TEMPERATURE REGULATION OF IXODES DAMMINI POPULATIONS (ACARI: IXODIDAE)

Ixodes dammini infestations in Massachusetts are limited to the immediate coastal area. This distribution was ascribed to the higher fall temperatures along the coast which allowed for a successful fall breeding period (McEnroe W. D., 1977: Acarology 18: 618—625). In this area there is a fall and spring cohort of adults with the fall adults entering activity from diapause and the spring adults derived from a late fall molt (McEnroe W. D., 1984: Acarology 25: 223—229). In the upper Cape Cod area the infestation level is highly variable with these ticks apparently rare or absent just off the Cape (personal observation). Over this area the October temperature runs about the same inland from the Cape but the November and December temperatures on the Cape remain above that found inland. The normal average mean temperature on the upper Cape is 3.0 °C (East Wareham station) where a marginal infestation is present, and decline inland to 2.5 °C just off the Cape (Taunton station) where no infestation has been noted.

The first effect of late fall temperature regulation on the two cohort life cycle is to limit reproductive success for spring larvae (McEnroe, W. D. 1984: op. cit.). This temperature regulation was shown by the higher level of spring larval activity on Nantucket Island than that found on Cape Cod (Piesman J. A. and Spielman S., 1979: Ann. Entomol. Soc. Am. 72: 829—832; Wilson M. L. and Spielman A., 1985: J. Med. Entomol. 22: 408—414). The November/December means on Nantucket Island runs about 2 °C above that on the Cape (Nantucket station).

The second effect of late fall temperature is to regulate the late season nymphal premolt period in the production of spring adults. In 1983 the November mean was 7.4 °C, 2.1 °C above normal for the upper Cape, and new adults were noted in late November (Fig. 1, line 1) as shown by the extended survival of a few adults which indicates the proportion of new and old ticks (McEnroe W. D. and Specht H. B., 1987: Can. J. Zool. 65: 455—457). In 1985, when the November/December mean was 3.7 °C, 0.7 above normal there were ca 85 % new ticks in late December as shown by the survival response (Fig. 1, line 2). In 1986 the November/December mean was 1.3 °C, 1.7 °C below normal and at the end of December there were ca 15 % new ticks (Fig. 1, line 3).

This late fall early winter temperature, by its effect on spring larvae, the late nymphal molt, and the resulting spring adult cohort, will control the overall infestation level. The traditional area of highest infestation is on Nantucket Island, where the normal November/December mean is 4.9 °C.

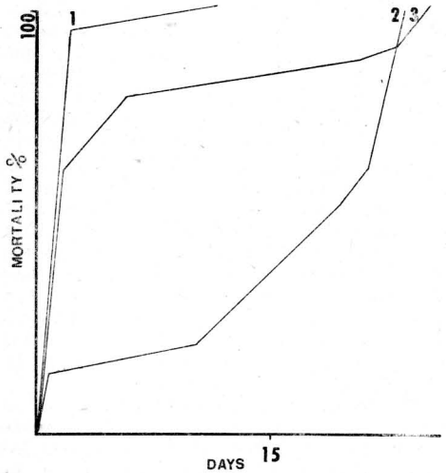

Fig. 1. Adult survival at 20 °C and 85 % relative humidity. Line 1, late November ticks, 1983. Line 2, late December ticks, 1985. Line 3, late December ticks, 1986.

The presence of a spring adult cohort is required in the life cycle and this cohort is subject to the temperature dependent late fall early winter premolt period. The temperature range at East Wareham (56 yrs) for November/December was 7.5 to — 0.5 °C. This year to year variation, via its control of the spring cohort can not only account for the variation of infestation level but secular trends above and below normal will shift the limit of the species range.

Although the immatures of this tick are introduced on birds over the entire region (Main A. J. and Anderson K. S., 1971: Manomet Bird Observatory, Manomet, MA report No. 2; Anderson J. F. and Magnarelli L. A., 1984: Yale J. Biol. Med. 57: 627—641), introduced ticks which cannot complete their life cycle in a foreign climate cannot become established (Daniel M., Černý V., Honzáková E., and Olejníček J., 1977: Folia parasitol. 24: 47—54).

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