



Effects of Global Warming on Insect Life Cycles

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Fields :

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● Research Topics

The climate of the Earth has warmed over the past 100 years, and there is ample evidence that global warming has already affected a broad range of organisms. In many insects, phenology and distribution ranges have shifted in relation to the climate change. However, effects of global warming on insect life cycles have not been fully clarified.

The fall webworm, *Hyphantria cunea* (Lepidoptera: Arctiidae), invaded Japan from North America in 1945. The life history of the insect was shifted from bivoltine to trivoltine in a south-eastern area of Japan after the invasion related to the expansion of its distribution range. The life-history traits of this species have been investigated in our laboratory.

The life cycle of the fall webworm in Fukui City (36°04'N, 136°13'E), Honshu Island, Japan, was predominantly bivoltine until the first half of the 1990s. After the years, however, the life cycle of the Fukui population is shifting from bivoltine to trivoltine. This shift of the life cycle would be related to global warming because the air temperature of Fukui has markedly increased in the last three decades.

Figure 1 shows the photoperiodic response controlling diapause induction in the Fukui population. The photoperiodic response curves in 2002 have shifted shorter photoperiod than those in 1988 and in 1995. The result suggests that the timing of diapause induction has shifted to the later season in relation to the shift in the life cycle from bivoltine to trivoltine.

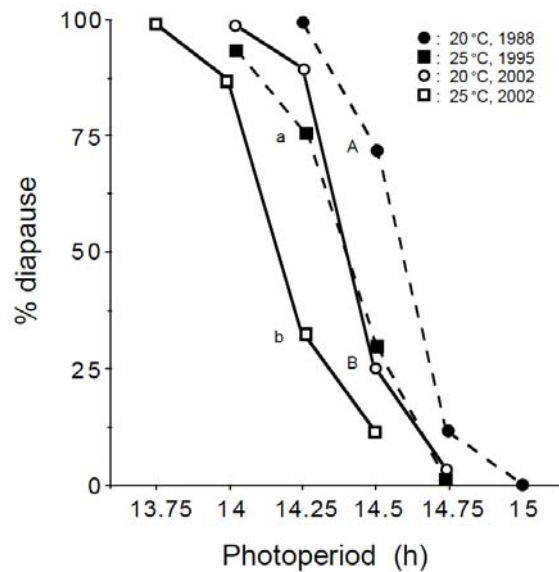


Figure 1. Photoperiodic response curves controlling diapause induction in *Hyphantria cunea* collected in Fukui, Japan. Larvae were reared on an artificial diet, "Insecta LFS". Solid lines with open symbols and broken lines with filled symbols show the present and previous results, respectively. The insects were collected in 1988 and in 1995 in the previous study, and in 2002 in the present study. The different capital and small letters indicate that the incidence of diapause is significantly different by Fisher's exact test ($P < 0.001$) under 14.5L-9.5D at 20°C and under 14.25L-9.75D at 25°C, respectively.

● Research Theme in the future

Purposes of our study are to elucidate effects of global warming on insect life cycles and life-history traits, and to clarify mechanisms and duration of adaptation to the climate change.

● Research Theme for Collaboration

Ecology of insects, especially seasonal adaptations, inhabited natural and agricultural ecosystems.

● Results in Collaboration with Society

Shobara City, Hiroshima Prefecture, Japan.