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PRELIMINARY DATA ON THE FOOD STRUCTURE OF THE SAND MARTIN NESTLINGS (*RIPARIA RIPARIA* L. 1758) (AVES: HIRUNDINIDAE) IN SOUTHERN ROMANIA

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Abstract. The paper presents some preliminary data on the food structure of the Sand Martin nestlings (*Riparia riparia* L., 1758) during the three months of the breeding season: May, June and July. Our researches were made in two colonies from the Argeş River, 3 km downstream the dam from Mihăileşti. We used the method of the analysis of the faeces eliminated by the nestlings. We collected 66 faeces at the end of May, 69 faeces in June, and 14 faeces in July. In all 159 studied samples we identified 2,116 preys which belong to two classes, 7 orders and 16 families of arthropods. Most of the preys were represented by coleopterans (60.39%), hymenopterans (29.02%), heteropterans (4.01%), dipterans (2.89%) and other groups (3.68%).

Résumé. Le travail présente quelques données préliminaires sur la structure de la nourriture de l'hirondelle de rivage (*Riparia riparia* L., 1758) pendant les trois mois de la saison de reproduction: mai, juin et juillet. Notre recherche a été faits dans deux colonies de la rivière Argeş, 3 kilomètres aval du barrage de Mihăileşti. Nous avons employé la méthode d'analyse des excréments. Nous avons collecté 66 excréments à fin du mai, 69 excréments en juin et 14 excréments en juillet. Dans tous les 159 échantillons étudiés nous avons identifié 2.116 proies qui appartiennent à deux classes, 7 ordres et 16 familles des arthropodes. La plupart des proies ont été représentés par des coléoptères (60,39%), hyménoptères (29,02%), hétéroptères (4,01%), diptéres (2,89%) et d'autres groupes (3,68%).

Key words: Sand Martin, *Riparia riparia*, nestlings diet.

In Romania, the studies on the food of the insectivorous birds are few in number. The first references on the food of the insectivorous birds were published by Dombrowski (1912) and Linţia (1946). But most of the papers appeared during the period 1958 - 1971. Such kind of studies were made by Korodi Gal (1958) for *Phoenicurus phoenicurus,* Korodi Gal (1965) for *Sylvia atricapilla;* Theiss & Ieniştea (1967), who followed the neck ring method in order to identified the composition of the nestlings food of *Passer domesticus* and *Passer montanus;* Iordache (1971), analysed the stomach content of the nestlings of the same species; Munteanu (1969), used also the neck ring method in analisying the food of *Phoenicurus ochruros* nestlings; Papadopol (1969), published a paper in which he referred to the main investigation methods on the bird food.

The reason which lies at the bottom of this paper was that there are very few papers dealing with the food of Hirundinidae in the specialized literature. Frequently it is asserted only that they are insectivorous, without details on the insect groups included in the diet of these birds and their share.

In the foreign literature, papers on the Hirundinidae food were published by: Kozena (1975), for *Delichon urbica,* Kozena (1979, 1980, 1983), for *Hirundo rustica,* Prodon (1982), for *Hirundo daurica rufula,* Turner (1984), for *Phaeoprogne tapera,* Kopij (2000), for *Hirundo rustica, H. albogularis, H. semirufa, H. cucullata,*

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H. spilodera, H. fuligula, Delichon urbica, Riparia paludicola and *Riparia cincta,* Mengelkoch & col. (2004), for *Tachycineta bicolor.*

As regards the food of the Sand Martin there are some previous papers, two of them on the populations of *Riparia riparia* from North America, Beal (1918) and Stoner (1936), one for the populations from United Kingdom, Waugh (1979), and one for Russia, Pavlova (1962).

In Romania, only one paper on the food of the Swallow, *Hirundo rustica,* was published, Pap & col. (1998).

Our paper is the first contribution to the knowledge of the food structure of Sand Martins from southern Romania.

MATERIAL AND METHOD

Main methods used during the study of the food structure of Hirundinidae are: analysis of the stomach content; the neck ring method and the analysis of the faeces. Besides these methods, Mc.Carty & Winkler (1991) used an artificial nestling for the identification of the food in *Tachycineta bicolor.*

The method of the analysis of the stomach content has a major shortcoming, it presuming the killing of the birds. Because of this reason the method is used now only for the study of the already dead specimens or preserved in liquid in different scientifically collections or museums.

The neck ring method is advantageous because it allows the estimation of the food quantity consumed during a period of time and, at the same time, it allows the exact identification of the preys. Beside this advantage, the method is disadvantageous because it induces a great stress to the nestlings.

The investigation of the faeces content is good because it does not imply the killing of the birds and the nestlings are not stressed. The method was used during the studies of the food structure of the Sand Martin nestlings by Waugh (1979). A disadvantage of this method is that the soft parts of some insects, as some dipterans or homoptera, are entirely digested or crumbled after they transited the alimentary canal, rising problem in identification. Thus, it is impossible to identify the exact number of the preys from the samples. The remains of coleopterans and hymenopterans are preserved better after they transit the alimentary canal, allowing the identification up to the species level.

For this study we collected 159 faeces, during the period May - July 2004, from two Sand Martin colonies *(Riparia riparia)* placed in a ballast-pit at 3 km downstream the dam from Mihăileşti, on the Argeş River (Fig. 1).

Later, the faeces were crumbled under binocular and the chitinuous remains were separated from the undigested ones. They were sorted and identified up to the species, family or order level.

For the identification of the undigested insect remains we also used comparative material, collected with the entomological net from the feeding habitat of the Sand Martins.

RESULTS AND DISCUSSIONS

The ecology and the behaviour of the Hirundinidae are independent from the distribution and abundance of the insects. Feeding territory of the Sand Martins surrounds the colony during the nesting period, at distances which varies from 200 m (Turner, 1989), to 6 km around the colony (Svenson, 1969). The distance towards this hunting territory depends on the feeding places available to Sand Martins.

Fig. 1 – General view of one of the two the colonies from where the samples were collected (Photo G. Chişamera).

Within the researched area, the feeding territories of the Sand Martins are the bed of the Argeş River, the banks covered by characteristic vegetation formed of *Salix* sp., *Crategus* sp., *Rosa canina* and rich grassy vegetation. Also, there are numerous agricultural lands, cultivated with wheat, oat, maize and lucerne.

Hirundinidae species which feed on large-sized and dispersed insects are generally solitary or nest in small groups, while the colonial species, as Sand Martins, feed on small-sized insects and which swarm (Turner, 1989). This behaviour seems to be a consequence of the colonial life, which increases the efficiency of exploration. This phenomenon is also pointed out by the large share of some insects which fly in swarms in the nestlings food. For instance, *Pleurophorus caesus,* (Coleoptera: Scarabeidae), which live on rotting vegetal matter and which fly in swarms above the fresh plough-land. This species represent 32.28% from the preys identified in May, and 31.45% from the preys identified in June. In July the winged ants are preferred, which represent 66.21% from the preys identified in this month.

Most of the preys are caught on the fly, but occasionally those on the ground and the water surface can also be captured (Cramp, 1988), the last ones, especially on bad weather.

For North America, Hobson & Sealy (1987) reports six Hirundinidae species which take the food from the ground: *Hirundo rustica, H. pyrrhonota, Tachycineta bicolor, Progne subis, Stelgidopteryx serripennis, Tachycineta thalassina* and *Riparia riparia.* In the studied samples taken from the colony from the Argeş River, we identified four possible preys, susceptibly of being caught on the ground or even in the nest. Thus, we identified five arachnid specimens (Arachnida) and a specimen of *Haploglossa gentilis* (Coleoptera: Staphylinidae), which maybe it was swallowed

Fig. 2 – Feeding habitat of the Sand Martin in the basin of the Argeş River (Photo G. Chişamera).

by nestlings just in their nest. For Europe, Prodon (1982) mentions this behaviour in *Hirundo daurica,* too.

The height they feed varies from 15 m (Turner, 1989) to almost the level of the ground. Thus, in the food of the Sand Martin a large diversity of insects occurs, those flying in swarm and the solitary ones from the level of the vegetation being prevalent, but also, they catch preys just from the ground.

The Sand Martins can catch, occasionally, preys belonging to other invertebrate classes. Therefore, in the 159 analysed faeces we also identified 5 specimens of arachnids, which probably were caught on the ground and vegetation.

The food structure during the breeding season, when we took the samples, varies in the share of different groups of eaten preys. Thus, in May and June, coleopterans have the largest share, and in July, hymenopterans.

In the 66 samples from May, we identified 951 preys, out of which 63.82% were coleopterans, 19.87% hymenopterans, 6.3% heteropterans, 5.78% dipterans, 1.15% homopterans and 3.04% other unidentified insect groups (Fig. 3).

From the coleopterans, which where prevalent in May, the largest share is represented by the families Scarabeidae (32.28%), Bruchidae (9.67%), represented by *Euspermophagus sericeus,* Curculionidae (8.7%), represented by several species, the most important being *Hypera variabilis,* which represent 4.2% alone, from the total of the preys (Tab. 1). Family Scarabeidae formed the largest percentage from the preys and it was exclusively represented by *Pleurophorus caesus,* species which lives on rotting vegetal matters. Vegetal remains which favour the appearance of the scarabs in the food, in a high number, are very numerous in the researched area, and are placed especially in the waste pit of Cornetu village, which is near the Sand Martin colonies and where we often remarked the martin flocks feeding themselves.

For June we studied 69 faeces and remarked the same prevalence of the coleopterans, which represent 63.51% from the preys. We also observed an

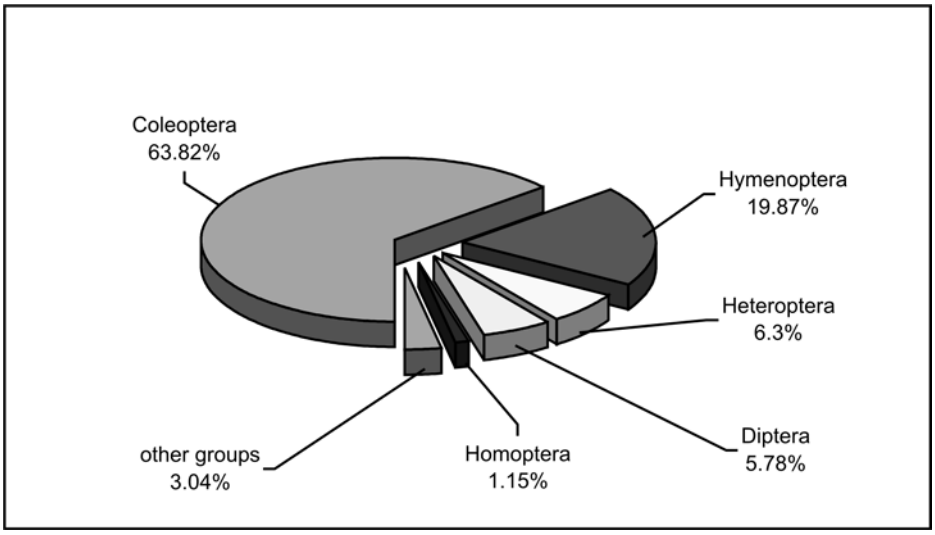

Fig. 3 – The share of the insect groups in the Sand Martin food, in May.

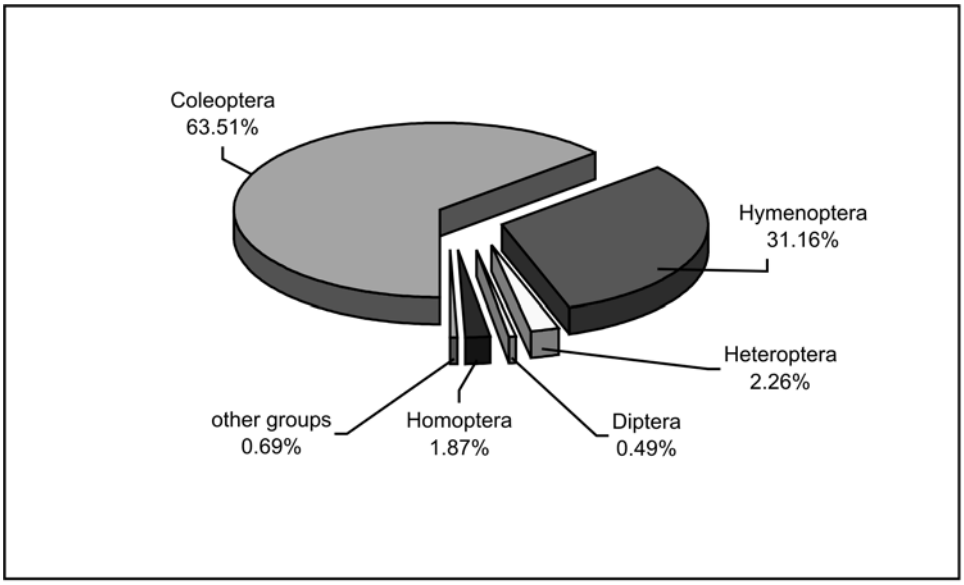

Fig. 4 – The share of the insect groups in the Sand Martin food, in June.

increasing of the hymenopteran percentage to 31.16%, to the prejudice of dipterans and heteropterans, whose percentages significantly decreased (Fig. 4).

From the coleopterans, the largest share is represented also by Scarabeidae (31.45%), exclusively represented by *Pleurophorus caesus,* followed by Curculionidae (15.27%), Bruchidae (4.63%) and Carabidae (4.04%).

Curculionidae are especially represented by *Ceutorhynchus erysimi* (0.29%) and *Hypera variabilis* (13.7%) in the preys identified in June.

Table 1

Taxonomical arthropod groups identified in the faeces collected during the period May-July 2004 from the Sand Martin colonies. from southern Romania.

Identified taxa	Month								
	May (66 samples)			June (69 samples)			July (14 samples)		
	Identified specs no	% from the specs no	Appearance frequency in the samples	Identified specs no	% from the specs no	Appearance frequency in the samples	Identified specs no	% from the specs no	Appearance frequency in the samples
1	2	3	4	5	6	7	8	9	10
Class ARACHNIDA									
Ord. Araneae	2	0.21	2	1	0.09	1	-		-
Fam. Araneidae -		-	2	0.19	1	-		-	
Class INSECTA									
Ord. Coleoptera									
Fam. Staphylinidae									
Haploglossa gentilis	1	0.1	1	-		-	-		-
Fam. Elateridae									
Drasterius bimaculatus Rossi	7	0.73	6	18	1.77	9	-		-
Fam. Hydrophilidae									
Subfam. Helophorinae	7	0.73	5	2	0.19	2	-		-
Helophorus granularis L.	46	4.83	27	13	1.28	8	-		-
Fam. Anthicidae									
Subfam. Anthicinae									
Formicomus pedestris Rossi.	3	0.31	3	5	0.49	5	-		-
Fam. Histeridae									
Subfam. Saprininae									
Saprinus rufipes Payk. 1775	1	0.1	1	4	0.39	2	-		-
Saprinus semistriatus Scriba	-		-	1	.09	1	-		-
Fam. Carabidae									
Dromius melanocephalus Dej.	1	0.1	1	41	4.04	12	-		-
Fam. Scarabeidae									
Pleurophorus caesus Creutzer 1796	307	32.28	52	319	31.45	41	9	5.96	3

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10
Fam. Bruchidae									
Subfam. Amblycerinae									
Euspermophagus sericeus Geoffr. 1785	92	9.67	37	47	4.63	27	10	6.62	7
Fam. Curculionidae	24	2.52	17	13	1.28	11	4	2.64	4
Tanysphyrus lemnae Payk. 1792	1	0.1	1	-		-	-		-
Ceutorhynchus erysimi F. 1787	14	1.47	10	3	0.29	3	-		-
Ceutorhynchus marginatus Payk. 1792	3	0.31	3	-		-			
Hypera variabilis Herbst. 1795	40	4.20	17	139	13.7	32	2	1.32	2
Baris coerulescens Scop.	1	0.1	1	-		-	-		-
Fam. Nitidulidae									
Meligethes subrugosus Gyll.	2	0.21	1	-		-	-		-
Heterostomus viliger Reitt.	-		-	1	0.09	1	-		-
Other groups of unidentified coleopterans	57	5.99	36	38	3.74	25	2	1.32	2
Ord. Hymenoptera									
Suprafam. Ichneumonoidea	1	0.1	1	-		-	-		-
Fam. Braconidae									
Subfam. Cheloninae	4	0.42	4	4	0.39	4	-		-
Fam. Ichneumonidae	-		-	4	0.39	1	-		-
Suprafam. Formicoidea	27	2.83	15	111	10.94	30	26	17.21	10
Fam. Formicidae	37	3.89	10	143	14.10	33	74	49	9
Suprafam. Vespoidea									
Fam. Chalcididae	5	0.52	5	2	0.19	2	-		-
Fam. Chrysididae	1	0.1	1	11	1.08	11	-		-
Other groups of unidentified hymenopterans	114	11.98	43	41	4.04	21	9	5.96	6
Ord. Homoptera									
Suprafam. Psylloidea									
Fam. Psyllidae	2	0.21	1	-		-	1	0.66	1
Suprafam. Cicadoidea	9	0.94	9	19	1.87	11	3	1.98	1
Ord. Heteroptera	60	6.30	18	23	2.26	21	2	1.32	1
Ord. Odonata	3	0.31	2	1	0.09	1	-		-
Ord. Diptera	55	5.78	22	5	0.49	3	1	0.66	1
Other groups of unidentified insects	24	2.52	10	3	0.29	3	8	5.29	6

An important percentage from the identified hymenopterans in June belongs to the winged ants, which represent 25.04% from the total number of the identified preys. Heteroptera (2.26%), dipterans (0.49%) and homopterans (1.87%) are less important in the diet of the Sand Martins in June.

In July, hymenopterans were prevalent, representing 72.18% from the preys, followed by coleopterans (17.88%). The hymenopterans identified in the food in this period are mostly represented by the winged ants. Homopterans and heteropterans, representing 2.64% and, respectively 1.32% from the food, and the dipterans, in a small percentage, of 0.66%, are insignificant.

Low percentage of dipterans from the total identified preys can be, on the one side, due to a shortcoming of the method, i.e. after the intestinal transit the small-sized dipterans are completely digested, and, on the other one, due to different ecological conditions from the areas where the studies on the food of the Sand

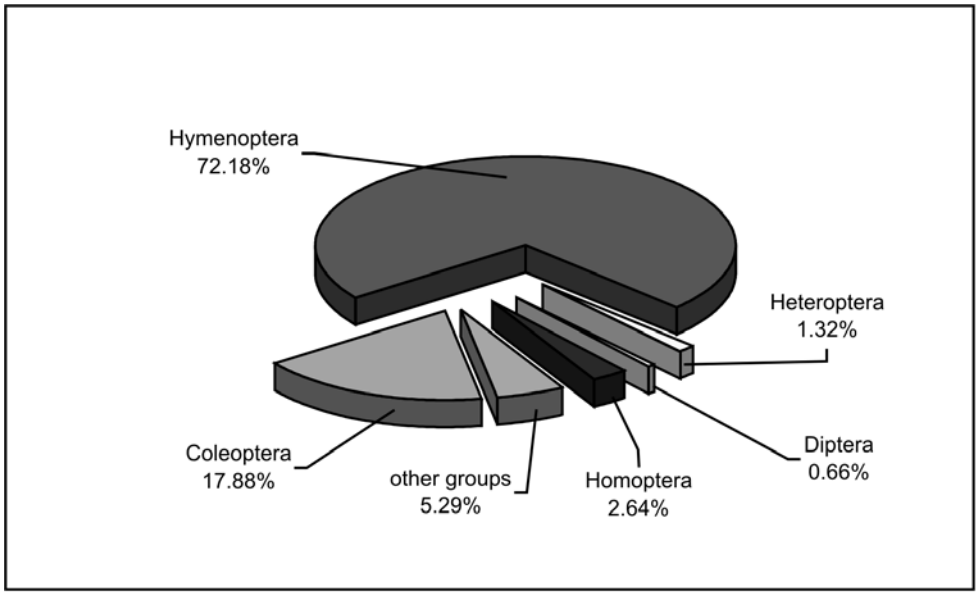

Fig. 5 – The share of the insect groups in the Sand Martin food, in July.

Martin nestlings were made: U.S.A. (Beal, 1918 and Stoner, 1936), United Kingdom (Waugh, 1979) and Romania.

The great variation in the share of the insect groups, presented for different Sand Martin populations, demonstrates that they are not selective predators, that means they do not select a certain kind of preys, the single selection implying the size of the prey (Tab. 2).

Apparent preference of the studied population for coleopterans is due to the great abundance of these insects in the feeding biotope of the Sand Martins, on the one hand, and on the other one, to the flight of coleopterans which is much slower and heavier than that of the hymenopterans and dipterans. Therefore coleopterans are easier preys.

The presence of the waste pit of Cornetu village and of numerous agricultural lands near the studied colony supports a rich coleopteran fauna, which is very much

Table 2

Comparison between the shares of the taxonomical insect groups from the Sand Martin food, in different studies.

Preys	S.U.A. (Beal, 1918)	S.U.A. (Stoner, 1936)	United Kingdom (Waugh, 1979)	Romania Present study (2004)
	- stomach analyses		- faeces analyses	
Coleoptera (%)	17.90	36.13	10.68	60.39
Hymenoptera (%)	33.49	5.66	4.93	29.02
Heteroptera (%)	7.69	23.94	12.53	4.01
Diptera (%)	26.63	31.59	69.26	2.89
Other groups (%)	14.02	2.68	2.60	3.68
TOTAL (%)	100	100	100	100

exploited by the Sand Martins. The high number of the *Pleurophorus caesus* specimens, found in the analysed faeces, is due to the large volume of rotting vegetal matters stored near the colony, and the presence of *Hypera variabilis* in food is due to the presence of some lucerne cultures near the studied colonies, on which this species develops.

A result similar to that of ours was underlined by Kopij (2000) in the populations of *Riparia cincta,* studied in southern Africa, in whose diet a percentage of 62.1% coleopterans were identified (Tab. 3)

Analysing the share of the coleopteran families identified in the food during the three months of study, we found out that Scarabeidae is the most important family from the prey number point of view, it being prevalent in May and June, followed by Curculionidae, which was occurred in a higher percentage in June (see fig 6). From Curculionidae we often identified *Hypera variabilis* and *Ceutorhynchus erysimi*.

Table 3

Comparison between the food structure in *Riparia paludicola*, *Riparia cincta* and *Riparia riparia.*

Preys	*Riparia paludicola* southern Africa, (Kopij, 2000) - stomach analyses	*Riparia cincta* Southern Africa, (Kopij, 2000) - stomach analyses	*Riparia riparia* (Romania) - faeces analyses
Coleoptera	35.7%	62.1%	60.39%
Hymenoptera	17.9%	0	29.02%
Diptera	0	32.4%	2.89%
Other preys	46.4%	5.5%	7.19%

Conclusions

The food structure during the three months of the breeding season of Sand Martins varied in the proportion of different prey groups which form the diet of this species (see fig. 3 and tab. 2).

The studied population showed an apparent preference for coleopterans, contrasting with the data from literature, on the one hand due to the abundance of these insects in the feeding biotope, and, on the other one, due to the slower and heavier flight of coleopterans than that of hymenopterans or dipterans, thus becoming easier preys.

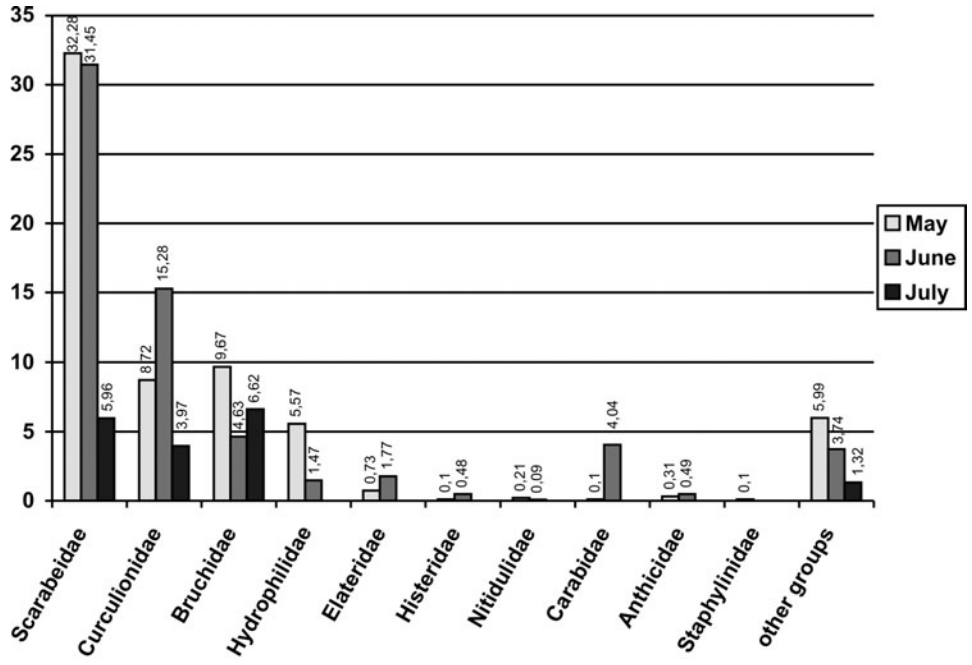

Fig. 6 – The share variation of the coleopteran families in the food of the Sand Martin chickens during the three months of the breeding season.

The high percentage of injurious coleopterans identified in the food of June underlines the importance of the Sand Martin populations in maintaining some populations of injurious insects to the agricultural lands under control.

In May and June, coleopterans have the largest share, and in July, hymenopterans.

Hypera variabilis is an important pest for the lucerne cultures. The adults gnaw the leaf epidermis and parenchyma and the stem tissue, thus generating the drying of the plant by the excessive loss of water. The consumption of this injurious species, within the proportions established by us (see tab. 1), points out a certain importance of the Sand Martin in the biological control of this injurious species, hence an economical importance of the trophic activity of the group.

The large variation in the insect group share for different Sand Martin populations demonstrates that they are not selective predators, that means they do not select a certain taxonomical prey group. The single selection is generated by the size of the preys.

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DATE PRELIMINARE ASUPRA COMPOZIȚIEI HRANEI PUILOR DE LĂSTUN DE MAL *(RIPARIA RIPARIA* L., 1758) (AVES: HIRUNDINIDAE) ÎN SUDUL ROMÂNIEI

REZUMAT

Lucrarea prezintă câteva date preliminare privind compoziția hranei puilor de lăstun de mal (*Riparia riparia* L., 1758) în cele trei luni ale sezonului de reproducere: mai, iunie şi iulie. Cercetările au fost efectuate în două colonii situate pe râul Argeş, la 3 km în aval de barajul de la Mihăileşti.

Metoda folosită a fost analiza conținutului sacilor fecaloizi eliminați de către pui. Am recoltat 66 saci fecaloizi de la sfârşitul lunii mai, 69 saci fecaloizi din luna iunie şi 14 saci fecaloizi din luna iulie. În toate cele 159 probe analizate am identificat 2116 prăzi care aparțin la două clase, 7 ordine şi 16 familii de artropode. Cele mai multe prăzi au fost reprezentate de coleoptere (60,39%), himenoptere (29,02%), heteroptere (4,01%), diptere (2,89%) şi alte grupe (3,68%).

Populația studiată a prezentat o aparentă preferință pentru coleoptere, contrastând cu datele din literatură, fapt care se datorează pe de o parte abundenței mari pe care o au aceste insecte în biotopul de hrănire şi pe de altă parte faptului că zborul coleopterelor este mult mai lent şi mai greoi decât cel al himenopterelor sau dipterelor, fiind astfel prăzi mult mai uşoare.

Procentul mare de coleoptere dăunătoare identificat în hrană în luna iunie, evidențiază importanța pe care o au populațiile de lăstun de mal în menținerea sub control a populațiilor unor specii de insecte dăunătoare culturilor agricole.

Consumul speciei dăunătoare *Hypera variabilis,* în proporțiile arătate în tabelul 1, evidențiază un anumit rol al lăstunului de mal în controlul biologic al acestei specii dăunătoare, deci o importanță economică a activității trofice a speciei.

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