



EGGS LAYING OF SOLIFUGAE *GALEODES ORIENTALIS* AND REARING IN THE LABORATORY CONDITIONS

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Abstract

The laid eggs and hatched eggs of *Galeodes orientalis* were analyzed. Observations were recorded on the following parameters like Behavior of Gravid Females and Oviposition. The data was collected from the tests of *Galeodes orientalis* female Solifugae. The maximum number of clutch sizes as compared to the body length and bodyweight of the females concluded that the Solifugae of larger body length could lay more eggs than smaller Solifugae. Solifugae lay different batches of eggs so the next set of experiments is taken to compare with the first clutch size who contains more eggs than the other one.

Keywords: oviposition, rearing Solifugae, laboratory conditions, Madhya Pradesh.

Most of the Solifugae species inhabit dry and deserted regions of tropical and subtropical parts of Asia, In India, as suggested by the previous research papers (Bastawade, 2005; Gajbe, 2009) and literature cited. They are also found widely in warm places of Madhya Pradesh especially in the semi-arid desert area of Nimar. In this study, *Galeodes orientalis* was successfully bred, maintained under laboratory conditions (Pandram, and Sharma, 2018). The solifugae *Galeodes orientalis* were collected from the rural area of the district Alirajpur (22°18'19"N 74°24'9"E) in 2017, It lies in the Malwa region of Madhya Pradesh, near the border with Gujarat and Maharashtra.

Hutton (1843) described *Galeodes vorax* Hutton, whereas females have whitish eggs and their size like a largish mustard seed and it has 50 masses. In continuation, Hingston (1925) studied *Galeodes arabs* Koch and observed opalescent eggs with 1/7'' of size with 203 masses. Turner (1916), Hingston (1925), Lawrence (1947 and 1948), and Junqua (1962) all observed deposition and eggs laid. In the field, eggs were deposited in the burrow or tunnel. Muma (1966) assigned details on the eggs deposition and incubation and eggs laying habits. Only *E. durangonus* yielded complete and fertilized in the laboratory, deposited fertile eggs.

Oviposition

The Solifugae were collected from the fields, their site of oviposition, and the period from collection day to oviposition was recorded. After laying eggs, they were counted.

The difference in batch sizes: Some Solifugae lay large clutch sizes while some maintain it small.

The difference in batch sizes between sequential batches and timing of oviposition: Solifugae lay sequence of batches as their inter-oviposition timing is also recorded.

Effect of maternal care on feeding: During maternal care, Solifugae starve to protect their eggs. Mating experiments were performed in the laboratory. Eggs that produced experimental specimens were deposited in the laboratory. Adults and instar of *Galeodes Orientalis* were held at 70 to 900 F and 70% relative humidity.

Laboratory procedures

Ovaries were classified based on their external appearance as partially developed, in which the ovary length reached the middle of the female's abdomen and contained many small, generally white-colored eggs. Fully developed, in which the ovary length reached more than two-thirds of the female's abdomen and contained many large, generally yellow-colored eggs.

Oviposition has occurred in eight cases and in all cases, single-clutch sizes were observed (Table 1).

Case one with single clutch size and 103 eggs were laid in which 80 were hatched and their percentage was 77.66 %, female body weight noted 4.6 gram just after mating and body length was 40 mm

Case second with single clutch size and 120 eggs were laid (highest in groups) in which 90 were hatched and their percentage was 75 %, female body weight noted 4.9 gram just after mating and body length was 42 mm

Case third with single clutch size and 20 eggs were laid in which 16 were hatched and their percentage was 80 %, female body weight noted 2.6 gram just after mating and body length was 30 mm

Case fourth with single clutch size and 30 eggs were laid in which 22 were hatched and their percentage was 73.33 %, female body weight noted 2.8 gram just after mating and body length was 32 mm

Case fifth with single clutch size and 50 eggs were laid in which 40 were hatched and their percentage was 80%, female body weight noted 3.6 gram just after mating and body length was 39 mm

Case sixth with single clutch size and 40 eggs were laid in which 27 were hatched and their percentage was 67.5%, female body weight noted 4.6 gram just after mating and body length was 40 mm

Case seventh with single clutch size and 30 eggs were laid in which 24 were hatched and their percentage was 80%, female body weight noted 27 gram just after mating and body length was 30 mm

Case eight with single clutch size and 50 eggs were laid in which 38 were hatched and their percentage was 76%, female body weight noted 3.4 gram just after mating and body length was 38 mm.

This study represents a two-year study and in this experiment, the observation of the eggs of *G. orientalis* in the laboratory conditions was obtained. The deposition has been observed in the lab whereas eight cases were successfully eggs laid by *Galeodes orientalis females*. Single clutch size or mass was observed in all eggs laid cases. Oviposition occurred mostly at night-time, the eggs are laid in a single cluster. The color of fertile eggs like pearl is pale yellow and has a round shape (picture 3). Eight females produced eight masses of eggs. The masses varied in the number of eggs from 20 to 120 with a mean of 55.375.

The abdomen sizes of females affect the clutch sizes and oviposition frequency is greater in Solifugae species with females of larger abdomen size (Punzo, 1998), suggesting that abdomen size is related to larger eggs and in more number. Based on the observations made on *Galeodes orientalis* suggests that species relatively lay smaller to higher batches due to smaller to greater abdomen distension capacity.

Table 1: Relationship between Egg mass, body weight, body length, and percent hatched of the Eggs of *Galeodes orientalis*.

Cases	Eggs Clutch/Mass	Egg Numbers	Hatched Eggs	Hatched Eggs Percent	Body Weight	Body Length
1	1	103	80	77.66%	4.6 Gram	40 mm
2	1	120	90	75%	4.9 Gram	42 mm
3	1	20	16	80%	2.6 Gram	30 mm
4	1	30	22	73.33%	2.8 Gram	32 mm
5	1	50	40	80%	3.6 Gram	39 mm
6	1	40	27	67.5%	3.4 Gram	36 mm
7	1	30	24	80%	2.7 Gram	30 mm
8	1	50	38	76%	3.4 Gram	38 mm
N = 8	8	443	337			

mm= milli meter



Picture 1 and 2: Images showing gravid female in different stages, (1) Large eggs clearly visible through abdomen, (2) early phase of eggs were clearly visible through abdomen. ©Bharat,pandram



Picture 3: *G. orientalis* female is showing maternal care with eggs after oviposition. ©Bharat,pandram

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References

- [1] Bastawade, D. B. (2005). Arachnida: Scorpionida and Solifugae. *Fauna of Melghat Tiger Reserve, Conservation Area Series, Zoological Survey of India*, 24, 411-419. <http://faunaofindia.nic.in/PDFVolumes/cas/024/index.pdf>
- [2] C. A. (2009). Pachmarhi Biosphere Reserve. <http://faunaofindia.nic.in/PDFVolumes/cas/039/index.pdf>
- [3] Hingston, R. W. G. (1925). *Nature at the desert's edge*. Witherby.
- [4] Hutton, T. (1843). IX.—Observations on the Habits of a large species of Galeodes. *Journal of Natural History*, 12(75), 83-85.
- [5] Junqua, C. (1962). Biologie-Donnees sur la Reproduction dun Solifuge-Othoes Saharae Panouse. *COMPTES RENDUS HEBDOMADAIRES DES SEANCES DE L ACADEMIE DES SCIENCES*, 255(20), 2673.
- [6] Lawrence, R. F. (1947, October). Some Observations on the Eggs and Newly Hatched Embryos of *Solpuga hostilis* White (Arachnida). In *Proceedings of the Zoological Society of London* (Vol. 117, No. 2-3, pp. 429-434). Oxford, UK: Blackwell Publishing Ltd.

- [7] Lawrence, R. F. (1948). Observations on the habits of a female solifuge, *Solpuga caffra* Pocock. *Annals of the Transvaal Museum*, 21(1), 197-200.
- [8] Muma, M. H. (1966). The life cycle of *Eremobates durangonus* (Arachnida: Solpugida). *The Florida Entomologist*, 49(4), 233-242.
- [9] Muma, M. H. (1966). Mating behaviour in the solpugid genus *Eremobates* Banks. *Animal Behaviour*, 14(2-3), 346-350.
- [10] Pandram, B., and Sharma, V. K. (2018). Mating strategies of solifugae *galeodes olivier* 1791,(arachnida: galeodidae) in laboratory conditions. doi: <https://doi.org/10.5281/zenodo.1313992>
- [11] Punzo, F. (2012). *The biology of camel-spiders: Arachnida, Solifugae*. Springer Science & Business Media. <https://www.springer.com/gp/book/9780792381556>
- [12] Punzo, F. (1998). The effects of reproductive status on sprint speed in the solifuge, *Eremobates marathoni* (Solifugae, Eremobatidae). *The Journal of Arachnology*, 26(1), 113-116.

