

Photoperiodic Control in the Initiation of Diapause by *Chaoborus americanus* (Diptera: Culicidae)¹

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Final (fourth) larval instars of *Chaoborus americanus* Johannsen overwinter beneath the ice of Nearctic ponds. These larvae are developmentally dormant but otherwise active; the maintenance and termination of diapause is known to be mediated by photoperiod and the availability of food (Bradshaw 1969). The control of the initiation of diapause has now been examined. It became possible to carry out this study when samples from George Pond

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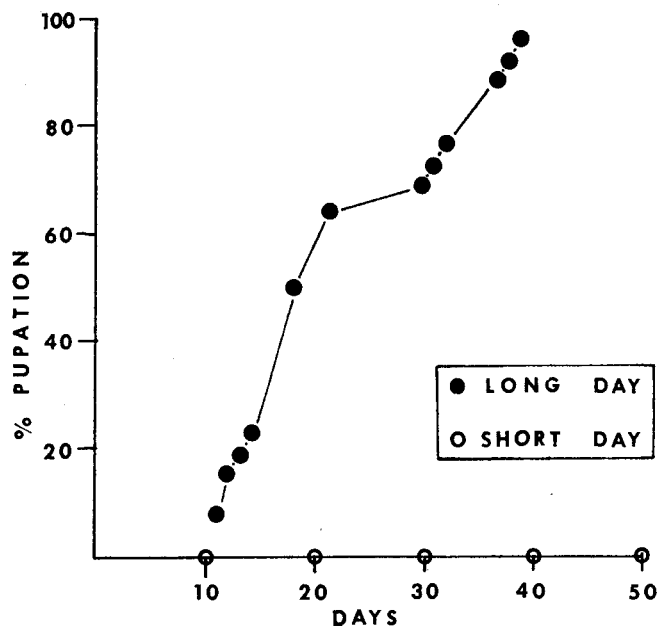


FIG. 1.—Percent pupation among larvae exposed to long- or short-day photoperiod since the 2nd stadium.

on the University of Michigan's E. S. George Reserve yielded numerous early instars of *C. americanus* on May 1, 1970.

To determine the role of photoperiod in controlling the onset of dormancy, samples of 2nd-stage larvae were exposed at $25 \pm 0.5^\circ\text{C}$ to long- or short-day photoperiod (17L:7D or 12L:12D) and fed *Artemia salina* (L.) which they readily consumed. Two to four larvae were placed in 50 ml of standing tap water and several such jars were exposed to each experimental regimen. Since uneaten *Artemia* contaminate the water, the latter was replaced every 4 to 7 days.

Of 26 larvae exposed to 17 hr of light per day, 13 had pupated after 20 days and 25 after 40 days. By contrast, none of the 23 larvae exposed to only 12 hr of light per day had pupated by the 50th day of the experiment (Fig. 1). All ceased to develop as 4th-stage larvae. Mortality was limited to 1 larva on the long-day regimen and none on the short-day regimen. Of the 24 pupae whose sex was ascertained, 13 were males and 11 were females; the median number of days to pupation was 17.5 and 18.0, respectively.

From these data, it appears that larvae reared from the 2nd stadium on short-day photoperiod entered diapause but those reared under the long-day schedule did not. Since larvae collected from George Pond represented the F_1 of overwintering larvae, they presumably had received long-day photoperiod throughout their previous embryonic and larval life. That all of these larvae subsequently entered diapause in response to short-day photoperiod (Fig. 1) suggests that maternal day length as well as light perceived by the egg and 1st instar is unimportant in determining diapause. Both males and females develop at the same rate under the influence of long days. The role of food in the initiation of diapause remains unclear. For the termination of diapause, feeding has 2 components: it provides nutrition for growth and development and acts as an environmental cue independently of its nutritive qualities (Bradshaw 1970). Whether it serves a similar dual function in averting diapause has not been examined.

REFERENCES CITED

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