Pak. J. Bot., 36(2): 235-246, 2004.

NEW SYNTAXA FROM THE WEST PART OF CENTRAL ANATOLIA

ERGIN HAMZAOĞLU[*], MUSTAFA AYDOĞDU[1], LATIF KURT[2] AND ARZU CANSARAN[3]

Department of Biology, Faculty of Science and Literature,
Kırıkkale University, Kırıkkale, Turkey
[*] E-mail: erginhamzaoglu@yahoo.com
[1]Gazi University, Education Faculty, Biology Department, Ankara, Turkey
[2]Ankara University, Science Faculty, Biology Department, Ankara, Turkey
[3]Ondokuzmayıs University, Amasya Education Faculty,
Biology Department, Amasya, Turkey

Abstract

Three plant communities in Central Anatolia are named, classified and briefly described. All the associations in the study area were attached to a new suballiance: *Ebeno hirsutae-Thymenion leucostomi* in the alliance *Convolvulo holosericei-Ajugion salicifoliae* Akman, Ketenoğlu, Quézel & Demirörs (1984) belonging to the order *Onobrychido armenae–Thymetalia leucostomi* Akman, Ketenoğlu & Quézel (1985) and the class *Astragalo microcephali–Brometea tomentelli* Quézel (1973). This suballiance is formed by steppe communities spreading on the calcareous soils between Cihanbeyli (Konya) and Çifteler (Eskişehir) located in the west part of Central Anatolia.

Introduction

The boundaries of Central Anatolia is encircled by the mountains. The mean annual temperature of most part of this region ranges from 8 to 12°C. The temperature is over 20°C during the summer season. In most part of the region the annual precipitation is under 400 mm; more than half of which falls during the winter and spring season. Water deficiency effectively occurs during the summer period.

According to ecological conditions the middle parts of the region are covered by true steppe. As in most of the world, the steppe vegetation which is peripherically delimited by woody vegetation of the Anatolian territory has been exploited by men, especially through grazing and intensive agricultural activities. The steppe vegetation of Central Anatolia has an interesting floristic and structural composition and it exhibits mosaic patterns due to different substrate types varying in short distances. The phytosociological peculiarities of the steppe vegetation in Central Anatolia are little known and much of the available information is based on small-scale studies. Most of the phytosociological research has focused on the forest vegetation of Turkey.

The steppe vegetation in Turkey is included in the class *Astragalo microcephali-Brometea tomentelli* Quézel (1973) which is represented in especially Central Anatolia by the order *Onobrychido armenae–Thymetalia leucostomi* Akman, Ketenoğlu & Quézel (1985). Until now, little attention has been paid to the steppes in the synecological and syntaxonomical studies carried out in Turkey. Although some synecological research have been done especially in steppe vegetation of Central Anatolia by Akman (1974), Akman & Ketenoğlu (1976), Akman *et al*., (1984, 1985, 1991, 1996), Aydoğdu *et al*., (1994, 1999), Birand (1970), Çetik (1981, 1985), Düzenli (1976), Hamzaoğlu (1999), Ketenoğlu *et al*., (1983, 1996, 2000), Kılınç (1974), Ocakverdi & Ünal (1991), Vural *et al*., (1995), Yurdakulol *et al*., (1990), this type of vegetation deserves more particular attention and needs detailed studies.

The aim of the study was to investigate the composition of flora and phytosociological structure of this particular area, and to classify the vegetation from there. As a result of the study, we describe a suballiance composed of three different associations in the west part of Central Anatolia.

Materials and Methods

In the analysis of the vegetation the traditional Braun-Blanquet approach (1964) was followed and modified scale of Barkman, Doing & Segal (1964) for the combined valuation of abundance and cover was used. Twenty six quadrats were taken. The size of the quadrats were estimated by means of "minimal area" which was 60 m^2 in all associations. The ecological data were placed at the top of each quadrat forming phytosociological tables. Association tables were made by grouping in one table all quadrats of identical or very similar floristic composition. Thus, appearance striking plant associations in the study area were differentiated by means of floristic and structural investigations. The floristic composition and structure of plant associations exhibiting a certain appearance, was established and they were identified and classified by the aid of differential, dominant and constant species. International Code of Phytosociological Nomenclature principles were followed for naming the new syntaxa (Weber *et al*., 2000). Moreover, to categorise the syntaxa correctly, relevant literatures were used (Quézel, 1973; Quézel *et al*., 1992; Akman *et al*., 1985, 1991).

Brief description of the area: The study area is located between the towns Cihanbeyli (Konya) and Çifteler (Eskişehir) in the west part of Central Anatolia (Fig. 1). The study area has a geological structure composed of calcareous brown soil. The altitudinal range of the area varies between 850 and 1150 m.

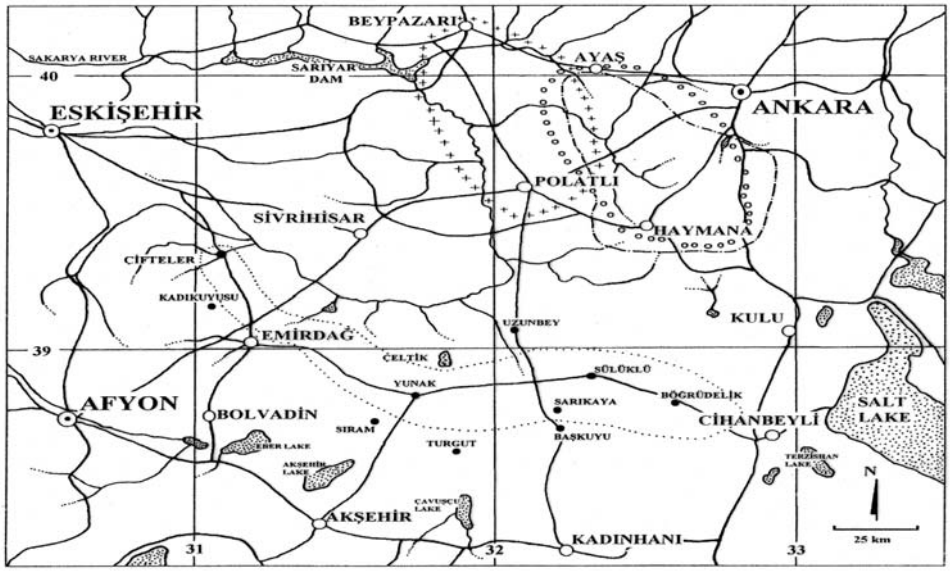

Fig. 1. Geographical map of the study area and surroundings and distribution of the relevant syntaxa.

…….: Ebeno hirsutae-Thymenion leucostomi ++++++: Convolvulo holosericei-Ajugion salicifoliae
oooooo: Salvio tchihatcheffii-Hedysarion varii — - — - —: Phlomido armeniacae-Astragalion microcephali

The climatic conditions of the region in which the steppe vegetation occurs are characterized by cold winters, often with frost, and hot summers with drought periods. The steppe vegetation develops under xeric conditions and is characterized by xerophytic species of Irano–Turanian origin. The data of the meteorological stations of Cihanbeyli and Eskişehir were used to determine the type of the climate in the region (Table 1).

Table 1. Climatic data of the Cihanbeyli and Eskişehir meteorological stations.

Station	Altitude (m)	P (mm)	M (^oC)	m (^oC)	Q	PE	S	Precipitation regime	Bioclimate
Cihanbeyli	969	308	29.6	-3.8	33.7	33	1.1	Sp-W-A-S	Arid upper very cold
Eskişehir	800	380.6	28.4	-3.5	41.7	56	1.9	W-Sp-A-S	Semi-arid lower very cold

P (mm): Mean annual precipitation, M (^oC): Mean maximum for the hottest month, m (^oC): Mean minimum for the coldest month, Q: Emberger's pluviometric quotient ($2000.P/M^2 - m^2$), PE: Summer rainfall, S: Emberger's index of xericity (S=PE / M), W: Winter, Sp: Spring, S: Summer, A: Autumn.

The meteorological station of Cihanbeyli has an arid upper very cold, and Eskişehir has a semi-arid lower very cold type of Mediterranean climate that is common in Central Anatolia (Akman, 1982). Rainfall decreases in summer, rendering the drought period more obvious, in the station of Cihanbeyli, in the western limits of the study area.

Classification of the vegetation: The study area is situated in the Irano-Turanian phytogeographical region (Zohary, 1973), with altitudes 850-1150 m, characterized by the cushion-forming chamaephytes and xerophytic species. We classified the steppe vegetation in one suballiance and three communities included in the *Convolvulo holosericei-Ajugion salicifoliae* Akman, Ketenoğlu, Quézel & Demirörs (1984) alliance. The associations described here have formed a new suballiance which has been considered in the following syntaxa:

Superclass: *Daphno-Festucetales* Quézel (1964).
Class: *Astragalo microcephali-Brometea tomentelli* Quézel (1973).
Order: *Onobrychido armenae-Thymetalia leucostomi* Akman, Ketenoğlu & Quézel (1985).
Suborder: *Onobrychido armenae-Thymenetalia leucostomi* Akman, Quézel, Barbéro, Ketenoğlu & Aydoğdu (1991).
Alliance: *Convolvulo holosericei-Ajugion salicifoliae* Akman, Ketenoğlu, Quézel & Demirörs (1984).
Suballiance: *Ebeno hirsutae - Thymenion leucostomi* Suball. Nova
(Type association: *Ebeno hirsutae – Thymetum leucostomi Ass. Nova*)

The plant cover represents a suballiance composed of three associations well-developed on the soils originating from calcareous mother rock in the study area. This suballiance extends between the towns of Cihanbeyli (Konya) and Çifteler (Eskişehir). It occupies the area with an elevation of 850-1150 m.

Due to its floristic composition, the suballiance was included in the class *Astragalo microcephali-Brometea tomentelli*, which has formed to include the peculiar communities

of spiny xerophytes, and its order *Onobrychido armenae-Thymetalia leucostomi* comprising most of the steppe formations in Central Anatolia. Also this suballiance is binded to the *Convolvulo holosericei-Ajugion salicifoliae* alliance to which according to the distribution, floristic and ecological properties it shows the most similar structure.

The characteristic species of the suballiance are: *Thymus leucostomus* Hausskn & Velen var. *leucostomus*, *Ebenus hirsuta* Jaub.& Spach, *Minuartia anatolica* (Boiss.) Woron. var. *arachnoidea* McNeill, *Astragalus vulnerariae* DC., *Cousinia iconica* Hub.-Mor., *Astragalus tmoleus* Boiss. var. *bounacanthus* (Boiss.) Chamberlain, *Alyssum niveum* Dudley, and *Achillea phrygia* Boiss. & Bal. All of them are endemic.

Three associations that can be included in this suballiance are described:

1. *Ebeno hirsutae – Thymetum leucostomi Ass. Nova*
(Holotype: Table 2, Quadrat no: 216)

It is a type association. For this reason according to most of its characters it shows similarity to the suballiance. This association occupies west, south and southwest slopes with an inclination of 5^o – 10^o and an altitude of 950 – 1050 m. It has a structure composed of herbaceous cushion and sheaf-forming xerophytes with a height of 10-40 cm. The coverage of the species is about 90-100 %. The dominant species of the association are *Festuca valesiaca* Schleicher ex Gaudin and *Thymus leucostomus* var. *leucostomus*. The association distributes between towns of Cihanbeyli and Emirdağ on the deep soil.

2. *Stipo holosericeae – Artemisietum santonici Ass. Nova*
(Holotype: Table 2, Quadrat no: 242)

This association has structure composed of chamaephytes and hemicryptophytes with a height of 20-50 cm. The coverage of the species is about 100%. This association is fairly characterized by the presence of *Artemisia santonicum* L., which is a chamaephyte within the association because of its 40-70 % cover. Other characteristic species are *Stipa holosericea* Trin., *Centaurea pichleri* Boiss. subsp. *extrarosularis* (Hayek & Siehe) Wagenitz and *Consolida stenocarpa* (Davis & Hossain) Davis. This association has a limited distribution on the east and northeast slopes or plain areas between the towns of Emirdağ and Çifteler with deep soil. It occupies an inclination of 0^o–5^o and an altitude of 850-900 m.

3. *Alysso sibirici – Convolvuletum compacti Ass. Nova*
(Holotype: Table 2, Quadrat no: 219)

This association is characterized by the presence of *Convolvulus compactus* Boiss., which is the dominant species, *Alyssum sibiricum* Willd., *Fumana procumbens* (Dun.) Gren.& Godr., *Genista involucrate* Spach, and *Haplophyllum buxbaumii* (Poiret) G.Don subsp.*buxbaumii* and occurs on west, southwest and northwest slopes with an inclination of 15^o–20^o and an altitude of 1000-1150 m. This association is widespread on the eroded calcareous soils especially extended between the towns of Cihanbeyli and Emirdağ. It has a structure especially composed of herbaceous xerophytes with a height of 5-25 cm. The coverage of the species is about 70-80 %.

Table 2. Associations within the suballiance *Ebeno hirsutae – Thymenion leucostomi* suball.nova.

Quadrate no	207	208	211	212	216	217	218	221	222	226	239	240	241	242	243	244	245	246	219	220	223	224	225	227	228	229	
Square (m^2)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
Altitude (x 10 m)	95	100	105	100	105	105	105	95	100	100	85	90	85	85	85	90	90	90	100	115	100	110	110	115	100	100	
Inclination (°)	10	10	10	10	10	5	5	5	10	10	0	0	5	0	0	5	5	5	15	20	20	15	15	20	20	20	
Exposition	S	SW	S	SW	SE	SE	W	W	SE	SW	-	-	NE	-	-	NE	E	NE	SW	W	SW	NW	NW	SW	NW	W	
Coverage (%)	90	90	90	90	90	100	90	100	90	90	100	100	100	100	100	100	100	100	80	80	70	80	70	80	70	80	
Mother rock (C: Calcareous)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Presence
Characteristic and differential species of the associations	*Ebeno hirsutae – Thymetum leucostomi*										*Stipo holosericeae – Artemisietum santonici*								*Alysso sibirici – Convolvuletum compacti*								
Artemisia santonicum	.	.	.	.	.	.	.	.	.	.	3	3	2b	2b	3	3	3	4	.	.	.	.	.	.	.	.	8
Centaurea pichleri ssp. *extrarosularis*	.	.	+	.	.	.	.	.	.	+	.	+	.	+	+	.	+	+	.	.	.	.	.	.	.	.	7
Consolida stenocarpa	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	.	.	+	.	.	.	.	.	.	.	.	5
Convolvulus compactus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	2a	3	2a	2b	3	3	8
Alyssum sibiricum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	+	1	1	+	+	8
Fumana procumbens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2a	+	2a	.	+	2a	.	+	6
Genista involucrata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	+	.	+	+	+	6
Haplophyllum buxbaumii ssp. *buxbaumii*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	+	.	.	4
Characteristic species of the suballiance *Ebeno hirsutae – Thymenion leucostomi*																											
Ebenus hirsuta	+	.	+	+	+	.	+	+	.	+	+	.	.	+	+	1	.	+	+	+	.	.	+	+	+	.	17
Minuartia anatolica var. *arachnoidea*	.	.	+	+	+	1	.	1	+	1	.	+	+	1	.	1	+	.	+	.	.	+	.	.	+	.	15
Astragalus vulnerariae	+	.	.	1	+	+	.	+	.	+	.	.	.	+	+	.	1	.	2a	.	+	.	+	1	.	+	14
Cousinia iconica	+	+	.	.	+	.	+	.	+	.	.	+	+	.	.	+	+	.	+	.	.	+	.	.	+	+	13
Astragalus tmoleus var. *bounacanthus*	.	+	.	.	+	+	.	.	.	.	+	.	.	+	.	.	+	+	+	.	.	+	1	.	.	.	10
Alyssum niveum	.	.	1	.	.	.	+	.	+	+	+	.	.	+	.	.	.	.	.	+	+	.	.	.	+	+	10
Achillea phyrgia	.	+	.	.	.	.	+	+	.	.	+	.	.	+	.	.	.	.	+	+	.	.	.	+	.	+	9
Characteristic species of the alliance *Convolvulo holosericei – Ajugion salicifoliae*																											
Convolvulus holosericeus ssp. *holosericeus*	+	.	+	.	+	.	+	+	+	.	+	.	.	+	+	+	.	+	+	+	.	+	+	+	+	+	18
Euphorbia macroclada	+	+	.	.	+	.	1	+	+	1	+	+	.	.	+	.	+	+	.	.	+	.	+	.	+	.	15
Ajuga salicifolia	.	.	+	+	+	+	.	.	.	.	.	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	8
Characteristic species of the order *Onobrychido armenae – Thymetalia leucostomi* and its type suborder (*)																											
Thymus leucostomus var. *leucostomus*	+	**1**	**4**	**4**	**2b**	+	**2a**	**3**	**2b**	**2b**	**2a**	**2a**	**3**	**3**	**2b**	**3**	**2b**	**1**	**3**	**3**	**1**	**2b**	**2a**	**3**	**3**	**2a**	26
Onobrychis armena	+	+	+	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	.	+	.	.	+	+	22
**Astragalus lydius*	.	+	.	1	1	.	+	+	+	+	+	.	+	.	+	+	+	+	.	+	+	+	+	.	+	+	19
Alyssum pateri ssp. *pateri*	+	.	.	.	+	.	+	.	+	.	+	.	1	+	+	+	+	+	+	+	.	+	+	.	+	+	17

Table 2 (Cont'd.)

Centaurea virgata	+	+	+	+	+	+	+	+	+	+	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	15
Minuartia hamata	+	+	.	.	.	.	+	.	+	+	.	+	.	.	.	+	.	.	+	.	+	+	+	+	.	.	12
Scabiosa argentea	+	+	+	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	+	.	11
Dianthus anatolicus	.	.	.	+	.	+	.	.	+	.	.	+	.	.	+	.	.	.	+	.	+	+	+	+	.	+	11
Marrubium parviflorum	+	.	.	+	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	+	9
**Hedysarum varium*	+	.	.	.	+	.	.	.	.	.	+	.	.	+	.	.	.	+	+	.	.	.	+	+	.	.	8
**Lappula barbata*	.	.	.	.	+	.	.	+	.	.	.	.	+	.	+	+	.	+	.	.	.	.	.	.	.	.	6
Polygala pruinosa ssp. *pruinosa*	+	.	.	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Helianthemum nummularium ssp. *nummularium*	.	.	.	.	+	.	.	.	+	.	.	+	.	.	.	.	.	.	.	+	.	.	+	.	.	.	5
Allium scorodoprasum ssp. *rotundum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	+	.	+	5
Globularia orientalis	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	4
**Noaea mucronata* ssp. *mucronata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	4
Moltkia coerulea	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	3
**Salvia cryptantha*	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Characteristic species of the class ***Astragalo microcephali – Brometea tomentelli***																											
Festuca valesiaca	3	1	2a	3	4	4	2b	3	3	3	3	3	2a	2b	2a	3	3	2a	+	2a	1	2b	2b	1	2a	2b	26
Bromus tomentellus	2a	1	1	+	+	2a	2a	+	2a	+	+	+	+	+	+	+	+	+	+	2a	1	1	1	1	1	2a	26
Koeleria cristata	+	+	.	+	+	.	+	+	+	+	.	.	+	+	.	.	+	+	+	+	2a	+	.	+	.	+	18
Centaurea urvillei ssp. *stepposa*	+	.	.	+	.	+	+	+	+	+	.	.	.	+	+	+	.	+	.	+	+	+	+	+	+	+	18
Eryngium campestre	.	.	+	+	1	+	.	.	+	+	.	+	+	.	+	+	+	+	+	+	+	.	+	.	+	+	18
Teucrium polium	.	+	.	+	.	+	+	.	+	+	+	.	+	+	.	+	.	+	+	.	+	+	.	+	.	+	16
Asyneuma limonifolium ssp. *limonifolium*	+	+	+	+	.	+	+	.	+	+	.	.	.	.	.	.	.	.	+	+	+	+	.	+	.	+	14
Cruciata taurica	.	+	.	+	.	+	.	.	+	+	.	+	.	+	.	.	.	+	.	.	+	+	+	+	+	.	13
Phlomis armeniaca	.	.	.	.	+	.	.	+	+	.	+	.	.	+	+	+	.	+	.	+	+	+	.	+	.	+	13
Stipa holosericea	.	1	.	.	.	+	.	.	+	.	**2a**	**1**	**1**	**+**	**1**	**1**	**1**	**+**	.	.	.	.	.	.	.	.	11
Dianthus zonatus var. *zonatus*	.	.	+	+	.	.	.	+	+	+	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	11
Anthemis cretica ssp. *anatolica*	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	+	.	+	.	+	.	+	+	+	.	+	10
Paronychia kurdica	.	.	.	.	.	.	.	.	.	.	1	1	1	+	.	+	+	+	.	.	.	.	.	.	.	.	8
Bromus tectorum	.	+	+	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Centaurea triumfetti	.	.	+	.	.	.	+	.	+	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	6
Thymelea passerina	+	+	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Leontodon asperrimus	+	.	.	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Veronica multifida	.	.	.	.	+	+	.	+	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	5
Silene spergulifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	5
Scabiosa rotate	.	+	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Galium incanum ssp. *elatius*	.	.	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Scutellaria orientalis ssp. *pinnatifida*	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3

Table 2 (Cont'd.)

Linum hirsutum ssp. *anatolicum*	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	3
Astragalus microcephalus	+	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Apera intermedia	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Hypericum origanifolium	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	2
Ajuga chamaepitys ssp. *chia* var. *chia*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	2
Iberis taurica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1
Companions																											
Asperula stricta ssp. *latibracteata*	+	+	+	+	+	.	+	+	+	+	.	.	.	+	+	+	.	.	+	.	+	+	+	+	.	+	18
Stipa lessingiana	+	+	+	+	2a	.	+	+	+	.	.	+	.	+	.	.	+	.	+	+	.	+	+	+	.	+	17
Sideritis montana ssp. *montana*	+	+	+	+	+	.	+	.	+	+	.	.	.	.	+	+	.	+	+	+	+	.	+	.	+	+	17
Bromus japonicus var. *japonicus*	+	+	.	+	+	.	+	.	+	+	.	.	+	+	+	.	+	.	.	+	.	+	.	+	+	+	16
Crepis foetida ssp. *rhoeadifolia*	+	+	.	+	+	.	+	+	.	+	+	.	+	.	+	.	+	.	+	.	+	+	.	+	.	+	16
Ziziphora tenuior	+	.	+	.	+	+	+	.	+	.	.	.	+	.	+	.	+	+	.	+	+	+	+	+	+	.	16
Erysimum crassipes	+	.	+	+	.	+	+	+	+	.	+	.	+	.	.	.	+	.	+	+	+	.	+	.	+	.	15
Allium pseudoflavum	+	.	+	.	.	+	.	+	.	.	+	.	+	+	.	+	.	+	+	.	+	.	+	+	+	+	15
Poa bulbosa	+	+	+	+	.	.	+	+	+	+	+	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	13
Acantholimon acerosum var. *acerosum*	+	1	.	1	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	10
Bupleurum sulphureum	+	+	.	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8
Astragalus micropterus	+	.	+	+	+	.	3	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Taeniatherum caput-medusae ssp. *crinitum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	+	.	6
Briza humilis	+	+	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
Anthemis wiedemanniana	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Eremopyrum triticeum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	+	.	.	.	.	.	.	.	.	4
Helichrysum arenarium ssp. *aucheri*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	4
Xeranthemum annuum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	4
Sanguisorba minor var. *muricata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	+	.	4
Aegilops triuncialis	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Alyssum linifolium var. *linifolium*	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Koelpinia linearis	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Onosma armena	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Allium scabriflorum	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Logfia arvensis	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Convolvulus lineatus	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3

Table 2 (Cont'd.)

Scariola orientalis	.	.	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Linaria corifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	3
Valerianella coronata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	3
Phleum exaratum ssp. *exaratum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	3
Ziziphora taurica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.	.	3
Centaurea patula	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Carlina oligocephala ssp. *oligocephala*	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Androsace maxima	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Hedysarum cappadocicum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2
Reseda lutea var. *lutea*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	2
Cirsium arvense	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	2
Melica ciliata var. *ciliata*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	2
Chardinia orientalis	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	2
Erodium absinthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	2
Eryngium bithynicum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	2
Alyssum hirsutum var. *hirsutum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	2
Malcolmia africana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	2
Alyssum desertorum var. *desertorum*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Picris strigosa ssp. *strigosa*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Minuartia sclerantha	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Polygonum arenastrum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Trigonella monantha ssp. *monantha*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Dactylis glomerata ssp. *hispanica*	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Trigonella fischeriana	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Boreava orientalis	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Pegamum harmala	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Artemisia scoparia	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Ziziphora capitata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1
Turgenia latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Anchusa leptophylla ssp. *leptophylla*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Senecio vernalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Echium italicum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Chondrilla juncea var. *arantholepis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1

Conclusion

The study area which is located within the west part of Central Anatolia is confined to the Irano-Turanian floristic province from the phytogeographical point of view. The soil type is derived from calcareous material. The arid upper and semi-arid lower very cold types of Mediterranean climate are effective in the area occupied by steppe vegetation adapted to xeric conditions in Central Anatolia. The associations described here have been considered within the syntaxa in the light of the latest works.

The class, *Astragalo microcephali-Brometea tomentelli* is composed of communities of cushion-forming spiny xerophytes and chamaephytes. In Central Anatolia, this class is represented by the order *Onobrychido armenae-Thymetalia leucostomi* comprising the steppic groups. The associations described here have been considered in the suballiance *Ebeno hirsutae-Thymenion leucostomi* suball. nova attached to the alliance *Convolvulo holosericei-Ajugion salicifoliae.*

Direction, slope and soil erosion are effective on distribution of associations. Type association of suballiance, *Ebeno hirsutae-Thymetum leucostomi*, and association *Stipo holosecicea-Artemisietum santonici* are spreading over deep soils. Direction and slope are effective on the seperation of these two associations. In the distribution of *Alysso sibirici-Convolvuletum compacti* association soil, slope and according to them erosion is effective.

Ebeno hirsutae-Thymenion leucostomi was compared to *Convolvulo holosericei-Ajugion salicifoliae*, *Salvio tchihatcheffii-Hedysarion varii* and *Phlomido armeniacae-Astragalion microcephali*, which were described by Akman *et al*., (1984) from Ankara with regard to their floristic similarities (Sorensen, 1948). It is found that there is a 36-42% similarity between *Ebeno hirsutae-Thymenion leucostomi* suballiance and this three alliance. These three alliance distributed on quite close geography and fit into one another. (Fig. 1). For this reason the floristic similarity ratio between syntaxons is approximately 45-55%.

Instead of floristic similarity presence of characteristic species and their dominance and ecological factors like soil and slope are effective in seperation of these three alliances. Because floristic diversity is usually stable in Central Anatolian steppes. In this geography, little changes in altitude, slope, direction and soil causes several species to become dominant in floristic structure. For this reason floristic similarity is not enough for the determination of syntaxonomy of Central Anatolian steppes. As well as floristic similarity especially soil and geographical situation are also taken into consideration. According to this, the flora density of characteristic species, ecology slope, altitude, soil and distribution geographical closeness suballiance *Ebeno hirsutae-Thymenion leucostomi* can be bond to the *Convolvulo holosericei-Ajugion salicifoliae* alliance. This alliance defined on calcereous soils at 650-1150 meters around Beypazarı, Ayaş and Polatlı.

Between suballiance *Ebeno hirsutae-Thymenion leucostomi* and *Convolvulo holosericei-Ajugion salicifoliae* alliance to which it is bond there is a closeness with regard to phisiognomy. In such a way that characteristic species of these two syntaxons coverege is weak. For this reason they don't have important role in physiognomy. At the regions where these syntaxons are present it is observed that at most some characteristic species of *Astragalo microcephali-Brometea tomentelli* classis, *Festuca valesiaca* and *Bromus tomentellus*, some characteristic species of order *Onobrychido armenae-Thymetalia leucostomi*, *Thymus leucostomus* var. *leucostomus* were dominated on

physiognomy. However in *Salvia tchihatcheffii-Hedysarion varii* and *Phlomido armeniacae-Astragalion microcephali* aliances their characteristic species as *Salvia tchihatcheffii*, *Hedysarum varium*, *Linum hirsutum* ssp. *anatolicum* and *Astragalus microcephalus* are dominant and have an important part in physiognomy.

Between *Alysso lycaonici-Cousinietum iconicae* association and *Ebeno hirsutae-Thymenion leucostomi* subalIiance distributed between Karaman and Ermenek, there is a similar relationship as above (Akman *et al*., 1996). When these two syntaxons are compared with respect to common table and with respect to associations there is a similarity ratio of 34.9 and 38.6% respectively. Also the characteristic species *Cousinia iconica* and *Ebenus hirsuta* are common in these syntaxons. The most important difference between these two syntaxons that show similarity in altitude, soil and partially direction and slope, is the species dominated on physiognomy and upper units that they are bond.

Alysso lycaonici-Cousinietum iconicae association was binded to the *Phlomido armeniacae-Astragalion microcephali* alliance. Because, in the distribution area of this association *Phlomis armeniaca* and *Astragalus microcephalus* have an important place in physiognomy. However at the same time, characteristic species of *Convolvulo holosericei-Ajugion salicifolia* alliance which are *Convolvulus holosericeus* subsp. *holosericeus* and *Euphorbia macroclada* are also present in the floristic structure of the association. *Alysso lycaonici-Cousinietum iconicae* association is bond to the *Phlomido armeniacae-Astragalion microcephali* alliance because the characteristic species of this alliance are more dominant.

Floristic and also ecological similarities show that there is a relationship between *Ebeno hirsutae-Thymenion leucostomi* subalIiance and *Alysso lycaonici-Cousinietum iconicae* association. It is too early to make a decision for the syntaxonomic situation and synchorology of these units. For this arrangement at least the steppes between Cihanbeyli and Konya Plateau must be studied in detail. After this study the synchorology of *Ebeno hirsutae-Thymenion leucostomi* subalIiance and to which alliance the *Alysso lycaonici-Cousinietum iconicae* association is bond would become clear.

Localities

207-208: Konya, between Cihanbeyli and Yunak towns, Insuyu village, Yılanlı plateau, 950-1000 m, 22.VI.2000; 211-212: Konya, Cihanbeyli, between Böğrüdelik and Sülüklü villages, 1000-1050 m, 22.VI.2000; 216: Konya, Cihanbeyli, between Sülüklü and Sarıkaya villages, 1050 m, 22.VI.2000; 217: Konya, Cihanbeyli, between Sarıkaya and Başkuyu villages, 1050 m, 22.VI.2000; 218: Konya, Cihanbeyli, between Sarıkaya and Turgut villages, 1050 m, 22.VI.2000; 219: Konya, Cihanbeyli, between Yunak and Çeltik villages, 1000 m, 23.VI.2000; 220: Konya, Cihanbeyli, around Yunak village, 1150 m, 23.VI.2000; 221: Konya, Cihanbeyli, between Turgut and Yunak villages, 950 m, 23.VI.2000; 222: Konya, Cihanbeyli, between Yunak and Sıram villages, 1000 m, 23.VI.2000; 223: Afyon, around Emirdağ town, 1000 m, 23.VI.2000; 224-225: Afyon, between Emirdağ and Yunak towns, 1100 m, 23.VI.2000; 226: Konya, Cihanbeyli, between Sülüklü and Uzunbey villages, 1000 m, 24.VI.2000; 227: Konya, Cihanbeyli, around Sıram village, 1150 m, 24.VI.2000; 228-229: Konya, Cihanbeyli, around Başkuyu village, 1000 m, 24.VI.2000; 239-240: Afyon, between Emirdağ and Kadıkuyusu towns, 850-900 m, 25.VI.2000; 241-242: Eskişehir, around Kadıkuyusu town, 850 m, 25.VI.2000; 243-244: Eskişehir, between Kadıkuyusu and Çifteler towns, 850-900 m, 25.VI.2000; 245-246: Eskişehir, around Çifteler town, 900 m, 25.VI.2000.

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(Received for publication 20 January 2003)