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Research Article

Diversity of Alticinae (Coleoptera, Chrysomelidae) in Kasnak Oak Forest Nature Reserve, Isparta, Turkey

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Abstract: Different habitat types chosen from Kasnak Oak Forest Nature Reserve (Isparta, Turkey) and 3 plots with vegetation structure, were studied comparatively with Alticinae (Coleoptera, Chrysomelidae) species composition, its richness and abundance. The study was conducted between the months of April and October at 15-day intervals during 2005 and 2006. Sixty-six sets of data were obtained during the survey, including 22 samplings for each plot. A total of 2650 individuals belonging to 57 species were recorded from the chosen plots. Species richness estimators were used to measure the completeness of the inventories. Values predicted by different non-parametric estimators showed that further sampling effort is needed in the region to assess the actual Alticinae diversity. However, as the species richness of the chosen plots was close to completeness, a superficial comparison could be made in terms of diversity. According to Shannon-Wiener, Simpson and Berger-Parker indices of diversity obtained from 2-year data, forest area dominated by vulcanic oak (VOF) was the most diverse plot followed closely by shrub and meadow lands (SML). Cluster analyses using Jaccard and Bray-Curtis similarity indices revealed a relatively high degree of similarity between Alticinae communities in plots VOF and SML for the whole study period. Similar to species diversity, open areas near roadside (OAR) had lower similarity percentages as compared with the other 2 plots.

Key words: Alticinae, biodiversity, species richness, completeness, similarity, abundance, Kasnak Oak Forest, Turkey

Kasnak Meşesi Ormanı (Isparta, Türkiye) Tabiatı Koruma Alanı'nın Alticinae (Coleoptera, Chrysomelidae) çeşitliliği

Özet: Kasnak Meşesi Ormanı Tabiatı Koruma Alanı (Isparta, Türkiye)'ndan seçilmiş farklı habitat özellikleri ve vejetasyon yapısına sahip üç parsel alanın Alticinae tür kompozisyonu, zenginliği ve bolluğu karşılaştırmalı olarak çalışılmıştır. Araştırma, 2005-2006 yılları süresince Nisan-Ekim ayları arasında 15 günlük periyotlarla gerçekleştirilmiştir. Çalışma süresince her parsel alanda 22 örnekleme olmak üzere, toplam 66 veri serisi elde edilmiştir. Seçilen parsel alanlardan 57 türe ait toplam 2650 birey kaydedilmiştir. Çalışma alanlarının tahmini tür zenginliğini belirlemek için çeşitli indeksler kullanılmıştır. Farklı indekslerden elde edilen değerler alanın kesin Alticinae çeşitliliğinin belirlenmesi için daha fazla örneklemeye ihtiyaç olduğunu göstermiştir. Bununla birlikte seçilen parsel alanların tür zenginliği tahmini rakamlara yakın olduğundan çeşitlilik açısından yüzeysel bir karşılaştırma yapmak mümkün olmuştur. İki yıllık verilerden elde edilen Shannon-Wiener, Simpson ve Berger-Parker çeşitlilik indeks sonuçlarına göre Kasnak meşesinin yoğun olduğu ormanlık alan (VOF) en çeşitli parsel olurken, çalı ağırlıklı çayırlık alan (SML) onu yakından takip etmiştir. Jaccard ve Bray-Curtis benzerlik indeksleri, tüm çalışma genelinde ormanlık alan ve çayırlık alanın daha yakın ilişkili olduğunu göstermiştir. Yol kenarına yakın açık alan (OAR) ise, tür çeşitliliğinde olduğu gibi benzerlik açısından da diğer iki alana uzak kalmıştır.

Anahtar sözcükler: Alticinae, biyoçeşitlilik, tür zenginliği, tahmini tür zenginliği, benzerlik, bolluk, Kasnak Meşesi Ormanı, Türkiye

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Introduction

The most significant change for natural sciences in the last 15 years has probably been the increased worldwide recognition of biodiversity, its importance and measurement (Magurran, 2004). Insects represent the dominant group in terrestrial and freshwater ecosystems accounting for about ¾ of the total animal species described (Wilson, 1999), thus constituting an important proportion of the biodiversity. The leaf beetles (Chrysomelidae) are a highly diverse family among the other phytophagous insects, including 37,000 described species, possibly up to 50,000 species, arranged in 19 subfamilies and more than 2000 genera (Jolivet et al., 1988; Jolivet and Verma, 2002).

The flea beetles (Alticinae) comprise the largest subfamily of Chrysomelidae with approximately 500 genera and more than 8000 species worldwide, and about 1388 species classified in 90 genera in the Palearctic Region (Konstantinov and Vandenberg, 1996; Gruev and Döberl, 2005). Adult flea beetles feed on various parts of the plants, including leaves and non-woody stems (Konstantinov and Tishechkin, 2004). Some of them are serious agricultural pests causing direct damage or transmitting viruses, although several species (including those of *Longitarsus* Berthold and *Altica* Müller) are beneficial as biological control agents of weeds (Booth et al., 1990; Jolivet and Verma, 2002). Alticinae constitute an important taxonomic group for comparative biodiversity studies and conservation activities, not only because of their close association and serious damage to host plants in both agricultural and forest areas, but also their huge population densities. However, to our knowledge, there have been no comparative studies focused exclusively on Alticinae species diversity and composition patterns, except the one performed by Furth et al. (2003), which is essentially a comparison on the effectiveness of the different sampling methods.

Studies on Chrysomelidae diversity have been mostly carried out in tropical rainforests, especially in the canopies (e.g., Farrell and Erwin, 1988; Wagner, 1998, 1999; Flowers and Hanson, 2003; Charles and Basset, 2005; Ødegaard, 2006). There is also good knowledge on diversity and comparison of leaf beetles in temperate communities (see Chikatunov et al., 2000; Wąsowska, 2001, 2004; Řehounek, 2002; Baselga and Novoa, 2005, 2006, 2007; Ohsawa and Nagaike, 2006; Baselga & Jiménez-Valverde, 2007), but that there are some areas, such as Mediterranean regions in general and Turkey in particular, where knowledge is lacking. Some studies on the leaf beetle fauna of southwestern Turkey have been recently published (Gök and Çilbiroğlu 2003, 2005; Çilbiroğlu and Gök, 2004; Gök and Aslan, 2006; Aslan and Gök, 2006); however, all of these are faunistic papers mostly dealing with host plant associations, and provide no quantitative data.

Turkey has great variability in topography and climate because of its significant geographical location joining 2 continents (Çıplak, 2004). It is also one of the most remarkable regions of the world in terms of the biodiversity hotspots such that 3 of them have major extensions into Turkey: Caucasus, Irano-Anatolian, and Mediterranean Basin (Myers et al., 2000; CI, 2007). Kasnak Oak Forest, covering an area of 1300 ha near the province Isparta in southern Turkey, forms pure and mixed stands of vulcanic oak or, "riddle-frame oak" as named by the natives which is endemic to Turkey. Except for some solitary groups living on the western Taurus Mountains in Anatolia, there is no other place known where the vulcanic oak still naturally exists (Balaban and Yılgör, 1999). Therefore, the area was declared as one of the famous nature reserves of Turkey.

Kasnak Oak Forest Nature Reserve is an important area not only because of its rich flora, but also its interesting insect fauna. It has recently become a popular area for collecting chrysomelids and other insect groups for native and foreign researchers because of its rich and remarkable vegetation. Therefore, the purpose of this paper was (i) to introduce the Alticinae diversity of the Kasnak Oak Forest Nature Reserve (ii) to estimate and compare species richness, composition and abundance of Alticinae communities in 3 chosen plots with different habitat characteristics, and (iii) to determine the completeness of the inventory by analyzing the rarefaction curves.

Materials and methods

Study site

The study was carried out at Kasnak Oak Forest Nature Reserve (KOFNR) located on the eastern slopes of Davraz Mountain (2637 m) in Isparta, southern Turkey. It is a unique region in the world where the endemic vulcanic oak [*Quercus vulcanica* Boiss. & Heldr. ex Kotschy] naturally exists in large populations. The rich flora accompanied by important populations of *Quercus vulcanica* makes the Kasnak Forest a natural arboretum in addition to its aesthetic beauty. Hence, the area was declared as nature reserve by the Turkish government in 1987. KOFNR presents pure stands of *Quercus vulcanica*, as well as dense forests composed of mixed conifer and deciduous species including *Quercus* spp., *Pinus* spp., *Juniperus* spp., *Acer* spp., *Fraxinus* spp. etc. The total land area covers about 1300 ha with the altitudes ranging from 1300-1800 m a.s.l. The average annual temperature is 10.1 °C, and average humidity is 58.2%.

Three plots each about 0.5 ha, representing different habitats and vegetation types were chosen from the study area (Figure 1). The main characteristics of the plots are as follows:

Plot 1 (VOF, vulcanic oak forest); is a closed forest area mainly dominated by *Quercus vulcanica* at an elevation of 1520 m (37°44.55'N, 30°49.76'E). The eastern part of the plot has only some scattered trees with various grass plants, while the northern parts include rocky areas composed of limestone. *Salvia cryptantha, Stachys* sp., *Nepeta* sp., *Vicia* sp., *Teucrium chamaedrys, Xeranthemum annuum, Cardaria draba* and *Thymus* sp. are the dominant plant species of the herbaceous cover.

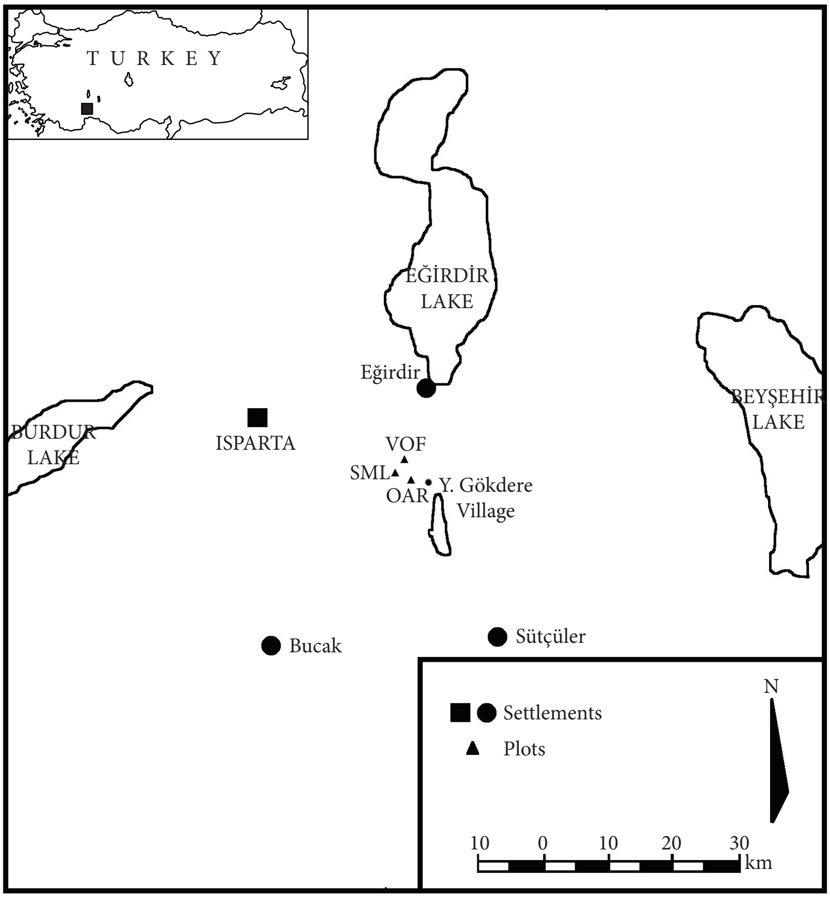

Figure 1. Map of Isparta, showing the plots studied in KOFNR.

Plot 2 (SML, shrub and meadow lands); is a valley continued with a meadow at elevations of 1500-1600 m (37°44.53'N, 30°49.35'E). Forest cover includes mixed populations of *Quercus vulcanica, Quercus* spp. and *Juniperus* spp. Higher elevations are xeric mountain slopes with shrub forms of *Quercus* spp. (about 1.5-2.5 m high) as most dominating. The lower parts are in the form of a mountainous meadow characterized by the presence of dense populations of *Verbascum* spp. Other plant genera common in the area are *Salvia, Nepeta, Erysimum, Alyssum, Thymus* and *Poa*.

Plot 3 (OAR, open areas near roadside); is an open area mostly inhabited by *Quercus* species, and rarely *Quercus vulcanica*, at an average elevation of 1500 m (37°44.34'N, 30°49.83'E). The herbaceous cover is somewhat uniform representing Fabaceae, Lamiaceae and Poaceae as the dominant families. *Salvia, Teucrium, Nepeta, Vicia* and *Verbascum* form the widespread plant genera. The area is much disturbed by human activities compared to plots 1 and 2.

Sampling method and collection

Samplings were conducted at 15-day intervals from April to October in 2005 and 2006. Adult Alticinae were collected from various plants using an entomological sweep-net and mouth aspirator. Eleven samplings were performed each year in each plot; one consisted of 500 sweeps of the net. Sampling was made randomly from herbaceous plants. Sixty-six sets of data were obtained during the survey. The temperature during the sampling period ranged from 4 °C to 23 °C in 2005 and 5 °C to 25 °C in 2006.

Collected beetles were killed by ethyl acetate and taken to the laboratory for further analysis and dissection. The specimens were identified to species under an Olympus SZ61 stereomicroscope using the taxonomic keys and figures given by Mohr (1966, 1981), Lopatin (1984), Döberl (1994), and Warchałowski (1996, 1998, 2000, 2003). Plants with leaves showing feeding marks were also carefully examined and searched for beetles. Plant species on which beetles were seen feeding constantly in the field observations were considered to be potential host plants. Damaged host plants were also collected, preserved by using standard methods, and sent to specialists for identification. The insect samples are deposited at the Biology Department of Süleyman Demirel University, Isparta.

Data analyses

As a previous step, to assess the completeness of the inventory 4 non-parametric estimators of species richness (including ICE, Chao 2, first-order Jackknife and second-order Jackknife) were used (Hortal et al., 2006). The rarefaction curves and non-parametric estimators were generated with EstimateS (Version 7.5.1) (Colwell 2004), using 100 randomizations.

Alticinae communities in the chosen plots were compared using the parameters species composition, total abundance, species richness and diversity. The Shannon-Wiener diversity index (H'), Shannon evenness index (J'), Simpson's index (1/D) and Berger-Parker index of dominance (1/d) were used as the alpha-diversity indices. The Jaccard (C_j) and Bray-Curtis (C_N, quantitative version of Sørensen index) indices were used to determine the degree of similarity in species composition between the Alticinae communities of different plots (Magurran, 2004). So, both presence/absence data and abundance data were examined. The similarity dendrograms obtained from the results of cluster analysis were plotted. Sample-based rarefaction curves and *k*-dominance plots were created to describe Alticinae communities in more detail. Data were analyzed using the program BioDiversity Pro (Version 2) (McAleece et al., 1997).

Results

Completeness of the inventories

The species accumulation curves generated from the complete samplings showing the observed species richness (S obs) and the estimators that produced the lowest and highest estimates for each plot and for the whole inventory are shown in Figure 2. The curves belonging to the plots show that the 2-year inventories are reasonably complete, although different estimators agree in their values that there are still some undetected species in each area. For example, in vulcanic oak forest the observed richness (S = 38) is not so far from the results obtained from the non-parametric estimators ICE (51), Chao 2 (45), Jackknife 1 (50) and Jackknife 2 (54). The percentage

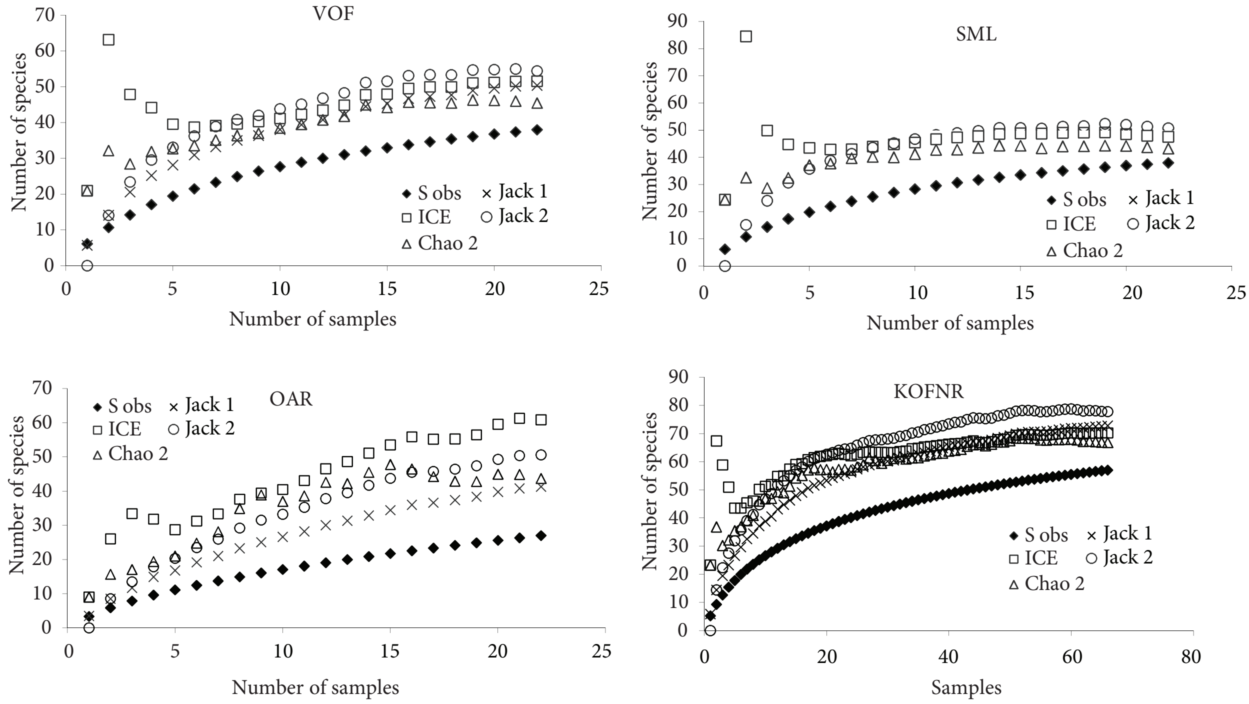

Figure 2. Species accumulation curves for each plot and for the total inventory (including 2-year samplings) and the non-parametric estimators ICE, Chao2 and first and second-order Jackknife.

of the detected Alticinae species in VOF falls between 69.8% and 83.6% (Table 1). According to the same estimators, these percentages are relatively higher for shrub and meadow lands (between 74.9% and 87.9%). On the other hand, for the third plot OAR (open areas near roadside), the observed species richness seems rather low (especially for ICE) compared with the estimated values (Table 1).

According to our results, the total Alticinae fauna of KOFNR comprises 57 recorded species, but the estimated total richness reaches between 66 (Chao 2) and 77 (Jackknife 2) (Table 1). The percentage of the undetected species in the area ranges between 15% and 27%, therefore we should expect that between 9 and 20 species will be added to the inventory in the future. Since this is the first study dealing with Alticinae diversity of KOFNR and we worked only in 3 plots, further samplings should be conducted in the area.

Species diversity and composition

A total of 2650 flea beetles belonging to 9 genera and 57 species were recorded from KOFNR: 43 species and 1272 individuals were collected in 2005; 46 species and 1378 individuals in 2006. *Longitarsus* was the most species-rich and abundant genus in both years, comprising more species than the sum of all the other genera included (Table 2). The most abundant species during the study period were *Longitarsus baeticus* (395), *L. aeneicollis* (268), *Derocrepis anatolica* (246), *L. angelikae* (230), *L. alfierii furthi* (172), *L. pellucidus* (134), *L. obliteratus* (122) and *Dibolia carpathica* (109) which summed 63% of all the individuals collected (Figure 3).

In 2005, vulcanic oak forest was the most diverse plot according to Shannon's, Simpson's and Berger-Parker's indices of diversity. These values were distinctly higher for shrub and meadow lands in 2006. The fewest numbers of species and individuals, hence the lowest diversity was in the third plot, open areas near roadside, for both years (Table 3).

On the whole study period, 38 flea beetle species were recorded each from plots VOF and SML, and 27 from OAR. Although species numbers were equal in VOF and SML, Shannon, Simpson, and Berger-Parker

Table 1. Number of the species recorded (S obs), estimates (Est.), and percentage (%) of the estimated value recorded for the total sampling including 2-year inventories

	VOF			SML			OAR			Total (KOFNR)		
	S obs	Est.	%	S obs	Est.	%	S obs	Est.	%	S obs	Est.	%
ICE	38	51	73.7	38	47	79.9	27	60	44.3	57	70	81.2
Chao 2	38	45	83.6	38	43	87.9	27	43	61.8	57	66	85.3
Jack 1	38	50	75.4	38	48	78.4	27	41	65.3	57	72	78.3
Jack 2	38	54	69.8	38	50	74.9	27	50	53.3	57	77	73.3

Table 2. Species composition and dominance of Alticinae species collected from the studied plots in the KOFNR, in 2005 and 2006

		2005			2006				
		Plots							
	Species	VOF	SML	OAR	VOF	SML	OAR	N	Dominance %
	Phyllotreta								
1	*P. bulgarica* Gruev	3						3	0.11
2	*P. corrugata* Reiche	2			14			16	0.60
3	*P. fornuseki* Čížek	6		1	47			54	2.04
4	*P. maculicornis* Pic				7			7	0.26
5	*P. nigripes* (Fabricius)	8	1		21	6		36	1.36
6	*P. procera* (Redtenbacher)	3						3	0.11
	Aphthona								
7	*A. pygmaea* Kutschera	4			11			15	0.57
	Longitarsus								
8	*L. aeneicollis* (Faldermann)	41	49	88	22	33	35	268	10.11
9	*L. alfierii furthi* Gruev	27	9	37	52	17	30	172	6.49
10	*L. anchusae* (Paykull)					8		8	0.30
11	*L. angelikae* Fritzlar	98	16	5	104	5	2	230	8.68
12	*L. aramaicus* Leonardi	36	4	7	15	3		65	2.45
13	*L. atricillus* (Linnaeus)				1	2		3	0.11
14	*L. australis* (Mulsant et Rey)		4			15		19	0.72
15	*L. baeticus* Leonardi	70	146	10	18	131	20	395	14.91
16	*L. ballotae* (Marsham)	22	61			18		101	3.81
17	*L. fallax* Weise		2	1		9	4	16	0.60
18	*L. foudrasi* Weise			21				21	0.79
19	*L. helvolus* Kutschera	28	11			55		94	3.55
20	*L. hermonensis* Furth					6		6	0.23
21	*L. karlheinzi* Warchałowski		4			10		14	0.53
22	*L. lateripunctatus personatus* Müller	1						1	0.04
23	*L. luridus* (Scopoli)			2	3	3		8	0.30
24	*L. minusculus* (Foudras)						2	2	0.08
25	*L. nanus* (Foudras)		5	14			8	27	1.02

Table 2. (Continued)

		2005			2006				
		Plots							
	Species	VOF	SML	OAR	VOF	SML	OAR	N	Dominance %
26	*L. nigrofasciatus* (Goeze)	11	3		2	4	3	23	0.87
27	*L. nimrodi* Furth				2			2	0.08
28	*L. noricus* Leonardi				2			2	0.08
29	*L. obliteratoides* Gruev		7					7	0.26
30	*L. obliteratus* (Rosenhauer)	2	34	6	5	66	9	122	4.60
31	*L. ochroleucus* (Marsham)	1			1		1	3	0.11
32	*L. pellucidus* (Foudras)	46	41	3	9	30	5	134	5.06
33	*L. pinguis* Weise	4		7	9			20	0.75
34	*L. pratensis* (Panzer)				4	1		5	0.19
35	*L. salviae* Gruev		3			8	19	30	1.13
36	*L. succineus* (Foudras)	20	2		5	8		35	1.32
37	*L. tabidus* (Fabricius)	11	42			51		104	3.92
38	*L. trepidus* Warchałowski	3					5	8	0.30
39	*A. ampelophaga* Guérin-Méneville			1				1	0.04
	Altica								
40	*A. oleraceae* (Linnaeus)		2	2				4	0.15
	Derocrepis								
41	*D. anatolica* Heikertinger	27	8	46	34	35	96	246	9.28
	Podagrica								
42	*P. malvae* (Illiger)				7	11		18	0.68
	Chaetocnema								
43	*C. arida* Foudras	3	3		4	24	3	37	1.40
44	*C. hortensis* (Geoffroy)		1			3		4	0.15
45	*C. montenegrina* Heikertinger	3	13		3	11		30	1.13
46	*C. scheffleri* (Kutschera)	1						1	0.04
47	*C. tibialis* (Illiger)					12		12	0.45
	Dibolia								
48	*D. carpathica* Weise	19	14	16	14	17	29	109	4.11
49	*D. cynoglossi* (Koch)	2						2	0.08
	Psylliodes								
50	*P. anatolicus* Gök&Çilbiroglu						2	2	0.08
51	*P. chalcomerus* (Illiger)					4		4	0.15
52	*P. cupreus* (Koch)	5	1		33	10	7	56	2.11
53	*P. drusei* Furth						14	14	0.53
54	*P. hyoscyami* (Linnaeus)		1					1	0.04
55	*P. instabilis* Foudras	5	2		13		4	24	0.91
56	*P. isatidis* Heikertinger					2		2	0.08
57	*P. napi* (Fabricius)	2	2					4	0.15
	Total	514	491	267	462	618	298	2650	-

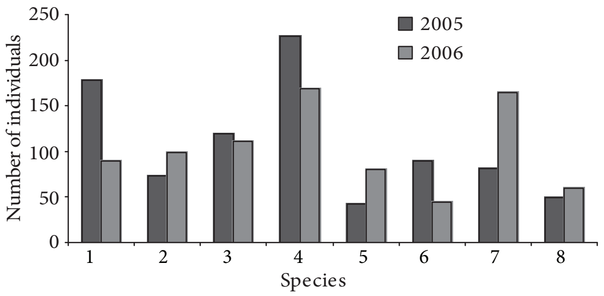

Figure 3. Numbers of individuals of the most abundant flea beetles in both study years (species with proportion of over 4% included): 1- *Longitarsus aeneicollis*, 2- *L. alfierii furthi*, 3- *L. angelikae*, 4- *Longitarsus baeticus*, 5- *L. obliteratus*, 6- *L. pellucidus*, 7- *Derocrepis anatolica*, 8- *Dibolia carpathica*.

index values revealed a high degree of diversity for VOF based on the regular distribution of individuals among species. The structure of dominance in the community changed significantly in SML, thus its diversity was lower than that of VOF. VOF followed closely by SML, while OAR had the lowest values. Comparing the total diversity among the years studied, 2006 had higher species richness, number of individuals and index values than 2005 (Table 3).

Of the total number of specimens, 41.85% were collected in plot SML, 36.83% in VOF and 21.32% in OAR. The abundance in plot SML ranked it highest in this respect. But, because the species diversity is closely related with the species abundance distribution, VOF is more diverse (Figure 4a). In the plot of k-dominance in which species are ranked with cumulative abundances, the curve corresponding to the plot OAR is located above the other 2 curves, which means that this community is the least diverse (Figure 4b).

Faunistic similarity

In 2005, 9 species out of 43 were shared between the 3 plots (Table 1), namely *Longitarsus aeneicollis, L. alfierii furthi, L. angelikae, L. aramaicus, L. baeticus, L. obliteratus, L. pellucidus, Derocrepis anatolica* and *Dibolia carpathica*. In 2006, 11 species out of 46 were shared between the 3 plots (Table 1). The shared species included *L. aeneicollis, L. alfierii furthi, L. angelikae, L. baeticus, L. nigrofasciatus, L. obliteratus,*

Table 3. Number of species, number of individuals and results of the alpha-diversity indices of the Alticinae communities in the plots studied according to years and whole study period

Plots	Number of species	Number of individuals	Shannon index (H')	Simpson index (1/D)	Berger-Parker index (1/d)
VOF					
2005	31	514	1.2	11.43	5.24
2006	28	462	1.19	10.62	4.44
SML					
2005	29	491	1.07	7.37	3.36
2006	32	618	1.25	11.74	4.71
OAR					
2005	17	267	0.92	5.85	3.03
2006	20	298	1.01	6.73	3.1
Total					
VOF	38	976	1.27	12.39	4.83
SML	38	1109	1.22	9.95	4
OAR	27	565	1.05	7.21	3.98
2005	43	1272	1.24	11.92	5.62
2006	46	1378	1.38	16.84	8.15

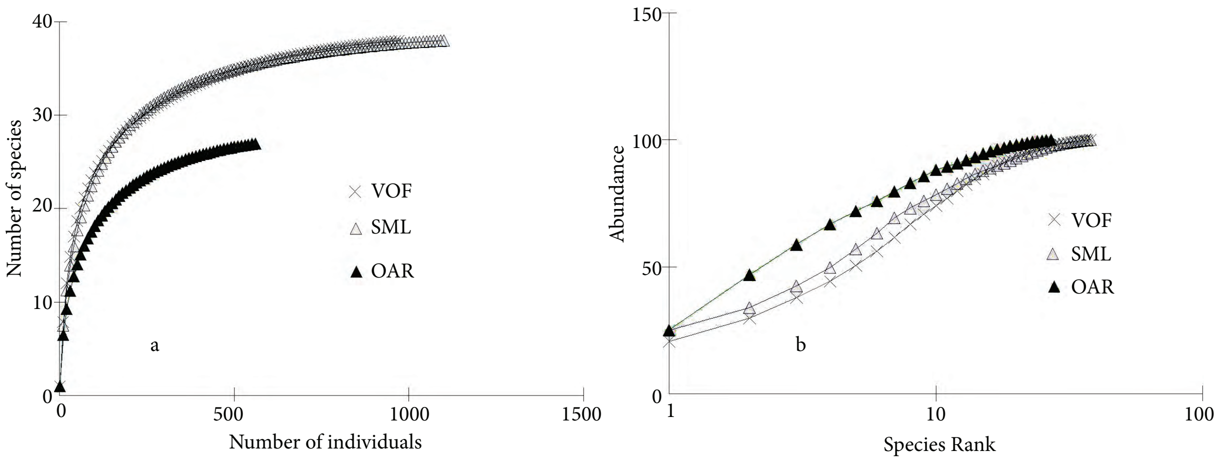

Figure 4. (a) Sample-based rarefaction curves for the flea beetles of the studied plots. (b) Diagram of k-dominance of flea beetle species in the studied plots.

L. pellucidus, Derocrepis anatolica, Chaetocnema arida, Dibolia carpathica and *Psylliodes cupreus*. The comparison of the 3 inventories obtained during the whole study period showed that, according to Jaccard's index the overall faunistic similarity of VOF and SML was 0.46, while it was 0.44 based on Bray-Curtis index (Figure 5).

Discussion and conclusion

Species composition of phytophagous insect communities is usually affected by a combination of geographical and environmental factors including vegetation, topography, altitude, climate, habitat and human influence (Wallner, 1987; Lien and Yuan, 2003; Andrew and Hughes, 2004; Wąsowska, 2004; Lassau et al., 2005). Among the 3 plots studied, there were distinct differences in terms of species richness, abundance and diversity of Alticinae. Vulcanic oak forest was the most diverse plot in 2005, and shrub and meadow lands were the most diverse in the latter year. Open areas near roadside had rather low diversity values in comparison with the other 2 plots in both 2005 and 2006.

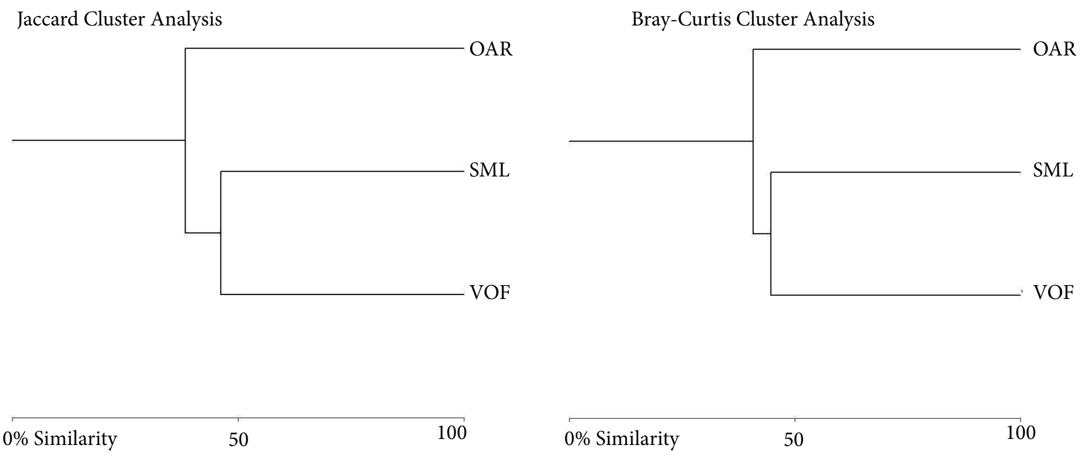

Figure 5. Similarity between flea beetle communities inhabiting different plots based on species composition (Jaccard index) and quantitative data (Bray-Curtis index).

The highest species richness, abundance and diversity values in the VOF and SML plots suggest that most alticines are distributed preferentially in the areas that have diverse herbaceous cover. Because alticines are highly specialized phytophagous insects (Furth, 1979), the differences in the diversity of the communities might be explained by the differences in the floristic composition and herbaceous plant density at the sites. VOF is a forest area dominated by vulcanic oak, and has a rich undergrowth plant composition preferred by many alticines. SML also provides many host plants for Alticinae, with its diverse grass vegetation accompanied by various shrubs. The structure of dominance in Alticinae communities also changed mainly depending on the presence of host plants. The following species were closely associated with the presence of their host plants: *Derocrepis anatolica* (*Vicia* sp.), *Dibolia carpathica* (*Nepeta nuda*), *Longitarsus aeneicollis* (*Verbascum* sp.), *Longitarsus alfierii furthi* (*Nepeta* sp.), *Longitarsus angelikae* (*Teucrium chamaedrys, Salvia cryptantha*) and *Longitarsus baeticus* (*Verbascum* spp.).

Cluster analysis with respect to species composition revealed a high degree of similarity between the communities VOF and SML. This might be explained by the fact that the 2 plots have similar altitudes as well as quite diverse grass cover, and provide more favorable conditions for Alticinae species. OAR differs from the other plots not only in plant composition and diversity, but also in habitat characteristics. The area has mostly uniform herbaceous cover and is much disturbed by grazing and human activities. These factors are probably responsible for the low species richness and distant faunistic composition of the plot OAR.

Longitarsus aeneicollis, L. alfierii furthi, L. angelikae, L. baeticus, L. obliteratus, L. pellucidus, Derocrepis anatolica and *Dibolia carpathica* were the most frequent and abundant species collected from all plots throughout the growing seasons in both 2005 and 2006. *Longitarsus* was remarkably dominant within the genera in all collections. This may be due to the broader trophic spectrum and ecological tolerance of the genus members in addition to their ability of using various microhabitats. The above mentioned species can be defined as the most characteristic Alticinae species for KOFNR. The presence and density of their actual or alternative host plants are important factors for their abundance as well as other suitable conditions.

Longitarsus lateripunctatus personatus, L. minusculus, Longitarsus nimrodi, L. noricus, Altica ampelophaga, Chaetocnema scheffleri, Dibolia cynoglossi, Psylliodes anatolicus, P. isatidis and *P. hyoscyami* occurred more rarely in the plots during the study period represented by singletons or doubletons. These rare species are either accidental species, coming from the vegetation nearby the study sites, or generalist species, that are not specialized on feeding on distinct plant species.

This study is a preliminary step to detect the Alticinae fauna of KOFNR. The collected 57 species represents only 3 plots chosen from the area, so additional records, especially from the other parts of the area, will dramatically increase this number. Based on the species accumulation curves, we can say that none of the plots was sampled long enough to collect all the species of Alticinae living there. Although inventories have reached a reasonable level of completeness, further sampling effort will reveal the presence of many more Alticinae species when future surveys are conducted in KOFNR. Also, only the addition of a higher number of inventories from different localities could allow the statistical analysis of the environmental causes of these diversity patterns. In conclusion, the results of the present study highlight the need for additional similar studies in the region to assess the actual Alticinae diversity. Therefore, more surveys and taxonomic effort, including other insect groups, should be encouraged to display the biodiversity of this protected region.

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