

EGG PRODUCTION IN *PHOLCUS PHALANGIOIDES* (FUSSLIN) (ARANEAE, PHOLCIDAE) UNDER A CONSTANT TEMPERATURE AND PHOTOPERIOD

Egg production in *Pholcus phalangioides* (Fuesslin) was examined. Ten final-instar female nymphs were collected from the animal rearing room of Tokyo Metropolitan University, Tokyo, in early June of 1984, and kept individually in plastic vessels 11.4 cm in diameter \times 25.2 cm in height. In each vessel, a strip of thick paper was placed slantways as a substrate. After the spiders had been reared to the adult stage in the laboratory, they were mated with males obtained in the same way, and reared individually in the above-mentioned vessels until the time of death, being provided one fly, *Phaenicia sericata*, at intervals of 3-4 days. Five of these individuals were subjected to a second or third mating at different periods of their life, as shown in Fig. 1. An additional seven females were collected just after they had mated in natural habitats, and three of them were also subjected to a second mating in the laboratory. The time of collection was within five days after their final molt.

Egg-sac production and the emergence of first-instar nymphs were recorded during the whole period of rearing, and the number of eggs per sac was determined as the number of first-instar nymphs which emerged from an egg-sac plus dead (unfertilized) eggs remaining in the sac. Dead nymphs were counted as fertilized eggs.

The rearing room was maintained at 23.5°C under 14L-10D. Light was provided by 40 W fluorescent tubes, which gave a light intensity of 600-800 lux. Relative humidity was not controlled, but fluctuated within a range of between 50 and 80%.

Figure 1 shows egg-sac production by 17 females. The females numbered 1-10 in the graph produced their first egg-sac 6-13 days after mating, the mean pre-oviposition period being 9.6 days. The period from oviposition to the emergence of first-instar nymphs varied from 17 to 24 days, with a mean and standard deviation (calculated from 44 egg-sacs indicated by solid circles in the graph) of 19.9 ± 1.34 days. A large number of females continued oviposition for 400 days or more. In natural habitats, however, egg-sac-carrying females were generally found for only 100-120 days, from middle or late May to late August or early September.

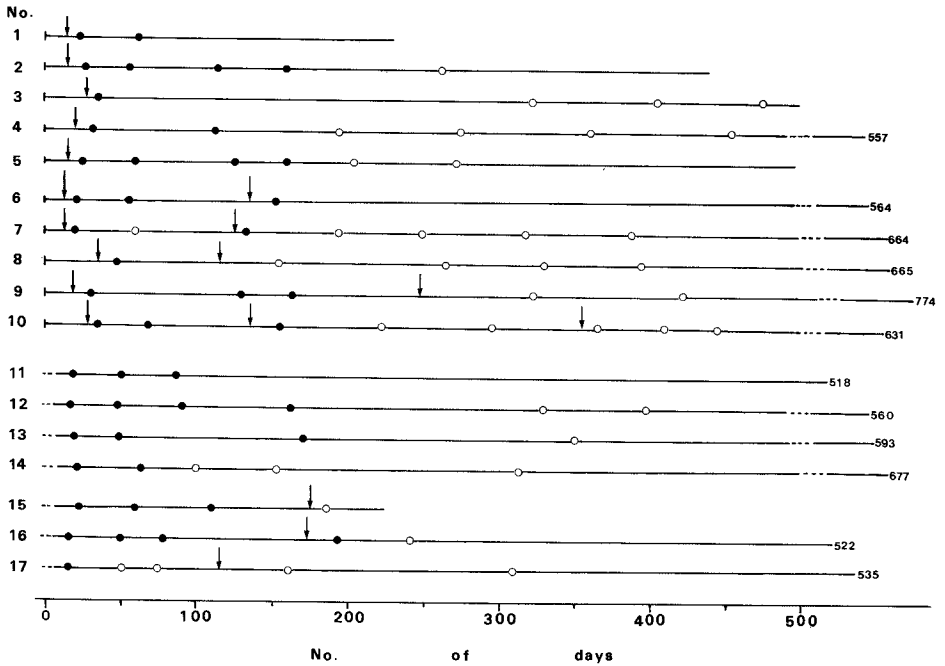


Fig. 1.—Occurrences of egg-sac production in 17 female *Pholcus phalangioides*, of which 10 (nos. 1-10) mated in the laboratory and 7 (nos. 11-17) did so in natural habitats. Solid circles indicate egg-sacs from which spiderlings emerged, and clear ones those that contained unfertilized eggs only. Arrows show matings in the laboratory. The figure following each line represents the life span of each individual in days.

The number of egg-sacs produced per female varied from 2 to 8, with a mean of 4.9 sacs. Egg-sac production intervals were irregular, and showed a tendency to become longer as time passed. The total number of eggs produced per female varied from 48 to 224, with a mean of 124.5, and the mean fertilization rate was 51.5%. Therefore, the mean number of fertilized eggs produced per female was 64.1.

According to the data for females numbered 6-10 and 15-17 in the graph, additional mating(s) showed almost no effect upon fertilization rate. This was considered not to have resulted from incomplete second or third matings, because the durations of the latter matings were similar to those of the first ones: mean and range of mating duration were 86.7 and 34-138 minutes in the former ($n=9$) and 65.9 and 22-98 minutes in the latter ($n=10$). The actual reason for the presence of unfertilized eggs remains unknown.

As shown in Table 1, the majority of the first, second and third egg-sacs contained a mixture of fertilized and unfertilized eggs, although the percentage of egg-sacs containing only fertilized eggs was somewhat higher in the first egg-sac. The fifth and subsequent egg-sacs contained unfertilized eggs only. The total number of eggs per sac, including fertilized and unfertilized ones, gradually decreased with time. Such a tendency has been described in many species of spiders, but few authors have reported the exact state of fertility of eggs in each sac. Miyashita (1987, J. Arachnol. 15:51-58) noted that a similar tendency to that shown in Table 1 was also observed in *Achaearanea tepidariorum* (C. L. Koch),

Table 1.—Levels of egg production in relation to egg-sac sequence in *Pholcus phalangioides*. Figures in parentheses represent unfertilized eggs.

INDIVIDUAL NUMBER	EGG-SAC SEQUENCE								TOTAL EGGS	
	1	2	3	4	5	6	7	8	Fertilized	Unfertilized
1	27	30							57	0
2	29	22	32	12(10)	(12)				95	22
3	28(2)	(16)	(10)	(6)					28	34
4	20	38(2)	(36)	(29)	(17)	(5)			58	89
5	26(3)	37	47(2)	22(4)	(25)	(33)			132	67
6	42(1)	28(1)	26(2)						96	4
7	35(2)	(35)	33(4)	(27)	(47)	(32)	(9)		68	156
8	10(2)	(10)	(14)	(11)	(16)				10	53
9	32	15(15)	5(29)	(18)	(28)				52	90
10	31	26	27(6)	(27)	(23)	(28)	(14)	(6)	84	104
11	7(11)	7(3)	9(11)						23	25
12	34(3)	19(13)	21(8)	19(9)	(31)	(14)			93	78
13	27	16	19(9)	(29)					62	38
14	7(11)	13(3)	(18)	(30)	(21)				20	83
15	20(9)	18(1)	5(7)	(15)					43	32
16	26(13)	25(5)	52	34(4)	(35)				137	57
17	31	(47)	(27)	(13)	(7)				31	94
\bar{X} no./sac	28.8	26.2	28.7	22.8	23.8	22.4	11.5	6.0	64.1	60.4
% fertility	88.3	66.1	60.1	27.3	0.0	0.0	0.0	0.0		

although the eggs in each sac were either all fertile or all infertile, and the mean fertilization rate was rather high as compared with that in *P. phalangioides*. However, Downes (1985, Australian J. Ecol. 10:261-264) reported that the number and fertility of eggs in *Latrodectus hasselti* Thorell fluctuated independently of egg-sac sequence.

In the present study, the life span of adult spiders varied from 223 to 774 days, with a mean of 538.4 days. These figures are slightly lower than those for American black widow spiders, *Latrodectus mactans* (Fabricius), *L. variolus* Walckenaer and *L. hesperus* Chamberlin and Ivie, as reported by Kaston (1970, Trans. San Diego Soc. Natur. Hist. 16 (no. 3), 82 pp). In males reared under the same conditions as these females, adult life span varied from 132 to 277 days, with a mean of 179.8 days ($n=11$ individuals that experienced mating(s)).

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