CHAPTER IV

LONGEVITY
Effect of Temperature and Photoperiod on Longevity

Results

Longevity of male and female *N. rufipes* at a temperature of 25°C, relative humidity of 60% and different photoperiods of 12:12 (table 63, fig. 9), 24:0 (table 65, fig. 11) and 0:24 (table 64, fig. 10) were found to vary. The males were found to live for a mean of 54.49 days (range 15-90 days) and females for 62.49 days (range 24-90 days) at a photoperiod of 12:12 and a temperature of 25°C and RH of 60%. Adult males and females lived for a mean of 46.77 days (range 11-77 days) and 55.64 days (range 21-82 days) respectively at 24:0, whereas the mean longevity of male was a mean of 57.53 days (range 17-90 days) and that of female 66.47 days (range 27-101 days) at 25°C; 0:24. Mean longevity of adult male at 30°C and 60% RH and a photoperiod of 12:12 (table 59, fig. 5), 24:0 (table 61, fig. 7) and 0:24 (table 60, fig. 6), was a mean of 70 days (range 22-109 days), 58.61 days (range 20-90 days) and 80.04 days (range 31-130 days) respectively while that of the female was 79.16 days (range 38-119 days), 67.79 days (range 31-101 days) and 93.63 days (range 44-152 days) respectively.

At 32.5°C, L: D 12:12, the longevity of *N. rufipes* male was a mean of 83.34 days (range 26-134 days), whereas that of female was 95.59 days (range 41-153 days). The longevity of male and female was found to be significantly different at 32.5°C (p= 0.020667) (table 66, fig. 12).

The male *N. rufipes* lived for a mean of 41.60 days (range 7-72 days) and female for 48.18 days (range 7-73 days) at 35°C, L:D 12:12. Longevity of adult male and female was significantly different (p=0.043139) (table 62, fig. 8).
Significant difference in mean longevity of adult males (table 55 and 56, fig. 2) and females (table 57 and 58, fig. 3) at different temperatures and photoperiods were observed. A comparison of the mean longevity of adult male and female at different temperatures and photoperiods is given in fig. 4.

**Discussion**

Comparison between the longevity of *N. rufipes* male and female indicated that the adult beetles lived longer at 32.5°C and L: D 12:12 than at any other temperatures and photoperiods tested. It was observed that the male and female *N. rufipes* had maximum longevity at 32.5°C (male 134 days; female 153 days), followed by 30°C (male 109 days; female 119 days), 25°C (male 90 days; female 90 days) and 35°C (male 72 days; female 73 days).

Though the increase in temperature up to 32.5°C increased the longevity, it declined at 35°C. Studies on *Dermestes frischii* have also shown that longevity of beetles is higher at 30°C than at 35°C (Amos and Morley, 1971). However, Azab et al., (1973 a) had observed that adult males and females of *D. maculatus* lived for up to 189 and 178 days respectively at 21.5°C. In the present study, at all temperatures and photoperiods tested, *N. rufipes* females lived longer than males and the maximum longevity for both males and females was obtained at 32.5°C, L: D 12:12, than at a lower temperature of 25°C. While at 35°C, L: D 12:12, the mean longevity of *N. rufipes* males and females was 72 days and 73 days respectively, in the case of *D. maculatus* it was only 49.1 and 51.9 days respectively (Azab et al., 1973 b). This increased longevity at higher temperatures in *N. rufipes* may help it in outcompeting *D. maculatus* in the field when the summer temperatures peak.

At 23-25°C longevity of male and female *D. maculatus* was 70 and 76 days respectively (Shahhosseini, 1980), while at this temperature adult male
and female of *N. rufipes* lived for 90 days. Adults of *D. lardarius* lived for only 36 days at 30°C, while adults of *N. rufipes* lived for 109 (males) and 119 (females) days (Jacob and Fleming, 1980a). These results emphasize the temperature tolerance of *N. rufipes* when compared to other species of *Dermestes* reared on a diet of fish.

The reason for the high infestation of *N. rufipes* during the summer, when temperature in the stocking shed is in the range 30-33°C, can be explained by the results of the present study, where the ideal temperature for growth of *N. rufipes* was observed to be 32.5°C. The extended longevity in the laboratory at 32.5°C correlates with its observed incidence in the field. A steep decline in the population of the beetle during rainy season when the temperature hardly reaches 25°C inside the stocking shed could also be explained on the basis of the results of the present study.

During the monsoon, when dried fish were not stocked in the stocking sheds, a residual population of the pest was seen in the fish refuse left back in the sheds. This may migrate in to the fresh stock of fish when dried fish are again stocked here and start a new infestation.

At temperatures (25°C and 30°C) and photoperiods (L: D 12:12, 24:0, 0:24), highest longevity was observed when they were reared in full darkness (L:D 00:24). *N. rufipes* was found to be photonegative and the observations in the field have also shown that *N. rufipes* preferred dark places. Most of the stocking sheds along the coastal belt of Kerala do not have any lighting, which is the ideal environment for the pest and it may help in better propagation of the beetle pest. Increased longevity ultimately leads to excessive reproduction as the beetle continues to lay eggs till death. Increased longevity also means persistent pest attack on stored dried fish in the stocking shed.
Prolific pest infestation was observed in the Puthiappa, Tanur, Tirur and Parappanangadi coastal areas where the stocking sheds were made of pleated palm leaves with little or no ventilation. As a result of this, the temperature as well as humidity increases to facilitate increased pest attack which affects the quality and quantity of the product eventually leading to tremendous economic loss to producers. While in Ponnani, Kasargod, Alleppey, Kollam and Thiruvananthapuram where many of the stocking sheds were made of concrete structures with moderate aeration and ventilation and experiences a 12:12 photoperiod as it is in the field, the population density was found to be moderate and obviously lower than what was observed in a stocking center in complete darkness (0:24).

In Alleppey district where there was a practice of stocking the dried fish in the open sand on the seashore, the pest attack was found to be less in comparison with those piled up inside the stocking shed. Unfavorable temperature and photoperiod were considered to be the limiting factors.