

DEVELOPMENT OF *PHOLCUS PHALANGIOIDES* (FUESSLIN) (ARANEAE, PHOLCIDAE) UNDER LONG AND SHORT PHOTOPERIODS

Pholcus phalangioides (Fuesslin) commonly inhabits buildings and therefore leads a normal life even under the strong influence of human activities, especially lighting and air conditioning. In the present study the effect of photoperiod on the development of this spider was investigated to clarify the reason why it is able to settle easily in buildings.

Five egg-sac-carrying females were collected from the animal rearing room of Tokyo Metropolitan University, Tokyo, in late May of 1984. The first-instar nymphs obtained from these females were kept individually in plastic vessels 5.7 cm in diameter \times 11.0 cm in height for the first to third instar period and in vessels measuring 11.4 cm \times 25.2 cm thereafter. A strip of thick paper was placed slantways in each vessel as a substrate. In order to investigate the effect on development of photoperiod and complete darkness, four groups each consisting of six individuals were prepared. Two groups were reared at 25°C under a long (16L-8D) or short (10L-14D) photoperiod, and two at 23.5°C under either complete darkness or 14L-10D. The light source was a 6W fluorescent tube, producing a light intensity of 250-300 lux. Relative humidity was not controlled, but fluctuated between 50 and 80%. Since first-instar nymphs molt without feeding, food supply was initiated at the second instar stage. The 2nd and 3rd-instar nymphs were alternately provided fruit flies, *Drosophila melanogaster*, and

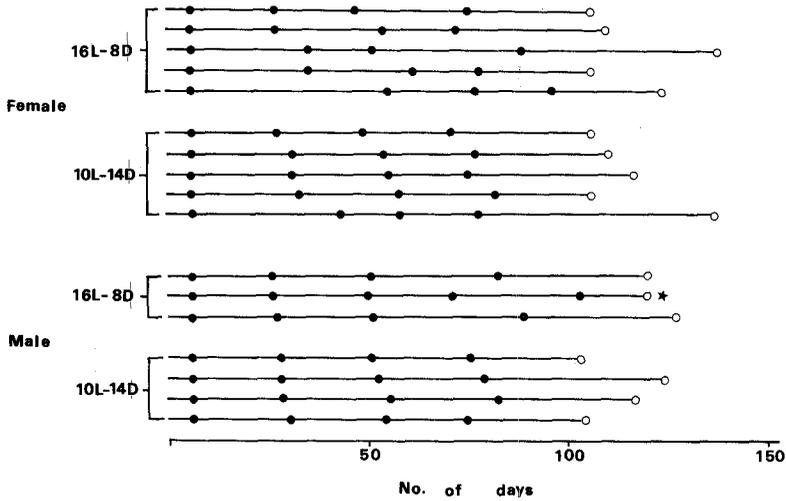


Fig. 1.—Developmental processes of *Pholcus phalangioides* nymphs reared at 25°C under long (16L-8D) or short (10L-14D) photoperiod. Solid circles indicate moltings, and clear ones final moltings. The horizontal line with a star indicates the male that molted six times.

plantoppers, mainly *Saccharosyden procerus*. The number of prey provided was increased from 1-2 to 3-5 as development proceeded. The nymphs from 4th-instar to the final molt were provided with a fly, *Phaenicia sericata*, each time. The feeding interval was every 3 or 4 days. Experimental animals reared under complete darkness were exposed to light for a few minutes at each feeding and vessel change. Individuals dying during the rearings were omitted from the graphs subsequently obtained.

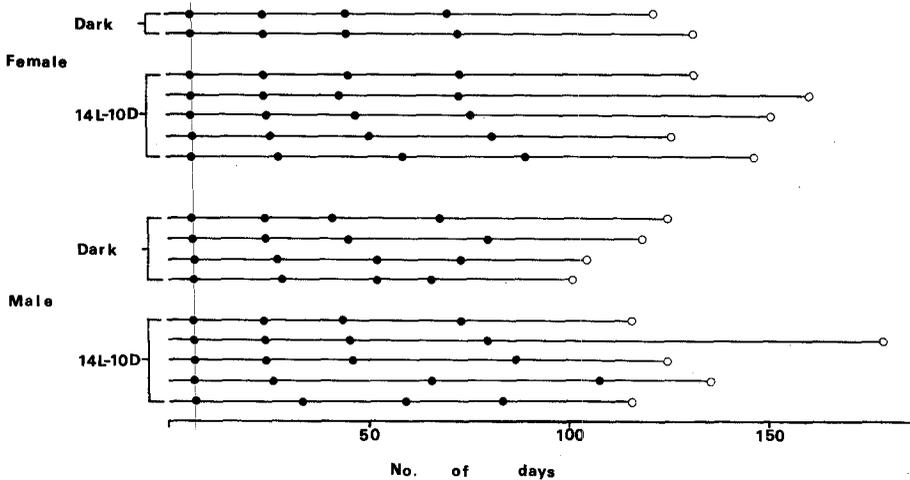


Fig. 2.—Developmental processes of *Pholcus phalangioides* nymphs reared at 23.5°C under complete darkness as compared with that of spiders reared under 14L-10D. Symbols are the same as for Figure 1.

Table 1.—Growth as indicated by carapace width in *Pholcus phalangioides* reared at 23.5°C under 14L-10D. Figures in parentheses indicate those for adults collected from natural habitats.

	INSTAR					ADULT	
	1	2	3	4	5	Female	Male
No. of indiv.	15	13	8	11	5	15(12)	14(12)
Mean (mm)	0.63	0.67	0.98	1.31	1.75	1.85(2.10)	1.74(2.09)
Range (mm)	0.59-0.66	0.63-0.72	0.91-1.03	1.25-1.38	1.66-1.88	1.63-2.19 (2.00-2.38)	1.63-1.81 (1.94-2.30)

First-instar nymphs molted without feeding by the 5-6th day after emergence and showed tolerance to fasting. The mean and range of longevity for 30 fasting nymphs kept individually at 23.5°C under 14L-10D were 31.8 and 22-40 days.

Figure 1 shows the result of rearings at 25°C under a long or short photoperiod. All the individuals reared under both photoperiods completed their development within a period ranging from 100 to 140 days. For females, the mean developmental period was calculated to be 116.8 days under the long photoperiod and 115.2 days under the short one. The same calculation for males gave means of 122.3 and 112.0 days, respectively. This difference of 10.3 days between the 2 photoperiods for males was insignificant (*t*-test). The number of molts was five for both sexes, except for one male which molted six times. In other words, development of the spiders was practically unaffected by photoperiod. According to Schaefer (1977, *Z. ang. Entomol.*, 83:113-134), the development of many spider species is closely connected with changes in temperature and photoperiod, and reactions to photoperiod differ among species. Hamamura (1982, *Japanese J. Appl. Entomol. Zool.*, 26:131-137) also ascertained that in *Philodromus subaureolus* Boesenberg et Strand, the effect of photoperiod on development was reversed before and after overwintering.

Figure 2 shows the result of rearing under complete darkness as compared with that under 14L-10D, revealing that *P. phalangioides* developed normally even under complete darkness. In addition, the developmental period for males showed a tendency to become shorter under complete darkness than under 14L-10D. The means were calculated to be 112.5 days under complete darkness and 134.3 days under 14L-10D, but this difference of 21.8 days was statistically insignificant. According to Miyashita (1987, *J. Arachnol.* 15:51-58), *Achaearanea tepidariorum* (C. L. Koch) developed more rapidly in darkness than under light, accompanied by a reduction in the number of molts.

Table 1 shows the growth of *P. phalangioides* as indicated by carapace width. Measurements were performed on the individuals reared at 23.5°C under 14L-10D. After each molt, several individuals were placed into 75% alcohol for preservation and measurement. As shown by the figures in the last column, the mean carapace width of adults was somewhat larger in individuals collected from natural habitats than in those reared artificially. The difference between them was 0.34 mm in females and 0.37 mm in males, but was not significant (*t*-test: $P > 0.2$ in the former and $P > 0.05$ in the latter). A similar observation was reported for *Chubiona phragmitis* C. L. Koch by Schaefer (op. cit.) and also for *A. tepidariorum* by Miyashita (op. cit.). However, the reason for this was unknown, except for the possible effect of a simple diet.

It can thus be concluded from the results described above that the reason why this species is able to settle easily in buildings is its apparent insensitivity to light during development.

Kazuyoshi Miyashita, Department of Biology, Faculty of Science, Tokyo Metropolitan University, Fukazawa 2-1-1, Setagaya-ku, Tokyo 158, Japan.

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