THE FEEDING INTENSITY OF THE NESTLINGS OF CHIFFCHAFF (*Phylloscopus collybita* VIEIL., 1817) AND BLACKCAP (*Sylvia atricapilla* L., 1758) IN SOME ECOSYSTEMS IN THE REPUBLIC OF MOLDOVA

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Abstract. Feeding activity of chicks of *Phylloscopus collybita* and *Sylvia atricapilla* was studied in biotopes located in the central part of the country. In the case of the Chiffchaff, the feeding is assured only by the female; rarely and only in the case of some pairs, the male it is also involved in feeding the nestlings, during the last days of their staying in nest. In the Blackcap both partners feed their chicks with different rates of participation. Intensifying rate of feeding chicks takes place in the 4-5th day, reaching the maximum rates during the sixth day of the postembryonic development in *Sylvia atricapilla,* and during the eighth day in *Phylloscopus collybita.* This is due to intensive development of anterior and posterior limbs, plumage and other body parts. Modelling the relationship between age and number of feedings/hour through regular regression shows a statistically significant correlation (r = 0.9063, p = 0.0001).

Keywords: feeding activity, intensity, Chiffchaff, Blackcap.

Rezumat. Intensitatea hrănirii puilor de pitulice mică (*Phylloscopus collybita* VIEIL., 1817) şi silvia-cap-negru (*Sylvia atricapila* L., 1758) în unele ecosisteme din Republica Moldova. Activitatea de hrănire a puilor la speciile *Phylloscopus collybita* şi *Sylvia atricapilla* a fost studiată în biotopuri din zona centrală a republicii. La specia *Phylloscopus collybita,* de hrănirea puilor se ocupă doar femela, doar în cazuri rare spre sfârşitul perioadei de şedere în cuib a puilor s-a observat participarea masculului. La specia *S. atricapilla* se ocupă ambii parteneri de hrănirea puilor, cu o rată diferită de participare. Intensificarea ritmului de hrănire a puilor are loc spre ziua a 4-a sau a 5-a, cotele maxime înregistrîndu-se în ziua a şasea de dezvoltare postembrionară la specia *Sylvia atricapilla,* iar la *Phylloscopus collybita*, în ziua a opta. Aceasta se datorează dezvoltării intense a membrelor anterioare şi posterioare, a penajului, precum şi a altor părţi ale corpului. Modelul regresional al relaţiei ritmului şi intensităţii hrănirii cu vârsta înregistrează o corelaţie semnificativă statistic (r = 0,9063; p = 0,0001).

Cuvinte cheie: activitate de hrănire, intensitate, pitulice mică, silvie-cap-negru.

INTRODUCTION

Feeding activity of nestlings of *Sylvia* and *Phylloscopus* species was study subject for some researchers (KORODI, 1965; IVANOV & BARANOVSKI, 2003; DRUP, 2008; PROKOFIEVA, 2008 etc.) and their results are included in general studies of the biology of species in different areas of their distribution. *Phylloscopus collybita* and *Sylvia atricapilla* are common species in the country, as in some biotopes they are dominant in the community of birds. Aspects about the biology and ecology of these species are found in the works issued by AVERIN & GANEA, 1970; KURGANOVA, 1986; BOGDEA, 2009; MUNTEANU, 2009.

MATERIAL AND METHODS

Observations on the rate of feeding nestlings of Chiffchaff and Blackcap were conducted in the interval May-June of 2009 and 2010 in the following sites: Trebujeni forest, Botanical Garden, Stăuceni park, "Sf. Lazar" cemetery. In these biotopes *Sylvia atricapilla* and *Phylloscopus collybita* have relatively high densities, being subdominant species, except for *Sylvia atricapilla* in the "Sf. Lazăr" cemetery.

Observations on feeding activity were performed on four Chiffchaff nests with different numbers of nestlings (three nests – 4 chicks, one ne-5 chicks) and 3 nests of Blackcap. The data were collected by visual observation with binoculars and recorded by video camera Panasonic SDR-H280. The regression model of the relationship between the age of nestlings and their feeding intensity/hour was realised with Statistica 6.0.

RESULTS AND DISCUSSIONS

Our observations allowed us to establish hat the duration of the "working day" of the species *Phylloscopus collybita* and *Sylvia atricapilla* lasts approximately 16 - 17.5 hours and the night time rest lasts about 5.5 - 6 hours. The beginning of the working day is observed at 5 o'clock in the morning, but in some specialized literature it is mentioned that some pairs begin to be active around 3 a.m. (PROKOFEVA, 2008). The end of the working day at *Phylloscopus collybita* is around 9.30-10 p.m. Early in the morning and late in the evening foraging takes place in low light conditions, lower temperature, and thus the feeding rate is reduced.

Immediately after hatching, in the first two-three days, parents spend most of their time on heating their nestlings. This is due to the fact that altricial birds are poikilotherm and the chemical thermoregulation is not developed. This is why in the first days after hatching nestlings are more warmed than fed. In the case of the species of the genus *Sylvia,* both parents are involved in keeping the nestlings warm, with a different rate of participation. From our

observations we can conclude that in the morning hours (from 8 to 11 a.m.) the female is the one that spends more time in the nest, the interval of time being 3-15 minutes. Between the 11 a.m. and 4 p.m., most of the time, the male was seen sitting in the nest, for about 11 minutes maximum.

Regarding the species *Phylloscopus collybita,* the care for nestlings (heating, feeding, and removing the excrements from the nest) is the female's task, very rarely and only in the case of some pairs the male being involved in feeding the nestlings at the age close to leaving the nest. This situation was recorded at the nest 4 from the Stăuceni park; it happened on the eighth day of chicks monitoring. The male fed the nestlings 3 times during 19 minutes, but in this time the female was in the nest. After acoustic communication between male and female, different as intensity and amplitude compared to the song and calls, the male went down to the nest. After another short acoustic communication the male left, but after a short time he returned with food in beak and gave it to the nestlings.

According to the observations and the records of the feeding rhythm (Table 1) it is ascertained an increase of the numbers of feedings with the nestlings' age until the 8th day in the Blackcap nestlings and until the 10th day in the Chiffchaff nestlings; afterwards, the feeding intensity decreases. The difference between the peaks of feeding intensity between the two genera is explained through the shorter time of Blackcap chicks staying in the nest. According to the data obtained from different nests, we concluded that the number of feedings is a subject of large oscillations, namely from 135 feedings at the age of 3 days to 316 for 9 days old chicks.

Table 1 The feeding activity of the adults of *Phylloscopus collybita* at different ages and different numbers of nestlings.
Tabel 1. Activitatea de hrănire a adulţilor de *Phylloscopus collybita* pe parcursul unei zile la diferite vârste şi număr diferit al puilor.

Nestlings age days	No. of nestlings in the nest	Feeding average /hour		Nr. of feeding/ hour minim	No. of feeding/hour maxim	Total number of feedings/day	Removing of excrements
		On nest	For 1 nestling				
3	4	7.94	1.9	3	15	135	26
4	4	13.6	3.4	7	22	232	41
7	3	11.9	3.9	5	18	203	32
9	5	18.6	3.72	12	24	316	52

During the first three days the number of feedings varies between 85 and 119; in average the chicks are fed approximately every 10 minutes (Table 1). After the 5th day, it is observed an increase in feedings number that reaches between 270 and 322 feedings/day, and nestlings receive food at every 2.5-3 minutes. The feeding rate for the 9 days old chicks is a little reduced, about 15.8/ nest/hour; chicks are fed at every 5-6.5 minutes during the hours of intensive activity.

In figure 1, by modelling the relationship between age and number of feedings/hour through polynomial regression, the graphic takes the form of plateau toward the end of the nest staying period. It is observed a statistically significant correlation (r = 0.91 p = 0.0001; y = -121.880182 + 1.252*x), the values being distributed within the confidence interval. The lowest feeding frequency is about 3 feedings/hour in the first days and 12 feedings – in the 9th day.

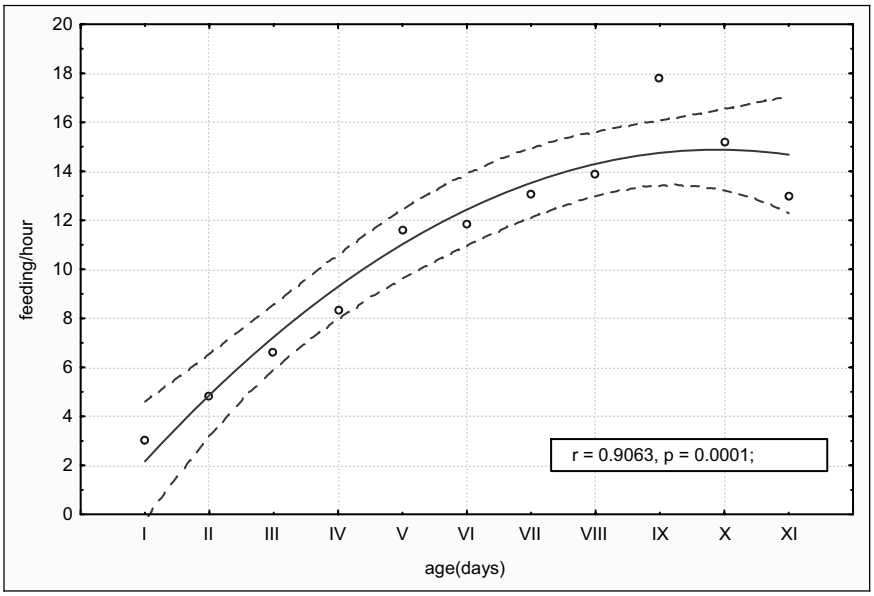

Figure 1. The relationship between the intensity of feedings/hour and nestlings'age in *Phylloscopus collybita.*
Figura 1. Relaţia dintre intensitatea hrănirii/oră şi vârsta puilor de *Phylloscopus collybita.*

We can observe from the dendrogram that the increase of feeding rhythm of the nestlings takes place in the 4-5th day, but maximum rates are recorded in the 6th day of development in the nestlings of *Sylvia* and in the 8th day in the genus *Phylloscopus* (Fig. 2). This is due to the rapid (intensive) development of the anterior and posterior limbs, plumage and other parts of the body. These physiological processes require high energy consumption.

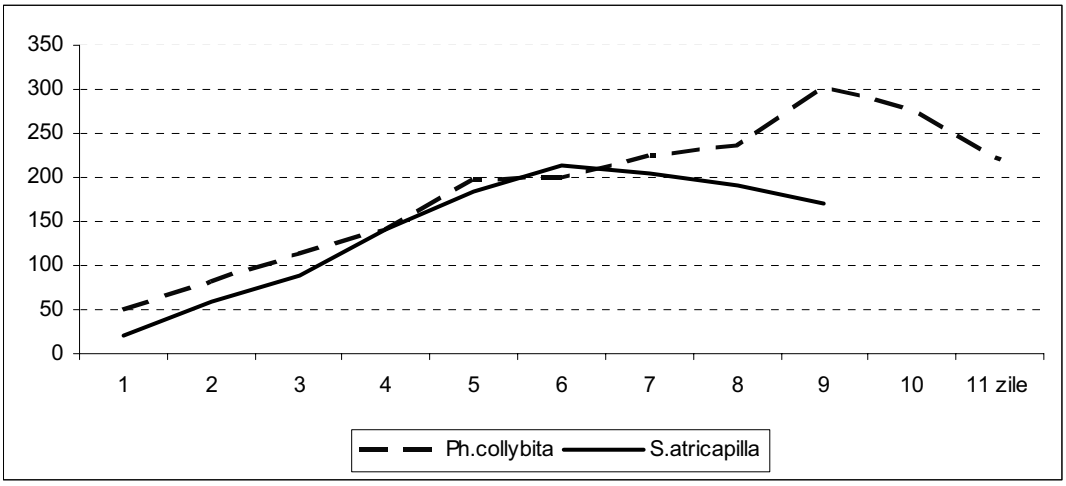

Figure 2. The relationship between the intensity of feedings/day and nestlings' age *Phylloscopus collybita* and *Sylvia atricapilla.*
Figura 2. Relaţia dintre intensitatea hrănirii/zi şi vârsta puilor de *Phylloscopus collybita* şi *Sylvia atricapilla.*

Toward the end of the period of chicks staying in the nest, the feedings frequency and the parents' activity diminish. In *Sylvia atricapilla*, during the 9-10th days, the number of arrivals with food was 177, as compared with the 5th day when we registered 281 feedings (Table 2).

Analysing the feeding rhythm, it is ascertained that in most cases, the adults' activity is more intensive in the morning and then in the evening. This common situation was not recorded in the case of a nest with 5 nestlings of *Phylloscopus collybita,* where an intense activity took place throughout the day. This is due, of course, to the high number of nestlings and their age.

It is known that the feeding intensity of nestlings is significantly influenced by climatic conditions (ARMSTRONG, 1954). Our observations were carried out in sunny and clear weather, but there were also some rainy days. It was observed that adults fed their chicks during rain, but very rarely, because of the difficulty of searching for insects.

In the case of Blackcap both parents are involved in feeding the nestlings (Table 2). From the observations made by us and figure No. 3 it is obvious that the rate of feeding performed by the male within the first days is higher as compared to the female, but when the chicks get older the male contribution decreases. This is due to the fact that the female spend most of her time in the nest, as we mentioned above.

Table 2. Feeding activity (/day) of adults of *Sylvia atricapilla* at different ages and different number of nestlings.
Tabel 2. Activitatea de hrănire (/zi) a adulţilor de *Sylvia atricapilla* la diferite vârste şi număr diferit al puilor.

Nestlings age days	No. of nestlings in nest	Total number of feedings			Feeding average/hour		Removing of excrements
		total	by female	by male	on nest	F/ 1 nestling	
3	5	119	52	67	6.91	1.38	18
5	4	281	176	105	16.3	4.08	28
9	5	273	98	79	15.8	3.17	41

Throughout our observations it was ascertained that the feeding frequency depends on some objective factors and on the weather. Diminishing the number of feedings was observed when the size of food sample is larger.

The duration of one feeding varies and depends on nestlings' age. For instance, the feeding of nestlings of 1-2 days lasts 3-5 min., in the case of older babies – 0.5-1.5 min.; it is obvious that the last ones swallow the food faster.

In the case of the species of the genus *Sylvia,* in the first 2-3 days the adults fly after food one by one shifting each other, reducing as much as possible the interval of leaving the nest alone. In the next days, it was observed two variants of feeding behaviour: - a) concurrent – both parents are feeding in the same time; - b) alternative – while the female feeds the nestlings; the male stays not far away from the nest with the prey in its beak and waits until the female leaves. But there was recorded such a situation when the male came with the prey in its beak and stayed near the nest, where at that moment was the female. Suddenly she came toward the male and took the prey, fed the nestlings, and immediately the male left.

After giving the food, the adult makes a lot of movements to arrange the blades from the nest's wall (substitution behavioural activities); in the meantime the chicks faeces are removed by adults and thrown at distances of 10-15 m away from the nest. But it was also observed that males of *Sylvia atricapilla* swallow faeces once at 2-3 transports. In the case of female the consumption of faeces is rarely recorded. As regards the female of *Ph. collybita,* the situation is opposite; they frequently swallowed the nestlings' faeces.

CONCLUSIONS

The analysis of the relationships between nestling age and the number of daily feedings shows that the number of feedings increases gradually between the 1st and the 4th days. There are two peaks: one at the age of 5-6 days and the second in the 9 days old nestlings. Afterwards the intensity and frequency of feedings decrease.

The dependence of the frequency and rhythm of feeding on certain factors are not always clear and the isolated effects of individual factors do not exist. In addition, more value can be related by individual attitude of parents toward chicks.

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