Life History of the Pholcid Spider, *Micropholcus fauroti* (Simon, 1887) (Araneae: Pholcidae) in Egypt

Naglaa F. R. Ahmad and M. M. Abou-Setta
Plant Protection Research Institute, Agric. Res. Center, Giza, Egypt.

ABSTRACT

Behavioral and biological aspects of the pholcid spider, *Micropholcus fauroti* (Simon, 1887) (Araneae: Pholcidae) at 26±2°C and 75±10% RH were studied. Female deposited its eggs in webbing basket, and carried it all around through eggs incubation period. Newly hatched spiderlings are very transparent and delicate. They stayed in the basket and molted inside or shortly after getting out of it. This spider went through eight spiderlings to reach adult as female and seven ones as male. First spiderling was noticed to molt for the following one without feeding. Second to fourth spiderlings were reared on *Tetranychus urticae* motile stages, while later ones on *Ephestia kuehniella* moths. Males developed faster than females during 187.53 and 208.81 days, respectively. Generation time expanded to 212.4 days. Adult females lived longer than males (i.e. 60.00 and 45.53 days, respectively). Life span averaged 268.8 and 233.1 days for females and males, respectively. Survival ratio of individuals reached maturity was 72%. Sex ratio was 0.682 females/total. Females' fecundity was 68.26 eggs/female. Female produced a mean of 4.02 sacs; each contained an average of 12.95 eggs/ sac. Mean number of eggs/sac was 13.22, 22.44, 14.51, 8.56 and 6.00 eggs/sac for first to fifth one, respectively. Intervals between egg sacs' deposition averaged 12.9 days. Mean consumption of *T. urticae* was 325.4 and 345.7 during second to fourth spiderlings for females and males, respectively. Obtained data indicated life table parameters of *M. fauroti* under studied conditions as mean generation time (T) = 232.2 days, net reproductive rate (R_o) = 40.174, intrinsic rate of increase (r_m) = 0.477 per month and exp (r_m) = 1.611 individual/individual/month, as this organism is slow developing one. Mean consumption of *E. kuehniella* was 326.58 and 238.23 moths/individual, for female and male, respectively, during fifth spiderling to adult stage. Mean consumption of *E. kuehniella* was 175.1 and 69.8 moths for females and males, respectively, during adult stage longevity.

Key words: *Micropholcus fauroti*, Pholcidae, behavior, biology, life table parameters, prey consumption.

INTRODUCTION

Spiders play an important role in agricultural ecosystems. They are generalist predators feed on insects and some other arthropods. Biological aspects of spiders have received considerable attention.

Family: Pholcidae C. L. Koch (1850) (Araneae: Pholcidae) is one of the most diverse spider families (Huber, 2003). It was described by C. L. Koch (1850) including 80 genera and 1611 species over the world (World Spider Catalog: NMBE, 2017). Six genera and species have been recorded in Egypt (El-Hennawy, 2006 and Huber & El-Hennawy, 2007).

Pholcids are among the dominant web-building spiders in many tropical and subtropical areas, occupying a wide variety of habitats ranging from leaf-litter to tree canopy. Several species occur in caves and in close proximity to humans (Huber, 2005).

Micropholcus includes 15 species of which *M. fauroti* (*Pholcus fauroti*) (Simon, 1887) is the genus type. Species of this genus are pan-tropical ones that spread around the world (Huber *et al*., 2017). They distribute from Temperate Asia to Americas, Belgium, Germany, Africa, Laos, Myanmar, Thailand, Vietnam, Indonesia, Australia and Pacific (World spider catalog: NMBE, 2017). Barrion *et al*. (2012) recorded *M. fauroti* on the island of Hainan (part of Southern China) with surrounding environments of irrigated rice fields.

General biology of spiders indicates going through egg stag followed by number of spiderlings before reaching maturity. Number of spiderlings of males and females can be similar or larger for females (Foelix, 2011).

Knowledge of pholcid spiders' life cycles is very scarce. The biology of *M. fauroti* has never been studied in any detail (Huber *et al.*, 2017). This study aimed to report the life history as a first step to understanding its behavior and role in natural control. Possibly it could be used as agent for stored products pests. It seems be a suitable environment for its existence.

MATERIALS AND METHODS

Adult females of *M. fauroti* were collected from compound house building located in Cairo, Egypt, where it built very flimsy webs in the building corners.

Behavioral aspects of this spider were observed and reported herein. Biological study of the spider was performed under constant temperature of 26±2°C and 75±10% R.H. Newly hatched spiderlings were

placed separately in plastic vials (3 cm diameter x 5 cm height). Second to fourth spiderlings were fed, every two days, on motile stages of *Tetranychus urticae*. Later spiderlings and adult stages were fed on *Ephestia kuehniella* adults.

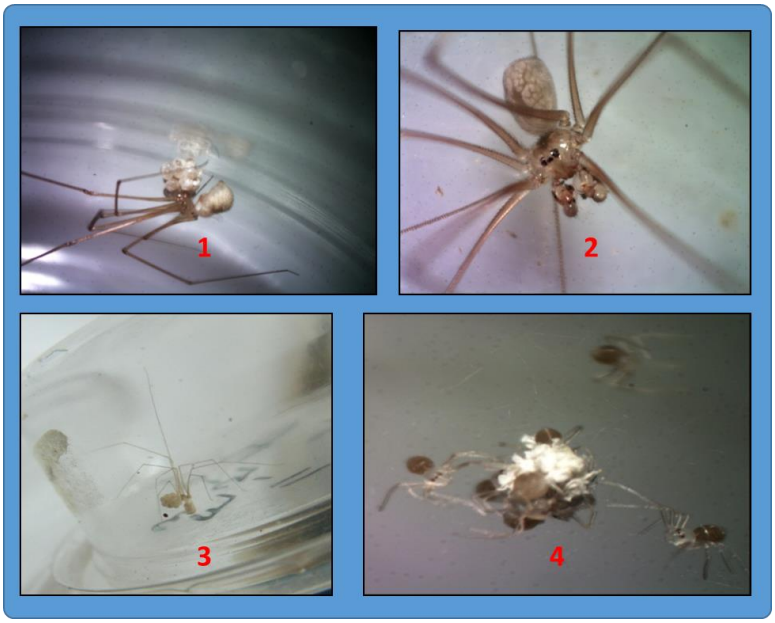
T. urticae culture was maintained under laboratory conditions on bean plants and *E. kuehniella* culture on wheat seeds germ.

Developmental stages and adults' life were observed daily. Different stages durations and consumption were determined and reported as well as female specific data.

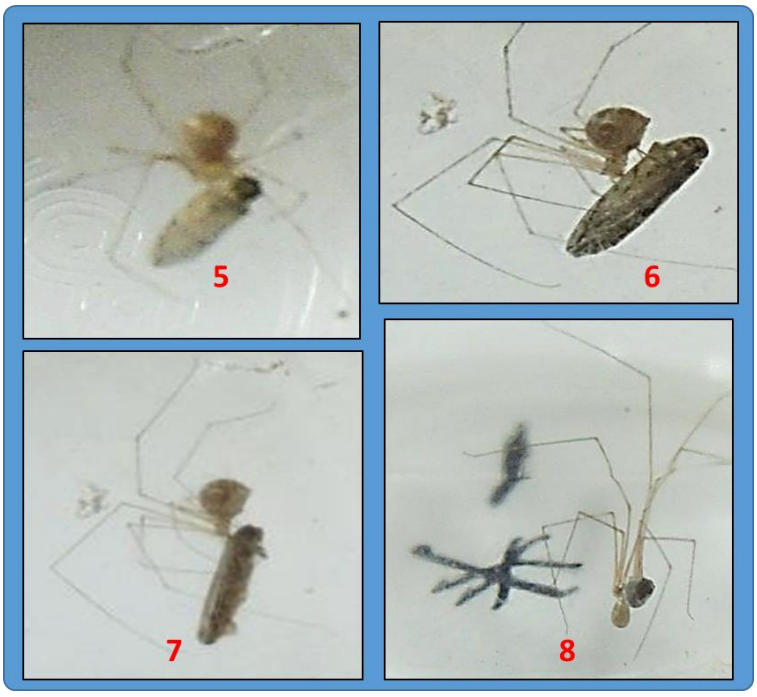
RESULTS AND DISCUSSION

Behavioral aspects:

This species was recorded as new record from Egypt (Huber *et al*., 2017), although it was included in Egyptian List by El-Hennawy (2006). Pictorial spider stages and *E. kuehniella* moth predation sequence are presented in Figs. (1-8).



Figs. (1 – 4). *Micropholcus fauroti* (Simon, 1887). 1&3 female carrying an egg sac. 2. male. 4. Newly hatched spierlings.



Figs. (5 – 8). Sequence of *Micropholcus fauroti* (Simon, 1887) female predation of *Ephestia kuehniella* moth.

Although this species has a vast worldwide distribution as building hold one, it was not previously reared. Females deposited their eggs in a basket of webbing, and carried it all around through eggs incubation period (Figs. 1 and 3). Newly hatched spiderlings are very transparent and delicate (Fig. 5). These hatch stay in the basket and molt inside it or shortly after getting out of it without feeding on any prey. Males (Fig. 2) can mate for more than one time. They escape away from females after mating, otherwise they will be prayed on, if they were slugish. Early stages prefer to hunt small ants. They can hunt them in a wonderful way in a very short time. Also, they can hunt small flying insects which are prober to their size. Later stages can hunt larger prey type. Activity area of this species is relatively small. More than one individual can occur in small area.

Biological aspects:

Biological aspects of *M. fauroti*, at 26±2°C and 75±10% R.H. reared on *T. urticae* motile stages and *E. kuehniella* moths are presented in Tables (1-3). Durations in days of different stages are presented in Table (1). This spider went through eight spiderlings to reach adult as female and seven ones as male. Males developed faster than females during 187.53 and 208.81 days, respectively. Females lived for longer times than males (i.e. 60.00 and 45.53 days, respectively). Life span was recorded as 268.8 and 233.1 days for females and males, respectively (Table 1). Survival ratio of individuals reached maturity was 72%. Sex ratio under these rearing conditions was 0.682 females/total.

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M. fauroti different female stages specific data are presented in Table 2. Pre-oviposition period was relatively short as 5.1 days; while oviposition period lasted 44.9 days. Generation time expanded to 212.4 days producing 68.26 eggs/female. It was produced in mean of 4.02 sacs/female (Table 2). Mean number of eggs per sac varied with the sac number per female. It was 13.22 eggs/sac within the first one. This number was maximum within the second one as 22.44 then decreased to 14.51 eggs/sac, in the third one.

Table (1): Developmental durations (days) of *Micropholcus fauroti* (Simon, 1887), different stages at 26±2°C and 75±10% R.H.

Developmental Stage	Female[1]			Male[2]		
	Mean	S.D.	Range	Mean	S.D.	Range
Incubation period	10.49	1.39	8-13	10.47	1.42	8-13
1st spiderling	3.93	1.28	2-6	4.12	1.36	2-6
2nd spiderling	9.16	1.41	8-12	9.88	1.36	8-12
3rd spiderling	13.88	2.22	12-20	16.41	2.96	12-20
4th spiderling	20.00	2.95	16-24	24.24	3.19	18-29
5th spiderling	26.63	3.12	19-35	34.24	3.07	28-38
6th spiderling	34.23	2.87	21-40	39.47	1.23	35-40
7th spiderling	41.98	2.23	40-50	48.71	0.99	48-50
8th spiderling	48.51	1.88	47-55	--	--	--
Total spiderlings	198.33	7.34	187-220	177.06	7.00	165-185
Life cycle	208.81	7.10	201-230	187.53	7.35	177-199
Adult longevity	60.00	5.81	46-74	45.53	4.48	38-52
Life span	268.81	8.15	256-297	233.06	7.46	216-245

[1] Number of females sample was 43. [2] number of males sample was 20.

Table (2): Female specific data of *Micropholcus fauroti* (Simon, 1887), at 26±2°C and 75±10% R.H.

Parameter	Durations or values			Number of consumed Moths			
	Mean	S.D.	Range	Mean	S.D.	Range	Daily rate
Pre-oviposition period	5.10	1.26	4-7	17.85	4.25	13-26	3.53
Oviposition period	44.88	5.83	35-55	146.68	18.96	104-181	3.28
Generation time	212.419	7.75	196-237	--	--	--	--
Post-oviposition period	9.75	1.45	7-12	10.6	2.41	8-15	1.09
Number of eggs/egg sac	12.95	5.22	6-25	--	--	--	--
Number of egg sacs/female	4.02	0.83	3-5	--	--	--	--
Number of eggs/female	68.26	12.28	50-85	--	--	--	--

Table (3): Food consumption of *Micropholcus fauroti* (Simon, 1887), at 26±2°C and 75±10% R.H.

Developmental stage	Prey	Female				Male			
		Mean	S.D.	Range	Daily rate	Mean	S.D.	Range	Daily rate
1st spiderling	--	--	--	--	--	--	--	--	--
2nd spiderling	*Tetranychus urticae* motile stages	47.63	10.51	32-70	5.2	45.71	6.35	32-60	4.64
3rd spiderling		89.18	22.67	48-128	6.4	94.71	18.1	72-140	5.83
4th spiderling		188.6	43.02	112-288	9.39	205.29	35.75	126-252	8.43
5th spiderling	*Ephestia kuehniella* moths	26.95	5.34	18-36	1.01	33.76	5.03	25-42	0.98
6th spiderling		51.38	6.1	32-60	1.5	68.06	7.06	58-81	1.72
7th spiderling		88.2	7.77	76-103	2.1	136.41	6.94	122-146	0.18
8th spiderling		160.05	10.41	141-179	3.3	--	--	--	--
Adult longevity		175.13	19.9	131-218	2.93	69.88	8.98	84-56	1.53

Lowest numbers occurred in the last two ones as 8.56 and 6.00 eggs/sac, respectively. Intervals between egg sacs deposition averaged 12.9 days. This mean number (12.95 eggs/sac) seemed to be low among spiders, but it can be explained by the caring mother behavior of carrying her egg sacs around the area until the eggs hatch and move out of the sac. This behavior maximizes the chance of newly emerged spiderlings survival, where they develop in a harsh type of environment.

Life table parameters:

Using the obtained biological and female specific data (Tables 1 and 2), life table parameters of *M. fauroti* (According to Birch, 1948) under these conditions were estimated as: mean generation time (T) = 232.2 days, net reproductive rate (R_o) = 40.174, intrinsic rate of increase (r_m) = 0.0159 per day, and exp (r_m) = 1.016 individual/individual/day. As this organism is slow developer, these parameters can be presented per month as: T = 7.74 months, r_m = 0.477 per month and exp (r_m) = 1.611 individual/individual/ month.

Food consumption of *M. fauroti* different stages is presented in Table (3). First spiderling was noticed to molt for the following one without feeding. In this study second to fourth spiderlings were reared on *T. urticae* motile stages; while fifth to eighth stage of females and seventh ones for males on adult moth of *E. kuehniella* (Table 3). Mean consumption of *T. urticae* motile stages were 325.4 and 345.7 during second to fourth spiderlings for females and males, respectively. Mean consumption *E.kuehniella* females and males were 326.58 and 238.23 moths, respectively, during fifth spiderling to adult stage. Mean consumption of *E. kuehniella* for females and males was 175.1 and 69.88 moths, respectively, during adult stage longevity (Table 3).

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REFERENCES

Birch, L. C. 1948. The intrinsic rate of natural increase of an insect population. J. Animal Ecology, 17: 15-26.

Barrion, A.T.; S. S. Villareal; J. L. A. Catindig; D. Cai; Q.H. Yuan and Heong K.L. 2012. The spider fauna in the rice agricultural landscape of Hainan Island, China: composition, abundance and feeding structure. Asia Life Sciences, 21:625–651.

El-Hennawy, H. K. 2006. A list of Egyptian spiders (revised in 2006). Serket, 10(2):65-76.

Foelix, R. F. 2011. Biology of spiders. Third edition. Oxford Univ., 432 pp.

Huber, B. A. 2003. High species diversity in one of the dominant groups of spiders in East African Mountain Forests (Araneae: Pholcidae: *Buitinga* n. gen., *Spermophora* Hentz). Zool. J. Linn. Soc., 137:555-619.

Huber, B. A.; Pérez, G., A. and Baptista, R. L. C. 2005. *Leptopholcus* (Araneae: Pholcidae) in continental America: rare relicts in low precipitation areas. Bonner Zool. Beitr., 53: 99-107.

Huber, B. A. and El-Hennawy, H. K. 2007. On old world ninetine spiders (Araneae: Pholcidae), with a new genus and species and the first record for Madagascar. Zootaxa, 1635: 45-53.

Huber, B. A.; Neumann, J.; A. Grabolle and Hula, V. 2017. Aliens in Europe updates on the distributions of *Modisimus culicinus* and *Micropholcus fauroti* (Araneae, Pholcidae). Arachnologische Mitteilungen/ Arachnology Letters, 53: 12-18.

World Spider Catalog. 2017. World spider catalog. Natural History Museum Bern. Online at http://wsc.nmbe.ch, version 18.0. accessed on September 5, 2017.