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ACARI, INSECTA AND NEMATODA OF WATERSHED 10, H. J. ANDREWS EXPERIMENTAL FOREST

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ABSTRACT

Populations of mites and nematodes were monitored on Watershed 10, H. J. Andrews Forest. A minimum of 50 families and 60 genera of mites are present, the majority being *Cryptostigmata*. Population estimates vary from 5000-350,000 per square meter. Nine categories of nematodes are present, most belonging to the saprozoic, dorylaimoid, aquatic and mononchoid groups. Population estimates vary from 400,000-2,000,000 per square meter. Preliminary correlations of population vs. moisture (climate) are made.

PART I - ACARI AND INSECTA

ABSTRACT

Three vegetation zones of the H. J. Andrews Forest, Watershed 10 were monitored for mite and insect populations using a cluster core sampling technique. Results show a minimum of 50 acarine families and 60 genera present, strongly representing the suborder *Cryptostigmata*. Population estimates vary from 5000-350,000 mites per square meter, depending on the time of year. Population densities are higher on the south-facing slope during the winter and the north-facing slope during the summer.

MATERIALS AND METHODS

Three of the larger vegetation zones of Watershed 10 were sampled at three- to four-week intervals. The zones were sampled at four sites along 30.5 m (100 foot) line transects. A cluster of three cylindrical core samples

(5 cm diameter x 7-10 cm deep) were taken from each site. Each core of the cluster was at a corner of an equilateral triangle 0.3 m (1 foot) on a side. This provided 12 cores for each transect. The cores were processed for 10 days in a high gradient Tullgren extractor for microarthropods. The design of the extractor eliminates arthropods larger than 1.7 mm diameter from the extracts.

Specimens were collected and preserved in 70% ethanol, and were counted under a dissecting microscope using a white background for the larger darker animals, and a white background with a 1 mm black stripe for small, immature light-colored specimens. Dry weights of some specimens were obtained with a Mettler Balance, Model H10.

RESULTS

The predominant insects collected were *Collembola*, whose numbers ranged from 3-300 per sampling date. Pseudoscorpions were collected in numbers from 0-22 per sampling date. The number of other insects, spiders and ticjs was insignificant.

Mites were the most numerous arthropods collected, the total ranging from 400-11,000 per sampling date. Estimates of mites per square meter are shown in Figure 1.

To date, 50 families and superfamilies representing four suborders of *Acarina* have been identified. These contain a minimum of 60 genera, many of which have not been identified. Sixteen genera have been found to be consistently abundant, representing 20-25% of all mites collected. Immature mites and those unidentifiable with a dissecting microscope account for another 30-50%. It is estimated that the litter and soil mite fauna of Watershed 10 will number over 100 species, many of which are undescribed.

The majority of the mites collected (72-97%, see Figure 2) belong to the suborder *Cryptostigmata* which are generally considered to be fungivorous, algivorous or saprophagous. They are typically heavily sclerotized and are not as susceptible to desiccation during the dry periods of the year as some of the more lightly sclerotized mites. Consequently, the percentage of *Cryptostigmata* present may rise during the summer (Figure 2) while the actual number of mites may be decreasing (Figures 1 and 3).

Specific information regarding a given species of *Cryptostigmata* is difficult to obtain, especially relating to life histories or behavior. Attempts to establish cultures of the more common *Acari* are being made to provide populations for study of their life histories, behavior, feeding habits and effects on litter decomposition.

The total population appears to fluctuate with moisture, being higher during the warm moist spring months and lower during the arid summer and fall (Figures 1 and 3). Winter data is still incomplete. There are also population differences between north- and south-facing slopes (Figure 3), the north-facing slope having a higher population during the summer but apparently lower during the winter and spring (see spring months, Figure 3). This would be expected if the north-facing slope is more moist than the south-facing slope during the summer (which it is) making the habitat more favorable. During the winter the south-facing slope probably would be warmer and, consequently, more favorable to a higher population density than on the north-facing slope. The variety of mites (number of families present) is not appreciably different between the two slopes. With the data presently available the average population of mites on Watershed 10 is estimated to vary, during the year, from 5,000-350,000 per square meter.

Dry weights have been obtained for 13 of the 16 common groups and range from 2-80 μg (1 μg = .000001 g) per individual. These and other weights (which are yet to be obtained) will be used for biomass estimates.

PART II - NEMATODA

ABSTRACT

Nine categories of nematodes and eight groups of other invertebrates were monitored for numbers from numerous sites including logs, litter and soil (Andrews Forest - Watershed 10). Analysis of nearly one year's data enables us to make preliminary correlations with moisture and to some extent temperature. Thus high moisture levels are usually low temperatures favor high populations and vice versa. A much higher population density occurs on the north-facing slope than on the south slope. Population estimates vary from 400,000 - 2,000,000 nematodes per square meter depending on time of sampling.

GOAL

The overall objective of our investigation is to determine the role of nematodes in the decomposition of forest litter. We plan to achieve this goal by detailed examinations of periodic samples from representative sites in Watershed 10 of the H. J. Andrews near Blue River, Oregon.

MATERIALS AND METHODS

Three representative vegetation zones of Watershed 10 were sampled at three-week intervals (weather permitting) during 1972-1973. Samples from sites in each of these zones invluded soil, litter from the forest floor, logs and occasionally lichens and moss from trees including some from the forest canopy. All samples were processed for nematodes and certain other small invertebrates by Baermann Funnel extractions. Following an extraction interval of three or four days the various animals were counted and assigned in various groupings.

Specific numbers of a species, genus or group of nematodes and certain other small invertebrates were selected at random for food chain studies. Selected individuals were surface sterilized in a dilute solution of chlorine (25 ppm Chlorox for 20 minutes) then crushed and plated on various agar media to determine bacterial and fungal contents.

RESULTS

Differences in the variety of nematodes and certain other invertebrates among the four sampled zones appear to be minor, however, fluctuations in numbers throughout the season may be significant. Over a season the most abundant categories in declining order are saprozoic, dorylaimoid, aquatic and mononchoid groups (Table 1). The food sources of two groups are fairly well known, e.g., saprozoic nematodes--feed on bacteria and Mononchoid--other nematodes. The other two groups are assumed to feed on bacteria, fungi, small invertebrates and possibly plants (mosses and algae). In general high populations of all groups can be expected to occur with the abundance of a particular food source.

Initial estimates (Figure 4) show a nematode population varying from 400,000-2,000,000 per square meter (combined average for the watershed over the season). Also large populations of these organisms seem to correlate with high moisture conditions and vice versa. We are attempting to correlate numbers with temperature even though an association with moisture seems more exact.

Nematodes appear to have a higher population density on the north-facing slope than on the south-facing slope (Figure 5). This is a yearly trend although only slight differences occurred during late spring and early summer. It also should be noted that populations from leaf and twig litter and from moss far surpassed those of logs and soil (Table 2).

Initially water samples were monitored for nematodes and small invertebrates from the dams in Watersheds 2 and 10. The extremely low recovery rate of these organisms from several consecutive sampling discouraged additional monitoring of the stream system.

Food chain data are being processed routinely but identification of isolated bacteria is an obstacle. Varieties of ingested organisms appear limited with bacteria and fungi most common.

FUTURE PLANS

We plan to convert population densities into biomass figures. Our monitoring plans will continue in certain instances we plan to process supplemental samples of canopy material as well aa specific litter types. Also we plan to develop a position for these animals in decomposition and food chain cycles.

Table 1. Number of nematodes collected, by groups, for the period March - November 1972

Group	Number
Saprozoic	14,518
Aquatic	8,470
Dorylaimoid	10,637
Tylenchidae	827
Plectus	592
Monochus	1,456
Helicotylenchus	112
Pratylenchus	3
Tripyla	496

Table 2. Number of nematodes collected litter and soil per sampling period March-November 1972

Date	Litter	Soil
Mar 16	1894	--
Apr 6	876	460
Apr 26	1436	--
May 17	3905	701
June 7	2610	1937
June 28	5298	390
July 16	1394	709
Aug 14	1031	482
Sept 13	2635	38
Oct 5	5277	277
Oct 26	2632	280
Nov 15	3014	196

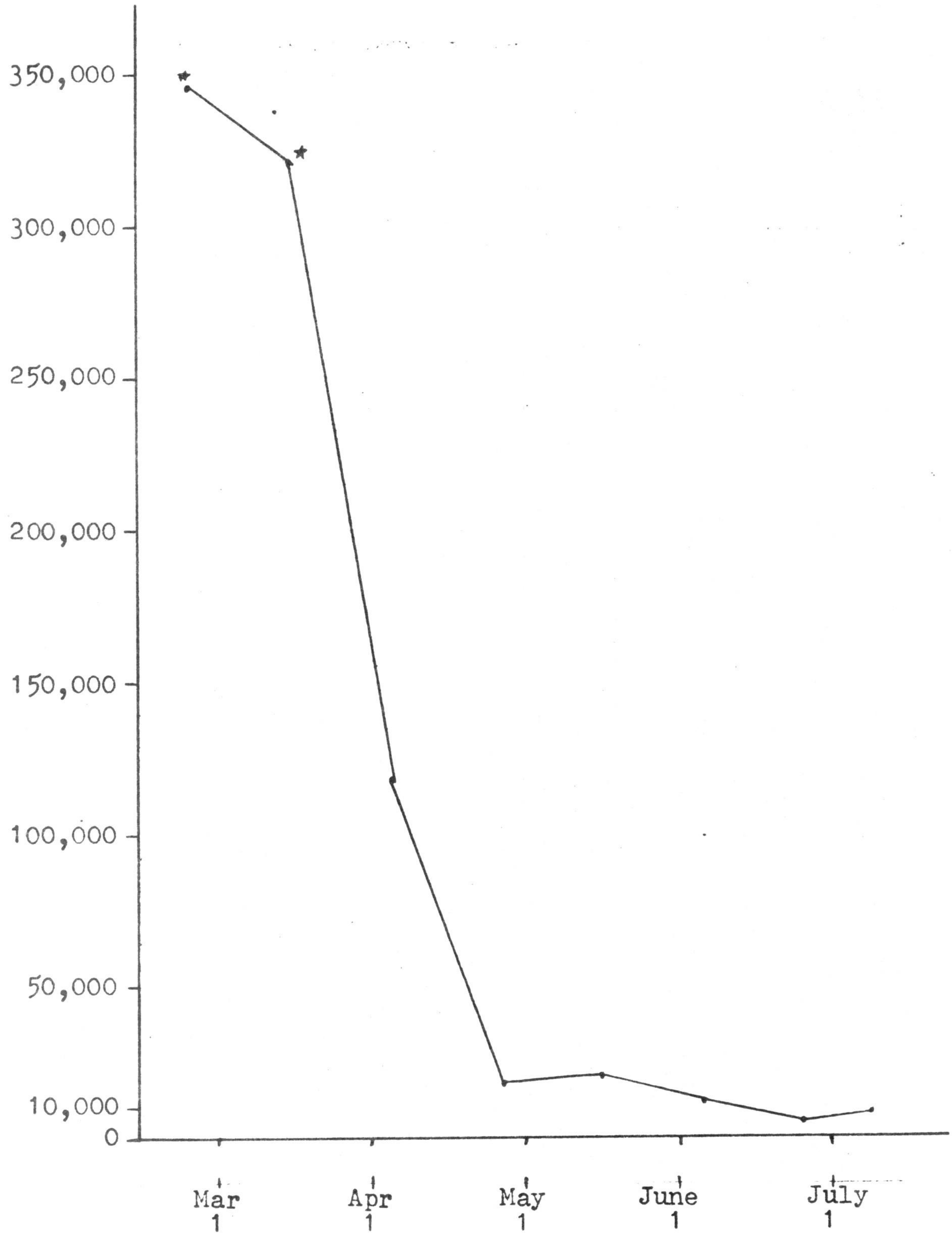

Figure 1. Average number of mites per square meter per collecting date. Estimates based on the sum of data from all zones. (★ =small sample size)

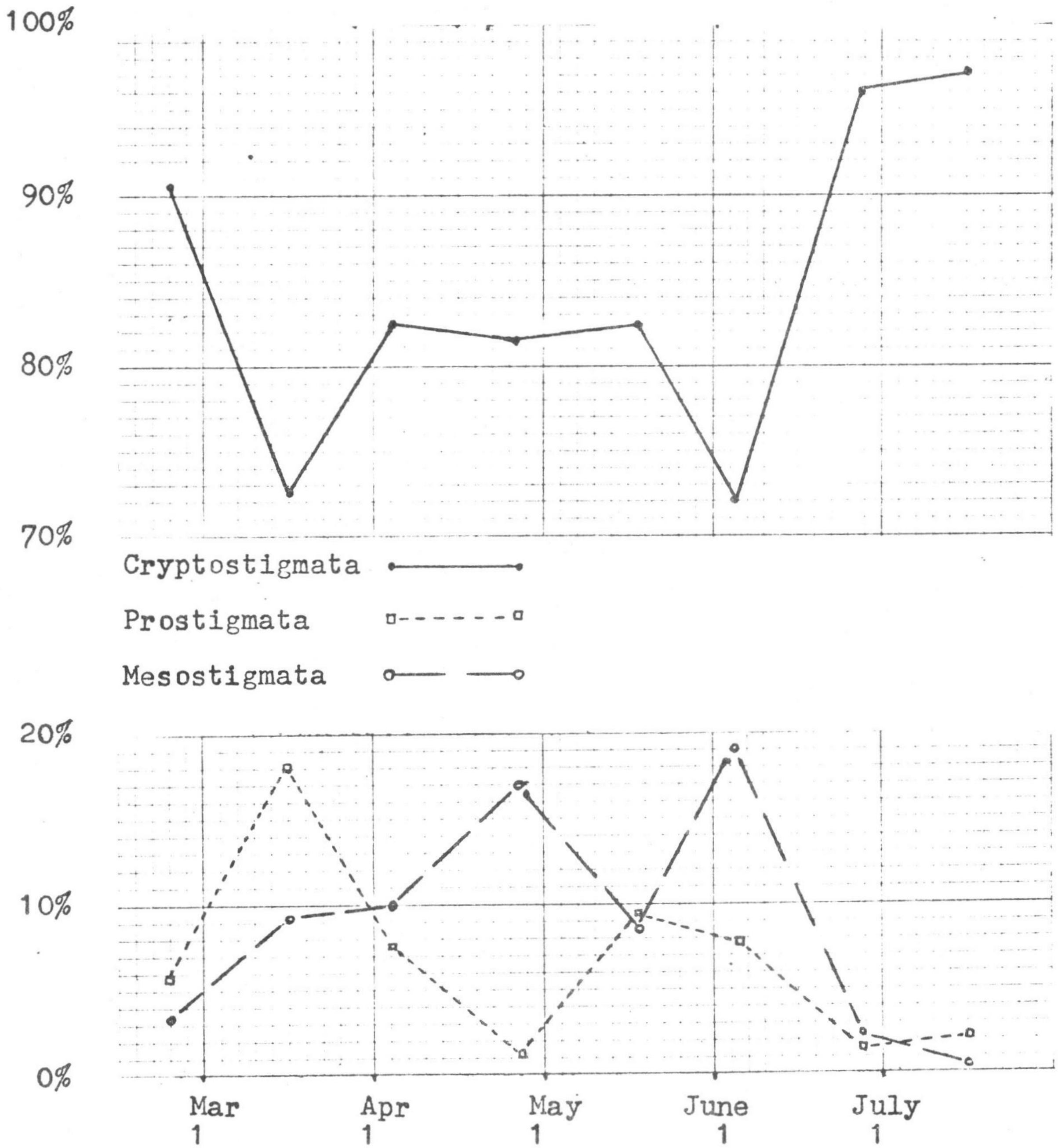

Figure 2. Percent of acarine suborders present in samples.

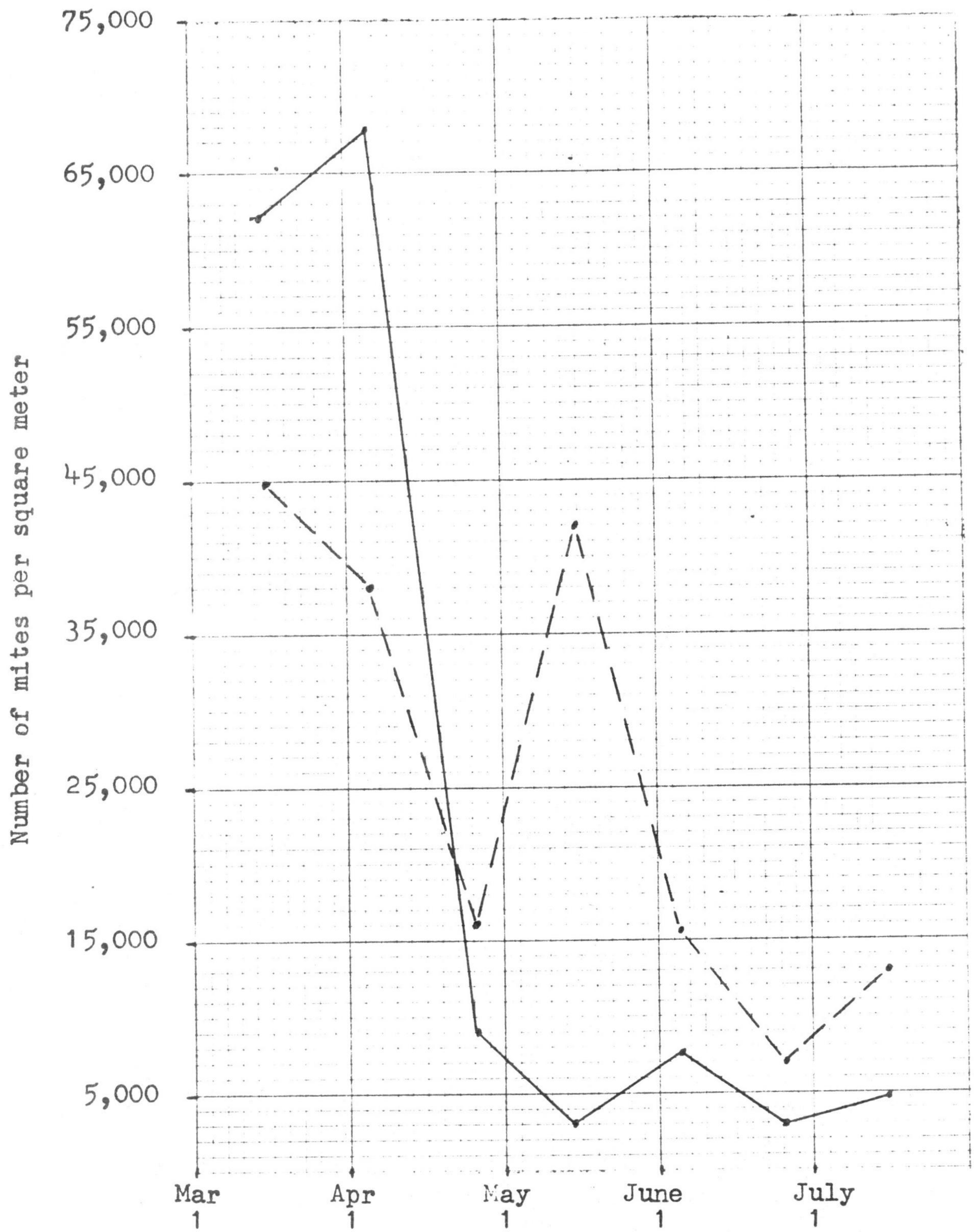

Figure 3. Population estimates- north vs. south facing slopes. North facing slope — — — —

South facing slope ————————

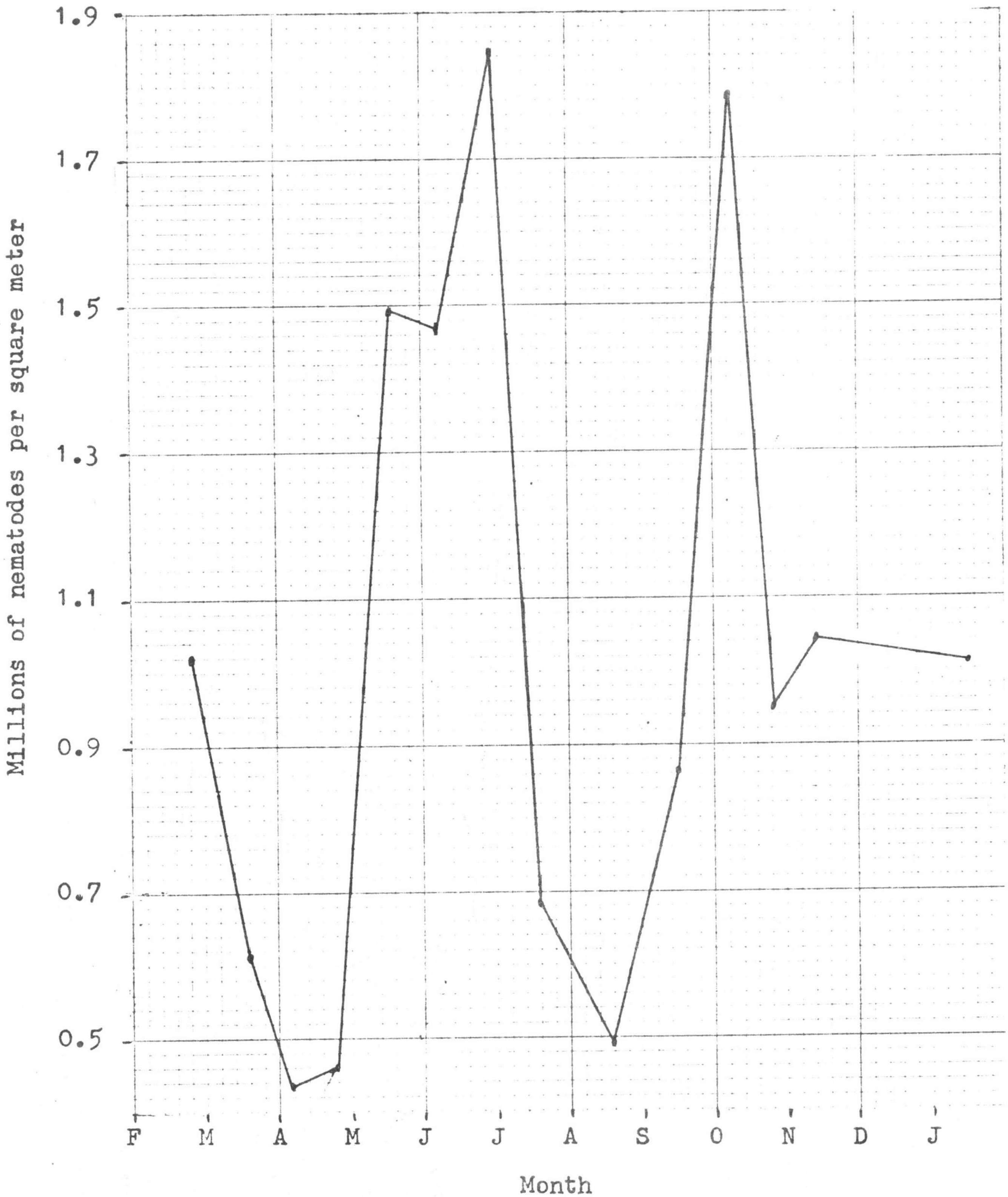

Figure 4. Estimated average population of nematodes per square meter. Estimates based on sum of data from all sampling zones.

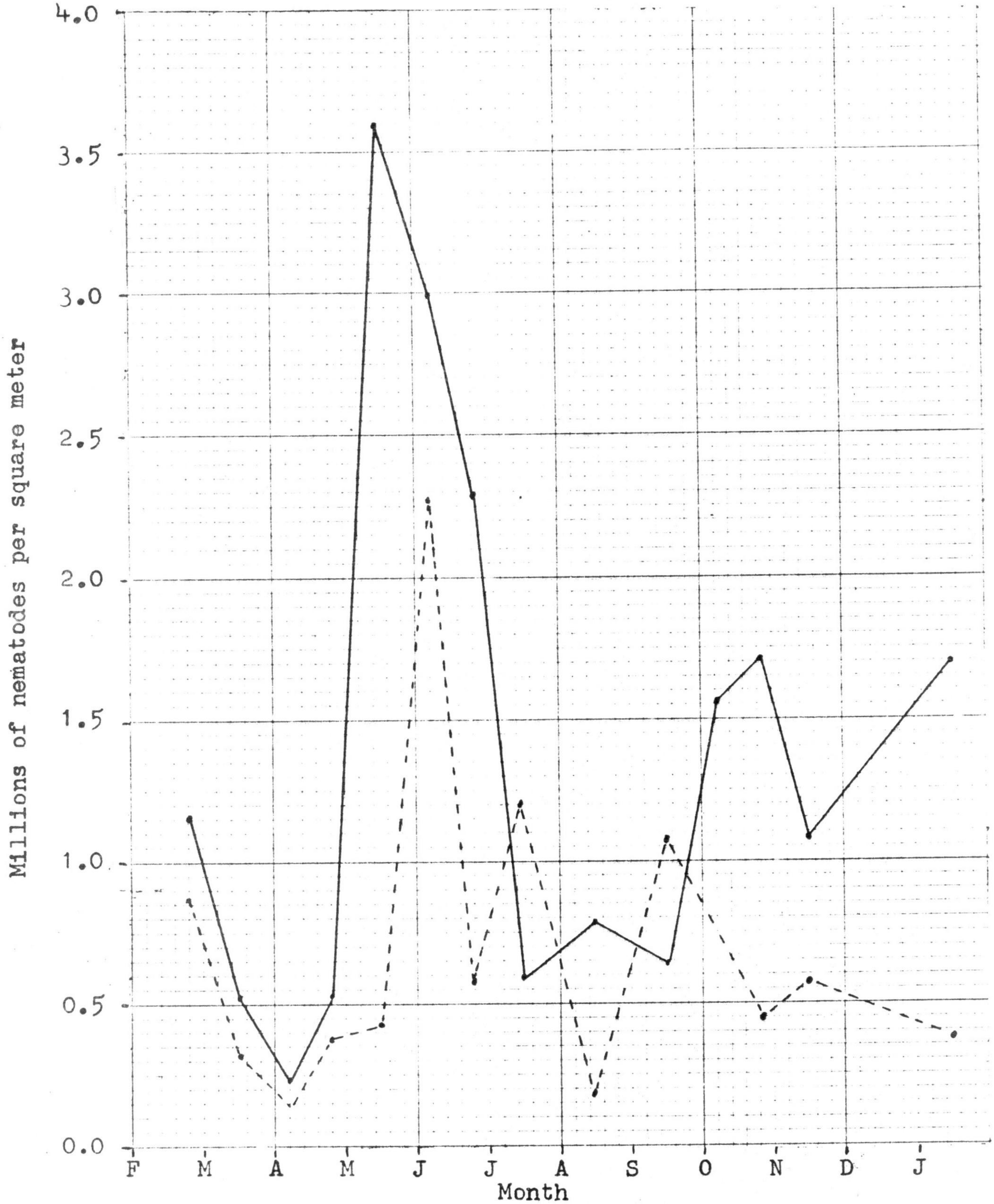

Figure 5. Nematode population estimates- north vs. south facing slopes. North facing slope ——————

South facing slope - - - - - - -