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A PHYTOSOCIOLOGICAL ANALYSIS ON KIZILKUYU WILDLIFE DEVELOPMENT AREA (ŞANLIURFA/TURKEY)

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ABSTRACT: Bordered by Taurus Mountains in the north and Syria - Iraq arid climate zone in the south, Southeastern Anatolia has wide steppe lands. As a conclusion to the phytosociological research done in accordance with Braun-Blanquet (1965) method in Kızılkuyu Wildlife Development Area, which was founded in these steppe lands, three associations belonging to steppe vegetation were found. Two of these associations are new to scientific world. Identified associations were generally found in slightly stony areas inappropriate to agricultural practices. The study area is in Irano-Turanian phytogeographic region and found in C7 square in Grid System (Davis 1965 – 1985).

1. INTRODUCTION

Southeastern Anatolian steppes cover the northern part of "fertile crescent" and they are significantly barren when compared with Central Anatolian steppes. Forest lower bound begins at 700 – 850 meters in the borders of the steppe. A wide area of Southeastern Anatolian steppe, excluding the Diyarbakır Basin, is a plateau area formed of prairies and flat hills following each other (Atalay, 1994).

This region, which is also known as Upper Mesopotamia, is a geographical transition zone between the Arabian Platform and the folded rocky mountains in the north where plateaus are widest. The plateau elevation is approximately 1000 meters in the north, and it decreases to about 500–600 meters in the south (Anonymous, 1986).

Şanlıurfa province, in where the study area is found, shows the characteristics of Pliocene period, which is the last period of Cenozoic era. The land was formed together with the old world. Not affected much by side pressures and eruptions occurred between the end of Cenozoic era and the beginning of Quaternary era, Şanlıurfa elevated on the hard rock body and formed folds in places. Northeastern parts of Şanlıurfa province, especially Siverek, Hilvan and Viranşehir are formed of basalts erupted from Karacadağ. A part of the province where the study area is also found is covered by limestone formations (Anonymous, 2011).

Because of climate, topography, and bedrock differences, there are different major soil groups in Şanlıurfa. Lithosol soils which are in the azonal soil group found in high inclination areas, brown soils, and colluvial soils, and the wasteland is formed of rocks and rubbles are seen in the study area.

Kızılkuyu Wildlife Development Area, found on Mesopotamian plains, covers an area of 20504 hectares, which is in southwest of Şanlıurfa. Its geographical position is between 36° 90' 00" and 37° 8' 00" in northern latitudes and 38° 30' 40" and 38° 50' 00" in eastern longitudes (Yeniyurt et al., 2009) (Fig. 1).

The study area is bordered by İkizce village in the east, Yanıkçöğür village in the west, Keberli village in the north and Altınbaşak village in the south (Fig. 2).

Average altitude of the study area is 600 meters and rocks and stones cover a big part of it. Highest hill is Dikilitaş hill, with an altitude of 764 meters. The altitude decreases gradually from north to south (Yeniyurt et al., 2009).

There are no streams flowing throughout the year in the study area. Intermittent streams extending through south between the hills form rift alluvial plains on the south part of the area. The hills composed of a bedrock that is formed of limestone are covered by a thin layer of soil and sparse vegetation. Northern part of the study area is nonarable, generally seems as a natural steppe. Southern parts, however, are comparably arable with wide lands of cultivation (Yeniyurt et al., 2009).

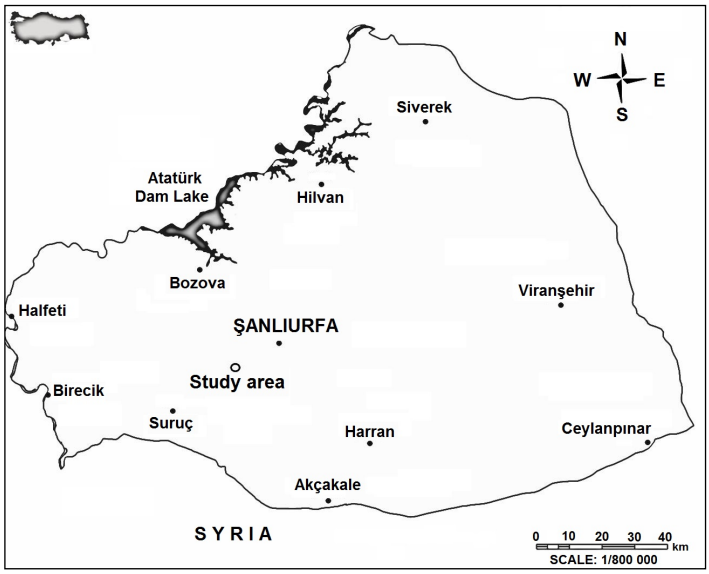

Figure 1. Geographical map of Şanlıurfa.

2. METHODS

Studies by Davis (1965-1985), Davis et al. (1988), Güner et al. (2000), Kaya and Ertekin (2009), Kaya (2010a; 2011a) and Kaya et al. (2011b)

Climate of the study area was evaluated in accordance with the meteorological data provided by the weather station of Şanlıurfa (Anonymous, 2010). The analysis of soil samples taken from places where can represent the associations in the study area was done in accordance with Tüzüner (1990) methods.

In this research, Braun – Blanquet's "Floristic Unit System" (1965) and cover-abundance scale elaborated in accordance with this system by Frey and Lösch (1998) were used for vegetation analysis. According to this scale; (r = 1 individual, also rare outside the relevé, small plant); + = 2-5 (small) individuals, cover < 5%; 1 = 6-50 individuals, cover < 5%; or few larger individuals (often given as 1-5) with a cover up to 5%; 1m = many individuals (> 50), cover < 5%; 2a = cover 5-12.4%; 2b = cover 12.5-25%; 3 = cover 25-50%; 4 = cover 50-75%; 5 = cover 75-100%).

In the determination of relevés width, "minimal area" method was followed and this value was determined as 50 m^2 for steppe vegetation. For the naming of the new associations, International code of phytosociological nomenclature" was referred (Weber et al., 2000). For the classification of steppe vegetation associations, studies of Quézel et al. (1973), Akman et al. (1985) with Kaya and Ketenoğlu (2010) were referred.

Comparison of identified associations with similar associations in the respect of floristic composition was made by using Sørensen (1948) similarity index [$C_s = (2 \times C \times 100) / (A + B)$]

(C_s = similarity coefficient, A is the number of species found in site A; B is the number of species in site B and C is the number of species shared by the two sites).

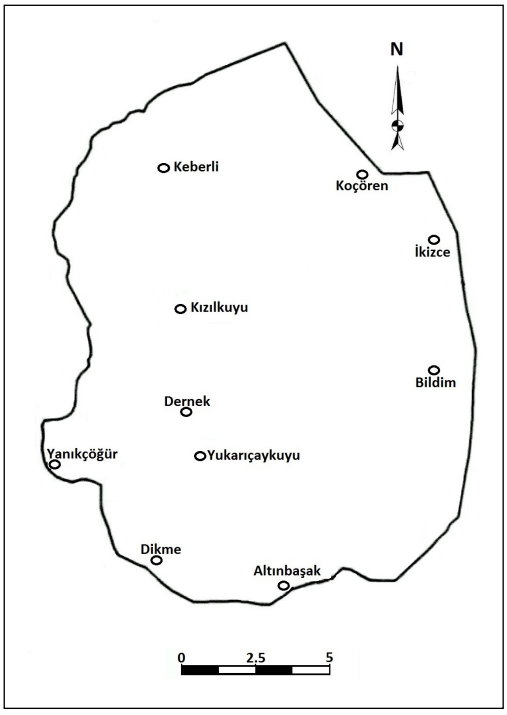

Figure 2. Local map of Kızılkuyu wildlife development area.

3. RESULTS AND DISCUSSIONS

Three associations belonging to steppe vegetation were identified in the study area.

***Eryngio cretico – Asphodelinetum brevicaulis* ass.nova**

Holotypus: relevé 5, 540 m, cover 80%, 50 m^2, Table 1

The association is characterized by *Asphodeline brevicaulis* subsp. *brevicaulis* var. *brevicaulis* and *Eryngium creticum*. The association is occurred by a single layer of vegetation, which is formed by xerophytes of 25 - 60 cm height, with a cover rate of 75 - 80%. Floristic composition of the association is not substantial. Many species in the association have low cover rates. Main reason for this is the fact that the area is being used as a grazing land by the neighbouring villages.

Asphodeline brevicaulis subsp. *brevicaulis* var. *brevicaulis*, dominating the physiognomy of the association, is an Eastern Mediterranean element, which spreads to Western and Eastern Anatolia's rocky and stony areas. This association around the dumping ground, that is about 2 km north of İkizce village, which deploys in northeast of the study area, shows prevalence on limestone bedrock at about 500 - 550 m altitude and 5^o - 10^o slope.

The texture class of the association soils is clay and loamy and shows slight alkaline reaction (pH 7.87 - 7.93). Lime level is 17.31% - 35.66% and organic matter level differs between 1.28% - 1.29%.

***Centaurea virgatae – Convolvuletum oxysepali* ass.nova**

Holotypus: relevé 17, 636 m, cover 75%, 50 m^2, Table 2

Characteristic taxa of the association are *Convolvulus dorycnium* subsp. *oxysephalus* and *Centaurea virgata*. Dominant species of the association is *Convolvulus dorycnium* subsp. *oxysephalus* is an Eastern Mediterranean element generally showing prevalence around Southern and Eastern Anatolia. This association is deployed in the stony area among Kızılkuyu, Güzelkuyu and Keberli villages, in average height of 610 - 650 m, 2^o - 5^o slope.

The association is formed of a single layer and has a cover rate of 55 - 75% and height of 5 - 40 cm. Texture class of soils is clay-loamy. The soil has pH values around 7.90 - 7.92 and is slight alkaline. Lime level is around 22.99% - 25.34% so the limiest soil of the study area belongs to this association's soil. Organic matter level differs between 1.18% - 1.40%

Table 1. Eryngio cretico – Asphodelinetum brevicaulis ass.nova

	Relevé no	21	22	23	24	**25**	26	27	28	29	30	
	Size of plot (m²)	50	50	50	50	**50**	50	50	50	50	50	
	Parent rock	LS	LS	LS	LS	**LS**	LS	LS	LS	LS	LS	
	Inclination (°)	5	5	5	10	**10**	7	10	8	5	5	
	Altitude (m)	536	540	540	550	**540**	535	542	547	538	543	Presence
	Exposition	W	W	E	E	**SE**	E	E	W	NW	E	
	Coverage (%)	75	75	75	75	**80**	75	75	75	75	75	
LF												
	Differential and characteristic species of the association											
H	*Asphodeline brevicaulis* subsp. *brevicaulis* var. *brevicaulis*	4	4	4	4	**5**	4	4	3	4	4	V
H	*Eryngium creticum*	1		1		**1**	+	+	1	+		IV
	Characteristic species of Astragalo erythrotaeni-Gundelion armatae											
H	*Gundelia tournefortii* var. *armata*	+			+	**+**		+		+		III
H	*Torilis leptocarpa*		+	+			+					II
	Characteristic species of Onobrychido armenae-Thymetalia lecostomi											
H	*Centaurea virgata*		+			**+**			+		+	II
H	*Paronychia kurdica* subsp. *kurdica* var. *kurdica*					**+**				+		I
	Characteristic species of Astragalo microcephali-Brometea tomentelli											
Ch	*Teucrium polium*	1			+	**1**		1		+	+	III
Th	*Xeranthemum annuum*	+	+			**+**		+				II
H	*Ajuga chamaepitys* subsp. *chia* var. *chia*	+			+		+			+		II
Th	*Picnomon acarna*			+				+				I
	Companions											
Th	*Trifolium speciosum*	+		+		**+**	+		+			III
Th	*Trifolium stellatum* var. *stellatum*		1		+	**1**	+	1	+			III
Th	*Ziziphora taurica* subsp. *taurica*	+		+		**1**	+			1	+	III
Th	*Tordylium hasselquistiae*		+	+		**+**		+		+		III
Th	*Valerianella vesicaria*			+		**+**				+		II
Th	*Alyssum strigosum* subsp. *strigosum*	+		+		**+**			+			II
H	*Astragalus diphtherites* var. *diphtherites*			+		**+**		+				II
H	*Echinops orientalis*			1	+	**+**						II
Th	*Aegilops triuncialis* subsp. *triuncialis*	+			+			1		+		II
Th	*Echinaria capitata*					**+**		+			1	II
Th	*Ziziphora capitata*	1							+	1	+	II
H	*Phlomis bruguieri*	+	1		+		+					II
H	*Sanguisorba minor* subsp. *magnolii*			+	+				+			II
Th	*Taeniatherum caput-medusae* subsp. *crinitum*		+			**+**			+		+	II
H	*Verbascum kotschyi*	+			+					+		II
H	*Trigonella coelesyriaca*			+		**+**		+			+	II
Th	*Scandix stellata*	+			+					+		II
Ch	*Thymbra spicata* var. *spicata*		+				+			+		II
Th	*Bromus tectorum*				+	+	+			+		II
Th	*Trigonella mesopotamica*		+			+		+				II
G	*Gladiolus atroviolaceus*		+				+		+			II
H	*Achillea aleppica* subsp. *aleppica*		+	+			+				+	II
Th	*Trifolium boissieri*			+	+		+				+	II
Th	*Hippocrepis unisiliqua* subsp. *unisiliqua*		+		+				+			II
Th	*Holesteum umbellatum* var. *umbellatum*		+			+				+		II
Th	*Trigonella monantha* subsp. *monantha*			+	+	+						II
Th	*Valerianella kotschyi*		+		+	**+**				+		II
Th	*Avena sterilis* subsp. *sterilis*		+				+			+		II
H	*Hordeum bulbosum*			1		+		+			+	II
Th	*Trifolium pilulare*	+				**+**						I
G	*Hyacinthella nervosa*	+										I
G	*Ixiolirion tataricum* subsp. *montanum*		+	+								I
Th	*Trifolium pauciflorum*	+				**+**						I
H	*Aristolochia bottae*		+			+						I
Th	*Geranium rotundifolium*		+								+	I
Th	*Senecio vernalis*				+				+			I
G	*Gagea reticulata*					**+**			+			I
H	*Salvia palaestina*	+					+					I

Table 2. Centaurea virgatae – Convolvuletum oxysepali ass.nova

	Relevé no	11	12	13	14	15	16	**17**	18	19	20	Presence
	Size of plot (m²)	50	50	50	50	50	50	**50**	50	50	50	
	Parent rock	LS	LS	LS	LS	LS	LS	**LS**	LS	LS	LS	
	Inclination (°)	2	2	3	5	2	2	**2**	5	3	3	
	Altitude (m)	620	621	617	630	625	635	**636**	640	638	635	
	Exposition	W	W	W	E	E	E	**E**	E	E	E	
	Coverage (%)	55	65	55	65	70	70	**75**	70	55	65	
LF												
	Differential and characteristic species of the association											
H	*Convolvulus dorycnium* subsp. *oxysephalus*	3	3	4	5	3	4	**5**	4	5	4	V
H	*Centaurea virgata*			1	1	+		**1**	+		+	III
	Characteristic species of Astragalo erythrotaeni-Gundelion armatae											
H	*Gundelia tournefortii* var. *armata*			+	+			**+**			+	II
	Characteristic species of Onobrychido armenae-Thymetalia lecostomi											
H	*Noaea mucronata* subsp. *mucronata*	+	+				+	+				III
H	*Achillea wilhelmsii*			+				+			+	II
H	*Paronychia kurdica* subsp. *kurdica* var. *kurdica*		+		+					+		II
	Characteristic species of Astragalo microcephali-Brometea tomentelli											
Ch	*Teucrium polium*		1		+	1		**1**			+	III
Th	*Medicago rigidula* var. *rigidula*		1		+		+	+	+			III
H	*Ajuga chamaepitys* subsp. *chia* var. *chia*			+				**+**			+	II
H	*Poa bulbosa*	+			+						+	II
G	*Allium scorodoprasum* subsp. *scorodoprasum*		+					**+**		+		II
Th	*Xeranthemum annuum*	+						**+**				I
	Companions											
Th	*Echinaria capitata*	+	+		1	+	1	**+**		1		IV
Th	*Trifolium pilulare*	+	+	1		+		**1**	+		+	IV
Th	*Erophila verna* subsp. *verna*			1	+	1	1	+				III
Th	*Lagoecia cuminoides*	1		+		+		**1**	+		1	III
H	*Trigonella coelesyriaca*	+				+		+	+		+	III
H	*Sanguisorba minor* subsp. *magnolii*	+			+	+			+	+		III
H	*Astragalus diphtherites* var. *diphtherites*		+				+	+		+	+	III
Th	*Avena sterilis* subsp. *sterilis*		+		+			**+**	+		+	III
Th	*Scandix pecten-veneris*			+	+		+	**+**	+			III
Th	*Aegilops triuncialis* subsp. *triuncialis*		1		+			**+**	+			II
H	*Vinca major* subsp. *major*			+							+	II
G	*Gynandriris sisyrinchium*		+				+		+		+	II
H	*Scorzonera mollis* subsp. *szowitzii*	+	+				+		+			II
H	*Onosma molle*	+			+			**+**				II
H	*Phlomis kurdica*		+				1		+		+	II
H	*Erodium ciconium*	+					+			+		II
Th	*Legousia speculum-veneris*		1		+			+	+			II
Th	*Trigonella monantha* subsp. *monantha*			+		1			+		1	II
Th	*Geranium rotundifolium*		+					**+**		+		II
H	*Ranunculus asiaticus*			+				+	+			II
Th	*Hippocrepis unisiliquosa* subsp. *unisiliquosa*			+		+	1				+	II
Th	*Trifolium boissieri*			+	+		+		+			II
H	*Hordeum bulbosum*		+			1	+					II
Th	*Crepis sancta*		+	+			+			+		II
Th	*Euphorbia petiolata*				+				+		+	II
Th	*Erodium gruinum*	+			+			**+**			+	II
H	*Cerastium kotschyi*		+	+			+		+			II
Ch	*Thymbra spicata* var. *spicata*		+		+			**+**			+	II
H	*Phlomis bruguieri*	1		+			+				+	II
H	*Micromeria myrtifolia*			+			+				+	II
Th	*Trigonella mesopotamica*			+				**+**				I
H	*Salvia syriaca*	+		+								I
H	*Pimpinella eriocarpa*	+			+							I
Th	*Campanula strigosa*		+									I
H	*Onopordum bracteatum*					+						I
H	*Andrachne telephioides*			+				**+**				I
Th	*Androsace maxima*				+							I
Th	*Alyssum minus* var. *minus*		+					**+**				I
G	*Biarum carduchorum*				+			**+**				I
H	*Convolvulus betonicifolius* subsp. *peduncularis*	+			+							I
Th	*Crupina crupinastrum*		+			1		**+**				I
H	*Umbilicus horizontalis* var. *intermedius*		+			+						I
H	*Tragopogon longirostis* var. *longirostis*			+				**+**				I

Phlomidetum kurdico – bruguieri **Kaya 2011 (Table 3)**

This association generally spreads on limestone bedrock, at around 550 - 590 m height and around 0^o - 3^o slope. The lime level of the soil is around 11.50 - 27.11% and the organic matter level is around 1.10 - 1.11% and it has pH values around 7.91 - 7.93 and slight alkaline. The texture class of soils is clay - loamy.

This association is widest and most scattered association in the study area. Its best deployed is observed at 500 - 550 m height, between Dernek and Yukarıçaykuyu villages.

Table 3. Phlomidetum kurdico – bruguieri Kaya 2011

	Relevé no	**1**	2	3	4	5	6	7	8	9	10	
	Size of plot (m²)	**50**	50	50	50	50	50	50	50	50	50	
	Parent rock	**LS**	LS	LS	LS	LS	LS	LS	LS	LS	LS	Presence
	Inclination (°)	**0**	2	1	0	3	0	2	0	3	0	
	Altitude (m)	**561**	563	565	570	570	565	580	580	560	570	
	Exposition	**N**	NW	SE	S	N	W	SE	S	S	W	
	Coverage (%)	**75**	70	75	70	70	65	65	70	65	70	
LF												
	Differential and characteristic species of the association											
H	*Phlomis bruguieri*	**5**	4	4	4	3	3	3	4	4	3	V
H	*Phlomis kurdica*	+	+	1	+	1	+	+	1	+	+	V
	Characteristic species of Astragalo erythrotaeni-Gundelion armatae											
H	*Gundelia tournefortii* var. *armata*	+				+	+					II
	Characteristic species of Onobrychido armenae-Thymetalia lecostomi											
H	*Marrubium parviflorum* subsp. *parviflorum*	+	+			+		+				II
H	*Paronychia kurdica* subsp. *kurdica* var. *kurdica*	+			+		+		+			II
H	*Centaurea virgata*			+	+			+				II
	Characteristic species of Astragalo microcephali-Brometea tomentelli											
Ch	*Teucrium polium*	+	1				+			1	+	III
Th	*Medicago radiata*	+			1	+	+		1		1	III
Th	*Lamium amplexicaule*	+	+			+		+			1	III
H	*Poa bulbosa*			+	+		1	+	+			III
Th	*Bromus japonicus* subsp. *japonicus*			+	+				+			II
Th	*Trifolium campestre*	+				+				+		II
Th	*Xeranthemum annuum*	+	+			+					+	II
H	*Ajuga chamaepitys* subsp. *chia* var. *chia*			+					+			I
	Companions											
Th	*Aegilops triuncialis* subsp. *triuncialis*	+		+	1	+		1	+		1	IV
Th	*Valerianella vesicaria*	**1**	+			1		+		+		III
Th	*Trifolium tomentosum*	**1**		+	+	1					+	III
H	*Onobrychis kotschyana*		+		+			+		+	+	III
Th	*Avena sterilis* subsp. *sterilis*	**1**	+			1			+	+		III
Th	*Echinaria capitata*	+			+		+	+			+	III
Th	*Filago pyramidata*	+	+		+				1		+	III
Th	*Coronilla scorpioides*		+				+		+		+	II
Th	*Papaver dubium* subsp. *dubium*	+						+				II
Th	*Trifolium speciosum*				+					+		II
H	*Torilis leptocarpa*	+						+			+	II
Th	*Cicer echinospermum*		+				+	+				II
H	*Achillea aleppica* subsp. *aleppica*	+		+						+		II
Th	*Trifolium boissieri*	+		+			+	+				II
Th	*Onobrychis aequidentata*			+				+			+	II
H	*Tragopogon longirostris* var. *longirostris*	+			1				+			II
H	*Dianthus strictus* var. *strictus*		+		1				+			II
H	*Convolvulus betonicifolius* subsp. *peduncularis*	+				+				+	+	II
Th	*Tordylium hasselquistiae*	+					+		1			II
Th	*Ziziphora capitata*	**1**	+				1			1		II
G	*Ornithogalum narbonense*		+				+		+			II
Th	*Rhagadiolus angulosus*			+				+			+	II
H	*Astragalus suberosus* subsp. *suberosus*	+				+				+		II
H	*Salvia multicaulis*		+				+		+		+	II
H	*Hordeum bulbosum*	+			+		1					II
H	*Onosma sericeum*	+			+		+			+		II
Th	*Alyssum strigosum* subsp. *strigosum*	+		+				+	+			II
H	*Astragalus diphtherites* var. *diphtherites*		+				+			+	+	II
H	*Sanguisorba minor* subsp. *magnolii*				+	+				+		II
H	*Aristolochia bottae*		+		+					+		II
Th	*Lens orientalis*	+					+	+				II
Th	*Cephalaria setosa*								+	+		I
H	*Andrachne telephioides*			+								I
Th	*Crupina crupinastrum*	+			+							I
H	*Echinops orientalis*		+						+			I
Th	*Trifolium cherleri*					+	1					I
Th	*Trifolium pilulare*				+				+			I
G	*Gagea reticulata*	+							+			I
Th	*Ceratocephalus falcatus*	**1**					+					I
Th	*Trigonella monspeliaca*				+			+				I
H	*Salvia palaestina*		+					+				I

Another area covered by this association is in the south of the study area, on the hills deploys south of Çakırlar village, where is out of study area's boundaries. The association shows weak presence in the hills between Koçören and Güzelkuyu villages, at 620 - 640 m height and between Koşma and Dernek villages, at 550 - 560 m height.

It is possible to encounter with the characteristic taxa of this association, *Phlomis bruguieri* and *Phlomis kurdica* in almost every part of the study area as small groups formed of 5 - 10 members.

Phlomis bruguieri is an Irano-Turanian element specifying the physiognomy of the association. This taxon spreads generally in South-eastern Anatolia.

This association was previously identified in a phytosociological research conducted by Kaya (2011a) in Germuş Mountain. When this association in the study area is compared with *Phlomidetum kurdico - bruguieri* identified in

Germuş Mountain, in accordance with Sørensen's (1948) similarity index, the similarity of floristic composition is calculated as 53.5%.

According to the data obtained from chemical analysis of soil samples from the study area, all the associations show prevalence on the clay - loamy soil. Such soil type has the optimum physical features for the vegetation. Soil types in the study area are slight alkaline in terms of pH value and in the class of saltless soils in terms of electrical conductivity (EC) (Table 4).

Table 4. Chemical analysis of the soils taken from the study area. (CL: clay-loamy)

Associations	Relevé No	Saturation (%)	EC ds/m	pH	$CaCO_3$ (%)	P_2O_5 (kg/da)	K_2O (kg/da)	Organic matter (%)	Texture
Eryngio cretico – Asphodelinetum brevicaulis	5	64	0,962	7,87	17,31	1,20	65,72	2,20	CL
	9	60	0,864	7,93	35,66	1,04	47,71	2,23	
Centaurea virgatae – Convolvuletum oxysepali	12	54	0,909	7,92	22,99	2,01	130,55	2,42	
	17	56	0,948	7,90	25,34	2,09	116,00	2,03	
Phlomidetum kurdico – bruguieri	21	60	0,944	7,93	11,50	1,52	92,44	1,91	
	28	61	0,947	7,91	27,11	1,85	86,15	1,90	

A large extent of Turkish soil is composed of lime soil (Gedikoğlu, 1990). Analysed association soils show great difference in terms of lime levels. While *Phlomidetum kurdico - bruguieri* spread on medium or high lime level soil, *Centaurea virgatae - Convolvuletum oxysepali* and *Eryngio cretico - Asphodelinetum brevicaulis* spread on high and very high lime level soils.

Turkish soil lacks phosphorus in a major part (Eyüpoğlu, 1999). Analysis conducted on association soils support this data. The phosphorus levels are low in all three syntaxa.

A major part of Turkish soil has potassium in abundance (Eyüpoğlu, 1999). Conclusion made from the analysis of association soils show that, even though potassium levels change in the soil of three syntaxa, the general level is high. Potassium support for plant efficiency is not required.

Turkish soil generally lacks organic matter (Eyüpoğlu, 1999). According to the results of the analysis, while organic matter levels are low in *Phlomidetum kurdico - bruguieri*, *Centaurea virgatae - Convolvuletum oxysepali* and medium in *Eryngio cretico - Asphodelinetum brevicaulis* .

As a result; in consequence of the conducted soil analysis, it is realized that the soil parameters are in optimal percentage for the growth of plants. According to this conclusion, weak vegetation is caused by other factors apart from soil such as overgrazing, land clearing, temperature, bare rocks etc.

South-eastern Anatolian climate shows characteristics of a continental steppe climate. Lowest temperatures and precipitation are features of winter, while summer is arid and hot. These facts put forward the existence of a vague Mediterranean type precipitation regime. As there are no altitude differences in the parts of the study area, amount of precipitation does not change. In the study area, amount of precipitation is high in winter and low in summer. Precipitation regime is W. Sp. A. Sm. (winter, spring, autumn, summer) thus, this signalizes Eastern Mediterranean precipitation regime, type 1 (Table 5).

Table 5. Climatic data of the station in the study area.

Meteorological elements	Periods (years)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Mean temperature (^{0}C)	41	5.6	6.9	11.0	16.1	22.3	28.2	31.9	31.1	26.8	20.2	12.5	7.3	18.3
Max. mean temperature	41	10.1	11.9	16.7	22.3	28.8	34.7	38.7	38.2	33.9	27.0	18.4	11.9	24.3
Min. mean temperature	41	2.2	3.0	6.3	10.7	15.8	21.0	24.5	24.0	20.2	15.0	8.3	4.0	12.9
Mean precipitation (mm)	41	73.0	69.1	65.0	47.0	25.4	3.6	0.7	1.1	3.0	25.6	45.9	72.9	432.3
Mean relative humidity (%)	41	69.6	66.7	61.4	57.5	46.1	35.0	32.3	35.5	38.1	47.7	61.0	70.2	51.7

4. CONCLUSIONS

Gazelles (*Gazella subgutturosa*), were regarded as endangered species in 1970's and were under protection. The species were reproduced semi-wildly at the reproduction station in Ceylanpınar town and for the release of surplus members to wildlife; the study area was announced as Kızılkuyu Wildlife Development Area in 2006. This area is in one of the 305 key biodiversity areas of Turkey, the "Akçakale Key Biodiversity Area" (Eken et al., 2006).

Gazelles left in the study area (86 individuals) grew rapidly and in present, there are 500 individuals. In addition to sheep, goats and cows belonging to the villages in the study area, the gazelles increased the grazing pressure on the existing vegetation. Progressively, this pressure increases and the study area is on the brink of exceeding the carrying capacity of a population. The proof to this is the existence of bare lands without vegetation in some parts of the study area.

South-eastern Anatolian steppe vegetation has been exposed to anthropological factors for years. This causes the vegetation to reproduce through regressive succession. The steppe vegetation of Kızılkuyu Wildlife Development Area can be regarded as malacophyllous steppe physiognomically. The area is floristically poor because of its topographical structure, which causes lack of isolated areas and overgrazing pressure.

Most common herbaceous plants in the study area are Paoceae family members such as *Poa bulbosa*, *Avena sterilis* subsp. *sterilis*, *Aegilops triuncialis* subsp. *triuncialis, Bromus japonicus* subsp. *japonicus*; tragacanthic plants characterized, thorny taxa such as *Astragalus spp*., *Onosma spp., Onopardum sp., Echinops sp.* etc.; and broad-leaved, perennial plants such as *Phlomis spp., Verbascum spp.*

There are no forest formations in the study area, but rarely, phanerophytes such as *Rosa canina, Cerasus microcarpa* subsp. *tortuosa* and *Ficus carica* subsp. *rupestris* are seen. Apart from the existing steppe species, vegetation belonging to ruderal and segetal taxa are also seen. The reason for this is the presence of cultivated areas and transportation roads.

As a result of the factors such as the existence of wide, stony areas and the usage of the land as a grazing point, the floristic composition of identified associations is composed of taxa not preferred by animals. In other words, we can say that there is a zootic climax in the study area by the effect of these biotic factors.

When the chronology of taxa in identified associations are analysed, it is seen that Irano - Turanian elements are higher in percentage. This result supports the idea that, Southeastern Anatolia, which was also included in Zohary's (1973) study area, exists in the Irano - Turanian phytogeographic region. Additionally, the existence of Eastern Mediterranean elements (*Convolvulus dorycnium* subsp. *oxysephalus* and *Centaurea virgata*) dominating the physiognomy of the two associations, shows that the study area is a microclimatic zone, where features of Mediterranean climate are observed (Figure 3).

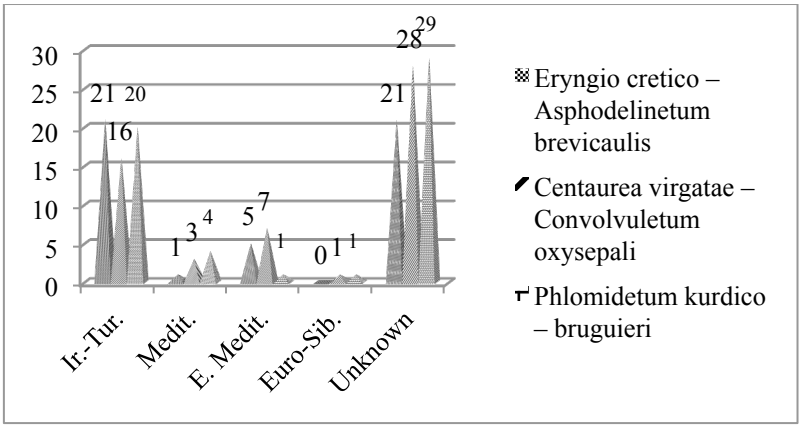

Figure 3. Chrology spectrum of associations.

When the life forms of identified taxa are analysed in accordance with Raunkiaer (1934) methods, the dominance of hemicryptophytes is understood. This result supports the opinion alleges that Irano - Turanian phytogeographic region is characterized by hemicryptophytes and chamaephytes (Zohary 1973) (Figure 4).

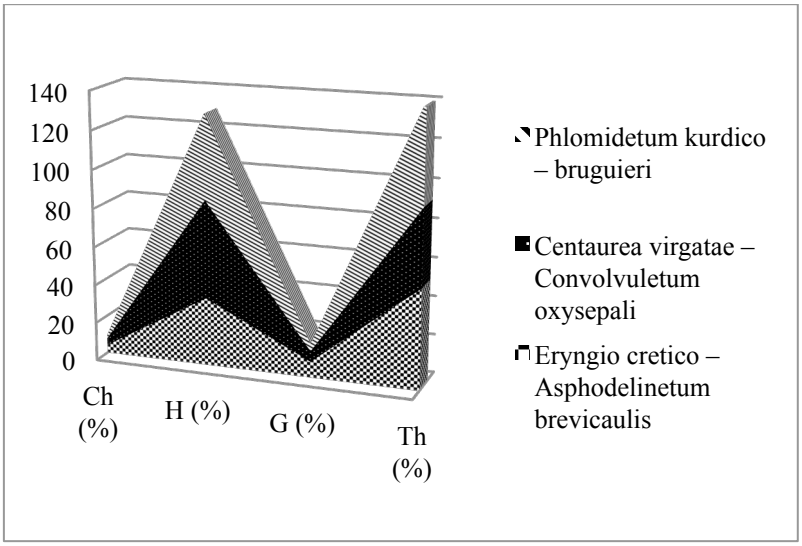

Figure 4. Life forms of associations (Ch: chamaephytes, H: hemicryptophytes, G: geophytes, Th: therophytes).

As a conclusion of the phytosociological research conducted on the study area, the identified syntaxa of steppe vegetation, and their upper syntaxonomic units are shown below:

Class: *Astragalo microcephali – Brometea tomentelli* Quézel 1973

Order: *Onobrychido armenae – Thymetalia leucostomi* Akman, Ketenoğlu & Quézel 1985

Alliance: *Astragalo erythrotaeni-Gundelion armatae* Kaya & Ketenoğlu 2010

Association: *Eryngio cretico – Asphodelinetum brevicaulis* ass.nova

Association: *Centaurea virgatae – Convolvuletum oxysepali* ass.nova

Association: *Phlomidetum kurdico – bruguieri* Kaya 2011

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