Technical Report No. 4

SUMMARY REPORT ON INITIAL SMALL-HERBIVOROUS-MAMMAL MODELING EFFORTS, PAWNEE SITE, GRASSLANDS BIOME

Prepared by Jack E. Gross and Carl J. Walters

GRASSLANDS BIOME

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INTRODUCTION

The ultimate goal of the US IBP Grassland Biome project is to gain a sufficient understanding of the ecosystem to permit the construction of a mathematical model and subsequent simulation of the system's functions. The small herbivorous mammals are a conspicuous element in the grassland ecosystem and presumably exert a significant role in the functioning of the ecosystem. The small mammal modeling effort has as a primary objective the delineation of this role.

Small herbivorous mammals form one of several arbitrarily-separated groups which have been designated as primary consumers on the Pawnee Site of the Grassland Biome. The small-herbivorous-mammal complex on the Pawnee Site is made up by about 25-30 species, ranging in size from 40 g mice, through 1,000 g prairie dogs, to 3,000 g jackrabbits. Eleven of these 25-30 small herbivores have been selected for study, the selection being made on the basis of estimates and opinions of relative densities, with the hope that the majority of the small mammal biomass will be included in a model simulating the demographic behavior of the 11 species. Eight of the species are rodents, and three are rabbits or hares.

APPROACH TO THE PROBLEM

One of the goals of a recently completed Information Synthesis Project in the Grassland Biome was to form an initial understanding of the nature and extent of the role of small herbivorous mammals in the functioning of the Grassland Biome. The information would have been used as a conceptual core for initial modeling efforts. Although the general nature of a number of plant-animal interactions was described in the synthesis effort, two facts were clearly evident: first, both the nature and extent of the role of small herbivorous mammals in the functioning of the system depends on periodic changes in animal speciation and changes in density of the dominant animal species; second, changes in speciation and changes in density are frequently caused by changes in the ecosystem, principally in the composition and condition of the vegetation. In a very real sense, the role of the small herbivorous mammals in the functioning of the grassland ecosystem depends in part on the impact of the ecosystem on the small herbivorous mammals.

Thus, the primary producers and primary consumers are linked by sets of negative- and positive-feedback loops, with the function of each influenced partially but not completely by conditions in the other. Since both the plant and animal complexes are in constant states of change, the problem of building a model seems to become one of locating a reference point where sufficient information is available to frame a conceptual mechanism of function. Since biomass (or density) seems to be the single most important element in the role of small herbivorous mammals in the functioning of the ecosystem, the basic problem in the small mammal complex becomes one of explaining the causative factors responsible for observed densities.

The small-herbivorous-mammal modeling effort has been attacked initially as a problem in defining the role of the ecosystem in the biomass dynamics of the small herbivorous mammal populations. The approach taken in the initial modeling effort is to describe the nature and extent of feedback loops from the environment to the animal populations. Subsequently, by using the plant-to-animal side of the feedback loop as a reference point, the remaining side of the loop, i.e., the effect of small herbivorous mammals on the ecosystem, may be more explicitly described.

CONCEPT OF THE INITIAL MODEL

Functional Concepts

The fundamental ecological problem can be simply stated: why does there exist, at any given place at any given time, a certain biomass or density of animals? If animal populations maintained static densities, the explanation would be greatly simplified. But in most populations, densities change through time and space. Explanations of intrinsic densities thus must include explanations of short-term fluctuations. The philosophy upon which we have based the conceptual mechanism that would explain short-term fluctuations is summed up by Lucas (1964):

> "An argument which seems not to be resolvable is whether the real universe has some truly random aspects, or whether the real universe is completely deterministic. The concept of randomness may have evolved simply as a device to cope with ignorance about the causes of events. Such ignorance can certainly make some things appear to be random. It seems clear enough, however, that the real universe, if not completely deterministic, has a core of deterministic features. Such must be so; otherwise science would be fruitless."

A number of basic deterministic concepts have been published which are intended to explain the causative agents responsible for population fluctuation, any of which could perhaps form the nucleus for a demographic and life-history simulator. However, for the initial modeling efforts, three conceptual demographic mechanisms have been selected for inclusion in the model's functions.

The core of the model is based on the concept of Wagner et al. (1965), who delineated the mechanisms of short-term fluctuations into two separate entities, *population balance* and *population mean density*: (1) Balance (the tendency of a population to return to a mean density following a departure from mean density) is achieved by causative agents whose influences are related to the density of the population; (2) Differences in mean density between geographic areas may result from causative agents whose influences are independent of the population's density; and (3) Mean density in any given area is achieved by the combined action of factors influenced and factors uninfluenced by the population's density. The Wagner conceptual mechanism is particularly relevant to this study because specific demographic behavior is related to a broad category of regulating factors which include the condition of the habitat.

The second concept which seems to be relevant for developing a simulation model appropriate for the entire Grassland Biome is that of Mullen (1968), who proposed the severity of action of within-population factors (in achieving population balance) increases with decreasing latitude. By deduction, Mullen's concept supplies a perspective that the role of the ecosystem in the functioning of small-herbivorous-mammal populations may vary with latitude, and thus in the more southerly grasslands where density-dependent mechanisms may exert pronounced balancing influences, the ecosystem may exert little effect on variations in densities of small mammal populations. Exactly where the Pawnee Site fits into this latitudinal framework will be one of the initial analysis goals of the simulation studies.

The third concept which has been built into the model has been considered in different forms by a number of authors, including Ricker (1954) and Salt (1967). The concept involves a security density below which the effects of a detrimental process normally no longer are effective. Although the mechanism is viewed as being basically functional between predators and prey, populations may react in a similar fashion to other environmental variables.

Integration Framework

The conceptual mechanisms of Wagner et al. (1965), Mullen (1968), and Salt (1967) have been integrated into a general functional framework (Fig. 1) according to a basic natality-mortality-density conceptual mechanisms first developed by Leopold (1955) and further developed by Gross (1969). In Fig. 1. specific-natality rates and specific-mortality rates are shown to be primarily functions of population density. According to our review of the small-herbivorous-mammal literature, specific-natality rates in natural populations tend to remain relatively constant over a wide range of densities. We therefore deduced that changes in specific-mortality rates contribute the primary dynamic properties of small-herbivorous-mammal populations. Thus in Fig. 1, specific-natality rates for a given latitude hold constant with changing population densities while specific-mortality rates change with changes in population densities.

The foregoing basic pattern is altered by several factors. First, specific-natality rates of many small herbivorous mammals typically change with changes in latitude. Thus, latitudinal changes in specific natality rates (and corresponding changes in specific-mortality rates) are included in the framework. The concept of Mullen (1968) is included as latitudinal variations in the response of specific-mortality-rate changes to changes in population density, and thus as latitudinal changes in the magnitude of density fluctuation. The increasing influence of density-dependent mortality dampening tends to dampen population fluctuations as geographic locations occur nearer the equator. The concepts of Wagner et al. (1965) are included in three framework perspectives: mean density tends to be higher in good habitat and lower in poorer habitat (habitat-dependent variation in mean density), the magnitude of population fluctuation tends to be greater in good habitat than in poorer habitat (habitat-dependent variation in magnitude of density fluctuations) and the rate of population change tends to be greater in good habitats than in poor habitats (habitat-dependent changes in net production). The concept of Salt (1967) is included as positive net production that changes little in the lowest density ranges.

PROCESSES OF THE SIMULATOR

Simulation Functions

The initial problem in developing the demographic simulator was one of: (1) constructing a bookkeeping mechanism with sufficient sensitivity and complexity to realistically process initial system-condition data; and (2) outputting reasonably realistic numerical behavior of real-world populations from which the initial system-condition data were gathered. Both of the foregoing problems were resolved by feeding blocks of discrete initial-system-condition values into a stepwise or time-segmented information processor (Appendices A, B, and C).

The basic demographic mechanism to be simulated and the primary initial system-condition information to be gathered are shown schematically in Fig. 2. The demographic mechanism consists of: (1) a certain number of individuals that enter the simulation period (one year) and thereafter die off at certain rates; and (2) a certain number of new individuals that are produced during the simulation period and subsequently die off at certain rates. Initial system condition information include data on periodic adult densities and periodic production. When properly processed, the initial system condition should provide valid periodic calculations on: (1) adult numbers, (2) juvenile numbers, (3) total numbers, and (4) total numbers dying (Appendix D). When secondary initial system condition information, i.e., age-specific weights, food consumption, and fecal production are supplied and integrated with initial system condition information, basic energy transfer information into and out of the small mammal complex is calculated (Appendix D).

The ability of the simulator to faithfully duplicate the behavior of the real-world population is determined by comparing measured final system conditions with simulated final system conditions. Two final-system-condition parameters are being used in the initial model to check the behavior of the simulated system: (1) total numbers of animals alive at or near the end of the simulation period, and (2) percentages of juveniles in the population during and following the reproductive season.

Analytical Functions

The basic functioning of the simulator is built around parameters that can be measured with reasonable accuracy in real-world populations. However, some parameters which constrain the behavior of the population (particularly juvenile mortality rates) and the nature and extend of the feedback mechanisms between plant and animal complexes are difficult if not impossible to measure in the field. Thus, initial synthesis functions of the simulator will be to supply information that cannot be measured or to generate optimum or maximum-likelihood combinations of variables that will produce known final-system conditions. Initial analyses will involve the generation of juvenile mortality rates that will produce age ratios measured in real-world populations, and then correlation of the mortality patterns with changes in weather variables that are suspect of influencing juvenile survival.

Finally, the simulator will include analytical mechanisms for delineating the role of certain environmental and population factors in the functioning of the small mammal populations. The initial effort in this area revolves around the role of nutrition in reproductive dynamics, and will be pursued through a submodel that calculates various nutritional interactions between animal populations and between each animal population and plant populations (Appendices E, F, and G). Initial system conditions for the submodel are dietary composition of each animal species, availability in the field of items in the diets, and population information calculated in the demographic simulator.

ACKNOWLEDGEMENTS

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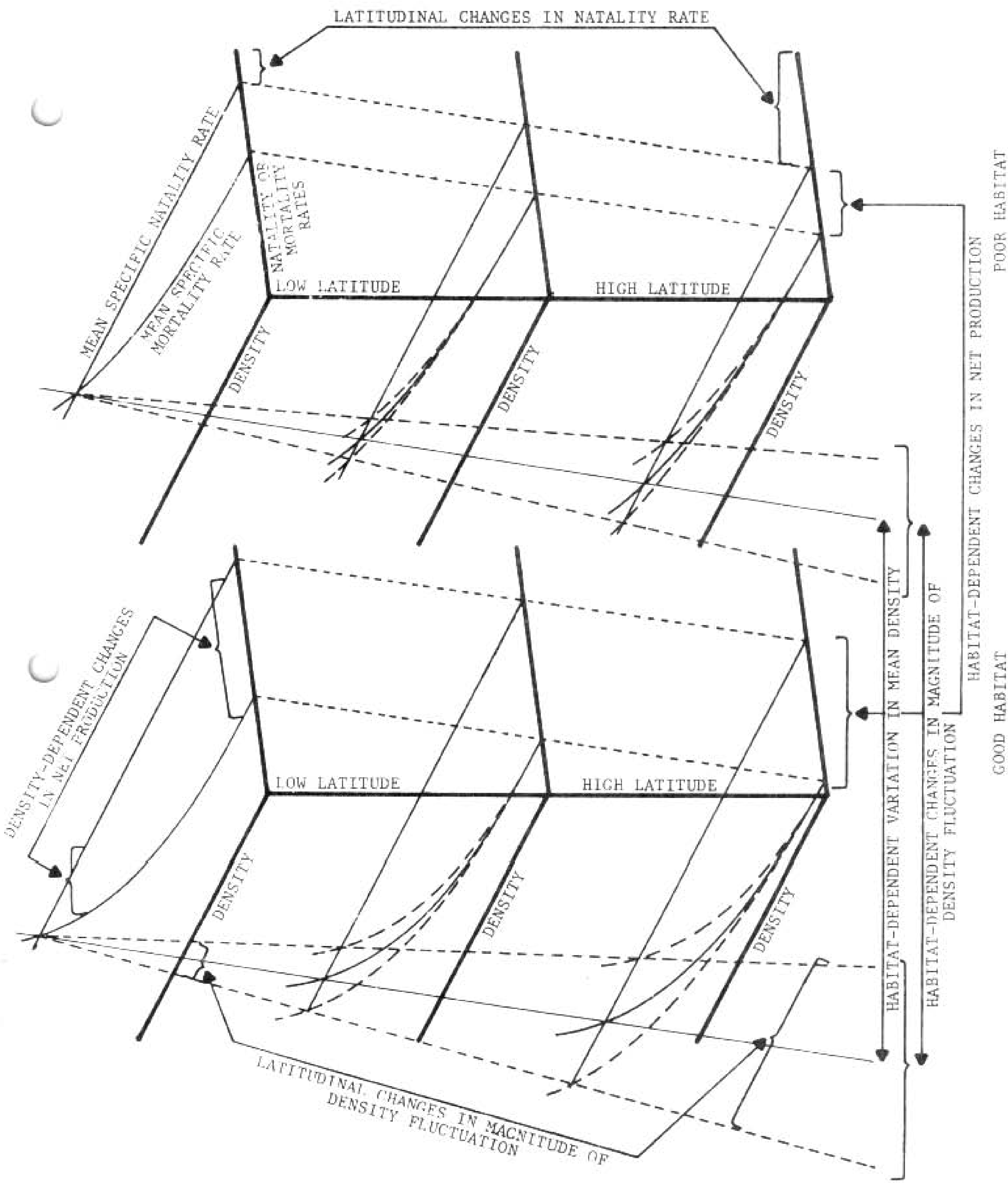

Fig. 1. Conceptual framework of proximate processes that influence population density through changes in specific-natality rates and specific-mortality rates.

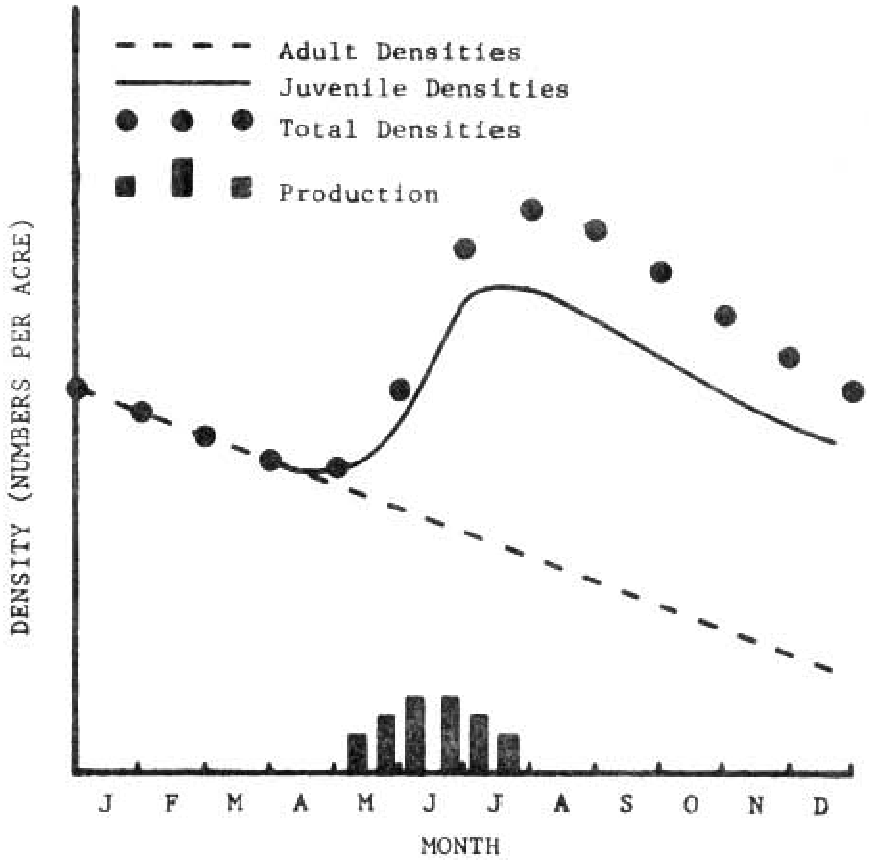

Fig. 2. Schematic representation of annual population density fluctuation.

APPENDIX A

INPUT DESCRIPTION--PROGRAM SMAMMAL

Columns	Variable	Description
CONTROL	(3I5)	
1-5	NSP	Number of species to be simulated (≤15)
6-10	NYR	" " years " " " (≤10)
11-15	NLONG	If NLONG is greater than 0, all output will be inhibited except plots of biomass and density for the species with index NLONG
16-20	MSPLT	If MSPLT is greater than 0, all output will be inhibited except plots of biomass and density for all species.
SPECIES NAMES		(8A10)
1-10	NAME(1)	Alphameric identifying name for species 1
11-20	NAME(2)	" " " " " 2
.		
.		
.		
71-80	NAME(8)	" " " " " 8
Second card (if NSP>8):		
1-10	NAME(9)	" " " " " 9
11-20	NAME(11)	" " " " " 10
.		
.		
.		
NSPth 10 cols	NAME(NSP)	" " " " " NSP
INDIVIDUAL PARAMETER PRINT-OUT CONTROL		(15I5)
1-5	IBOP	If IBOP is greater than 0, BOP is printed out.
6-10	IPAOUT	If IPAOUT is " " " PAOUT is printed out.
11-15	IPJOUT	If IPJOUT " " " " PJOUT " " "
16-20	IPTOUT	" IPTOUT " " " " PTOUT " " "
21-25	ICON	" ICON " " " " CON " " "
26-30	IFEC	" IFEC " " " " FEC " " "
31-35	IDEAD	" IDEAD " " " " DEAD " " "
36-40	IARJI	" IARJI " " " " ARJI " " "
41-45	MOAJ	" MOAJ " " " " MOAJ will be executed*
FIRST WEEK OF BREEDING SEASON		(15I5)
1-5	IBP(1)	first week of breeding season for species 1 (from Jan 1-7)
6-10	IBP(2)	first week of breeding season for species 2
11-15	IBP(3)	" " " " " " " 3
.		
.		
.		
71-75	IBP(15)	" " " " " " " 15

*Routine MOAJ should not be used until proofing is accomplished.

LENGTH OF BREEDING SEASON (15I5)

1-5	LBP(1)	length in weeks of the breeding season for species 1
6-10	LBP(2)	" " " " " " " " " 2
11-15	LBP(3)	" " " " " " " " " 3
.		
.		
.		
71-75	LBP(15)	" " " " " " " " " 15

LENGTH OF WEANING PERIOD (15I5)

1-5	LW(1)	age in weeks at weaning of species 1 juveniles
.		
.		
.		
71-75	LW(15)	" " " " " " " 15 "

LENGTH OF FIRST JUVENILE PERIOD (15I5)

1-5	LJP1(1)	length in weeks of first juvenile period, species 1
.		
.		
.		
71-75	LJP1(15)	" " " " " " " " 15

LENGTH OF SECOND JUVENILE PERIOD (15I5)

1-5	LJP2(1)	length in weeks of second juvenile period, species 1
6-10	LJP2(2)	" " " " " " " " 2
.		
.		
.		
71-75	LJP2(15)	" " " " " " " " 15

LENGTH OF THIRD JUVENILE PERIOD (15I5)

1-5	LJP3(1)	length in weeks of third juvenile period, species 1
6-10	LJP3(2)	" " " " " " " " 2
.		
.		
.		
71-75	LJP3(15)	" " " " " " " " 15

LENGTH OF FOURTH JUVENILE PERIOD (15I5)

1-5	LJP4(1)	length in weeks of fourth juvenile period, species 1
6-10	LJP4(2)	" " " " " " " " 2
.		
.		
.		
71-75	LJP4(15)	" " " " " " " " 15

NOTE: LJP1(I)+LJP2(I)+LJP3+LJP4 = PJW(I) $\leq$ 52. Animals are assumed to become adults at age PJW(I).

AGE OF JUVENILES AT ATTAINMENT OF ADULT WEIGHT (15I5)

1-5	PJW(1)	week of age that juveniles reach adult weight, species 1
6-10	PJW(2)	" " " " " " " " " 2
.		
.		
.		
71-75	PJW(15)	" " " " " " " " " 15

CRITICAL POPULATION DENSITY (15I5) (Used with routine MOAJ)

1-5	PAC(1)	density above which population growth is constrained, species 1
6-10	PAC(2)	density above which population growth is constrained, species 2
.		
.		
.		
71-75	PAC(15)	density above which population growth is constrained, species 15

CRITICAL JUVENILE AGES WITHIN WHICH PAC IS EXECUTED (15I5) (used with routine MOAJ)

CARD 1

1-5	LCI(1)	Initial week when population control is applied, species 1
6-10	LCI(2)	Initial week when population control is applied, species 2
.		
.		
.		
71-75	LCI(15)	Initial week when population control is applied, species 15

CARD 2 (used with routine MOAJ)

1-5	LCE(1)	Final week when population control is applied, species 1
6-10	LCE(2)	Final week when population control is applied, species 2
.		
.		
.		
71-75	LCE(15)	Final week when population control is applied, species 15

NOTE: LCI and LCE values must coincide with beginning and end of one or several combined LJP periods.

END OF HIBERNATION (15I5)

1-5	NLWH(1)	week when hibernation ends for species 1
6-10	NLWH(2)	" " " " " " 2
		(leave blank if species I does not hibernate)
.		
.		
.		
71-75	NLWH(15)	week when hibernation ends for species 15

START OF HIBERNATION (15I5)

1-5	NFWH(1)	week when hibernation starts, species 1
6-10	NFWH(2)	" " " " " 2
		(leave blank if species I does not hibernate)
.		
.		
.		
71-75	NFWH(15)	week when hibernation starts, species 15

JUVENILE WEIGHT-AT-AGE (15F5.0)

BLOCK 1: species 1 juvenile weights-at-age

CARD 1

1-5	WJ(1,1)	mean weight of animals aged one week
6-10	WJ(1,2)	" " " " " two weeks
.		
.		
.		
71-75	WJ(1,15)	" " " " " 15 weeks

CARD 2

1-5	WJ(1,16)	" " " " " 16 weeks
.		
.		
.		
71-75	WJ(1,30)	" " " " " 30 weeks

NOTE: Use only enough cards to read in LJ(1) values)

```
BLOCK 2:  species 2 juvenile weights-at-age
     CARD 1
      1-5          WJ(2,1)     mean weight of animals aged one week
      6-10         WJ(2,2)      "     "     "     "      "  two  "
        .
        .
        .
     71-75         WJ(2,15)     "     "     "     "      "  15 weeks

     CARD 2
      1-5          WJ(2,16)     "     "     "     "      "  16 weeks
        .
        .
        .
     71-75         WJ(2,30)     "     "     "     "      "  30 weeks

NOTE:  Use only enough cards to read in LJ(2) values.
   .
   .
   .
BLOCK NSP:  Species NSP juvenile weights-at-age
     CARD 1
      1-5          WJ(NSP,1)   mean weight of animals aged one week
        .
        .
        .
     71-75         WJ(NSP,15)   "     "     "     "      "  15 weeks

NOTE:  Use only enough cards to read in LJ(NSP) values.

ADULT WEIGHTS                                 (15F5.0)
      1-5          WA(1)       weight of an adult of species 1
      6-10         WA(2)         "    "  "    "    "     "    2
        .
        .
        .
     71-75         WA(15)        "    "  "    "    "     "    15

JUVENILE FOOD CONSUMPTION-AT-AGE              (15F5.0)
Blocks of cards in same format as above; each block contains for one species the
   mean food consumption per week of juveniles of each week of age.

BLOCK 1:  species 1 juvenile food consumption rates
     CARD 1
      1-5          CJ(1,1)     weekly food consumption by an individual aged 1 week
        .
        .
        .
     71-75         CJ(1,15)     "      "        "        "  "      "       " 15 weeks

NOTE:  Use only enough cards to read in LJ(1) values.
```

BLOCK 2: species 2 juvenile food consumption rates

CARD 1

1-5	CJ(2,1)	weekly food consumption by an individual aged 1 week
.		
.		
.		
71-75	CJ(2,15)	" " " " " " " 15 weeks

NOTE: Use only enough cards to read in LJ(2) values.

.
.
.

BLOCK NSP: species NSP juvenile food consumption rates

CARD 1

1-5	CJ(NSP,1)	weekly food consumption by an individual aged 1 week
.		
.		
.		
71-75	CJ(NSP,15)	" " " " " " " 15 weeks

NOTE: Use only enough cards to read in LJ(NSP) values.

ADULT FOOD CONSUMPTION (15F5.0)

1-5	CA(1)	weekly food consumption by an adult of species 1
.		
.		
.		
71-75	CA(15)	" " " " " " " " 15

JUVENILE FECAL PRODUCTION-AT-AGE (15F5.0)

Blocks of cards in same format as above; each block contains for one species the mean fecal production per week of juveniles of each week of age

BLOCK 1: fecal production rates by juveniles of species 1

CARD 1

1-5	FJ(1,1)	weekly fecal production by an individual aged 1 week
.		
.		
.		
71-75	FJ(1,15)	" " " " " " " 15 weeks

NOTE: Use only enough cards to read in LJ(1) values at 15 values per card)

BLOCK 2: fecal production rates by juveniles of species 2

CARD 1

1-5	FJ(2,1)	weekly fecal production by an individual aged 1 week
.		
.		
.		
71-75	FJ(2,15)	" " " " " " " 15 weeks

NOTE: Use only enough cards to read in LJ(2) values.

.
.
.

BLOCK NSP: fecal production rates by juveniles of species NSP

CARD 1

```
1-5        FJ(NSP,1)   weekly fecal production by an individual aged 1 week
 .
 .
 .
71-75      FJ(NSP,15)    "     "     "     "  "     "     "   15 weeks
```

NOTE: Use only enough cards to read in LJ(NSP) values

ADULT FECAL PRODUCTION (15F5.0)

```
1-5        FA(1)       weekly fecal production by an adult of species 1
 .
 .
 .
71-75      FA(15)        "     "     "     "  "  "  "  "   15
```

JUVENILE SURVIVAL CURVE SLOPE PARAMETER (15F5.0)

There are 4 cards; each card contains the exponential coefficients of decrease in survival rate with density for one juvenile stage for all species.

CARD 1: survival curve slopes for first juvenile period

```
1-5        DDM(1,1)    slope coefficient for first juvenile period, species 1
6-10       DDM(2,1)      "     "     "  "  "     "     "   2
 .
 .
 .
71-75      DDM(15,1)     "     "     "  "  "     "     "   15
```

CARD 2: survival curve slopes for juveniles for second juvenile period

```
1-5        DDM(1,2)    slope coefficient for second juvenile stage, species 1
6-10       DDM(2,2)      "     "     "  "  "     "     "   2
 .
 .
 .
71-75      DDM(15,2)     "     "     "  "  "     "     "   15
```

CARD 3: survival curve slopes for juveniles for third juvenile period

```
1-5        DDM(1,3)    slope coefficient for third juvenile stage, species 1
6-10       DDM(2,3)      "     "     "  "  "     "     "   2
 .
 .
 .
71-75      DDM(15,3)     "     "     "  "  "     "     "   15
```

CARD 4: survival curve slopes for juveniles for fourth juvenile period

```
1-5        DDM(1,4)    slope coefficient for fourth juvenile stage, species 1
6-10       DDM(2,4)      "     "     "  "  "     "     "   2
 .
 .
 .
71-75      DDM(15,4)     "     "     "  "  "     "     "   15
```

JUVENILE DENSITY DEPENDENCE THRESHHOLD (15F5.0)

There are 4 cards; each card contains the total species biomass necessary to cause survival rate in a juvenile stage to begin to decrease with further total biomass increase

CARD 1: threshhold biomass necessary to initiate density dependent mortality in first juvenile period

1-5	BCO(1,1)	threshhold biomass for first period of juvenile, species 1
6-10	BCO(2,1)	threshhold biomass for first period of juvenile, species 2
.		
.		
.		
71-75	BCO(15,1)	threshhold biomass for first period of juvenile, species 15

CARD 2: threshhold biomass necessary to initiate density dependent mortality in second juvenile period

1-5	BCO(1,2)	biomass for second period of juveniles, species 1
6-10	BCO(2,2)	" " " " " " " 2
.		
.		
.		
71-75	BCO(15,2)	" " " " " " " 15

CARD 3: threshhold biomass necessary to initiate density dependent mortality in third juvenile period

1-5	BCO(1,3)	biomass for third period of juveniles, species 1
6-10	BCO(2,3)	" " " " " " " 2
.		
.		
.		
71-75	BCO(15,3)	" " " " " " " 15

CARD 4: threshhold biomass necessary to initiate density dependent mortality in fourth juvenile period

1-5	BCO(1,4)	biomass for fourth period of juveniles, species 1
6-10	BCO(2,4)	" " " " " " " 2
.		
.		
.		
71-75	BCO(15,4)	" " " " " " " 15

LOW DENSITY JUVENILE SURVIVAL RATE (15F5.0)

There are 4 cards, in same format as above; each card contains the low density weekly survival rates of juveniles of one stage for the species

CARD 1: low density weekly survival rates for first juvenile period

1-5	SO(1,1)	survival rate for unweaned juveniles, species 1
6-10	SO(2,1)	" " " " " " 2

.
.
.
71-75 SO(15,1) survival rate for unweaned juveniles, species 15

CARD 2: low density weekly survival rates for second juvenile period

1-5	SO(1,2)	survival rates for second juvenile period, species 1
6-10	SO(2,2)	" " " " " " " 2
.		
.		
.		
71-75	SO(15,2)	" " " " " " " 15

CARD 3: low density weekly survival rates for third juvenile period

1-5	SO(1,3)	survival rates for juvenile period, species 1
6-10	SO(2,3)	" " " " " " 2
.		
.		
.		
71-75	SO(15,3)	" " " " " " 15

CARD 4: low density weekly survival rates for fourth juvenile period

1-5	SO(1,4)	Survival rates for fourth juvenile period, species 1
6-10	SO(2,4)	" " " " " " " 2
.		
.		
.		
71-75	SO(15,4)	" " " " " " " 15

COMPETITION MATRIX (15F5.0)

There are NSP cards. The ith card should contain the relative value of a unit of biomass of each other species in affecting survival rates of juveniles of species i.

CARD 1: relative effects of biomass of other species on survival rate of weaned juveniles of species 1

1-5	COM(1,1)	(leave all i,i positions blank)
6-10	COM(1,2)	effect of unit of spcies 2 biomass on species 1 survival
.		
.		
.		
71-75	COM(1,15)	effect of a unit of species 15 on species 1 survival

CARD 2: relative effects of other species on species 2

1-5	COM(2,1)	effect of a unit of species 1 biomass on species 2 survival
6-10	COM(2,2)	(leave all i,i positions blank)
11-15	COM(2,3)	effect of a unit of species 3 biomass on speices 2 survival
.		
.		
.		

71-75	COM(2,15)	effect of a unit of species 15 biomass on species 2 survival

.
.
.

CARD NSP: relative effect of other species on species NSP

1-5	COM(15,1)	effect of a unit of species 1 biomass on species 15 survival
6-10	COM(15,2)	effect of a unit of species 2 biomass on species 15 survival
.		
.		
.		
71-75	COM(15,15)	(leave blank)

ADULT POPULATION ESTIMATE (I2,4F10.0)

Each card should contain two estimates of adult population density (at two different weeks) for one species. The two estimates are used to calculate weekly adult survival rate. Cards need not be in order.

CARD FORM: (There should be NSP cards, one for each species)

1-2	IND	index or number of a species
3-12	P1	first (early) adult population estimate for the species
13-22	P2	second (late) adult population estimate for the species
23-32	W1	week of first population estimate (from Jan. 1-7)
33-42	W2	week of second population estimate (from Jan. 1-7)

ADULT SEX RATIO (15F5.0)

This program version assumes that sex ratio of adults is constant over time

1-5	SR(1)	sex ratio (females/males) for species 1 adults
.		
.		
.		
71-75	SR(15)	" " " " " " 15 "

REPRODUCTION CONTROL (I5)

1-5	IREAD	If new seasonal birth patterns are to be read in for each year, set IREAD=1. Otherwise, leave card blank. If IREAD=1 then card sequences #24 and #25 must be repeated NYR times, with each sequence containing reproductive rates for one year.

PROPORTION BREEDING (15F5.0)

There should be NSP blocks of cards, each block containing the LBP(I) weekly values of birth rate for species I females, 15 weekly values per card. "birth rate" is defined here to be the proportion of females actually giving birth during a week.

BLOCK 1: weekly birth rates for species 1 females

CARD 1

1-5	PB(1,1)	birth rate during week 1
.		
.		
.		
71-75	PB(1,15)	birth rate during week 15

CARD 2:

1-5	PB(1,16)	" " " " 16

NOTE: Use only enough cards to read in LBP(1) values.

CARD 1

1-5	PB(2,1)	birth rate during week 1
.		
.		
.		
71-75	PB(2,15)	" " " " 15

CARD 2

1-5	PB(2,16)	" " " " 1

NOTE: Use only enough cards to read in LBP(2) values.

.
.
.

BLOCK NSP: weekly birth rates for species NSP females

CARD 1

1-5	PB(NSP,1)	birth rate during week 1
.		
.		
.		
71-75	PB(NSP,15)	" " " " 15

CARD 2

1-5	PB(NSP,16)	" " " " 16

NOTE: Use only enough cards to read in LBP(NSP) cards.

WEEKLY LITTER SIZES (15F5.0)

Format as above. There should be NSP blocks of cards, each block containing the LBP(I) weekly values of mean litter size for species I, at 15 values per card. "litter size" is here defined to the mean number of young actually born per female that actually gives birth during the week.

BLOCK 1: weekly litter sizes for species 1 females

CARD 1

1-5	SLT(1,1)	litter size during week 1 of breeding season
.		
.		
.		

71-75	SLT(1,15)	litter size during week 15 of breeding season

CARD 2

1-5	SLT(1,16)	" " " " 16 " " "

NOTE: Use only enough cards to read in LBP(2) values.

BLOCK NSP: weekly litter sizes for species NSP females

CARD 1

1-5	SLT(NSP,1)	litter sizes during week one of breeding season
.		
.		
.		
71-75	SLT(NSP,15)	" " " " 15 " " "

CARD 2

1-5	SLT(NSP,16)	" " " " 16 " " "

NOTE: Use only enough cards to read in LBP(NSP) values

POPULATION AGE RATIO (15F5.0)

Format as above. There should be NSP blocks of cards, each block containing the ARJ1(I) weekly values of percentage of juveniles in population for species I, at 15 values per card, and total potential of 52 values.

BLOCK 1: Age ratio values for species 1

CARD 1

1-5	ARJI(1,1)	percentage of juveniles in population, week 1
6-10	ARJI(1,2)	" " " " " " 2
.		
.		
.		
71-75	ARJI(1,15)	" " " " " " 15

CARD 2

1-5	ARJI(1,16)	" " " " " " 16
6-10	ARJI(1,17)	" " " " " " 17
.		
.		
.		
71-75	ARJI(1,30)	" " " " " " 30

CARD 3

1-5	ARJI(1,31)	" " " " " " 31
6-10	ARJI(1,32)	" " " " " " 32
.		
.		
.		
71-75	ARJI(1,45)	" " " " " " 45

CARD 4		
1-5	ARJI(1,46)	percentage of juveniles in population, week 46
6-10	ARJI(1,47)	" " " " " " 47
.		
.		
.		
31-35	ARJI(1,52)	" " " " " " 52

BLOCK 2:

Same as BLOCK 1

APPENDIX B

FORTRAN Listing for PROGRAM SMAMMAL

```
C     ======================================================================
      DIMENSION ARJI(15,52),ARJC(15,52),NAGE(15),DEAD(15,52),
     1IHP(15),LHP(15),PB(15,52),SR(15),AC(15),IDUM(15),LW(15),
     2CJ(15,52),CA(15),FJ(15,52),FA(15),WJ(15,52),WA(15),
     3PJ(15,52),PA(15),LJ(15),PAREF(15),BUW(15), BWJ(15),
     40MWK(52),COM(15,15),DDM(15,4),BCO(15,4),SO(15,4),
     5JUVA(15),SLT(15,52),FEC(15,52),CON(15,52),NAME(15),
     6LJP4(15),PTOUT(15,52),PAOUT(15,52),BTJ(15),SAUD(10),
     7PJW(15),PJOUT(15,52),BA(15),BOP(15,52),SJC(15,4),
     8SJ(15,52),SA(15,52),CONJ(15,52),NLWH(15),NFWH(15),
     9LJP1(15),LJP2(15),PAC(15),LCI(15),LCE(15),LJP3(15),
      REWIND 1
1000  READ 100,NSP,NYR,NLONG,MSPLT
      IF (NSP.EQ.99999) STOP
      NO=NSP+1
      READ 102,(NAME(I),I=1,NSP)
      READ 100,IHOP,IPAOUT,IPJOUT,IPTOUT,ICON,IFEC,IDEAD,IARJI,MOA
      READ 100,(IHP(I),I=1,NSP)
      READ 100,(LHP(I),I=1,NSP)
      READ 100,(LW(I),I=1,NSP)
      READ 100,(LJP1(I),I=1,NSP)
      READ 100,(LJP2(I),I=1,NSP)
      READ 100,(LJP3(I),I=1,NSP)
      READ 100,(LJP4(I),I=1,NSP)
      READ 101,(PJW(I),I=1,NSP)
      READ 101,(PAC(I),I=1,NSP)
      READ 100,(LCI(I),I=1,NSP)
      READ 100,(LCE(I),I=1,NSP)
      READ 100,(NLWH(I),I=1,NSP)
      READ 100,(NFWH(I),I=1,NSP)
      DO 50 I=1,NSP
      LJ(I)=IFIX(PJW(I))
      LO=LJ(I)
   50 READ 101,(WJ(I,J),J=1,LO)
```

```
      READ 101,(WA(I),I=1,NSP)
      DO 51 I=1,NSP
      LO=LC(I)
   51 READ 101,(CJ(I,J),J=1,LO)
      READ 101,(CA(I),I=1,NSP)
      DO 52 I=1,NSP
      LO=LJ(I)
   52 READ 101,(FJ(I,J),J=1,LO)
      READ 101,(FA(I),I=1,NSP)
      DO 53 L=1,4
   53 READ 101,(DOM(I,L),I=1,NSP)
      DO 54 L=1,4
   54 READ 101,(HCO(I,L),I=1,NSP)
      DO 55 L=1,4
   55 READ 101,(SO(I,L),I=1,NSP)
      DO 56 I=1,NSP
   56 READ 101,(COM(I,J),J=1,NSP)
      DO 57 I=1,NSP
      READ 103,IND,P1,P2,W1,W2
      SA(IND)=(P2/P1)**(1./(W2-W1))
      PA(IND)=P1/(SA(IND)**W1)
      PAREF(IND)=PA(IND)
      JJ=LJ(I)
      DO 57 J=1,JJ
   57 PJ(I,J)=0.
      READ 101,(SR(I),I=1,NSP)
      READ 100,IREAD
C ***** SIMULATION *****
C        YEARS
      DO 1111 IYR=1,NYR
      IF(IYR.GT.1) GO TO 60
C        PRINT OUT CONTROL INFORMATION OF FIRST ITERATION
      PRINT 200,(NAME(I),I=1,NSP)
      PRINT 201,( IHP(I),I=1,NSP)
      PRINT 202,( LHP(I),I=1,NSP)
      PRINT 204,(  LW(I),I=1,NSP)
      PRINT 205,(LJP1(I),I=1,NSP)
      PRINT 206,(LJP2(I),I=1,NSP)
      PRINT 216,(LJP3(I),I=1,NSP)
      PRINT 217,(LJP4(I),I=1,NSP)
      PRINT 203, (LJ(I),I=1,NSP)
      PRINT 214,(NLWH(I),I=1,NSP)
      PRINT 215,(NFWH(I),I=1,NSP)
      PRINT 207,(  WA(I),I=1,NSP)
      PRINT 208,(  CA(I),I=1,NSP)
      PRINT 209,(  FA(I),I=1,NSP)
      PRINT 210,(  SA(I),I=1,NSP)
      PRINT 211,(  PA(I),I=1,NSP)
      PRINT 213,(  SR(I),I=1,NSP)
   60 IF(IYR.GT.1.AND.IREAD.EQ.0) GO TO 61
      DO 58 I=1,NSP
      IF(NLWH(I).EQ.0)NFWH(I)=52
      LE=LHP(I)
```

```
   58 READ 101,(PB(I,J),J=1,LL)
      DO 62 I=1,NSP
      LL=LBP(I)
   62 READ 101,(SLT(I,J),J=1,LL)
      DO 990 I=1,NSP
  990 READ 101,(ARJI(I,NWK),NWK=1,52)
   61 CONTINUE
      DO 59 I=1,NSP
      IDUM(I)=0
   59 JUVA(I)=0.
      DO 620 NWK=1,52
      BMWK(NWK)=0.
      FEC(NO,NWK)=0.
      CON(NO,NWK)=0.
      PTOUT(NO,NWK)=0.
      PAOUT(NO,NWK)=0.
      PJOUT(NO,NWK)=0.
      DEAD(NO,NWK)=0.
      BDWT=0.
      DO 620 J=1,NO
      CONJ(J,NWK)=0.
  620 CONTINUE
      ADJ=.05
C ***** SIMULATION  - SPECIES
      DO 10 I=1,NSP
      LI=1
      LITADJ=0
      DIFF=0.
      DIFREF=.99
C ***** SIMULATION  - WEEKS
      GO TO 810
805   LI=LLL
  810 DO 10 NWK=LI,52
      IF(LI.EQ.1)GO TO 25
      LL=LI+NAGE(I)-1
      DO 24 LP=LI,LL
      LS=LP-IBP(I)+1
      SAUD(LS)=0.
   24 CONTINUE
   25 PBAR=.5*PA(I)*(1.+SA(I))
      PJ(I,1)=0.
      IF(NWK.GE.IBP(I).AND.NWK.LT.(IBP(I)+LBP(I)))1,2
    1 III=IBP(I)
      IF(LITADJ.EQ.0)GO TO 618
      SLT(I,NWK-III+1)=SLT(I,NWK-III+1)+ADJ*SLT(I,NWK-III+1)
  618 CONTINUE
      PJ(I,1)=PBAR*PB(I,NWK-III+1)*SR(I)*SLT(I,NWK-III+1)
    2 JJJ=LJ(I)
      JJ=LW(I)
      CON(I,NWK)=0.
      IF  (NWK.LT.NLWH(I).OR.NWK.GT.NFWH(I)) GO TO 20
      CON(I,NWK)=PBAR*CA(I)
      IF(CON(I,NWK).EQ.0.)CON(I,NWK)=WA(I)**.75*7.0*PBAR*.001
```

```
   20 PAOUT(I,NWK)=PA(I)
      PJOUT(I,NWK)=0.
      BUW(I)=0.
      BWJ(I)=0.
      BTJ(I)=0.
      BA(I)=PBAR*WA(I)
      FEC(I,NWK)=PBAR*FA(I)
      IF(NWK.GT.(IBP(I)+LBP(I)+LJ(I)))GO TO 81
      DO 3 J=1,JJJ
      W=PJ(I,J)*WJ(I,J)
      IF(J.LE.LW(I))BUW(I)=BUW(I)+W
      IF(J.GT.LW(I)) BWJ(I)=BWJ(I)+W
      BTJ(I)=BTJ(I)+W
      PJOUT(I,NWK)=PJOUT(I,NWK)+PJ(I,J)
    3 CONTINUE
   81 CONTINUE
      BOP(I,NWK)=BTJ(I)+BA(I)
      PTOUT(I,NWK)=PAOUT(I,NWK)+PJOUT(I,NWK)
      ARJC(I,NWK)=PJOUT(I,NWK)/PTOUT(I,NWK)
      IF (MOAJ.NE.1) GO TO 804
      NAGE(I)=7
      IF(NWK.NE.IBP(I)+NAGE(I))GO TO 804
C     LITTER SIZE ADJUSTMENT COMPUTATION
      DIFF=ARJC(I,NWK)-ARJI(I,NWK)
      IF(ABS(DIFF).LT..001)ARJC(I,NWK)=ARJI(I,NWK)
      IF(ABS(DIFF).LT..001)DIFF=0.0
      PRINT 374, DIFF,ARJC(I,NWK),ARJI(I,NWK),LBP(I),NWK
  374 FORMAT (* DIFF=*F10.3*  ARJC*F10.3* ARJI=*F10.3*  LBP=*I3*  NWK=*
     1I3)
      IF(DIFF.EQ.0.)GO TO 610
      IF(DIFREF.LT.0..AND.DIFF.LT.0.)ADJ=.05
      IF(DIFREF.GT.0..AND.DIFF.GT.0.)ADJ=-.05
      IF(DIFREF.LT.0..AND.DIFF.GT.0.)ADJ=ADJ/(-2.0)
      IF(DIFREF.GT.0..AND.DIFF.LT.0.)ADJ=ADJ/(-2.0)
      DIFREF=DIFF
      LITADJ=1
      LLL=IBP(I)
      DO 43 J=1,JJJ
   43 PJ(I,J)=0.0
      PA(I)=PAOUT(I,LI)
      GO TO 805
  610 IF(LITADJ.EQ.0)GO TO 804
      DIFREF=.99
  804 ITO=NSP+1
      IF(ITO.LT.15)NAME(ITO)=10H
      BC=0.
      JJ=LJ(I)
      DEAD(I,NWK)=0.
      IF(NWK.GT.(IBP(I)+LBP(I)+LJ(I)))GO TO 82
      DUM=0.0
      AC(I)=PAOUT(I,NWK)
      DUMMY=0.0
  814 DO 5 JT=1,JJ
```

```
      J=JJ-JT+1
      IF (JT.LE.LJP4(I)) L=4
      IF (JT.GT.LJP4(I).AND.JT.LE.(LJP4(I)+LJP3(I))) L=3
      IF (JT.GT.(LJP4(I)+LJP3(I)).AND.JT.LE.(LJP4(I)+LJP3(I)+LJP2(I)))
     1 L=2
      IF (JT.GT.(LJP4(I)+LJP3(I)+LJP2(I)).AND.JT.LE.LJ(I)) L=1
      IF(AC(I).LE.BCO(I,L))SJ(I,J)=SO(I,L)
      IF(AC(I).GT.BCO(I,L))SJ(I,J)=SO(I,L)*EXP(-DDM(I,L)*(AC(I)-
     1BCO(I,L)))
      IF(J.LE.LW(I))SJ(I,J)=SJ(I,J)*SA(I)
      AVG=PJ(I,J)*.5*(1.+SJ(I,J))
      S=0.
      IF (NWK.LT.NLWH(I).OR.NWK.GT.NFWH(I)) GO TO 21
      S=CJ(I,J)*AVG
      IF (S.LE.0.) S=WJ(I,J)**.75*.007*AVG
      CONJ(I,NWK)=CONJ(I,NWK)+S
      CON(I,NWK)=CON(I,NWK)+S
      FEC(I,NWK)=FEC(I,NWK)+AVG*FJ(I,J)
   21 CONTINUE
      DEAD(I,NWK)=DEAD(I,NWK)+PJ(I,J)*WJ(I,J)*(1.-SJ(I,J))
      IF(MOAJ.EQ.1.AND. NWK.GE.IBP(2).AND.NWK.LT.IBP(I)+NAGE(I))GO TO 22
      GO TO 23
   22 LS=NWK-IBP(I)+1
      SAUD(LS)=SAUD(LS)+PJ(I,J)*WJ(I,J)*(1.-SJ(I,J))
   23 IF(J.GT.(LW(I)+1))DUMMY=DUMMY+PJ(I,J)
      PJ(I,J)=PJ(I,J)*SJ(I,J)
      IF(NWK.EQ.52)DUM=DUM+PJ(I,J)
      IF(J.EQ.JJ.AND.NWK.NE.52)DUM=PJ(I,J)
      IF(J.LT.JJ)PJ(I,J+1)=PJ(I,J)
    5 CONTINUE
   82 CONTINUE
C  COLLECT TOTALS FOR OUTPUT
C
C  DONT COLLECT IF LITTER SIZE IS BEING ADJUSTED AND IS NOT YET COMPLETED
      IF (DIFF.NE.0.) GO TO 815
      BUWT=BUWT+BUW(I)
      DEAD(I,NWK)=DEAD(I,NWK)+PA(I)*WA(I)*(1.-SA(I))
C  IF LITTER SIZE IS NOT TO BE ADJUSTED, SKIP THIS SEGMENT
      IF (MOAJ.NE.1) GO TO 816
      LL=IBP(I)
      LU=LL+NAGE(I)-1
C  IF LAST CHECK ON LITTER SIZE NOT MADE YET, SKIP THIS SEGMENT
      IF(NWK.GE.LL.AND.NWK.LE.LU) GO TO 815
      NOPLT=52*(IYR-1)+NWK
      IF (NWK.NE.LU+1) GO TO 816
C  ACCUMULATE TOTALS FOR THE  NAGE-1  WEEKS WHICH WERE NOT ENTERED UNTIL
C  THE LITTER SIZE ADJUSTMENT WAS COMPLETED.
      DO  817 L=LL,LU
      BMWK(L)=BMWK(L)+BOP(I,L)
      PTOUT(NO,L)=PTOUT(NO,L)+PTOUT(I,L)
      PAOUT(NO,L)=PAOUT(NO,L)+PAOUT(I,L)
      PJOUT(NO,L)=PJOUT(NO,L)+PJOUT(I,L)
      CON(NO,L)=CON(NO,L)+CON(I,L)
```

```
      FEC(NO,L)=FEC(NO,L)+FEC(I,L)
      LS=L-IBP(I)+1
      DEAD(I,L)=DEAD(I,L)+SAUD(LS)
      DEAD(NO,L)=DEAD(NO,L)+DEAD(I,L)
      IF(NLONG.EQ.0.AND.MSPLT.EQ.0)GO TO 817
      IF (MSPLT.NE.0) WRITE(1) NOPLT,PTOUT(I,L),BOP(I,L)
      IF (MSPLT.EQ.0.AND.NLONG.EQ.1) WRITE (1) NOPLT,PTOUT(I,L),BOP(I,L)
  817 CONTINUE
  816 CONTINUE
      BMWK(NWK)=BMWK(NWK)+BOP(I,NWK)
      PTOUT(NO,NWK)=PTOUT(NO,NWK)+PTOUT(I,NWK)
      PAOUT(NO,NWK)=PAOUT(NO,NWK)+PAOUT(I,NWK)
      PJOUT(NO,NWK)=PJOUT(NO,NWK)+PJOUT(I,NWK)
      CON(NO,NWK)=CON(NO,NWK)+CON(I,NWK)
      FEC(NO,NWK)=FEC(NO,NWK)+FEC(I,NWK)
      DEAD(NO,NWK)=DEAD(NO,NWK)+DEAD(I,NWK)
      IF(NLONG.EQ.0.AND.MSPLT.EQ.0)GO TO 722
      IF(MSPLT.NE.0)WRITE(1)NOPLT,PTOUT(I,NWK),BOP(I,NWK)
      IF(MSPLT.EQ.0.AND.NLONG.EQ.1)WRITE(1)NOPLT,PTOUT(I,NWK)
     1,BOP(I,NWK)
  722 CONTINUE
  815 IF(NWK.GT.(IBP(I)+LBP(I)+LJ(I)-2))DUM=0.
      PA(I)=PA(I)*SA(I)+DUM
      JUVA(I)=JUVA(I)+DUM
      IF (MOAJ.NE.1) GO TO 4
      AC(I)=AC(I)+DUMMY
      IF(AC(I).GT.PAC(I))IDUM(I)=1
      IF(AC(I).LE.PAC(I).AND.IDUM(I).EQ.0)GO TO 4
      IF(NWK.LT.(LCI(I)+IBP(I)).OR.NWK.GT.(LCE(I)+IBP(I)))GO
     1TO 4
      PTOUT(I,52)=PAREF(I)
      PJOUT(I,52)=PTOUT(I,52)-PAREF(I)*SA(I)**(52)
      NC1=IBP(I)+LJP1(I)
      NC2=NC1+LJP2(I)
      NC3=NC2+LJP3(I)
      NC4=NC3+LJP4(I)
      IF(NC4.EQ.52)GO TO 11
      PJOUT(I,NC4)=PJOUT(I,52)
      GO TO 12
   11 PJOUT(I,NC4)=PJOUT(I,52)/(SA(I)**(52-(NC4-1)))
   12 IF((LCI(I)+IBP(I)).GE.NC3) GO TO 19
      IF((LCI(I)+IBP(I)).GE.NC2.AND.(LCE(I)+IBP(I)).LE.NC3)
     1GO TO 16
      IF((LCI(I)+IBP(I)).GE.NC1.AND.(LCE(I)+IBP(I)).LE.NC2)
     1GO TO 17
      IF((LCI(I)+IBP(I)).GE.IBP(I).AND.(LCE(I)+IBP(I)).LE.NC1)
     1GO TO 18
   19 SJC(I,4)=SO(I,4)
      SO(I,4)=(PJOUT(I,NC4)/PJOUT(I,NC3))**(1./(NC4-NC3))
      GO TO 4
   16 PJOUT(I,NC3)=PJOUT(I,NC4)/(SJ(I,4))**(NC4-NC3)
      SJC(I,3)=SO(I,3)
      SO(I,3)=(PJOUT(I,NC3)/PJOUT(I,NC2))**(1./(NC3-(NC2)))
```

```
      GO TO 4
   17 PJOUT(I,NC2)=PJOUT(I,NC3)/(SJ(I,3))**(NC3-NC2)
      SJC(I,2)=SO(I,2)
      SO(I,2)=(PJOUT(I,NC2)/PJOUT(I,NC1))**(1./(NC2-NC1))
      GO TO 4
   18 PJOUT(I,NC1)=PJOUT(I,NC2)/(SJ(I,2))**(NC2-NC1)
      SJC(I,1)=SO(I,1)
      IXX=IBP(I)
      SO(I,1)=(PJOUT(I,NC1)/PJOUT(I,IXX))**(1./(NC1-IXX))
    4 CONTINUE
   10 CONTINUE
C *****  END OF SPECIES, WEEK LOOPS
C        PRINT OUT SUMMARY FOR THE YEAR
      IF(NLONG.GT.0)GO TO 1112
      NTEMP=NO
      IF(NTEMP.LE.15)NAME(NTEMP)=10H      TOTAL
      IF(IBOP.EQ.0) GO TO 84
      PRINT 300,(NAME(I),I=1,NTEMP)
      DO 70 I=1,52
   70 PRINT 306,I,(BOP(J,I),J=1,NSP),BMWK(I)
   84 IF(IPAOUT.EQ.0) GO TO 85
      PRINT 301,(NAME(I),I=1,NTEMP)
      DO 71 I=1,52
   71 PRINT 306,I,(PAOUT(J,I),J=1,NO)
   85 IF(IPJOUT.EQ.0) GO TO 86
      PRINT 302,(NAME(I),I=1,NTEMP)
      DO 72 I=1,52
   72 PRINT 306,I,(PJOUT(J,I),J=1,NO)
   86 IF(IPTOUT.EQ.0) GO TO 87
      PRINT 303,(NAME(I),I=1,NTEMP)
      DO 73 I=1,52
   73 PRINT 306,I,(PTOUT(J,I),J=1,NO)
   87 IF(ICON.EQ.0) GO TO 88
      PRINT 304,(NAME(I),I=1,NTEMP)
      DO 74 I=1,52
   74 PRINT 306,I,(CON(J,I),J=1,NO)
   88 IF(IFEC.EQ.0) GO TO 89
      PRINT 305,(NAME(I),I=1,NTEMP)
      DO 75 I=1,52
   75 PRINT 306,I,(FEC(J,I),J=1,NO)
   89 IF(IDEAD.EQ.0)GO TO 900
      PRINT 309,(NAME(I),I=1,NO)
      DO 76 I=1,52
   76 PRINT 306,I,(DEAD(J,I),J=1,NO)
  900 PRINT 310,(NAME(I),I=1,NSP)
      DO 910 I=1,52
  910 PRINT 311,I,(ARJI(J,I),ARJC(J,I),J=1,NSP)
      IF(NYR.GT.1)GO TO 1111
      IF(NLONG.EQ.0)GO TO 1111
 1112 IF(MSPLT.NE.0)GO TO 161
      REWIND 1
      WRITE(6,312)NAME(NLONG)
      CALL PLOT(2,BOP,1)
```

```
      GO TO 1111
  161 WRITE(6,221)
  221 FORMAT(1H1*NUMBER*/1H0)
      CALL PLOT(11,PTOUT,1)
      WRITE(6,220)
  220 FORMAT(1H1*BIOMASS*/1H0)
      CALL PLOT(11,BOP,1)
 1111 CONTINUE
C ***** END OF YEAR LOOP
      REWIND 1
      IF(NYR.EQ.1)GO TO 77
      IF(MSPLT.EQ.0)GO TO 162
      WRITE(6,218)NYR
  218 FORMAT(1H1*SUMMARY FOR*I4*  YEARS*/* NUMBERS*)
      CALL PLOT(11,PTOUT,NYR)
      GO TO 77
  162 WRITE(6,219)NAME(NLONG),NYR
  219 FORMAT(1H1*SUMMARY FOR SPECIES*A10*  FOR*I4*  YEARS*)
      CALL PLOT(2,BOP,NYR)
   77 GO TO 1000
  100 FORMAT(15I5)
  101 FORMAT(15F5.0)
  102 FORMAT(8A10)
  103 FORMAT(I2,4F10.0)
  200 FORMAT(*1MARK -.013 SMALL MAMMAL SIMULATOR*/*0*,50X,*
     1BASIC INPUT SUMMARY*/*0*,57X,*SPECIES*/*0*,5X,12A10)
  201 FORMAT(*AIBP *12I10)
  202 FORMAT(*ALBP *12I10)
  204 FORMAT(*ALW  *12I10)
  205 FORMAT(*ALJP1*12I10)
  206 FORMAT(*ALJP2*12I10)
  216 FORMAT(* LJP3*12I10)
  217 FORMAT(*ALJP4*12I10)
  203 FORMAT (* LJ  *,12I10)
  207 FORMAT(*AWA  *12F10.4)
  208 FORMAT(*ACA  *12F10.4)
  209 FORMAT(*AFA  *12F10.4)
  210 FORMAT(*ASA  *12F10.4)
  211 FORMAT(*APA  *12F10.4)
  213 FORMAT(*ASH  *12F10.4)
  214 FORMAT(*ANLWH*12I10)
  215 FORMAT(*ANFWH*12I10)
  300 FORMAT(*1*,40X,*TOTAL BIOMASS SUMMARY*/*0WEEK *12A10)
  301 FORMAT(*1*,40X,*ADULT NUMBERS SUMMARY*/*0WEEK *12A10)
  302 FORMAT(*1*,40X,*JUVENILE NUMBERS SUMMARY*/*0WEEK *12A10)
  303 FORMAT(*1*,40X,*TOTAL NUMBERS SUMMARY*/*0WEEK*12A10)
  304 FORMAT(*1*,40X,*FOOD CONSUMPTION SUMMARY*/*0WEEK *12A10)
  305 FORMAT(*1*,40X,*FECAL PRODUCTION SUMMARY*/*0WEEK *12A10)
  306 FORMAT(1H ,I4,2X,12F10.3)
  307 FORMAT(*1*,30X,*PLOT OF SPECIES *A10)
  308 FORMAT(*1*,40X,*TOTAL BIOMASS OVER ALL SPECIES*)
  309 FORMAT(*1*,40X,*WEEKLY DEATH SUMMARY (BIOMASS LOST)*/*0WEEK *
     112A10)
```

```
310 FORMAT(*1*,30X,*MEASURED PERCENTAGE OF JUVENILES*
   1* AND CALCULATED PERCENTAGE OF JUVENILES*/*0WEEK*11
   2(A10,1X))
311 FORMAT(1H ,I3,2X,11(2F5.2,1X))
312 FORMAT(1H1*PLOT OF BIOMASS AND 100 TIMES NUMBERS FOR*
   1A10/1H0)
    END
    SUBROUTINE PLOT(N,Y,NYR)
    DIMENSION Y(15,52),PLATE(101),STAMP(12),SCAL(11),IY(11)
    INTEGER PLATE,STAMP
    DATA (STAMP(I),I=1,12)/1H+,1H0,1H=,1H.,1H$,1H-,1H*,1H>
   1,1H<,1H],1H≡,1HI/
    TSCAL=10HV.........
    XL=YL=0.0
    LYR=0
    IYR=1
    IF(NYR.EQ.1.AND.N.GT.2)GO TO 35
    DO 30 I=1,52
    READ(1)NPLT,Y(1,I),Y(2,I)
    Y(2,I)=Y(2,I)*.1
 30 Y(1,I)=Y(1,I)*10.
    REWIND 1
    GO TO 20
 35 IF(NYR.EQ.1)GO TO 20
    IF(N.GT.2)GO TO 21
 25 DO 22 J=1,52
 22 READ(1)NPLT,Y(1,NPLT),Y(2,NPLT)
    GO TO 20
 21 DO 23 J=1,52
    DO 23 I=1,N
 23 READ(1)NPLT,Y(I,J),DUM
    GO TO 20
 26 DO 24 J=1,52
    DO 24 I=1,N
 24 READ(1)NPLT,DUM,Y(I,J)
 20 CALL MAX(Y,52,N,YU)
    LYR=LYR+1
    IFF=LYR*52+1
    IF(LYR.GT.1)GO TO 31
    SINCY=(YU-YL)/100.
    HINCY=(YU-YL)/10.
    DO 1 I=1,11
  1 SCAL(I)=YL+(I-1)*HINCY
    PRINT 2000,SCAL
    PRINT 3000,(TSCAL,K=1,11)
 31 DO 100 LCTR=IYR,IFF
    DO 4 I=1,101
  4 PLATE(I)=1H
    IF(LCTR.EQ.1)GO TO 105
    DO 3 I=1,N
  3 IY(I)=Y(I,LCTR-1)/SINCY+1.5
    NCTR=MOD(LCTR-1,10)
    DO 5 K=1,N
```

```
      IREF=IY(K)
      IF(IREF.GT.101)GO TO 5
      KK=K-1
      DO 6 J=1,KK
      IF(IY(K).EQ.IY(J).AND.K.NE.1)GO TO 10
    6 CONTINUE
      PLATE(IREF)=STAMP(K)
      GO TO 5
   10 PLATE(IREF)=STAMP(12)
    5 CONTINUE
  101 IF(NCTR)106,105,106
  105 SCALX=FLOAT(LCTR-1)
      PRINT 1001,SCALX,PLATE
      GO TO 100
  106 PRINT 1000,PLATE
  100 CONTINUE
      IYR=LYR*52
      IF(NYR.GT.1.AND.N.LF.2.AND.LYR.LE.NYR)GO TO 25
      IF(NYR.GT.1.AND.N.GT.2.AND.LYR.LE.NYR)GO TO 21
      IF(NYR.GT.1. AND.N.GT.2.AND.LYR.LE.NYR*2)GO TO 26
      IF(NYR.EQ.1)RETURN
      RETURN
 1000 FORMAT(12X,*,*,101A1)
 1001 FORMAT(1X,F10.3,*>,*,101A1)
 3000 FORMAT(13X,10A10,A1)
 2000 FORMAT(7X,11F10.3)
      END
```

APPENDIX C

Listing and Definition of Variables Used in PROGRAM SMAMMAL

```
PROGRAM       SMAMMAL   FORTRAN EXTENDED VERSION 2.0              03/30/70              11.4
                PROGRAM SMAMMAL
          C   =====================================================================
          C     VARIABLE DEFINITIONS:
          C         AC(I)=EFFECTIVE DENSITY THAT INITIATES DENSITY
          C         -DEPENDENT REDUCTION OF POPULATION (SIMULATES A
          C         -RETURN TO AVERAGE BREEDING DENSITY)
          C         ARJC(I,NWK)=CALCULATED PERCENTAGE OF SPECIES I
          C         -JUVENILES IN POPULATION IN NWK WEEK
          C         ARJI(I,NWK)=MEASURED PERCENTAGE OF OF SPECIES I
          C         -JUVENILES IN POPULATION IN WEEK N
          C         AVG=AVERAGE NUMBER OF JUVENILES J WEEKS OLD OF
          C         *SPECIES I IN WEEK N
          C         BA=MEAN BIOMASS OF ADULTS OF SPECIES I ALIVE IN
          C         *WEEK N
          C         BC=
          C         BCO(I,L)=THRESHOLD DENSITIES (IN TERMS OF BIOMASS)
          C         -OF COMBINED SPECIES NECESSARY TO INDICATE DENSITY
          C         -DEPENDENT MORTALITY
          C         BMWK(NWK)=TOTAL MEAN BIOMASS FOR ALL SPECIES IN
          C         *WEEK N
          C         BOP=TOTAL MEAN BIOMASS OF SPECIES I IN WEEK N
          C         BTJ(I)=TOTAL BIOMASS OF JUVENILES OF SPECIES I IN
          C         *WEEK N
          C         BUW(I)=BIOMASS OF UNWEANED JUVENILES J WEEKS OLD OF
          C         *SPECIES I IN WEEK N
          C         BWJ(I)=BIOMASS OF WEANED JUVENILES J WEEKS OLD OF
          C         *SPECIES I IN WEEK N
          C         CA(I)=NORMAL WEEKLY FOOD CONSUMPTION OF ADULT OF
          C         *OF SPECIES I
          C         CJ(I,J)=NORMAL WEEKLY FOOD CONSUMPTION OF J WEEK OLD
          C         *JUVENILES OF SPECIES I
          C         COM(I,J)=RELATIVE EFFECT OF VALUE OF A MEMBER OF
          C         *SPECIES J IN INDUCING DENSITY DEPENDENT MORTALITY
          C         *OF SPECIES I JUVENILES
          C         CON(I,NWK)=UNCONSTRAINED FOOD BIOMASS CONSUMPTION
          C         *BY ADULTS OF SPECIES I IN WEEK N
          C         CON(I,NWK)=FOOD BIOMASS CONSUMED BY ADULTS PLUS
          C         *JUVENILES OF SPECIES I IN WEEK N
          C         CON(NO,NWK)=TOTAL FOOD BIOMASS CONSUMED BY ADULTS
          C         *PLUS JUVENILES OF ALL SPECIES IN WEEK N
          C         DDM(I,L)=DENSITY DEPENDENCE MORTALITY RATE COEFFIC*
          C         *IENTS FOR SPECIES I AND L TH JUVENILE PAGE (L=1=
          C         *FIRST POST-WEANED, L=3=2 ND POST-WEANED
          C         DEAD(I,NWK)=BIOMASS OF SPECIES I DYING DURING WEEK N
          C         DEAD(I,NWK)=TOTAL NUMBER OF ANIMALS OF SPECIES I
          C         *DYING DURING WEEK N
          C         DEAD(NO,NWK)=TOTAL NUMBER OF ANIMALS DYING IN WEEK N
          C         DUM=NUMBER OF SPECIES I JUVENILES OF AGE J IN WEEK
          C         *N TO BE ADDED TO ADULT POPULATION IN WEEK N+1
          C         FA(I)=NORMAL WEEKLY FECAL PRODUCTION OF ADULT OF
          C         -SPECIES I
          C         FEC(I,NWK)=MEAN BIOMASS OF FECES PRODUCED BY ADULTS
          C         *OF SPECIES I IN WEEK N
```

```
C         FEC(I,NWK)=MEAN BIOMASS OF FECES PRODUCED BY ADULTS
C         #PLUS JUVENILES OF SPECIES I IN WEEK N
C         FEC(NO,NWK)=TOTAL MEAN BIOMASS OF FECES PRODUCED BY
C         #ADULTS PLUS JUVENILES OF ALL SPECIES IN WEEK N
C         FJ(I,J)=NORMAL WEEKLY FECAL PRODUCTION OF J WEEK OLD
C         #JUVENILE OF SPECIES I
C         I=NUMBER OF SPECIES WITH NAME I
C         II=DUMMY VARIABLE SERVING AS SPECIES COUNTER
C         III=DUMMY VARIABLE FOR INITIAL WEEK OF BREEDING
C         IHOP,ETC.=INDIVIDUAL PARAMATER CONTROLS FOR SUMMARY
C         -PRINT OUT(0=NO PRINT,1=PRINT)
C         IBP(I)=FIRST BREEDING WEEK FOR SPECIES I
C         IND=SPECIES NAME INDEX NUMBER
C         IREAD=BREEDING PATTERN CHANGE CONTROL CARD
C         ITO=NUMBER OF ITERATIONS
C         J=AGE IN WEEKS OF JUVENILES OF SPECIES I IN WEEK N
C         J=REVERSED INDEX=AGE IN WEEKS OF JUVENILES OF AGE J
C         #IN WEEK N
C         JJ=DUMMY VARIABLE FOR LENGTH OF JUVENILE PERIOD
C         JJ=DUMMY VARIABLE FOR LENGTH OF NURSING PERIOD
C         JJJ=DUMMY VARIABLE FOR LENGTH OF JUVENILE PERIOD
C         JT=
C         JUVA=
C         LBP(I)=LENGTH (WEEKS) OF BREEDING SEASON FOR SPECIES I
C         LCE(I)=WEEK WHEN BOTTLENECK POPULATION REDUCTION
C         -IS COMPLETE
C         LCI(I)=WEEK WHEN BOTTLENECK POPULATION REDUCTION
C         -IS INITIATED
C         LJ(I)=LENGTH OF JUVENILE PERIOD TO FIRST REPRODUCTION
C         #FOR SPECIES I
C         LL=DUMMY VARIABLE FOR LENGTH OF BREEDING PERIOD
C         LO(I)=DUMMY VARIABLE FOR LENGTH OF JUVENILE PERIOD
C         #FOR SPECIES I
C         LJP1(I)=LENGTH OF FIRST POST-WEANING JUVENILE PERIOD
C         #FOR SPECIES I
C         LJP2(I)=LENGTH OF SECOND POST-WEANING JUVENILE PERIOD
C         #FOR SPECIES I
C         LJP3(I)=LENGTH OF THIRD JUVENILE PERIOD FOR SPECIES I
C         LJP4(I)=LENGTH OF FOURTH JUVENILE PERIOD FOR SPECIES I
C         LW(I)=LENGTH OF WEANING PERIOD FOR SPECIES I
C         MSPLT=CONTROL CARD FOR MASS PLOT-IF MSPLT = 1 MASS
C         -PLOT IS PROVIDED.IF MSPLT =0 MASS PLOT IS INHIBITED
C         MOAJ=IF MOAJ IS SET EQUAL TO 1 THE MORTALITY RATES
C         -FOR JUVENILES OF A SPECIFIED AGE WILL BE ADJUSTED
C         -TO MAKE SIMULATED JUVENILE AGE RATIOS EQUAL TO
C         -MEASURED AGE RATIOS
C         NAME(I)=NAME OF SPECIES I
C         NEWH(I)=WEEK OF START OF HIBERNATION FOR SPECIES I
C         #(=0 IMPLIES NO HIBERNATION#IF NO HIBERNATION INSERT
C         #BLANK SPACE FOR SPECIES I IN NLWH CARD
C         NLONG=TOTAL SUMMARIES PRINTED OUT IF NLONG = 0
C         NLWH(I)=WEEK OF END OF HIBERNATION FOR SPECIES I
C         NO=DUMMY SPECIES CREATING COLUMN FOR OUTPUTTING
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C         *TOTALS
C         NOPLT=WEEK OF SIMULATION
C         NSP=NUMBER OF SPECIES IN SIMULATION RUN
C  NWK=WEEK OF SIMULATION
C         NYR=NUMBER OF YEARS TO SIMULATE
C         P1=FIRST POPULATION MEASUREMENT
C         P2=SECOND POPULATION MEASUREMENT
C         PA(I)=NUMBER OF ADULTS OF SPECIES I (PER UNIT AREA)
C         *ALIVE AT BEGINNING OF SIMULATION YEAR
C         PA(I)=NUMBER OF ADULTS OF SPECIES I SURVIVING WEEK N
C         *(INCLUDES YOUNG THAT GROW INTO ADULT CLASSIFICATION)
C         PAC(I)=MAXIMUM AVERAGE DENSITY OF SPECIES I
C         PB(I,J)=PROPORTION OF SPECIES I FEMALES GIVING BIRTH
C         *IN WEEK J FROM START OF BREEDING SEASON
C         PBAR=MEAN NUMBER OF SPECIES I ALIVE IN WEEK N
C         PAOUT(I,NWK)=NUMBER OF ADULTS OF SPECIES I ALIVE IN
C         *WEEK N(FOR SUMMARY PRINT OUT)
C         PAOUT(NO,NWK)=TOTAL NUMBER OF ADULTS ALIVE OF ALL
C         *SPECIES IN WEEK N(FOR SUMMARY PRINT OUT)
C         PJOUT(I,NWK)=NUMBER OF JUVENILES OF SPECIES I ALIVE
C         *IN WEEK N (FOR SUMMARY PRINT OUT)
C         PJOUT(NO,NWK)=TOTAL NUMBER OF JUVENILES ALIVE OF ALL
C         *SPECIES IN WEEK N(FOR SUMMARY PRINT OUT)
C         PJOUT(I,NC4)=DENSITY OF SPECIES I JUVENILES DURING
C         -WEEK NC4 WHEN NC4 EQ. WEEK 52
C         PJOUT(I,NC4)=DENSITY OF SPECIES I JUVENILES DURING
C         -WEEK NC4 WHEN NC4 LT. 52
C         PJOUT(I,NC3)=DENSITY OF SPECIES I JUVENILES DURING
C         -WEEK NC3
C         PJOUT(I,NC2)=DENSITY OF SPECIES I JUVENILES DURING
C         -WEEK NC2
C         PJOUT(I,NC1)=DENSITY OF SPECIES I JUVENILES DURING
C         -WEEK NC1
C         PTOUT(I,NWK)=TOTAL NUMBER OF ANIMALS ALIVE OF SPECIES
C         *I IN WEEK N(FOR SUMMARY AND GRAPHIC PRINT OUT)
C         PTOUT(NO,NWK)=TOTAL NUMBER OF ANIMALS ALIVE OF ALL
C         *SPECIES IN WEEK N(FOR SUMMARY PRINT OUT)
C         PTOUT(I,52)=ARBITRARLY ESTABLISHED DENSITY OF SPECIES
C         -I DURING WEEK 52 (CAN BE TREATED AS A STOCHASTIC
C         -VARIABLE OR AS ENVIRONMENTALLY CONTROLLED VARIABLE)
C         PJ(I,J)=NUMBER OF JUVENILES OF AGE J OF SPECIES I
C         *SURVIVING WEEK N
C         PJ(I,J+1)=ADVANCE OF AGE OF JUVENILES ONE WEEK
C         PJ=NUMBER OF JUVENILES OF I TH SPECIES PRODUCED
C         *IN WEEK N(NUMBER OF 1*WEEK*OLD JUVENILES)
C         PJW(I)=WEEK THAT SPECIES I JUVENILE REACHES ADULT
C         *WEIGHT
C         SA(I)=SURVIVAL RATES OF ADULTS
C         SJ(I,J)=SURVIVAL RATE OF JUVENILES J WEEKS OLD OF
C         *SPECIES I IN WEEK N
C         SLT(I,J)=LITTER SIZE OF  SPECIES I FEMALE ON WEEK J
C         *OF BREEDING SEASON
C         SO(I,L)=SURVIVAL RATES IN ABSENCE OF DENSITY DEPENDENT
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      C         ≠EFFECTS (SUBSCRIPTS AS ABOVE) WHEN BIOMASS IS LESS
      C         ≠THAN BCO(I,L)
      C         SO(I,4)=SURVIVAL RATE OF SPECIES I JUVENILES DURING
      C         -JUVENILE PERIOD 4
      C         SO(I,3)=SURVIVAL RATE OF SPECIES I JUVENILES DURING
      C         -JUVENILE PERIOD 3
      C         SO(I,2)=SURVIVAL RATE OF SPECIES I JUVENILES DURING
      C         -JUVENILE PERIOD 2
      C         SO(I,1)=SURVIVAL RATE OF SPECIES I JUVENILES DURING
      C         -JUVENILE PERIOD 1
      C         SR=SEX RATIO OF ADULTS
      C         W=DUMMY VARIABLE REPRESENTING JUVENILE BIOMASS OF
      C         ≠SPECIES I IN WEEK N
      C         W1=WEEK OF FIRST POPULATION MEASUREMENT(INITIAL WEEK
      C         ≠BEGINNING JAN. 1)
      C         W2=WEEK OF SECOND POPULATION MEASUREMENT
      C         WA(I)=WEIGHT OF SPECIES I ADULT
      C         WJ(I,J)=MEAN WEIGHT OF J WEEK OLD JUVENILES OF
      C         -SPECIES I
```

APPENDIX D
SUMMARY PRINTOUT*
PROGRAM SMAMMAL

MARK -.01B SMALL MAMMAL SIMULATOR

BASIC INPUT SUMMARY

SPECIES

	CITTRI	CITSPI	CYNLUD	GEOBUR	DIPORD	ONYLEU	PERMAN	MICOCH	LEPTOW	LEPCAL	SYLAUD
IBP	14	14	9	12	1	3	9	5	9	8	8
LBP	3	3	3	12	82	20	50	16	20	20	25
LGES	4	4	4	4	4	3	3	3	9	9	4
LW	5	5	4	4	4	3	3	4	6	6	4
LWP1	5	5	4	4	4	2	2	5	5	3	2
LWP2	1	1	1	2	2	2	2	1	2	2	2
LWP3	15	15	29	2	24	5	9	2	4	4	2
LWP4	1	1	7	2	1	5	44	1	25	23	4
NLWH	12	14	0	0	0	0	0	0	0	0	0
NFWH	32	29	0	0	0	0	0	0	0	0	0
MA	160.0000	160.0000	980.0000	110.0000	45.0000	16.0000	20.0000	90.0000	2300.0000	2300.0000	1500.0000
CA	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.
FA	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.
SA	.9986	.9931	.9870	.9814	.9080	.9401	.9003	.9781	.9451	.9451	.9825
PA	31.8300	21.8846	2.9033	22.3839	20.0241	8.0703	22.8260	12.2030	.4505	.4505	.9432
SP	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

*Appendix D is a dummy printout obtained from initial-system-condition information synthesized from the literature and should not be interpreted as function for the Pawnee Site.

TOTAL BIOMASS SUMMARY

WEEK	CITTRI	CITSPI	CYNLUD	GEOBUR	DIPORO	ONTLEU	PERMAN	MICOCH	LEPTOM	LEPCAL	STLAUD	TOTAL
1	5000.000	3436.790	2741.346	2481.614	940.607	128.013	570.371	885.914	1028.638	1028.638	1262.190	19282.48[illegible]
2	5076.982	3413.895	2707.941	2450.469	990.244	118.376	564.036	900.300	960.303	960.303	1240.102	19079.16
3	5054.363	3390.579	2674.944	2409.906	1072.900	123.875	560.364	877.306	916.064	916.064	1218.432	18912.366
4	5032.241	3365.917	2642.349	2380.724	1161.660	138.808	563.929	864.749	865.750	865.750	1197.141	18775.274
5	5010.216	3342.610	2610.181	2360.122	1287.731	149.190	548.064	804.922	818.190	818.190	1176.221	18694.[illegible]
6	4988.207	3319.408	2578.346	2347.607	1348.180	163.402	545.252	684.412	773.260	773.260	1186.660	18675.229
7	4966.484	3296.502	2546.027	2327.440	1436.603	178.670	537.961	787.888	730.789	730.789	1135.475	18674.6[illegible]
8	4944.717	3273.603	2519.892	2307.374	1525.649	194.902	552.741	868.429	690.650	690.650	1151.115	18670.7[illegible]
9	4923.079	3251.022	2520.748	2287.473	1615.078	232.940	8.352	938.601	657.368	657.368	1129.003	18748.35[illegible]
10	4901.920	3228.518	2570.866	2267.743	1662.747	202.817	528.681	1038.425	639.402	639.402	1133.295	18895.42[illegible]
11	4880.078	3206.170	2628.847	2248.184	1698.084	378.911	529.636	1140.972	629.306	629.306	1147.306	19113.99[illegible]
12	4858.716	3183.976	2668.291	2234.843	1708.158	507.414	532.249	1038.280	626.638	626.635	1184.592	19160.[illegible]
13	4837.480	3161.836	2708.038	2232.620	1706.644	538.509	537.374	822.911	629.724	629.724	1230.618	19129.34[illegible]
14	5141.376	3288.814	2758.985	2236.218	1697.187	505.765	543.904	824.687	638.757	638.757	1302.377	19687.98[illegible]
15	5730.282	3601.908	2828.697	2247.153	1690.039	481.409	551.719	827.671	652.671	652.671	1386.962	20750.[illegible]
16	6278.886	3867.682	2968.497	2332.980	1688.003	458.534	558.025	829.211	672.077	672.077	1472.791	21890.559
17	6731.081	4260.239	2848.184	2480.451	1685.969	437.105	566.661	830.420	694.296	694.296	1577.957	23017.[illegible]
18	7274.788	4581.803	3063.788	2719.564	1683.938	417.859	606.138	831.901	725.686	725.686	1699.456	24439.[illegible]
19	7946.287	4969.187	3228.163	3085.518	1681.908	398.254	639.871	880.893	759.087	759.087	1828.152	26110.46[illegible]
20	8763.368	5405.495	3348.606	3388.332	1679.882	388.673	678.165	880.889	796.312	796.312	1968.964	28089.[illegible]
21	9842.762	6138.874	3402.596	3635.157	1677.858	364.247	716.445	874.824	836.260	836.260	2120.655	30446[illegible]
22	9961.166	6473.405	3412.602	3976.206	1675.837	348.942	742.714	820.514	878.639	878.639	2276.655	31445.[illegible]
23	9984.334	6434.824	3402.509	4217.931	1673.817	334.728	735.299	754.995	921.317	921.317	2434.840	3158[illegible]
24	9102.812	6500.485	3394.117	4317.279	1671.801	321.577	728.305	692.494	964.872	964.872	2600.661	31054.[illegible]
25	8731.188	6115.703	3387.034	4346.963	1669.786	309.467	721.582	635.441	1009.046	1009.046	2764.194	30699.[illegible]
26	8280.148	5944.214	3378.717	4311.505	1667.774	298.375	714.918	582.235	1052.862	1052.862	2935.012	30195.4[illegible]
27	7818.988	5494.984	3368.852	4259.670	1665.765	288.274	708.313	548.729	1094.045	1094.045	3103.070	29425.035
28	7378.281	5436.387	3341.887	4194.161	1663.758	279.120	701.765	533.199	1134.593	1134.593	3264.517	28862.[illegible]
29	6974.748	5178.860	3320.087	4103.921	1661.753	270.830	695.276	525.840	1175.215	1175.215	3422.181	28299.[illegible]
30	6609.178	4928.759	3295.430	3993.155	1659.751	265.249	688.843	518.644	1210.204	1210.204	3577.094	[illegible]
31	6282.134	4690.295	3268.215	3919.487	1705.973	253.569	682.468	511.616	1244.976	1244.976	3722.[illegible]	[illegible]
32	5682.385	4464.099	3238.707	3885.482	1780.005	242.380	676.148	504.751	1277.964	1277.964	3861.145	[illegible]
33	5707.048	4231.318	3207.154	3852.168	1885.661	230.041	669.885	298.047	1307.917	1307.917	3986.559	2658[illegible]
34	5048.905	3641.575	3173.786	3818.943	2012.745	216.889	665.677	291.495	1335.665	1335.665	4102.778	[illegible]
35	4882.077	3362.105	3138.815	3786.005	2159.550	202.693	657.524	285.115	1360.845	1360.845	4208.976	[illegible]
36	4980.478	3314.070	3102.437	3753.350	2308.679	185.421	651.425	278.875	1382.701	1382.701	4305.787	[illegible]
37	5041.224	3834.690	3064.833	3720.978	2459.550	164.405	645.381	272.771	1400.427	1400.427	4385.287	[illegible]
38	5019.150	3812.217	3026.172	3688.884	2615.379	138.245	639.390	266.801	1414.957	1414.957	4456.951	[illegible]
39	4997.191	3487.908	2986.608	3657.068	2777.630	106.245	631.878	260.962	1426.744	1426.744	4516.892	[illegible]
40	4978.320	3463.761	2718.137	3625.526	2946.698	62.851	622.920	255.250	1436.226	1436.226	4567.155	26110.[illegible]
41	4953.844	3439.784	2360.812	3594.256	3123.461	42.680	612.591	249.664	1442.380	1442.380	4610.976	25872.5[illegible]
42	4931.863	3415.974	1978.060	3563.255	3308.171	33.107	601.075	244.200	1445.007	1445.007	4644.345	25606.[illegible]
43	4910.277	3392.328	1791.142	3532.522	3500.213	28.409	587.703	238.855	1437.578	1437.578	4668.763	25524.9[illegible]
44	4888.786	3368.845	1692.983	3502.054	3699.265	25.848	568.694	233.627	1426.231	1426.231	4685.825	25516.[illegible]
45	4867.388	3345.526	1638.713	3471.848	3857.661	24.506	540.382	228.514	1409.861	1409.861	4695.975	2549[illegible]
46	4846.088	3322.367	1597.855	3441.904	3989.038	23.234	501.431	223.513	1388.892	1388.892	4698.885	25422.[illegible]
47	4824.874	3299.369	1570.536	3412.218	4100.550	22.028	445.436	218.621	1365.652	1365.652	4696.521	25315.2[illegible]
48	4803.757	3276.531	1548.618	3382.788	4198.358	20.884	360.694	213.836	1334.844	1334.844	4680.260	25164.[illegible]
49	4782.732	3253.850	1529.739	3353.611	4292.640	19.800	357.194	209.156	1302.797	1302.797	4676.153	2530[illegible]
50	4761.799	3231.324	1511.099	3324.686	4395.325	18.771	353.729	204.570	1268.020	1268.020	4659.527	24994.[illegible]
51	4740.987	3208.959	1492.686	3296.011	4509.506	17.797	350.296	200.101	1230.787	1230.787	4637.600	24915.48[illegible]
52	4720.207	3186.746	1474.497	3267.583	4627.355	16.873	346.898	195.721	1191.525	1191.525	4615.860	24832.76[illegible]

TOTAL NUMBERS SUMMARY

WEEK	CITTRI	CITSPI	CYNLUO	GEOBUR	DIPORO	ONYLEU	PERMAN	MICOCH	LEPTOM	LEPCAL	SYLAUO	TOTAL
1	31.958	21.888	2.903	22.384	23.666	8.079	22.926	12.204	.459	.459	.943	147.576
2	31.790	21.408	2.868	22.191	26.903	7.660	22.704	11.937	.435	.435	.927	149.259
3	31.659	21.287	2.833	21.999	29.518	9.936	22.485	11.675	.410	.410	.910	155.891
4	31.520	21.110	2.798	21.810	31.856	11.930	22.265	11.420	.387	.387	.895	156.378
5	31.383	20.964	2.764	21.622	33.946	13.666	22.049	19.677	.366	.366	.879	167.681
6	31.248	20.819	2.731	21.435	35.699	15.151	21.838	26.568	.346	.346	.864	177.058
7	31.108	20.675	2.697	21.250	37.760	16.524	21.625	28.072	.327	.327	.849	181.2[illegible]
8	30.972	20.532	2.668	21.067	39.769	17.792	21.414	29.252	.309	.309	1.101	185.18[illegible]
9	30.837	20.389	4.448	20.885	42.815	20.657	22.261	30.677	.314	.314	1.341	194.115
10	30.702	20.248	6.256	20.705	40.524	24.788	23.079	32.454	.371	.371	1.584	201.063
11	30.567	20.108	7.929	20.527	39.368	30.738	23.870	34.644	.420	.420	1.815	210.406
12	30.434	19.969	7.832	20.866	38.557	39.168	24.607	32.784	.464	.464	2.035	217.16[illegible]
13	30.300	19.831	7.757	21.198	37.996	40.419	25.304	30.508	.502	.502	2.248	216.544
14	84.381	46.188	7.646	21.523	37.757	38.521	25.962	30.838	.539	.539	2.500	296.344
15	151.414	80.849	7.558	21.841	37.579	36.649	26.583	31.022	.572	.572	2.744	397.482
16	164.179	106.817	7.360	26.644	37.534	34.890	27.169	30.426	.601	.601	2.967	438.877
17	163.460	105.780	7.088	31.349	37.489	33.239	27.722	29.969	.627	.627	3.184	440.535
18	162.745	105.049	6.838	35.959	37.443	31.690	30.405	29.634	.654	.654	3.393	444.466
19	162.033	104.321	6.599	40.487	37.398	30.238	32.674	28.517	.682	.682	3.522	447.[illegible]55
20	159.116	102.933	6.371	42.892	37.353	28.876	35.192	32.957	.705	.705	3.648	450.549
21	153.584	100.786	6.182	45.207	37.308	27.600	37.654	27.468	.727	.727	3.795	440.888
22	129.950	90.174	5.943	47.086	37.263	26.409	39.366	23.022	.746	.746	3.860	404.545
23	109.032	77.969	5.742	48.216	37.218	25.299	38.971	19.621	.756	.756	3.957	367.538
24	92.424	67.812	5.550	46.064	37.174	24.269	38.603	17.023	.765	.765	4.055	334.502
25	79.220	59.384	5.367	45.966	37.129	23.315	38.250	14.779	.774	.774	4.135	307.062
26	68.714	52.306	5.191	41.935	37.084	22.438	37.901	12.552	.782	.782	4.214	283.878
27	60.348	46.429	5.022	40.243	37.039	21.635	37.555	6.892	.782	.782	4.281	261.008
28	53.681	41.525	4.861	38.820	36.985	20.903	37.211	6.739	.782	.782	4.335	246.635
29	48.561	37.428	4.706	37.559	36.950	20.237	36.871	6.590	.782	.782	4.387	234.655
30	44.111	34.002	4.558	36.450	36.906	19.629	36.533	6.444	.782	.782	4.458	224.636
31	40.710	31.133	4.415	35.786	41.245	18.425	36.199	6.301	.780	.780	4.471	220.246
32	37.984	28.727	4.279	35.477	45.666	17.290	35.867	6.165	.778	.778	4.504	[illegible]
33	35.792	26.707	4.148	35.171	50.156	16.198	35.538	6.027	.776	.776	4.442	[illegible]
34	34.026	25.007	4.025	34.868	54.084	15.096	35.212	5.894	.774	.774	4.384	[illegible]
35	32.598	23.575	3.902	34.567	58.140	13.988	34.889	5.765	.771	.771	4.328	[illegible]
36	31.818	22.643	3.787	34.269	61.863	12.663	34.569	5.639	.765	.765	4.275	[illegible]
37	31.577	22.181	3.676	33.974	65.705	11.114	34.251	5.516	.749	.749	4.224	[illegible]
38	31.439	22.028	3.569	33.681	69.766	9.270	33.936	5.395	.737	.737	4.176	[illegible]
39	31.301	21.875	3.467	33.390	74.071	7.005	32.837	5.277	.726	.726	4.150	[illegible]
40	31.164	21.724	3.081	33.102	78.600	4.115	31.765	5.161	.715	.715	4.086	[illegible]
41	31.028	21.573	2.622	32.817	83.354	2.769	30.714	5.049	.706	.706	4.041	[illegible]
42	30.892	21.424	2.140	32.534	88.298	2.152	29.704	4.938	.696	.696	3.997	[illegible]
43	30.757	21.276	1.913	32.253	93.421	1.819	28.724	4.830	.685	.685	3.984	220.[illegible]
44	30.622	21.128	1.798	31.975	98.723	1.659	27.419	4.724	.672	.672	3.911	223.303
45	30.488	20.982	1.734	31.699	99.891	1.572	25.632	4.621	.658	.658	3.869	221.904
46	30.354	20.837	1.693	31.426	100.508	1.491	23.136	4.520	.643	.643	3.827	219.077
47	30.222	20.693	1.663	31.155	101.785	1.413	19.581	4.421	.627	.627	3.785	218.98[illegible]
48	30.089	20.549	1.640	30.886	103.664	1.340	14.498	4.324	.610	.610	3.744	211.95[illegible]
49	29.958	20.407	1.620	30.619	106.093	1.270	14.357	4.229	.593	.593	3.704	213.44[illegible]
50	29.827	20.266	1.600	30.355	108.885	1.204	14.218	4.137	.575	.575	3.664	216.304
51	29.696	20.126	1.581	30.094	111.830	1.142	14.080	4.046	.556	.556	3.624	217.330
52	29.566	19.986	1.562	29.834	114.797	1.083	13.944	3.988	.537	.537	3.588	218.36[illegible]

ADULT NUMBERS SUMMARY

WEEK	CITTRI	CITSPI	CYALUD	GEOBUR	DIPORD	ONTLEU	PERMAN	MICOCH	LEPTOW	LEPCAL	SYLAUD	TOTAL
1	31.938	21.555	2.903	22.384	20.024	8.079	22.926	12.204	.459	.459	.945	143.875
2	31.798	21.405	2.868	22.191	20.000	7.660	22.704	11.937	.433	.433	.927	142.356
3	31.659	21.257	2.833	21.999	19.976	7.262	22.483	11.675	.410	.410	.910	140.875
4	31.520	21.110	2.798	21.810	19.952	6.885	22.265	11.420	.387	.387	.895	139.429
5	31.383	20.964	2.764	21.622	19.928	6.528	22.049	11.170	.366	.366	.879	138.0[illegible]
6	31.245	20.819	2.731	21.435	19.904	6.189	21.835	10.926	.346	.346	.864	136.658
7	31.108	20.675	2.697	21.250	22.075	5.867	21.623	10.686	.327	.327	.849	137.485
8	30.972	20.532	2.665	21.067	24.235	5.563	21.414	10.453	.309	.309	.834	138.55[illegible]
9	30.837	20.389	2.632	20.885	26.211	5.274	21.206	10.224	.292	.292	.819	139.06[illegible]
10	30.702	20.248	2.600	20.705	28.165	5.000	21.000	10.000	.276	.276	.805	139.7[illegible]
11	30.567	20.108	2.568	20.527	30.094	4.740	20.796	9.781	.261	.261	.791	140.494
12	30.434	19.969	2.537	20.350	31.831	4.494	20.594	9.567	.246	.246	.777	141.04[illegible]
13	30.300	19.831	2.506	20.174	33.730	4.261	20.395	9.358	.233	.233	.763	141.78[illegible]
14	30.168	19.693	2.476	20.000	35.593	4.040	20.197	9.155	.220	.220	.750	142.50[illegible]
15	30.036	19.557	2.445	19.828	37.579	3.830	20.001	8.955	.208	.208	.737	143.38[illegible]
16	29.904	19.422	2.416	19.656	37.534	3.631	19.807	8.757	.196	.196	.724	142.243
17	29.773	19.287	2.386	19.487	37.489	3.443	19.615	8.565	.186	.186	.711	141.12[illegible]
18	29.643	19.154	2.357	19.319	37.443	3.264	19.424	8.378	.176	.176	.699	140.03[illegible]
19	29.513	19.021	2.328	19.152	37.398	3.094	19.236	8.194	.166	.166	.687	138.95[illegible]
20	29.384	18.890	2.300	19.359	37.353	2.934	19.049	8.015	.157	.157	.675	138.27[illegible]
21	29.256	18.759	2.272	19.492	37.308	2.781	18.864	7.840	.148	.148	.663	137.55[illegible]
22	29.127	18.629	2.244	19.622	37.263	2.637	18.681	7.669	.140	.140	.651	136.804
23	29.000	18.500	2.217	19.747	37.218	2.501	18.500	7.501	.132	.132	.640	136.08[illegible]
24	28.873	18.372	2.190	22.501	37.174	2.372	18.320	7.338	.125	.125	.629	138.01[illegible]
25	28.747	18.245	2.163	25.205	37.129	2.250	18.143	7.177	.118	.118	.618	139.9[illegible]
26	28.621	18.118	2.137	27.860	37.084	2.137	17.967	7.021	.112	.112	.607	141.77[illegible]
27	28.496	17.993	2.111	30.456	37.039	2.032	17.792	6.868	.106	.106	.596	143.595
28	28.371	17.869	2.085	31.901	36.995	1.937	17.620	6.719	.100	.100	.586	144.28[illegible]
29	28.247	17.745	2.060	33.334	36.950	1.854	17.449	6.575	.094	.094	.576	144.975
30	28.123	17.622	2.035	34.565	36.906	1.785	17.279	6.430	.089	.089	.566	145.488
31	28.000	17.500	2.010	35.786	36.861	1.734	17.112	6.291	.084	.084	.556	146.0[illegible]
32	27.877	17.379	1.985	35.477	36.817	1.704	16.946	6.154	.080	.080	.546	145.34[illegible]
33	27.755	17.259	1.961	35.171	36.772	1.694	16.781	6.021	.075	.075	.537	144.1[illegible]
34	27.634	17.139	1.937	34.868	36.728	1.701	16.619	5.894	.071	.071	.527	145.18[illegible]
35	29.445	18.842	1.914	34.567	36.684	1.717	16.457	5.765	.067	.067	.518	146.04[illegible]
36	31.317	20.785	1.890	34.269	36.640	1.735	16.298	5.639	.063	.063	.509	149.2[illegible]
37	31.577	22.181	1.867	33.974	38.915	1.746	16.139	5.516	.060	.060	.500	152.5[illegible]
38	31.439	22.028	1.845	33.681	41.505	1.747	15.983	5.395	.057	.057	.491	154.2[illegible]
39	31.301	21.875	1.822	33.390	44.402	1.739	15.828	5.277	.054	.054	.483	156.2[illegible]
40	31.164	21.724	1.800	33.102	47.263	1.725	15.674	5.161	.051	.051	.474	158.19[illegible]
41	31.028	21.575	1.778	32.817	50.396	1.707	15.522	5.049	.060	.060	.466	160.454
42	30.892	21.424	1.756	32.534	53.465	1.688	15.372	4.938	.096	.096	.458	162.719
43	30.757	21.276	1.735	32.253	56.653	1.672	15.222	4.830	.128	.128	.450	165.10[illegible]
44	30.622	21.128	1.714	31.975	59.975	1.659	15.075	4.724	.159	.159	.442	167.631
45	30.488	20.982	1.693	31.699	63.443	1.572	14.928	4.621	.188	.188	.434	170.232
46	30.354	20.837	1.675	31.426	67.043	1.491	14.784	4.520	.212	.212	.427	172.980
47	30.222	20.693	1.657	31.155	70.783	1.415	14.640	4.421	.235	.235	.419	175.874
48	30.089	20.549	1.640	30.886	74.648	1.340	14.498	4.324	.258	.258	.412	178.895
49	29.958	20.407	1.620	30.619	78.625	1.270	14.357	4.229	.273	.273	.405	182.034
50	29.827	20.266	1.600	30.355	82.716	1.204	14.218	4.137	.288	.288	.398	185.3[illegible]
51	29.696	20.126	1.581	30.094	85.196	1.142	14.080	4.046	.303	.303	.391	186.958
52	29.566	19.986	1.562	29.834	87.302	1.085	13.944	3.958	.318	.315	.384	188.249

JUVENILE NUMBERS SUMMARY

WEEK	CITTRI	CITSPI	CYNLUO	GEOBUR	DIPORD	ONYLEU	PERMAN	MICOCH	LEPTOW	LEPCAL	SYLAUD	TOTAL
1	0.	0.	0.	0.	3.642	0.	0.	0.	0.	0.	0.	3.642
2	0.	0.	0.	0.	6.903	0.	0.	0.	0.	0.	0.	6.903
3	0.	0.	0.	0.	9.542	2.674	0.	0.	0.	0.	0.	12.216
4	0.	0.	0.	0.	11.904	5.045	0.	0.	0.	0.	0.	16.949
5	0.	0.	0.	0.	14.019	7.138	0.	8.507	0.	0.	0.	29.664
6	0.	0.	0.	0.	15.795	8.963	0.	15.643	0.	0.	0.	40.400
7	0.	0.	0.	0.	15.685	10.657	0.	17.386	0.	0.	0.	43.727
8	0.	0.	0.	0.	15.554	12.229	0.	18.800	0.	0.	.267	46.850
9	0.	0.	1.813	0.	15.805	15.363	1.055	20.453	.022	.022	.522	55.055
10	0.	0.	3.636	0.	12.359	19.788	2.079	22.494	.096	.096	.779	61.287
11	0.	0.	5.361	0.	9.274	25.997	3.073	21.801	.160	.160	1.024	69.911
12	0.	0.	5.295	.517	6.706	35.546	4.013	23.217	.218	.218	1.258	76.115
13	0.	0.	5.231	1.024	4.266	36.158	4.909	21.150	.269	.269	1.485	74.761
14	54.183	26.494	5.171	1.523	2.144	34.481	5.765	21.685	.319	.319	1.172	153.835
15	121.378	61.392	5.112	2.014	0.	32.820	6.582	22.069	.364	.364	2.007	254.101
16	134.275	87.095	4.934	6.987	0.	31.259	7.363	21.669	.404	.404	2.245	296.634
17	133.687	86.493	4.702	11.862	0.	29.796	8.108	21.404	.442	.442	2.475	299.408
18	133.102	85.894	4.481	16.641	0.	28.426	37.284	21.256	.480	.480	2.695	304.456
19	132.819	85.299	4.271	21.335	0.	27.143	13.438	20.322	.516	.516	2.836	308.196
20	129.732	84.043	4.071	18.804	0.	25.942	16.145	24.542	.548	.548	2.975	312.076
21	124.329	81.947	3.880	25.715	0.	24.819	18.790	19.628	.578	.578	3.092	303.356
22	100.802	71.545	3.698	27.465	0.	23.772	20.684	15.354	.606	.606	3.209	267.740
23	80.032	59.469	3.525	28.468	0.	22.798	20.471	12.120	.623	.623	3.317	251.448
24	63.951	49.440	3.360	23.863	0.	21.897	20.282	9.686	.640	.640	3.424	196.485
25	50.473	41.109	3.203	18.761	0.	21.065	20.108	7.602	.655	.655	3.517	167.149
26	40.093	34.188	3.054	14.075	0.	20.301	19.934	5.511	.670	.670	3.607	142.103
27	31.883	28.436	2.911	9.787	0.	19.603	19.762	.024	.676	.676	3.685	117.414
28	26.310	23.656	2.776	6.919	0.	18.966	19.592	.020	.682	.682	3.749	102.357
29	20.115	19.683	2.646	4.224	0.	18.384	19.422	.017	.688	.688	3.811	89.678
30	15.988	16.380	2.525	1.886	0.	17.844	19.254	.014	.693	.693	3.872	79.147
31	12.710	13.633	2.406	0.	1.423	16.690	19.087	.011	.696	.696	3.916	74.228
32	10.106	11.349	2.294	0.	8.849	15.586	18.921	.008	.698	.698	3.958	72.468
33	8.037	9.448	2.187	0.	13.384	14.496	18.757	.005	.701	.701	3.906	71.42[illegible]
34	6.392	7.868	2.086	0.	17.356	13.305	18.504	0.	.702	.702	3.857	70.952
35	7.049	7.405	1.989	0.	21.457	12.263	18.432	0.	.704	.704	3.810	67.24[illegible]
36	.502	1.858	1.897	0.	25.224	10.928	18.271	0.	.699	.699	3.766	65.8[illegible]
37	0.	0.	1.809	0.	26.790	9.368	18.112	0.	.689	.689	3.724	61.1[illegible]
38	0.	0.	1.725	0.	28.261	7.523	17.953	0.	.680	.680	3.685	60.5[illegible]
39	0.	0.	1.625	0.	29.669	5.265	17.009	0.	.672	.672	3.646	59.5[illegible]
40	0.	0.	1.291	0.	31.337	2.308	16.089	0.	.665	.665	3.611	56.045
41	0.	0.	.844	0.	32.958	1.062	15.192	0.	.646	.646	3.575	54.924
42	0.	0.	.384	0.	34.832	.444	14.353	0.	.600	.600	3.539	54.7[illegible]
43	0.	0.	.178	0.	36.768	.147	13.802	0.	.556	.556	3.504	55.2[illegible]
44	0.	0.	.085	0.	38.748	0.	12.344	0.	.513	.513	3.469	58.472
45	0.	0.	.041	0.	36.448	0.	10.704	0.	.473	.473	3.434	51.575
46	0.	0.	.018	0.	33.465	0.	8.382	0.	.431	.431	3.400	46.09[illegible]
47	0.	0.	.006	0.	31.001	0.	4.980	0.	.392	.392	3.366	40.167
48	0.	0.	0.	0.	29.018	0.	.000	0.	.358	.358	3.332	33.06[illegible]
49	0.	0.	0.	0.	27.468	0.	.000	0.	.320	.320	3.298	31.408
50	0.	0.	0.	0.	26.167	0.	.000	0.	.288	.288	3.266	30.003
51	0.	0.	0.	0.	26.643	0.	.000	0.	.282	.282	3.233	30.381
52	0.	0.	0.	0.	27.494	0.	.000	0.	.222	.222	3.201	31.150

FOOD CONSUMPTION SUMMARY

WEEK	CITTRI	CITSPI	CYNLUO	GEOBUR	DIPORD	ONTLEU	PERMAN	MICOCH	LEPTOW	LEPCAL	SYLAUD	TOTAL
1	10.056	6.764	3.486	5.299	2.580	.441	1.786	1.809	1.037	1.057	1.458	778.550
2	9.992	6.717	3.414	5.253	2.766	.418	1.768	1.554	.980	.980	1.432	768.68[illegible]
3	9.948	6.671	3.373	5.208	2.982	.447	1.751	1.520	.926	.926	1.407	759.478
4	9.904	6.625	3.332	5.163	3.220	.487	1.734	1.487	.875	.875	1.382	750.954
5	9.861	6.579	3.291	5.119	3.475	.554	1.717	1.650	.827	.827	1.358	745.30[illegible]
6	9.818	6.533	3.251	5.074	3.712	.611	1.701	1.949	.782	.782	1.335	756.705
7	9.775	6.488	3.211	5.031	3.950	.670	1.684	2.251	.739	.739	1.311	750.5[illegible]
8	9.732	6.443	3.172	4.987	4.185	.767	1.668	2.451	.698	.698	1.327	725.692
9	9.690	6.399	3.270	4.944	4.430	.940	1.664	2.666	.668	.668	1.346	721.951
10	9.647	6.354	3.433	4.902	4.528	1.203	1.668	2.934	.662	.662	1.377	720.[illegible]
11	9.605	6.310	3.624	4.859	4.586	1.578	1.678	2.958	.664	.664	1.421	718.[illegible]
12	9.563	6.267	3.711	4.845	4.605	1.844	1.694	2.639	.674	.674	1.499	714.656
13	9.521	6.223	3.813	4.849	4.601	1.841	1.716	2.487	.688	.688	1.588	709.547
14	10.950	6.889	3.922	4.869	4.580	1.754	1.742	2.499	.708	.708	1.710	707.2[illegible]
15	13.362	8.108	4.034	4.902	4.568	1.670	1.771	2.514	.733	.733	1.845	710.[illegible]
16	15.108	9.488	4.078	5.186	4.562	1.592	1.798	2.519	.763	.763	1.981	720.543
17	16.387	10.333	4.194	5.636	4.557	1.518	1.888	2.523	.796	.796	2.158	756.492
18	17.785	11.206	4.347	6.229	4.551	1.449	2.009	2.479	.833	.833	2.312	760.665
19	19.322	12.108	4.549	6.922	4.546	1.384	2.136	2.387	.874	.874	2.486	792.191
20	20.886	13.237	4.676	7.594	4.540	1.324	2.270	2.404	.917	.917	2.671	852.625
21	22.051	14.101	4.729	8.279	4.535	1.267	2.385	2.329	.962	.962	2.864	875.191
22	21.505	14.387	4.716	8.884	4.529	1.215	2.420	2.166	1.008	1.008	3.058	898.520
23	20.146	13.873	4.678	9.286	4.524	1.166	2.396	1.976	1.051	1.051	3.250	908.399
24	18.793	13.277	4.641	9.413	4.518	1.121	2.374	1.794	1.095	1.095	3.447	915.600
25	17.668	12.633	4.606	9.396	4.513	1.080	2.352	1.616	1.138	1.138	3.657	916.478
26	16.584	12.052	4.565	9.286	4.507	1.042	2.330	1.217	1.180	1.180	3.851	915.955
27	15.399	11.381	4.521	9.158	4.502	1.008	2.309	.897	1.218	1.218	4.019	907.591
28	14.407	10.735	4.473	8.983	4.497	.977	2.287	.877	1.255	1.255	4.198	901.654
29	13.529	10.125	4.421	8.781	4.491	.949	2.266	.858	1.289	1.289	4.371	894.[illegible]
30	12.768	9.558	4.367	8.588	4.486	.923	2.245	.839	1.321	1.321	4.539	886.[illegible]
31	12.092	9.037	4.311	8.472	4.654	.885	2.225	.820	1.351	1.351	4.694	879.461
32	11.516	8.563	4.252	8.399	4.894	.842	2.204	.802	1.378	1.378	4.841	873.[illegible]
33	10.988	8.099	4.192	8.326	5.207	.795	2.184	.785	1.402	1.402	4.965	790.5[illegible]
34	9.884	7.018	4.131	8.258	5.555	.745	2.164	.767	1.425	1.425	5.079	765.[illegible]
35	9.431	6.588	4.068	8.185	5.984	.689	2.144	.751	1.445	1.445	5.180	759.[illegible]
36	9.840	6.525	4.005	8.115	6.352	.621	2.124	.734	1.461	1.461	5.269	765.004
37	9.922	6.961	3.941	8.043	6.761	.557	2.104	.718	1.472	1.472	5.338	784.08[illegible]
38	9.879	6.913	3.877	7.975	7.184	.433	2.085	.702	1.480	1.480	5.398	789.[illegible]
39	9.835	6.865	3.667	7.905	7.627	.301	2.056	.687	1.485	1.485	5.445	446.[illegible]
40	9.792	6.817	3.253	7.836	8.088	.188	2.022	.672	1.488	1.488	5.481	436.444
41	9.750	6.770	2.768	7.769	8.570	.138	1.983	.657	1.490	1.490	5.511	430.284
42	9.707	6.723	2.396	7.702	9.073	.110	1.941	.643	1.486	1.486	5.529	424.8[illegible]
43	9.664	6.677	2.211	7.635	9.595	.097	1.886	.629	1.476	1.476	5.539	428.[illegible]
44	9.622	6.631	2.112	7.570	10.135	.090	1.807	.615	1.461	1.461	5.542	432.[illegible]
45	9.580	6.585	2.081	7.504	10.524	.086	1.689	.602	1.441	1.441	5.537	436.8[illegible]
46	9.538	6.539	2.010	7.440	10.840	.081	1.524	.588	1.417	1.417	5.526	430.008
47	9.496	6.494	1.978	7.375	11.121	.077	1.279	.576	1.389	1.389	5.510	441.[illegible]
48	9.455	6.449	1.983	7.312	11.388	.073	1.129	.563	1.358	1.358	5.490	445.9[illegible]
49	9.413	6.404	1.929	7.249	11.654	.069	1.118	.551	1.324	1.324	5.464	447.250
50	9.372	6.360	1.905	7.186	11.946	.066	1.107	.539	1.287	1.287	5.435	379.807
51	9.331	6.316	1.882	7.124	12.258	.062	1.097	.527	1.248	1.248	5.401	382.794
52	9.290	6.272	1.859	7.063	12.575	.058	1.086	.515	1.207	1.207	5.366	385.819

WEEKLY DEATH SUMMARY (BIOMASS LOST)

WEEK	CITTRI	CITSPI	CYNLUD	GEOBUR	DIPORD	ONYLEU	PERMAN	MICOCH	LEPTOW	LEPCAL	SYLAUD	TOTAL
	22.366	25.075	35.609	21.257	5.235	6.712	5.561	15.355	57.925	57.925	22.250	270.045
2	22.268	25.707	35.200	21.054	11.511	6.365	5.507	15.065	54.742	54.742	21.861	267.818
3	22.170	25.543	32.795	20.872	19.156	6.690	5.454	12.777	51.755	51.755	21.479	268.407
4	22.075	25.380	32.595	20.692	28.437	7.421	5.401	12.497	48.894	48.894	21.104	271.188
5	21.977	25.219	32.001	20.515	31.296	8.480	5.348	18.147	46.208	46.208	20.755	274.152
6	21.881	25.058	31.611	20.337	33.665	8.597	5.297	32.025	43.670	43.670	20.375	285.981
7	21.785	22.888	31.226	20.161	34.553	8.531	5.245	47.697	41.272	41.272	20.017	294.456
8	21.690	22.740	30.845	19.987	35.320	-10.990	5.194	45.946	39.005	39.005	20.090	268.851
9	21.595	22.582	30.999	19.815	36.604	-28.994	5.185	56.936	37.206	37.206	20.220	239.354
10	21.500	22.426	31.510	19.644	34.056	-55.233	5.216	21.905	36.502	36.502	20.525	194.550
11	21.406	22.271	32.215	19.475	28.828	-91.411	5.436	229.334	36.350	36.350	21.087	361.340
12	21.312	22.117	32.595	19.373	21.545	15.517	5.653	235.585	36.606	36.606	21.315	468.022
13	21.219	21.963	32.850	19.339	11.550	60.787	5.951	126.706	37.020	37.020	21.636	396.021
14	22.549	22.912	33.430	19.369	7.094	58.737	6.291	126.977	37.128	37.128	22.236	393.852
15	25.166	24.939	47.453	19.463	2.038	55.493	6.669	125.168	35.795	35.795	26.003	403.979
16	27.524	27.539	55.208	21.138	2.035	52.378	7.022	121.216	34.642	34.642	26.676	410.019
17	29.510	29.564	60.129	23.554	2.033	49.431	-22.740	116.487	33.520	33.520	27.614	382.621
18	31.886	31.857	66.622	25.538	2.030	46.648	-15.296	146.045	32.604	32.604	28.855	429.391
19	96.635	53.101	75.099	46.368	2.028	44.023	-18.905	142.334	31.651	31.651	30.124	554.069
20	194.757	86.852	81.400	55.140	2.025	41.513	-17.754	143.170	30.790	30.790	31.241	679.925
21	1027.876	456.356	85.167	67.195	2.023	39.108	-5.947	143.292	30.045	30.045	32.431	1907.590
22	1114.745	611.894	86.504	148.949	2.020	36.800	27.544	119.181	29.401	29.401	33.622	2240.059
23	1054.567	608.561	86.879	216.819	2.018	34.583	26.939	101.199	28.590	28.590	34.604	2203.150
24	944.822	588.405	87.322	214.806	2.016	32.451	26.489	90.628	27.808	27.808	35.613	2078.165
25	871.923	560.102	87.815	210.322	2.013	33.402	26.250	89.808	27.059	27.059	36.981	1969.735
26	782.750	534.062	88.099	176.010	2.011	28.443	26.013	221.644	26.369	26.369	38.411	1950.161
27	690.931	494.908	88.193	147.407	2.008	26.594	25.779	7.645	25.586	25.586	39.871	1574.510
28	604.644	454.345	88.114	134.088	2.006	24.896	25.546	7.465	25.059	25.059	41.245	1452.428
29	525.493	413.965	87.879	119.611	2.003	23.427	25.316	7.288	24.486	24.486	42.579	1296.534
30	454.191	374.861	87.501	75.089	2.001	22.298	25.087	7.115	23.965	23.965	43.871	1137.945
31	390.853	337.747	86.994	33.952	7.928	21.469	24.860	6.947	23.415	23.415	45.093	1002.675
32	335.215	303.061	86.373	33.659	17.268	21.050	24.635	6.783	23.097	23.097	46.202	920.440
33	280.530	266.657	85.647	33.569	30.486	20.953	24.412	6.622	22.773	22.773	47.143	841.344
34	149.041	170.909	84.829	33.081	46.324	21.155	24.191	6.450	22.459	22.459	48.038	628.917
35	41.501	81.334	83.928	32.796	56.819	23.186	23.972	6.309	22.145	22.145	48.755	442.891
36	21.931	23.820	82.954	32.513	66.744	25.674	23.754	6.171	21.820	21.820	49.316	375.717
37	22.113	24.567	81.915	32.232	72.567	29.231	23.538	6.034	21.574	21.574	49.516	384.463
38	22.816	24.397	80.820	31.954	78.907	34.949	23.325	5.904	20.866	20.866	49.585	393.589
39	21.920	24.228	300.867	31.679	84.855	43.552	23.082	5.778	20.336	20.336	50.096	626.725
40	21.824	24.060	378.884	31.406	92.241	20.324	22.811	5.648	19.798	19.798	50.515	686.976
41	21.728	23.893	392.473	31.135	99.989	9.724	22.432	5.525	20.620	20.620	50.866	690.005
42	21.633	23.728	191.502	30.866	108.796	4.852	22.063	5.404	24.425	24.425	51.117	508.812
43	21.538	23.564	100.479	30.600	118.252	2.866	23.843	5.286	27.731	27.731	51.280	434.550
44	21.444	23.401	58.362	30.336	128.303	1.378	31.719	5.170	30.768	30.768	51.370	415.019
45	21.350	23.239	38.437	30.074	131.696	1.306	42.528	5.057	33.366	33.366	51.385	411.614
46	21.257	23.078	27.605	29.815	130.107	1.239	58.012	4.946	35.937	35.937	51.344	419.277
47	21.164	22.918	22.025	29.568	124.237	1.174	82.759	4.838	38.101	38.101	51.244	436.120
48	21.071	22.759	18.986	29.303	114.934	1.115	5.517	4.732	39.898	39.898	51.087	347.309
49	20.979	22.602	18.755	29.050	109.684	1.055	5.483	4.628	41.360	41.360	50.885	345.848
50	20.887	22.445	18.526	28.800	108.598	1.001	5.449	4.527	42.788	42.788	50.684	341.402
51	20.796	22.290	18.300	28.581	108.950	.948	5.418	4.428	43.894	43.894	50.364	345.792
52	20.705	22.136	18.077	28.308	114.298	.899	5.382	4.351	44.678	44.678	50.057	381.808

MEASURED PERCENTAGE OF JUVENILES AND CALCULATED PERCENTAGE OF JUVENILES

WEEK	CITTRI			CITSPI		CYNLUD		GEOBUR		DIPORD		ONTLEU		PERMAN		MICOCH		LEPTOW		LEPCAL		STLAUD
1	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.15	-0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	0.
2	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.26	-0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	0.
3	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.32	-0.	.27	-0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	0.
4	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.37	-0.	.42	-0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	0.
5	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.41	-0.	.52	-0.	0.	-0.	.43	-0.	0.	-0.	0.	-0.	0.
6	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.44	-0.	.59	-0.	0.	-0.	.59	-0.	0.	-0.	0.	-0.	0.
7	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.42	-0.	.64	-0.	0.	-0.	.62	-0.	0.	-0.	0.	-0.	0.
8	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.39	-0.	.69	-0.	0.	-0.	.64	-0.	0.	-0.	0.	-0.	.24
9	0.	0.	-0.	0.	-0.	.41	-0.	0.	-0.	.38	-0.	.74	-0.	.05	-0.	.67	-0.	.07	-0.	.07	-0.	.39
10	0.	0.	-0.	0.	-0.	.58	-0.	0.	-0.	.30	-0.	.80	-0.	.09	-0.	.69	-0.	.26	-0.	.26	-0.	.49
11	0.	0.	-0.	0.	-0.	.68	-0.	0.	-0.	.24	-0.	.85	-0.	.13	-0.	.72	-0.	.38	-0.	.38	-0.	.56
12	0.	0.	-0.	0.	-0.	.68	-0.	.02	-0.	.17	-0.	.89	-0.	.16	-0.	.71	-0.	.47	-0.	.47	-0.	.62
13	0.	0.	-0.	0.	-0.	.68	-0.	.05	-0.	.11	-0.	.89	-0.	.19	-0.	.69	-0.	.54	-0.	.54	-0.	.66
14	.64	.64	-0.	.57	-0.	.68	-0.	.07	-0.	.06	-0.	.90	-0.	.22	-0.	.70	-0.	.59	-0.	.59	-0.	.70
15	.80	.80	-0.	.76	-0.	.68	-0.	.09	-0.	0.	-0.	.90	-0.	.25	-0.	.71	-0.	.64	-0.	.64	-0.	.73
16	.82	.82	-0.	.f2	-0.	.67	-0.	.26	-0.	0.	-0.	.90	-0.	.27	-0.	.71	-0.	.67	-0.	.67	-0.	.76
17	.82	.82	-0.	.82	-0.	.66	-0.	.38	-0.	0.	-0.	.90	-0.	.29	-0.	.71	-0.	.70	-0.	.70	-0.	.78
18	.82	.82	-0.	.82	-0.	.66	-0.	.46	-0.	0.	-0.	.90	-0.	.36	-0.	.72	-0.	.75	-0.	.75	-0.	.79
19	.82	.82	-0.	.82	-0.	.65	-0.	.53	-0.	0.	-0.	.90	-0.	.41	-0.	.71	-0.	.76	-0.	.76	-0.	.81
20	.82	.82	-0.	.82	-0.	.64	-0.	.55	-0.	0.	-0.	.90	-0.	.46	-0.	.75	-0.	.78	-0.	.78	-0.	.82
21	.81	.81	-0.	.81	-0.	.63	-0.	.57	-0.	0.	-0.	.90	-0.	.50	-0.	.71	-0.	.80	-0.	.80	-0.	.82
22	.78	.78	-0.	.79	-0.	.62	-0.	.58	-0.	0.	-0.	.90	-0.	.53	-0.	.67	-0.	.81	-0.	.81	-0.	.83
23	.74	.73	-0.	.76	-0.	.61	-0.	.59	-0.	0.	-0.	.90	-0.	.55	-0.	.62	-0.	.82	-0.	.82	-0.	.84
24	.70	.69	-0.	.75	-0.	.61	-0.	.51	-0.	0.	-0.	.90	-0.	.55	-0.	.57	-0.	.84	-0.	.84	-0.	.84
25	.65	.64	-0.	.69	-0.	.60	-0.	.43	-0.	0.	-0.	.90	-0.	.53	-0.	.51	-0.	.85	-0.	.85	-0.	.85
26	.60	.58	-0.	.65	-0.	.59	-0.	.34	-0.	0.	-0.	.90	-0.	.53	-0.	.44	-0.	.86	-0.	.86	-0.	.86
27	.55	.53	-0.	.61	-0.	.58	-0.	.24	-0.	0.	-0.	.91	-0.	.53	-0.	.00	-0.	.86	-0.	.86	-0.	.84
28	.49	.47	-0.	.57	-0.	.57	-0.	.18	-0.	0.	-0.	.91	-0.	.53	-0.	.00	-0.	.87	-0.	.87	-0.	.86
29	.44	.42	-0.	.53	-0.	.56	-0.	.11	-0.	0.	-0.	.91	-0.	.55	-0.	.00	-0.	.88	-0.	.88	-0.	.87
30	.39	.36	-0.	.48	-0.	.55	-0.	.05	-0.	0.	-0.	.91	-0.	.53	-0.	.00	-0.	.89	-0.	.89	-0.	.87
31	.34	.31	-0.	.44	-0.	.54	-0.	0.	-0.	.11	-0.	.91	-0.	.53	-0.	.00	-0.	.89	-0.	.89	-0.	.88
32	.29	.27	-0.	.40	-0.	.54	-0.	0.	-0.	.19	-0.	.90	-0.	.55	-0.	.00	-0.	.90	-0.	.90	-0.	.88
33	.25	.22	-0.	.35	-0.	.53	-0.	0.	-0.	.27	-0.	.90	-0.	.53	-0.	.00	-0.	.90	-0.	.90	-0.	.89
34	.21	.19	-0.	.31	-0.	.52	-0.	0.	-0.	.32	-0.	.89	-0.	.55	-0.	0.	-0.	.91	-0.	.91	-0.	.89
35	.11	.10	-0.	.20	-0.	.51	-0.	0.	-0.	.37	-0.	.88	-0.	.53	-0.	0.	-0.	.91	-0.	.91	-0.	.88
36	.02	.02	-0.	.08	-0.	.50	-0.	0.	-0.	.41	-0.	.86	-0.	.53	-0.	0.	-0.	.92	-0.	.92	-0.	.88
37	0.	0.	-0.	0.	-0.	.49	-0.	0.	-0.	.41	-0.	.84	-0.	.55	-0.	0.	-0.	.92	-0.	.92	-0.	.89
38	0.	0.	-0.	0.	-0.	.48	-0.	0.	-0.	.41	-0.	.81	-0.	.53	-0.	0.	-0.	.92	-0.	.92	-0.	.90
39	0.	0.	-0.	0.	-0.	.47	-0.	0.	-0.	.40	-0.	.75	-0.	.52	-0.	0.	-0.	.93	-0.	.93	-0.	.88
40	0.	0.	-0.	0.	-0.	.42	-0.	0.	-0.	.40	-0.	.58	-0.	.51	-0.	0.	-0.	.93	-0.	.93	-0.	.88
41	0.	0.	-0.	0.	-0.	.32	-0.	0.	-0.	.40	-0.	.38	-0.	.49	-0.	0.	-0.	.92	-0.	.92	-0.	.88
42	0.	0.	-0.	0.	-0.	.18	-0.	0.	-0.	.39	-0.	.21	-0.	.48	-0.	0.	-0.	.86	-0.	.86	-0.	.80
43	0.	0.	-0.	0.	-0.	.09	-0.	0.	-0.	.39	-0.	.08	-0.	.47	-0.	0.	-0.	.81	-0.	.81	-0.	.89
44	0.	0.	-0.	0.	-0.	.05	-0.	0.	-0.	.39	-0.	0.	-0.	.45	-0.	0.	-0.	.76	-0.	.76	-0.	.89
45	0.	0.	-0.	0.	-0.	.02	-0.	0.	-0.	.36	-0.	0.	-0.	.42	-0.	0.	-0.	.72	-0.	.72	-0.	.89
46	0.	0.	-0.	0.	-0.	.01	-0.	0.	-0.	.35	-0.	0.	-0.	.36	-0.	0.	-0.	.67	-0.	.67	-0.	.80
47	0.	0.	-0.	0.	-0.	.00	-0.	0.	-0.	.30	-0.	0.	-0.	.28	-0.	0.	-0.	.62	-0.	.62	-0.	.89
48	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.28	-0.	0.	-0.	.08	-0.	0.	-0.	.58	-0.	.58	-0.	.89
49	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.26	-0.	0.	-0.	.00	-0.	0.	-0.	.54	-0.	.54	-0.	.89
50	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.24	-0.	0.	-0.	.00	-0.	0.	-0.	.50	-0.	.50	-0.	.86
51	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.24	-0.	0.	-0.	.00	-0.	0.	-0.	.49	-0.	.49	-0.	[illegible]
52	0.	0.	-0.	0.	-0.	0.	-0.	0.	-0.	.24	-0.	0.	-0.	.00	-0.	0.	-0.	.41	-0.	.41	-0.	[illegible]

APPENDIX E

INPUT DESCRIPTION--PROGRAM DIETCMP

Columns	Variable	Description

There are NPER blocks of cards. Each block contains complete control data for the kth week of computations.

BLOCK 1: Control data for week 1

CONTROL DATA (16I5)

1-5	NANM	Number of animal species
6-10	NCAT	Number of plant species (or categories)
11-15	NPER	Number of weeks to be simulated

PLANT SPECIES NAME AND DIETARY COMPOSITION (A5,15F5.0)

CARD 1:

1-5	PNM(1)	alphameric identifying name, plant species 1
6-10	PLT(1,1)	percentage occurrence of plant species 1 in animal species 1
11-15	PLT(1,2)	percentage occurrence of plant species 1 in animal species 2
.		
.		
.		
76-80	PLT(1,15)	percentage occurrence of plant species 1 in animal species 15

CARD 2:

1-5	PNM(2)	alphameric identifying name, plant species 2
6-10	PLT(2,1)	percentage occurrence of plant species 2 in animal species 1
11-15	PLT(2,2)	percentage occurrence of plant species 2 in animal species 2
.		
.		
.		
76-80	PLT(2,15)	percentage occurrence of plant spcies 2 in animal species 15

NOTE: Use only enough cards to read in PNM(NCAT) values.

PLANT AVAILABILITY (16F5.0)

1-5	PLTAV(1)	biomass available for consumption, species 1
6-10	PLTAV(2)	" " " " " 2
.		
.		
76-80	PLTAV(16)	" " " " " 16

NOTE: Use only enough cards to read in PLTAV(NCAT) values.

CARBOHYDRATE CONTENT (16F5.0)

1-5	CARB(1)	carbohydrate percentage content, species 1
6-10	CARB(2)	" " " " 2
.		
.		
.		
76-80	CARB(16)	" " " " 16

NOTE: Use only enough cards to read in CARB(NCAT) values.

CARBOHYDRATE ENERGY (16F5.0)

1-5	CBNRG(1)	energy content of carbohydrates, species 1
6-10	CBNRG(2)	" " " " " 2
.		
.		
.		
76-80	CBNRG(16)	" " " " " 16

NOTE: Use only enough cards to read in CBNRG(NCAT) values.

FAT CONTENT (16F5.0)

1-5	FATS(1)	fat percentage content, species 1
6-10	FATS(2)	" " " " 2
.		
.		
.		
76-80	FATS(16)	" " " " 16

NOTE: Use only enough cards to read in FATS(NCAT) values.

FAT ENERGY (16F5.0)

1-5	FTNRG(1)	energy content of fats, species 1
6-10	FTNRG(2)	" " " " " 2
.		
.		
.		
76-80	FTNRG(16)	" " " " " 16

NOTE: Use only enough cards to read in FTNRG(NCAT) values.

PROTEIN CONTENT (16F5.0)

1-5	PROT(1)	protein percentage content, species 1
6-10	PROT(2)	" " " " 2
.		
.		
.		
76-80	PROT(16)	" " " " 16

NOTE: Use only enough cards to read in PROT(NCAT) values

```
PROTEIN ENERGY              (16F5.0)
      1-5       PRNRG(1)    energy content of proteins, species 1
      6-10      PRNRG(2)       "      "     "     "         "   2
       .
       .
       .
     76-80      PRNRG(16)      "      "     "     "         "   16

NOTE:  Use only enough cards to read in PRNRG(NCAT) values.

ANIMAL SPECIES NAMES        (15A5)
      1-5       ANM(1)      alphameric identifying name, species 1
      6-10      ANM(2)          "           "        "      "    2
       .
       .
       .
     71-75      ANM(15)         "           "        "      "    15

ANIMAL DENSITIES            (15F5.0)
      1-5       SP(1)       number of individuals per unit area, species 1
      6-10      SP(2)         "    "      "        "   "    "      "     2
       .
       .
       .
     71-75      SP(15)        "    "      "        "   "    "      "     15

STOMACH WEIGHTS             (15F5.0)
      1-5       WTS(1)      average weight of stomach contents, species 1
      6-10      WTS(2)         "      "     "     "      "         "    2
       .
       .
       .
     71-75      WTS(15)        "      "     "     "      "         "    15

STOMACHFULLS EATEN          (15F5.0)
      1-5       STFLS(1)    number of stomachfulls eaten per week, species 1
      6-10      STFLS(2)      "    "       "          "    "   "      "     2
       .
       .
       .
     71-75      STFLS(15)     "    "       "          "    "   "      "     15

UNCONSTRAINED FOOD CONSUMPTION   (15F5.0)
      1-5       UNCONS(1)   unconstrained food consumption, species 1
      6-10      UNCONS(2)         "         "        "          "    2
       .
       .
       .
     71-75      UNCONS(15)        "         "        "          "    15

BLOCK 2:  Control data for week 2
          Same as in BLOCK 1
```

APPENDIX F

PROGRAM DIETCMP

```
C         DIMENSION VARIABLES

      DIMENSION PNM(50),PLT(53,15),PLTAV(50),PLTNRG(50),CARB
     1(50),FATS(50),PROT(50),ANM(15),SP(15),WTS(15),STFLS(15)
     2, TOTCNS(50,15),BIOMETN(50,15),TOTETN(50),TOTO2(50),
     3RATIO1(50),RATIO2(50),COMP(50,15),COMINV(50,15),
     4UNCONS(50,15),CARBG(50,15),FATG(50,15),PROTG(50,15),
     5TOTG(50,15),CARBK(50,15),FATK(50,15),PROTK(50,15),TOTK
     6(50,15),RELPOR(50,15),TOTCOMP(50),CBNRG(50),FTNRG(50),
     7PRNRG(50),DIFF(50),CARBR(50),FATR(50),PROTR(50),TOTR
     8(50),CARBRK(50),FATRK(50),PROTRK(50),TOTRK(50),CARBE(50
     9,15),CARBEK(50,15),FATE(50,15),PROTE(50,15),TOTE(50,15)
     1,FATEK(50,15),PROTEK(50,15),TOTEK(50,15),A(10),B(10),C
     2(10),T(10),X(10),Y(10)

C         READ CONTROL CARD
C         NANM = NO. OF ANIMAL SPECIES
C         NCAT = NO. OF CATEGORIES IN ANIMALS DIET
C         NPER = NO. PERIODS FOR WHICH THE SIMULATION IS TO BE RUN
      READ(5,101)NANM,NCAT,NPER

C         START SIMULATION LOOP, ONE PERIOD AT A TIME

      DO 99 K=1,NPER

C         READ INPUT PARAMETERS FOR EACH PERIOD

      DO 1 I=1,NCAT
    1 READ(5,100)PNM(I),(PLT(I,J),J=1,NANM)
C         PNM(I) = ALPHAMERIC IDENTIFICATION FOR THE ITH PLANT
C         =SPECIES
C         PLT(I) = PROPORTION OF ITH SPECIES OF PLANT IN THE
C         =DIET OF THE JTH ANIMAL
      READ(5,102)(PLTAV(I),I=1,NCAT)
C         PLTAV(I) = BIOMASS OF THE ITH PLANT SPECIES
C         =AVAILABLE FOR CONSUMPTION
      READ(5,102)(CARB(I),I=1,NCAT)
C         CARB(I) = CARBOHYDRATE CONTENT OF THE ITH PLANT
C         =SPECIES
      READ(5,102)(CBNRG(I),I=1,NCAT)
C         CBNRG(I) = ENERGY CONTENT OF CARBOHYDRATE PORTION
C         =OF ITH PLANT SPECIES
      READ(5,102)(FATS(I),I=1,NCAT)
C         FATS(I) = FAT CONTENT OF THE ITH PLANT SPECIES
      READ(5,102)(FTNRG(I),I=1,NCAT)
C         FTNRG(I) = ENERGY CONTENT OF FAT PORTION OF ITH
C         =PLANT SPECIES
      READ(5,102)(PROT(I),I=1,NCAT)
C         PROT(I) = PROTEIN CONTENT OF THE ITH PLANT SPECIES
      READ(5,102)(PRNRG(I),I=1,NCAT)
C         PRNRG(I) = ENERGY CONTENT OF PROTEIN PORTION OF ITH
C         =PLANT SPECIES
      READ(5,103)(ANM(J),J=1,NANM)
C         ANM(J) = ALPNAMERIC IDENTIFICATION FOR JTH ANIMAL
C         =SPECIES
      READ(5,102)(SP(J),J=1,NANM)
C         SP(J) = NUMBER OF INDIVIDUALS PER UNIT AREA OF THE
C         =JTH ANIMAL SPECIES
```

```
      READ(5,102)(WTS(J),J=1,NANM)
C        WTS(J) = AVERAGE WEIGHT OF STOMACH CONTENTS OF JTH
C        =ANIMAL SPECIES
      READ(5,102)(STFLS(J),J=1,NANM)
C        STFLS(J) = NUMBER OF STOMACH FULLS PER PERIOD EATEN
C        =BY JTH ANIMAL SPECIES
      DO 5 I=1,NCAT
    5 READ(5,102)(UNCONS(I,J),J=1,NANM)


      DO 2 I=1,NCAT
      DO 2 J=1,NANM

      IF(WTS(J).EQ.0.0.OR.STFLS(J).EQ.0.0)GO TO 3

C        COMPUTE TOTAL CONSUMPTION OF ITH SPECIES OF PLANT BY
C        =JTH SPECIES OF ANIMAL..VARIABLE TOTCNS(I,J)

      TOTCNS(I,J)=WTS(J)*STFLS(J)*SP(J)*PLT(I,J)/1000.
      GO TO 2
    3 TOTCNS(I,J)=BIOMETN(I,J)*SP(J)/1000.
    2 CONTINUE
      DO 4 I=1,NCAT
      TOTETN(I)=0.0
      DO 4 J=1,NANM

C        COMPUTE MASS OF CARBOHYDRATES FOR ITH SPECIES
C        =CONSUMED BY JTH ANIMAL SPECIES--VARIABLE CARBG(I,J)

      CARBG(I,J)=CARB(I)*TOTCNS(I,J)

C        COMPUTE MASS OF FAT FOR ITH SPECIES CONSUMED BY JTH
C        =SPECIES OF ANIMAL --VARIABLE FATG(I,J)

      FATG(I,J)=FATS(I)*TOTCNS(I,J)

C        COMPUTE MASS OF PROTEIN FOR ITH SPECIES CONSUMED BY
C        =JTH ANIMAL SPECIES--VARIABLE PROTG(I,J)

      PROTG(I,J)=PROT(I)*TOTCNS(I,J)

C        COMPUTE TOTAL MASS OF CARBOHYDRATES, FATS, AND
C        =PROTEINS OF ITH SPECIES CONSUMED BY THE JTH ANIMAL
C        =SPECIES--VARIABLE TOTG(I,J)

      TOTG(I,J)=CARBG(I,J)+FATG(I,J)+PROTG(I,J)

C        COMPUTE KCAL. OF CARBOHYDRATES IN ITH SPECIES
C        =CONSUMED BY JTH SPECIES OF ANIMAL..VARIABLE CARBK(I,J)

      CARBK(I,J)=CARBG(I,J)*CBNRG(I)

C        COMPUTE KCAL OF FAT IN ITH SPECIES CONSUMED BY JTH
C        =ANIMAL SPECIES --VARIABLE FATK(I,J)

      FATK(I,J)=FATG(I,J)*FTNRG(I)

C        COMPUTE KCAL OF PROTEIN IN ITH SPECIES CONSUMED BY
C        =JTH ANIMAL SPECIES--VARIABLE PROTK(I,J)
```

```
      PROTK(I,J)=PROTG(I,J)*PRNRG(I)
C        COMPUTE TOTAL KCAL OF CARBOHYDRATES, FATS, AND
C        =PROTEINS IN THE ITH SPECIES CONSUMED BY THE JTH
C        =ANIMAL SPECIES--VARIABLE TOTK(I,J)

      TOTK(I,J)=CARBK(I,J)+FATK(I,J)+PROTK(I,J)

C        COMPUTE TOTAL BIOMASS OF ITH PLANT SPECIES EATEN BY
C        =ALL ANIMALS..VARIABLE TOTETN(I)

    4 TOTETN(I)=TOTETN(I)+TOTCNS(I,J)

C        BEGIN COMPETITION CALCULATIONS

      DO 12 J=1,NANM
      TOT=0.0
      TOTCNS1=0.0
      DO 8 I=1,NCAT

C        TOTCNS1 = TOTAL CONSUMPTION FOR JTH ANIMAL SPECIES

C        TOTCNS2 = TOTAL CONSUMPTION OF ALL PLANTS BY ALL
C        =ANIMAL SPECIES EXCEPT THE JTH ANIMAL SPECIES
      TOTCNS1=TOTCNS1+TOTCNS(I,J)

C        TOT = TOTAL CONSUMPTION OF ALL PLANTS BY ALL ANIMALS

      TOT=TOT+TOTETN(I)
    8 CONTINUE

      TOTCNS2=TOT-TOTCNS1
      DO 10 I=1,NCAT

C        TOTO2(I) = TOTAL CONSUMPTION OF THE ITH PLANT
C        =SPECIES BY ALL BUT THE JTH ANIMAL SPECIES

      TOTO2(I)=TOTETN(I)-TOTCNS(I,J)

C        RATIO1(I) = RELATIVE IMPORTANCE OF PLANT SPECIES I
C        =IN THE DIET OF ANIMAL SPECIES J

      RATIO1(I)=TOTCNS(I,J)/TOTCNS1

C        RATIO2(I) = RELATIVE IMPORTANCE OF SPECIES I IN THE
C        =DIETS OF ALL ANIMAL SPECIES BUT SPECIES J

      RATIO2(I)=TOTO2(I)/TOTCNS2

C        COMP(I,J) = RELATIVE COMPETITION OF ALL OTHER ANIMAL
C        =SPECIES AGAINST SPECIES J FOR PLANT SPECIES I

      COMP(I,J)=(TOTO2(I)*RATIO2(I))/(TOTCNS(I,J)*RATIO1(I))

C        COMINV(I,J) = RELATIVE COMPETITION OF JTH SPECIES OF
C        =ANIMAL AGAINST ALL OTHER ANIMAL SPECIES FOR THE ITH
C        =PLANT SPECIES

      COMINV(I,J)=1.0/COMP(I,J)
```

```
   10 CONTINUE
   12 CONTINUE

      DO 31 I=1,NCAT
      TOTCOMP(I)=0.

C        COMPUTE DIFFERENCE BETWEEN BIOMASS CONSUMPTION AND
C        =BIOMASS AVAILABLE FOR ITH PLANT SPECIES--VARIABLE
C        =DIFF(I)

      DIFF(I)=PLTAV(I)-TOTETN(I)

C        COMPUTE PROPORTION OF DIFF(I) WHICH IS CARBOHYDRATES
C        =FOR ITH PLANT SPECIES--VARIABLE CARBR(I)

      CARBR(I)=DIFF(I)*CARB(I)

C        COMPUTE PROPORTION OF DIFF(I) WHICH IS FATS FOR ITH
C        =PLANT SPECIES--VARIABLE FATR(I)

      FATR(I)=DIFF(I)*FATS(I)

C        COMPUTE PROPORTION OF DIFF(I) WHICH IS PROTEIN FOR
C        =ITH PLANT SPECIES--VARIABLE PROTR(I)

      PROTR(I)=DIFF(I)*PROT(I)

C        COMPUTE TOTAL PROPORTION OF DIFF(I) WHICH IS MADE UP
C        =OF CARBOHYDRATES FATS, PROTEINS FOR THE ITH SPECIES
         =OF PLANT--VARIABLE TOTR(I)

      TOTR(I)=CARBR(I)+FATR(I)+PROTR(I)

C        COMPUTE KCAL OF CARBOHYDRATES FOR ITH SPECIES PRESENT
C        =IN DIFF(I) --VARIABLE CARBRK(I)

      CARBRK(I)=CARBR(I)*CBNRG(I)

C        COMPUTE KCAL OF FATS FOR ITH SPECIES PRESENT IN
C        =DIFF(I)--VARIABLE FATRK(I)

      FATRK(I)=FATR(I)*FTNRG(I)

C        COMPUTE KCAL OF PROTEINS FOR ITH SPECIES PRESENT IN
C        =DIFF(I)..VARIABLE PROTRK(I)

      PROTRK(I)=PROTR(I)*PRNRG(I)

C        COMPUTE TOTAL KCAL PRESENT FOR CARBOHYDRATES, FATS,
C        =AND PROTEINS IN ITH SPECIES PRESENT IN DIFF(I)
C        =..VARIABLE TOTRK(I)

      TOTRK(I)=CARBRK(I)+FATRK(I)+PROTRK(I)
      DO 31 J=1,NANM

         COMPUTE TOTAL RELATIVE COMPETITION OF ALL ANIMALS
C        =FOR THE ITH PLANT SPECIES--VARIABLE TOTCOMP(I)

   31 TOTCOMP(I)=TOTCOMP(I)+COMP(I,J)
```

```
C          THE FOLLOWING CONSUMPTION CALCULATIONS BASED ON
C          =CONSUMPTION OF 100 PERCENT OF THE BIOMASS OF THE
C          =ITH SPECIES OF PLANT WHICH IS AVAILABLE

      DO  30 I=1,NCAT
      DO 30 J=1,NANM

C          COMPUTE THE CONSUMPTION OF ITH PLANT FOR JTH ANIMAL
C          =SPECIES OF ALL BIOMASS IS TO BE CONSUMED BASED ON
C          =COMPETITION INDEX..VARIABLE RELPOR(I,J)

      RELPOR(I,J)=(DIFF(I)/((COMP(I,J)/(TOTCOMP(I)-COMP(I,J)))+1.0))
     1+TOTCNS(I,J)

C          COMPUTE CARBOHYDRATE BIOMASS OF ITH SPECIES CONSUMED
C          =BY JTH ANIMAL SPECIES--VARIABLE CARBE(I,J)

      CARBE(I,J)=CARB(I)*RELPOR(I,J)

C          COMPUTE FAT BIOMASS OF ITH SPECIES CONSUMED BY JTH
C          =ANIMAL SPECIES--VARIABLE FATE(I,J)

      FATE(I,J)=FATS(I)*RELPOR(I,J)

C          COMPUTE PROTEIN BIOMASS OF ITH SPECIES CONSUMED BY
C          =JTH ANIMAL SPECIES--VARIABLE PROTE(I,J)

      PROTE(I,J)=PROT(I)*RELPOR(I,J)

C          COMPUTE TOTAL PROTEIN, CARBOHYDRATE, AND FAT BIOMASS
C          =OF ITH SPECIES CONSUMED BY JTH ANIMAL SPECIES--VARIABLE
C          =TOTE(I,J)

      TOTE(I,J)=CARBE(I,J)+FATE(I,J)+PROTE(I,J)

C          COMPUTE KCAL OF CARBOHYDRATE OF ITH SPECIES CONSUMED
C          =BY JTH ANIMAL SPECIES--VARIABLE CARBEK(I,J)

      CARBEK(I,J)=CARBE(I,J)*CBNRG(I)

C          COMPUTE KCAL OF FATS OF ITH SPECIES CONSUMED BY JTH
C          =ANIMAL SPECIES --VARIABLE FATEK(I,J)

      FATEK(I,J)=FATE(I,J)*FTNRG(I)

C          COMPUTE KCAL OF PROTEINS OF ITH SPECIES CONSUMED BY
C          =JTH ANIMAL SPECIES--VARIABLE PROTEK(I,J)

      PROTEK(I,J)=PROTE(I,J)*PRNRG(I)

C          COMPUTE TOTAL KCAL OF PROTEIN,FATS,AND CARBOHYDRATS
C          =OF ITH PLANT SPECIES CONSUMED BY JTH ANIMAL SPECIES-
C          =-VARIABLE TOTEK(I,J)

      TOTEK(I,J)=CARBEK(I,J)+FATEK(I,J)+PROTEK(I,J)
   30 CONTINUE

C          WRITE RESULTS
```

```
      WRITE(6,200)NANM,NCAT,NPER,K
      WRITE(6,201)(ANM(J),J=1,NANM)
      DO 20 I=1,NCAT
   20 WRITE(6,204)PNM(I),(PLT(I,J),J=1,NANM)
      WRITE(6,203)
      DO 21 I=1,NCAT
   21 WRITE(6,202)PNM(I),PLTAV(I),CARB(I),CBNRG(I),FATS(I),
     1FTNRG(I),PROT(I),PRNRG(I)
      WRITE(6,205)
      DO 22 J=1,NANM
   22 WRITE(6,206)ANM(J),SP(J),WTS(J),STFLS(J)
      WRITE(6,210)
      DO 24 J=1,NANM
      DO 24 I=1,NCAT
   24 WRITE(6,212)ANM(J),PNM(I),CARBG(I,J),FATG(I,J),PROTG
     1(I,J),TOTG(I,J),CARBK(I,J),FATK(I,J),PROTK(I,J),TOTK
     2(I,J),UNCONS(I,J)
      WRITE(6,215)
      DO 35 I=1,NCAT
   35 WRITE(6,216)PNM(I),CARBR(I),FATR(I),PROTR(I),TOTR(I),
     1CARBRK(I),FATRK(I),PROTRK(I),TOTRK(I)
      WRITE(6,217)
      DO 36 J=1,NANM
      DO 36 I=1,NCAT
   36 WRITE(6,212)ANM(J),PNM(I),CARBE(I,J),FATE(I,J),PROTE(I
     1,J),TOTE(I,J),CARBEK(I,J),FATEK(I,J),PROTEK(I,J),TOTEK
     2(I,J)
      WRITE(6,208)
      DO 23 J=1,NANM
      WRITE(6,207)ANM(J)
      DO 23 I=1,NCAT
   23 WRITE(6,209)PNM(I),COMP(I,J),COMINV(I,J)

      X(K)=TOTCNS(1,1)    $    Y(K)=PROT(1)

      A(K)=CARBG(1,1) $ T(K)=FLOAT(K) $ B(K)=FATG(1,1) $C(K)
     1=PROTG(1,1)
   99 CONTINUE

C          CORRELATION EXAMPLE--COMPARE CONSUMPTION OF BTJR
C          =WITH PERCENT PROTEIN CONTENT OF BLUE GRAMMA
      CALL CORR(Y,X,NPER,RXY,B1,B0)
      WRITE(6,220)RXY,B0,B1
  220 FORMAT(1H1*CORRELATIONS*/1H0*CONSUMPTION OF BOGR VERSES
     1PERCENT PROTEIN CONTENT FOR BTJR*/1H0*CORRELATION*F8.
     25/1H0*INTERCEPT*E15.4/1H0*SLOPE*E15.4)
C       PLOT EXAMPLE


C          FORMATS USED

C              INPUT FORMATS

  100 FORMAT(A5,15F5.0)
  101 FORMAT(16I5)
  102 FORMAT(16F5.0)
  103 FORMAT(15A5)

C              OUTPUT FORMATS
```

```
  200 FORMAT(1H1*NO. ANIMAL SPECIES*I5*  NO. DIET CATEGORIES*
     1**I5*  NO. PERIODS OF SIMULATION*I5*  THIS IS PERIOD*I5)
  201 FORMAT(1H ,10X,10(A5,4X))
  202 FORMAT(1H0,A5,F10.2,5X,3(F5.2,F12.2,3X))
  203 FORMAT(1H0,6X*BIOMASS AVAIL      CARBOHYDRATES*11X*FATS*
     1**14X*PROTEINS*/1H ,11X*G.*7X,3(3X*PC*7X*KCAL/G*2X))
  204 FORMAT(1H0,A5,10F9.2)
  205 FORMAT(1H0*ANIMALS     NUMBER    STOMACH WT    STOMACH *
     1*FULLS*)
  206 FORMAT(1H0,A5,3F12.2)
  208 FORMAT(1H0*COMPETITION INDICES*)
  207 FORMAT(1H0,A5,10X,*COMPETITION FELT   COMPETITION GIVEN*)
  209 FORMAT(1H0,10X,A5,F10.2,F20.2)
  210 FORMAT(1H0,38X*ACTUAL CONS*
     1*UMPTION*24X*UNCONSTRAINED CONSUMPTION*/1H *ANIMAL  PLA*
     2*NT*17X*G.*29X*KCAL*/1H ,15X,2(*  CARB     FATS     PRO*
     2*T     TOTL  *))
  212 FORMAT(1H0,A5,3X,A5,2X,8(F7.2,1X),F16.2)
  215 FORMAT(1H0*PLANT*35X*REMAINING BIOMASS*/1H ,30X*G.*29X
     1*KCAL*/1H ,15X,2(*  CARB     FATS     PROT     TOTL  *))
  216 FORMAT(1H0,A5,10X,8(F7.2,1X))
  217 FORMAT(1H0,20X*CONSUMPTION IF ALL BIOMASS IS EATEN*/1H
     1 *ANIMAL  PLANT*17X*G.*29X*KCAL*/1H ,15X,2(*  CARB     F*
     2*ATS     PROT     TOTL  *))
      END
      SUBROUTINE CORR(Y,X,N,RXY,B1,B0)
C
C     THIS SUBROUTINE CALCULATES A LINEAR CORRELATION BETWEEN TWO VARI
C     OR A REGRESSION OF ONE VARIABLE ON ANOTHER AND RETURNS THE
C     CORRELATION COEFFICIENT, INTERCEPT AND SLOPE OF THE LINE.
C
C     VARIABLES USED
C        X=SINGLE DIMENSIONED ARRAY OF INDEPENDENT VARIABLE
C        Y=SINGLE DIMENSIONED ARRAY OF DEPENDENT VARIABLE
C        N= NO. OF OBSERVATIONS
C        RXY=CORRELATION COEFFICIENT
C        B1=SLOPE OF LINE
C        B0=INTERCEPT OF LINE
C
      DIMENSION X(100),Y(100)
      SX=SY=SSX=SSY=SSXY=0.0
      DO 1 I=1,N
      SX=SX+X(I)
      SY=SY+Y(I)
      SSY=SSY+Y(I)*Y(I)
      SSX=SSX+X(I)*X(I)
    1 SSXY=SSXY+X(I)*Y(I)
      SCP=SSXY-(SX*SY)/FLOAT(N)
      RXY=SCP/SQRT((SSX-(SX*SX)/FLOAT(N))*(SSY-(SY*SY)/FLOAT(N)))
      B1 = SCP/(SSX-(SX*SX)/FLOAT(N))
      B0 = (SY/FLOAT(N))-B1*(SX/FLOAT(N))
      RETURN
      END
END OF JOB
*END
```

APPENDIX G

SUMMARY PRINTOUT
PROGRAM DIETCMP

No. Animal Species 2   No. Diet Categories 2   No. Periods of Simulation 9

Diet Composition   This is Period 2

	BTJR	WTJR
BOGR	.80	.90
BUDA	.20	.10

	BIOMASS AVAIL	CARBOHYDRATES		FATS		PROTEINS	
	G.	PC	KCAL/G	PC	KCAL/G	PC	KCAL/G
BOGR	90.00	.50	4.15	.30	9.40	.20	5.65
BUDA	40.00	.50	4.15	.30	9.40	.20	5.65

ANIMALS	NUMBER	STOMACH WT	STOMACH FULLS
BTJR	100.00	30.00	14.00
WTJR	100.00	30.00	14.00

ACTUAL CONSUMPTION

ANIMAL	PLANT	G.				KCAL			
		CARB	FATS	PROT	TOTL	CARB	FATS	PROT	TOTL
BTJR	BOGR	16.80	10.08	6.72	33.60	69.72	94.75	37.97	202.44
BTJR	BUDA	4.20	2.52	1.68	8.40	17.43	23.69	9.49	50.61
WTJR	BOGR	18.90	11.34	7.56	37.80	78.43	106.60	42.71	227.74
WTJR	BUDA	2.10	1.26	.84	4.20	8.71	11.84	4.75	25.30

REMAINING BIOMASS

PLANT	G.				KCAL			
	CARB	FATS	PROT	TOTL	CARB	FATS	PROT	TOTL
[illegible]	9.30	5.58	3.72	18.60	38.60	52.45	21.02	112.07
BUDA	13.70	8.22	5.48	27.40	56.85	77.27	30.96	165.08

CONSUMPTION IF ALL BIOMASS IS EATEN

ANIMAL	PLANT	G.				KCAL			
		CARB	FATS	PROT	TOTL	CARB	FATS	PROT	TOTL
BTJR	BOGR	20.37	12.22	8.15	40.75	84.55	114.91	46.05	245.51
BTJR	BUDA	17.09	10.26	6.84	34.19	70.94	96.41	38.63	205.98
WTJR	BOGR	24.63	14.78	9.85	49.25	102.20	138.89	55.65	296.74
WTJR	BUDA	2.91	1.74	1.16	5.81	12.06	16.39	6.57	35.02

COMPETITION INDICES

BTJR		COMPETITION FELT	COMPETITION GIVEN
	BOGR	1.27	.79
	BUDA	.25	4.00

WTJR		COMPETITION FELT	COMPETITION GIVEN
	BOGR	.79	1.27
	BUDA	4.00	.25

UNCONSTRAINED CONSUMPTION

ANIMAL	PLANT	
BTJR	BOGR	50.00
BTJR	BUDA	25.00
WTJR	BOGR	50.00
WTJR	BUDA	25.00