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Diet of *Rhinolophus hipposideros* during breeding season in the south-western Italian Alps

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Abstract. We studied the diet of the lesser horseshoe bat *Rhinolophus hipposideros* at seven breeding colonies in the south-western Italian Alps: three colonies in the province of Cuneo (Piedmont), and four in the province of Imperia (Ligury). The analysis was based on 210 bat droppings, which were collected during two field campaigns that took place in the period between June and August 2008 and 2009, respectively. We identified members of the following groups of arthropods: Acarina, Lepidoptera, Diptera, Hymenoptera, Neuroptera, Coleoptera, Hemiptera and Chilopoda. According to the calculated frequency, occurrence and volume percentages, the most important prey items are Lepidoptera and Diptera. These two taxa seem to dominate the diet of *Rhinolophus hipposideros* all across Europe. To cover its food requirements, it seems that *Rhinolophus hipposideros* needs areas with mature forest vegetation, especially near waterways or wetlands, and the presence of pastures for hunting during the reproductive period.

***Rhinolophus hipposideros*, diet, prey, food habits, Italian Alps**

Introduction

The study of the diet of chiropterans based on the observation of tracks in droppings is considered a reliable method both from the qualitative and quantitative point of view (Kunz & Whitaker 1983). Despite uncertainties, this analysis provides information on the frequency of occurrence of individual prey items and an estimation of the mean volume of each prey item in the whole sample (Whitaker et al. 2009). However, it is important to mention the difficulties that this method of work involves, especially in the determination of the remains due to a high degree of digestion and mastication. For this reason, determination of the fragments of arthropods has mainly been made at the level of order, while the family can be identified only in few cases. Nonetheless, guano analysis provides a fair picture of the variety of types of prey consumed by insectivorous species (Kunz & Whitaker 1983, Dickman & Huang 1988, McAney et al. 1991, Roué 1999).

The aim of this contribution is to increase the knowledge on the diet of *Rhinolophus hipposideros* (Borkhausen, 1797) in the breeding season in the south-western Alps; as such information is entirely missing.

The existing studies on the diet of *Rhinolophus hipposideros* have been carried out in European areas with a climate and vegetation typical for the temperate region and Mediterranean mountains: western Ireland (McAney & Fairley 1989), France (Lorraine) (Artois et al.1990), Switzerland (Godat et al. 1991, Beck 1995), Belgium and Luxembourg (Motte 1998), Britain (Leishman 1983, Williams et al. 2011), and Portugal (Lino et al. 2014). No data have been gathered on the diet of *Rhinolophus hipposideros* in the southern Alps.

The research conducted in western Ireland showed that the diet of *Rhinolophus hipposideros* consists primarily of insects belonging to nematoceran Diptera (McAney & Fairley 1989). In

western Ireland, 23 families of insects belonging to seven different orders were identified: Lepidoptera, Neuroptera, Trichoptera, Hymenoptera, Coleoptera, Diptera, Hemiptera and Araneae. In general, there are nine orders of arthropods known to be a part of the diet of *Rhinolophus hipposideros*: Psocoptera, Hemiptera, Neuroptera, Coleoptera, Diptera, Lepidoptera, Trichoptera, Hymenoptera, and Araneae (Poulton 1929, Leishman 1983, McAney & Fairley 1989, Hollyfield 1993, Beck et al. 1989, Beck 1995, Artois et al. 1990, Godat et al. 1991, Williams et al. 2011, Motte 1998, Lino et al. 2014).

In this study we analyzed the diet of a population of *Rhinolophus hipposideros* in the south--western Italian Alps between Ligury and Piedmont. Specifically, we aimed to characterize the diet of *Rhinolophus hipposideros* in this region and compare the diet between the two areas.

Material and Methods

Seven mono-specific breeding colonies of *Rhinolophus hipposideros* were studied. Three (Demonte, Valdieri and Bagnasco) were located in the province of Cuneo (Piedmont) and four (Badalucco, Molini di Triora, Triora and Baiardo) in the province of Imperia (Ligury) in the north-west of Italy (Fig. 1). The studied colonies consist of a minimum of 9 to a maximum of 56 females (Table 1). The Piedmont colonies are located at the bottom of a wide valley of the Po basin, characterized by large forested areas alternating with grasslands, pastures and riparian habitats. In the Ligurian landscape there are narrow furrows, which are mainly characterized by extensive forest areas (Table 2). For each site, 30 dropping samples (i.e. 210 total) were collected during two field campaigns directly under the bat roost sites in the period between June and August 2008 and 2009, respectively. The guano was stored in plastic containers kept open for 24 hours to allow the

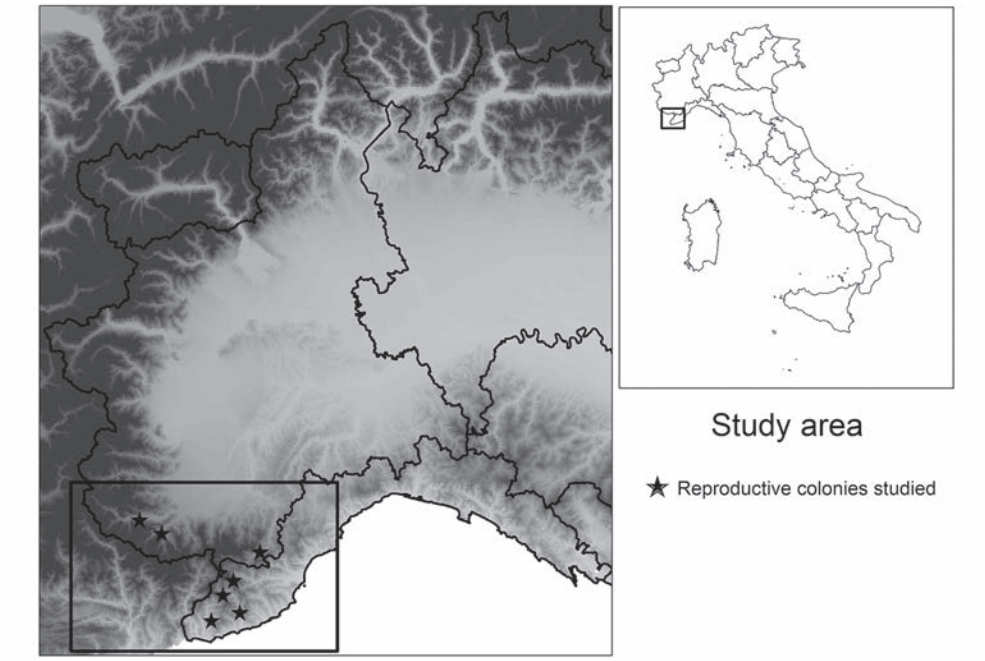

Fig. 1. The area under study and the *Rhinolophus hipposideros* colonies studied.
Obr. 1. Studované území a studované kolonie vrápence malého (*Rhinolophus hipposideros*).

Table 1. List of the studied breeding colonies of *Rhinolophus hipposideros* and the number of the adult females observed
Tab. 1. Soupis studovaných mateřských kolonií vrápence malého (*Rhinolophus hipposideros*) a počet pozorovaných dospělých samic

region region	locality lokalita	province provincie	altitude nadmořská výška [m a. s. l. / m n. m.]	number ♀♀ počet ♀♀
Piedmont	Demonte	Cuneo	849	35
Piedmont	Valdieri	Cuneo	758	9
Piedmont	Bagnasco	Cuneo	847	13
Ligury	Badalucco	Imperia	295	56
Ligury	Molini di Triora	Imperia	440	37
Ligury	Triora	Imperia	750	18
Ligury	Baiardo	Imperia	690	35

desiccation of the material and avoid the formation of mould. About 24 hours before the observation under the microscope, the excrements were put into Eppendorf tubes (2 ml) filled with 70% alcohol (Whitaker et al. 2009).

All fecal pellets were soaked in glycerol in order to be softened, crushed with tweezers and placed under the stereomicroscope for the determination of the fragments of arthropods. For identification, the fragments were separated from the rest, cleaned in water, and eventually placed once more in Eppendorf tubes filled with 70% alcohol. The determination of the fragments was carried out based on the studies by Beck (1995) and Shiel et al. (1997) and specimens preserved in entomological collections (MCCI – Museo Civico di Storia Naturale di Carmagnola; MRSN – Museo Regionale di Scienza Naturali di Torino). When the determination was questionable, the term "cfr." (namely "compare") was applied.

The results were expressed as in Vaughan (1997):

volume percentages: the percentage estimate of volume of the remains of each taxon in each sample of guano (total=100%). In the present study, the estimation of the volume was not based on an appreciation in classes of 5%, but on the number of fragments belonging to different members of the taxon found in the excrement

occurrence percentage: the percentage of fecal pellets examined containing each prey taxon (total>100%);

frequency percentage: the number of taxon occurrences (i.e. the number of pellets which contained it), divided by the total number of occurrences, multiplied by 100 (total=100%).

The differences between the results were analyzed using the chi-square distribution (χ^2) and multivariate analysis (ANOVA) after transformation of the percentages of arcsin volumes as shown by Whittaker et al. (2009). The diversity of the diet of each colony was estimated using the Shannon-Weaver index of diversity (Krebs 1999). The Mann-Whitney U-test (Z) was performed to calculate the difference between the values of diversity obtained in various localities, and

Table 2. Percentage of habitats present in a radius of 5 km from the colony roosts and distance to rivers; AA = % agricultural areas, WSA = % wooded and seminaturals areas, UA = % urban areas, DR = distance to rivers in meters (APAT 2005)
Tab. 2. Procentuální zastoupení jednotlivých biotopů v kruhu o poloměru 5 km kolem úkrytu kolonie a vzdálenost úkrytu od řeky; AA = % zemědělské plochy, WSA = % lesní a polopřirozené plochy, UA = % osídlené plochy, DR = vzdálenost k řece v metrech (APAT 2005)

region	locality / lokalita	AA	WSA	UA	DR
Ligury	Molini di Triora	4.1	95.9		293
	Triora	1.8	98.2		198
	Baiardo	16.8	82.9	0.13	321
	Badalucco	8.5	91.5		470
Piedmont	Bagnasco	15.3	83.6	1.13	259
	Valdieri	13.8	82.9	3.30	478
	Demonte	19.6	79.7	0.76	808

Table 3. Occurrence, percentage occurrence, percentage frequency and volume percentage for each taxon in the *Rhinolophus hipposideros* diet recorded in Piedmont and Ligury
Tab. 3. Výskyt (počet kusů trusu s výskytem taxonu), procentuální výskyt, procentuální četnost a procentuální objem každého taxonu zjištěného v potravě vrápence malého (*Rhinolophus hipposideros*) zjištěné v Piemontu a Ligurii

taxon	region	occurrence výskyt	% occurrence % výskytu	% frequency % četnosti	% volume % objemu
Acarina	Piedmont	10	11.11	3.7	0.9
	Ligury	4	3.3	1.3	0.4
Lepidoptera	Piedmont	86	95.7	31.4	35.9
	Ligury	116	96.7	38.2	52.7
Diptera	Piedmont	87	96.7	31.8	45.2
	Ligury	95	79.2	31.3	30.6
Hymenoptera	Piedmont	34	37.8	12.4	7.1
	Ligury	31	25.8	10.2	5.7
Neuroptera	Piedmont	33	36.7	12.0	7.2
	Ligury	31	25.8	10.2	5.8
Coleoptera	Piedmont	15	16.7	5.5	2.7
	Ligury	15	12.5	4.9	3.4
Heteroptera	Piedmont	9	10.0	3.3	0.9
	Ligury	11	9.2	3.6	1.3
Chilopoda	Piedmont	0	0.0	0.0	0.0
	Ligury	1	0.8	0.3	0.0

to measure the difference between the number of taxa in Piedmont and Ligury. Finally, the correlation was carried out using the Spearman's rank correlation (R_s) between the volume percentage of main prey identified compared to some environmental variables present in a 5 km radius from the colonies (Table 2), considering this as a maximum distance of movements between roosts and hunting areas (Bontadina et al. 2002, Laurent et al. 2009).

Results

A total of eight orders of arthropods were identified; Lepidoptera were the most frequent (96.2%), followed by Diptera (86.7%) (Fig. 2). Hymenoptera and Neuroptera were present in 30% of the pellets, Coleoptera in 14.3% and Hemiptera-Hetereoptera, Acarina and Chilopoda in less than 10%.

The percentage of occurrence highlights some differences between the sites in Piedmont and those in Ligury. The results from Piedmont show higher values for the following orders: Diptera, Hymenoptera, Neuroptera, Coleoptera and Acarina. The orders Lepidoptera and Hemiptera: Heteroptera appear with similar values (Table 3).

The frequency percentage, however, shows higher values for Lepidoptera in Ligury when compared to samples from Piedmont samples, while Diptera appear with similar values. The statistical comparison of the occurrence shows significant differences between the two regions (χ^2=19.21, P=0.007, df=7).

Regarding the volume, the most represented groups are Lepidoptera (45.1% of volume) followed by Diptera (37.2% of volume), while others have volume percentages below 10% (Fig. 3).

In particular, the Ligurian sites show higher Lepidoptera values than those in Piedmont, whereas Diptera have a greater volume percentage in fecal pellets from Piedmont than those from Ligury. Coleoptera and Hemiptera: Heteroptera have higher values in Liguria than in Piedmont.

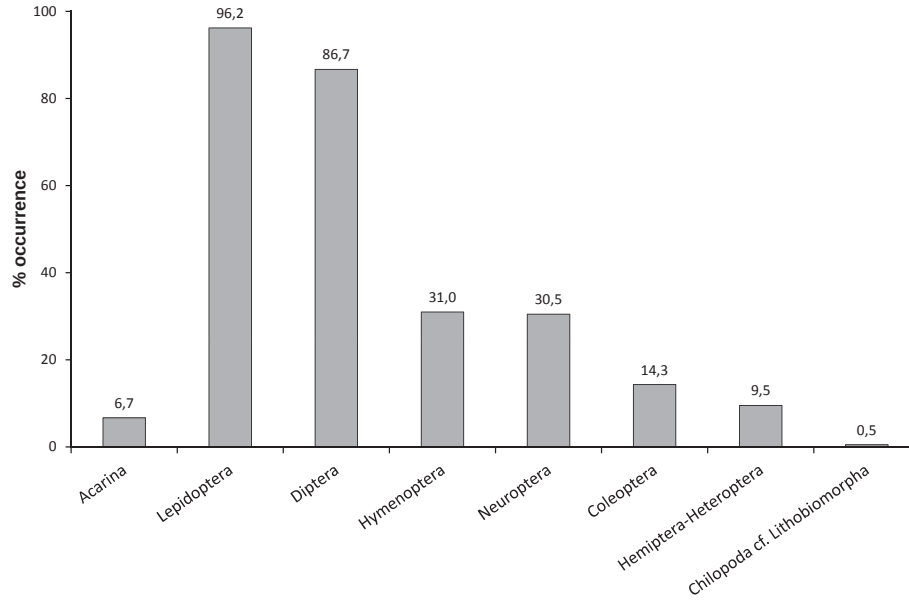

Fig. 2. Percentage occurrence of particular taxa within the fecal pellets of *Rhinolophus hipposideros* (n=210).
Obr. 2. Procentuální výskyt jednotlivých taxonů v trusu (n=210) vrápence malého (*Rhinolophus hipposideros*).

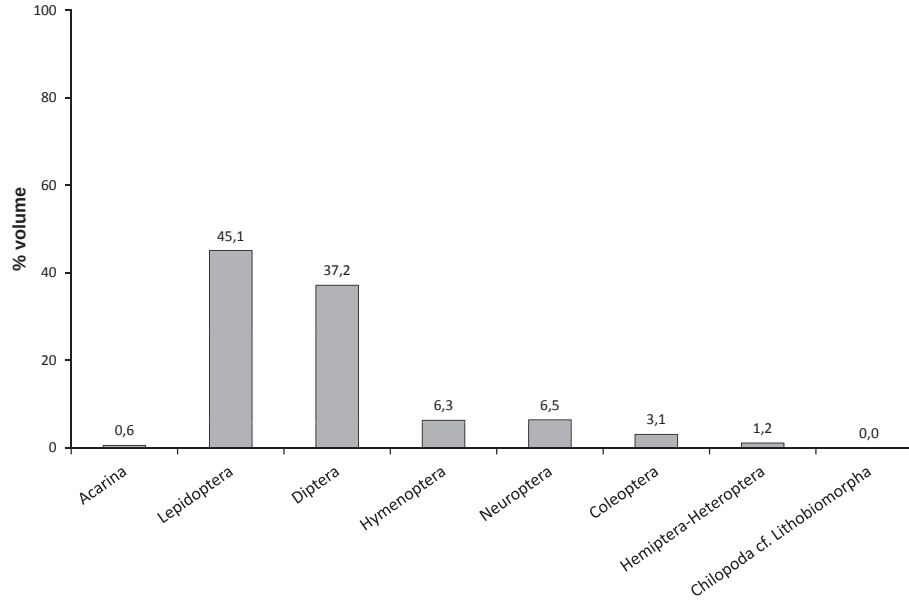

Fig. 3. Volume percentage of particular taxa within the fecal pellets of *Rhinolophus hipposideros* (n=210).
Obr. 3. Procentuální objem jednotlivých taxonů v trusu (n=210) vrápence malého (*Rhinolophus hipposideros*).

Table 4. Percentage occurrence for each taxon and the Shannon-Weaver Index in the *Rhinolophus hipposideros* diet recorded from the seven roost studied
Tab. 4. Procentuální výskyt každého taxonu a hodnota jeho Shannonova-Weaverova indexu v potravě vrápence malého (*Rhinolophus hipposideros*) zaznamenané v sedmi studovaných úkrytech v severozápadní Italii; Legend / Vysvětlivky: Aca = Acarina, Lep = Lepidoptera, Dip = Diptera, Hym = Hymenoptera, Neu = Neuroptera, Col = Coleoptera, HH = Hemiptera-Heteroptera, Ara = Araneae, H' = Shannon-Weaver Index / Shannonův-Weaverův index

locality / lokalita	Aca	Lep	Dip	Hym	Neu	Col	HH	Ara	H'
Bagnasco	16.7	86.7	93.3	40.0	50.0	6.7	6.7	0.0	1.4
Valdieri	13.3	100.0	96.7	46.7	30.0	26.7	16.7	0.0	1.4
Demonte	3.3	100.0	100.0	26.7	30.0	16.7	6.7	0.0	1.1
Molini di Triora	0.0	96.7	73.3	66.7	6.7	23.3	13.3	0.0	1.2
Triora	3.3	96.7	76.7	20.0	46.7	6.7	13.3	0.0	1.2
Baiardo	3.3	100.0	86.7	13.3	33.3	13.3	6.7	3.3	1.2
Badalucco	6.7	93.3	80.0	3.3	16.7	6.7	3.3	0.0	1.1

The difference in the volume percentage of the orders between Piedmont and Liguria is significant (χ^2=56.86, P<0.0001, df=7).

In terms of families, the more diversified order is that of Diptera in which fragments of Tipulidae, Culicidae and Scatophagidae were identified (Fig. 4). Tipulidae reach the highest values in

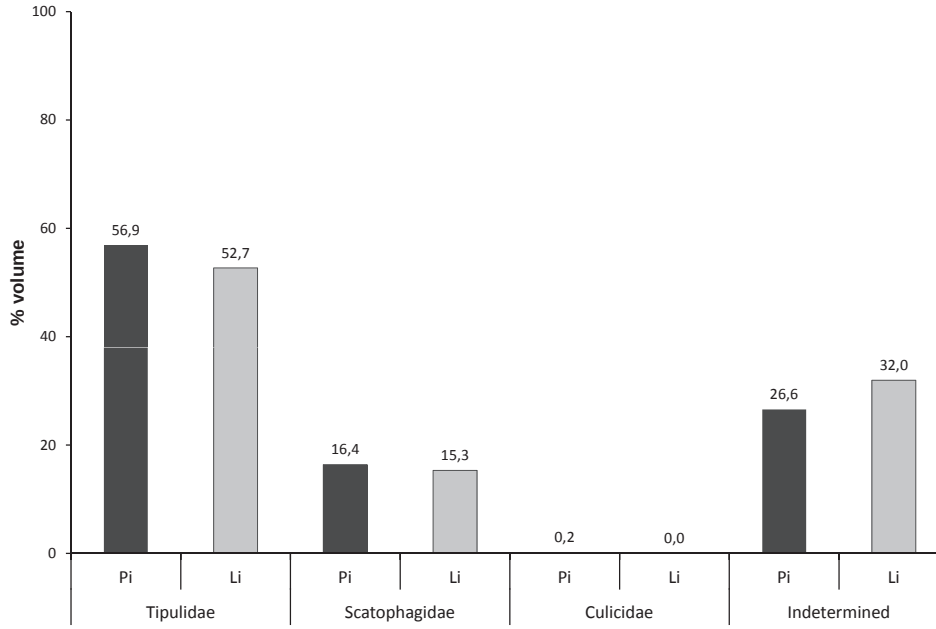

Fig. 4. Volume percentage for each Diptera family in the *Rhinolophus hipposideros* diet recorded from Piedmont (Pi) and Ligury (Li).
Obr. 4. Procentuální objem každé čeledi dvokřídlého hmyzu (Diptera) v potravě vrápence malého (*Rhinolophus hipposideros*) zaznamený v Piemontu (Pi) a v Ligurii (Li).

both regions, followed by Scatophagidae. In comparison, the family Culicidae was found only once in one of the 30 samples taken from the Demonte (CN) colony.

Other families recognized belong to Hymenoptera (Ichneumonidae), Neuroptera (Hemerobiidae), Coleoptera (Scarabaeoidea, Ptinidae, Carabidae, Cerambycidae). The percentages of such families were calculated only for individual localities, because values for the regions are too low and thus not significant.On average, 2.7 taxa were identified in individual pellets (n=210 samples, range 2.13–3.30, sd=0.36). These values were rather homogeneous, but the three Piedmont sites showed higher mean values than the four Ligurian sites. The mean number of taxa present in each of the 90 pellets from Piedmont is 3.05 (range 2.83–3.30, sd=0.24), while that of the 120 pellets from Liguria is 2.54 (range 2.13–2.80, sd=0.12).

The difference between the number of taxa between Piedmont and Liguria is highly significant (Z=3.802, P<0.001, n=210).

The percentage of occurrence shows that even at the local level, most prey captured consists of Lepidoptera and Diptera followed by Neuroptera, except for Valdieri (CN) and Molini di Triora (IM) where much more Hymenoptera were recorded (46.67% and 66.67%, respectively). The Shannon-Wiener diversity index indicated that dietary diversity was relatively constant in the seven colonies but the three areas in Piedmont show higher values than those in Ligury (Tab. 4).

The differences in the percentage of volume between localities are significant for Lepidoptera ($F_{6,203}$=8.74, p<0.001), Diptera ($F_{6,20\,3}$=6.21, p<0.001), Hymenoptera ($F_{6,203}$=8.42, p<0.001) and Neuroptera ($F_{6,203}$=3.80, p<0.05).Using the Post Hoc Test, the importance of each order at individual localities was calculated.

Lepidoptera show a significant importance at six sites out of seven. Only in Bagnasco (CN), the percentage is not significant (23%) compared to other areas with a mean volume of about 50%. The order Diptera has a significant importance in Demonte (CN), Bagnasco (CN) and Valdieri (CN) and the mean volume percentage found in Ligury is generally lower than that in Piedmont. Hymenoptera are statistically significant at the sites of Molini di Triora (IM), Valdieri (CN) and Bagnasco (CN). Neuroptera are statistically significant in Bagnasco (CN) and Triora (IM). For Acarina, Coleoptera, Hemiptera: Heteroptera and Chilopoda, the differences in the mean volumes between the seven sites are not significant.

Some families of Neuroptera are connected to habitats of river banks with herbaceous vegetation and sandy shores (Letardi 2005), while the Dipteran family Scatophagidae is a mainly coprophagous group (Morge 1976) with high density in areas used by domestic livestock (cattle and sheep).

Regarding Neuroptera there is a trend towards lower volume percentage with increasing distance of the bat colony from water, suggesting increased predation of these insects by bats present in roosts near streams, but these results are not statistically significant (R_s=–0.50, p>0.05). A similar non-significant negative correlation (R_s=–0.107, p>0.05) was found for Scatophagidae (Diptera) whose volume percentage tends to decrease with the increasing area of a pasture, suggesting a specific use regardless of its density.

Discussion

The results obtained in this work on the summer diet of *Rhinolophus hipposideros* are generally in agreement with other studies (Poulton 1929, Leishman 1983, McAney & Fairley 1989 Hollyfield 1993, Beck et al. 1989, Beck 1995, Artois 1990, Godat et al. 1991, Williams et al. 2001, Motte 1998, Lino et al. 2014). These studies show that the diet of the lesser horseshoe bat consists mainly

of Lepidoptera and Diptera. The observed discrepancy with what is known in the literature refers only to some works in which Trichoptera have been found in England (Leishman 1983, Hollyfield 1993), Ireland (McAney & Fairley 1989), Switzerland (Arlettaz et al. 2000), and Psocoptera in Switzerland (Beck et al. 1989, Beck 1995, Godat et al. 1991, Arlettaz et al. 2000). These two orders were not recorded in our study.In the above studies, Trichoptera were found in the diet in August (McAney & Fairley 1989) and September (Arlettaz et al. 2000). It is assumed that*Rhinolophus hipposideros* may select certain species of arthropods which are seasonally present (McAney & Fairley 1989). The seasonal variation in the abundance of prey leads to a seasonal variation in the diet (Bontandina et al. 2002).

Rhinolophus hipposideros is considered an opportunistic species (Dietz et al. 2009, Laurent et al. 2009), which feeds on prey according to their size (Andreas et al. 2013), location and recognition through the emission of ultrasound (Griffin et al. 1955). It is likely that they are more selective in search of prey when insects are abundant, as in the summer months from June to August, while in the months when prey availability is low (early and late summer), *Rhinolophus hipposideros* opt for more general choices in their diet (Emlen 1966). In Ireland, McAney & Fairley (1989) showed that Lepidoptera and Neuroptera are more preyed on in July and August, while Diptera only at the beginning and end of summer despite their presence in the hunting areas in the summer months.

Most of the taxa that were found in the diet of *Rhinolophus hipposideros* in the study area are represented by flying insects such as Lepidoptera, Diptera, Hymenoptera, Hemiptera: Heteroptera, Neuroptera, Coleoptera (Grassé 1949, Servadei et al. 1972, Morge 1976, Chinery 1987, Letardi 2005); parasites (Acarina) and terrestrial prey (Chilopoda) are taken only occasionally and they are not actively selected. The presence of Acarina in the pellets, of which many species are parasites of *Rhinolophus hipposideros* (Lanza 1999), results from the phenomenon of mutual grooming between individuals of the same colony (Shiel et al. 1997) and is probably also due to the presence of the parasites on the body of the prey (Grassé 1949, Servadei et al. 1972, Chinery 1987). The order cfr. Lithobiomorpha (class Chilopoda) is likely to be present in the sample only accidentally as it appears in one fragment of 210 analyzed, furthermore, the order Acarina and the class Chilopoda have never been mentioned in the literature regarding dietary studies of *Rhinolophus hipposideros*.

Rhinolophus hipposideros hunts in flight but it can directly catch arthropods from vegetation surface (Jones & Rayner 1989, Dietz et al. 2009). Some flying prey is in fact active during the day, so it is conceivable that *Rhinolophus hipposideros* finds this prey in the foliage during the hours when they lie hidden in the vegetation (Servadei et al. 1972).

Predation of Neuroptera, Coleoptera (families Scarabaeidae, Cerambycidae and Ptinidae) and Diptera: Scatophagidae, which are related to specific habitats (Grassé 1949, Servadei et al. 1972, Morge 1976, Chinery 1987, Letardi 2005) is arguably non-random. The greater percentage of Lepidoptera: Heterocera calculated in Ligury than in Piedmont can be explained by environmental characteristics. In Ligury, there are areas covered by extensive woodlands or shrubs which are preferred by Lepidoptera: Heterocera (Grassé 1949, Servadei et al. 1972, Chinery 1987).

At the sites in Piedmont, the order of Diptera dominates; only at the site of Valdieri (CN) the occurrence percentage and volume of Lepidoptera slightly prevails over Diptera: the percentage of forest habitats in this area is greater than in other places in Piedmont.

Among families, Diptera: Tipulidae, which are often found in moist soil (Morge 1976), are important in all sites considered but have a significant volume only in Bagnasco (CN), which is also very close to streams and wetlands, and Demonte (CN), where the streams are far apart but

are characterized by extensive gravel beds with large areas of riparian wetland vegetation. It is therefore likely that *Rhinolophus hipposideros* go hunting near the river of Stura di Demonte, although it is 808 meters away from the roosts, it is probably richer in prey than the surrounding areas.

For prey such as Diptera: Scatophagidae and Neuroptera, correlations were investigated between their mean volume in the diet and habitat that represents them, and both are statistically insignificant indicating a probable active search for such prey, although sometimes difficult to find.

In the first case, it seems that in general the volume of Neuroptera increases when *Rhinolophus hipposideros* roosts are located near water. Molini di Triora (IM) is relatively close to a river but it is the locality with the smallest percentage of Neuroptera, and this may depend on other factors such as environmental quality and the surface of the stream. Demonte (CN) has a relatively high percentage volume of Neuroptera but the colony has the greatest distance from the main stream, which may be due to the surface of riparian habitats present in the vicinity of this colony rather than the distance of these.The correlation between the volume of Scatophagidae and the percentage of pastures and meadows in Bagnasco (CN), Badalucco (IM) and Baiardo (IM) shows that this family is preyed on massively despite the limited grazed areas.

From the calculation of the Shannon-Weaver index of diversity it is obvious that the diets observed in various localities in the two regions are rather homogeneous, although the three roosts in Piedmont show on average higher values than those in Liguria. This similarity can be explained by the presence of similar forest habitats in both regions (mainly coniferous and broad-leaved forests), but at different percentages. In the calculation of the Mann-Whitney U-test, the difference in the mean number of taxa between Piedmont and Liguria is highly significant, indicating a more mixed diet for the Piedmont colonies, thus suggesting a greater environmental heterogeneity of these areas compared to Ligurian colonies.

The results obtained allow the formulation of useful recommendations for the protection of foraging habitats of the species. The importance of preserving forest habitats and extensive mature vegetation interspersed with open grasslands used as pastures is clear.

Finally, most of the prey of *Rhinolophus hipposideros* have positive phototropism, in particular Lepidoptera and Diptera (Grassé 1949, Servadei et al. 1972, Morge 1976, Chinery 1987), however, *Rhinolophus hipposideros* are photophobic and change their foraging habits in illuminated areas (Rydell et al. 1996). For this reason, they may be threatened by the loss of suitable hunting areas (Stone et al. 2009). Therefore reducing light sources is essential for the conservation of the species, to preserve hunting areas rich in prey and limit possible competition for food with bat species better adapted to foraging near light sources, such as *Pipistrellus pipistrellus* which may cause the decrease of *Rhinolophus hipposideros* in some areas as highlighted in Switzerland (Arlettaz et al. 2000).

Souhrn

Potrava vrápence malého (*Rhinolophus hipposideros*) v rozmnožovacím období v italských jihozápadních Alpách. Potravu vrápence malého (*Rhinolophus hipposideros*) jsme studovali v sedmi mateřských koloniích v oblasti italských jihozápadních Alp: tři kolonie v provincii Cuneo v Piemontu a čtyři v provincii Imperia v Ligurii. Analysa byla založena na 210 kusech trusu, které byly kolektovány během dvou sběrných akcí mezi červnem a srpnem v letech 2008 a 2009. Určili jsme přítomnost následujících skupin členovců: Acarina, Lepidoptera, Diptera, Hymenoptera, Neuroptera, Coleoptera, Hemiptera a Chilopoda. Podle vypočtených hodnot procentuální četnosti, výskytu a objemu, jako nejvýznamnější složky potravy se ukázali být motýli (Lepidoptera) a dvoukřídlí (Diptera). Tyto dvě skupiny se ostatně zdají převládat v potravě vrápence malého

v celé Evropě. Zdá se, že vrápenci malí v průběhu rozmnožovacího období potřebují k pokrytí potravních nároků území se vzrostlou lesní vegetací, zejména kolem vodních toků nebo mokřadů a přítomnost pastvin.

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