECTA	DIPTERA	UNKNOWN	4	1	21.0	2	0	1	0	0	LARVA	.008	UNKNOWN
50	INSECTA	DIPTERA	UNKNOWN	4	2	0.8	2	0	5	2	0	LARVA	.008	UNKNOWN
51	INSECTA	DIPTERA	UNKNOWN	4	2	0.8	2	0	1	0	0	PUPA	.105	UNKNOWN
52	INSECTA	DIPTERA	UNKNOWN	4	2	1.2	1	1	0	0	0	LARVA	.008	UNKNOWN
53	INSECTA	DIPTERA	UNKNOWN	4	2	1.2	2	2	7	0	0	LARVA	.008	UNKNOWN
54	INSECTA	DIPTERA	UNKNOWN	4	2	2.0	1	0	1	0	0	LARVA	.008	UNKNOWN
55	INSECTA	DIPTERA	UNKNOWN	4	2	2.0	2	0	28	0	0	LARVA	.008	UNKNOWN

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
56	INSECTA	DIPTERA	UNKNOWN	4	4	1.2	1	1	0	0	1	ADULT	0.060	UNKNOWN
57	INSECTA	DIPTERA	MUSCIDAE	4	1	21.0	2	2	0	0	0	LARVA	0.105	DETRITIV
58	INSECTA	DIPTERA	PHORIDAE	2	1	0.4	2	1	1	0	0	ADULT	0.038	DETRITIV
59	INSECTA	DIPTERA	PHORIDAE	2	2	0.4	1	0	0	1	0	ADULT	0.038	DETRITIV
60	INSECTA	DIPTERA	PHORIDAE	3	1	0.4	1	5	1	1	10	ADULT	0.038	DETRITIV
61	INSECTA	DIPTERA	PHORIDAE	3	1	0.4	2	1	0	1	2	ADULT	0.038	DETRITIV
62	INSECTA	DIPTERA	PHORIDAE	3	1	1.2	1	1	2	1	3	ADULT	0.038	DETRITIV
63	INSECTA	DIPTERA	PHORIDAE	3	1	1.2	2	1	1	0	0	ADULT	0.038	DETRITIV
64	INSECTA	DIPTERA	PHORIDAE	3	1	1.6	1	1	0	1	1	ADULT	0.038	DETRITIV
65	INSECTA	DIPTERA	PHORIDAE	3	1	1.6	2	0	3	0	0	ADULT	0.038	DETRITIV
66	INSECTA	DIPTERA	PHORIDAE	3	1	21.0	1	0	0	0	1	ADULT	0.038	DETRITIV
67	INSECTA	DIPTERA	PHORIDAE	3	1	21.0	2	0	0	0	4	ADULT	0.038	DETRITIV
68	INSECTA	DIPTERA	PHORIDAE	3	2	0.4	1	7	1	0	3	ADULT	0.038	DETRITIV
69	INSECTA	DIPTERA	PHORIDAE	3	2	0.4	2	0	1	1	2	ADULT	0.038	DETRITIV
70	INSECTA	DIPTERA	PHORIDAE	3	2	0.8	1	0	1	10	0	ADULT	0.038	DETRITIV
71	INSECTA	DIPTERA	PHORIDAE	3	2	0.8	2	0	0	3	2	ADULT	0.038	DETRITIV
72	INSECTA	DIPTERA	PHORIDAE	3	2	1.2	1	2	1	3	2	ADULT	0.038	DETRITIV
73	INSECTA	DIPTERA	PHORIDAE	3	2	1.2	2	0	0	1	0	ADULT	0.038	DETRITIV
74	INSECTA	DIPTERA	PHORIDAE	3	2	2.0	1	0	1	1	0	ADULT	0.038	DETRITIV
75	INSECTA	DIPTERA	PHORIDAE	3	4	0.4	1	0	0	0	2	ADULT	0.038	DETRITIV
76	INSECTA	DIPTERA	PHORIDAE	3	4	1.2	1	2	0	1	0	ADULT	0.038	DETRITIV
77	INSECTA	DIPTERA	PHORIDAE	3	4	1.2	2	1	0	0	0	ADULT	0.038	DETRITIV
78	INSECTA	DIPTERA	PHORIDAE	4	4	0.8	2	0	0	1	0	ADULT	0.038	DETRITIV
79	INSECTA	DIPTERA	SCIARIDAE	1	1	1.2	1	0	0	1	0	LARVA	0.021	FUNGIVOR
80	INSECTA	DIPTERA	SCIARIDAE	1	1	1.2	2	1	0	1	0	LARVA	0.021	FUNGIVOR
81	INSECTA	DIPTERA	SCIARIDAE	1	1	1.6	2	0	0	2	0	LARVA	0.021	FUNGIVOR
82	INSECTA	DIPTERA	SCIARIDAE	1	1	21.0	2	1	2	19	7	LARVA	0.021	FUNGIVOR
83	INSECTA	DIPTERA	SCIARIDAE	1	2	0.4	1	0	4	0	0	LARVA	0.021	FUNGIVOR
84	INSECTA	DIPTERA	SCIARIDAE	1	2	0.8	1	0	0	1	3	LARVA	0.021	FUNGIVOR
85	INSECTA	DIPTERA	SCIARIDAE	1	2	0.8	2	8	13	10	0	LARVA	0.021	FUNGIVOR
86	INSECTA	DIPTERA	SCIARIDAE	1	2	1.2	1	0	0	1	3	LARVA	0.021	FUNGIVOR
87	INSECTA	DIPTERA	SCIARIDAE	1	2	1.2	2	5	0	12	0	LARVA	0.021	FUNGIVOR
88	INSECTA	DIPTERA	SCIARIDAE	1	2	2.0	1	0	1	0	0	LARVA	0.021	FUNGIVOR
89	INSECTA	DIPTERA	SCIARIDAE	1	2	2.0	2	0	10	3	1	LARVA	0.021	FUNGIVOR
90	INSECTA	DIPTERA	SCIARIDAE	1	4	1.2	2	2	1	0	0	LARVA	0.021	FUNGIVOR
91	INSECTA	DIPTERA	SCIARIDAE	2	1	21.0	2	0	0	2	0	ADULT	0.050	UNKNOWN
92	INSECTA	DIPTERA	SCIARIDAE	2	2	0.4	2	0	1	0	0	LARVA	0.021	FUNGIVOR
93	INSECTA	DIPTERA	SCIARIDAE	2	2	1.2	1	0	0	0	1	ADULT	0.050	UNKNOWN
94	INSECTA	DIPTERA	SCIARIDAE	2	2	2.0	2	0	0	2	0	ADULT	0.050	UNKNOWN
95	INSECTA	DIPTERA	SCIARIDAE	3	1	21.0	2	0	0	3	0	ADULT	0.050	UNKNOWN
96	INSECTA	DIPTERA	SCIARIDAE	3	2	0.4	2	0	1	0	0	LARVA	0.021	FUNGIVOR
97	INSECTA	DIPTERA	SCIARIDAE	3	2	0.8	2	3	0	0	0	LARVA	0.021	FUNGIVOR
98	INSECTA	DIPTERA	SCIARIDAE	3	2	1.2	1	0	0	6	0	LARVA	0.021	FUNGIVOR
99	INSECTA	DIPTERA	SCIARIDAE	3	2	1.2	2	0	0	0	3	LARVA	0.021	FUNGIVOR
100	INSECTA	DIPTERA	SCIARIDAE	3	2	2.0	2	0	3	0	0	ADULT	0.050	UNKNOWN
101	INSECTA	DIPTERA	SCIARIDAE	3	2	2.0	2	1	0	3	1	LARVA	0.021	FUNGIVOR
102	INSECTA	DIPTERA	SCIARIDAE	4	1	21.0	2	0	1	0	0	LARVA	0.021	FUNGIVOR
103	INSECTA	DIPTERA	SCIARIDAE	4	2	0.8	1	0	0	0	1	LARVA	0.021	FUNGIVOR
104	INSECTA	DIPTERA	SCIARIDAE	4	2	0.8	2	0	0	2	3	LARVA	0.021	FUNGIVOR
105	INSECTA	DIPTERA	SCIARIDAE	4	2	1.2	1	0	0	3	1	LARVA	0.021	FUNGIVOR
106	INSECTA	DIPTERA	SCIARIDAE	4	2	1.2	2	2	1	1	1	LARVA	0.021	FUNGIVOR
107	INSECTA	DIPTERA	SCIARIDAE	4	2	2.0	1	6	0	0	0	LARVA	0.021	FUNGIVOR
108	INSECTA	DIPTERA	SCIARIDAE	4	2	2.0	2	1	19	8	0	LARVA	0.021	FUNGIVOR
109	INSECTA	DIPTERA	SCIARIDAE	4	4	0.4	2	1	0	0	0	LARVA	0.021	FUNGIVOR
110	INSECTA	DIPTERA	SCIARIDAE	4	4	1.2	2	4	0	0	0	LARVA	0.021	FUNGIVOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
111	INSECTA	DIPTERA	SYRPHIDAE	1	1	21.0	2	0	1	0	0	LARVA	7.317	DETRITIV
112	INSECTA	DIPTERA	SYRPHIDAE	1	2	0.8	2	0	0	1	0	LARVA	7.317	DETRITIV
113	INSECTA	DIPTERA	SYRPHIDAE	1	4	1.2	2	0	0	1	0	LARVA	7.317	DETRITIV
114	INSECTA	DIPTERA	SYRPHIDAE	2	2	2.0	1	1	0	0	0	LARVA	7.317	DETRITIV
115	INSECTA	DIPTERA	SYRPHIDAE	3	4	1.2	2	0	0	1	0	LARVA	7.317	DETRITIV
116	INSECTA	DIPTERA	TIPULIDAE	1	1	21.0	2	0	1	0	0	LARVA	24.033	DETRITIV
117	INSECTA	DIPTERA	TIPULIDAE	1	2	2.0	2	1	1	1	0	LARVA	24.033	DETRITIV
118	INSECTA	DIPTERA	TIPULIDAE	1	4	1.2	2	1	0	0	0	LARVA	24.033	DETRITIV
119	INSECTA	DIPTERA	TIPULIDAE	2	1	0.4	2	0	1	0	1	ADULT	0.042	UNKNOWN
120	INSECTA	DIPTERA	TIPULIDAE	2	1	0.4	2	0	0	0	1	LARVA	24.033	DETRITIV
121	INSECTA	DIPTERA	TIPULIDAE	2	1	0.8	1	0	0	0	1	ADULT	0.042	UNKNOWN
122	INSECTA	DIPTERA	TIPULIDAE	2	1	0.8	2	0	0	0	1	ADULT	0.042	UNKNOWN
123	INSECTA	DIPTERA	TIPULIDAE	2	1	1.2	1	1	0	0	0	ADULT	0.042	UNKNOWN
124	INSECTA	DIPTERA	TIPULIDAE	2	1	1.6	2	0	1	0	0	LARVA	24.033	DETRITIV
125	INSECTA	DIPTERA	TIPULIDAE	2	1	21.0	1	0	0	1	0	ADULT	0.042	UNKNOWN
126	INSECTA	DIPTERA	TIPULIDAE	2	1	21.0	2	0	1	0	0	ADULT	0.042	UNKNOWN
127	INSECTA	DIPTERA	TIPULIDAE	3	1	1.2	2	1	0	0	0	ADULT	0.042	UNKNOWN
128	INSECTA	DIPTERA	TIPULIDAE	3	2	0.4	1	0	0	1	0	ADULT	0.042	UNKNOWN
129	INSECTA	DIPTERA	TIPULIDAE	3	2	0.4	2	0	0	1	0	ADULT	0.042	UNKNOWN
130	INSECTA	DIPTERA	TIPULIDAE	3	2	1.2	1	0	2	0	0	ADULT	0.042	UNKNOWN
131	INSECTA	DIPTERA	TIPULIDAE	3	2	2.0	1	0	0	1	0	ADULT	0.042	UNKNOWN
132	INSECTA	DIPTERA	TIPULIDAE	4	1	1.2	2	0	0	1	0	LARVA	24.033	DETRITIV
133	INSECTA	DIPTERA	TIPULIDAE	4	1	1.6	1	0	0	2	0	LARVA	24.033	DETRITIV
134	INSECTA	DIPTERA	TIPULIDAE	4	2	2.0	2	0	1	0	0	LARVA	24.033	DETRITIV
135	INSECTA	DIPTERA	TIPULIDAE	4	4	0.4	2	0	1	0	0	LARVA	24.033	DETRITIV
136	INSECTA	DIPTERA	BIBIONIDAE	2	1	1.2	2	83	0	0	0	LARVA	0.357	LITTGRAZ
137	INSECTA	DIPTERA	PSYCHODIDAE	1	4	1.2	1	0	0	0	1	ADULT	0.140	UNKNOWN
138	INSECTA	DIPTERA	PSYCHODIDAE	2	1	0.4	1	0	0	1	0	ADULT	0.140	UNKNOWN
139	INSECTA	DIPTERA	PSYCHODIDAE	2	1	0.8	1	1	0	0	0	ADULT	0.140	UNKNOWN
140	INSECTA	DIPTERA	PSYCHODIDAE	2	1	1.2	1	0	0	2	0	ADULT	0.140	UNKNOWN
141	INSECTA	DIPTERA	PSYCHODIDAE	2	1	1.2	2	1	0	0	0	ADULT	0.140	UNKNOWN
142	INSECTA	DIPTERA	PSYCHODIDAE	2	1	1.6	2	0	0	1	0	ADULT	0.140	UNKNOWN
143	INSECTA	DIPTERA	PSYCHODIDAE	2	1	21.0	1	0	0	1	0	ADULT	0.140	UNKNOWN
144	INSECTA	DIPTERA	PSYCHODIDAE	2	1	21.0	2	0	0	1	0	ADULT	0.140	UNKNOWN
145	INSECTA	DIPTERA	PSYCHODIDAE	2	2	0.4	1	0	0	3	0	ADULT	0.140	UNKNOWN
146	INSECTA	DIPTERA	PSYCHODIDAE	2	2	0.8	2	0	0	1	0	ADULT	0.140	UNKNOWN
147	INSECTA	DIPTERA	PSYCHODIDAE	2	2	2.0	1	0	1	0	0	ADULT	0.140	UNKNOWN
148	INSECTA	DIPTERA	PSYCHODIDAE	2	4	0.4	1	0	0	0	2	ADULT	0.140	UNKNOWN
149	INSECTA	DIPTERA	PSYCHODIDAE	2	4	0.8	1	1	0	0	1	ADULT	0.140	UNKNOWN
150	INSECTA	DIPTERA	PSYCHODIDAE	2	4	1.2	1	0	0	0	1	ADULT	0.140	UNKNOWN
151	INSECTA	DIPTERA	PSYCHODIDAE	2	4	1.2	2	0	1	0	0	ADULT	0.140	UNKNOWN
152	INSECTA	DIPTERA	PSYCHODIDAE	3	1	0.4	1	1	0	0	0	ADULT	0.140	UNKNOWN
153	INSECTA	DIPTERA	PSYCHODIDAE	3	1	1.6	2	0	1	0	0	ADULT	0.140	UNKNOWN
154	INSECTA	DIPTERA	PSYCHODIDAE	3	1	21.0	2	1	0	0	0	ADULT	0.140	UNKNOWN
155	INSECTA	DIPTERA	PSYCHODIDAE	3	2	1.2	1	0	1	0	0	ADULT	0.140	UNKNOWN
156	INSECTA	DIPTERA	PSYCHODIDAE	3	4	0.4	1	0	0	0	1	ADULT	0.140	UNKNOWN
157	INSECTA	DIPTERA	PSYCHODIDAE	3	4	0.8	2	1	0	0	0	ADULT	0.140	UNKNOWN
158	INSECTA	DIPTERA	PSYCHODIDAE	4	1	0.4	1	1	1	0	0	ADULT	0.140	UNKNOWN
159	INSECTA	DIPTERA	PSYCHODIDAE	4	1	1.6	2	0	1	0	1	ADULT	0.140	UNKNOWN
160	INSECTA	DIPTERA	PSYCHODIDAE	4	4	1.2	2	0	1	0	0	ADULT	0.140	UNKNOWN
161	INSECTA	DIPTERA	RHAGIONIDAE	1	2	0.4	1	0	0	1	0	LARVA	0.010	PREDATOR
162	INSECTA	DIPTERA	RHAGIONIDAE	2	2	1.2	1	0	1	0	0	LARVA	0.010	PREDATOR
163	INSECTA	DIPTERA	SCATOPSIDAE	1	2	2.0	1	1	0	0	0	LARVA	0.422	FUNGIVOR
164	INSECTA	DIPTERA	SCATOPSIDAE	4	1	1.2	2	0	0	0	16	LARVA	0.422	FUNGIVOR
165	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	0.8	1	0	1	0	0	ADULT	0.102	UNKNOWN

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
166	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	0.8	1	0	1	1	0	LARVA	.111	LITTGRAZ
167	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	0.8	2	1	1	3	1	ADULT	.102	UNKNOWN
168	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	0.8	2	0	0	3	0	LARVA	.111	LITTGRAZ
169	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	1.2	1	0	0	0	1	ADULT	.102	UNKNOWN
170	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	1.2	1	0	0	1	0	LARVA	.111	LITTGRAZ
171	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	1.2	2	2	1	1	11	ADULT	.102	UNKNOWN
172	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	1.2	2	2	8	6	0	LARVA	.111	LITTGRAZ
173	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	1.6	2	1	1	3	4	ADULT	.102	UNKNOWN
174	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	1.6	2	8	40	15	5	LARVA	.111	LITTGRAZ
175	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	21.0	1	0	0	1	0	ADULT	.102	UNKNOWN
176	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	21.0	2	0	2	3	4	ADULT	.102	UNKNOWN
177	INSECTA	DIPTERA	CECIDOMYIDAE	1	1	21.0	2	8	1	0	1	LARVA	.111	LITTGRAZ
178	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	0.4	1	2	0	0	0	ADULT	.102	UNKNOWN
179	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	0.8	1	1	1	8	4	ADULT	.102	UNKNOWN
180	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	0.8	1	0	0	2	4	LARVA	.111	LITTGRAZ
181	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	0.8	2	4	3	13	0	ADULT	.102	UNKNOWN
182	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	0.8	2	0	5	6	0	LARVA	.111	LITTGRAZ
183	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	1.2	1	0	0	0	1	ADULT	.102	UNKNOWN
184	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	1.2	1	0	4	3	17	LARVA	.111	LITTGRAZ
185	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	1.2	2	0	1	0	0	ADULT	.102	UNKNOWN
186	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	1.2	2	11	23	10	1	LARVA	.111	LITTGRAZ
187	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	2.0	1	0	1	1	1	ADULT	.102	UNKNOWN
188	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	2.0	1	0	0	4	0	LARVA	.111	LITTGRAZ
189	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	2.0	2	3	1	3	2	ADULT	.102	UNKNOWN
190	INSECTA	DIPTERA	CECIDOMYIDAE	1	2	2.0	2	11	7	7	20	LARVA	.111	LITTGRAZ
191	INSECTA	DIPTERA	CECIDOMYIDAE	1	4	0.4	2	0	1	0	0	ADULT	.102	UNKNOWN
192	INSECTA	DIPTERA	CECIDOMYIDAE	1	4	0.8	2	0	1	0	1	LARVA	.111	LITTGRAZ
193	INSECTA	DIPTERA	CECIDOMYIDAE	1	4	1.2	1	1	0	0	2	LARVA	.111	LITTGRAZ
194	INSECTA	DIPTERA	CECIDOMYIDAE	1	4	1.2	2	2	1	1	0	ADULT	.102	UNKNOWN
195	INSECTA	DIPTERA	CECIDOMYIDAE	1	4	1.2	2	6	4	0	5	LARVA	.111	LITTGRAZ
196	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	0.4	1	0	0	0	1	ADULT	.102	UNKNOWN
197	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	0.8	1	2	0	3	0	ADULT	.102	UNKNOWN
198	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	0.8	2	0	0	3	0	ADULT	.102	UNKNOWN
199	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	0.8	2	0	0	1	0	LARVA	.111	LITTGRAZ
200	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	1.2	1	4	4	4	3	ADULT	.102	UNKNOWN
201	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	1.2	2	2	1	4	1	ADULT	.102	UNKNOWN
202	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	1.2	2	0	4	0	1	LARVA	.111	LITTGRAZ
203	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	1.6	2	2	0	2	5	ADULT	.102	UNKNOWN
204	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	1.6	2	0	0	0	2	LARVA	.111	LITTGRAZ
205	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	21.0	1	2	2	0	0	ADULT	.102	UNKNOWN
206	INSECTA	DIPTERA	CECIDOMYIDAE	2	1	21.0	2	1	0	0	0	ADULT	.102	UNKNOWN
207	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	0.4	1	0	0	1	1	ADULT	.102	UNKNOWN
208	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	0.4	2	0	4	2	0	LARVA	.111	LITTGRAZ
209	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	0.8	1	0	0	1	0	ADULT	.102	UNKNOWN
210	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	0.8	1	0	0	1	0	LARVA	.111	LITTGRAZ
211	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	0.8	2	0	0	0	1	ADULT	.102	UNKNOWN
212	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	1.2	1	0	0	1	0	ADULT	.102	UNKNOWN
213	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	1.2	2	4	3	0	2	LARVA	.111	LITTGRAZ
214	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	2.0	1	1	2	0	1	ADULT	.102	UNKNOWN
215	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	2.0	1	1	0	0	0	LARVA	.111	LITTGRAZ
216	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	2.0	2	1	5	0	2	ADULT	.102	UNKNOWN
217	INSECTA	DIPTERA	CECIDOMYIDAE	2	2	2.0	2	3	0	5	0	LARVA	.111	LITTGRAZ
218	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	0.4	1	0	1	0	0	ADULT	.102	UNKNOWN
219	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	0.4	2	0	0	0	3	LARVA	.111	LITTGRAZ
220	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	0.8	1	0	2	0	1	ADULT	.102	UNKNOWN

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	WGHT	TROFLEVL
221	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	0.8	1	0	0	5	0	LARVA	.111	LITTGRAZ
222	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	0.8	2	2	0	0	0	ADULT	.102	UNKNOWN
223	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	1.2	1	2	0	2	1	ADULT	.102	UNKNOWN
224	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	1.2	1	0	0	2	0	LARVA	.111	LITTGRAZ
225	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	1.2	2	3	0	0	0	ADULT	.102	UNKNOWN
226	INSECTA	DIPTERA	CECIDOMYIDAE	2	4	1.2	2	0	13	2	1	LARVA	.111	LITTGRAZ
227	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	0.4	1	0	1	0	1	ADULT	.102	UNKNOWN
228	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	0.4	2	1	0	0	0	ADULT	.102	UNKNOWN
229	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	0.8	1	1	1	4	0	ADULT	.102	UNKNOWN
230	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	0.8	2	1	1	0	0	ADULT	.102	UNKNOWN
231	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	0.8	2	0	0	0	3	LARVA	.111	LITTGRAZ
232	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	1.2	1	0	0	1	0	ADULT	.102	UNKNOWN
233	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	1.2	2	1	0	2	6	ADULT	.102	UNKNOWN
234	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	1.6	1	0	0	2	1	ADULT	.102	UNKNOWN
235	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	1.6	1	0	0	2	0	LARVA	.111	LITTGRAZ
236	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	1.6	2	2	0	0	0	ADULT	.102	UNKNOWN
237	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	21.0	1	0	0	1	1	ADULT	.102	UNKNOWN
238	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	21.0	2	1	0	1	1	ADULT	.102	UNKNOWN
239	INSECTA	DIPTERA	CECIDOMYIDAE	3	1	21.0	2	1	0	1	1	LARVA	.111	LITTGRAZ
240	INSECTA	DIPTERA	CECIDOMYIDAE	3	2	0.4	2	1	0	0	2	LARVA	.111	LITTGRAZ
241	INSECTA	DIPTERA	CECIDOMYIDAE	3	2	1.2	1	0	1	0	0	LARVA	.111	LITTGRAZ
242	INSECTA	DIPTERA	CECIDOMYIDAE	3	2	1.2	2	1	0	0	0	LARVA	.111	LITTGRAZ
243	INSECTA	DIPTERA	CECIDOMYIDAE	3	2	2.0	1	0	1	0	0	ADULT	.102	UNKNOWN
244	INSECTA	DIPTERA	CECIDOMYIDAE	3	2	2.0	2	0	0	0	1	ADULT	.102	UNKNOWN
245	INSECTA	DIPTERA	CECIDOMYIDAE	3	2	2.0	2	0	0	3	1	LARVA	.111	LITTGRAZ
246	INSECTA	DIPTERA	CECIDOMYIDAE	3	4	0.4	1	1	0	1	1	ADULT	.102	UNKNOWN
247	INSECTA	DIPTERA	CECIDOMYIDAE	3	4	0.8	1	2	4	3	6	ADULT	.102	UNKNOWN
248	INSECTA	DIPTERA	CECIDOMYIDAE	3	4	0.8	2	2	0	1	0	ADULT	.102	UNKNOWN
249	INSECTA	DIPTERA	CECIDOMYIDAE	3	4	1.2	1	0	1	0	2	ADULT	.102	UNKNOWN
250	INSECTA	DIPTERA	CECIDOMYIDAE	3	4	1.2	2	0	0	2	1	ADULT	.102	UNKNOWN
251	INSECTA	DIPTERA	CECIDOMYIDAE	3	4	1.2	2	5	0	0	0	LARVA	.111	LITTGRAZ
252	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	0.4	1	0	1	1	0	LARVA	.111	LITTGRAZ
253	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	0.4	2	1	0	0	0	LARVA	.111	LITTGRAZ
254	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	0.8	1	3	0	1	2	LARVA	.111	LITTGRAZ
255	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	0.8	2	2	0	0	1	LARVA	.111	LITTGRAZ
256	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	1.2	1	0	0	4	1	LARVA	.111	LITTGRAZ
257	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	1.2	2	1	1	37	0	LARVA	.111	LITTGRAZ
258	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	1.6	1	0	0	1	1	LARVA	.111	LITTGRAZ
259	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	1.6	2	3	11	5	0	LARVA	.111	LITTGRAZ
260	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	21.0	1	1	0	2	2	LARVA	.111	LITTGRAZ
261	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	21.0	2	1	0	0	0	ADULT	.102	UNKNOWN
262	INSECTA	DIPTERA	CECIDOMYIDAE	4	1	21.0	2	8	5	21	5	LARVA	.111	LITTGRAZ
263	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	0.8	1	0	0	1	1	LARVA	.111	LITTGRAZ
264	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	0.8	2	2	0	4	4	LARVA	.111	LITTGRAZ
265	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	1.2	1	3	4	2	4	LARVA	.111	LITTGRAZ
266	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	1.2	2	30	0	6	29	LARVA	.111	LITTGRAZ
267	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	2.0	1	0	0	0	3	LARVA	.111	LITTGRAZ
268	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	2.0	2	1	0	1	0	ADULT	.102	UNKNOWN
269	INSECTA	DIPTERA	CECIDOMYIDAE	4	2	2.0	2	14	11	46	24	LARVA	.111	LITTGRAZ
270	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	0.4	1	1	0	0	0	ADULT	.102	UNKNOWN
271	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	0.4	2	0	0	0	4	ADULT	.102	UNKNOWN
272	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	0.4	2	7	0	0	0	LARVA	.111	LITTGRAZ
273	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	0.8	1	3	0	9	0	LARVA	.111	LITTGRAZ
274	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	0.8	2	1	0	9	0	LARVA	.111	LITTGRAZ
275	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	1.2	1	0	1	0	0	LARVA	.111	LITTGRAZ

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
276	INSECTA	DIPTERA	CECIDOMYIDAE	4	4	1.2	2	3	4	7	3	LARVA	0.111	LITTGRAZ
277	INSECTA	DIPTERA	CHIRONOMIDAE	1	1	1.6	1	0	0	0	1	ADULT	0.035	UNKNOWN
278	INSECTA	DIPTERA	CHIRONOMIDAE	1	4	0.4	1	0	1	0	0	ADULT	0.035	UNKNOWN
279	INSECTA	DIPTERA	CHIRONOMIDAE	1	4	1.2	2	0	0	0	1	ADULT	0.035	UNKNOWN
280	INSECTA	DIPTERA	CHIRONOMIDAE	2	1	0.8	1	0	0	2	0	ADULT	0.035	UNKNOWN
281	INSECTA	DIPTERA	CHIRONOMIDAE	2	1	0.8	2	0	0	1	0	ADULT	0.035	UNKNOWN
282	INSECTA	DIPTERA	CHIRONOMIDAE	2	1	1.2	1	0	0	0	1	ADULT	0.035	UNKNOWN
283	INSECTA	DIPTERA	CHIRONOMIDAE	2	2	2.0	1	0	0	0	2	ADULT	0.035	UNKNOWN
284	INSECTA	DIPTERA	CHIRONOMIDAE	2	4	0.8	1	0	0	1	0	ADULT	0.035	UNKNOWN
285	INSECTA	DIPTERA	CHIRONOMIDAE	2	4	1.2	1	0	1	0	0	ADULT	0.035	UNKNOWN
286	INSECTA	DIPTERA	CHIRONOMIDAE	2	4	1.2	2	0	0	1	0	ADULT	0.035	UNKNOWN
287	INSECTA	DIPTERA	CHIRONOMIDAE	3	1	0.8	1	1	1	0	0	ADULT	0.035	UNKNOWN
288	INSECTA	DIPTERA	CHIRONOMIDAE	3	1	0.8	2	0	0	0	1	ADULT	0.035	UNKNOWN
289	INSECTA	DIPTERA	CHIRONOMIDAE	3	1	1.6	1	0	0	1	0	ADULT	0.035	UNKNOWN
290	INSECTA	DIPTERA	CHIRONOMIDAE	3	1	1.6	2	1	0	0	0	ADULT	0.035	UNKNOWN
291	INSECTA	DIPTERA	CHIRONOMIDAE	3	2	0.4	1	0	0	0	1	ADULT	0.035	UNKNOWN
292	INSECTA	DIPTERA	CHIRONOMIDAE	3	2	0.8	1	0	1	1	1	ADULT	0.035	UNKNOWN
293	INSECTA	DIPTERA	CHIRONOMIDAE	3	2	0.8	2	1	0	1	0	ADULT	0.035	UNKNOWN
294	INSECTA	DIPTERA	CHIRONOMIDAE	3	2	1.2	1	1	0	0	0	ADULT	0.035	UNKNOWN
295	INSECTA	DIPTERA	CHIRONOMIDAE	3	4	0.8	1	1	0	0	0	ADULT	0.035	UNKNOWN
296	INSECTA	DIPTERA	CHIRONOMIDAE	3	4	0.8	2	0	0	0	1	ADULT	0.035	UNKNOWN
297	INSECTA	DIPTERA	CHIRONOMIDAE	3	4	1.2	1	2	0	0	0	ADULT	0.035	UNKNOWN
298	INSECTA	DIPTERA	CHIRONOMIDAE	3	4	1.2	2	1	0	0	1	ADULT	0.035	UNKNOWN
299	INSECTA	DIPTERA	CHIRONOMIDAE	4	1	1.2	1	1	0	1	0	ADULT	0.035	UNKNOWN
300	INSECTA	DIPTERA	CHIRONOMIDAE	4	1	1.6	2	0	1	0	0	ADULT	0.035	UNKNOWN
301	INSECTA	DIPTERA	CHIRONOMIDAE	4	1	21.0	2	0	0	1	0	ADULT	0.035	UNKNOWN
302	INSECTA	DIPTERA	DROSOPHILIDAE	1	1	1.2	2	0	1	0	1	LARVA	0.020	FUNGIVOR
303	INSECTA	DIPTERA	SARCOPHAGIDAE	4	1	0.4	2	0	0	0	1	ADULT	6.475	DETRITIV
304	INSECTA	DIPTERA	SARCOPHAGIDAE	4	2	0.8	2	0	1	0	0	ADULT	6.475	DETRITIV
305	INSECTA	DIPTERA	STRATIOMYIDAE	1	1	0.4	2	0	2	0	0	LARVA	0.026	DETRITIV
306	INSECTA	DIPTERA	STRATIOMYIDAE	1	1	1.2	1	0	1	0	0	LARVA	0.026	DETRITIV
307	INSECTA	DIPTERA	STRATIOMYIDAE	1	1	1.2	2	7	3	10	3	LARVA	0.026	DETRITIV
308	INSECTA	DIPTERA	STRATIOMYIDAE	1	1	1.6	2	4	0	0	3	LARVA	0.026	DETRITIV
309	INSECTA	DIPTERA	STRATIOMYIDAE	1	1	21.0	2	1	6	5	8	LARVA	0.026	DETRITIV
310	INSECTA	DIPTERA	STRATIOMYIDAE	1	2	1.2	2	0	0	0	1	LARVA	0.026	DETRITIV
311	INSECTA	DIPTERA	STRATIOMYIDAE	1	2	2.0	1	0	0	3	3	LARVA	0.026	DETRITIV
312	INSECTA	DIPTERA	STRATIOMYIDAE	1	2	2.0	2	3	5	0	0	LARVA	0.026	DETRITIV
313	INSECTA	DIPTERA	STRATIOMYIDAE	1	4	0.4	2	1	2	0	0	LARVA	0.026	DETRITIV
314	INSECTA	DIPTERA	STRATIOMYIDAE	1	4	0.8	2	1	0	2	1	LARVA	0.026	DETRITIV
315	INSECTA	DIPTERA	STRATIOMYIDAE	1	4	1.2	2	0	0	1	0	LARVA	0.026	DETRITIV
316	INSECTA	DIPTERA	STRATIOMYIDAE	2	1	0.8	2	2	2	0	0	LARVA	0.026	DETRITIV
317	INSECTA	DIPTERA	STRATIOMYIDAE	2	1	1.2	2	0	3	3	2	LARVA	0.026	DETRITIV
318	INSECTA	DIPTERA	STRATIOMYIDAE	2	1	1.6	2	1	0	0	0	LARVA	0.026	DETRITIV
319	INSECTA	DIPTERA	STRATIOMYIDAE	2	1	21.0	1	0	0	1	0	LARVA	0.026	DETRITIV
320	INSECTA	DIPTERA	STRATIOMYIDAE	2	1	21.0	2	3	0	0	0	LARVA	0.026	DETRITIV
321	INSECTA	DIPTERA	STRATIOMYIDAE	2	2	0.8	1	0	0	1	0	LARVA	0.026	DETRITIV
322	INSECTA	DIPTERA	STRATIOMYIDAE	2	2	0.8	2	2	2	0	1	LARVA	0.026	DETRITIV
323	INSECTA	DIPTERA	STRATIOMYIDAE	2	2	1.2	2	0	0	0	10	LARVA	0.026	DETRITIV
324	INSECTA	DIPTERA	STRATIOMYIDAE	2	2	2.0	1	0	1	0	0	LARVA	0.026	DETRITIV
325	INSECTA	DIPTERA	STRATIOMYIDAE	2	2	2.0	2	2	2	0	0	LARVA	0.026	DETRITIV
326	INSECTA	DIPTERA	STRATIOMYIDAE	2	4	0.4	1	0	0	0	1	LARVA	0.026	DETRITIV
327	INSECTA	DIPTERA	STRATIOMYIDAE	2	4	0.8	2	0	2	0	0	LARVA	0.026	DETRITIV
328	INSECTA	DIPTERA	STRATIOMYIDAE	2	4	1.2	1	0	2	0	0	LARVA	0.026	DETRITIV
329	INSECTA	DIPTERA	STRATIOMYIDAE	3	1	0.4	2	0	0	2	0	LARVA	0.026	DETRITIV
330	INSECTA	DIPTERA	STRATIOMYIDAE	3	1	0.8	2	0	0	0	2	LARVA	0.026	DETRITIV

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
331	INSECTA	DIPTERA	STRATIOMYIDAE	3	1	1.6	2	2	2	0	0	LARVA	0.026	DETRITIV
332	INSECTA	DIPTERA	STRATIOMYIDAE	3	1	21.0	2	0	2	1	0	LARVA	0.026	DETRITIV
333	INSECTA	DIPTERA	STRATIOMYIDAE	3	2	1.2	2	0	0	1	8	LARVA	0.026	DETRITIV
334	INSECTA	DIPTERA	STRATIOMYIDAE	3	2	2.0	2	0	0	0	2	LARVA	0.026	DETRITIV
335	INSECTA	DIPTERA	STRATIOMYIDAE	3	4	1.2	2	2	0	0	0	LARVA	0.026	DETRITIV
336	INSECTA	DIPTERA	STRATIOMYIDAE	4	1	0.4	1	0	2	0	0	LARVA	0.026	DETRITIV
337	INSECTA	DIPTERA	STRATIOMYIDAE	4	1	0.4	2	4	0	4	0	LARVA	0.026	DETRITIV
338	INSECTA	DIPTERA	STRATIOMYIDAE	4	1	0.8	2	2	5	0	0	LARVA	0.026	DETRITIV
339	INSECTA	DIPTERA	STRATIOMYIDAE	4	1	1.2	2	0	2	0	6	LARVA	0.026	DETRITIV
340	INSECTA	DIPTERA	STRATIOMYIDAE	4	1	1.6	2	3	1	3	0	LARVA	0.026	DETRITIV
341	INSECTA	DIPTERA	STRATIOMYIDAE	4	1	21.0	2	5	4	5	10	LARVA	0.026	DETRITIV
342	INSECTA	DIPTERA	STRATIOMYIDAE	4	2	0.8	1	0	0	0	1	LARVA	0.026	DETRITIV
343	INSECTA	DIPTERA	STRATIOMYIDAE	4	2	0.8	2	2	0	1	3	LARVA	0.026	DETRITIV
344	INSECTA	DIPTERA	STRATIOMYIDAE	4	2	1.2	2	1	0	5	5	LARVA	0.026	DETRITIV
345	INSECTA	DIPTERA	STRATIOMYIDAE	4	2	2.0	1	0	0	1	0	LARVA	0.026	DETRITIV
346	INSECTA	DIPTERA	STRATIOMYIDAE	4	2	2.0	2	0	12	3	1	LARVA	0.026	DETRITIV
347	INSECTA	DIPTERA	STRATIOMYIDAE	4	4	1.2	2	1	0	0	0	LARVA	0.026	DETRITIV
348	INSECTA	DIPTERA	TRICHOCERIDAE	3	1	21.0	2	0	0	0	1	LARVA	3.650	DETRITIV
349	INSECTA	DIPTERA	TRICHOCERIDAE	4	1	21.0	2	1	0	0	0	LARVA	3.650	DETRITIV
350	INSECTA	DIPTERA	TRICHOCERIDAE	4	2	1.2	2	0	1	0	0	LARVA	3.650	DETRITIV
351	INSECTA	DIPTERA	DOLICHOPODIDAE	1	1	1.2	2	0	1	0	0	LARVA	0.120	PREDATOR
352	INSECTA	DIPTERA	DOLICHOPODIDAE	1	1	1.6	2	0	0	0	1	LARVA	0.120	PREDATOR
353	INSECTA	DIPTERA	DOLICHOPODIDAE	1	1	21.0	1	1	0	0	0	LARVA	0.120	PREDATOR
354	INSECTA	DIPTERA	DOLICHOPODIDAE	1	1	21.0	2	0	0	2	0	LARVA	0.120	PREDATOR
355	INSECTA	DIPTERA	DOLICHOPODIDAE	1	4	1.2	2	0	0	1	0	LARVA	0.120	PREDATOR
356	INSECTA	DIPTERA	DOLICHOPODIDAE	2	1	0.8	1	0	0	0	1	ADULT	0.330	PREDATOR
357	INSECTA	DIPTERA	DOLICHOPODIDAE	2	1	0.8	2	0	0	0	1	LARVA	0.120	PREDATOR
358	INSECTA	DIPTERA	DOLICHOPODIDAE	2	1	1.2	2	1	0	1	0	LARVA	0.120	PREDATOR
359	INSECTA	DIPTERA	DOLICHOPODIDAE	2	1	1.6	2	0	0	3	1	LARVA	0.120	PREDATOR
360	INSECTA	DIPTERA	DOLICHOPODIDAE	2	4	0.8	1	1	0	0	0	ADULT	0.330	PREDATOR
361	INSECTA	DIPTERA	DOLICHOPODIDAE	3	1	0.4	2	0	0	1	0	LARVA	0.120	PREDATOR
362	INSECTA	DIPTERA	DOLICHOPODIDAE	3	1	21.0	1	1	0	0	0	ADULT	0.330	PREDATOR
363	INSECTA	DIPTERA	DOLICHOPODIDAE	3	1	21.0	2	1	0	0	0	ADULT	0.330	PREDATOR
364	INSECTA	DIPTERA	DOLICHOPODIDAE	4	1	1.2	2	2	1	0	0	LARVA	0.120	PREDATOR
365	INSECTA	DIPTERA	DOLICHOPODIDAE	4	1	1.6	2	0	1	0	0	LARVA	0.120	PREDATOR
366	INSECTA	DIPTERA	DOLICHOPODIDAE	4	1	21.0	2	0	0	1	0	LARVA	0.120	PREDATOR
367	INSECTA	DIPTERA	DOLICHOPODIDAE	4	2	1.2	1	0	0	0	1	LARVA	0.120	PREDATOR
368	INSECTA	DIPTERA	DOLICHOPODIDAE	4	2	2.0	2	0	0	0	8	LARVA	0.120	PREDATOR
369	INSECTA	DIPTERA	DOLICHOPODIDAE	4	4	0.4	2	1	0	0	0	LARVA	0.120	PREDATOR
370	INSECTA	DIPTERA	DOLICHOPODIDAE	4	4	0.8	2	1	0	0	0	LARVA	0.120	PREDATOR
371	INSECTA	DIPTERA	DOLICHOPODIDAE	4	4	1.2	2	1	0	0	0	LARVA	0.120	PREDATOR
372	INSECTA	DIPTERA	MYCETOPHILIDAE	1	1	0.4	1	0	0	1	0	ADULT	0.049	UNKNOWN
373	INSECTA	DIPTERA	MYCETOPHILIDAE	1	1	0.8	1	0	0	0	1	ADULT	0.049	UNKNOWN
374	INSECTA	DIPTERA	MYCETOPHILIDAE	1	1	1.2	2	0	0	0	1	ADULT	0.049	UNKNOWN
375	INSECTA	DIPTERA	MYCETOPHILIDAE	1	1	1.6	1	0	0	0	1	ADULT	0.049	UNKNOWN
376	INSECTA	DIPTERA	MYCETOPHILIDAE	1	4	0.4	2	0	0	1	0	ADULT	0.049	UNKNOWN
377	INSECTA	DIPTERA	MYCETOPHILIDAE	1	4	0.8	1	0	0	0	2	ADULT	0.049	UNKNOWN
378	INSECTA	DIPTERA	MYCETOPHILIDAE	1	4	0.8	2	0	1	0	0	ADULT	0.049	UNKNOWN
379	INSECTA	DIPTERA	MYCETOPHILIDAE	1	4	1.2	1	0	0	0	1	ADULT	0.049	UNKNOWN
380	INSECTA	DIPTERA	MYCETOPHILIDAE	1	4	1.2	2	1	1	0	1	ADULT	0.049	UNKNOWN
381	INSECTA	DIPTERA	MYCETOPHILIDAE	2	1	0.4	1	0	2	1	0	ADULT	0.049	UNKNOWN
382	INSECTA	DIPTERA	MYCETOPHILIDAE	2	1	0.4	2	1	0	0	2	ADULT	0.049	UNKNOWN
383	INSECTA	DIPTERA	MYCETOPHILIDAE	2	1	0.8	1	1	1	0	1	ADULT	0.049	UNKNOWN
384	INSECTA	DIPTERA	MYCETOPHILIDAE	2	1	1.2	1	0	1	0	0	ADULT	0.049	UNKNOWN
385	INSECTA	DIPTERA	MYCETOPHILIDAE	2	1	1.6	1	1	1	1	2	ADULT	0.049	UNKNOWN

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	WGHT	TROFLEVL
386	INSECTA	DIPTERA	MYCETOPHILIDAE	2	1	1.6	2	1	0	1	0	ADULT	0.049	UNKNOWN
387	INSECTA	DIPTERA	MYCETOPHILIDAE	2	4	0.4	1	1	1	1	0	ADULT	0.049	UNKNOWN
388	INSECTA	DIPTERA	MYCETOPHILIDAE	2	4	0.4	2	0	1	0	0	ADULT	0.049	UNKNOWN
389	INSECTA	DIPTERA	MYCETOPHILIDAE	2	4	0.8	1	0	0	0	0	ADULT	0.049	UNKNOWN
390	INSECTA	DIPTERA	MYCETOPHILIDAE	2	4	1.2	1	0	0	1	2	ADULT	0.049	UNKNOWN
391	INSECTA	DIPTERA	MYCETOPHILIDAE	2	4	1.2	2	2	0	1	0	ADULT	0.049	UNKNOWN
392	INSECTA	DIPTERA	MYCETOPHILIDAE	3	1	1.6	2	0	0	1	0	ADULT	0.049	UNKNOWN
393	INSECTA	DIPTERA	CERATOPOGONIDAE	2	2	1.2	2	0	0	1	0	ADULT	0.058	PREDATOR
394	INSECTA	DIPTERA	CERATOPOGONIDAE	3	2	2.0	1	0	0	0	1	ADULT	0.058	PREDATOR
395	INSECTA	DIPTERA	CERATOPOGONIDAE	4	1	21.0	1	1	1	0	0	ADULT	0.058	PREDATOR
396	INSECTA	DIPTERA	CERATOPOGONIDAE	4	1	21.0	2	0	0	1	0	ADULT	0.058	PREDATOR
397	INSECTA	PROTURA	UNKNOWN	1	1	21.0	2	0	0	1	2	ADULT	0.008	DETRITIV
398	INSECTA	PROTURA	UNKNOWN	1	2	1.2	2	0	0	3	0	ADULT	0.008	DETRITIV
399	INSECTA	PROTURA	UNKNOWN	1	2	2.0	1	1	0	0	1	ADULT	0.008	DETRITIV
400	INSECTA	PROTURA	UNKNOWN	2	1	0.4	2	1	0	0	0	ADULT	0.008	DETRITIV
401	INSECTA	PROTURA	UNKNOWN	2	1	21.0	2	1	0	0	0	ADULT	0.008	DETRITIV
402	INSECTA	PROTURA	UNKNOWN	2	2	1.2	2	1	0	0	0	ADULT	0.008	DETRITIV
403	INSECTA	PROTURA	UNKNOWN	2	4	0.4	2	1	0	2	0	ADULT	0.008	DETRITIV
404	INSECTA	PROTURA	UNKNOWN	2	4	0.8	2	0	0	0	1	ADULT	0.008	DETRITIV
405	INSECTA	PROTURA	UNKNOWN	3	1	21.0	2	1	0	2	0	ADULT	0.008	DETRITIV
406	INSECTA	PROTURA	UNKNOWN	4	2	0.8	2	0	0	0	1	ADULT	0.008	DETRITIV
407	INSECTA	ISOPTERA	UNKNOWN	1	1	1.6	2	0	6	0	0	ADULT	0.302	DETRITIV
408	INSECTA	ISOPTERA	UNKNOWN	3	4	1.2	2	0	0	0	5	ADULT	0.302	DETRITIV
409	INSECTA	HEMIPTERA	ARADIDAE	3	4	1.2	2	0	0	0	1	ADULT	1.840	FUNGIVOR
410	INSECTA	HEMIPTERA	REDUVIDAE	1	1	1.6	2	0	0	0	1	ADULT	1.730	PREDATOR
411	INSECTA	HEMIPTERA	REDUVIDAE	1	2	1.2	2	0	0	0	1	ADULT	1.730	PREDATOR
412	INSECTA	HEMIPTERA	REDUVIDAE	2	4	0.4	2	0	0	0	1	ADULT	1.730	PREDATOR
413	INSECTA	HEMIPTERA	REDUVIDAE	2	4	1.2	2	0	0	1	0	ADULT	1.730	PREDATOR
414	INSECTA	HEMIPTERA	REDUVIDAE	4	1	0.8	2	0	1	0	0	ADULT	1.730	PREDATOR
415	INSECTA	HEMIPTERA	REDUVIDAE	4	4	0.8	2	0	2	0	0	ADULT	1.730	PREDATOR
416	INSECTA	COLEOPTERA	UNKNOWN	1	1	0.4	2	0	0	0	2	LARVA	0.035	UNKNOWN
417	INSECTA	COLEOPTERA	UNKNOWN	1	1	1.6	2	5	0	0	0	LARVA	0.035	UNKNOWN
418	INSECTA	COLEOPTERA	UNKNOWN	1	2	0.8	1	0	0	1	0	LARVA	0.035	UNKNOWN
419	INSECTA	COLEOPTERA	UNKNOWN	1	2	0.8	2	0	0	1	0	LARVA	0.035	UNKNOWN
420	INSECTA	COLEOPTERA	UNKNOWN	1	2	1.2	2	0	0	1	1	LARVA	0.035	UNKNOWN
421	INSECTA	COLEOPTERA	UNKNOWN	1	2	2.0	1	0	0	0	1	LARVA	0.035	UNKNOWN
422	INSECTA	COLEOPTERA	UNKNOWN	1	2	2.0	2	4	0	0	1	LARVA	0.035	UNKNOWN
423	INSECTA	COLEOPTERA	UNKNOWN	2	1	1.6	2	0	0	0	9	LARVA	0.035	UNKNOWN
424	INSECTA	COLEOPTERA	UNKNOWN	2	1	21.0	2	2	0	2	0	LARVA	0.035	UNKNOWN
425	INSECTA	COLEOPTERA	UNKNOWN	2	2	0.4	1	0	0	4	0	LARVA	0.035	UNKNOWN
426	INSECTA	COLEOPTERA	UNKNOWN	2	2	0.8	1	0	0	0	1	LARVA	0.035	UNKNOWN
427	INSECTA	COLEOPTERA	UNKNOWN	2	2	1.2	1	0	0	0	1	LARVA	0.035	UNKNOWN
428	INSECTA	COLEOPTERA	UNKNOWN	2	2	1.2	2	2	0	0	0	LARVA	0.035	UNKNOWN
429	INSECTA	COLEOPTERA	UNKNOWN	2	2	2.0	2	0	0	1	3	LARVA	0.035	UNKNOWN
430	INSECTA	COLEOPTERA	UNKNOWN	3	1	0.8	1	0	1	0	0	LARVA	0.035	UNKNOWN
431	INSECTA	COLEOPTERA	UNKNOWN	3	1	0.8	2	1	0	0	0	LARVA	0.035	UNKNOWN
432	INSECTA	COLEOPTERA	UNKNOWN	3	1	1.6	1	2	0	0	0	LARVA	0.035	UNKNOWN
433	INSECTA	COLEOPTERA	UNKNOWN	3	1	21.0	1	0	0	0	4	LARVA	0.035	UNKNOWN
434	INSECTA	COLEOPTERA	UNKNOWN	3	1	21.0	2	8	2	2	2	LARVA	0.035	UNKNOWN
435	INSECTA	COLEOPTERA	UNKNOWN	3	2	1.2	1	0	9	7	0	LARVA	0.035	UNKNOWN
436	INSECTA	COLEOPTERA	UNKNOWN	3	2	1.2	2	0	2	4	2	LARVA	0.035	UNKNOWN
437	INSECTA	COLEOPTERA	UNKNOWN	3	2	2.0	1	0	1	0	0	LARVA	0.035	UNKNOWN
438	INSECTA	COLEOPTERA	UNKNOWN	3	2	2.0	2	0	0	3	0	LARVA	0.035	UNKNOWN
439	INSECTA	COLEOPTERA	UNKNOWN	3	4	0.8	2	1	0	0	0	LARVA	0.035	UNKNOWN
440	INSECTA	COLEOPTERA	UNKNOWN	3	4	1.2	1	0	1	1	2	LARVA	0.035	UNKNOWN

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	HGWT	TROPLEVL
441	INSECTA	COLEOPTERA	UNKNOWN	4	1	0.8	1	0	0	1	0	LARVA	0.035	UNKNOWN
442	INSECTA	COLEOPTERA	UNKNOWN	4	1	1.2	1	0	1	0	0	LARVA	0.035	UNKNOWN
443	INSECTA	COLEOPTERA	UNKNOWN	4	1	1.2	2	1	0	4	0	LARVA	0.035	UNKNOWN
444	INSECTA	COLEOPTERA	UNKNOWN	4	1	21.0	1	2	0	0	0	LARVA	0.035	UNKNOWN
445	INSECTA	COLEOPTERA	UNKNOWN	4	1	21.0	2	1	0	0	0	LARVA	0.035	UNKNOWN
446	INSECTA	COLEOPTERA	UNKNOWN	4	2	0.8	2	2	0	1	1	LARVA	0.035	UNKNOWN
447	INSECTA	COLEOPTERA	UNKNOWN	4	2	1.2	2	3	0	1	1	LARVA	0.035	UNKNOWN
448	INSECTA	COLEOPTERA	UNKNOWN	4	2	2.0	2	2	0	1	1	LARVA	0.035	UNKNOWN
449	INSECTA	COLEOPTERA	UNKNOWN	4	4	0.8	2	1	0	2	0	LARVA	0.035	UNKNOWN
450	INSECTA	COLEOPTERA	UNKNOWN	4	4	1.2	2	1	0	0	0	LARVA	0.035	UNKNOWN
451	INSECTA	COLEOPTERA	CARABIDAE	1	1	21.0	2	0	1	0	0	LARVA	0.350	PREDATOR
452	INSECTA	COLEOPTERA	CARABIDAE	1	2	0.8	2	0	1	0	0	ADULT	6.033	PREDATOR
453	INSECTA	COLEOPTERA	CARABIDAE	1	2	1.2	1	0	0	0	2	ADULT	6.033	PREDATOR
454	INSECTA	COLEOPTERA	CARABIDAE	1	4	1.2	2	0	0	1	0	ADULT	6.033	PREDATOR
455	INSECTA	COLEOPTERA	CARABIDAE	2	1	21.0	2	0	0	0	12	LARVA	0.350	PREDATOR
456	INSECTA	COLEOPTERA	CARABIDAE	3	1	1.2	2	0	0	0	1	ADULT	6.033	PREDATOR
457	INSECTA	COLEOPTERA	CARABIDAE	3	2	0.8	2	3	0	0	0	LARVA	0.350	PREDATOR
458	INSECTA	COLEOPTERA	CARABIDAE	3	2	1.2	1	0	1	0	0	ADULT	6.033	PREDATOR
459	INSECTA	COLEOPTERA	LAGRIIDAE	3	1	21.0	2	1	0	0	0	LARVA	17.180	DETRITIV
460	INSECTA	COLEOPTERA	PTILIIDAE	1	1	0.4	2	0	1	0	0	ADULT	0.127	FUNGIVOR
461	INSECTA	COLEOPTERA	PTILIIDAE	1	1	0.8	1	0	0	9	0	ADULT	0.127	FUNGIVOR
462	INSECTA	COLEOPTERA	PTILIIDAE	1	1	0.8	2	2	0	14	0	ADULT	0.127	FUNGIVOR
463	INSECTA	COLEOPTERA	PTILIIDAE	1	1	1.2	1	0	0	0	1	ADULT	0.127	FUNGIVOR
464	INSECTA	COLEOPTERA	PTILIIDAE	1	1	1.2	2	0	0	5	0	ADULT	0.127	FUNGIVOR
465	INSECTA	COLEOPTERA	PTILIIDAE	1	1	1.6	2	0	1	3	0	ADULT	0.127	FUNGIVOR
466	INSECTA	COLEOPTERA	PTILIIDAE	1	2	0.8	1	0	0	0	2	ADULT	0.127	FUNGIVOR
467	INSECTA	COLEOPTERA	PTILIIDAE	1	2	0.8	2	0	2	0	0	ADULT	0.127	FUNGIVOR
468	INSECTA	COLEOPTERA	PTILIIDAE	1	2	1.2	1	0	0	0	2	ADULT	0.127	FUNGIVOR
469	INSECTA	COLEOPTERA	PTILIIDAE	1	4	0.4	2	0	6	3	0	ADULT	0.127	FUNGIVOR
470	INSECTA	COLEOPTERA	PTILIIDAE	1	4	0.8	2	1	0	0	1	ADULT	0.127	FUNGIVOR
471	INSECTA	COLEOPTERA	PTILIIDAE	1	4	1.2	2	1	1	2	0	ADULT	0.127	FUNGIVOR
472	INSECTA	COLEOPTERA	PTILIIDAE	2	1	0.4	2	1	0	0	0	ADULT	0.127	FUNGIVOR
473	INSECTA	COLEOPTERA	PTILIIDAE	2	1	1.6	2	0	0	0	2	ADULT	0.127	FUNGIVOR
474	INSECTA	COLEOPTERA	PTILIIDAE	2	1	21.0	2	1	0	0	0	ADULT	0.127	FUNGIVOR
475	INSECTA	COLEOPTERA	PTILIIDAE	2	2	0.8	1	0	0	0	1	ADULT	0.127	FUNGIVOR
476	INSECTA	COLEOPTERA	PTILIIDAE	2	2	0.8	2	0	5	0	0	ADULT	0.127	FUNGIVOR
477	INSECTA	COLEOPTERA	PTILIIDAE	2	2	1.2	1	1	0	0	0	ADULT	0.127	FUNGIVOR
478	INSECTA	COLEOPTERA	PTILIIDAE	2	2	2.0	2	1	0	0	0	ADULT	0.127	FUNGIVOR
479	INSECTA	COLEOPTERA	PTILIIDAE	2	4	0.4	1	0	0	0	1	ADULT	0.127	FUNGIVOR
480	INSECTA	COLEOPTERA	PTILIIDAE	2	4	0.8	2	1	0	0	0	ADULT	0.127	FUNGIVOR
481	INSECTA	COLEOPTERA	PTILIIDAE	3	1	0.8	2	1	0	0	0	ADULT	0.127	FUNGIVOR
482	INSECTA	COLEOPTERA	PTILIIDAE	3	1	1.2	2	1	0	0	2	ADULT	0.127	FUNGIVOR
483	INSECTA	COLEOPTERA	PTILIIDAE	3	1	1.6	2	6	0	0	0	ADULT	0.127	FUNGIVOR
484	INSECTA	COLEOPTERA	PTILIIDAE	3	1	21.0	2	0	0	1	7	ADULT	0.127	FUNGIVOR
485	INSECTA	COLEOPTERA	PTILIIDAE	3	2	0.8	2	0	0	0	3	ADULT	0.127	FUNGIVOR
486	INSECTA	COLEOPTERA	PTILIIDAE	3	2	1.2	2	0	0	1	0	ADULT	0.127	FUNGIVOR
487	INSECTA	COLEOPTERA	PTILIIDAE	3	4	0.4	2	0	1	1	0	ADULT	0.127	FUNGIVOR
488	INSECTA	COLEOPTERA	PTILIIDAE	3	4	1.2	2	0	0	3	0	ADULT	0.127	FUNGIVOR
489	INSECTA	COLEOPTERA	PTILIIDAE	4	1	0.8	2	2	0	0	0	ADULT	0.127	FUNGIVOR
490	INSECTA	COLEOPTERA	PTILIIDAE	4	1	1.2	2	0	0	0	1	ADULT	0.127	FUNGIVOR
491	INSECTA	COLEOPTERA	PTILIIDAE	4	1	1.6	2	0	1	0	0	ADULT	0.127	FUNGIVOR
492	INSECTA	COLEOPTERA	PTILIIDAE	4	1	21.0	2	0	0	0	1	ADULT	0.127	FUNGIVOR
493	INSECTA	COLEOPTERA	PTILIIDAE	4	2	0.8	2	0	0	0	2	ADULT	0.127	FUNGIVOR
494	INSECTA	COLEOPTERA	PTILIIDAE	4	2	1.2	2	3	0	0	1	ADULT	0.127	FUNGIVOR
495	INSECTA	COLEOPTERA	PTILIIDAE	4	4	0.4	2	5	0	0	0	ADULT	0.127	FUNGIVOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
496	INSECTA	COLEOPTERA	PTILIIDAE	4	4	0.6	2	1	0	1	0	ADULT	0.127	FUNGIVOR
497	INSECTA	COLEOPTERA	PTILIIDAE	4	4	1.2	2	2	0	0	0	ADULT	0.127	FUNGIVOR
498	INSECTA	COLEOPTERA	SILPHIDAE	4	4	0.8	2	0	0	1	0	ADULT	0.460	DETRITIV
499	INSECTA	COLEOPTERA	ELATERIDAE	1	1	0.4	2	1	0	0	0	LARVA	0.253	DETRITIV
500	INSECTA	COLEOPTERA	ELATERIDAE	1	1	0.8	2	0	0	1	0	LARVA	0.253	DETRITIV
501	INSECTA	COLEOPTERA	ELATERIDAE	1	1	1.2	2	0	0	1	3	LARVA	0.253	DETRITIV
502	INSECTA	COLEOPTERA	ELATERIDAE	1	1	1.6	2	3	2	1	0	LARVA	0.253	DETRITIV
503	INSECTA	COLEOPTERA	ELATERIDAE	1	1	21.0	1	0	0	1	0	LARVA	0.253	DETRITIV
504	INSECTA	COLEOPTERA	ELATERIDAE	1	1	21.0	2	1	0	1	0	LARVA	0.253	DETRITIV
505	INSECTA	COLEOPTERA	ELATERIDAE	1	2	0.8	1	0	0	0	1	LARVA	0.253	DETRITIV
506	INSECTA	COLEOPTERA	ELATERIDAE	1	2	0.8	2	1	0	0	0	LARVA	0.253	DETRITIV
507	INSECTA	COLEOPTERA	ELATERIDAE	1	2	1.2	1	0	0	0	3	LARVA	0.253	DETRITIV
508	INSECTA	COLEOPTERA	ELATERIDAE	1	2	1.2	2	1	0	1	0	LARVA	0.253	DETRITIV
509	INSECTA	COLEOPTERA	ELATERIDAE	1	2	2.0	2	2	0	1	0	LARVA	0.253	DETRITIV
510	INSECTA	COLEOPTERA	ELATERIDAE	1	4	0.4	2	0	0	1	0	LARVA	0.253	DETRITIV
511	INSECTA	COLEOPTERA	ELATERIDAE	1	4	0.8	2	0	0	0	1	LARVA	0.253	DETRITIV
512	INSECTA	COLEOPTERA	ELATERIDAE	1	4	1.2	2	0	0	1	0	LARVA	0.253	DETRITIV
513	INSECTA	COLEOPTERA	ELATERIDAE	2	1	0.4	2	0	0	1	0	LARVA	0.253	DETRITIV
514	INSECTA	COLEOPTERA	ELATERIDAE	2	1	0.8	2	2	1	0	1	LARVA	0.253	DETRITIV
515	INSECTA	COLEOPTERA	ELATERIDAE	2	1	1.2	2	5	2	2	1	LARVA	0.253	DETRITIV
516	INSECTA	COLEOPTERA	ELATERIDAE	2	1	1.6	2	0	1	0	0	LARVA	0.253	DETRITIV
517	INSECTA	COLEOPTERA	ELATERIDAE	2	1	21.0	2	4	0	0	0	LARVA	0.253	DETRITIV
518	INSECTA	COLEOPTERA	ELATERIDAE	2	2	0.8	2	2	4	0	1	LARVA	0.253	DETRITIV
519	INSECTA	COLEOPTERA	ELATERIDAE	2	2	2.0	2	0	5	2	7	LARVA	0.253	DETRITIV
520	INSECTA	COLEOPTERA	ELATERIDAE	2	4	0.8	2	1	0	0	0	LARVA	0.253	DETRITIV
521	INSECTA	COLEOPTERA	ELATERIDAE	2	4	1.2	2	1	0	0	0	LARVA	0.253	DETRITIV
522	INSECTA	COLEOPTERA	ELATERIDAE	3	1	0.4	2	2	0	1	4	LARVA	0.253	DETRITIV
523	INSECTA	COLEOPTERA	ELATERIDAE	3	1	0.8	2	2	2	2	1	LARVA	0.253	DETRITIV
524	INSECTA	COLEOPTERA	ELATERIDAE	3	1	1.2	2	1	0	0	2	LARVA	0.253	DETRITIV
525	INSECTA	COLEOPTERA	ELATERIDAE	3	1	1.6	2	7	1	0	0	LARVA	0.253	DETRITIV
526	INSECTA	COLEOPTERA	ELATERIDAE	3	1	21.0	2	3	6	11	11	LARVA	0.253	DETRITIV
527	INSECTA	COLEOPTERA	ELATERIDAE	3	2	0.8	2	1	0	0	0	LARVA	0.253	DETRITIV
528	INSECTA	COLEOPTERA	ELATERIDAE	3	2	1.2	1	0	1	0	0	LARVA	0.253	DETRITIV
529	INSECTA	COLEOPTERA	ELATERIDAE	3	2	1.2	1	0	0	1	0	LARVA	0.253	DETRITIV
530	INSECTA	COLEOPTERA	ELATERIDAE	3	2	1.2	2	2	1	2	2	LARVA	0.253	DETRITIV
531	INSECTA	COLEOPTERA	ELATERIDAE	3	2	2.0	2	0	0	2	2	LARVA	0.253	DETRITIV
532	INSECTA	COLEOPTERA	ELATERIDAE	3	2	2.0	2	0	3	0	0	LARVA	0.253	DETRITIV
533	INSECTA	COLEOPTERA	ELATERIDAE	3	4	0.8	2	2	2	0	0	LARVA	0.253	DETRITIV
534	INSECTA	COLEOPTERA	ELATERIDAE	3	4	1.2	2	0	2	2	0	LARVA	0.253	DETRITIV
535	INSECTA	COLEOPTERA	ELATERIDAE	4	1	0.4	2	0	1	1	0	LARVA	0.253	DETRITIV
536	INSECTA	COLEOPTERA	ELATERIDAE	4	1	1.2	2	0	2	1	0	LARVA	0.253	DETRITIV
537	INSECTA	COLEOPTERA	ELATERIDAE	4	1	1.6	2	0	1	0	0	LARVA	0.253	DETRITIV
538	INSECTA	COLEOPTERA	ELATERIDAE	4	1	21.0	2	1	0	1	1	LARVA	0.253	DETRITIV
539	INSECTA	COLEOPTERA	ELATERIDAE	4	2	0.8	2	0	0	0	3	LARVA	0.253	DETRITIV
540	INSECTA	COLEOPTERA	ELATERIDAE	4	2	1.2	2	1	0	0	0	LARVA	0.253	DETRITIV
541	INSECTA	COLEOPTERA	ELATERIDAE	4	2	2.0	2	0	0	2	0	LARVA	0.253	DETRITIV
542	INSECTA	COLEOPTERA	ELATERIDAE	4	4	0.4	2	2	0	0	0	LARVA	0.253	DETRITIV
543	INSECTA	COLEOPTERA	ELATERIDAE	4	4	1.2	2	2	0	0	0	LARVA	0.253	DETRITIV
544	INSECTA	COLEOPTERA	LAMPYRIDAE	2	1	21.0	1	0	1	0	0	ADULT	5.360	PREDATOR
545	INSECTA	COLEOPTERA	LAMPYRIDAE	3	1	21.0	2	0	0	0	1	ADULT	5.360	PREDATOR
546	INSECTA	COLEOPTERA	LAMPYRIDAE	3	2	0.4	1	1	0	0	0	ADULT	5.360	PREDATOR
547	INSECTA	COLEOPTERA	CANTHARIDAE	1	1	0.8	1	0	0	1	0	LARVA	0.045	PREDATOR
548	INSECTA	COLEOPTERA	CANTHARIDAE	1	1	0.8	2	1	0	4	0	LARVA	0.045	PREDATOR
549	INSECTA	COLEOPTERA	CANTHARIDAE	1	1	1.2	2	0	0	0	1	LARVA	0.045	PREDATOR
550	INSECTA	COLEOPTERA	CANTHARIDAE	1	1	1.6	2	0	1	2	0	LARVA	0.045	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	WGWT	TROPLEVL
551	INSECTA	COLEOPTERA	CANTHARIDAE	1	1	21.0	1	0	0	1	0	LARVA	0.045	PREDATOR
552	INSECTA	COLEOPTERA	CANTHARIDAE	1	1	21.0	2	0	0	1	10	LARVA	0.045	PREDATOR
553	INSECTA	COLEOPTERA	CANTHARIDAE	1	2	0.8	1	0	0	0	1	LARVA	0.045	PREDATOR
554	INSECTA	COLEOPTERA	CANTHARIDAE	1	2	0.8	2	0	1	2	0	LARVA	0.045	PREDATOR
555	INSECTA	COLEOPTERA	CANTHARIDAE	1	2	1.2	2	0	0	0	2	LARVA	0.045	PREDATOR
556	INSECTA	COLEOPTERA	CANTHARIDAE	1	2	2.0	1	0	0	2	0	LARVA	0.045	PREDATOR
557	INSECTA	COLEOPTERA	CANTHARIDAE	1	2	2.0	2	3	0	2	0	LARVA	0.045	PREDATOR
558	INSECTA	COLEOPTERA	CANTHARIDAE	2	1	0.8	2	0	0	2	0	LARVA	0.045	PREDATOR
559	INSECTA	COLEOPTERA	CANTHARIDAE	2	1	1.6	1	0	0	0	2	LARVA	0.045	PREDATOR
560	INSECTA	COLEOPTERA	CANTHARIDAE	2	1	1.6	2	0	0	0	2	LARVA	0.045	PREDATOR
561	INSECTA	COLEOPTERA	CANTHARIDAE	2	1	21.0	2	7	0	1	2	LARVA	0.045	PREDATOR
562	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	0.4	2	0	0	1	0	LARVA	0.045	PREDATOR
563	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	0.8	1	0	0	0	1	LARVA	0.045	PREDATOR
564	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	0.8	2	0	1	0	0	LARVA	0.045	PREDATOR
565	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	1.2	1	2	1	1	0	LARVA	0.045	PREDATOR
566	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	1.2	2	1	0	2	7	LARVA	0.045	PREDATOR
567	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	2.0	2	8	0	0	0	LARVA	0.045	PREDATOR
568	INSECTA	COLEOPTERA	CANTHARIDAE	2	2	2.0	2	0	1	4	2	LARVA	0.045	PREDATOR
569	INSECTA	COLEOPTERA	CANTHARIDAE	2	4	1.2	2	1	2	0	1	LARVA	0.045	PREDATOR
570	INSECTA	COLEOPTERA	CANTHARIDAE	3	1	0.8	2	0	0	2	3	LARVA	0.045	PREDATOR
571	INSECTA	COLEOPTERA	CANTHARIDAE	3	1	1.2	2	1	0	7	0	LARVA	0.045	PREDATOR
572	INSECTA	COLEOPTERA	CANTHARIDAE	3	1	1.6	1	1	0	0	0	LARVA	0.045	PREDATOR
573	INSECTA	COLEOPTERA	CANTHARIDAE	3	1	1.6	2	3	1	0	0	LARVA	0.045	PREDATOR
574	INSECTA	COLEOPTERA	CANTHARIDAE	3	1	21.0	2	8	0	5	9	LARVA	0.045	PREDATOR
575	INSECTA	COLEOPTERA	CANTHARIDAE	3	2	0.8	2	0	3	0	1	LARVA	0.045	PREDATOR
576	INSECTA	COLEOPTERA	CANTHARIDAE	3	2	1.2	2	3	4	3	1	LARVA	0.045	PREDATOR
577	INSECTA	COLEOPTERA	CANTHARIDAE	3	2	2.0	2	1	1	2	4	LARVA	0.045	PREDATOR
578	INSECTA	COLEOPTERA	CANTHARIDAE	3	4	0.4	2	0	0	1	0	LARVA	0.045	PREDATOR
579	INSECTA	COLEOPTERA	CANTHARIDAE	3	4	0.8	2	1	0	0	0	LARVA	0.045	PREDATOR
580	INSECTA	COLEOPTERA	CANTHARIDAE	3	4	1.2	2	0	0	2	0	LARVA	0.045	PREDATOR
581	INSECTA	COLEOPTERA	CANTHARIDAE	4	1	0.4	2	1	1	0	1	LARVA	0.045	PREDATOR
582	INSECTA	COLEOPTERA	CANTHARIDAE	4	1	0.8	2	2	0	0	0	LARVA	0.045	PREDATOR
583	INSECTA	COLEOPTERA	CANTHARIDAE	4	1	21.0	2	2	1	2	1	LARVA	0.045	PREDATOR
584	INSECTA	COLEOPTERA	CANTHARIDAE	4	2	0.8	2	0	0	0	2	LARVA	0.045	PREDATOR
585	INSECTA	COLEOPTERA	CANTHARIDAE	4	2	1.2	2	4	1	0	0	LARVA	0.045	PREDATOR
586	INSECTA	COLEOPTERA	CANTHARIDAE	4	2	2.0	1	0	1	1	0	LARVA	0.045	PREDATOR
587	INSECTA	COLEOPTERA	CANTHARIDAE	4	2	2.0	2	0	3	1	1	LARVA	0.045	PREDATOR
588	INSECTA	COLEOPTERA	CANTHARIDAE	4	4	0.8	2	1	1	0	0	LARVA	0.045	PREDATOR
589	INSECTA	COLEOPTERA	CANTHARIDAE	4	4	1.2	2	2	0	1	0	LARVA	0.045	PREDATOR
590	INSECTA	COLEOPTERA	NITIDULIDAE	1	1	1.2	2	0	1	0	3	ADULT	1.060	DETRITIV
591	INSECTA	COLEOPTERA	NITIDULIDAE	1	1	1.6	2	0	1	0	1	ADULT	1.060	DETRITIV
592	INSECTA	COLEOPTERA	NITIDULIDAE	1	1	21.0	2	4	1	1	1	ADULT	1.060	DETRITIV
593	INSECTA	COLEOPTERA	NITIDULIDAE	1	2	0.8	1	0	0	1	2	ADULT	1.060	DETRITIV
594	INSECTA	COLEOPTERA	NITIDULIDAE	1	2	0.8	2	0	0	3	0	ADULT	1.060	DETRITIV
595	INSECTA	COLEOPTERA	NITIDULIDAE	1	2	1.2	1	0	0	0	2	ADULT	1.060	DETRITIV
596	INSECTA	COLEOPTERA	NITIDULIDAE	1	2	1.2	2	0	0	0	1	ADULT	1.060	DETRITIV
597	INSECTA	COLEOPTERA	NITIDULIDAE	1	2	2.0	1	0	0	0	1	ADULT	1.060	DETRITIV
598	INSECTA	COLEOPTERA	NITIDULIDAE	1	4	0.8	2	0	0	3	0	ADULT	1.060	DETRITIV
599	INSECTA	COLEOPTERA	NITIDULIDAE	2	1	0.8	1	1	0	1	0	ADULT	1.060	DETRITIV
600	INSECTA	COLEOPTERA	NITIDULIDAE	2	1	0.8	2	1	0	0	0	ADULT	1.060	DETRITIV
601	INSECTA	COLEOPTERA	NITIDULIDAE	2	1	1.2	2	1	1	0	0	ADULT	1.060	DETRITIV
602	INSECTA	COLEOPTERA	NITIDULIDAE	2	1	1.6	1	0	0	0	1	ADULT	1.060	DETRITIV
603	INSECTA	COLEOPTERA	NITIDULIDAE	2	1	1.6	2	3	0	0	0	ADULT	1.060	DETRITIV
604	INSECTA	COLEOPTERA	NITIDULIDAE	2	1	21.0	2	3	0	1	1	ADULT	1.060	DETRITIV
605	INSECTA	COLEOPTERA	NITIDULIDAE	2	2	0.8	1	0	0	1	1	ADULT	1.060	DETRITIV

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROPLEVL
606	INSECTA	COLEOPTERA	NITIDULIDAE	2	2	0.8	2	0	0	1	1	ADULT	1.060	DETRITIV
607	INSECTA	COLEOPTERA	NITIDULIDAE	2	2	2.0	2	5	0	2	0	ADULT	1.060	DETRITIV
608	INSECTA	COLEOPTERA	NITIDULIDAE	3	1	1.2	2	0	1	4	0	ADULT	1.060	DETRITIV
609	INSECTA	COLEOPTERA	NITIDULIDAE	3	1	1.6	1	2	0	1	0	ADULT	1.060	DETRITIV
610	INSECTA	COLEOPTERA	NITIDULIDAE	3	1	1.6	2	0	1	0	0	ADULT	1.060	DETRITIV
611	INSECTA	COLEOPTERA	NITIDULIDAE	3	1	21.0	1	0	0	0	1	ADULT	1.060	DETRITIV
612	INSECTA	COLEOPTERA	NITIDULIDAE	3	2	0.8	2	1	1	0	0	ADULT	1.060	DETRITIV
613	INSECTA	COLEOPTERA	NITIDULIDAE	3	2	1.2	2	0	1	0	0	ADULT	1.060	DETRITIV
614	INSECTA	COLEOPTERA	NITIDULIDAE	3	2	2.0	2	0	0	0	1	ADULT	1.060	DETRITIV
615	INSECTA	COLEOPTERA	NITIDULIDAE	3	4	0.4	1	1	0	0	0	ADULT	1.060	DETRITIV
616	INSECTA	COLEOPTERA	NITIDULIDAE	4	1	1.2	2	2	1	0	0	ADULT	1.060	DETRITIV
617	INSECTA	COLEOPTERA	NITIDULIDAE	4	1	21.0	2	1	1	3	1	ADULT	1.060	DETRITIV
618	INSECTA	COLEOPTERA	NITIDULIDAE	4	2	0.8	2	0	0	1	0	ADULT	1.060	DETRITIV
619	INSECTA	COLEOPTERA	NITIDULIDAE	4	2	2.0	2	4	0	4	0	ADULT	1.060	DETRITIV
620	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	0.4	2	1	0	0	0	ADULT	0.034	FUNGIVOR
621	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	0.8	1	0	0	7	0	ADULT	0.034	FUNGIVOR
622	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	0.8	2	1	0	5	0	ADULT	0.034	FUNGIVOR
623	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	1.2	1	0	0	0	1	ADULT	0.034	FUNGIVOR
624	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	1.2	2	0	0	5	12	ADULT	0.034	FUNGIVOR
625	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	1.6	2	1	2	0	0	ADULT	0.034	FUNGIVOR
626	INSECTA	COLEOPTERA	PSELAPHIDAE	1	1	21.0	2	8	1	0	2	ADULT	0.034	FUNGIVOR
627	INSECTA	COLEOPTERA	PSELAPHIDAE	1	2	0.4	1	0	0	0	1	ADULT	0.034	FUNGIVOR
628	INSECTA	COLEOPTERA	PSELAPHIDAE	1	2	0.4	2	1	0	1	1	ADULT	0.034	FUNGIVOR
629	INSECTA	COLEOPTERA	PSELAPHIDAE	1	2	0.8	1	0	0	0	1	ADULT	0.034	FUNGIVOR
630	INSECTA	COLEOPTERA	PSELAPHIDAE	1	2	0.8	2	1	1	0	0	ADULT	0.034	FUNGIVOR
631	INSECTA	COLEOPTERA	PSELAPHIDAE	1	4	0.4	2	0	7	9	0	ADULT	0.034	FUNGIVOR
632	INSECTA	COLEOPTERA	PSELAPHIDAE	1	4	0.8	2	1	0	0	0	ADULT	0.034	FUNGIVOR
633	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	0.4	1	0	3	0	0	ADULT	0.034	FUNGIVOR
634	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	0.4	2	3	0	1	3	ADULT	0.034	FUNGIVOR
635	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	0.8	1	2	0	0	0	ADULT	0.034	FUNGIVOR
636	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	0.8	2	2	1	0	0	ADULT	0.034	FUNGIVOR
637	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	1.2	2	4	6	0	4	ADULT	0.034	FUNGIVOR
638	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	1.6	1	0	0	0	1	ADULT	0.034	FUNGIVOR
639	INSECTA	COLEOPTERA	PSELAPHIDAE	2	1	1.6	2	1	1	0	3	ADULT	0.034	FUNGIVOR
640	INSECTA	COLEOPTERA	PSELAPHIDAE	2	2	0.4	1	0	0	1	0	ADULT	0.034	FUNGIVOR
641	INSECTA	COLEOPTERA	PSELAPHIDAE	2	2	0.4	2	0	2	2	0	ADULT	0.034	FUNGIVOR
642	INSECTA	COLEOPTERA	PSELAPHIDAE	2	2	0.8	1	0	0	1	0	ADULT	0.034	FUNGIVOR
643	INSECTA	COLEOPTERA	PSELAPHIDAE	2	2	1.2	1	1	0	0	0	ADULT	0.034	FUNGIVOR
644	INSECTA	COLEOPTERA	PSELAPHIDAE	2	4	0.4	1	0	0	0	1	ADULT	0.034	FUNGIVOR
645	INSECTA	COLEOPTERA	PSELAPHIDAE	2	4	0.4	2	11	3	1	1	ADULT	0.034	FUNGIVOR
646	INSECTA	COLEOPTERA	PSELAPHIDAE	2	4	0.8	2	1	0	0	0	ADULT	0.034	FUNGIVOR
647	INSECTA	COLEOPTERA	PSELAPHIDAE	2	4	1.2	2	0	0	0	1	ADULT	0.034	FUNGIVOR
648	INSECTA	COLEOPTERA	PSELAPHIDAE	3	1	0.4	2	1	1	4	2	ADULT	0.034	FUNGIVOR
649	INSECTA	COLEOPTERA	PSELAPHIDAE	3	1	0.8	2	0	1	0	0	ADULT	0.034	FUNGIVOR
650	INSECTA	COLEOPTERA	PSELAPHIDAE	3	1	1.2	2	1	0	0	0	ADULT	0.034	FUNGIVOR
651	INSECTA	COLEOPTERA	PSELAPHIDAE	3	1	1.6	2	3	0	2	2	ADULT	0.034	FUNGIVOR
652	INSECTA	COLEOPTERA	PSELAPHIDAE	3	1	21.0	2	0	0	4	2	ADULT	0.034	FUNGIVOR
653	INSECTA	COLEOPTERA	PSELAPHIDAE	3	2	0.4	2	0	7	2	9	ADULT	0.034	FUNGIVOR
654	INSECTA	COLEOPTERA	PSELAPHIDAE	3	2	0.8	2	0	1	0	0	ADULT	0.034	FUNGIVOR
655	INSECTA	COLEOPTERA	PSELAPHIDAE	3	2	1.2	2	0	1	1	0	ADULT	0.034	FUNGIVOR
656	INSECTA	COLEOPTERA	PSELAPHIDAE	3	4	0.4	2	1	1	0	1	ADULT	0.034	FUNGIVOR
657	INSECTA	COLEOPTERA	PSELAPHIDAE	4	1	0.4	2	0	5	0	0	ADULT	0.034	FUNGIVOR
658	INSECTA	COLEOPTERA	PSELAPHIDAE	4	1	1.2	1	0	1	0	0	ADULT	0.034	FUNGIVOR
659	INSECTA	COLEOPTERA	PSELAPHIDAE	4	1	1.2	2	0	0	0	1	ADULT	0.034	FUNGIVOR
660	INSECTA	COLEOPTERA	PSELAPHIDAE	4	4	0.4	2	4	0	2	0	ADULT	0.034	FUNGIVOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	AGWT	TROPLEVL
661	INSECTA	COLEOPTERA	PSELAPHIDAE	4	4	1.2	2	1	0	0	0	ADULT	0.034	FUNGIVOR
662	INSECTA	COLEOPTERA	DERODONTIDEA	3	1	0.8	1	0	0	0	1	ADULT	0.275	FUNGIVOR
663	INSECTA	COLEOPTERA	DERODONTIDEA	4	1	1.2	1	0	0	1	0	ADULT	0.275	FUNGIVOR
664	INSECTA	COLEOPTERA	ORTHOPERIDAE	1	1	21.0	1	0	0	0	1	LARVA	0.096	DETRITIV
665	INSECTA	COLEOPTERA	ORTHOPERIDAE	2	1	1.6	2	0	0	0	1	LARVA	0.096	DETRITIV
666	INSECTA	COLEOPTERA	ORTHOPERIDAE	2	1	21.0	1	7	1	3	3	LARVA	0.096	DETRITIV
667	INSECTA	COLEOPTERA	ORTHOPERIDAE	2	1	21.0	2	6	0	0	0	LARVA	0.096	DETRITIV
668	INSECTA	COLEOPTERA	ORTHOPERIDAE	3	2	2.0	2	0	0	0	1	LARVA	0.096	DETRITIV
669	INSECTA	COLEOPTERA	ORTHOPERIDAE	4	1	21.0	2	0	1	0	0	LARVA	0.096	DETRITIV
670	INSECTA	COLEOPTERA	SCYDMAENIDAE	1	1	1.6	2	1	0	0	0	ADULT	0.537	UNKNOWN
671	INSECTA	COLEOPTERA	SCYDMAENIDAE	1	4	0.4	2	0	1	0	0	ADULT	0.537	UNKNOWN
672	INSECTA	COLEOPTERA	SCYDMAENIDAE	3	2	0.4	2	0	0	0	1	ADULT	0.537	UNKNOWN
673	INSECTA	COLEOPTERA	COCCINELLIDAE	4	2	2.0	2	0	0	1	0	ADULT	4.360	PREDATOR
674	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	0.4	2	1	0	0	0	ADULT	0.643	DETRITIV
675	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	0.4	2	1	0	0	0	LARVA	0.025	DETRITIV
676	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	0.8	2	0	3	0	0	ADULT	0.643	DETRITIV
677	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	0.8	2	0	2	0	0	LARVA	0.025	DETRITIV
678	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	1.2	2	0	1	0	2	ADULT	0.643	DETRITIV
679	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	1.6	2	0	0	1	0	ADULT	0.643	DETRITIV
680	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	1	21.0	2	3	1	2	0	ADULT	0.643	DETRITIV
681	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	2	1.2	1	0	0	0	1	ADULT	0.643	DETRITIV
682	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	2	1.2	2	4	5	1	0	ADULT	0.643	DETRITIV
683	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	2	2.0	1	0	0	1	0	ADULT	0.643	DETRITIV
684	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	2	2.0	2	2	0	3	2	ADULT	0.643	DETRITIV
685	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	4	0.4	2	0	1	0	0	ADULT	0.643	DETRITIV
686	INSECTA	COLEOPTERA	STAPHYLINIDAE	1	4	0.4	2	0	1	0	0	LARVA	0.025	DETRITIV
687	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	0.4	1	0	1	0	0	ADULT	0.643	DETRITIV
688	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	0.4	2	0	1	0	0	ADULT	0.643	DETRITIV
689	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	0.8	2	0	0	1	0	ADULT	0.643	DETRITIV
690	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	1.2	2	0	3	0	0	ADULT	0.643	DETRITIV
691	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	1.2	2	0	0	0	1	LARVA	0.025	DETRITIV
692	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	1.6	1	0	0	0	1	ADULT	0.643	DETRITIV
693	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	1.6	2	1	0	0	0	ADULT	0.643	DETRITIV
694	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	1.6	2	0	0	0	1	LARVA	0.025	DETRITIV
695	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	21.0	1	1	0	0	0	ADULT	0.643	DETRITIV
696	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	1	21.0	1	1	0	0	0	LARVA	0.025	DETRITIV
697	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	2	1.2	1	1	0	0	0	ADULT	0.643	DETRITIV
698	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	2	1.2	2	0	1	0	1	ADULT	0.643	DETRITIV
699	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	2	2.0	2	4	1	2	2	ADULT	0.643	DETRITIV
700	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	2	2.0	2	0	1	0	0	LARVA	0.025	DETRITIV
701	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	4	0.4	2	2	0	0	1	ADULT	0.643	DETRITIV
702	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	4	0.8	2	1	0	0	0	ADULT	0.643	DETRITIV
703	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	4	1.2	1	0	1	0	0	ADULT	0.643	DETRITIV
704	INSECTA	COLEOPTERA	STAPHYLINIDAE	2	4	1.2	2	0	2	0	0	ADULT	0.643	DETRITIV
705	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	1	0.8	2	0	1	1	0	LARVA	0.025	DETRITIV
706	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	1	1.2	2	0	0	0	2	ADULT	0.643	DETRITIV
707	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	1	1.6	2	0	1	0	0	ADULT	0.643	DETRITIV
708	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	2	0.8	2	1	0	0	0	ADULT	0.643	DETRITIV
709	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	2	1.2	2	1	1	1	0	ADULT	0.643	DETRITIV
710	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	2	2.0	2	0	2	0	0	ADULT	0.643	DETRITIV
711	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	2	2.0	2	0	2	1	1	ADULT	0.643	DETRITIV
712	INSECTA	COLEOPTERA	STAPHYLINIDAE	3	4	0.8	2	1	0	1	0	ADULT	0.643	DETRITIV
713	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	1	0.8	2	0	1	0	0	ADULT	0.643	DETRITIV
714	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	1	1.2	2	0	0	0	1	LARVA	0.025	DETRITIV
715	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	1	1.6	2	0	0	1	0	ADULT	0.643	DETRITIV

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
716	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	1	1.6	2	0	2	0	0	LARVA	0.025	DETRITIV
717	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	1	21.0	2	2	1	1	2	ADULT	0.643	DETRITIV
718	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	2	2.0	2	0	2	0	0	ADULT	0.643	DETRITIV
719	INSECTA	COLEOPTERA	STAPHYLINIDAE	4	4	1.2	2	2	0	0	0	ADULT	0.643	DETRITIV
720	INSECTA	COLEOPTERA	TENEBRIONIDAE	1	1	1.2	2	0	0	0	1	LARVA	37.030	DETRITIV
721	INSECTA	COLEOPTERA	TENEBRIONIDAE	1	1	1.6	2	1	0	0	0	LARVA	23.370	DETRITIV
722	INSECTA	COLEOPTERA	TENEBRIONIDAE	1	2	0.8	1	0	0	0	1	ADULT	22.737	OMNIVORE
723	INSECTA	COLEOPTERA	TENEBRIONIDAE	2	1	1.6	1	0	0	0	1	ADULT	22.737	OMNIVORE
724	INSECTA	COLEOPTERA	TENEBRIONIDAE	2	1	21.0	2	2	0	0	0	LARVA	37.030	DETRITIV
725	INSECTA	COLEOPTERA	TENEBRIONIDAE	3	1	1.2	2	0	0	1	0	LARVA	37.030	DETRITIV
726	INSECTA	COLEOPTERA	TENEBRIONIDAE	3	1	1.6	2	0	1	0	0	ADULT	22.737	OMNIVORE
727	INSECTA	COLEOPTERA	TENEBRIONIDAE	3	2	0.8	2	1	0	0	0	ADULT	22.737	OMNIVORE
728	INSECTA	COLEOPTERA	TENEBRIONIDAE	3	4	0.8	2	0	0	0	1	LARVA	23.370	DETRITIV
729	INSECTA	COLEOPTERA	ACANTHOCERINAE	4	1	1.6	2	0	0	0	1	ADULT	4.700	DETRITIV
730	INSECTA	COLLEMBOLA	PODURIDAE	1	1	0.4	2	0	2	0	0	ADULT	0.008	DETRITIV
731	INSECTA	COLLEMBOLA	PODURIDAE	1	1	0.8	1	0	4	4	0	ADULT	0.008	DETRITIV
732	INSECTA	COLLEMBOLA	PODURIDAE	1	1	0.8	2	40	20	20	22	ADULT	0.008	DETRITIV
733	INSECTA	COLLEMBOLA	PODURIDAE	1	1	1.2	1	20	0	0	0	ADULT	0.008	DETRITIV
734	INSECTA	COLLEMBOLA	PODURIDAE	1	1	1.2	2	16	20	3	80	ADULT	0.008	DETRITIV
735	INSECTA	COLLEMBOLA	PODURIDAE	1	1	1.6	2	400	70	40	25	ADULT	0.006	DETRITIV
736	INSECTA	COLLEMBOLA	PODURIDAE	1	1	21.0	1	0	1	1	0	ADULT	0.008	DETRITIV
737	INSECTA	COLLEMBOLA	PODURIDAE	1	1	21.0	2	16	80	14	25	ADULT	0.008	DETRITIV
738	INSECTA	COLLEMBOLA	PODURIDAE	1	2	0.8	1	0	0	3	0	ADULT	0.006	DETRITIV
739	INSECTA	COLLEMBOLA	PODURIDAE	1	2	1.2	1	0	0	2	6	ADULT	0.008	DETRITIV
740	INSECTA	COLLEMBOLA	PODURIDAE	1	2	1.2	2	8	4	9	6	ADULT	0.008	DETRITIV
741	INSECTA	COLLEMBOLA	PODURIDAE	1	2	2.0	1	2	0	90	45	ADULT	0.008	DETRITIV
742	INSECTA	COLLEMBOLA	PODURIDAE	1	2	2.0	2	208	40	300	40	ADULT	0.008	DETRITIV
743	INSECTA	COLLEMBOLA	PODURIDAE	1	4	0.8	1	0	0	2	0	ADULT	0.008	DETRITIV
744	INSECTA	COLLEMBOLA	PODURIDAE	1	4	0.8	2	5	8	0	2	ADULT	0.008	DETRITIV
745	INSECTA	COLLEMBOLA	PODURIDAE	1	4	1.2	1	0	2	0	0	ADULT	0.008	DETRITIV
746	INSECTA	COLLEMBOLA	PODURIDAE	1	4	1.2	2	3	3	6	1	ADULT	0.008	DETRITIV
747	INSECTA	COLLEMBOLA	PODURIDAE	2	1	0.4	2	0	0	2	0	ADULT	0.008	DETRITIV
748	INSECTA	COLLEMBOLA	PODURIDAE	2	1	0.8	2	17	0	60	20	ADULT	0.008	DETRITIV
749	INSECTA	COLLEMBOLA	PODURIDAE	2	1	1.2	1	0	0	12	0	ADULT	0.008	DETRITIV
750	INSECTA	COLLEMBOLA	PODURIDAE	2	1	1.2	2	2	7	12	0	ADULT	0.008	DETRITIV
751	INSECTA	COLLEMBOLA	PODURIDAE	2	1	1.6	1	0	0	0	10	ADULT	0.005	DETRITIV
752	INSECTA	COLLEMBOLA	PODURIDAE	2	1	1.6	2	30	0	36	1	ADULT	0.008	DETRITIV
753	INSECTA	COLLEMBOLA	PODURIDAE	2	1	21.0	2	24	3	5	0	ADULT	0.008	DETRITIV
754	INSECTA	COLLEMBOLA	PODURIDAE	2	2	0.4	1	0	0	2	0	ADULT	0.008	DETRITIV
755	INSECTA	COLLEMBOLA	PODURIDAE	2	2	0.8	1	0	0	0	1	ADULT	0.008	DETRITIV
756	INSECTA	COLLEMBOLA	PODURIDAE	2	2	0.8	2	2	2	4	0	ADULT	0.008	DETRITIV
757	INSECTA	COLLEMBOLA	PODURIDAE	2	2	1.2	1	0	85	0	2	ADULT	0.008	DETRITIV
758	INSECTA	COLLEMBOLA	PODURIDAE	2	2	1.2	2	15	32	24	64	ADULT	0.008	DETRITIV
759	INSECTA	COLLEMBOLA	PODURIDAE	2	2	2.0	2	140	200	360	30	ADULT	0.008	DETRITIV
760	INSECTA	COLLEMBOLA	PODURIDAE	2	4	0.4	2	6	0	0	0	ADULT	0.008	DETRITIV
761	INSECTA	COLLEMBOLA	PODURIDAE	2	4	0.8	2	7	0	3	0	ADULT	0.008	DETRITIV
762	INSECTA	COLLEMBOLA	PODURIDAE	2	4	1.2	2	12	15	12	0	ADULT	0.008	DETRITIV
763	INSECTA	COLLEMBOLA	PODURIDAE	3	1	0.4	2	15	0	0	5	ADULT	0.008	DETRITIV
764	INSECTA	COLLEMBOLA	PODURIDAE	3	1	0.8	2	1	1	0	0	ADULT	0.008	DETRITIV
765	INSECTA	COLLEMBOLA	PODURIDAE	3	1	1.2	1	2	1	3	2	ADULT	0.008	DETRITIV
766	INSECTA	COLLEMBOLA	PODURIDAE	3	1	1.2	2	0	6	0	2	ADULT	0.008	DETRITIV
767	INSECTA	COLLEMBOLA	PODURIDAE	3	1	1.6	1	7	12	3	6	ADULT	0.008	DETRITIV
768	INSECTA	COLLEMBOLA	PODURIDAE	3	1	1.6	2	30	8	30	45	ADULT	0.008	DETRITIV
769	INSECTA	COLLEMBOLA	PODURIDAE	3	1	21.0	2	15	0	40	0	ADULT	0.008	DETRITIV
770	INSECTA	COLLEMBOLA	PODURIDAE	3	2	0.8	2	0	3	2	0	ADULT	0.008	DETRITIV

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
771	INSECTA	COLLEMBOLA	PODURIDAE	3	2	1.2	2	0	2	0	0	ADULT	.008	DETRITIV
772	INSECTA	COLLEMBOLA	PODURIDAE	3	2	2.0	1	0	2	0	0	ADULT	.008	DETRITIV
773	INSECTA	COLLEMBOLA	PODURIDAE	3	2	2.0	2	0	0	12	40	ADULT	.008	DETRITIV
774	INSECTA	COLLEMBOLA	PODURIDAE	3	4	0.4	2	0	0	6	6	ADULT	.008	DETRITIV
775	INSECTA	COLLEMBOLA	PODURIDAE	3	4	0.8	2	0	0	8	10	ADULT	.008	DETRITIV
776	INSECTA	COLLEMBOLA	PODURIDAE	3	4	1.2	2	0	0	6	4	ADULT	.008	DETRITIV
777	INSECTA	COLLEMBOLA	PODURIDAE	4	1	0.4	1	10	0	0	0	ADULT	.008	DETRITIV
778	INSECTA	COLLEMBOLA	PODURIDAE	4	1	0.8	2	35	50	0	10	ADULT	.008	DETRITIV
779	INSECTA	COLLEMBOLA	PODURIDAE	4	1	1.2	1	0	0	4	0	ADULT	.008	DETRITIV
780	INSECTA	COLLEMBOLA	PODURIDAE	4	1	1.2	2	5	2	80	60	ADULT	.008	DETRITIV
781	INSECTA	COLLEMBOLA	PODURIDAE	4	1	1.6	2	25	60	100	40	ADULT	.008	DETRITIV
782	INSECTA	COLLEMBOLA	PODURIDAE	4	1	21.0	2	30	0	60	20	ADULT	.008	DETRITIV
783	INSECTA	COLLEMBOLA	PODURIDAE	4	2	0.8	2	0	1	1	2	ADULT	.008	DETRITIV
784	INSECTA	COLLEMBOLA	PODURIDAE	4	2	1.2	2	4	0	1	0	ADULT	.008	DETRITIV
785	INSECTA	COLLEMBOLA	PODURIDAE	4	2	2.0	1	0	0	2	0	ADULT	.008	DETRITIV
786	INSECTA	COLLEMBOLA	PODURIDAE	4	2	2.0	2	2	34	80	7	ADULT	.008	DETRITIV
787	INSECTA	COLLEMBOLA	PODURIDAE	4	4	0.4	2	155	0	3	0	ADULT	.008	DETRITIV
788	INSECTA	COLLEMBOLA	PODURIDAE	4	4	0.8	2	25	12	25	0	ADULT	.008	DETRITIV
789	INSECTA	COLLEMBOLA	PODURIDAE	4	4	1.2	2	32	0	0	0	ADULT	.008	DETRITIV
790	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	0.4	2	5	3	0	0	ADULT	.045	FUNGIVOR
791	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	0.8	1	0	0	3	0	ADULT	.045	FUNGIVOR
792	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	0.8	2	2	1	2	2	ADULT	.045	FUNGIVOR
793	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	1.2	1	2	0	0	0	ADULT	.045	FUNGIVOR
794	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	1.2	2	64	20	50	120	ADULT	.045	FUNGIVOR
795	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	1.6	2	100	30	12	12	ADULT	.045	FUNGIVOR
796	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	21.0	1	0	3	0	1	ADULT	.045	FUNGIVOR
797	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	1	21.0	2	50	80	200	110	ADULT	.045	FUNGIVOR
798	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	2	0.4	2	1	0	1	0	ADULT	.045	FUNGIVOR
799	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	2	0.8	1	0	2	16	0	ADULT	.045	FUNGIVOR
800	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	2	1.2	1	2	3	4	40	ADULT	.045	FUNGIVOR
801	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	2	1.2	2	52	14	40	14	ADULT	.045	FUNGIVOR
802	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	2	2.0	1	3	2	30	20	ADULT	.045	FUNGIVOR
803	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	2	2.0	2	24	4	6	2	ADULT	.045	FUNGIVOR
804	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	4	0.4	2	0	2	0	0	ADULT	.045	FUNGIVOR
805	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	4	0.8	2	6	0	0	5	ADULT	.045	FUNGIVOR
806	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	1	4	1.2	2	2	2	2	2	ADULT	.045	FUNGIVOR
807	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	0.4	2	0	0	3	0	ADULT	.045	FUNGIVOR
808	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	0.8	1	15	4	4	2	ADULT	.045	FUNGIVOR
809	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	0.8	2	3	0	0	2	ADULT	.045	FUNGIVOR
810	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	1.2	1	0	4	2	3	ADULT	.045	FUNGIVOR
811	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	1.2	2	0	5	15	0	ADULT	.045	FUNGIVOR
812	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	1.6	1	1	2	0	4	ADULT	.045	FUNGIVOR
813	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	1.6	2	10	2	6	1	ADULT	.045	FUNGIVOR
814	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	21.0	1	25	0	10	50	ADULT	.045	FUNGIVOR
815	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	1	21.0	2	80	6	10	6	ADULT	.045	FUNGIVOR
816	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	0.4	1	0	1	3	0	ADULT	.045	FUNGIVOR
817	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	0.4	2	0	1	0	0	ADULT	.045	FUNGIVOR
818	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	0.8	1	0	1	0	8	ADULT	.045	FUNGIVOR
819	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	0.8	2	2	2	0	3	ADULT	.045	FUNGIVOR
820	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	1.2	1	24	1	2	1	ADULT	.045	FUNGIVOR
821	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	1.2	2	30	0	6	8	ADULT	.045	FUNGIVOR
822	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	2	2.0	2	67	100	180	110	ADULT	.045	FUNGIVOR
823	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	4	0.4	1	1	0	1	2	ADULT	.045	FUNGIVOR
824	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	4	0.4	2	12	0	2	0	ADULT	.045	FUNGIVOR
825	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	4	0.8	1	3	5	0	0	ADULT	.045	FUNGIVOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
826	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	4	0.8	2	0	0	1	0	ADULT	0.045	FUNGIVOR
827	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	4	1.2	1	3	3	1	0	ADULT	0.045	FUNGIVOR
828	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	2	4	1.2	2	5	0	0	0	ADULT	0.045	FUNGIVOR
829	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	0.4	1	0	5	4	0	ADULT	0.045	FUNGIVOR
830	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	0.4	2	0	4	0	1	ADULT	0.045	FUNGIVOR
831	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	0.8	1	4	0	6	7	ADULT	0.045	FUNGIVOR
832	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	0.8	2	6	3	0	7	ADULT	0.045	FUNGIVOR
833	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	1.2	1	8	7	8	1	ADULT	0.045	FUNGIVOR
834	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	1.2	2	9	0	3	2	ADULT	0.045	FUNGIVOR
835	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	1.6	1	26	28	2	2	ADULT	0.045	FUNGIVOR
836	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	1.6	2	100	24	50	45	ADULT	0.045	FUNGIVOR
837	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	21.0	1	0	0	0	4	ADULT	0.045	FUNGIVOR
838	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	1	21.0	2	20	0	100	0	ADULT	0.045	FUNGIVOR
839	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	2	0.4	1	0	3	0	1	ADULT	0.045	FUNGIVOR
840	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	2	0.8	1	0	2	0	5	ADULT	0.045	FUNGIVOR
841	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	2	0.8	2	0	5	3	0	ADULT	0.045	FUNGIVOR
842	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	2	1.2	1	5	0	0	10	ADULT	0.045	FUNGIVOR
843	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	2	2.0	1	0	5	0	0	ADULT	0.045	FUNGIVOR
844	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	2	2.0	2	0	0	0	20	ADULT	0.045	FUNGIVOR
845	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	4	0.4	1	12	1	0	0	ADULT	0.045	FUNGIVOR
846	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	4	0.8	1	7	0	0	2	ADULT	0.045	FUNGIVOR
847	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	4	0.8	2	0	0	8	0	ADULT	0.045	FUNGIVOR
848	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	4	1.2	1	0	3	3	0	ADULT	0.045	FUNGIVOR
849	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	3	4	1.2	2	0	0	0	2	ADULT	0.045	FUNGIVOR
850	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	0.4	1	1	2	2	0	ADULT	0.045	FUNGIVOR
851	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	0.8	1	1	0	0	0	ADULT	0.045	FUNGIVOR
852	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	0.8	2	3	0	0	0	ADULT	0.045	FUNGIVOR
853	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	1.2	2	20	0	0	15	ADULT	0.045	FUNGIVOR
854	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	1.6	1	1	0	0	0	ADULT	0.045	FUNGIVOR
855	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	1.6	2	4	0	4	2	ADULT	0.045	FUNGIVOR
856	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	21.0	1	3	1	0	0	ADULT	0.045	FUNGIVOR
857	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	1	21.0	2	20	0	16	6	ADULT	0.045	FUNGIVOR
858	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	0.4	1	3	0	3	0	ADULT	0.045	FUNGIVOR
859	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	0.4	2	2	0	2	0	ADULT	0.045	FUNGIVOR
860	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	0.8	1	0	0	1	0	ADULT	0.045	FUNGIVOR
861	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	0.8	2	0	1	0	2	ADULT	0.045	FUNGIVOR
862	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	1.2	1	0	1	1	1	ADULT	0.045	FUNGIVOR
863	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	1.2	2	1	0	0	0	ADULT	0.045	FUNGIVOR
864	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	2.0	1	1	0	0	0	ADULT	0.045	FUNGIVOR
865	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	2	2.0	2	1	4	12	3	ADULT	0.045	FUNGIVOR
866	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	4	0.4	1	0	3	0	1	ADULT	0.045	FUNGIVOR
867	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	4	0.4	2	15	0	2	1	ADULT	0.045	FUNGIVOR
868	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	4	0.6	2	1	1	0	0	ADULT	0.045	FUNGIVOR
869	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	4	1.2	1	3	0	2	0	ADULT	0.045	FUNGIVOR
870	INSECTA	COLLEMBOLA	ENTOMOBRYIDAE	4	4	1.2	2	5	0	0	0	ADULT	0.045	FUNGIVOR
871	INSECTA	NEUROPTERA	CHRYSOPIDAE	4	2	0.4	1	0	0	0	1	ADULT	2.100	PREDATOR
872	INSECTA	NEUROPTERA	CHRYSOPIDAE	4	4	0.4	2	0	0	1	0	ADULT	2.100	PREDATOR
873	INSECTA	NEUROPTERA	ASCALAPHIDAE	1	2	1.2	1	0	0	1	0	LARVA	1.360	PREDATOR
874	INSECTA	NEUROPTERA	ASCALAPHIDAE	2	1	0.4	2	1	0	0	0	LARVA	1.360	PREDATOR
875	INSECTA	NEUROPTERA	ASCALAPHIDAE	4	1	0.8	2	1	0	0	0	LARVA	1.360	PREDATOR
876	INSECTA	NEUROPTERA	HEMEROBIIDAE	4	2	0.4	1	1	0	0	0	ADULT	1.790	PREDATOR
877	INSECTA	ORTHOPTERA	BLATTIDAE	1	1	0.4	1	0	0	0	1	ADULT	2.720	OMNIVORE
878	INSECTA	ORTHOPTERA	BLATTIDAE	1	1	0.8	1	0	1	0	0	ADULT	2.720	OMNIVORE
879	INSECTA	ORTHOPTERA	BLATTIDAE	1	1	1.6	1	1	1	0	0	ADULT	2.720	OMNIVORE
880	INSECTA	ORTHOPTERA	BLATTIDAE	1	1	1.6	2	1	2	0	1	ADULT	2.720	OMNIVORE

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
881	INSECTA	ORTHOPTERA	BLATTIDAE	1	2	2.0	1	0	1	0	2	ADULT	2.720	OMNIVORE
882	INSECTA	ORTHOPTERA	BLATTIDAE	1	2	2.0	2	1	1	0	0	ADULT	2.720	OMNIVORE
883	INSECTA	ORTHOPTERA	BLATTIDAE	1	4	0.8	1	0	0	1	0	ADULT	2.720	OMNIVORE
884	INSECTA	ORTHOPTERA	BLATTIDAE	2	1	1.6	1	0	0	0	1	ADULT	2.720	OMNIVORE
885	INSECTA	ORTHOPTERA	BLATTIDAE	2	1	1.6	2	0	0	0	2	ADULT	2.720	OMNIVORE
886	INSECTA	ORTHOPTERA	BLATTIDAE	2	2	2.0	2	2	0	0	0	ADULT	2.720	OMNIVORE
887	INSECTA	ORTHOPTERA	BLATTIDAE	3	1	1.2	1	1	0	0	0	ADULT	2.720	OMNIVORE
888	INSECTA	ORTHOPTERA	BLATTIDAE	3	1	1.6	2	0	2	0	0	ADULT	2.720	OMNIVORE
889	INSECTA	ORTHOPTERA	BLATTIDAE	3	4	1.2	2	0	0	0	1	ADULT	2.720	OMNIVORE
890	INSECTA	ORTHOPTERA	BLATTIDAE	4	4	1.2	2	2	0	0	0	ADULT	2.720	OMNIVORE
891	INSECTA	PSOCOPTERA	UNKNOWN	1	1	1.2	1	1	0	0	0	ADULT	0.038	DETRITIV
892	INSECTA	PSOCOPTERA	UNKNOWN	1	1	1.2	2	1	0	0	3	ADULT	0.038	DETRITIV
893	INSECTA	PSOCOPTERA	UNKNOWN	1	1	21.0	1	6	4	0	3	ADULT	0.038	DETRITIV
894	INSECTA	PSOCOPTERA	UNKNOWN	1	2	0.8	1	0	1	0	0	ADULT	0.038	DETRITIV
895	INSECTA	PSOCOPTERA	UNKNOWN	1	2	1.2	1	0	1	0	0	ADULT	0.038	DETRITIV
896	INSECTA	PSOCOPTERA	UNKNOWN	1	2	1.2	2	0	0	0	1	ADULT	0.038	DETRITIV
897	INSECTA	PSOCOPTERA	UNKNOWN	1	4	0.4	1	0	0	1	0	ADULT	0.038	DETRITIV
898	INSECTA	PSOCOPTERA	UNKNOWN	2	1	0.8	1	1	0	0	0	ADULT	0.038	DETRITIV
899	INSECTA	PSOCOPTERA	UNKNOWN	2	1	1.2	1	0	3	1	0	ADULT	0.038	DETRITIV
900	INSECTA	PSOCOPTERA	UNKNOWN	2	1	1.6	1	1	0	1	1	ADULT	0.038	DETRITIV
901	INSECTA	PSOCOPTERA	UNKNOWN	2	1	21.0	1	2	0	0	3	ADULT	0.038	DETRITIV
902	INSECTA	PSOCOPTERA	UNKNOWN	2	2	0.8	2	0	0	1	0	ADULT	0.038	DETRITIV
903	INSECTA	PSOCOPTERA	UNKNOWN	2	2	1.2	1	2	0	0	0	ADULT	0.038	DETRITIV
904	INSECTA	PSOCOPTERA	UNKNOWN	2	2	2.0	1	1	1	0	1	ADULT	0.038	DETRITIV
905	INSECTA	PSOCOPTERA	UNKNOWN	2	2	2.0	2	5	0	0	0	ADULT	0.038	DETRITIV
906	INSECTA	PSOCOPTERA	UNKNOWN	2	4	0.4	1	0	0	1	1	ADULT	0.038	DETRITIV
907	INSECTA	PSOCOPTERA	UNKNOWN	2	4	0.8	1	0	1	1	0	ADULT	0.038	DETRITIV
908	INSECTA	PSOCOPTERA	UNKNOWN	2	4	1.2	1	0	1	0	0	ADULT	0.038	DETRITIV
909	INSECTA	PSOCOPTERA	UNKNOWN	3	1	0.8	1	2	0	0	3	ADULT	0.038	DETRITIV
910	INSECTA	PSOCOPTERA	UNKNOWN	3	1	1.2	1	0	0	1	1	ADULT	0.038	DETRITIV
911	INSECTA	PSOCOPTERA	UNKNOWN	3	1	1.6	1	2	0	0	0	ADULT	0.038	DETRITIV
912	INSECTA	PSOCOPTERA	UNKNOWN	3	1	21.0	1	0	1	0	0	ADULT	0.038	DETRITIV
913	INSECTA	PSOCOPTERA	UNKNOWN	3	2	0.8	1	0	1	0	0	ADULT	0.038	DETRITIV
914	INSECTA	PSOCOPTERA	UNKNOWN	3	2	1.2	1	0	1	0	0	ADULT	0.038	DETRITIV
915	INSECTA	PSOCOPTERA	UNKNOWN	3	2	2.0	1	0	0	1	0	ADULT	0.038	DETRITIV
916	INSECTA	PSOCOPTERA	UNKNOWN	4	1	0.8	1	2	1	0	1	ADULT	0.038	DETRITIV
917	INSECTA	PSOCOPTERA	UNKNOWN	4	1	1.2	1	0	0	1	0	ADULT	0.038	DETRITIV
918	INSECTA	PSOCOPTERA	UNKNOWN	4	1	1.6	1	1	0	0	0	ADULT	0.038	DETRITIV
919	INSECTA	PSOCOPTERA	UNKNOWN	4	1	21.0	1	0	3	1	0	ADULT	0.038	DETRITIV
920	INSECTA	PSOCOPTERA	UNKNOWN	4	1	21.0	2	0	0	0	1	ADULT	0.038	DETRITIV
921	INSECTA	PSOCOPTERA	UNKNOWN	4	2	0.8	1	3	1	0	1	ADULT	0.038	DETRITIV
922	INSECTA	PSOCOPTERA	UNKNOWN	4	2	2.0	1	1	0	0	2	ADULT	0.038	DETRITIV
923	INSECTA	HYMENOPTERA	UNKNOWN	2	1	1.6	1	0	0	0	1	LARVA	0.030	UNKNOWN
924	INSECTA	HYMENOPTERA	DORYLINAE	1	1	0.8	1	0	0	1	0	ADULT	0.455	PREDATOR
925	INSECTA	HYMENOPTERA	DORYLINAE	1	1	1.2	2	0	1	0	0	ADULT	0.455	PREDATOR
926	INSECTA	HYMENOPTERA	DORYLINAE	1	1	1.6	2	0	0	0	1	ADULT	0.455	PREDATOR
927	INSECTA	HYMENOPTERA	DORYLINAE	1	4	0.8	2	0	1	0	0	ADULT	0.455	PREDATOR
928	INSECTA	HYMENOPTERA	DORYLINAE	2	1	0.4	2	2	0	0	0	ADULT	0.455	PREDATOR
929	INSECTA	HYMENOPTERA	DORYLINAE	2	1	1.2	2	0	0	0	1	ADULT	0.455	PREDATOR
930	INSECTA	HYMENOPTERA	DORYLINAE	2	4	0.8	2	0	1	0	0	ADULT	0.455	PREDATOR
931	INSECTA	HYMENOPTERA	DORYLINAE	2	4	1.2	2	0	4	2	15	ADULT	0.455	PREDATOR
932	INSECTA	HYMENOPTERA	DORYLINAE	3	2	2.0	2	0	1	0	0	ADULT	0.455	PREDATOR
933	INSECTA	HYMENOPTERA	DORYLINAE	3	4	1.2	2	1	0	2	2	ADULT	0.455	PREDATOR
934	INSECTA	HYMENOPTERA	DORYLINAE	4	2	0.4	2	0	0	1	0	ADULT	0.455	PREDATOR
935	INSECTA	HYMENOPTERA	PONERINAE	1	1	0.8	2	0	1	1	0	ADULT	0.102	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
936	INSECTA	HYMENOPTERA	PONERINAE	1	1	1.2	2	0	0	5	0	ADULT	.102	PREDATOR
937	INSECTA	HYMENOPTERA	PONERINAE	1	1	1.6	2	0	1	0	0	ADULT	.102	PREDATOR
938	INSECTA	HYMENOPTERA	PONERINAE	1	2	1.2	2	0	0	2	0	ADULT	.102	PREDATOR
939	INSECTA	HYMENOPTERA	PONERINAE	1	4	0.8	2	2	0	0	0	ADULT	.102	PREDATOR
940	INSECTA	HYMENOPTERA	PONERINAE	1	4	1.2	2	0	0	0	1	ADULT	.102	PREDATOR
941	INSECTA	HYMENOPTERA	PONERINAE	2	1	0.4	2	1	0	5	0	ADULT	.102	PREDATOR
942	INSECTA	HYMENOPTERA	PONERINAE	2	1	0.8	2	0	1	0	0	ADULT	.102	PREDATOR
943	INSECTA	HYMENOPTERA	PONERINAE	2	1	1.2	2	0	5	1	1	ADULT	.102	PREDATOR
944	INSECTA	HYMENOPTERA	PONERINAE	2	1	1.6	1	0	0	0	2	ADULT	.102	PREDATOR
945	INSECTA	HYMENOPTERA	PONERINAE	2	1	1.6	2	0	1	2	3	ADULT	.102	PREDATOR
946	INSECTA	HYMENOPTERA	PONERINAE	2	1	21.0	2	0	0	0	7	ADULT	.102	PREDATOR
947	INSECTA	HYMENOPTERA	PONERINAE	2	2	0.8	2	1	0	0	0	ADULT	.102	PREDATOR
948	INSECTA	HYMENOPTERA	PONERINAE	2	2	1.2	2	0	19	0	0	ADULT	.102	PREDATOR
949	INSECTA	HYMENOPTERA	PONERINAE	2	2	2.0	2	0	1	0	0	ADULT	.102	PREDATOR
950	INSECTA	HYMENOPTERA	PONERINAE	2	4	0.4	2	2	0	1	0	ADULT	.102	PREDATOR
951	INSECTA	HYMENOPTERA	PONERINAE	2	4	0.8	1	1	1	0	0	ADULT	.102	PREDATOR
952	INSECTA	HYMENOPTERA	PONERINAE	2	4	0.8	2	1	1	1	0	ADULT	.102	PREDATOR
953	INSECTA	HYMENOPTERA	PONERINAE	2	4	1.2	2	0	0	1	1	ADULT	.102	PREDATOR
954	INSECTA	HYMENOPTERA	PONERINAE	3	1	1.2	2	24	0	0	1	ADULT	.102	PREDATOR
955	INSECTA	HYMENOPTERA	PONERINAE	3	1	1.6	2	1	0	0	26	ADULT	.102	PREDATOR
956	INSECTA	HYMENOPTERA	PONERINAE	3	1	21.0	2	0	0	2	0	ADULT	.102	PREDATOR
957	INSECTA	HYMENOPTERA	PONERINAE	3	2	0.8	2	1	0	0	0	ADULT	.102	PREDATOR
958	INSECTA	HYMENOPTERA	PONERINAE	3	2	1.2	1	0	0	1	0	ADULT	.102	PREDATOR
959	INSECTA	HYMENOPTERA	PONERINAE	3	2	1.2	2	2	1	1	46	ADULT	.102	PREDATOR
960	INSECTA	HYMENOPTERA	PONERINAE	3	2	2.0	2	0	1	0	0	ADULT	.102	PREDATOR
961	INSECTA	HYMENOPTERA	PONERINAE	3	4	0.6	2	1	0	2	0	ADULT	.102	PREDATOR
962	INSECTA	HYMENOPTERA	PONERINAE	4	4	0.8	2	0	0	1	0	ADULT	.102	PREDATOR
963	INSECTA	HYMENOPTERA	BRACONIDAE	3	2	0.4	1	0	1	0	0	ADULT	.070	PREDATOR
964	INSECTA	HYMENOPTERA	EULOPHIDAE	1	1	0.8	2	0	0	0	1	ADULT	.140	PREDATOR
965	INSECTA	HYMENOPTERA	EULOPHIDAE	2	4	1.2	2	0	0	1	0	ADULT	.140	PREDATOR
966	INSECTA	HYMENOPTERA	EULOPHIDAE	4	4	0.4	2	0	1	0	0	ADULT	.140	PREDATOR
967	INSECTA	HYMENOPTERA	EUPELMIDAE	2	1	1.2	2	2	0	4	0	ADULT	.047	PREDATOR
968	INSECTA	HYMENOPTERA	EUPELMIDAE	2	1	1.6	1	0	0	0	1	ADULT	.047	PREDATOR
969	INSECTA	HYMENOPTERA	EUPELMIDAE	4	1	1.6	2	0	1	0	0	ADULT	.047	PREDATOR
970	INSECTA	HYMENOPTERA	FORMICINAE	1	1	21.0	2	1	0	0	0	ADULT	.110	OMNIVORE
971	INSECTA	HYMENOPTERA	FORMICINAE	1	2	0.8	1	0	0	0	3	ADULT	.110	OMNIVORE
972	INSECTA	HYMENOPTERA	FORMICINAE	1	2	2.0	1	0	4	0	0	ADULT	.110	OMNIVORE
973	INSECTA	HYMENOPTERA	FORMICINAE	1	2	2.0	2	0	6	0	0	ADULT	.110	OMNIVORE
974	INSECTA	HYMENOPTERA	FORMICINAE	2	1	0.4	1	54	0	0	0	ADULT	.110	OMNIVORE
975	INSECTA	HYMENOPTERA	FORMICINAE	2	1	0.4	2	42	0	0	0	ADULT	.110	OMNIVORE
976	INSECTA	HYMENOPTERA	FORMICINAE	2	1	0.8	2	0	22	0	0	ADULT	.110	OMNIVORE
977	INSECTA	HYMENOPTERA	FORMICINAE	2	1	1.2	2	0	0	11	0	ADULT	.110	OMNIVORE
978	INSECTA	HYMENOPTERA	FORMICINAE	2	2	2.0	2	1	0	0	1	ADULT	.110	OMNIVORE
979	INSECTA	HYMENOPTERA	FORMICINAE	2	4	1.2	1	1	0	0	0	ADULT	.110	OMNIVORE
980	INSECTA	HYMENOPTERA	FORMICINAE	2	4	1.2	2	0	0	0	8	ADULT	.110	OMNIVORE
981	INSECTA	HYMENOPTERA	FORMICINAE	3	1	1.2	2	0	0	4	0	ADULT	.110	OMNIVORE
982	INSECTA	HYMENOPTERA	FORMICINAE	3	2	0.8	2	0	0	5	0	ADULT	.110	OMNIVORE
983	INSECTA	HYMENOPTERA	FORMICINAE	4	1	1.6	2	0	4	0	0	ADULT	.110	OMNIVORE
984	INSECTA	HYMENOPTERA	MRYMICINAE	1	1	0.8	1	0	0	1	0	ADULT	.270	OMNIVORE
985	INSECTA	HYMENOPTERA	MRYMICINAE	1	1	1.2	2	1	1	0	0	ADULT	.270	OMNIVORE
986	INSECTA	HYMENOPTERA	MRYMICINAE	1	1	1.6	2	2	1	0	0	ADULT	.270	OMNIVORE
987	INSECTA	HYMENOPTERA	MRYMICINAE	1	1	21.0	1	0	1	0	0	ADULT	.270	OMNIVORE
988	INSECTA	HYMENOPTERA	MRYMICINAE	1	1	21.0	2	1	3	6	2	ADULT	.270	OMNIVORE
989	INSECTA	HYMENOPTERA	MRYMICINAE	1	2	0.4	2	0	0	1	0	ADULT	.270	OMNIVORE
990	INSECTA	HYMENOPTERA	MRYMICINAE	1	2	0.8	2	0	1	0	0	ADULT	.270	OMNIVORE

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	WGHT	TROFLEVL
991	INSECTA	HYMENOPTERA	MRYMICINAE	1	2	1.2	1	0	0	1	1	ADULT	0.270	OMNIVORE
992	INSECTA	HYMENOPTERA	MRYMICINAE	1	2	1.2	2	1	0	0	0	ADULT	0.270	OMNIVORE
993	INSECTA	HYMENOPTERA	MRYMICINAE	1	2	2.0	2	2	2	0	1	ADULT	0.270	OMNIVORE
994	INSECTA	HYMENOPTERA	MRYMICINAE	1	4	1.2	1	0	1	0	0	ADULT	0.270	OMNIVORE
995	INSECTA	HYMENOPTERA	MRYMICINAE	1	4	1.2	2	1	1	0	1	ADULT	0.270	OMNIVORE
996	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	0.4	1	1	2	1	0	ADULT	0.270	OMNIVORE
997	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	0.4	2	1	0	0	0	ADULT	0.270	OMNIVORE
998	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	0.8	1	0	0	1	0	ADULT	0.270	OMNIVORE
999	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	0.8	2	1	0	2	0	ADULT	0.270	OMNIVORE
1000	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	1.2	1	1	0	0	0	ADULT	0.270	OMNIVORE
1001	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	1.2	2	1	1	1	6	ADULT	0.270	OMNIVORE
1002	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	1.6	1	11	0	0	24	ADULT	0.270	OMNIVORE
1003	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	1.6	2	0	1	1	1	ADULT	0.270	OMNIVORE
1004	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	21.0	1	1	0	26	3	ADULT	0.270	OMNIVORE
1005	INSECTA	HYMENOPTERA	MRYMICINAE	2	1	21.0	2	0	0	2	0	ADULT	0.270	OMNIVORE
1006	INSECTA	HYMENOPTERA	MRYMICINAE	2	2	0.4	1	0	0	1	0	ADULT	0.270	OMNIVORE
1007	INSECTA	HYMENOPTERA	MRYMICINAE	2	2	0.8	2	2	1	0	0	ADULT	0.270	OMNIVORE
1008	INSECTA	HYMENOPTERA	MRYMICINAE	2	2	1.2	2	0	0	1	0	ADULT	0.270	OMNIVORE
1009	INSECTA	HYMENOPTERA	MRYMICINAE	2	2	2.0	1	0	0	55	0	ADULT	0.270	OMNIVORE
1010	INSECTA	HYMENOPTERA	MRYMICINAE	2	2	2.0	2	0	1	8	4	ADULT	0.270	OMNIVORE
1011	INSECTA	HYMENOPTERA	MRYMICINAE	2	4	0.4	2	0	0	2	0	ADULT	0.270	OMNIVORE
1012	INSECTA	HYMENOPTERA	MRYMICINAE	2	4	0.8	2	1	0	1	3	ADULT	0.270	OMNIVORE
1013	INSECTA	HYMENOPTERA	MRYMICINAE	2	4	1.2	1	0	3	0	6	ADULT	0.270	OMNIVORE
1014	INSECTA	HYMENOPTERA	MRYMICINAE	2	4	1.2	2	0	2	1	2	ADULT	0.270	OMNIVORE
1015	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	0.4	2	1	0	1	0	ADULT	0.270	OMNIVORE
1016	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	0.8	2	1	1	0	1	ADULT	0.270	OMNIVORE
1017	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	1.2	1	1	0	0	0	ADULT	0.270	OMNIVORE
1018	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	1.2	2	2	0	3	1	ADULT	0.270	OMNIVORE
1019	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	1.6	1	1	40	0	0	ADULT	0.270	OMNIVORE
1020	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	1.6	2	1	96	2	2	ADULT	0.270	OMNIVORE
1021	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	21.0	1	0	1	16	0	ADULT	0.270	OMNIVORE
1022	INSECTA	HYMENOPTERA	MRYMICINAE	3	1	21.0	2	3	0	22	0	ADULT	0.270	OMNIVORE
1023	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	0.4	2	0	0	1	0	ADULT	0.270	OMNIVORE
1024	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	0.8	1	0	0	1	0	ADULT	0.270	OMNIVORE
1025	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	0.8	2	0	8	2	0	ADULT	0.270	OMNIVORE
1026	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	1.2	1	0	0	126	0	ADULT	0.270	OMNIVORE
1027	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	1.2	2	0	2	76	0	ADULT	0.270	OMNIVORE
1028	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	2.0	1	1	0	0	0	ADULT	0.270	OMNIVORE
1029	INSECTA	HYMENOPTERA	MRYMICINAE	3	2	2.0	2	0	2	2	2	ADULT	0.270	OMNIVORE
1030	INSECTA	HYMENOPTERA	MRYMICINAE	3	4	0.4	2	1	1	0	2	ADULT	0.270	OMNIVORE
1031	INSECTA	HYMENOPTERA	MRYMICINAE	3	4	0.8	2	2	2	1	1	ADULT	0.270	OMNIVORE
1032	INSECTA	HYMENOPTERA	MRYMICINAE	3	4	1.2	2	1	0	2	0	ADULT	0.270	OMNIVORE
1033	INSECTA	HYMENOPTERA	MRYMICINAE	4	1	0.8	1	0	1	0	0	ADULT	0.270	OMNIVORE
1034	INSECTA	HYMENOPTERA	MRYMICINAE	4	1	0.8	2	0	0	16	0	ADULT	0.270	OMNIVORE
1035	INSECTA	HYMENOPTERA	MRYMICINAE	4	1	1.2	1	11	0	0	0	ADULT	0.270	OMNIVORE
1036	INSECTA	HYMENOPTERA	MRYMICINAE	4	1	1.6	2	0	0	0	1	ADULT	0.270	OMNIVORE
1037	INSECTA	HYMENOPTERA	MRYMICINAE	4	4	0.4	2	1	0	0	0	ADULT	0.270	OMNIVORE
1038	INSECTA	HYMENOPTERA	MRYMICINAE	4	4	0.8	2	0	0	1	7	ADULT	0.270	OMNIVORE
1039	INSECTA	HYMENOPTERA	MRYMICINAE	4	4	1.2	2	0	1	2	0	ADULT	0.270	OMNIVORE
1040	INSECTA	HYMENOPTERA	AMPULICIDAE	2	1	0.8	1	0	0	1	0	ADULT	0.090	PREDATOR
1041	INSECTA	HYMENOPTERA	CHALCIDOIDEA	2	1	21.0	1	0	2	0	0	ADULT	0.017	PREDATOR
1042	INSECTA	HYMENOPTERA	CHALCIDOIDEA	2	1	21.0	2	0	0	5	0	ADULT	0.017	PREDATOR
1043	INSECTA	HYMENOPTERA	CHALCIDOIDEA	2	2	0.4	2	0	1	0	0	ADULT	0.017	PREDATOR
1044	INSECTA	HYMENOPTERA	CHALCIDOIDEA	2	2	0.8	1	1	0	0	0	ADULT	0.017	PREDATOR
1045	INSECTA	HYMENOPTERA	CHALCIDOIDEA	2	4	0.4	2	1	0	0	0	ADULT	0.017	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
1046	INSECTA	HYMENOPTERA	CHALCIDOIDEA	2	4	0.8	2	0	1	0	0	ADULT	0.017	PREDATOR
1047	INSECTA	HYMENOPTERA	CHALCIDOIDEA	3	1	1.2	1	1	0	0	0	ADULT	0.017	PREDATOR
1048	INSECTA	HYMENOPTERA	CHALCIDOIDEA	3	1	1.6	2	0	1	0	0	ADULT	0.017	PREDATOR
1049	INSECTA	HYMENOPTERA	CHALCIDOIDEA	3	2	0.4	2	0	0	0	1	ADULT	0.017	PREDATOR
1050	INSECTA	HYMENOPTERA	CHALCIDOIDEA	3	2	0.8	2	0	0	0	1	ADULT	0.017	PREDATOR
1051	INSECTA	HYMENOPTERA	CHALCIDOIDEA	4	1	0.4	2	0	0	0	1	ADULT	0.017	PREDATOR
1052	INSECTA	HYMENOPTERA	CHALCIDOIDEA	4	1	0.8	2	0	0	0	1	ADULT	0.017	PREDATOR
1053	INSECTA	HYMENOPTERA	CHALCIDOIDEA	4	1	1.2	2	0	0	1	0	ADULT	0.017	PREDATOR
1054	INSECTA	HYMENOPTERA	CHALCIDOIDEA	4	2	0.8	2	0	0	0	1	ADULT	0.017	PREDATOR
1055	INSECTA	HYMENOPTERA	ICHNEUMONIDAE	1	1	0.8	2	0	1	0	0	ADULT	1.140	PREDATOR
1056	INSECTA	HYMENOPTERA	ICHNEUMONIDAE	1	1	1.2	1	0	0	1	0	ADULT	1.140	PREDATOR
1057	INSECTA	HYMENOPTERA	ICHNEUMONIDAE	1	2	0.4	1	1	0	0	0	ADULT	1.140	PREDATOR
1058	INSECTA	HYMENOPTERA	ICHNEUMONIDAE	2	1	21.0	2	0	0	1	0	ADULT	1.140	PREDATOR
1059	INSECTA	HYMENOPTERA	ICHNEUMONIDAE	2	2	0.8	1	0	0	0	1	ADULT	1.140	PREDATOR
1060	INSECTA	HYMENOPTERA	ICHNEUMONIDAE	4	1	0.4	1	1	0	0	0	ADULT	1.140	PREDATOR
1061	INSECTA	HYMENOPTERA	DOLICHODERINAE	2	1	21.0	1	1	0	0	0	ADULT	0.930	OMNIVORE
1062	INSECTA	HYMENOPTERA	DOLICHODERINAE	2	2	2.0	2	0	0	2	0	ADULT	0.930	OMNIVORE
1063	INSECTA	HYMENOPTERA	DOLICHODERINAE	3	2	0.4	2	0	0	0	1	ADULT	0.930	OMNIVORE
1064	INSECTA	HYMENOPTERA	DOLICHODERINAE	3	2	0.8	1	0	5	0	0	ADULT	0.930	OMNIVORE
1065	INSECTA	HYMENOPTERA	DOLICHODERINAE	3	2	2.0	1	1	0	0	0	ADULT	0.930	OMNIVORE
1066	INSECTA	HYMENOPTERA	PROCTOTRUPOIDEA	1	4	0.8	1	0	1	0	0	ADULT	0.125	PREDATOR
1067	INSECTA	HYMENOPTERA	PROCTOTRUPOIDEA	2	2	2.0	2	0	1	0	0	ADULT	0.125	PREDATOR
1068	INSECTA	HYMENOPTERA	PROCTOTRUPOIDEA	4	2	2.0	2	0	0	0	1	ADULT	0.125	PREDATOR
1069	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	1	1	1.2	2	1	0	0	0	ADULT	0.023	PREDATOR
1070	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	1	4	0.8	1	0	0	1	0	ADULT	0.023	PREDATOR
1071	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	1	4	0.8	2	1	1	2	0	ADULT	0.023	PREDATOR
1072	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	1	4	1.2	2	0	0	0	1	ADULT	0.023	PREDATOR
1073	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	2	1	0.8	2	1	0	1	0	ADULT	0.023	PREDATOR
1074	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	2	1	1.2	2	0	1	0	1	ADULT	0.023	PREDATOR
1075	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	2	2	0.8	2	0	2	0	0	ADULT	0.023	PREDATOR
1076	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	2	4	0.8	2	1	0	0	0	ADULT	0.023	PREDATOR
1077	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	2	4	1.2	2	0	0	0	2	ADULT	0.023	PREDATOR
1078	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	1	0.4	2	0	0	0	1	ADULT	0.023	PREDATOR
1079	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	1	0.8	2	2	0	0	0	ADULT	0.023	PREDATOR
1080	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	1	1.2	2	1	0	0	0	ADULT	0.023	PREDATOR
1081	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	2	0.8	2	0	0	0	1	ADULT	0.023	PREDATOR
1082	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	2	1.2	1	0	0	0	1	ADULT	0.023	PREDATOR
1083	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	2	2.0	2	1	0	0	0	ADULT	0.023	PREDATOR
1084	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	3	4	1.2	2	0	0	4	0	ADULT	0.023	PREDATOR
1085	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	4	1	1.2	1	0	0	0	1	ADULT	0.023	PREDATOR
1086	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	4	1	21.0	2	2	0	0	0	ADULT	0.023	PREDATOR
1087	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	4	2	1.2	2	0	1	0	0	ADULT	0.023	PREDATOR
1088	INSECTA	HYMENOPTERA	UNKNOWNPARASITE	4	4	0.8	2	0	4	1	0	ADULT	0.023	PREDATOR
1089	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	0.8	1	0	0	7	0	ADULT	0.022	FUNGIVOR
1090	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	0.8	2	2	0	3	0	ADULT	0.022	FUNGIVOR
1091	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	1.2	1	0	1	3	2	ADULT	0.022	FUNGIVOR
1092	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	1.2	2	1	3	0	14	ADULT	0.022	FUNGIVOR
1093	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	1.6	1	0	0	5	0	ADULT	0.022	FUNGIVOR
1094	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	1.6	2	0	2	12	13	ADULT	0.022	FUNGIVOR
1095	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	21.0	1	0	0	1	0	ADULT	0.022	FUNGIVOR
1096	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	1	21.0	2	0	0	2	5	ADULT	0.022	FUNGIVOR
1097	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	2	1.2	1	0	0	0	5	ADULT	0.022	FUNGIVOR
1098	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	2	1.2	2	2	0	0	2	ADULT	0.022	FUNGIVOR
1099	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	2	2.0	1	0	0	0	1	ADULT	0.022	FUNGIVOR
1100	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	2	2.0	2	4	0	5	0	ADULT	0.022	FUNGIVOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	WGHT	TROFLEVL
1101	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	4	0.8	1	0	0	2	0	ADULT	0.022	FUNGIVOR
1102	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	4	0.8	2	0	0	0	2	ADULT	0.022	FUNGIVOR
1103	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	1	4	1.2	2	1	0	0	0	ADULT	0.022	FUNGIVOR
1104	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	0.4	1	0	2	0	0	ADULT	0.022	FUNGIVOR
1105	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	0.8	2	0	0	0	1	ADULT	0.022	FUNGIVOR
1106	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	1.2	1	0	0	0	2	ADULT	0.022	FUNGIVOR
1107	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	1.2	2	1	0	0	0	ADULT	0.022	FUNGIVOR
1108	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	1.6	1	0	0	0	1	ADULT	0.022	FUNGIVOR
1109	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	21.0	1	4	2	2	3	ADULT	0.022	FUNGIVOR
1110	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	1	21.0	2	1	6	8	0	ADULT	0.022	FUNGIVOR
1111	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	0.4	1	0	0	1	0	ADULT	0.022	FUNGIVOR
1112	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	0.8	1	0	0	2	1	ADULT	0.022	FUNGIVOR
1113	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	0.8	2	0	9	0	0	ADULT	0.022	FUNGIVOR
1114	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	1.2	1	4	0	0	0	ADULT	0.022	FUNGIVOR
1115	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	1.2	2	1	0	1	0	ADULT	0.022	FUNGIVOR
1116	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	2.0	1	0	1	0	0	ADULT	0.022	FUNGIVOR
1117	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	2	2.0	2	0	6	1	0	ADULT	0.022	FUNGIVOR
1118	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	2	4	0.8	2	0	1	0	0	ADULT	0.022	FUNGIVOR
1119	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	1	0.8	1	0	0	1	0	ADULT	0.022	FUNGIVOR
1120	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	1	1.2	1	0	0	0	1	ADULT	0.022	FUNGIVOR
1121	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	1	1.6	1	0	0	0	2	ADULT	0.022	FUNGIVOR
1122	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	1	1.6	2	3	3	8	0	ADULT	0.022	FUNGIVOR
1123	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	1	21.0	1	0	3	0	23	ADULT	0.022	FUNGIVOR
1124	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	1	21.0	2	23	3	8	0	ADULT	0.022	FUNGIVOR
1125	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	2	0.4	2	0	0	0	1	ADULT	0.022	FUNGIVOR
1126	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	2	0.8	1	1	5	1	0	ADULT	0.022	FUNGIVOR
1127	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	2	0.8	2	0	15	0	0	ADULT	0.022	FUNGIVOR
1128	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	2	1.2	1	1	0	0	0	ADULT	0.022	FUNGIVOR
1129	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	2	1.2	2	0	2	0	1	ADULT	0.022	FUNGIVOR
1130	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	2	2.0	2	1	5	0	0	ADULT	0.022	FUNGIVOR
1131	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	4	0.8	1	2	0	0	1	ADULT	0.022	FUNGIVOR
1132	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	3	4	1.2	2	1	0	0	0	ADULT	0.022	FUNGIVOR
1133	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	1	0.4	1	0	0	0	1	ADULT	0.022	FUNGIVOR
1134	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	1	1.2	2	6	0	0	0	ADULT	0.022	FUNGIVOR
1135	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	1	1.6	2	3	0	1	0	ADULT	0.022	FUNGIVOR
1136	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	1	21.0	1	0	0	0	1	ADULT	0.022	FUNGIVOR
1137	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	1	21.0	2	0	1	1	0	ADULT	0.022	FUNGIVOR
1138	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	2	1.2	1	1	0	1	0	ADULT	0.022	FUNGIVOR
1139	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	2	1.2	2	1	0	0	0	ADULT	0.022	FUNGIVOR
1140	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	2	2.0	1	0	0	1	0	ADULT	0.022	FUNGIVOR
1141	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	2	2.0	2	1	2	0	4	ADULT	0.022	FUNGIVOR
1142	INSECTA	THYSANOPTERA	PHLOEOTHRIPIDAE	4	4	1.2	2	0	2	0	0	ADULT	0.022	FUNGIVOR
1143	SYMPHYLA	UNKNOWN	UNKNOWN	2	2	0.8	2	1	0	0	1	ADULT	0.063	DETRITIV
1144	SYMPHYLA	UNKNOWN	UNKNOWN	2	2	1.2	2	1	0	0	0	ADULT	0.063	DETRITIV
1145	SYMPHYLA	UNKNOWN	UNKNOWN	2	2	2.0	2	0	1	1	1	ADULT	0.063	DETRITIV
1146	ARACHNIDA	ARANEAE	ZORIDAE	4	1	0.4	1	1	0	0	0	ADULT	2.277	PREDATOR
1147	ARACHNIDA	ARANEAE	ZORIDAE	4	1	0.8	2	1	0	0	0	ADULT	2.277	PREDATOR
1148	ARACHNIDA	ARANEAE	HAHNIIDAE	1	1	0.4	2	1	0	0	0	ADULT	0.125	PREDATOR
1149	ARACHNIDA	ARANEAE	HAHNIIDAE	2	1	1.2	2	0	0	0	3	ADULT	0.125	PREDATOR
1150	ARACHNIDA	ARANEAE	HAHNIIDAE	2	2	0.8	2	0	0	0	1	ADULT	0.125	PREDATOR
1151	ARACHNIDA	ARANEAE	HAHNIIDAE	2	2	1.2	2	0	1	0	0	ADULT	0.125	PREDATOR
1152	ARACHNIDA	ARANEAE	HAHNIIDAE	2	4	1.2	2	0	0	1	0	ADULT	0.125	PREDATOR
1153	ARACHNIDA	ARANEAE	HAHNIIDAE	4	1	1.2	2	0	0	1	0	ADULT	0.125	PREDATOR
1154	ARACHNIDA	ARANEAE	HAHNIIDAE	4	1	1.6	2	0	0	1	0	ADULT	0.125	PREDATOR
1155	ARACHNIDA	ARANEAE	LYCOSIDAE	1	2	1.2	1	0	1	0	0	ADULT	0.120	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROPLEVL
1156	ARACHNIDA	ARANEAE	LYCOSIDAE	3	1	0.4	1	0	0	1	0	ADULT	0.120	PREDATOR
1157	ARACHNIDA	ARANEAE	LYCOSIDAE	3	2	1.2	1	1	0	0	0	ADULT	0.120	PREDATOR
1158	ARACHNIDA	ARANEAE	LYCOSIDAE	4	2	2.0	2	0	0	0	1	ADULT	0.120	PREDATOR
1159	ARACHNIDA	ARANEAE	OONOPIDAE	4	1	1.2	1	1	0	0	0	ADULT	0.160	PREDATOR
1160	ARACHNIDA	ARANEAE	AGELENIDAE	2	2	2.0	2	0	0	1	1	ADULT	1.785	PREDATOR
1161	ARACHNIDA	ARANEAE	DYSDERIDAE	1	2	2.0	1	0	0	0	1	ADULT	3.335	PREDATOR
1162	ARACHNIDA	ARANEAE	DYSDERIDAE	2	1	1.6	2	1	0	0	0	ADULT	3.335	PREDATOR
1163	ARACHNIDA	ARANEAE	DYSDERIDAE	3	1	0.8	2	1	0	0	0	ADULT	3.335	PREDATOR
1164	ARACHNIDA	ARANEAE	DYSDERIDAE	3	1	1.2	1	0	0	1	0	ADULT	3.335	PREDATOR
1165	ARACHNIDA	ARANEAE	DYSDERIDAE	4	4	1.2	1	1	0	0	0	ADULT	3.335	PREDATOR
1166	ARACHNIDA	ARANEAE	OECOBIIDAE	1	4	0.8	1	0	1	0	0	ADULT	0.380	PREDATOR
1167	ARACHNIDA	ARANEAE	OECOBIIDAE	2	1	1.2	1	0	0	0	1	ADULT	0.380	PREDATOR
1168	ARACHNIDA	ARANEAE	OECOBIIDAE	2	2	0.6	2	0	0	1	0	ADULT	0.380	PREDATOR
1169	ARACHNIDA	ARANEAE	SALTICIDAE	1	1	1.2	2	0	0	0	1	ADULT	0.188	PREDATOR
1170	ARACHNIDA	ARANEAE	SALTICIDAE	1	1	21.0	2	0	1	0	0	ADULT	0.188	PREDATOR
1171	ARACHNIDA	ARANEAE	SALTICIDAE	1	2	0.4	1	0	0	1	0	ADULT	0.188	PREDATOR
1172	ARACHNIDA	ARANEAE	SALTICIDAE	1	4	0.4	1	1	0	0	0	ADULT	0.188	PREDATOR
1173	ARACHNIDA	ARANEAE	SALTICIDAE	1	4	1.2	2	0	0	1	0	ADULT	0.188	PREDATOR
1174	ARACHNIDA	ARANEAE	SALTICIDAE	3	1	0.8	1	1	0	0	0	ADULT	0.188	PREDATOR
1175	ARACHNIDA	ARANEAE	SALTICIDAE	3	1	1.2	1	1	0	0	0	ADULT	0.188	PREDATOR
1176	ARACHNIDA	ARANEAE	SALTICIDAE	3	2	0.4	2	0	0	1	0	ADULT	0.188	PREDATOR
1177	ARACHNIDA	ARANEAE	SALTICIDAE	3	4	0.4	1	0	0	1	0	ADULT	0.186	PREDATOR
1178	ARACHNIDA	ARANEAE	SALTICIDAE	3	4	0.8	2	0	0	1	0	ADULT	0.188	PREDATOR
1179	ARACHNIDA	ARANEAE	SALTICIDAE	4	2	0.4	2	0	0	1	1	ADULT	0.188	PREDATOR
1180	ARACHNIDA	ARANEAE	SALTICIDAE	4	2	0.8	2	0	0	1	0	ADULT	0.188	PREDATOR
1181	ARACHNIDA	ARANEAE	SALTICIDAE	4	4	0.8	1	0	0	1	0	ADULT	0.188	PREDATOR
1182	ARACHNIDA	ARANEAE	SALTICIDAE	4	4	0.8	2	0	0	0	1	ADULT	0.188	PREDATOR
1183	ARACHNIDA	ARANEAE	SALTICIDAE	4	4	1.2	2	0	1	0	0	ADULT	0.188	PREDATOR
1184	ARACHNIDA	ARANEAE	THOMISIDAE	1	1	0.8	2	0	0	0	1	ADULT	0.120	PREDATOR
1185	ARACHNIDA	ARANEAE	THOMISIDAE	1	1	21.0	1	0	0	1	0	ADULT	0.120	PREDATOR
1186	ARACHNIDA	ARANEAE	THOMISIDAE	1	1	21.0	2	0	0	0	1	ADULT	0.120	PREDATOR
1187	ARACHNIDA	ARANEAE	THOMISIDAE	1	2	2.0	2	1	1	0	0	ADULT	0.120	PREDATOR
1188	ARACHNIDA	ARANEAE	THOMISIDAE	1	4	0.6	2	0	1	0	0	ADULT	0.120	PREDATOR
1189	ARACHNIDA	ARANEAE	THOMISIDAE	1	4	1.2	1	1	0	0	0	ADULT	0.120	PREDATOR
1190	ARACHNIDA	ARANEAE	THOMISIDAE	2	1	21.0	2	0	0	0	1	ADULT	0.120	PREDATOR
1191	ARACHNIDA	ARANEAE	THOMISIDAE	2	4	0.8	1	1	0	0	0	ADULT	0.120	PREDATOR
1192	ARACHNIDA	ARANEAE	THOMISIDAE	3	1	1.2	2	1	0	0	0	ADULT	0.120	PREDATOR
1193	ARACHNIDA	ARANEAE	THOMISIDAE	3	1	21.0	1	0	0	0	1	ADULT	0.120	PREDATOR
1194	ARACHNIDA	ARANEAE	THOMISIDAE	3	2	1.2	1	0	0	0	1	ADULT	0.120	PREDATOR
1195	ARACHNIDA	ARANEAE	THOMISIDAE	3	2	2.0	1	0	2	0	0	ADULT	0.120	PREDATOR
1196	ARACHNIDA	ARANEAE	THOMISIDAE	4	1	21.0	1	0	0	0	1	ADULT	0.120	PREDATOR
1197	ARACHNIDA	ARANEAE	THOMISIDAE	4	1	21.0	2	0	0	1	0	ADULT	0.120	PREDATOR
1198	ARACHNIDA	ARANEAE	THOMISIDAE	4	2	0.4	2	0	0	0	1	ADULT	0.120	PREDATOR
1199	ARACHNIDA	ARANEAE	THOMISIDAE	4	2	1.2	1	0	1	0	0	ADULT	0.120	PREDATOR
1200	ARACHNIDA	ARANEAE	THOMISIDAE	4	2	1.2	2	1	0	0	0	ADULT	0.120	PREDATOR
1201	ARACHNIDA	ARANEAE	THOMISIDAE	4	4	0.4	2	0	1	0	0	ADULT	0.120	PREDATOR
1202	ARACHNIDA	ARANEAE	THOMISIDAE	4	4	0.8	2	0	1	0	1	ADULT	0.120	PREDATOR
1203	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	1	0.8	1	0	0	2	0	ADULT	0.995	PREDATOR
1204	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	1	0.8	2	0	0	2	0	ADULT	0.995	PREDATOR
1205	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	1	21.0	2	1	0	0	0	ADULT	0.995	PREDATOR
1206	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	2	2.0	1	0	1	0	0	ADULT	0.995	PREDATOR
1207	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	2	2.0	2	0	1	0	1	ADULT	0.995	PREDATOR
1208	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	4	0.8	2	1	0	0	1	ADULT	0.995	PREDATOR
1209	ARACHNIDA	ARANEAE	CLUBIONIDAE	1	4	1.2	1	0	1	0	0	ADULT	0.995	PREDATOR
1210	ARACHNIDA	ARANEAE	CLUBIONIDAE	2	2	0.8	1	0	0	0	2	ADULT	0.995	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
1211	ARACHNIDA	ARANEAE	CLUBIONIDAE	2	2	2.0	2	0	1	0	0	ADULT	.995	PREDATOR
1212	ARACHNIDA	ARANEAE	CLUBIONIDAE	3	1	0.8	1	1	0	0	0	ADULT	.995	PREDATOR
1213	ARACHNIDA	ARANEAE	CLUBIONIDAE	3	1	1.6	1	1	0	0	0	ADULT	.995	PREDATOR
1214	ARACHNIDA	ARANEAE	CLUBIONIDAE	3	4	1.2	1	0	1	0	0	ADULT	.995	PREDATOR
1215	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	1	0.4	2	1	0	0	0	ADULT	.433	PREDATOR
1216	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	1	0.8	1	0	0	1	0	ADULT	.433	PREDATOR
1217	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	1	0.8	2	0	0	1	0	ADULT	.433	PREDATOR
1218	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	1	1.2	1	1	0	1	0	ADULT	.433	PREDATOR
1219	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	1	21.0	1	0	0	0	1	ADULT	.433	PREDATOR
1220	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	2	2.0	1	0	0	0	1	ADULT	.433	PREDATOR
1221	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	2	2.0	2	0	0	1	4	ADULT	.433	PREDATOR
1222	ARACHNIDA	ARANEAE	GNAPHOSIDAE	1	4	1.2	2	0	0	1	0	ADULT	.433	PREDATOR
1223	ARACHNIDA	ARANEAE	GNAPHOSIDAE	2	1	0.4	1	0	0	0	1	ADULT	.433	PREDATOR
1224	ARACHNIDA	ARANEAE	GNAPHOSIDAE	2	1	0.4	2	2	0	0	0	ADULT	.433	PREDATOR
1225	ARACHNIDA	ARANEAE	GNAPHOSIDAE	2	2	1.2	1	0	0	0	1	ADULT	.433	PREDATOR
1226	ARACHNIDA	ARANEAE	GNAPHOSIDAE	2	2	1.2	2	0	0	0	1	ADULT	.433	PREDATOR
1227	ARACHNIDA	ARANEAE	GNAPHOSIDAE	2	2	2.0	2	0	1	0	0	ADULT	.433	PREDATOR
1228	ARACHNIDA	ARANEAE	GNAPHOSIDAE	2	4	0.4	2	0	0	2	0	ADULT	.433	PREDATOR
1229	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	1	0.8	1	1	0	0	0	ADULT	.433	PREDATOR
1230	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	1	1.6	1	1	1	0	0	ADULT	.433	PREDATOR
1231	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	1	1.6	2	2	0	0	1	ADULT	.433	PREDATOR
1232	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	1	21.0	1	0	0	1	1	ADULT	.433	PREDATOR
1233	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	1	21.0	2	0	0	0	1	ADULT	.433	PREDATOR
1234	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	2	0.8	2	1	0	0	0	ADULT	.433	PREDATOR
1235	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	2	1.2	1	0	0	1	0	ADULT	.433	PREDATOR
1236	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	2	2.0	1	0	0	1	0	ADULT	.433	PREDATOR
1237	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	2	2.0	2	1	0	0	0	ADULT	.433	PREDATOR
1238	ARACHNIDA	ARANEAE	GNAPHOSIDAE	3	4	0.8	1	1	0	0	0	ADULT	.433	PREDATOR
1239	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	1	0.4	1	1	0	0	0	ADULT	.433	PREDATOR
1240	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	1	0.4	2	1	0	0	0	ADULT	.433	PREDATOR
1241	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	1	1.6	2	0	1	0	0	ADULT	.433	PREDATOR
1242	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	1	21.0	2	1	0	1	0	ADULT	.433	PREDATOR
1243	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	2	2.0	2	0	0	1	1	ADULT	.433	PREDATOR
1244	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	4	0.8	2	0	0	0	1	ADULT	.433	PREDATOR
1245	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	4	1.2	1	1	0	0	0	ADULT	.433	PREDATOR
1246	ARACHNIDA	ARANEAE	GNAPHOSIDAE	4	4	1.2	2	1	0	0	0	ADULT	.433	PREDATOR
1247	ARACHNIDA	ARANEAE	ANYPHAENIDAE	4	1	21.0	2	0	0	1	0	ADULT	.200	PREDATOR
1248	ARACHNIDA	ARANEAE	LINYPHIINAE	1	1	1.2	1	0	0	0	1	ADULT	.280	PREDATOR
1249	ARACHNIDA	ARANEAE	LINYPHIINAE	1	1	1.2	2	0	0	1	0	ADULT	.280	PREDATOR
1250	ARACHNIDA	ARANEAE	LINYPHIINAE	1	1	1.6	2	0	1	0	0	ADULT	.280	PREDATOR
1251	ARACHNIDA	ARANEAE	LINYPHIINAE	1	1	21.0	1	0	0	1	0	ADULT	.280	PREDATOR
1252	ARACHNIDA	ARANEAE	LINYPHIINAE	1	1	21.0	2	0	1	0	0	ADULT	.280	PREDATOR
1253	ARACHNIDA	ARANEAE	LINYPHIINAE	1	2	0.4	1	0	0	1	1	ADULT	.280	PREDATOR
1254	ARACHNIDA	ARANEAE	LINYPHIINAE	1	2	0.4	2	1	0	0	1	ADULT	.280	PREDATOR
1255	ARACHNIDA	ARANEAE	LINYPHIINAE	1	2	1.2	2	0	0	0	1	ADULT	.280	PREDATOR
1256	ARACHNIDA	ARANEAE	LINYPHIINAE	1	2	2.0	1	0	1	1	2	ADULT	.280	PREDATOR
1257	ARACHNIDA	ARANEAE	LINYPHIINAE	1	2	2.0	2	0	2	2	0	ADULT	.280	PREDATOR
1258	ARACHNIDA	ARANEAE	LINYPHIINAE	1	4	0.4	2	0	1	0	0	ADULT	.280	PREDATOR
1259	ARACHNIDA	ARANEAE	LINYPHIINAE	2	1	1.6	1	0	0	0	1	ADULT	.280	PREDATOR
1260	ARACHNIDA	ARANEAE	LINYPHIINAE	2	2	0.4	2	0	0	1	0	ADULT	.280	PREDATOR
1261	ARACHNIDA	ARANEAE	LINYPHIINAE	3	1	0.4	2	0	0	1	0	ADULT	.280	PREDATOR
1262	ARACHNIDA	ARANEAE	LINYPHIINAE	3	1	0.8	1	0	0	0	1	ADULT	.280	PREDATOR
1263	ARACHNIDA	ARANEAE	LINYPHIINAE	3	1	1.2	1	0	0	1	0	ADULT	.280	PREDATOR
1264	ARACHNIDA	ARANEAE	LINYPHIINAE	3	1	1.2	2	2	0	0	0	ADULT	.280	PREDATOR
1265	ARACHNIDA	ARANEAE	LINYPHIINAE	3	1	1.6	1	1	0	0	0	ADULT	.280	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGNT	TROFLEVL
1266	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	1	1.6	2	1	0	0	0	ADULT	.280	PREDATOR
1267	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	1	21.0	2	1	0	0	0	ADULT	.280	PREDATOR
1268	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	2	0.4	1	0	1	0	0	ADULT	.280	PREDATOR
1269	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	2	0.4	2	1	0	2	0	ADULT	.280	PREDATOR
1270	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	2	1.2	1	1	0	0	1	ADULT	.280	PREDATOR
1271	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	2	2.0	1	1	1	0	0	ADULT	.280	PREDATOR
1272	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	4	0.4	1	4	1	0	0	ADULT	.280	PREDATOR
1273	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	4	0.8	1	1	0	0	0	ADULT	.280	PREDATOR
1274	ARACHNIDA	ARANEAE	LINYPHYIINAE	3	4	1.2	1	0	0	0	1	ADULT	.280	PREDATOR
1275	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	1	0.4	1	1	0	0	0	ADULT	.280	PREDATOR
1276	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	1	0.4	2	1	0	0	0	ADULT	.280	PREDATOR
1277	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	1	1.2	1	1	0	0	1	ADULT	.280	PREDATOR
1278	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	1	21.0	2	1	0	0	0	ADULT	.280	PREDATOR
1279	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	2	1.2	1	2	0	0	0	ADULT	.280	PREDATOR
1280	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	2	1.2	2	2	0	0	0	ADULT	.280	PREDATOR
1281	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	2	2.0	1	0	0	0	1	ADULT	.280	PREDATOR
1282	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	2	2.0	2	0	0	2	1	ADULT	.280	PREDATOR
1283	ARACHNIDA	ARANEAE	LINYPHYIINAE	4	4	0.8	2	0	0	1	0	ADULT	.280	PREDATOR
1284	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	0.4	2	0	1	0	0	ADULT	.137	PREDATOR
1285	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	0.8	1	0	0	1	0	ADULT	.137	PREDATOR
1286	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	0.8	2	0	0	3	0	ADULT	.137	PREDATOR
1287	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	1.2	1	7	0	0	0	ADULT	.137	PREDATOR
1288	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	1.2	2	0	0	1	1	ADULT	.137	PREDATOR
1289	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	1.6	2	0	2	1	0	ADULT	.137	PREDATOR
1290	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	1	21.0	2	3	0	0	0	ADULT	.137	PREDATOR
1291	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	2	0.8	1	0	0	0	2	ADULT	.137	PREDATOR
1292	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	2	0.8	2	1	0	0	0	ADULT	.137	PREDATOR
1293	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	2	1.2	1	0	0	0	2	ADULT	.137	PREDATOR
1294	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	2	1.2	2	1	0	0	0	ADULT	.137	PREDATOR
1295	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	2	2.0	2	2	1	0	0	ADULT	.137	PREDATOR
1296	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	4	0.4	2	5	0	0	0	ADULT	.137	PREDATOR
1297	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	4	0.8	2	1	1	0	2	ADULT	.137	PREDATOR
1298	ARACHNIDA	ARANEAE	MICRYPHANTINAE	1	4	1.2	2	2	1	1	0	ADULT	.137	PREDATOR
1299	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	0.8	1	1	0	0	0	ADULT	.137	PREDATOR
1300	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	0.8	2	0	0	0	1	ADULT	.137	PREDATOR
1301	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	1.2	1	1	1	0	0	ADULT	.137	PREDATOR
1302	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	1.2	2	0	1	1	0	ADULT	.137	PREDATOR
1303	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	1.6	2	0	0	3	2	ADULT	.137	PREDATOR
1304	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	21.0	1	1	0	1	0	ADULT	.137	PREDATOR
1305	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	1	21.0	2	8	0	1	0	ADULT	.137	PREDATOR
1306	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	0.4	2	0	0	2	0	ADULT	.137	PREDATOR
1307	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	0.8	1	0	0	0	3	ADULT	.137	PREDATOR
1308	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	0.8	2	1	0	0	0	ADULT	.137	PREDATOR
1309	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	1.2	1	0	0	1	0	ADULT	.137	PREDATOR
1310	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	1.2	2	1	0	0	0	ADULT	.137	PREDATOR
1311	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	2.0	1	0	0	1	0	ADULT	.137	PREDATOR
1312	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	2	2.0	2	4	5	1	2	ADULT	.137	PREDATOR
1313	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	4	0.4	2	1	0	0	0	ADULT	.137	PREDATOR
1314	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	4	0.8	1	0	0	1	0	ADULT	.137	PREDATOR
1315	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	4	0.8	2	9	7	3	0	ADULT	.137	PREDATOR
1316	ARACHNIDA	ARANEAE	MICRYPHANTINAE	2	4	1.2	2	0	1	0	0	ADULT	.137	PREDATOR
1317	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	0.4	1	0	0	1	0	ADULT	.137	PREDATOR
1318	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	0.4	2	0	1	0	0	ADULT	.137	PREDATOR
1319	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	0.4	2	0	0	1	0	ADULT	.137	PREDATOR
1320	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	0.8	1	0	0	0	1	ADULT	.137	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROPLEVL
1321	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	0.8	2	1	2	0	0	ADULT	.137	PREDATOR
1322	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	1.2	1	1	0	0	0	ADULT	.137	PREDATOR
1323	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	1.2	2	0	0	0	3	ADULT	.137	PREDATOR
1324	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	1.6	1	1	1	0	0	ADULT	.137	PREDATOR
1325	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	1	1.6	2	0	3	0	0	ADULT	.137	PREDATOR
1326	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	2	0.8	2	0	0	0	1	ADULT	.137	PREDATOR
1327	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	2	1.2	1	0	0	1	0	ADULT	.137	PREDATOR
1328	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	2	2.0	2	0	0	0	1	ADULT	.137	PREDATOR
1329	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	4	0.4	2	0	1	0	0	ADULT	.137	PREDATOR
1330	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	4	0.8	2	0	1	1	1	ADULT	.137	PREDATOR
1331	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	4	1.2	1	0	1	0	0	ADULT	.137	PREDATOR
1332	ARACHNIDA	ARANEAE	MICRYPHANTINAE	3	4	1.2	2	1	0	1	0	ADULT	.137	PREDATOR
1333	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	1	0.4	1	0	0	0	4	ADULT	.137	PREDATOR
1334	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	1	0.4	2	1	0	0	0	ADULT	.137	PREDATOR
1335	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	1	1.2	2	0	0	0	1	ADULT	.137	PREDATOR
1336	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	1	1.6	2	0	1	1	0	ADULT	.137	PREDATOR
1337	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	1	21.0	2	1	0	1	0	ADULT	.137	PREDATOR
1338	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	2	0.4	2	1	0	0	0	ADULT	.137	PREDATOR
1339	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	2	2.0	2	0	0	1	0	ADULT	.137	PREDATOR
1340	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	4	0.4	2	4	2	0	0	ADULT	.137	PREDATOR
1341	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	4	0.8	2	0	1	1	0	ADULT	.137	PREDATOR
1342	ARACHNIDA	ARANEAE	MICRYPHANTINAE	4	4	1.2	1	1	0	0	0	ADULT	.137	PREDATOR
1343	ARACHNIDA	PHALANGIDA	PHALANGIDIDAE	1	2	2.0	2	1	0	0	0	NYMPH	.048	DETRITIV
1344	ARACHNIDA	PHALANGIDA	PHALANGIDIDAE	1	4	0.4	2	0	0	0	2	NYMPH	.048	DETRITIV
1345	ARACHNIDA	PHALANGIDA	PHALANGIDIDAE	1	4	1.2	1	1	0	0	0	NYMPH	.048	DETRITIV
1346	ARACHNIDA	PHALANGIDA	PHALANGIDIDAE	4	2	0.8	2	35	0	0	0	NYMPH	.048	DETRITIV
1347	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	1	0.8	2	1	1	0	2	ADULT	.045	PREDATOR
1348	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	1	1.2	2	0	4	2	3	ADULT	.045	PREDATOR
1349	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	1	1.6	2	3	5	4	5	ADULT	.045	PREDATOR
1350	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	1	21.0	1	0	0	1	0	ADULT	.045	PREDATOR
1351	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	1	21.0	2	1	1	0	8	ADULT	.045	PREDATOR
1352	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	2	0.8	1	0	0	2	0	ADULT	.045	PREDATOR
1353	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	2	0.8	2	5	6	2	0	ADULT	.045	PREDATOR
1354	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	2	1.2	1	0	1	0	4	ADULT	.045	PREDATOR
1355	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	2	1.2	2	9	2	2	4	ADULT	.045	PREDATOR
1356	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	2	2.0	1	0	0	2	2	ADULT	.045	PREDATOR
1357	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	2	2.0	2	5	2	8	6	ADULT	.045	PREDATOR
1358	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	4	0.4	2	1	0	0	1	ADULT	.045	PREDATOR
1359	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	4	0.8	2	1	0	1	3	ADULT	.045	PREDATOR
1360	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	1	4	1.2	2	0	1	3	1	ADULT	.045	PREDATOR
1361	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	0.8	1	3	5	5	0	ADULT	.045	PREDATOR
1362	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	0.8	2	2	0	0	1	ADULT	.045	PREDATOR
1363	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	1.2	1	4	0	0	0	ADULT	.045	PREDATOR
1364	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	1.2	2	4	6	6	2	ADULT	.045	PREDATOR
1365	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	1.6	1	0	0	0	1	ADULT	.045	PREDATOR
1366	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	1.6	2	2	4	3	4	ADULT	.045	PREDATOR
1367	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	21.0	1	2	0	2	2	ADULT	.045	PREDATOR
1368	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	1	21.0	2	1	1	2	1	ADULT	.045	PREDATOR
1369	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	2	0.8	1	0	0	4	1	ADULT	.045	PREDATOR
1370	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	2	0.8	2	1	0	0	0	ADULT	.045	PREDATOR
1371	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	2	1.2	1	9	1	2	0	ADULT	.045	PREDATOR
1372	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	2	1.2	2	3	1	7	6	ADULT	.045	PREDATOR
1373	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	2	2.0	2	1	1	5	0	ADULT	.045	PREDATOR
1374	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	4	0.4	2	0	0	0	1	ADULT	.045	PREDATOR
1375	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	4	0.8	2	1	0	0	1	ADULT	.045	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	HOR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
1376	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	2	4	1.2	2	0	1	0	1	ADULT	0.045	PREDATOR
1377	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	0.4	1	0	1	0	0	ADULT	0.045	PREDATOR
1378	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	0.8	1	0	0	1	0	ADULT	0.045	PREDATOR
1379	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	0.8	2	2	0	0	0	ADULT	0.045	PREDATOR
1380	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	1.2	1	0	0	2	0	ADULT	0.045	PREDATOR
1381	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	1.2	2	0	0	0	2	ADULT	0.045	PREDATOR
1382	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	1.6	1	0	1	0	0	ADULT	0.045	PREDATOR
1383	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	1.6	2	2	1	2	3	ADULT	0.045	PREDATOR
1384	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	21.0	1	0	2	0	0	ADULT	0.045	PREDATOR
1385	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	1	21.0	2	1	0	1	0	ADULT	0.045	PREDATOR
1386	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	2	0.8	1	1	0	0	0	ADULT	0.045	PREDATOR
1387	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	2	0.8	2	2	0	1	3	ADULT	0.045	PREDATOR
1388	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	2	1.2	1	0	0	0	1	ADULT	0.045	PREDATOR
1389	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	2	1.2	2	1	6	0	2	ADULT	0.045	PREDATOR
1390	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	2	2.0	1	0	0	0	1	ADULT	0.045	PREDATOR
1391	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	2	2.0	2	1	1	1	8	ADULT	0.045	PREDATOR
1392	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	4	0.4	2	0	0	2	2	ADULT	0.045	PREDATOR
1393	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	4	0.8	1	1	0	0	0	ADULT	0.045	PREDATOR
1394	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	3	4	0.8	2	0	3	0	2	ADULT	0.045	PREDATOR
1395	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	1	0.4	2	0	1	0	0	ADULT	0.045	PREDATOR
1396	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	1	0.8	2	1	0	0	0	ADULT	0.045	PREDATOR
1397	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	1	1.2	2	0	1	0	0	ADULT	0.045	PREDATOR
1398	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	1	1.6	2	0	0	1	0	ADULT	0.045	PREDATOR
1399	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	1	21.0	2	0	1	1	5	ADULT	0.045	PREDATOR
1400	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	2	0.8	1	0	1	0	0	ADULT	0.045	PREDATOR
1401	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	2	0.8	2	1	0	0	0	ADULT	0.045	PREDATOR
1402	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	2	1.2	1	1	1	1	0	ADULT	0.045	PREDATOR
1403	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	2	1.2	2	3	2	0	0	ADULT	0.045	PREDATOR
1404	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	2	2.0	2	2	2	2	0	ADULT	0.045	PREDATOR
1405	ARACHNIDA	PSEUDOSCORPIONIDA	UNKNOWN	4	4	0.4	2	1	0	0	0	ADULT	0.045	PREDATOR
1406	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	1	0.8	1	0	0	0	1	ADULT	2.318	PREDATOR
1407	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	1	0.8	2	1	0	0	0	ADULT	2.318	PREDATOR
1408	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	1	1.2	2	0	0	0	1	ADULT	2.318	PREDATOR
1409	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	2	1.2	1	0	1	0	2	ADULT	2.318	PREDATOR
1410	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	2	1.2	2	0	1	0	0	ADULT	2.318	PREDATOR
1411	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	2	2.0	1	0	0	1	0	ADULT	2.318	PREDATOR
1412	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	1	2	2.0	2	1	2	0	3	ADULT	2.318	PREDATOR
1413	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	2	1	0.4	2	0	0	1	0	ADULT	2.318	PREDATOR
1414	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	2	1	21.0	2	0	0	0	1	ADULT	2.318	PREDATOR
1415	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	2	4	1.2	2	0	1	0	0	ADULT	2.318	PREDATOR
1416	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	3	1	21.0	2	1	0	0	0	ADULT	2.318	PREDATOR
1417	CHILOPODA	GEOPHILOMORPHA	UNKNOWN	4	1	21.0	2	0	1	0	0	ADULT	2.318	PREDATOR
1418	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	1	1	1.6	2	0	0	0	1	ADULT	0.354	PREDATOR
1419	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	1	1	21.0	2	1	0	0	0	ADULT	0.354	PREDATOR
1420	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	1	4	0.8	2	0	0	0	1	ADULT	0.354	PREDATOR
1421	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	2	2	1.2	2	0	0	1	0	ADULT	0.354	PREDATOR
1422	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	2	2	2.0	2	1	0	1	0	ADULT	0.354	PREDATOR
1423	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	3	2	1.2	2	0	0	0	2	ADULT	0.354	PREDATOR
1424	CHILOPODA	LITHOBIOMORPHA	HENICOPIDAE	3	2	2.0	2	0	1	0	0	ADULT	0.354	PREDATOR
1425	CHILOPODA	LITHOBIOMORPHA	LITHOBIIDAE	1	2	2.0	2	1	0	1	1	ADULT	20.075	PREDATOR
1426	CHILOPODA	LITHOBIOMORPHA	LITHOBIIDAE	3	2	2.0	2	0	0	0	1	ADULT	20.075	PREDATOR
1427	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	1	0.8	1	0	1	0	0	ADULT	0.664	PREDATOR
1428	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	1	1.2	2	0	1	0	3	ADULT	0.664	PREDATOR
1429	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	1	1.6	2	0	0	0	2	ADULT	0.664	PREDATOR
1430	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	2	1.2	1	0	0	0	2	ADULT	0.664	PREDATOR

OBS	CLASS	ORDER	FAMILY	SSN	DIR	DIST	ROR	RONE	RTWO	RTHREE	RFOUR	LIFESTGE	MGWT	TROFLEVL
1431	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	2	1.2	2	0	2	0	0	ADULT	0.664	PREDATOR
1432	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	2	2.0	2	2	1	0	0	ADULT	0.664	PREDATOR
1433	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	1	4	1.2	2	0	0	1	0	ADULT	0.664	PREDATOR
1434	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	1	0.4	2	0	0	0	1	ADULT	0.664	PREDATOR
1435	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	1	0.8	1	0	0	1	0	ADULT	0.664	PREDATOR
1436	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	1	0.8	2	0	1	1	1	ADULT	0.664	PREDATOR
1437	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	1	1.2	1	1	0	0	0	ADULT	0.664	PREDATOR
1438	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	1	1.2	2	0	0	3	1	ADULT	0.664	PREDATOR
1439	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	1	21.0	2	0	0	1	0	ADULT	0.664	PREDATOR
1440	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	2	0.8	2	1	0	0	0	ADULT	0.664	PREDATOR
1441	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	2	1.2	2	0	0	0	2	ADULT	0.664	PREDATOR
1442	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	2	2.0	2	0	4	3	12	ADULT	0.664	PREDATOR
1443	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	4	0.4	2	1	0	0	1	ADULT	0.664	PREDATOR
1444	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	2	4	1.2	2	1	1	0	0	ADULT	0.664	PREDATOR
1445	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	3	1	0.4	2	0	0	0	1	ADULT	0.664	PREDATOR
1446	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	3	2	1.2	2	0	0	2	1	ADULT	0.664	PREDATOR
1447	CHILOPODA	SCOLOPENDROMORPHA	CRYPTOPIDAE	3	2	2.0	2	1	2	1	4	ADULT	0.664	PREDATOR
1448	DIPLOPODA	CHORDEUMIDA	UNKNOWN	1	2	2.0	2	0	1	2	0	ADULT	15.970	LITTGRAZ
1449	DIPLOPODA	CHORDEUMIDA	UNKNOWN	3	2	0.8	2	0	1	0	0	ADULT	15.970	LITTGRAZ

APPENDIX C

Seasonal means of heavy metal content (Pb, Zn, Cu, Cd) ranked according to results of Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level.

Seasonal means of heavy metal concentrations in O1 litter collected March, 1974, and analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

Pb Concentration (µg/g)			Zn Concentration (µg/g)			Cu Concentration (µg/g)			Cd Concentration (µg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
NW .4	63.3	A	NE .4	21.3	A	NE 1.2	31.6	A	NW .4	115.0	A
NE .4	48.7	AB	NE 1.2	21.1	A	NE .8	27.4	B	NE .4	88.5	AB
N .4	46.6	AB	NW .4	18.6	AB	NE .4	10.1	C	N .4	85.0	AB
W .4	39.4	BC	N .4	18.5	AB	N .4	9.9	C	W .4	69.5	BC
NE 1.2	28.8	CD	NE .8	14.1	BC	NW .4	9.1	C	NE 1.2	45.3	CD
NE .8	25.1	CDE	W .4	11.5	CD	W .4	4.6	D	NE .8	39.3	CDE
N .8	15.3	DEF	N .8	7.1	DE	N .8	2.5	DE	N .8	31.3	DE
W .8	11.9	DEF	N 1.2	5.5	EF	N 1.2	2.2	DE	W .8	30.3	DE
NW .8	10.9	EF	W .8	4.4	EF	W .8	1.7	E	NW .8	29.0	DE
N 1.2	10.7	EF	NW .8	4.3	EF	NW .8	1.6	E	N 1.2	27.8	DE
NW 1.2	8.0	EF	NW 1.2	4.3	EF	NW 1.2	1.2	E	NW 1.2	20.8	DE
N 2.0	6.4	F	N 2.0	3.0	EF	N 2.0	1.2	E	N 2.0	16.7	DE
NW 2.0	4.8	F	NW 2.0	2.3	EF	NW 2.0	1.0	E	W 1.2	13.3	DE
W 1.2	4.1	F	W 1.2	2.2	EF	W 1.2	.9	E	NW 2.0	12.5	DE
W 1.6	3.0	F	W 1.6	1.9	EF	W 1.6	.6	E	W 1.6	12.5	DE
W 21.0	.4	f	W 21.0	.7	F	W 21.0	.2	E	W 21.0	3.0	E

Seasonal means of heavy metal concentrations in O2 litter collected March, 1974, and analyzed by Duncan's New Multiple Range Test.

Pb Concentration (μg/g)			Zn Concentration (μg/g)			Cu Concentration (μg/g)			Cd Concentration (μg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
NW .4	82.6	A	NE 1.2	49.1	A	NE 1.2	50.4	A	N .4	125.8	A
N .4	68.3	AB	NE .4	22.5	B	NE .8	31.5	B	NE .4	115.8	AB
W .4	65.2	B	NE .8	21.8	B	NE .4	13.2	C	N .8	111.7	AB
NE .4	64.9	B	N .4	21.4	BC	NW .4	11.9	C	NE 1.2	108.3	ABC
NE 1.2	48.1	C	NW .4	18.2	BCD	N .4	11.5	CD	W .4	105.3	ABCD
N .8	36.5	CD	W .4	16.8	CD	W .4	9.0	DE	NW .4	104.3	ABCD
NW .8	33.3	CD	N .8	14.4	DE	N .8	6.5	EF	NE .8	77.5	BCDE
NE .8	28.6	DE	NW .8	10.5	EF	NW .8	4.9	FG	NW .8	71.3	CDEF
N 1.2	22.2	DEF	N 1.2	9.8	EFG	N 1.2	4.2	FGH	N 1.2	69.0	DEF
W .8	19.1	DEF	W .8	7.4	FGH	W .8	2.8	GHI	W .8	48.3	EFG
NW 1.2	11.7	EFG	NW 1.2	5.1	GHI	NW 1.2	1.8	HI	NW 1.2	35.8	FGH
W 1.2	8.7	FG	N 2.0	3.9	HI	N 2.0	1.5	HI	W 1.6	28.8	GH
N 2.0	8.6	FG	W 1.6	3.8	HI	W 1.2	1.4	HI	W 1.2	21.8	GH
W 1.6	7.1	FG	W 1.2	3.7	HI	W 1.6	1.2	I	N 2.0	20.7	GH
NW 2.0	4.6	FG	NW 2.0	2.3	HI	NW 2.0	.8	I	NW 2.0	14.3	GH
W 21.0	.3	G	W 21.0	1.2	I	W 21.0	.2	I	W 21.0	2.7	H

Seasonal means of heavy metal concentrations in O1 litter collected June, 1974, and analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not statistically significant at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

Pb Concentration (μg/g)			Zn Concentration (μg/g)			Cu Concentration (μg/g)			Cd Concentration (μg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
NW .4	73.3	A	NE .4	23.6	A	NE 1.2	29.0	A	NE .4	119.9	A
NE .4	53.2	B	N .4	20.9	AB	NE .8	26.4	A	N .4	100.6	AB
N .4	51.4	B	NW .4	16.8	BC	N .4	12.1	B	NW .4	89.3	AB
W .4	45.8	B	NE 1.2	16.6	BC	NE .4	11.9	B	W .4	75.1	B
NE 1.2	26.2	C	NE .8	13.4	C	NW .4	8.9	C	NE 1.2	39.6	C
NE .8	20.4	CD	W .4	11.9	C	W .4	5.3	D	NW .8	32.8	C
N .8	19.3	CDE	N .8	5.6	D	W .8	3.4	DE	N .8	32.8	C
NW .8	17.3	CDE	N 1.2	5.6	D	N .8	2.9	DEF	NE .8	29.7	C
W .8	11.3	CDE	NW .8	5.5	D	N 1.2	2.6	DEF	W .8	27.0	C
N 1.2	11.3	CDE	W .8	4.6	D	NW .8	2.4	EF	N 1.2	22.7	C
NW 1.2	10.8	CDE	NW 1.2	4.0	D	W 1.2	1.6	EF	NW 1.2	21.8	C
W 1.2	6.9	DE	N 2.0	3.3	D	NW 1.2	1.6	EF	W 1.2	15.7	C
N 2.0	6.8	DE	W 1.2	3.3	D	N 2.0	1.5	EF	N 2.0	13.5	C
NW 2.0	3.2	DE	NW 2.0	1.5	D	W 1.6	.7	EF	NW 2.0	7.9	C
W 1.6	2.9	DE	W 1.6	1.4	D	NW 2.0	.5	EF	W 1.6	7.7	C
W 21.0	1.0	E	W 21.0	.8	D	W 21.0	.3	F	W 21.0	1.0	C

Seasonal means of heavy metal concentrations in O1 litter collected September, 1974, and analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

Pb Concentration (μg/g)			Zn Concentration (μg/g)			Cu Concentration (μg/g)			Cd Concentration (μg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
N .4	75.4	A	NE 1.2	37.1	A	NE 1.2	42.7	A	N .4	159.1	A
NE .4	74.1	A	NE .4	30.3	B	NE .8	39.3	B	NE .4	150.1	A
NW .4	69.0	A	N .4	28.3	BC	NE .4	19.6	C	NE 1.2	79.1	B
W .4	60.6	A	NE .8	24.3	C	N .4	17.3	C	NW .4	78.8	B
NE 1.2	34.3	B	W .4	17.8	D	NW .4	8.8	D	W .4	72.2	B
NW .8	30.8	BC	NW .4	15.5	D	W .4	8.7	D	NE .8	71.3	B
NE .8	27.4	BCD	NW .8	9.4	E	N .8	4.8	E	N .8	59.7	BC
N .8	25.7	BCDE	N .8	8.8	EF	NW .8	4.5	E	NW .8	59.4	BC
W .8	18.6	BCDEF	N 1.2	8.3	EFG	N 1.2	3.4	EF	N 1.2	49.3	BCD
N 1.2	17.4	BCDEF	N 2.0	7.2	EFG	W .8	3.2	EF	W .8	46.6	BCD
N 2.0	13.9	CDEF	W .8	7.2	EFG	N 2.0	2.6	EFG	N 2.0	45.2	BCD
W 1.2	10.2	DEF	W 1.2	4.0	FGH	W 1.2	1.8	EFG	NW 2.0	25.9	CDE
NW 1.2	8.8	EF	NW 1.2	4.0	FGH	NW 1.2	1.3	FG	NW 1.2	25.0	CDE
NW 2.0	8.1	EF	NW 2.0	3.6	FGH	NW 2.0	1.3	FG	W 1.2	22.1	CDE
W 1.6	6.7	F	W 1.6	3.2	GH	W 1.6	1.1	FG	W 1.6	18.8	DE
W 21.0	.3	F	W 21.0	.6	H	W 21.0	.1	G	W 21.0	0.	E

Seasonal means of heavy metal concentrations in O2 litter collected June, 1974, and analyzed by Duncan's New Multiple Range Test.

Pb Concentration (μg/g)			Zn Concentration (μg/g)			Cu Concentration (μg/g)			Cd Concentration (μg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
NW .4	65.3	A	NE .4	22.0	A	NE 1.2	32.1	A	NW .4	106.7	A
N .4	49.2	B	NE 1.2	19.7	AB	NE .8	20.0	B	NE .4	99.1	AB
NE .4	40.9	B	NW .4	17.0	BC	N .4	9.3	C	N .4	75.8	ABC
W .4	33.4	BC	N .4	12.6	CD	NE .4	9.0	C	W .4	63.6	BCD
NE 1.2	32.0	BC	NE .8	11.9	DE	NW .4	8.9	C	NE 1.2	46.5	CDE
NE .8	21.3	CD	W .4	9.2	DEF	W .4	4.1	D	NE .8	36.8	DEF
NW .8	17.4	CDE	NW .8	7.2	EFG	NW .8	3.9	D	NW .8	35.8	DEF
N 1.2	14.6	DE	N 1.2	7.2	EFG	N 1.2	3.2	DE	N 1.2	35.6	DEF
N .8	13.3	DE	NW 1.2	5.9	FGH	NW 1.2	2.8	DEF	NW 1.2	30.0	DEF
NW 1.2	13.0	DE	N .8	5.2	FGH	N .8	2.3	DEF	W .8	29.2	DEF
W .8	9.5	DE	W .8	5.0	FGH	W .8	1.5	DEF	N .8	26.8	DEF
W 1.2	8.2	DE	W 1.2	3.9	GH	NW 2.0	1.4	DEF	W 1.2	21.7	EF
NW 2.0	8.0	DE	N 2.0	3.4	GH	N 2.0	1.4	DEF	N 2.0	16.6	EF
N 2.0	6.1	DE	NW 2.0	3.3	GH	W 1.2	1.2	DEF	NW 2.0	15.4	EF
W 1.6	4.3	DE	W 1.6	2.6	GH	W 1.6	.8	EF	W 1.6	14.5	EF
W 10.4	.2	E	W 21.0	.5	H	W 10.4	.1	F	W 10.4	1.1	F
W 21.0	.1	E	W 16.3	.5	H	W 21.0	.1	F	W 16.3	.6	F
W 16.3	.1	D	W 10.4	.5	H	W 16.3	.1	F	W 21.0	0.0	F

Seasonal means of heavy metal concentrations in O2 litter collected September, 1974, and analyzed by Duncan's New Multiple Range Test.

Pb Concentration (µg/g)			Zn Concentration (µg/g)			Cu Concentration (µg/g)			Cd Concentration (µg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
NW .4	103.0	A	NE 1.2	49.9	A	NE 1.2	60.8	A	NE .4	179.3	A
NE .4	91.5	AB	NE .4	37.3	B	NE .8	32.2	B	NW .4	143.7	B
N .4	76.2	BC	NW .4	26.1	C	NE .4	21.0	C	W .4	125.9	BC
W .4	70.5	C	NE .8	21.2	D	NW .4	15.1	D	N .4	117.6	BC
NE 1.2	54.2	D	N .4	20.5	D	N .4	12.3	E	NE 1.2	110.4	BC
N .8	39.0	DE	W .4	19.6	D	W .4	10.2	E	N .8	96.9	CD
NW .8	33.0	EF	N .8	13.7	E	N .8	7.1	F	NE .8	73.8	DE
NE .8	32.0	EFG	N 1.2	10.9	EF	NW .8	4.9	FG	N 1.2	68.5	DEF
N 1.2	21.6	FGH	NW .8	9.4	EFG	N 1.2	4.2	GH	NW .8	55.1	EFG
W .8	17.7	FGHI	W .8	7.0	FGH	W .8	2.8	GHI	NW 1.2	44.7	EFG
NW 1.2	15.0	GHI	NW 1.2	6.4	FGHI	NW 1.2	2.4	GHI	W .8	42.9	EFG
W 1.2	11.9	HI	N 2.0	5.8	GHIJ	N 2.0	2.2	GHI	N 2.0	34.0	FGH
N 2.0	11.1	HI	NW 2.0	5.2	GHIJ	W 1.2	1.5	HI	W 1.2	29.0	GH
NW 2.0	9.0	HI	W 1.2	4.2	HIJ	NW 2.0	1.5	HI	NW 2.0	24.3	GH
W 1.6	7.4	HI	W 2.0	3.7	HIJ	W 1.6	1.3	HI	W 1.6	19.7	GH
W 10.4	.2	I	W 16.3	1.5	IJ	W 10.4	.2	I	W 21.0	2.2	H
W 16.3	.2	I	W 21.0	1.1	J	W 16.3	.1	I	W 16.3	2.1	H
W 21.0	.1	I	W 10.4	.7	J	W 21.0	.1	I	W 10.4	1.1	H

Seasonal means of heavy metal concentrations in O1 litter collected January, 1975, and analyzed by Duncan's New Multiple Range Test. Means followed by the same letter are not significantly different at the 5% level (Duncan, 1951; Steel and Torrie, 1960).

Pb Concentration (μg/g) Site (km)	Mean (x 10^3)	Duncan
W .4	33.2	A
NW .4	30.1	A
NE .4	25.9	AB
N .4	23.4	ABC
N .8	11.0	BCD
NW .8	11.0	BCD
NE 1.2	10.6	BCD
N 1.2	8.5	BCD
NE .8	8.0	BCD
W .8	5.5	CD
N 2.0	5.2	CD
NW 1.2	4.5	D
W 1.2	3.0	D
W 1.6	2.9	D
NW 2.0	2.5	D
W 16.3	1.0	D
W 10.4	.7	D
W 21.0	.3	D

Zn Concentration (μg/g) Site (km)	Mean (x 10^2)	Duncan
NE .4	17.2	A
NW .4	15.0	AB
N .4	13.1	AB
NE 1.2	12.9	AB
W .4	10.1	BC
N 1.2	5.4	CD
N .8	5.3	CD
NW .8	4.8	D
NE .8	4.8	D
N 2.0	3.3	D
NW 1.2	2.6	D
W .8	2.3	D
W 1.6	1.9	D
NW 2.0	1.8	D
W 1.2	1.7	D
W 16.3	1.0	D
W 10.4	.7	D
W 21.0	.7	D

Cu Concentration (μg/g) Site (km)	Mean (x 10^2)	Duncan
NE 1.2	13.5	A
NE .8	11.5	A
NE .4	4.8	B
W .4	4.7	BC
NW .4	4.6	BC
N .4	4.3	BC
N 1.2	2.4	BCD
N .8	1.9	BCD
NW .8	1.8	CD
N 2.0	1.2	D
NW 2.0	.9	D
W .8	.9	D
W 1.6	.9	D
NW 1.2	.8	D
W 16.3	.6	D
W 1.2	.5	D
W 10.4	.5	D
W 21.0	.2	D

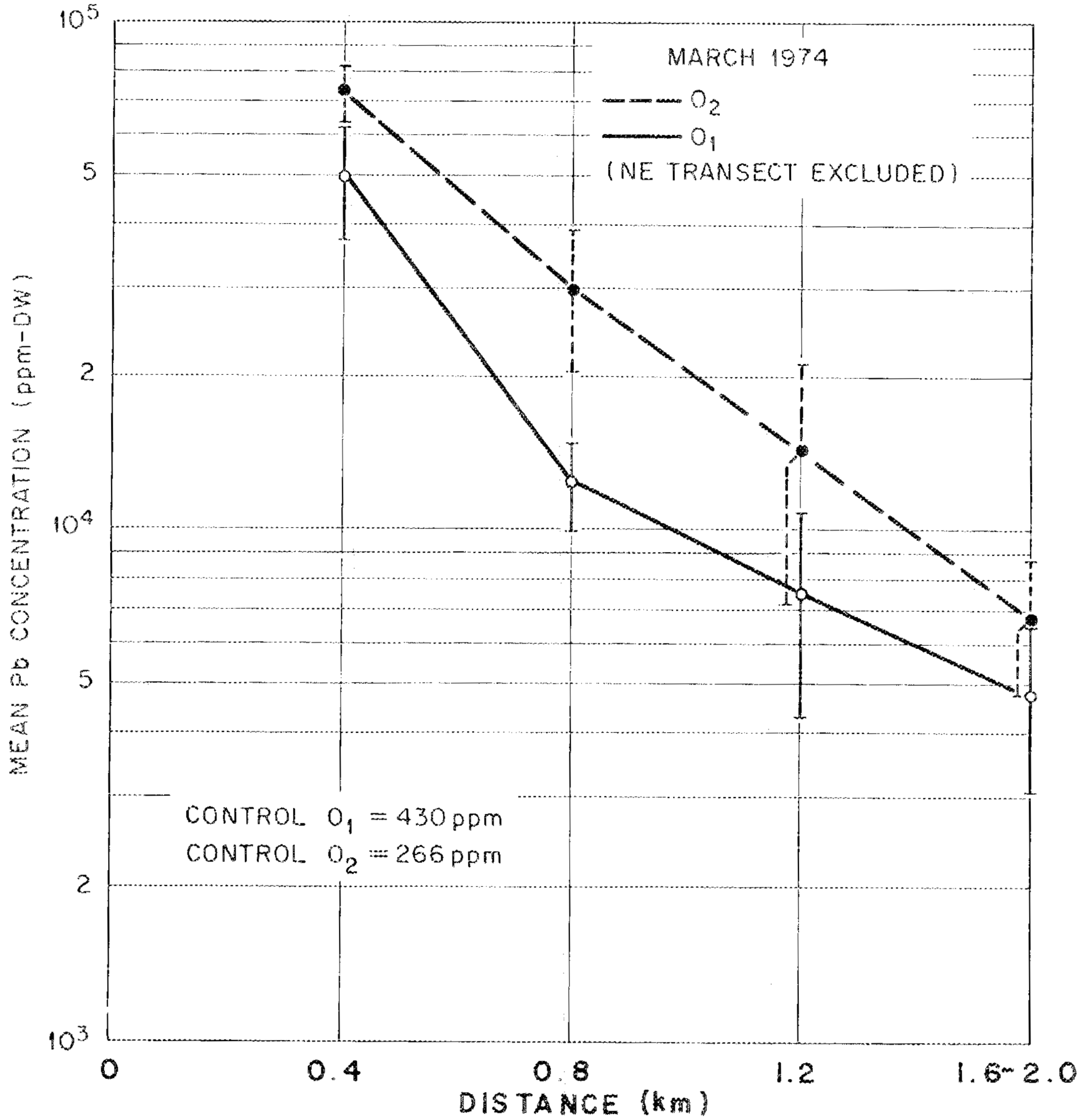
Cd Concentration (μg/g) Site (km)	Mean	Duncan
NW .4	300.3	A
W .4	165.5	B
NE .4	159.7	B
N .4	153.0	B
NW .8	63.3	C
N .8	55.0	CD
N 1.2	45.2	CDE
NE 1.2	34.5	CDE
W .8	30.0	CDE
NW 1.2	29.6	CDE
NE .8	27.6	CDE
N 2.0	24.2	CDE
W 1.2	21.4	DE
W 1.6	15.9	DE
NW 2.0	13.1	E
W 16.3	5.7	E
W 10.4	4.7	E
W 21.0	1.8	E

Seasonal means of heavy metal concentrations in O2 litter collected January, 1975 and analyzed by Duncan's New Multiple Range Test.

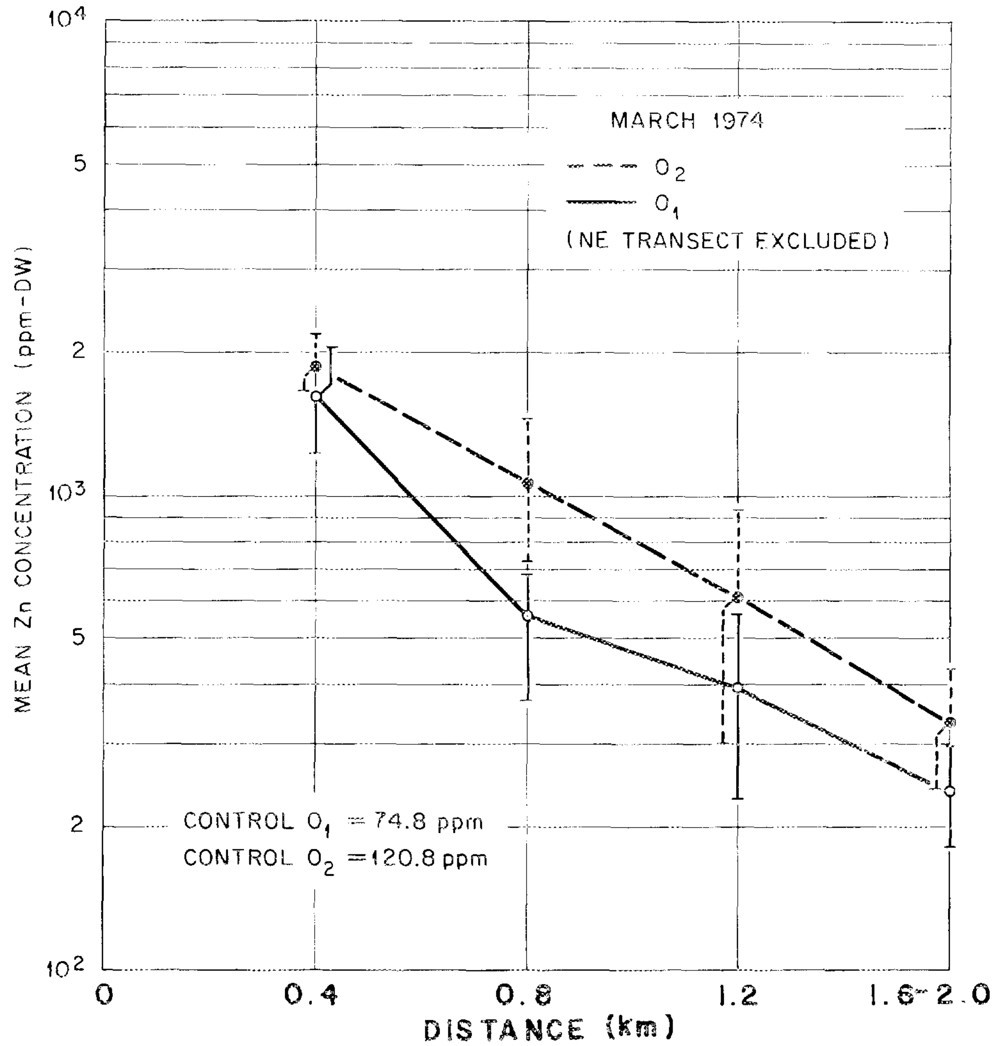
Pb Concentration (µg/g)			Zn Concentration (µg/g)			Cu Concentration (µg/g)			Cd Concentration (µg/g)		
Site (km)	Mean (x 10^3)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean (x 10^2)	Duncan	Site (km)	Mean	Duncan
W .4	85.0	A	NE 1.2	34.8	A	NE 1.2	43.2	A	N .4	154.0	A
N .4	81.9	A	NE .4	29.8	B	NE .8	34.4	B	NW .4	148.9	A
NW .4	75.3	A	N .4	24.4	C	NE .4	17.4	C	NE .4	144.9	A
NE .4	70.6	A	NE .8	21.5	CD	N .4	16.7	C	W .4	144.7	A
NE 1.2	41.7	B	NW .4	21.4	CD	NW .4	13.2	D	N .8	92.3	B
N .8	36.9	BC	W .4	21.2	CD	W .4	12.1	D	NE 1.2	80.8	BC
NE .8	28.9	BCD	N .8	17.3	D	N .8	7.0	E	NE .8	73.0	BCD
NW .8	24.5	BCDE	N 1.2	9.8	E	N 1.2	4.1	F	N 1.2	62.2	BCDE
N 1.2	20.2	CDEF	NW .8	7.4	EF	NW .8	3.7	FG	NW .8	49.4	CDEF
W .8	14.4	DEFG	NW 1.2	5.4	EFG	W .8	2.1	FGH	NW 1.2	38.6	DEFG
NW 1.2	11.9	DEFG	W .8	4.9	EFG	N 2.0	1.9	FGH	W .8	32.1	EFG
N 2.0	8.8	EFG	N 2.0	4.9	EFG	NW 1.2	1.8	FGH	N 2.0	27.1	EFG
W 1.2	6.5	FG	NW 2.0	3.0	FG	W 1.6	1.4	FGH	W 1.2	19.7	FG
NW 2.0	5.8	FG	W 1.6	3.0	FG	W 1.2	1.1	FGH	NW 2.0	17.9	FG
W 1.6	5.5	FG	W 1.2	2.9	FG	NW 2.0	1.0	FGH	W 1.6	16.8	FG
W 21.0	.9	G	W 21.0	1.6	G	W 21.0	.6	GH	W 10.4	5.5	G
W 16.3	.9	G	W 10.4	1.3	G	W 10.4	.5	H	W 21.0	5.4	G
W 10.4	.7	G	W 16.3	1.1	G	W 16.3	.3	H	W 16.3	5.1	G

APPENDIX D

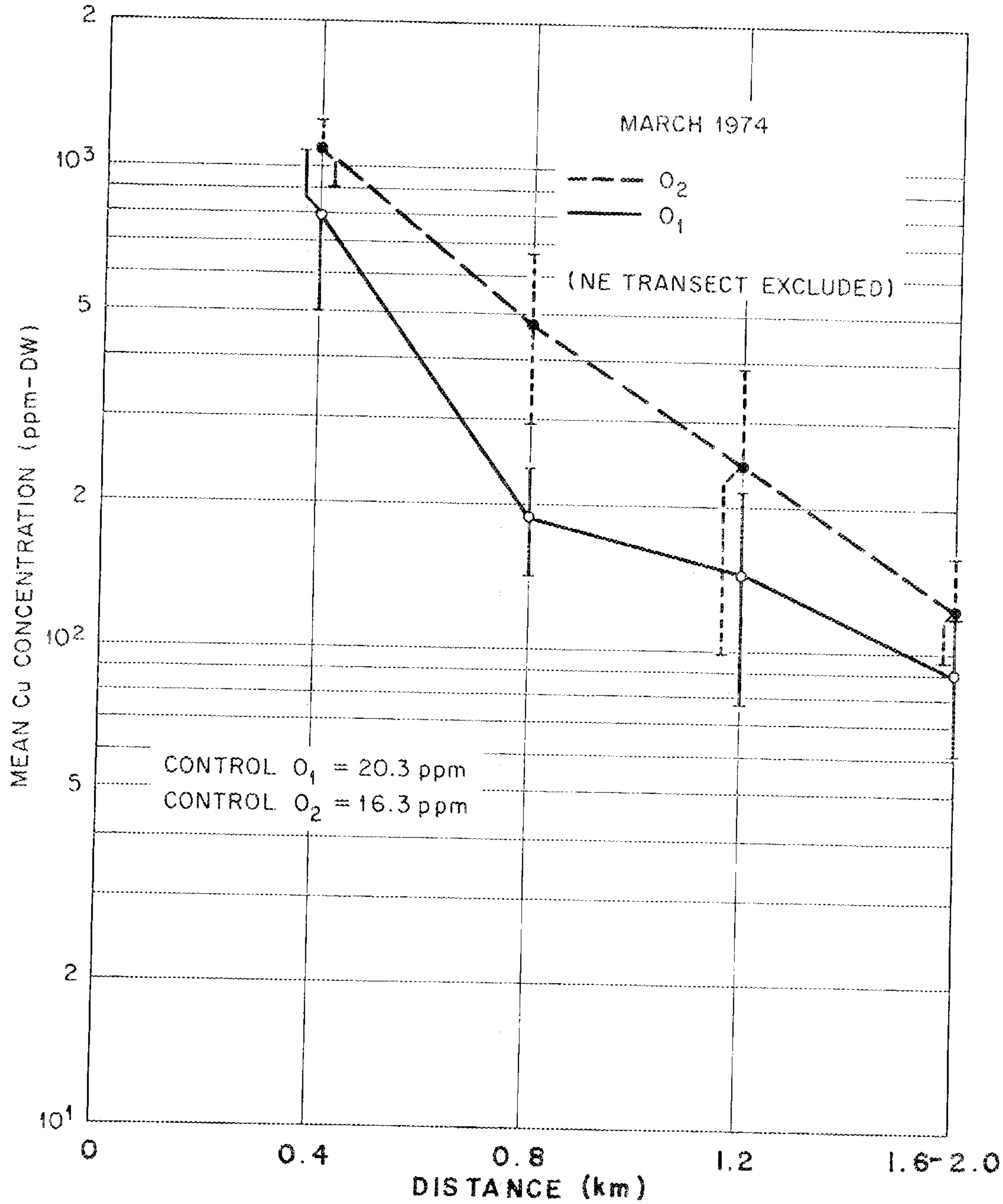
Pooled, seasonal means of litter Pb, Zn, Cu and Cd content ($\mu g/g$ dry wt) as a function of distance from the smelter. Values for the NE transect were excluded from computation ($\bar{x} \pm 1$ S.E., $n = 12$).

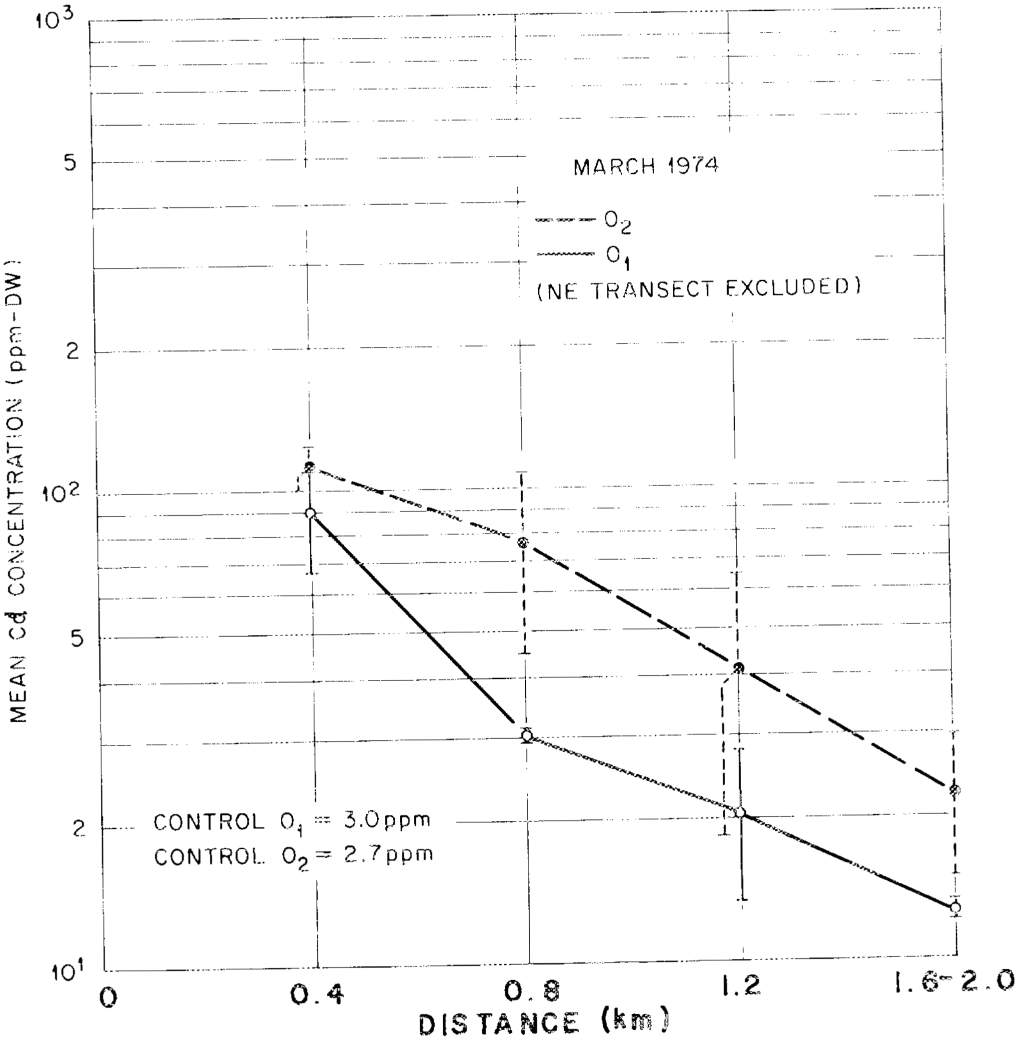


MARCH 1974
O2
O1
(NE TRANSECT EXCLUDED)
CONTROL O1 = 430 ppm
CONTROL O2 = 266 ppm
MEAN Pb CONCENTRATION (ppm-DW)
10^5
5
2
10^4
5
2
10^3
0
0.4
0.8
1.2
1.6~2.0
DISTANCE (km)

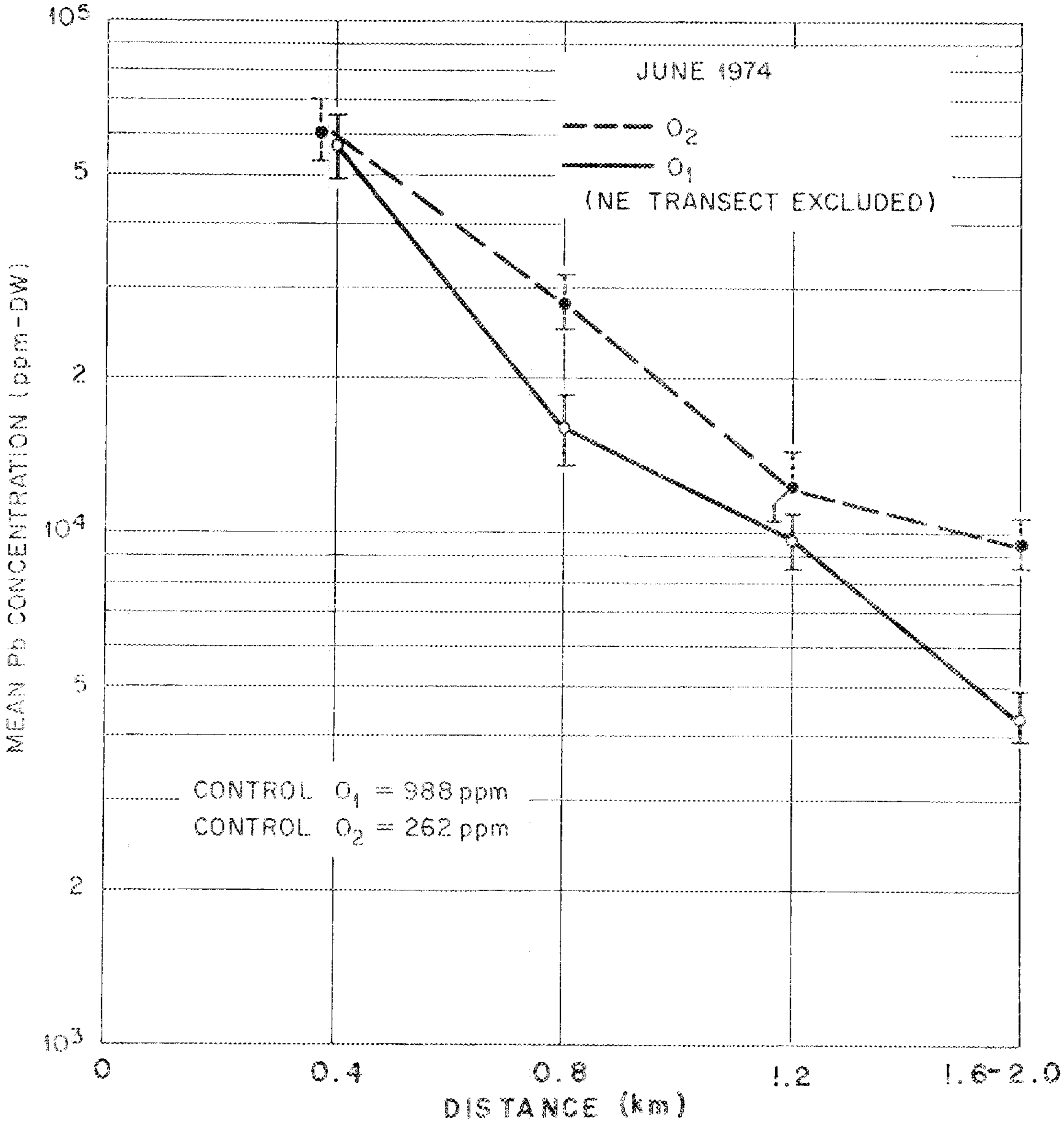


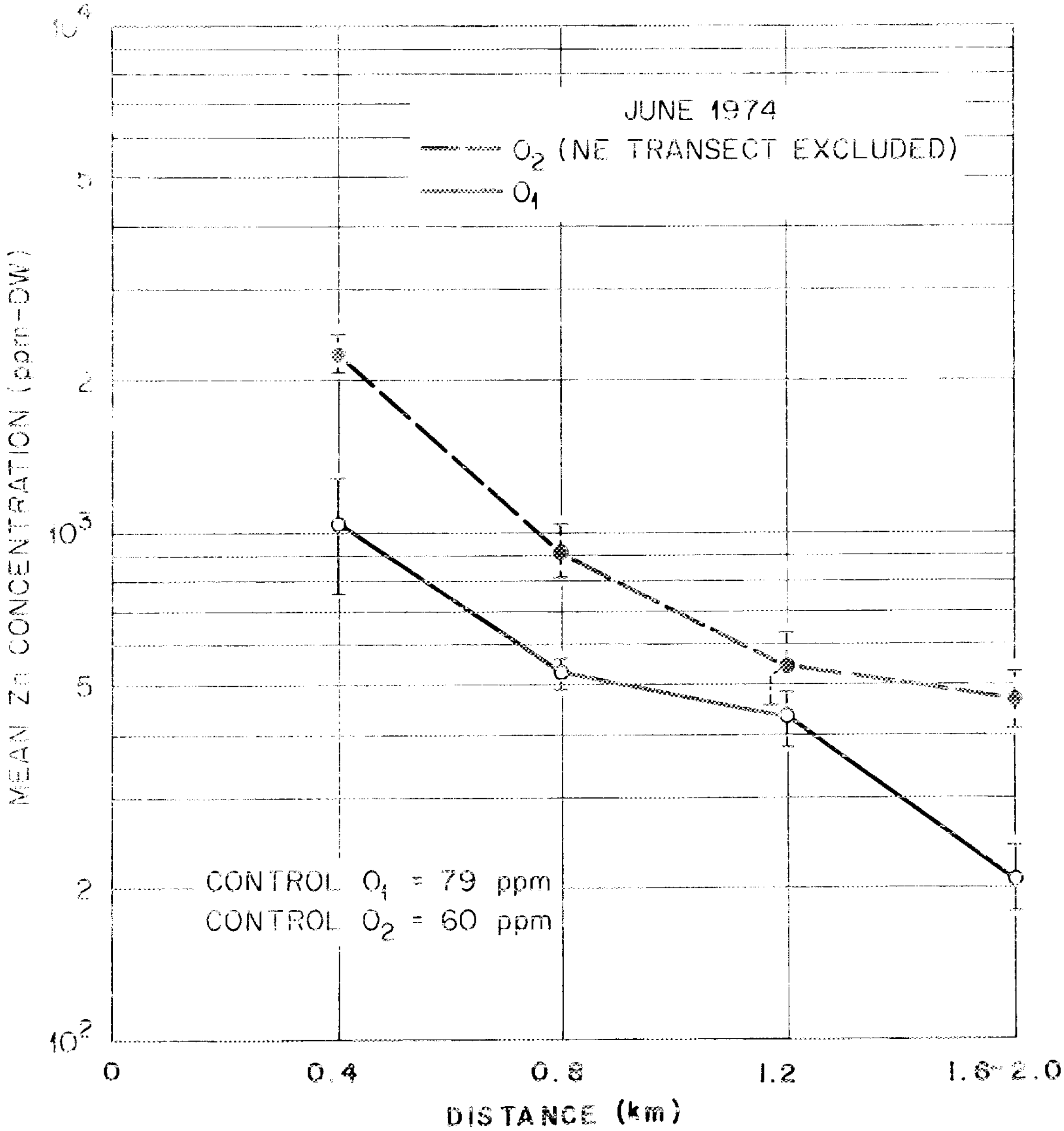
MARCH 1974
O_2
O_1
(NE TRANSECT EXCLUDED)
CONTROL O_1 = 74.8 ppm
CONTROL O_2 = 120.8 ppm
MEAN Zn CONCENTRATION (ppm-DW)
10^4
5
2
10^3
5
2
10^2
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)

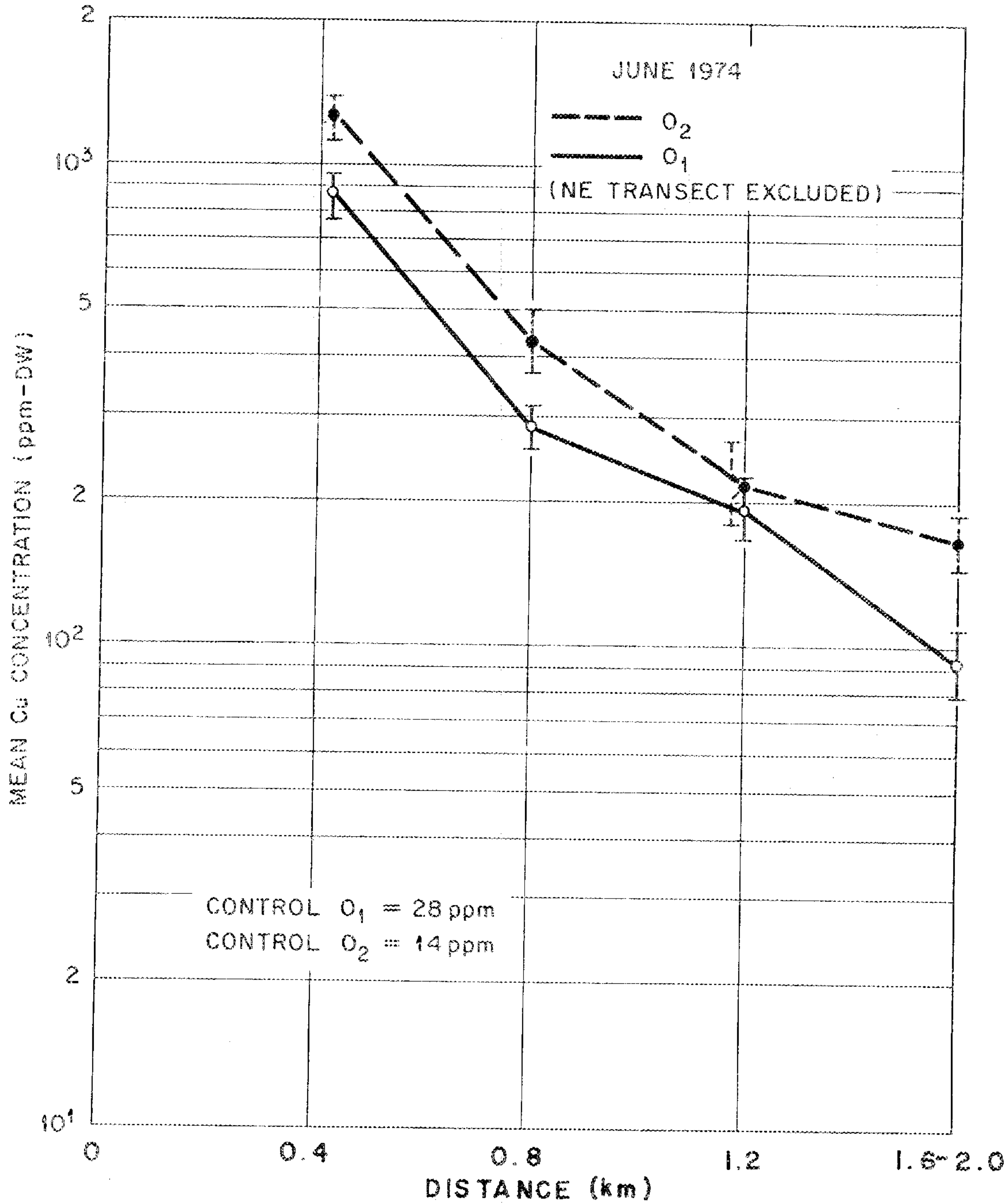

MARCH 1974
O_2
O_1
(NE TRANSECT EXCLUDED)
CONTROL O_1 = 20.3 ppm
CONTROL O_2 = 16.3 ppm
MEAN Cu CONCENTRATION (ppm-DW)
10^3
5
2
10^2
5
2
10^1
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)

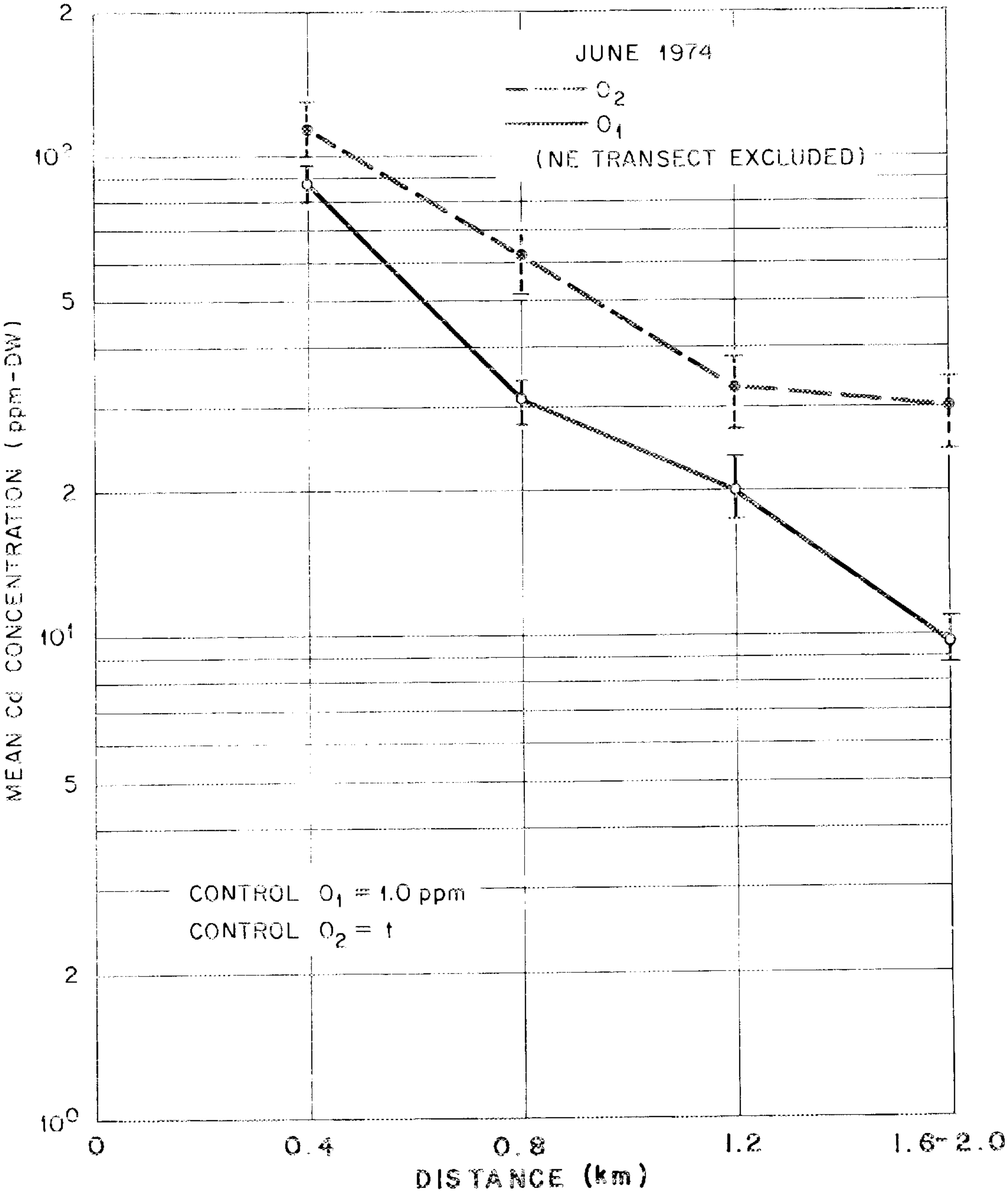


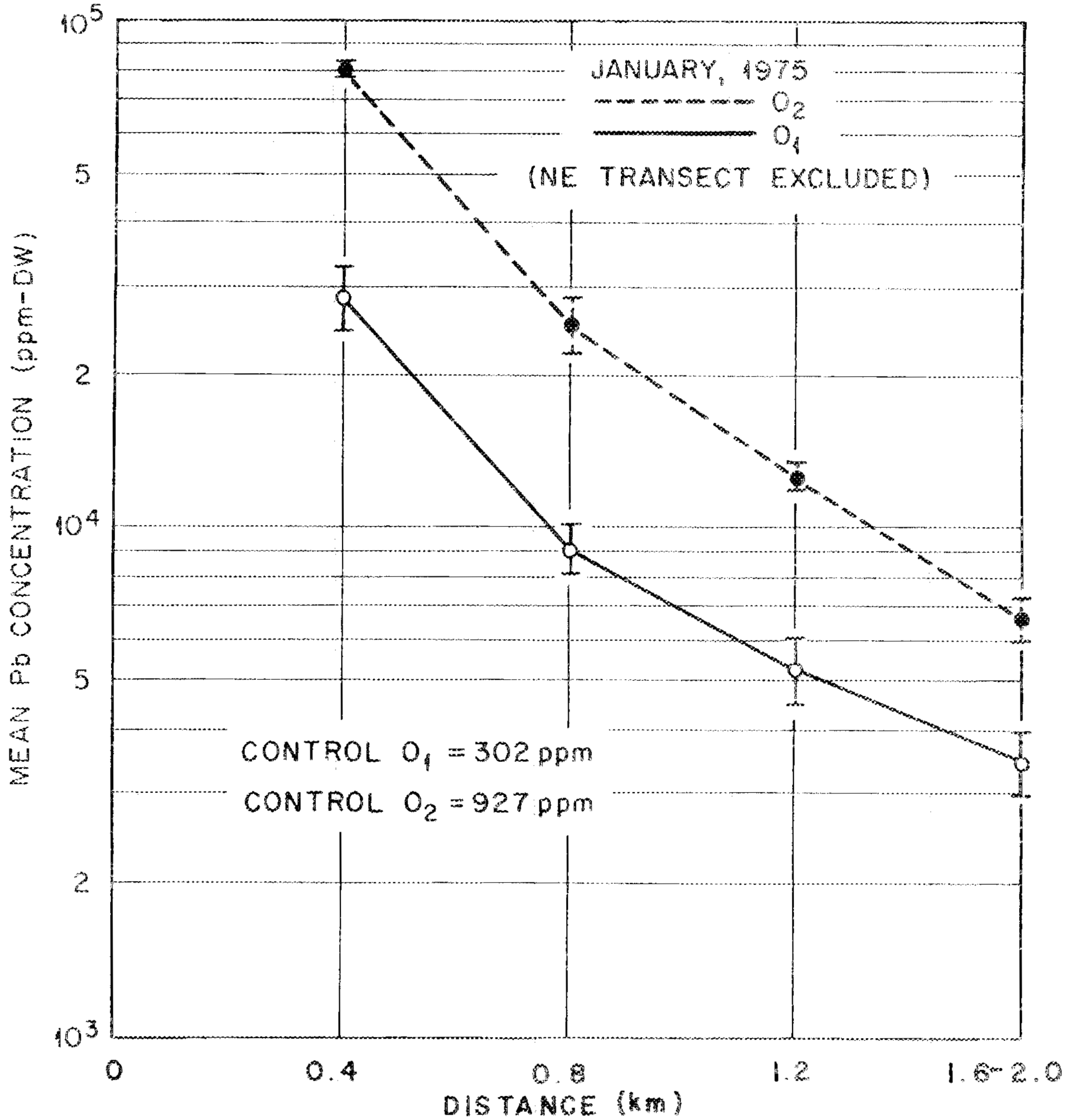
10³
5
2
10²
5
2
10¹
MEAN Cd CONCENTRATION (ppm-DW)
MARCH 1974
O₂
O₁
(NE TRANSECT EXCLUDED)
CONTROL O₁ = 3.0ppm
CONTROL O₂ = 2.7ppm
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)

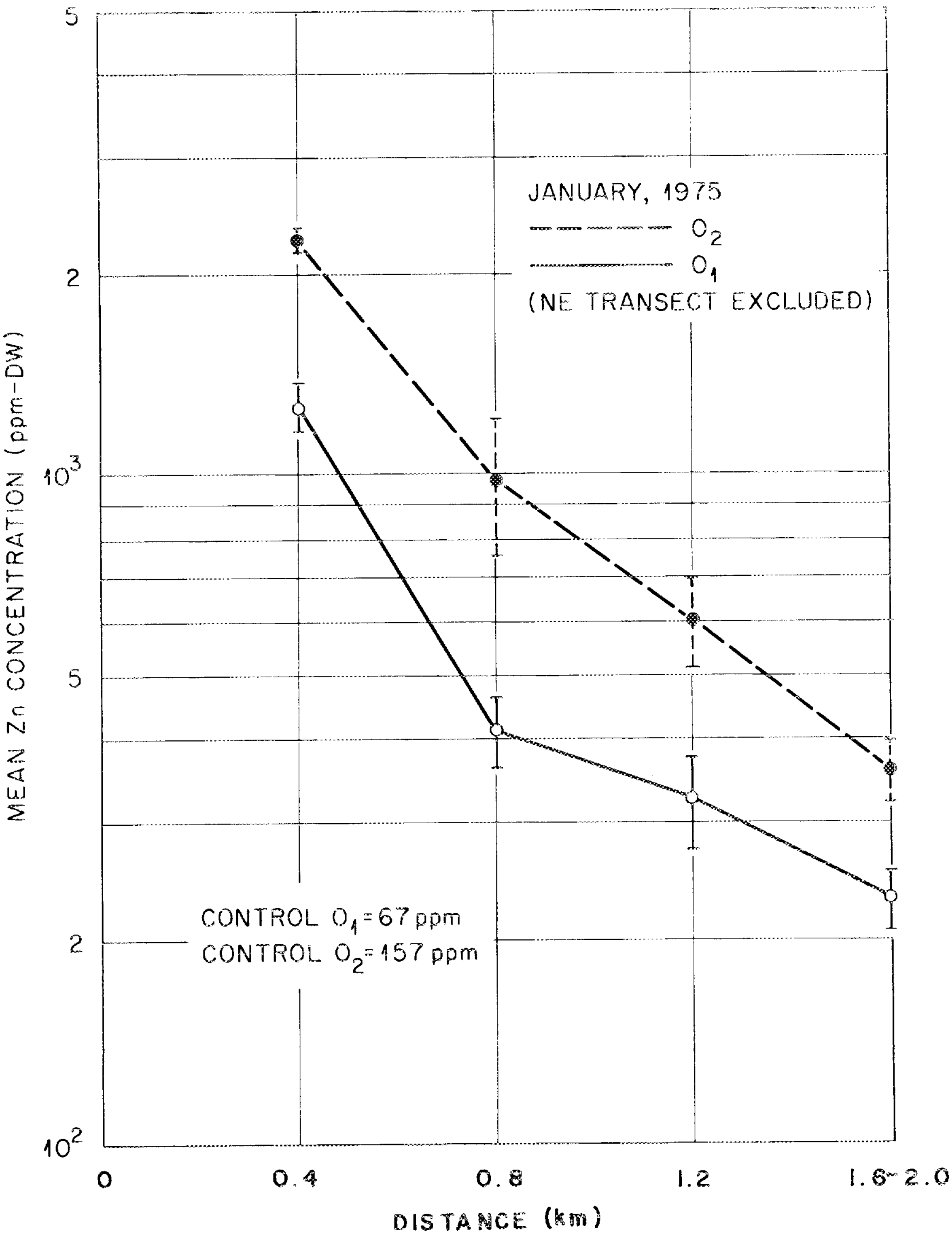

JUNE 1974
O2
O1
(NE TRANSECT EXCLUDED)
CONTROL O1 = 988 ppm
CONTROL O2 = 262 ppm
MEAN Pb CONCENTRATION (ppm-DW)
DISTANCE (km)
10^5
5
2
10^4
5
2
10^3
0
0.4
0.8
1.2
1.6-2.0

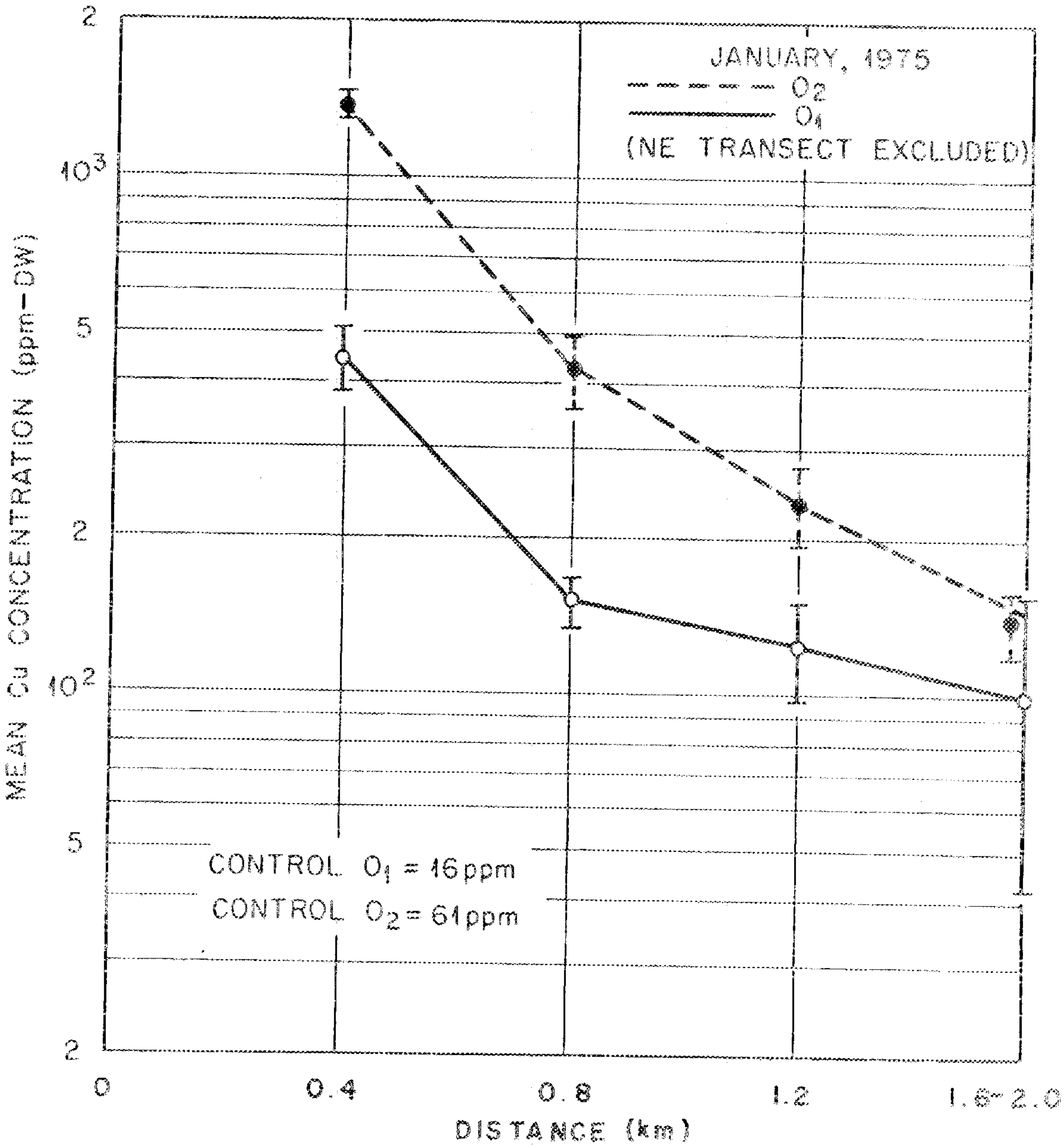

JUNE 1974
O2 (NE TRANSECT EXCLUDED)
O1
CONTROL O1 = 79 ppm
CONTROL O2 = 60 ppm
MEAN Zn CONCENTRATION (ppm-DW)
10^4
5
2
10^3
5
2
10^2
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)

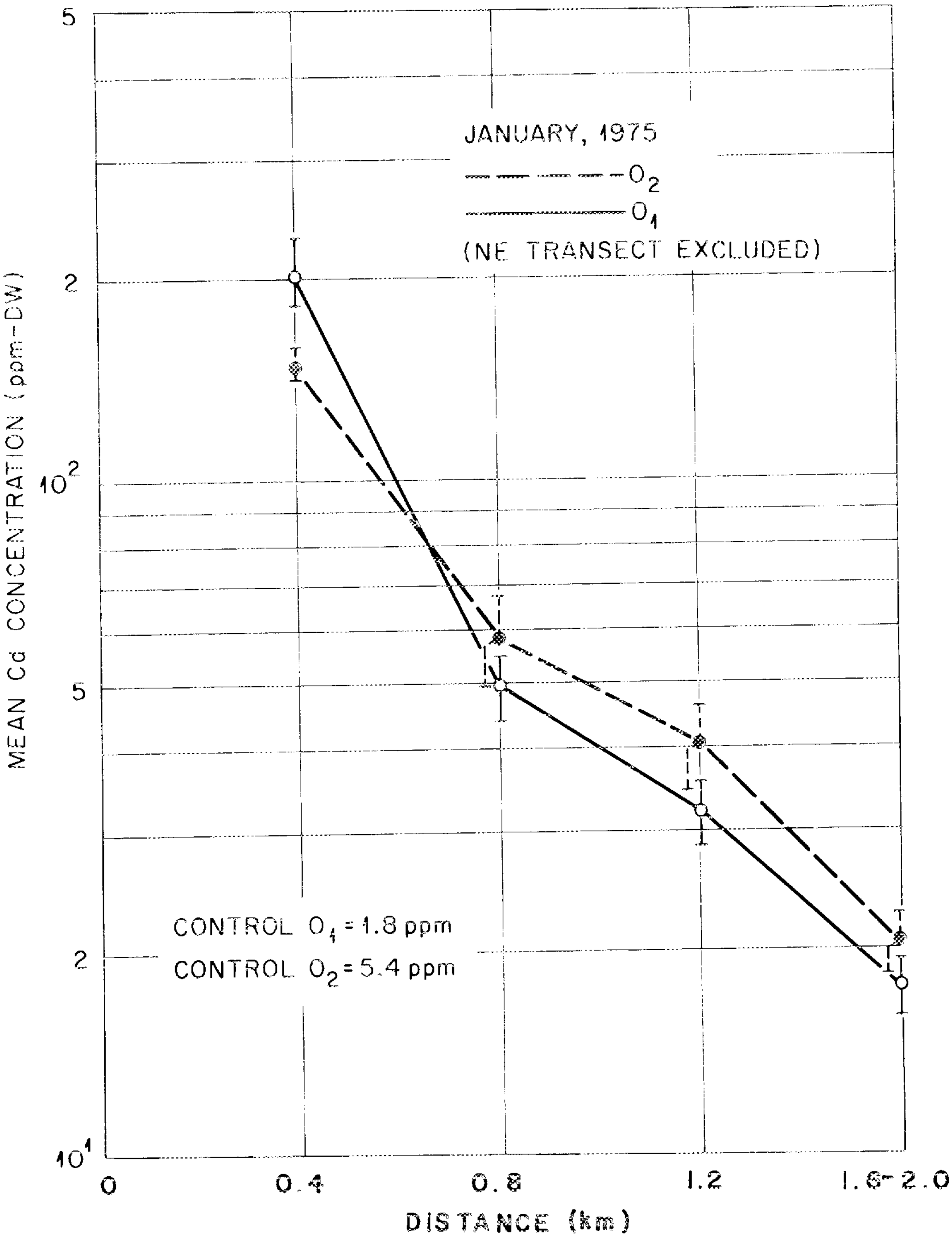

JUNE 1974
O2
O1
(NE TRANSECT EXCLUDED)
CONTROL O1 = 28 ppm
CONTROL O2 = 14 ppm
MEAN Cu CONCENTRATION (ppm-DW)
10¹
2
5
10²
2
5
10³
2
0
0.4
0.8
1.2
1.6~2.0
DISTANCE (km)


JUNE 1974
O2
O1
(NE TRANSECT EXCLUDED)
CONTROL O1 = 1.0 ppm
CONTROL O2 = t
MEAN Cd CONCENTRATION (ppm-DW)
DISTANCE (km)
0
0.4
0.8
1.2
1.6-2.0
10^0
2
5
10^1
2
5
10^2
2


JANUARY, 1975
O2
O1
(NE TRANSECT EXCLUDED)
CONTROL O1 = 302 ppm
CONTROL O2 = 927 ppm
MEAN Pb CONCENTRATION (ppm-DW)
10^5
5
2
10^4
5
2
10^3
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)


JANUARY, 1975
O2
O1
(NE TRANSECT EXCLUDED)
CONTROL O1 = 67 ppm
CONTROL O2 = 157 ppm
MEAN Zn CONCENTRATION (ppm-DW)
5
2
10^3
5
2
10^2
0
0.4
0.8
1.2
1.6~2.0
DISTANCE (km)


JANUARY, 1975
O2
O1
(NE TRANSECT EXCLUDED)
MEAN Cu CONCENTRATION (ppm-DW)
2
10³
5
2
10²
5
2
CONTROL O1 = 16 ppm
CONTROL O2 = 61 ppm
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)


JANUARY, 1975
O_2
O_1
(NE TRANSECT EXCLUDED)
CONTROL O_1 = 1.8 ppm
CONTROL O_2 = 5.4 ppm
MEAN Cd CONCENTRATION (ppm-DW)
5
2
10^2
5
2
10^1
0
0.4
0.8
1.2
1.6-2.0
DISTANCE (km)

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