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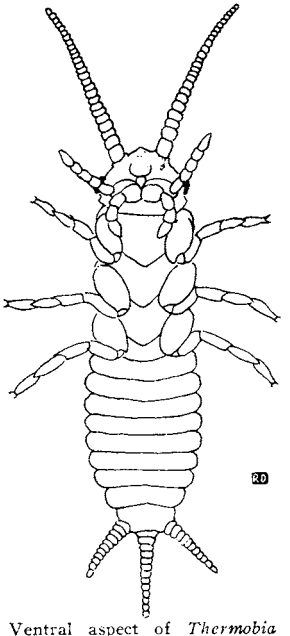
FURTHER OBSERVATIONS ON THE FIREBRAT, THERMOBIA DOMESTICA (PACKARD) (THYSANURA)

J. Alfred Adams

Data upon the first four instars of *Thermobia domestica* (Packard) appeared in a previous paper (Adams, 1933b). The rapid growth of the sensory appendages was emphasized. Nothing was written, however, about the duration of these early instars or the variations to be found in the dimensions of individuals within a given instar.



Ventral aspect of *Thermobia domestica* (Packard) in first instar.

Duration of Early Instars

Firebrat eggs produced during known 24-hours periods in breeding cages were incubated in five groups, the groups ranging in size from thirty to two hundred individuals. Each group was kept in a glass culture dish, about six centimeters in diameter and two centimeters in depth. The bottoms of the dishes were coated inside with a thin farinaceous paste to provide for tarsal traction of hatching young. A few kernels of rolled oats for food and a piece of unsized paper, about two centimeters square, folded in narrow plaits to serve as a hiding place, were placed in each dish. The lids were supported by wax blocks to allow for air circulation. The dishes were kept in an incubator operated at 37° C. and 70 per cent relative humidity (Adams 1933a). The light was of twilight intensity. Observations, which were made for about forty days, entailed the daily removal of the culture dishes from the incubator for half an hour or less for the counting or estimation of the number of young in each instar.

Space does not permit a detailed statement of the results. The eggs hatched during periods of two to three days and had an average incubation period of fourteen and one-half days. There

Proceedings of the Iowa Academy of Science, Vol. 43 [1936], No. 1, Art. 136

was no mortality in the eggs and little in the first instar but in subsequent instars, particularly the third, the mortality was very high in all groups. Only about one-fifth of the number which hatched survived to the fifth instar. The shortest interval between the mid-point of the 24-hour period in which the eggs were laid and the appearance of an individual in the fifth instar was thirty-three and one-half days. The average interval from the date of oviposition to the attainment of the second instar by the majority (about ninety per cent) of the young was sixteen days; to the third instar, twenty days; to the fourth, thirty-one days; and to the fifth (from more limited data), about forty-five days. Hence the lengths of the respective instars for these insects was about one and one-half, four, eleven, and fourteen days. The various individuals showed great variation in their rates of development and the overlapping of instars in the groups increased with time. Of twenty-one insects in one culture dish at the close of the experiment (all of one age) four were in the third instar, twelve in the fourth, and five in the fifth.

Size Increase During the Third Instar

It was noticed in the course of semi-weekly measurements made upon selected individuals that not only does the length of the body increase during the instar but also the width of the cranium and of the mesonotum. To confirm this point ten specimens in the third instar were taken at random from each of three groups of firebrats of known age. The firebrats in the first group resulted from eggs laid on January 16. On the date of inspection, February 2, most of the insects in this group had just molted into the third instar and some were still in the second instar. The firebrats in the second group were from eggs laid January 11 and were all in the third instar when measured. The firebrats in the third group had hatched from eggs laid January 8 and already one quarter of them were in the fourth instar. The specimens were etherized and the measurements were made in the same manner as those given in the previous paper (Adams 1933b). The results are summarized in Table I.

Table I — Averages and ranges of certain measurements upon three series of firebrats in the third instar, differing in age.

Measured in millimeters	Early in instar	Middle of instar	Late in instar	Range
Width of head	0.521	0.526	0.531	0.504 to 0.546
Width, mesonotum	0.585	0.617	0.638	0.560 to 0.672
Length, antenna	2.79	2.66	2.63	2.09 to 3.00
Length, body	2.00	2.37	2.68	1.90 to 2.91
L. caudal filament	2.14	2.00	2.02	1.81 to 2.27

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It will be noted that the length of body and widths of head and mesonotum show substantial differences pointing to growth during the instar. It may also be noted that firebrats freshly molted into the third instar had longer antennae and caudal filaments than those late in the instar. It is probable that shortening of these delicate appendages by breakage of the tips more than offsets any elongation by growth.

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