

DIURNAL ACTIVITY OF *ALOPECOSA PULVERULENTA* (CLERCK 1757) (LYCOSIDAE, ARANEAE)

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ABSTRACT

In this study, diel activity of *Alopecosa pulverulenta* (Clerck, 1757) was established using the time-sorting pitfall trap in a grassland located between crop fields in northeast England. In spite of capture of *A. pulverulenta* during day-time and night, most were caught during the light periods. The male and female specimens were more active in the afternoon and morning periods, respectively, and followed by the sunset period. 73.4 % of the adults were collected only in the afternoon and morning periods. Little activity was recorded during the evening, midnight and sunrise periods. The males were caught more than the females during the study (1/0.73 lycosid per hour per collection). Like adults the immatures were caught in all periods. However they were more active in the afternoon periods.

INTRODUCTION

Spiders are among the most abundant arthropod predators. For this reason, spiders in agroecosystem have been the subject of numerous studies (Nyffeler 1982, 1987, 1988; Whitcomb et al. 1963, Yeargan et al. 1974, 1975; Bayram et al. 1993 a,b; Bayram 1993, 1994). Despite the prevalence of nonweb-building spiders, such as the lycosids, in some field crops (Dean et al. 1982, Whitcomb et al. 1963, Yeargan et al. 1974, 1975), studies attempting to determine the prey items and frequency of prey taken are relatively uncommon. Furthermore, the abundance of wolf spiders in agricultural environments such as crop fields has invited ecologists to investigate many ecological aspects such as feeding, the relationship between prey and predator, life-cycle, seasonal and diurnal activity of this group of animals (Dean et al. 1982, Nyffeler 1982, Yeargan 1975, Heong et al. 1989, Wu et al. 1988).

In order to measure diel rhythms of locomotory activity in spiders aktograph apparatus has been used by some researchers (Buchli 1961, Herrero et al. 1983, Minch 1978). Time-sorting pitfall traps were another apparatus in activity works (Williams 1958, 1959, 1962; Houston

1971, Luff 1978). Subjects such as daily activity patterns, relationships between locomotion and ambient temperature and other climatic factors (Abraham 1983, Carnei 1980, Horn 1969), the relationship between activity of spider and that of its prey species (Yeargan, 1975), seasonal variation in activity, and immigration have been studied by means of these apparatus. Among wolf spiders diel activity and seasonal abundance of an American spider *Pardosa ramulosa* and its prey species was investigated by Yeargan (1975) by using time-sorting pitfall traps. The activity of *P. lugubris* and *P. amentata* was determined by Granström (1973, 1977) in Northern Sweden by means of automatic pitfall traps. Also, Edgar (1970) discussed the activity of *P. amentata* and its prey. In addition, Williams (1962) has worked on seasonal and diurnal activity of some spiders including *Trochosa ruricola* and *T. terricola*. Unfortunately there is no work on the activity of *Alopecosa pulverulenta*.

In this work, diurnal activity of *A. pulverulenta* was studied by the time-sorting pitfall trap in a grassland in northeast England.

MATERIAL and METHOD

In order to collect specimens and establish the diurnal activity of *A. pulverulenta* a time-sorting pitfall trap was used in a grassland situated in a cultivated area at Close House (Heddon-on-the-Wall, Northumberland, NGR N2131660, England). The grassland (about 3 000 m²) was located between two wheat fields bordered by two woodlands. Flora was including mainly *Dactylis glomerata* Linnaeus, *Deschampsia caespitosa* (L.), *Holcus lanatus* L., and *Festuca rubra* L. *Dactylis glomerata* was the dominant grass species. The site was also containing some *Prunus avium* L. trees and patches of *Ulex europaeus* L. This site has been used for ecological studies over 20 years.

The collection was made by means of the time-sorting pitfall trap. The mechanism of the trap has already been described by Bayram. The work was carried out from 1 June 1992 to 05 July 1992. At the end of the collection period the trap was removed to the laboratory. The lycosids caught in each period were counted, identified and kept in 70 % alcohol in small containers. To determine the distribution of activity throughout the diel, the 24 pots were divided into six periods in the climatic conditions of Northumberland during May and June, namely:

1. **Midnight:** From midnight to one hour before sunrise (01 to 05, 4 hrs)

2. **Sunrise:** From one hour before sunrise to one hour after sunrise (05 to 07, 2 hrs)
3. **Morning:** From one hour after sunrise to noon (07 to 13,6 hrs)
4. **Afternoon:** From noon to one hour before sunset (13 to 19,6 hrs)
5. **Sunset:** From one hour before sunset to one hour after sunset (19 to 21, 2 hrs)
6. **Evening:** From one hour after sunset to midnight (21 to 01, 4 hrs)

RESULTS and DISCUSSION

In this study, *A. pulverulenta* could be caught about in all periods in the site. However, it was remarkably captured during the light periods. The ratio of spiders caught during the light periods to the dark periods was 1/0.39 *pulverulenta* per hour per collection, and 78 % of the adult spiders was collected only in the light periods. *A. pulverulenta* was more active especially during the afternoon period. 19.2 adult lycosids were caught per hour per collection during the afternoon period. The morning period was second (10.3 *pulverulenta* per hr per collection), and followed by the sunset period (Table 1). *A. pulverulenta* could also be collected in the evening, midnight and sunrise periods but in less numbers. The activity of spiders collected in the evening and sunrise periods were similar. The activity of adult spiders showed a remarkable increase between 11 and 18, and reached the maximum in 16. Then, a gradual decrease was recorded (Figure 1).

Table 1. Individual numbers of the adults and immatures of *A. pulverulenta* caught during the work.

Per.	Midnight	Sri.	Morning	Afternoon	Sunset	Evening	Tot.
Hour	1 2 3 4	5 6	7 8 9 10 11 12	13 14 15 16 17 18	19 20	21 22 23 24	
Male	1 2 3 2	2 3	3 4 6 10 7 13	14 12 10 18 6 4	4 4	3 2 2 4	139
Fem.	0 3 2 2	3 3	1 2 3 4 5 4	9 8 9 8 12 5	5 4	3 4 1 2	102
Ad.	1 5 5 4	5 6	4 6 9 14 12 17	23 20 19 26 18 9	10 7	6 6 3 6	241
Imm.	0 1 0 1	2 2	2 1 2 3 4 5	7 9 7 7 5 4	3 2	3 2 2 0	74

23.5 % of the total lycosids collected in the site was immature. Like adults the immatures were found in all periods. The activity of the immatures and adults showed a similarity. 81 % of immatures was collected only during the light periods. The immatures were mostly found in the afternoon period (6.5 *pulverulenta* per hr. per coll. in the after-

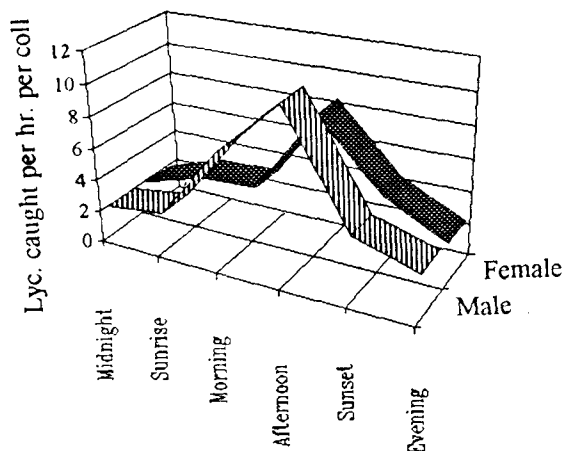


Figure 1. The activity of the males and females of *Alopecosa pulverulenta*.

noon, Table 1, Figure 2), and followed by the morning and evening periods (2.8 *pulverulenta* per hr. in the morning, 2.5 *pulverulenta* per hr. in the sunset). The immatures were collected in limited numbers in the dark periods. The least immatures were caught in the midnight period (Table 2).

Table 2. Total numbers of the adults and immatures collected in the periods during the work.

Sex and Stage	P	E	R	I	O	D	TOTAL
	Midnight	Sunrise	Morning	Afternoon	Sunset	Evening	
Male	8	5	43	64	8	11	139
Female	7	6	19	51	9	10	102
Adult	15	11	62	115	17	21	241
Immature	2	4	17	39	5	7	74

In this study, the males and females of *A. pulverulenta* could be caught in all periods. The males were found more active than the females. The catch ratio of total males to the females was 1/0.73 lycosid. More activity was established in the afternoon and morning periods for both sexes. 76.9 % of the males and 68.6 % of the females were collected in the afternoon and morning periods. Among the light periods the

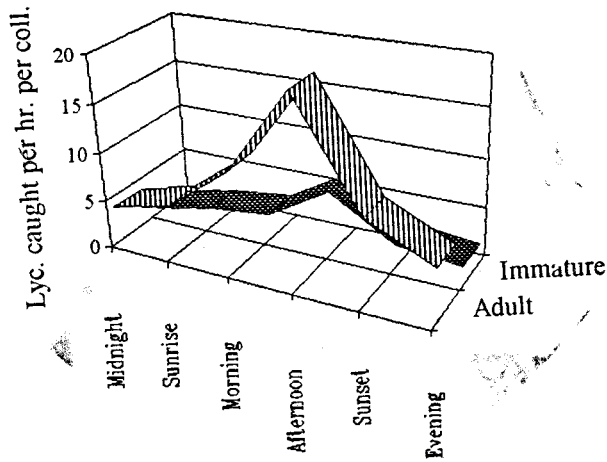


Figure 2. The activity of the adults and immatures of *Alopecosa pulverulenta*.

males and females were more active in the afternoon. 10.7 male *pulverulenta* and 8.5 female *pulverulenta* were caught per hour per collection in the afternoon period (Table 3). The males and females of *A. pulverulenta* were less active in the midnight, evening and sunrise periods. The males and females were found more active in the sunset period than the sunrise period. So, the males and females were remarkably more active during the light periods. They showed a pick in the afternoon period, and then decreased gradually (Figure 2). No female with egg sac of *A. pulverulenta* was caught during this work.

Table 3. The numbers of individuals of *A. pulverulenta* caught per hour by the time-sorting pitfall trap during the work.

Sex and Stage	P	E	R	I	O	D
	Midnight	Sunrise	Morning	Afternoon	Sunset	Evening
Male	2	2.5	7.2	10.7	4	2.8
Female	1.8	3	3.2	8.5	4.5	2.5
Adult	3.8	5.5	10.3	19.2	8.5	5.3
Immature	0.5	2	2.8	6.5	2.5	1.8

In this study, more males were caught than the females. Approximately in all periods, the number of the males caught per hour was higher than that of the females. This highness in the male population is an indicator of activity of the males. In many works, more males were

caught in April and May (Merrett 1968, Bayram 1993, Hollander 1971). From the middle of April to the end of May male lycosids seek the females to copulate, and this period is called as 'copulation period' by some authors. As a matter of fact in another study continued over three years, after the copulation period in *Pardosa* and *Alopecosa* species a remarkable decrease was recorded in male populations, and while the males generally disappeared at the mid-August, the females carried on until the beginning of October (Bayram, 1993).

Surprisingly neither in this study nor the habitat selection and phenology studies continued over three years by pitfall trapping the females with egg sacs of *A. pulverulenta* were encountered. Whereas in this grassland which used for ecological studies for many years, the females with egg sac of *Pardosa* and *Trochosa* were easily caught by pitfalls, time-sorting traps or hand collections. The females with egg sacs were collected after May in other genera. However, any of egg sac of *A. pulverulenta* or a female carrying spiderlings on her back was found in this site. It is known that fertilized females of some lycosid species move to more open places (Norgaard, 1945). In addition, some authors (Edgar 1971, Aart 1973) reported that hunting spiders during their life cycle might be found on places different from those frequented by adults. Generally the different developmental stages (juvenile ,sub-adult) or even the sexes may live in slightly different habitats. Particularly females carrying egg sacs move away from the places frequented by juveniles, subadult and males in order to stay at sites which are more exposed to the sun. *A. pulverulenta* may be a species like this. In the site studied, the grass was over 20 cm, and the site was containing many humid grass tussocks.

Williams (1962) records only two adult of *A. pulverulenta* from Mill Copse in his work. He collected these specimens in the afternoon period. Unfortunately there is no more information on the activity of this species.

During the experiment a long gutter was added to the time-sorting pitfall trap in order to collect more specimens. This device is more suitable for some ground living insects such as Carabidae (Houston 1971, Luff 1978). I observed that lycosid spiders certainly can climb out of the trap. Also, being curved inside at the rims of the gutter did not matter for spiders. In spite of this, this device and method was found to be effective to collect spiders. Especially in the grassland, more specimens were collected than I expected, even though the galvanized wire mesh can also prevent the fitpall capture of spiders.

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