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Biological Studies on *Holocnemus pluchei* (Pholcidae) When Fed on Various Prey Species

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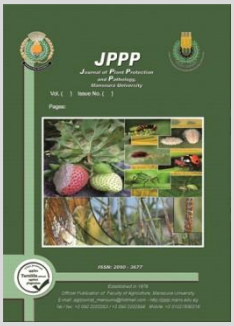

ABSTRACT

Behavioral and biological studies pholcid, *Holocnemus pluchei* (Scopoli, 1763) (Araneae: Pholcidae) at laboratory conditions of 60 ± 70% R.H and 25 ± 2°C. 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 six spiderlings to reach adult as female and five ones as male. First to third spiderlings were reared on *Tetranychus urticae* mobile stages, while later ones on *Ephestia kuehniella* moths and *Dorsophila melanogaster*. Males developed faster than females during 93.5 and 154.9 days, respectively. Life span averaged 342.6 and 130.3 days for females and males, respectively. Females' fecundity was 68.26 eggs/female. Female produced a mean of 4.0 sacs. Intervals between egg sacs' deposition averaged 11.2 days. Mean consumption of *T. urticae* was 266.9 and 217.8 from first to third spiderlings for females and males, respectively. Mean consumption of *E. kuehniella* and *Dorsophila melanogaster* was 66.8 and 56.8 individual, for females and males, respectively, during fifth spiderling to adult stage. Mean consumption of *E. kuehniella* and *D. melanogaster* was 104.6 for females, during adult stage longevity.

Keywords: Behavioral, biological studies , *Holocnemus pluchei* , various preys

INTRODUCTION

Most spiders are generalists with respect to their diet but for efficient pest control hardly play spiders a major role in controlling insect pests; Ghavani (2006). 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 Koch (1850) (Araneae: Pholcidae) is one of the most diverse spider families (Huber, 2003). It was described by Koch (1850) including 94 genera and 1744 species over the world (Platnick, 2020). 6 genera and 7 species have been recorded in Egypt (Huber & El-Hennawy, 2007 and El-Hennawy, 2017).

Pholcidae spiders are among the dominant web-building 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). *Holocnemus* includes 4 species of which *H. pluchei* 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 America, Belgium, Germany, Africa, Laos, Myanmar, Thailand, Vietnam, Indonesia, Australia and Pacific Platnick (2020). *H. pluchei* was recorded on the island of Hainan (part of Southern China) with surrounding environments of irrigated rice fields Barrion *et al.* (2012)

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 *H. pluchei* 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 *H. pluchei* 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 25±2°C and 60±70% R.H. Newly hatched spiderlings were placed separately in plastic vials (3 cm diameter x 5 cm height). First to third spiderlings were fed, every two days, on mobile stages of *Tetranychus urticae*. Later spiderlings and adult stages were fed on *Ephestia kuehniella* and *D. melanogaster* 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

Mating behaviour

Although this species has a vast worldwide distribution as building hold one, it was not previously reared. Despite the clumsy pace it is nevertheless able to climb vertical surfaces. After the mating the females sits

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inverted in her web carrying her eggs in her chelicerae. Females deposited their eggs in a basket of webbing and carried it all around through eggs incubation period. Newly hatched spiderlings are very transparent and delicate. These hatches stay in the basket and molt inside it or shortly after getting out of it without feeding on any prey. Males 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.

Developmental stages

Female spiders have a longer lifespan compared to males. Male and female spiders are white-brown in color, and gradually change as they develop to a darker and dark brown color in adulthood. When the 1st, 2nd and 3rd spiderlings fed on *T . urticae,* the duration was averaged 9.9, 14.7 and 22.2 for female and 7.3, 13.0, 18.3 for male, separately. These values averaged 23.5, 31.7 for female 17.0, 27.5 for male, separately when the 4th and 5th spiderlings were fed on stages of *D. melanogaster* and *E. kuehniella,* On the other hand, when feding *E. kuehniella* and *D. melanogaster* the 6th female spiderlings, durated 41.7 days. (Table 1).

Table 1. Length of time of *Hoiocnemus pluchei* developmental stages when fed on various prey under laboratory conditions of (25 ± 2°C and 60-70% R.H).

developmental stages	Prey	Females	Males
		Mean ± SE	Mean ± SE
Incubation period	.	11.2 ± 0.55	-
1st spiderlinq		9.9 ± 1.14	7.3 ± 0.48
2nd spiderlinq	*Tetranychus urticae*	14.7 ± 1.20	13.0 ± 0.91
3rd spiderlinq	Koch	22.2 ± 1.00	18.3 ± 1.49
4th spiderlinq	*Ephestia kuehniella*	23.5 ± 1.16	17.0 ± 1.08
5th spiderlinq	Zeller	31.7 ± 1.23	27.5 ± 1.04
6th spiderlinq	*Dorsophila melanogaster* Meigen	41.7 ± 1.11	-
Life cycle		154.9± 2.28	93.5± 2.25
Life span		330.3± 2.94	268.9±3.68

Oviposition and egg incubation

The data in Table (2) showed that the females life span lasted 342.6 days, while it was only 130.3 days for male. The adult female spider remained 15.7 days at (pre-oviposition period), 29.9 days at (oviposition period) and 129.8 days at (post- oviposition peri). (The longevity averaged 175.4 days).

Table 2. Longevity and fecundity of *Hoiocnemus pluchei* when fed on various prey under laboratory conditions (25±2°C and 60 ± 70% R.H).

Biological aspects	In days	Fecundity	Numbers
Pre-oviposition period	15.7 ± 1.03	Egg sac	4.0 ± 0.55
Oviposition period	29.9 ± 1.11	Total average of eggs	88.8 ± 2.82
Post-oviposition period	129.8 ± 1.69		
Longevity	175.4 ± 1.65		

The average numbers of egg-sacs per females averaged (4.0 egg-sacs), and the total numbers of eggs per sac averaged (88.8 eggs). The adult females lay their eggs in colored sacs, Oviposition was not directly observed, but resulted in an egg sac held in the mouthparts of the female. (Table, 2).

Food consumption

The present results arranged in Table (3) show that, the 1st to 3rd spiderlings of female stage of spider, *H. pluchei* consumed an average of 53.5, 84.8 and 128.6 individuals of respectively, while those of the male stage were 42.5, 64.0 and 111.3 individuals, *T . Urticae,* separately.

When feeding on mobile stages of *D. melanogaster* and *E. kuehniella* during the 4th to 6th spiderlings consumed averaged of 53.7, 66.0 and 104.6 individuals for female, while the male consumed averaged of 43.0 and 56.8 individuals, separately.

This study agrees with that of (El-Hennawy and Mohafez, 2003; Ahmed.; 2012 and Rashwan.; 2017).

Table 3. Food consumption of *Hoiocnemus pluchei* when fed on various prey under laboratory conditions (25±2°C and 60-70% R.H).

Stages	Prey	Females	Males
		Mean±SE	Mean ±SE
1st spiderling	*Tetranychus urticae*	53.5 ± 1.12	42.5±1.04
2nd spiderling		84.8±1.41	64.0±1.35
3rd spiderling		128.6±0.29	111.3±0.75
4th spiderling	*Ephestia kuehniell* *Dorsophila melanogaster*	53.7±1.30	43.0±1.22
5th spiderling		66.0±1.21	56.8±2.69
6th spiderling		104.6±2.93	-

Description

Since a few decades, this species shows some spreading tendencies within Europe. Under rocks, in warm terrain, in caves and basements, large webs with irregular meshes. Nevertheless, it shall not be listed as alien or invasive because it is native for Europe.

Troglophile species (Mammola *et al.* 2018), (Van Helsdingen, 2020).

Male

Femur with dark spots, femur I and tibia I ventrally with numerous, short spines. Prosoma whitish, often with dark longitudinal band. Sternum black. Chelicerae with

lateral stridulatory ridges. Legs: femur I with a prolateral series of 30 to 36 spines. Opisthosoma whitish, dorsally with vague spots, ventrally with black longitudinal band Fig. (1)., Fig. (3). Body length male: 5-7 mm

Female

prosoma often with dark band, sternum black, with a strong tubercle between coxae IV. Palp light brownish, tarsus darker, tibia and tarsus widened. Colouration whitish, Eyes: AME less than one diameter apart. Opisthosoma dorsally with a median red-brown band, ventrally with a wide longitudinal dark band. Opisthosoma oval, without extension behind. Fig. (2), Fig. (3). Body length female: 5-7.5 mm

Fig. 1. Adult male

Fig. 2. Adult female

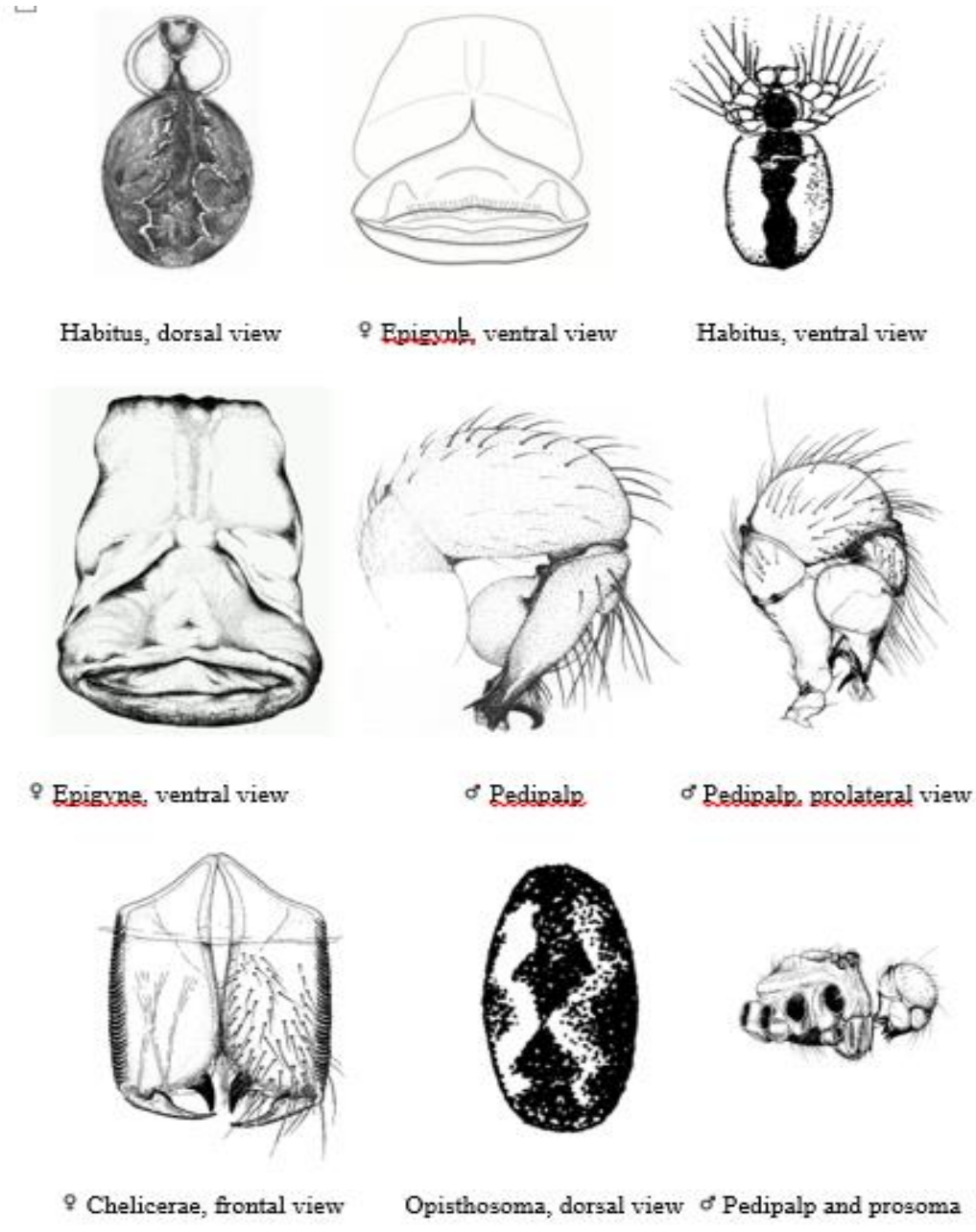

Fig. 3. Different morphological characters of *Holocnemus pluchei*.

REFERENCES

Ahmed, H. S. K. (2012). Studies on the spiders of fruit orchards in Assuit Governorate. Ph. D. Thesis, Fac. Agric. Al-Azhar Univ., 163 pp.

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. (2017). A list of Egyptian spiders (revised in 2017). Serket, vol. 15(4): 167-183.

El-Hennawy, H. K. and Mohafez, M. A. (2003). Life history of *Stegodyphus dufouri* (Audoiun, 1825) (Arachnida: Araneida: Eresidae) in Egypt. A step on the way from a social to social. Serket, 8 (3): 113-124.

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

Ghavani, S. (2006). Abundance of spiders (Arachanida: Araneae) in olive orchards in Northern Part of Iran. Pakistan J. Biological Sci., 9: 795-7699.

Huber, B. A. (2000). New World pholcid spiders (Araneae: Pholcidae): A revision at generic level. Bulletin of the American Museum of Natural History, 254: 1-348

Huber, B. A. (2001). The pholcids of Australia (Araneae; Pholcidae): taxonomy, biogeography, and relationships. Bull. Am. Mus.nat. Hist., 260: 1-144

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

Huber, B. A. and El-Hennawy, H. K. 2007. On old world ninetine spiders (Araneae: Pholcidae),

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.

Mammola, S.; Cardoso, P.; Ribera, C.; Pavlek, M. and Isaia, M. (2018). A synthesis on cave-dwelling spiders in Europe. Zoological Systematics and Evolutionary Research 56: 301-316

Miyoshita, K. (1968). Growth and development of *Lycosa timsignata* Boes et str. (Araneae: Lycosidae) under different feeding conditions. Appl. Entomol., Zool., 381.

Platnick, N. I. (2020). The world spider catalogue, version 21.0 American Museum of Natural History. Online at http://research armnh.arg/entomology/spiders catalogue 81-87/index.html.

Rashwan, A. M. A. (2017). Ecological and biological studies on spiders associated with orchard and field crops in Assuit Governorate. M. Sc. Thesis, Fac. Agric. Al-Azhar Uinv., 175 pp.

Sunderland, D. F. (1999). Predator behaviour and prey density: evaluating density-dependent interspecific interactions on predator functional responses. J. Anim. Ecol., 70: 14-19.

Van Helsdingen P. J. (2020). Araneae. In: Fauna European Database (Version 2020.1), online at www.european-arachnology.org

Word, D. and Lubin, Y. (1993). Habitat selection and the live history of desert spider *Stegodphus lineatus* (Eresidae) J.Anim. Ecol. 62-353.

دراسات بيولوجية على النوع (HOLOCNEMUS PLUCHEI) عندما يتم التغذيته على فرائس مختلفة.

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قسم الحيوان الزراعى والنيماتودا ـ كليه الزراعة ـ جامعة الأزهر ـفرع أسيوط.

تمت دراسة المظاهر البيولوجية والسلوكية للنوع العنكبوتي *Holocnemus pluchei*. وكانت هذه الدراسة تحت ظروف المعمل فى درجة حرارة 2±25 درجه مئوية ورطوبة نسبيه 70%-60. الاناث تضع البيض في كيس البيض وتظل محتفظة بكيس البيض خلال فترة الحضانة. بعد فقس البيض الافراد تكون شفافة وحساسة. بعض الافراد تظل داخل الكيس حتى تنسلخ تصل الافراد للبلوغ بعد ستة انسلا خات بالنسبة للأنثى وخمسة انسلا خات بالنسبة للذكر عندما تمت تغذيته على اربعة فرائس. تم تغذية الطور الأول الى الثالث من النوع العنكبوتي على الأطوار المتحركة من العنكبوت الاحمر، تم تغذية باقي الاطوار من النوع العنكبوتي على فراشة الحبوب المخزونة والدروسوفيلا. الذكر وصل الى البلوغ قبل الأنثى حيث استغرق ٩٣,٥و ١٥٤,٩ يوم على التوالي. وبلغت فترة طول العمر ٣٤٢,٦،١٣٠,٣ يوما للذكر والانثى على التوالي. قامت الأنثى بإنتاج أربعة أكياس بيض وكان متوسط عدد البيض في الكيس ٦٨,٢٦ بيضه. النتائج المتحصل عليها أشارت إلى أن استهلاك الفرائس من العنكبوت الأحمر عندما تمت تغذية الطور الأول الى الثالث ٢٦٦,٩ ،٢١٧,٨ للأنثى والذكر على التوالي .وكان متوسط استهلاك فراشة الحبوب المخزونة والدروسوفيلا ٦٦,٨، ٥٦,٨ فرد للإناث والذكور في الطور الخامس .