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THE EARLY INSTARS OF THE FIREBRAT,  
*THERMOBIA DOMESTICA* (PACKARD),  
 (THYSANURA)

J. ALFRED ADAMS

The firebrat, one of the minor household pests of Iowa, is an insect of more than usual scientific interest. Besides being remarkably thermophilic it represents the primitive order of the Apterygota, the Thysanura, the biology of which should have considerable bearing in the fields of insect physiology and phylogeny.

Using a constant temperature of 37° C. and other favorable conditions the insects are being reared the year around at Iowa State College. The eggs, which the females readily deposit into

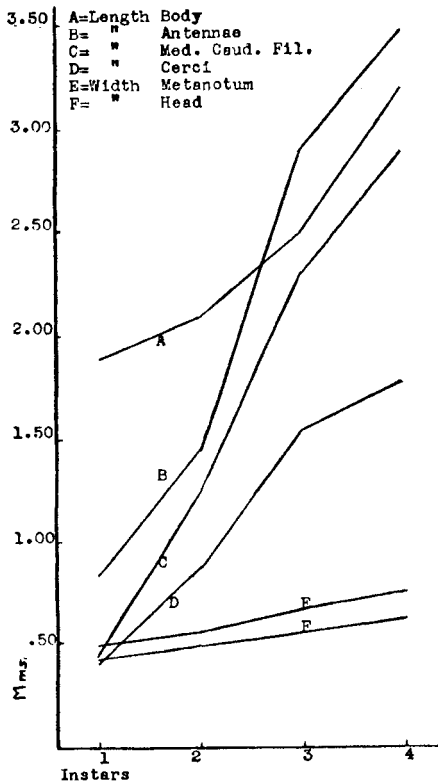


Fig. 1. Graphical Comparison of dimensions in early instars of the firebrat

cotton batting, hatch in about fifteen days at this temperature. Some data regarding the younger instars, which are passed usually in concealment, are herewith presented.

The general features of the life cycle in Apterygota have been summarized by J. W. Folsom (Annals Ent. Soc. Amer., 13:133-137, 1920) who pointed out that although the number of molts is indefinite and metamorphosis is absent, the young are not, however, structurally complete at hatching but undergo a considerable post-embryonic development. These principles are illustrated by the present study.

The newly hatched firebrat has a resemblance to more primitive Thysanura such as *Campodea*. It has parallel lateral margins; equal, squarish, well spaced thoracic nota; no scales, and few hairs. The body is waxy white, the ommatidia darkly pigmented, and the five filamentous appendages are water-clear.

The accompanying table and graph (fig. 1) show six average dimensions based upon about ten specimens for each of the first four instars. The measurement of body length is made from frons to tip of the telson. The measurements of cranial and notal widths are made on the longest transverse axis, and the former include the eyes. It will be seen that (a) the antennae and caudal filaments

INSTARS	1	2	3	4
Head width in mm.	.43	.49	.55	.61
Metathorax width in mm.	.49	.55	.66	.74
Length of body in mm.	1.88	2.08	2.50	3.20
Length of antennae in mm.	.85	1.42	2.90	3.48
Length of cercus in mm.	.40	.87	1.54	1.76
Length of med. caud. fil. in mm.	.45	1.24	2.30	2.90

elongate most rapidly, (b) the growth in body length accelerates, (c) the growth in width of head and metanotum is steady and that (d) the metanotum broadens more rapidly than the cranium. (The latter observation still holds when calculated on a percentage basis.)

The average number of annulations in the three types of filamentous appendages in the four instars are now given:

INSTAR	1	2	3	4
Antennae	24	38	54	78
Cerci	11	16	23	34
Median caudal filament	13	22	28	45

The third molt is of particular interest because it is at this molt that the body scales and the styli of the ninth sternite make their first external appearance. The scales of the fourth instar can be

seen through the transparent skin of the third, just before the molt.

Sexual maturity is attained by these insects after numerous molts but well before the animals have reached maximum weight. The cycle from egg to egg is completed in about eleven weeks at 37° C. with other conditions favorable.

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