

NOTES ON THE BIOLOGY OF THE SPIDER *STEGODYPHUS LINEATUS* (LATREILLIE, 1817) (ARANEAE: ERESIDAE)

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ABSTRACT: *Biological studies were carried out to determine the life cycle of a spider desert *Stegodyphus lineatus* under laboratory conditions at temperature of $27 \pm 1^\circ\text{C}$ and relative humidity of 60-70 %.*

*40 spiderling were reared separate as (individual rearing), while 49 spiderling reared together as (communal rearing). Males and females maturity reached after passing 7 spiderlings. The life cycle durated an average time 233 ± 3.8 and 234 ± 4.73 days for males and females respectively. Larvae of cotton leaf worm *Spodoptera littoralis* and the adults of Fruit fly *Ceratitis capitata* as well as *Musca domestica* were used as prey for feed different instars of spiderlings.*

Keywords: *Life history, Spiders, Eresidae, *Stegodyphus lineatus*, prey, Sociality.*

INTRODUCTION

Family Eresidae C. L. Koch, 1850 includes 100 species and subspecies, from Africa, Asia, Europe and Brazil, classified within 10 genera (Platnick, 2009). Genus *Stegodyphus* Simon, 1873 is one of the three big genera, in number of species, of family Eresidae. It includes 21 species from Africa, Asia, Southern Europe and Brazil (Platnick, 2009). Also, this genus has an experience extended maternal care; in which spiderlings continue to be fed beyond their first instars and remain together after the mother's death (Schneider, 1995). The eresid *Stegodyphus lineatus* (Latreille, 1817) is considered sub-social. After a phase of living communally in the maternal nest, young *S. lineatus* disperse and settle singly. Spiders live one year, and their nests are often found in clusters separated by large distances of similar, but uninhabited habitat. Dispersing young initially settle in the vicinity of the maternal web (Lubin, *et al.* 1998) but nest relocation is not uncommon. Lubin *et al.* (1998) suggested that limited movement of young's during dispersal and their preference for certain species of shrubs results in clumped distributions. The eresid spider *S. lineatus* is annual and semelparous. Female produces a single clutch and feed the young's via regurgitation after they emerge from the egg sac (Kullmann, *et al.* 1971). Brood care is suicidal and ends with matrophagy, where the mother is sucked dry by her young's. Matrophagy usually occurs 2 weeks after the young are

released from the egg sac. Young benefit from brood care through an increased body size, which improves survival over winter (Schneider, 1996).

In an experimental field study, the young spiderlings removed from their mother shortly before matrophagy would have occurred and they showed that females are able to lay eggs again (Schneider and Lubin, 1997). Thus, the females retain their capacity to produce eggs until the end of brood care. However, they were only able to raise a second brood if they were protected from predators. Most of the adult mortality was explained by parasitism of a wasp specialized on adult female *Stegodyphus* (El-Hennawy, 1987 and Henschel, *et al.* 1996). In addition, high costs of brood care through regurgitation feeding may have further increased mortality. In a model, the author calculated that there should be a threshold in brood size below which it does not pay the female to sacrifice her life for such a small brood (Schneider and Lubin, 1997). If females lose most of their brood or if the hatching rate is low (both cases occur in nature), they will maximize their fitness by producing another clutch as quickly as possible while raising the remaining young to independence. In nature, however, we never observed that a female had young and eggs in her nest at the same time.

In Egypt, there are a few studies on *Stegodyphus dufouri*, the first one about the relation between *S. dufouri* and the pompilid wasp *Pseudopompilus humboldti* (Dahlbom, 1845). These studies reported that females of *P. humboldti* attack and paralyse adult females of *S. dufouri* and that their larvae devour the paralysed spiders to complete their metamorphosis to the adult stage (i.e. wasps) (El-Hennawy, 1985;1986 and 1987). This relation was almost the only available information on the biology of *S. dufouri* (Kraus & Kraus, 1988 and Seibt & Wickler, 1988). In 1986, El-Hennawy also reported few notes on the biology of *S. dufouri*. Moreover, he recently summarized the relationship between the mother and her brood (El-Hennawy, 2002). After that, El-Hennawy and Mohafez (2003) studied the life history of *S. dufouri* as a step on the way from asocial to social. *Stegodyphus lineatus* (Latreille, 1817) was recorded from Alexandria, Cairo, Damietta, El-Burullus, El-Shalateen, Bir El-Gahliya, El-Zaranik, Nabq, Ras El-Barr, Siwa Oasis, Southern Sinai, Suez, El-Hennawy (2006). The life cycle of this spider was not yet studied in Egypt.

Therefore, they decided to rear *S. lineatus* in laboratory to study some aspects of its life cycle.

MATERIALS AND METHODS

Adult female of *Stegodyphus lineatus* (Latreille, 1817) was collected with her egg sac from Ras El-Barr city, Damietta Governorate, Egypt. It was found among wild plants adjacent to cultivated plants. It was reared inside a test tube until the egg sac hatched. The spiderlings which produced in the laboratory were reared individually after the 1st molting. Every adult specimen was individually reared inside a glass cylinder (13 cm diameter, 25

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cm height), including in its middle a bar of wood (1x5x22 cm). Each glass cylinder was located over a plastic pot (20 cm height, 15 cm diameter) filled with sand soil to fix the glass cylinder. The number of spiderlings which produced in the laboratory were reared individually (40 spiderlings) after 1st molting and some of them were reared together (49 spiderlings; communal rearing). All obtained spiderlings were reared under laboratory conditions at temperature of 27± 1°C and relative humidity 60-70 %.

The spiderlings were fed once every two days on different stages of the 1st, 2nd, 3rd and 4th instars of larvae of cotton leaf worm, *Spodoptera littoralis* (Boisduval, 1833) for the 1st, 2nd, 3rd spiderlings and on the adult stage of the fruit fly, *Ceratitis capitata* (Wiedemann, 1824), as well as house fly, *Musca domestica* Linnaeus, 1758 for the 4th spiderlings till reached the adult spider stage.

Number of specimens investigated for the average of duration stages of the spiderling instars were 86 spiderlings and for average life cycle is 22 (life cycle: 10 males and 12 females).

RESULTS AND DISCUSSION

Egg sac, eggs and incubation period:-

The laid egg sac of *S. lineatus* was slightly swollen circular in shape and a light yellow in color which changed to pale yellow just before hatching. The eggs were creamy in color after egg sac lying, changed to dark before hatching. The mother kept the egg-sac among her first and second pairs of legs and under her body. The eggs incubation period durated for 25 days to yield 86 spiderlings. The mother died after 12 days by feeding the spiderlings on her body, which they suck dry. Forty spiderlings were individually reared, after 1st molting, in separate glass vials and 46 spiderlings together (communal rearing).

Spiderlings:-

During rearing individual spiderlings, 15 individuals died before reaching maturity (Mortality before maturity: 37.5%): 4 died after 2nd molting, 3 died after 3rd molting, 5 died after 4th molting, and 3 died after 5th molting. The rest individuals were excluded from the calculation of instars' duration. The remaining 25 individuals reached maturity; 10 males (40%) and 15 females (60%).

[Sex ratio, ♂/♀ = 1:1.5] All females and males reached maturity after 6 moults. The duration of every instar is shown in Table (1). The life cycle duration, was 230-249 days for males and 229-242 for females, respectively.

Table 1: Duration of different stages of *Stegodyphus lineatus* (Latreille, 1817) when fed on different types of prey.

Developmental Stages	Duration (Days)					
	Male			Female		
	Range	Mean	S.D	Range	Mean	S.D
1 st Instar	1-24	22.1	0.87	21-24	23	1.27
2 nd Instar	26-28	26.9	1.10	24-29	25.91	1.62
3 rd Instar	16-19	17.7	1.15	16-21	18.25	1.21
4 th Instar	12-20	16.1	2.60	12-19	16	2.08
5 th Instar	22-30	26	2.66	22-30	26.25	2.56
6 th Instar	60-70	64.7	3.74	61-71	65.91	3.84
7 th Instar	30-43	34.9	3.54	30-38	33.91	2.19
Life cycle	230-249	233.4	3.80	229-242	234.5	4.73

Food consumption:-

Three different prey were used in feeding spiderlings and adults of *S. lineatus*, the larvae of Cotton leaf worm (*Spodoptera littoralis*) (Boisduval, 1833), two flies of fruit fly, *Ceratitis capitata* (Wiedemann, 1824) and house fly *Musca domestica* Linnaeus, 1758. Feeding rate (every two days): 1st instar spiderlings were fed together on 15 larvae of 1st, 2nd, 3rd instars of *Spodoptera littoralis*; every 2nd instar spiderling was fed on an individual of 2nd instar larva of *S. littoralis*; every 3rd instar spiderling was fed on one 3rd instar larva of *S. littoralis*; every spiderling or sub-adult spider of 4th – 7th instars was fed on a mixture of individual adults of *C. capitata* and *M. domestica*; while adult spiders were fed on the same mixture with the increase of the quantity according to the spider's size. Number of consumed prey by different spiderling instars is in Table (2). Kullmann *et al.* (1972) reported that males of *S. lineatus* reach maturity after 7, 8 or 9 moults and females after 9 moults or later, while in this study *S. lineatus* reached maturity after 7 moults for both males and females. The duration of life cycle was nearly the same for both males and females, but usually shorter in males than females, therefore the mating behavior could not be noticed in this study because most males died before females maturity. The life cycle of this species is similar to the life cycle of *S. dufouri* (El-Hennawy and Mohafez, 2003).

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Table 2: Food consumption of *Stegodyphus lineatus* (Latreille, 1817) on different types of prey at room temperature 27± 1°C and humidity 60-70%.

Developmental Stage	Prey	Number of consumed individuals of prey					
		Male			Female		
		Range	Mean	S.D.	Range	Mean	S.D.
1 st Instar	1 st , 2 nd and 3 rd (<i>Spodoptera littoralis</i>)	69-96	82.58	9.79	75-96	86.25	8.83
2 nd Instar		78-108	96.5	8.56	87-112	98.5	7.62
3 rd Instar		32-42	36.33	2.38	32-42	36.33	2.38
4 th Instar	(Ceratitis capitata) and (Musca domestica)	98-130	108.91	9.48	100-130	113.58	9.25
5 th Instar		170-200	182.33	9.99	185-216	196.17	9.36
6 th Instar		380-410	396.5	9.03	390-420	400	10.44
7 th Instar		380-418	396.66	9.87	295-432	403	9.75
Life cycle		950-984	972.08	8.28	1260-1290	972.08	8.28

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ملاحظات بيولوجية علي النوع
***Stegodyphus lineatus* (Latreille, 1817)**
(Araneae: Eresidae).

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المخلص العربي

تم دراسة المظاهر البيولوجية للنوع (*Stegodyphus lineatus* (Latreille, 1817)

تحت الظروف المعملية.

تصل الذكور الي طور البلوغ بعد ٧ اطوار (233.4 ± 3.80 ايام) والاناث بعد ٧ اطوار

(234.5 ± 4.73 ايام).

تم تربية بعض الأطوار العنكبوتية غير الكاملة معا تربية جماعية، وقد تم تربية أفراد الجيل

الثاني معا تربية جماعية لمزيد من الملاحظات. تم استخدام فرائس عديدة لتغذية الاطوار

المختلفة لهذا النوع.