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Metropolitan Mosquito Control District

Ixodes scapularis Distribution Study Report

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DEER TICK SURVEILLANCE PROGRAM
1990 TICK DISTRIBUTION STUDY

Abstract:

A deer tick (Ixodes dammini) distribution study was conducted in the seven county metropolitan area by the Metropolitan Mosquito Control District. Small mammal trapping and drag cloth sampling were used to collect ticks from 250 woodlots chosen for the study. We found at least one I. dammini at 88 of these sites. A baseline I. dammini distribution map was formulated.

Introduction:

Deer ticks and human cases of Lyme disease have been reported from several counties in Minnesota (mainly North and East of the Twin Cities metropolitan area). However, confirmed human cases appear to have occurred within the seven county metropolitan area as well.

In 1990 the Metropolitan Mosquito Control District initiated a Lyme Disease Tick Surveillance Program. The main goals of the program are to determine the distribution, density, and infection rates (with Borrelia burgdorferi) of deer ticks within the seven county area.

Prior to this study there had been no efforts to determine the deer tick distribution over the entire seven county metropolitan area. Our 1990 study provides baseline deer tick distribution data for the Twin Cities metropolitan area.

Methods and Materials:

Sampling site selection

We divided our sampling effort in the following way:
- 70% in Anoka and Washington counties
- 30% in Dakota, Ramsey, Hennepin, Scott, and Carver counties

We defined Anoka and Washington counties as our highest priority sampling areas due to the higher number of confirmed Lyme disease cases (human), and the number of deer ticks turned in by our field staff. In addition, the density of deer in these two counties is somewhat higher than the other metropolitan counties (average of 5-9 deer/square mile vs. 2-4 deer (MDNR, Carlos Avery Game Farm, personal commun.)).

Specific sampling locations varied by county:
- Anoka, Washington- systematic random sampling of woodlots (n=175 sites)
- Dakota, Ramsey, Hennepin, Scott, and Carver- high public use areas (n= 75 sites)

A total of 250 woodlots were chosen for the study.

Deer tick collection methods

We used small mammal trapping and drag sampling to search for I. dammini. At each sampling location we set up a 300 foot transect through the woods or brush of the site. Sherman live traps baited with peanut butter and oats were placed along these transects at 50 foot intervals. Any rodents caught in the traps were euthanized and searched for ticks. All ticks found were removed with forceps and stored in alcohol for later identification. Drag samples were taken along the same transect lines using a standard tick drag (1 square yard flannel cloth attached to a pole). The cloth was inspected for ticks after each drag was taken. Any ticks found were removed and stored for later identification.

Sampling was initiated on 4/23/90 and ended on 10/26/90. Approximately 30 sites were sampled each week during this 27 week period. Each site was sampled for three one week periods during the year. Each week consisted of three trap nights and three drag samples.

Results:

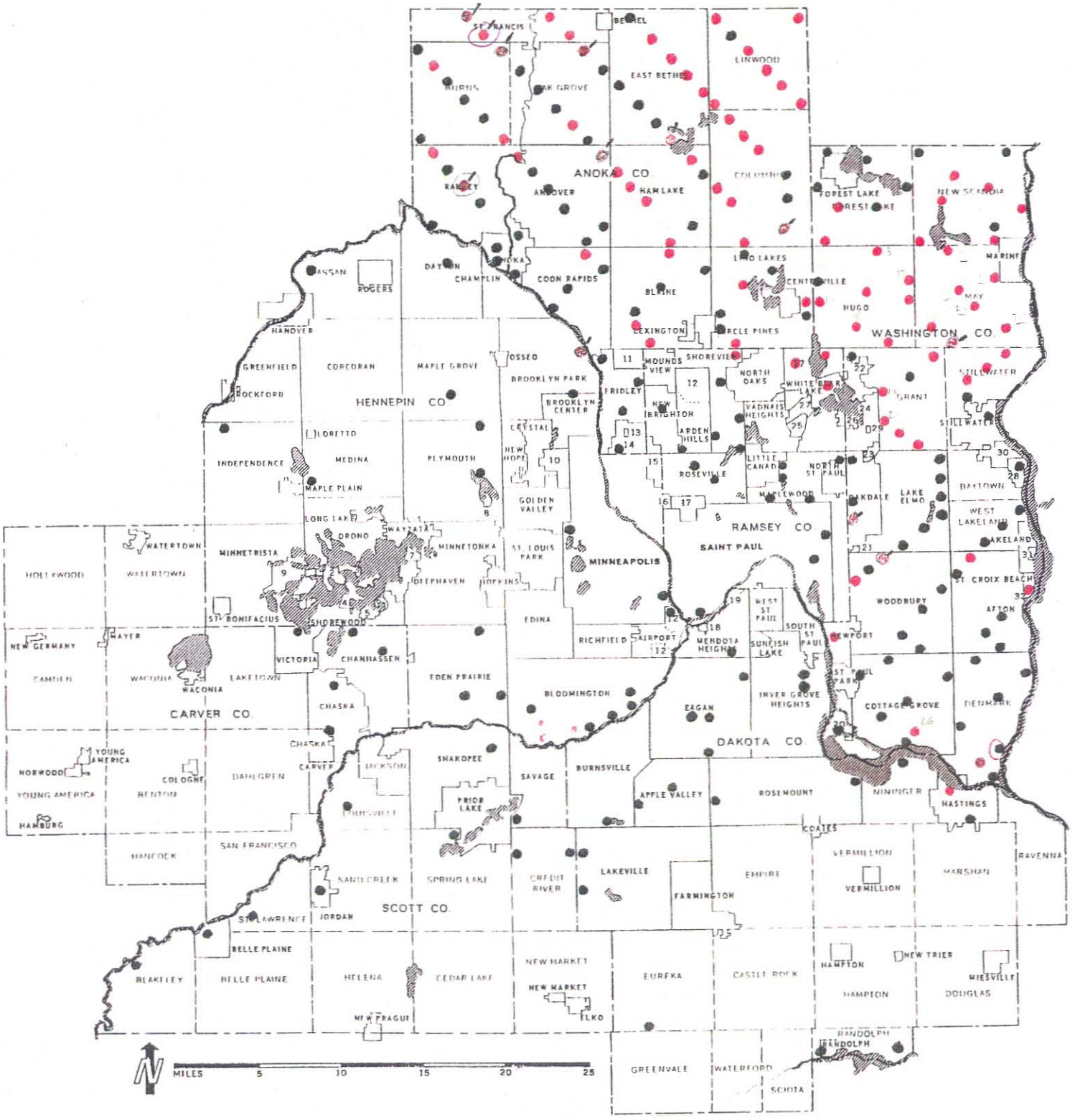
During our 1990 study we collected a total of 10,209 ticks of which 660 were I. dammini. We found at least one I. dammini at 88/250 sampling sites. All but six of the positive sampling sites were in Anoka and Washington counties (Fig 1).

Small mammal sampling gave us the majority of our tick data. We inspected a total of 3651 mammals (Fig. 2) and removed 9957 ticks (647 I. dammini) from them (Fig.3). The most prelavent tick species and stage collected were larval Dermacentor variabilis at a season mean of 2.54/mammal. The season mean number of I. dammini/mammal was .177 (larvae: .157/mammal, nymphs: .020/mammal). Very low total numbers of I. dammini were collected at most of our sites (Fig 4).

The number of ticks collected each week showed definite seasonal trends. The average number of both I. dammini larvae and nymphs collected/week peaked in late May-early June. Lower numbers of larvae and nymphs were collected during the rest of the season (Figs. 5, 6). D. variabilis larvae peaked in late April-early May and were essentially gone by mid-July, while the nymphal populations peaked in June and July.

Drag sampling was much less successful at sampling I. dammini populations. Of 2240 drag samples, 1559 (70%) samples were negative for all tick species. Another 527 (23%) samples could not be taken because of rain. Of the 154 (7%) samples taken that had ticks, only 13 had I. dammini. Although only 13 of the 252 ticks collected were I. dammini, we did find three additional sites where I. dammini was not detected through mammal sampling.

1990 Ixodes dammini Presence/Absence Study
Map of Sampling Locations (n=250)

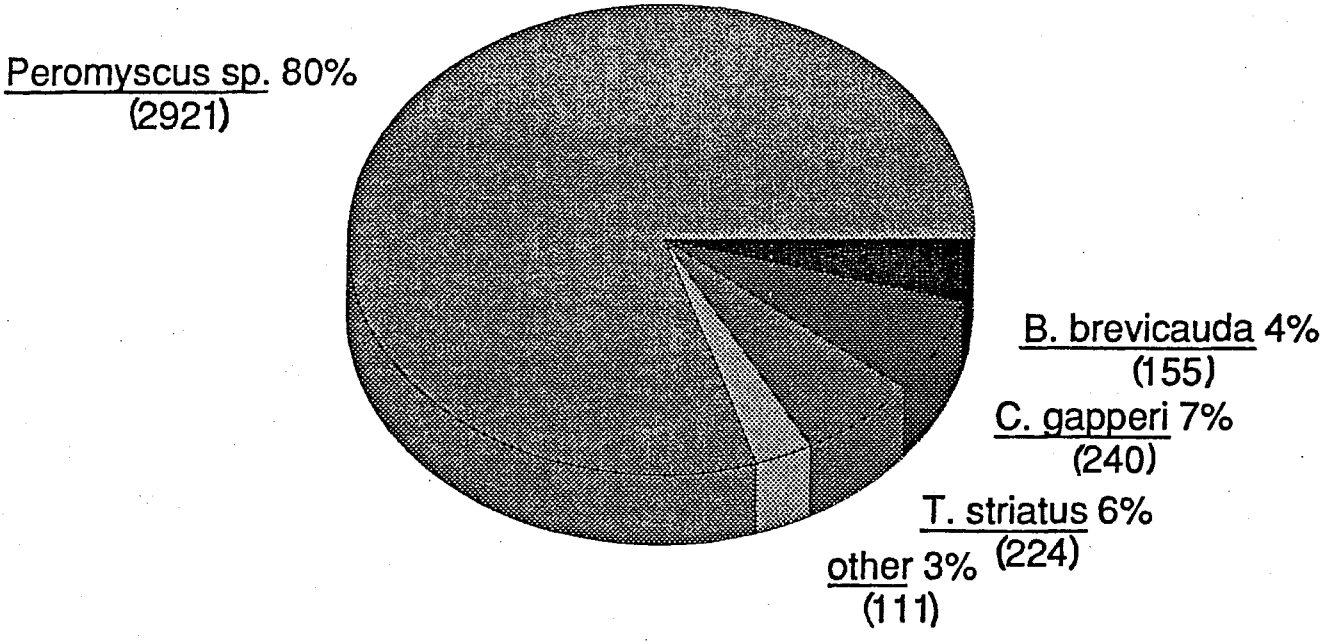


Key:

- Ixodes dammini found at the site
- Ixodes dammini not found at the site

Figure 2

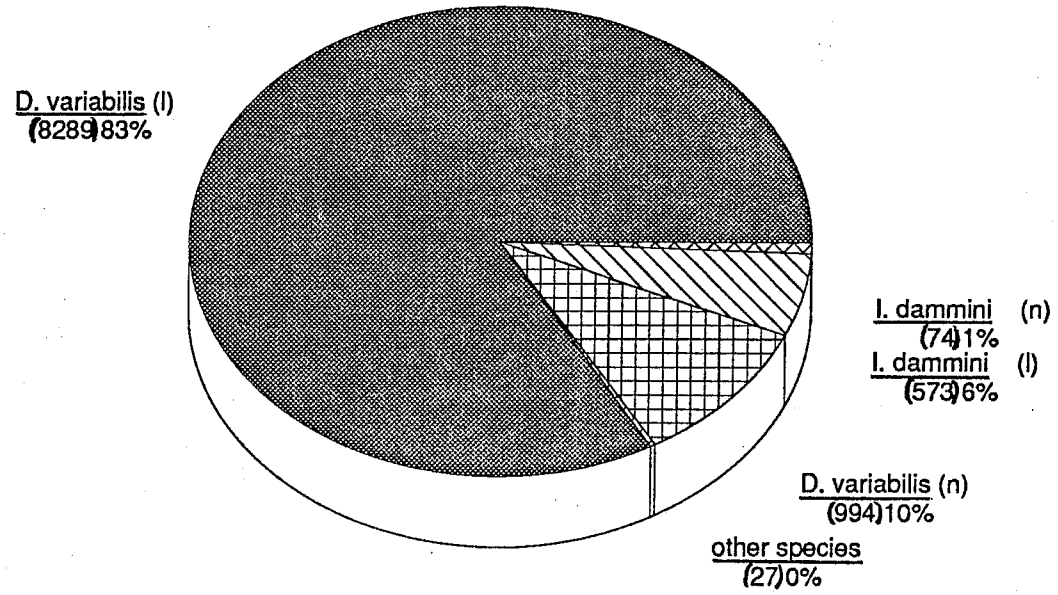
Small Mammals Collected 1990



n=3651 mammals

Figure 3

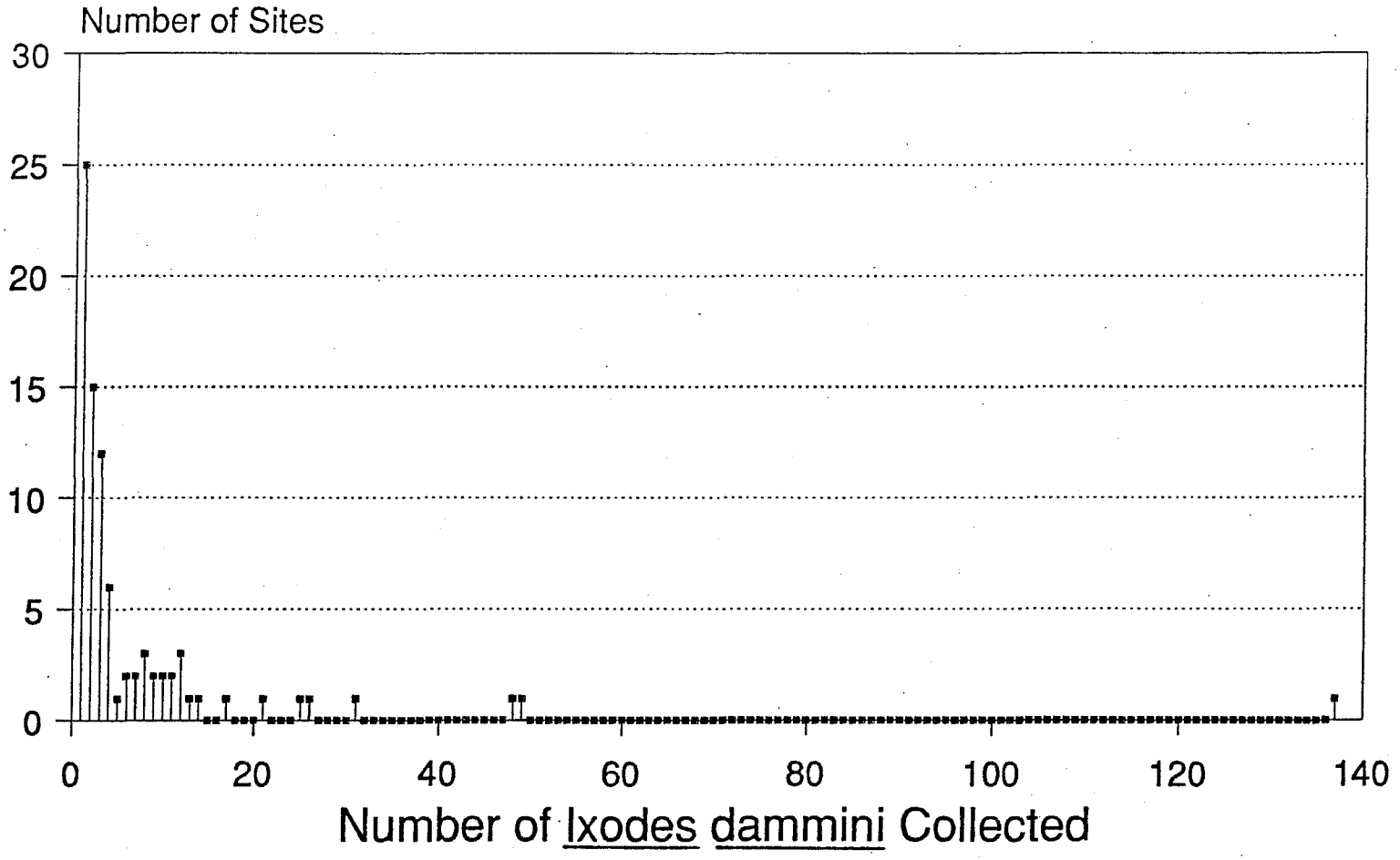
Total Ticks Collected From Small Mammals By Tick Species and Stage: 1990



n=9957 ticks

Figure 4

Frequency Distribution Of Ixodes dammini
Collected From Mammals
At 85 Sampling Locations (1990)



We found no I. dammini at 165/250 sites

Figure 5

Ixodes dammini Larvae

Average Number Collected By Week: 1990

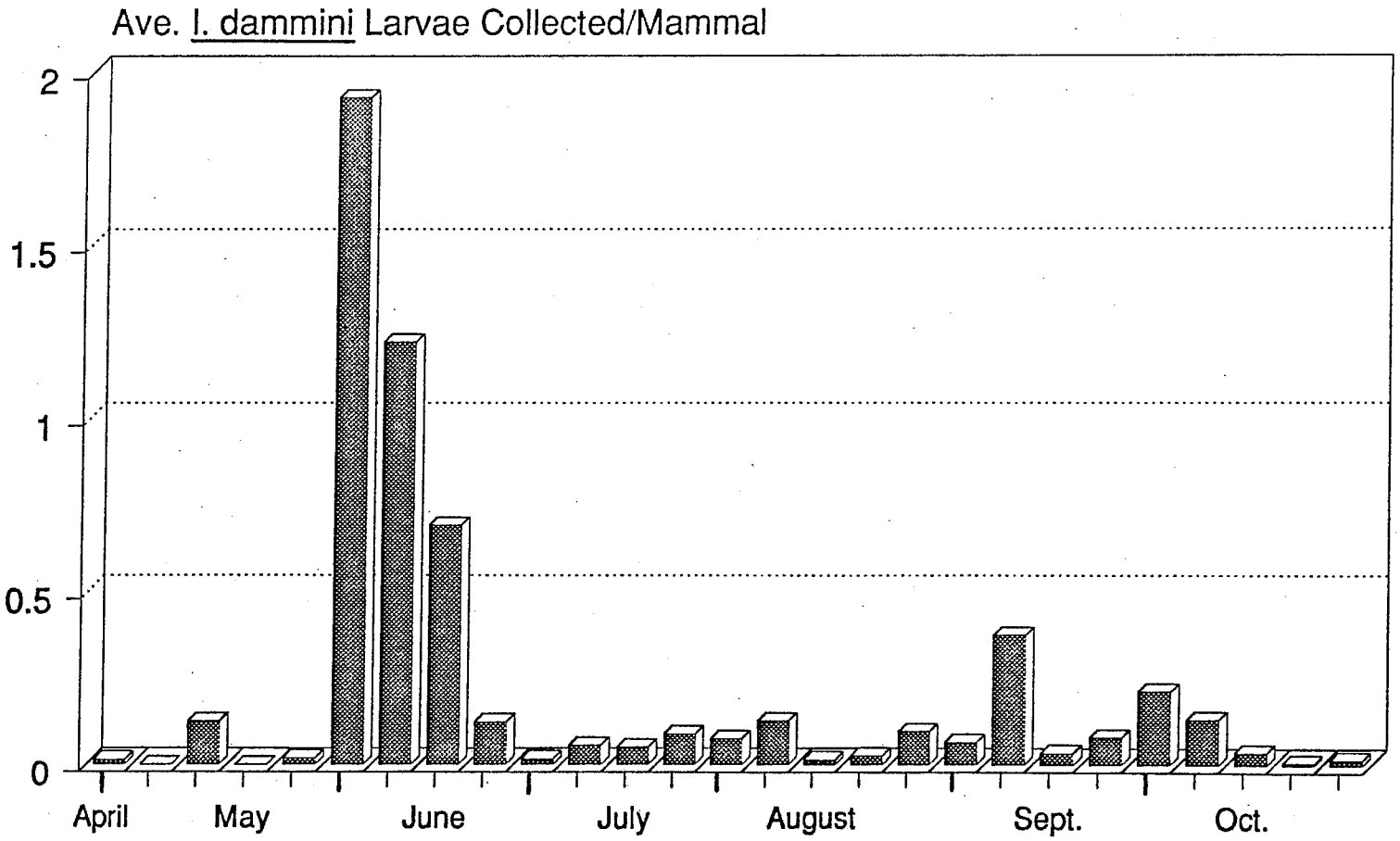
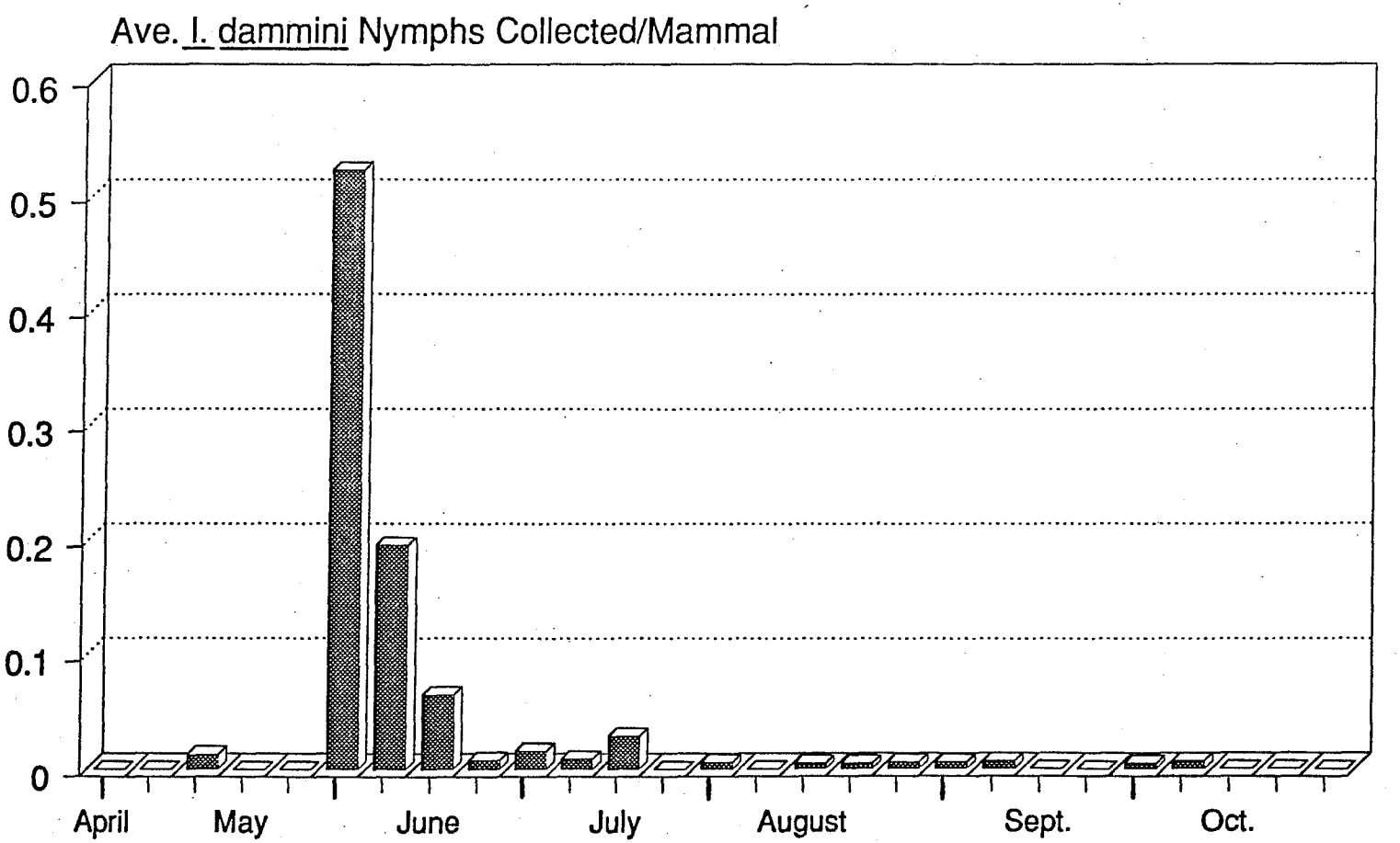


Figure 6

Ixodes dammini Nymphs

Average Number Collected By Week: 1990



Discussion:

During the 1990 distribution study we found *I. dammini* where we expected to find them. In general, the further north and east a sampling site was, the more likely it was to have a population of *I. dammini*.

We believe we took a good initial survey even though five of the seven District counties were not monitored as intensely as Washington and Anoka counties. We found *I. dammini* in only 6/75 sites in these five counties, versus 82/175 sites in Washington and Anoka counties. Most of the 75 sites sampled were selected in the best potential sites in their areas (ie. large woodlots with good deer populations). For example, we sampled several locations in the Minnesota River valley between St. Paul and Belle Plaine. This area is known for its high deer numbers, yet we found no evidence of *I. dammini*.

In the sites where we did find *I. dammini* this year the numbers we collected seem to indicate low populations of ticks. At 25 of our 88 positive sampling sites we only collected one *I. dammini* all season. Our season averages were .157 and .020 *I. dammini*/mammal (larvae and nymphs respectively). Even if all sites with 0 *I. dammini* are excluded, the means only increase to .371 and .048 *I. dammini*/mammal.

If *I. dammini* numbers are higher than our sampling indicated then we may have problems with our study methods. Trap disturbance (mainly by raccoons) probably reduced the number of mammals collected significantly, in turn reducing the total numbers of ticks collected. In addition, drag sampling was nearly impossible to conduct effectively for most of the season. The amount of brush in most of our sampling sites made it difficult to get the drag cloth down into the leaf litter where immature *I. dammini* would have been questing.

If *I. dammini* numbers are low as we speculate, the above problems become more important. In addition, the time of year sampled becomes more important. We potentially left *I. dammini* populations undetected due to our site visitation schedule of three random weekly visits per site per year. With a low tick population, it would be much easier for us to miss the peak numbers of *I. dammini* larvae and nymphs and possibly miss detecting the ticks at all. However, our data seems to indicate that if we are missing the detection of an

I. dammini population, it is probably either a very small population or in the initial stages of establishment.

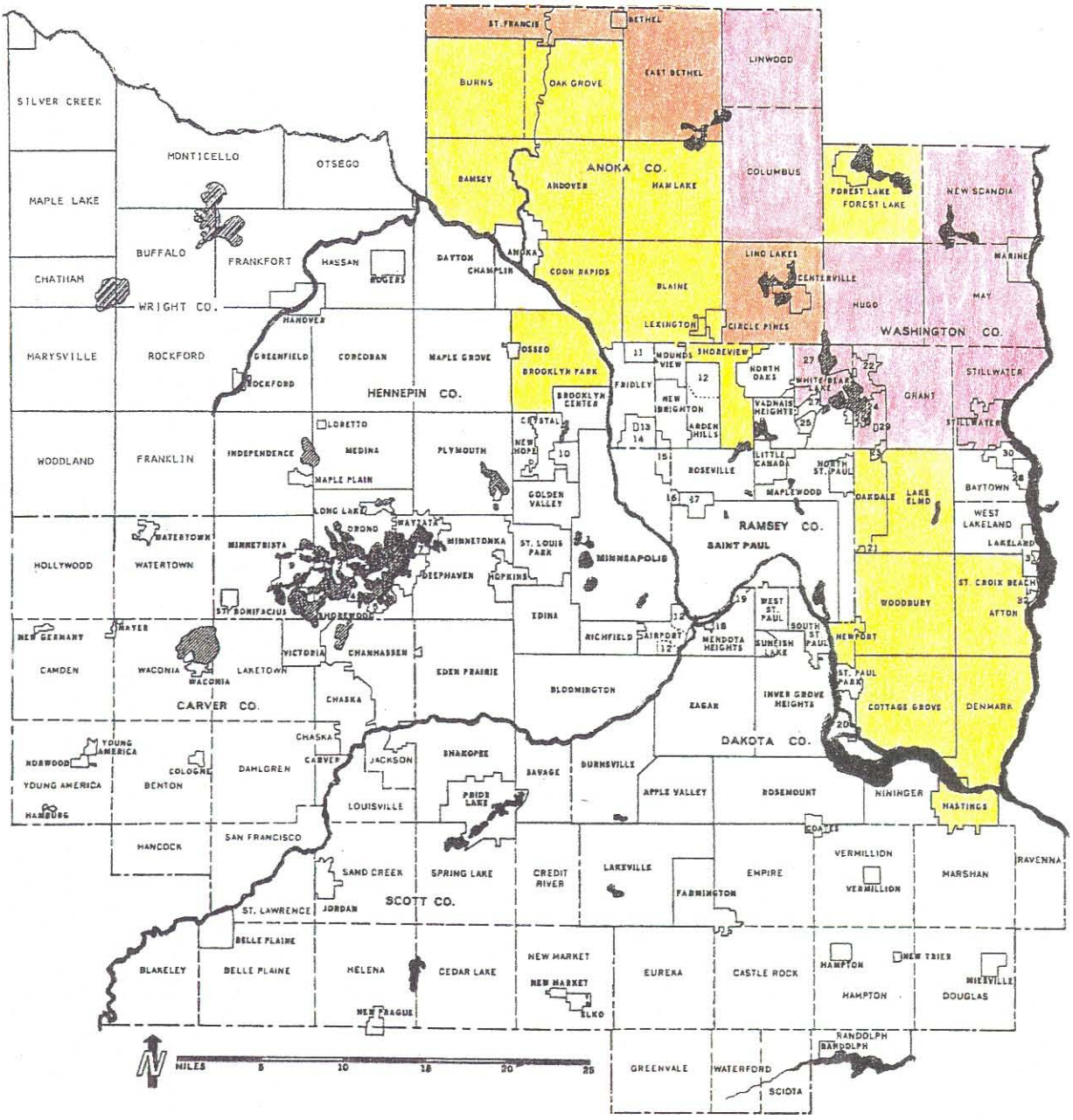
Further sampling is definitely needed through the middle of our District (Dakota, Scott, and Hennepin counties). The current edge of the local *I. dammini* distribution (except for isolated infestations) may be somewhere near the Mississippi River valley. In 1991 we plan to continue the distribution study. We plan to sample northern Dakota, Scott and Ramsey counties, most of Hennepin county, and southern Anoka and Washington counties.

Note:

Our 1990 study was specifically designed to address the deer tick distribution question. Therefore we did not discuss deer tick density in the report. However, we feel that looking at the percentage of small mammals that had deer ticks may be a sensitive method of determining the approximate relative deer tick abundance on a regional basis.

this map looked basically the same when using percentages of sites (+) in a township (vs. sites (-)).

Percentage Of Small Mammals With Ixodes dammini By Township (1990)



In townships where I. dammini was found:

% of small mammals with I. dammini

- = ≥10%
- = ≥5%<10%
- = <5%

IXODES DAMMINI DISTRIBUTION
1991 STUDY PROPOSAL

Introduction:

In 1990 we began a study to determine the distribution of deer ticks (Ixodes dammini) within the seven county Metropolitan area (Minneapolis-St. Paul, MN). During that study we sampled 250 woodlots, concentrating much of our efforts in the northeastern parts of the District. We found I. dammini at 88 of these sites (mainly in Anoka and Washington counties).

In 1991 we plan to continue the distribution study, shifting the focus to the middle of the District along the Mississippi River. In our 1990 study the number of sites positive for I. dammini seemed to decrease as the river was approached. South and West of the river we found the ticks at only 2/55 sites.

Methods and Materials:

Sampling site selection

South of the Mississippi River, our sampling efforts will be concentrated in Hennepin and northern Dakota counties. Portions of Scott and Carver counties will be sampled,also. North of the Mississippi River we plan to sample sites in southern Anoka, northern Ramsey, and southern Washington counties.

Field sampling methods

We will use the same methods as in the 1990 study, although we may not continue drag sampling.

Results Expected:

1. We will complete our baseline I. dammini distribution study (including a distribution map).
2. We will have a rough idea of relative tick densities and infection rates.