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The Vegetation of Beynam Forest

by

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The Vegetation of Beynam Forest

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SUMMARY

The Beynam Forest is under the influence of a semi-Continental climate and large portion is overed with loam brown forest soil formed on serpentine motherrock. According to Braun-Blanquet floristic method the vegetation types of Beynam Forest may be considered in three main groups: a) Forest vegetation: *Pinus nigra* subsp. *pallasiana* and *Quercus pubescens*, b) River vegetation: *Salix alba*, c) Step vegetation: *Astragalus microcephalus*, *Silene ruscifolia*.

INTRODUCTION

Beynam Forest (Kuyrukçu Mauntain) is a very interesting area in two respects: firstly, it a relic pine forest; secondly, the neighborhood accommodates three distinct types of vegetation such as forest, river and steppe.

There is no ecological research conducted in the region. However, B. Kasapgil (1961) has some study on the flora of the Mauntain.

In this study, the climate, plant community and the soil of Beynam forest are determined. Furthermore, the fact that a great part of the Mauntain is covered with serpentine motherrock adds to the characteristics of the study.

I. THE GEOGRAPHIC SITUATION OF THE REGION STUDIED

The Beynam forest, situated within the boundaries of Ankara, on the 40 th. km. of the Ankara Bâlâ highway, at the south of the village of Beynam, is a relic which covers the Kuyrukçu

mountain and consists of *Pinus nigra Arnold. subsp. pallasiana (Lamb.) Holmboe* and *Quercus pubescens willd.*

1601 hektar of the mountain's area is fenced in and has belonged to the Government since 1954. It was set a side as a conservation forest on 1.7.1966 by law No. 4785 and has been maintained as preserve during the years following.

The principal altitudes around the Kuyrukçu mountain are Sada hills (1403 m.) Çatalkaya and Karakaya hills (1484 m.), yağmur yağan hills (1517 m.) and Otlubel (1521 m.) Fig. 1.

The mountain although relatively small, is quite rich in springs, surrounded almost completely by them. For this reason, small rivers have formed in the narrow valleys of the various parts of this mountain; and a special vegetation has olso been formed. It is possible to find three types of vegetation within a small area namely, steppe, forest and river.

Two different roads have been constracted to Beynam Forest one of them passing near the Beynam village and the other in the vicinity of Çammezarı Fountain. Apart from these, there is another old road which unites with the road of Çammezarı. These roads traverse the whole of the forest and the Holos and Karaali villages.

The main villages surrounding the Kuyrukçu mountain are Holos, Karaali at the south and Beynam at the north.

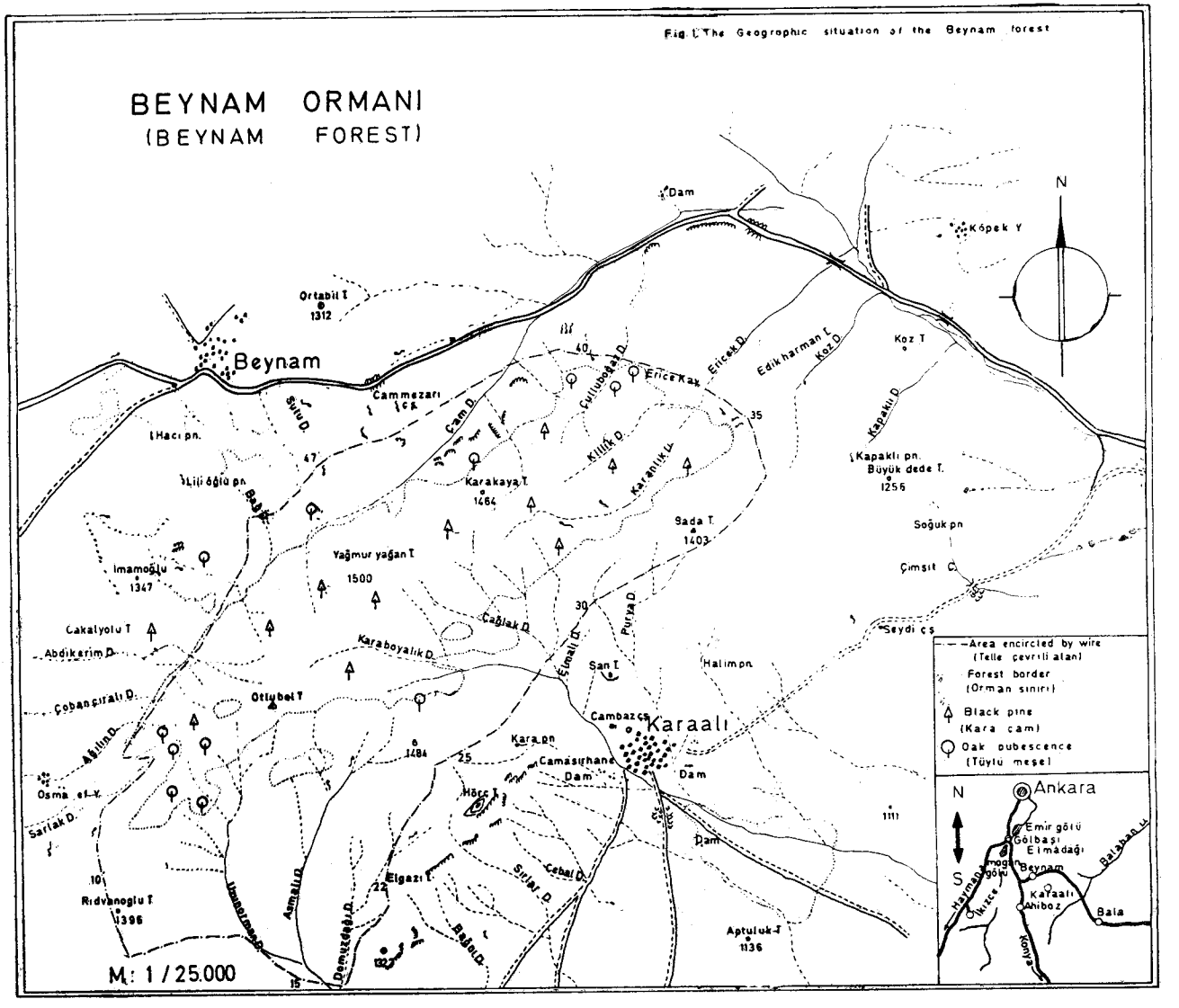
II. THE GEOLOGICAL SITUATION OF THE REGION

The geological unites present in the region can be considered as large series, sedimentary and magmatic (fig. 2.).

A. *Sedimentary series*

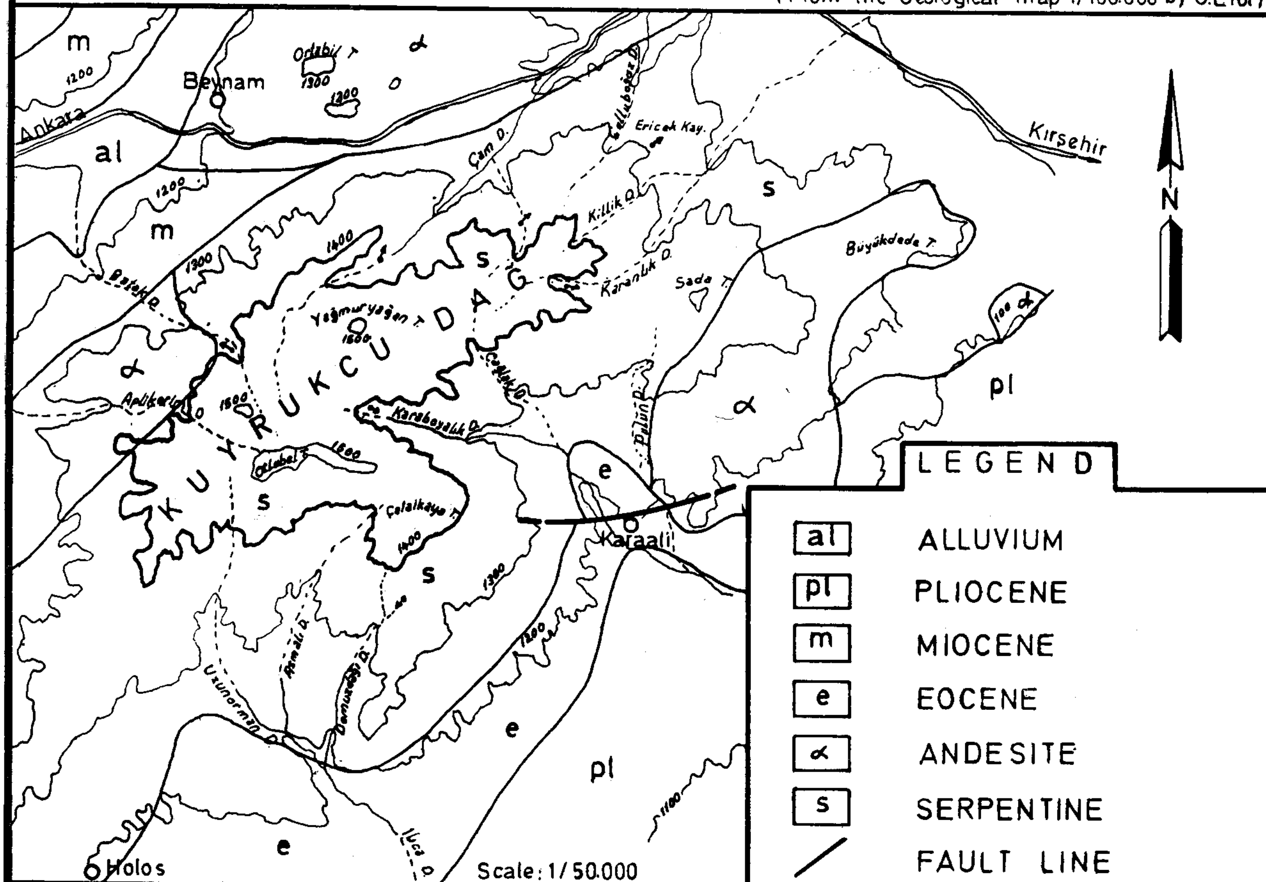
Eocene: This constitutes the oldest formation. It crops out at the south of the Kuyrukçu mountain. The limestones around the region of Karaali which are the parts of the eocene are usully yellow and contain plenty of fossils, including Nummilites and Assilina. These limestones are found on the nummulitic flysch and located on the serpentine between Karaali and Holos.

Fig. 1 The Geographic situation of the Beynam forest



Geological map of the area

(From the Geological map 1/100.000 by O.Erol)



Miocene: The miocene seen at the west and south of Beynam is represented in two different facies. These two facies can not be distinguished clearly. It is composed of lake sediments within lignitous marl and calcareous layers containing volcanic material and limestone and marl facies without a volcanic component. Layers without volcanic material contain gypsum in some areas.

Pliocene: There is a pliocene lake facies covering a large area at the south and south-east of Karaali, made of pink silt sand gravel layers. It shows crossed layers. Toward the top layers, red silt and sand predominate.

Quaternary: It is made of valley alluvium covering a minor area seen in the river beds.

B. *Magmatic series*

I. *Intrusives*: The Kuyrukçu Mountain constituting the main research area, is composed of ultrabasic rocks. These are commonly lavas of serpentine, peridotide and spilite. Also seen are harzburgite, pyroxenite and pillow structures.Among these intrusive masses, massive limestone blocks, plaquet limestones containing radiolaria and radiolarites covering a large area are found. The age of the intrusion is probably the upper jura.

II. *Volcanics*: The age of the volcanism in this region is accepted as oligo-miocene. The volcanic activity continued until pliocene. It is made of andesite, dasite, tuffite and tuff. Generally, miocene is at the mid-layer together with lake sediments. The light-coloured volcanic breccias comprise masses that are thrust into serpentine.

Geomorphology

O. Erol has differentiated two series of peaks running from southwest to northeast in Elma Mountain (apple mountain). There are tectonic collapses and a depression caused by erosion in between them, Kuyrukçu mountain is the peak at the extreme soutwestern and of the second southern most and lower series. The main mass of Kuyrukçu mountain, 2–3 km. wide and 6–7 km.

long, is idome shaped in general appearance, as determined by the serpentine. This mass corresponds to the outline and outlevs of an anticline whose surfaces have worn a way. In the upper parts of the mountain, at a height of 1500 m., there are the remains of an erosion surface. This level may be the very damaged remains of the high (spilite considerably deeply by running water). described by O. Erol at Apple mountain.

III. CLIMATE AND BIOLOGICAL ASPECT

The region under investigation is situated at the North of Central Anatolia in Turkey and is under the influence of semi-continental elimate.

Continentality depends both on precipitation and temperature; therefore it is possible to consider precipitation and temperature continentality separately.

Precipitation continentality is the ratio of the precipitation amount in the warmest six months. The higher the ratio, the more continental the elimate. Value of "C" is between 0,50–0,60 for the region studied. The value of precipation continentalty, shows that winter precipittion exceeds summer precipitation so that the value of 1,5, which typifies continentality, can not be reached.

The value of the temperature continentality (K') in the region studied, varies between 25–30 %

The total continentality is the study of both precipitation and temperature (K') 25 and C> 25 and C> 1). Climate is semi-continental of one of these conditions is found to hold and continental if both them hold.

Since the temperature continentality value alone is positive, the region must be described as semi-continental.

According to Emberger's climate classification, the region is of the type having a semi-arid very cold mediterranean climate of daily and seasonal photoperiodism. The aridity index (S = PE/ME) is much less than 7; S = 0,6

This indicates that summer precipitation little in this region;

vegetation is under the effect of the summer drought and the precipitation regime is mediterraneen.

It can be said that the summer temperature and the coldness of winter are the main factors characterizing the climate; The presence of such species as *Pinus nigra subsp, pallasiana, Quercus pubescens, Astragalus* and *Acantholimon* confirms this. Precipitation occurs at cold or relatively cold season; therefore the plants cannot profit a great deal from it.

1. *Temperatures*:

At balâ, the mean annual temperature, according to the three yeras of abservations of D. Ü. Ç. is 12,5 °C. The mean annual temperatures are shown on table I.

The minimal mean temperature of the coldest month (January) is m = -3,3 °C; that is to say winter is quite cold and is drought with long lasting periods of frost.

The mean maximum temperature of the wormest month (August) is M = 31,7 °C.

The difference between the mean maximum (M) of the warmest month and the mean minimum of the coldest (m), that is the continentality is M-m = 28 °C.

The maximum and minimum mean temperature values are shown is Tables II and III.

The warmest month is August (with a mean of 25,7 °C in 1962), but the temperature has exceeded 35 °C on some days. The highest temperature recorded is 38 °C on July. 18. 1962.

2. *Precipitation*:

The annual precipitation has as strong an influence on vegetation as that of temperature. The occurence of a dry season as a resulting from uneven seasonal or monthly distribution of the annual precipitation is particularly important.

The average of the mean annual precipitation for the 10-year period 1960–1969, is 416 4 mm., distributed over the months as follows:

TABLE I

Monthly and annual mean temperature (Bâlâ D. Ü. Ç.)

Years	Montly means (C.)												Ann.
	01x	02	03	04	05	06	07	08	09	10	11	12	
1961	– 1.2	0.6	4.3	14.0	17.2	20.0	22.3	22.8	14.4	13.7	8.4	3.0	11.6
1962	1.0	1.4	8.0	10.8	16.9	21.1	24.9	25.7	18.5	15.0	12.6	4.6	13.4
1963	1.7	4.6	3.7	11.5	14.8	19.8	23.1	25.1	19.2	14.2	9.1	2.6	12.5

TABLE II

Monthly and annual mean maximum temperature (Bâlâ. D, Ü. Ç.)

Years	Monthy means (C.)												Ann.
	01	02	03	04	05	06	07	08	09	10	11	12	
1961	1.2	2.7	9.7	19.0	22.8	25.6	28.3	28.4	19.9	15.6	13.8	6.3	16.1
1962	4.1	5.2	13.5	16.3	22.0	26.7	30.2	31.2	26.2	19.5	17.1	7.9	18.3
1963	5.4	8.6	9.7	16.9	20.5	26.3	29.6	31.7	25.7	20.0	14.5	6.6	18.0

TABLE III

Monthly and annual mean minimum temperature (Bâlâ. D. Ü. Ç.)

Years	Monthly means (C.)												Ann.
	01	02	03	04	05	06	07	08	09	10	11	12	
1961	—3.3	—1.4	—0.4	8.4	15.0	14.0	15.7	15.3	8.7	9.1	4.0	0.4	7.1
1962	—2.0	—1.8	2.9	5.2	10.8	13.6	16.9	17.6	12.6	9.1	7.5	1.8	7.8
1963	—1.1	1.2	—1.2	5.8	9.5	11.9	14.7	15.2	12.1	9.1	3.5	—1.1	6.6

* 01, 02 ..... 12: January, February .... December.

TABLE IV

Extreme maximum wind, speed and direction (in m/sec.) (Bâlâ D. Ü. Ç.)

Years	Monthyl means												Ann.
	01	02	03	04	05	06	07	08	09	10	11	12	
1961	S^2	S^6	SE^7	SE^3	NE^3	SE^2	NE^2	NE^2	NE^2	NE^2	SW^4	NE^3	7 SE
1962	N^3	SW^9	SW^9	SW^8	SW^2	SW^2	SW^3	SW^2	N^3	N^2	SW^3	SW^8	9 SW
1963	SW^6	E^8	SW^6	SW^5	NE^3	SW^5	N^4	E^2	NE^2	NE^2	N^2	SW^3	8 E

TABLE V

Monthly and annual mean relative humidity (Bâlâ D. Ü. Ç.)

Years	Monthly means												Ann.
	01	02	03	04	05	06	07	08	09	10	11	12	
1961	76	76	76	76	75	75	62	68	70	73	75	89	74
1962	87	83	64	62	62	51	51	56	69	82	78	78	68
1963	73	75	56	65	65	58	42	35	49	64	67	77	59

January	: 48,3 mm.	July	: 10,6 mm.
February	: 48,7 mm.	August	: 5,8 mm.
March	: 43,7 mm.	September	: 17,6 mm.
April	: 43,6 mm.	October	: 14,0 mm.
May	: 57,3 mm.	November	: 30,6 mm.
June	: 41,7 mm.	December	: 54,6 mm.

The mean annual precipitation varies from year to year. For example, it was 350,6 mm. for 1960 and 442,2 mm, in 1961.

Winter is the most rainy season, followed by spring. Summer is the driest season, with autumn coming after it. The precipitation regime is of the W. S. A. S. type (in order of diminishing precipitation values):

M_1– first maximum	:	winter	151,6 mm. (W)
M_2– second "	:	spring	144,6 mm. (S)
m_2– second minimum	:	Autumn	62,2 mm. (A)
m_1– first "	:	summer	:58,2 mm. (S)

According to this, summer rain is occasionnally observed in the region; this is because of the heavy precipitation which occurs at the beginning of June. These spring and early summer rains occur within a very short period and cause a great deal of water erosion in the vegetation-poor central Anatolian plateau. The greater part of the winter precipitation falls as snow. On central Anatolia precipitation is the factor dominating all others.

The dry season is of rather long duration; this period begins in June continues until October or even November; that is 5–6 months. This is why the dominating vegetation of the Beynam (aside from the river vegeatation) is of xerophytic constitution. Although the annual precipitation is 400 mm., it is of no use to the vegatation, as the great part of it falls in cold seasons, the mean daily temperature for rainfall to be of use being at 7°C.

3. *Winds*:

The wind factor does not have an important effect on the vegetation of the region. The dominant wind directions are SE, SW and E (Table IV).

4. *Other Factors*:

a. The mean annual cloudness is around 50

b. The mean annual number of sunny days is 54

c. The mean annual number of overcost days is 47

d. The mean annual relative humidity is 67, this figure falls to 35 % during the summer months.

e. The mean duration of daylight is rather long, the sky is clear for a great part of the year and fog is rarely observed.

IV. EDAPHIC CHARACTER

7 profiles of 10 soil samples have been made in order to describe the soils of the region and to investigate their relationship with the vegetation. The analysis of the samples was performed in the Botany laboratory of the Science Faculty.

As a great part of Kuyrukçu Mountain is composed of serpentine motherrock and the soil does not show much diversity. Two types of soil may be specified according to the field observations and analytical data:

1. Brown forest soil covering the serpentine motherrock.
2. Brown calcareous erosion soils.

1. *Brown forest soil covering serpentine motherrock*

a. *Distribution and main properties*

A great part of the mountain is composed of brown forest soil on serpentine motherrock. This type of soil changes to erosion soils in places where the vegetation has been destroyed. This soil contains a small amount of $CaCO_3$ and has strongly alkaline characteristics: pH = 8–9. Its texture is clearly that of loam or sandy loam. It has a moderate amount of organic matter, 3–5 %. Its colour is brown or grayish borwn. Its profile type is A (B) C, or ABC. It contains a 3–4 cm. thick A_{oo} layer and a humus layer of the same thickness.

b. *An examination of profile types* 4–5

Quadrat No: 3

Region : Ankara, Beynam forest

Altitude : 1280 m.

Exposition : West

Motherrock : Serpentine

Precipitation : 400 mm.

Slope : 20 %

Vegetation : Top layer - *Pinus nigra subsp. pallasiana* Botton layer -*Quercus pubescens*, *Amelanchier* rotundifolia subsp. integrifolia.

Description of the profile

1. 5 – 9 cm. This horizon consists of an A_{oo} layer with thickness of 3–4 cm. of pine needles a 4 cm. thick humus layer is situated under this; dark-brown, 7.5 YR 3/2. Its texture is sandy loam. Its HCL reaction is negligible. It is alkaline, pH = 8,1. Its $CaCO_3$ contain is negligible, 0,59 %. Saturation is 145 %. Humus type is Mull forest.

4 – 5 (*quadrats*, 3) *profile analysis table*

Physical analysis	horizon I	horizon II
Texture %		
Clay 0,002 mm.	15.04	18.02
Silt 0,002–0,05 mm.	9.22	32.00
Sand 0,05 mm.	75.64	49.88
Organic matter %	10.9	4.6
Permeability cm/h cm.	2.70	0.57
Saturation %	145	66
Chemical analysis		
Organic carbon	6.4	2.7
Total nitrogen	0.10	0.19
C/N	59.1	14.1
$CaCO_3$	0.36	—
Ca^{++}	0.46	—
Mg^{++}	7.50	6.91
Na^{+}	0.34	0.20
S (exchangeable metal cations m.e/100 gr)	7.0	24.0
T (cation exchange capacity m.e/100 gr)	13.7	31.0
V % $\frac{S}{T}$ — 100	51.1	77.4
pH	8.1	8.9

II. 9–30 cm. Brown, 10 YR 5/3. Texture, sandy loam; structure, morphologically variable or granular. No reaction with 1/2 HCl. The soil is alkaline, pH = 8.9 Has a moderate amount of organic matter, 4,6 %. Contains thick plant roots.

2. *Brown calcereous erosion soils*

a. *Distribution and main proporties*

The soils are found as small islands in Beynam Forest that is, they are not widely distributed. They usually have a single horizon, of profile type AC. They contain little organic matter. The $CaCO_3$ amount is rather high, sometimes as much as 30 %, but the amount of active limestone is low. They are strongly alkaline, pH = 9–9,8. These soils may have a depth of 1 m. in some areas. Their colour is brown or grayish brown.

b. *The description of profile type* 6

Quadrat No: 2

Region : Ankara, Beynam ormanı

Altitude : 1220 m.

Exposition : East

Motherroock : Limestone

Precipitation : 400 mm.

Slope : 5 %

Vegetation : Top layer - *Quercus pubescens*

Bottom layer = *Helianthemum canum*

Description of the profile

I. 0–30 cm. Grayish brown 2,5 Y 5/2. This horizon is in contact with motherrock. Texture, sandy loam. Structure, polyhedric. $CaCO_3$ amount very high, 30,4 %. 1/2 HCl reaction very strong. Soil is allkaline, pH = 9,1.

Description of some analysis of Beynam Forest soils

1. *Texture*: The textural investigation of the soils analyzed has shown that these soils usually contain sandy loam or loam.

3 (*Quadrats*, 2) *profile analysis table*

Physial analysis	horizon I
Texture %	
Clay 0,002 mm.	9.04
Silt 0,002–0,05 mm.	17.32
Sand 0,05 mm.	73.64
Organic matter %	3.6
Permeability % cm/h cm.	0.59
Saturation %	42
Chemical analysis	
Total carbon	2.1
Total Nitrogen	0.18
C/N	12.1
$CaCO_3$	30.4
Ca^{++}	0.31
Mg^{++}	7.87
Na^{+}	0.25
K^{+}	0.001
S (exchangeable metal cations m.e/100 gr.	19.8
T (cation exchange capacity m.e. /100 gr.	27.0
V % $\frac{S}{T}$ x 100	73.3
pH	9.1

The percentages of the sand and silt which the horizons contain are as follows:

$$45 > \text{sand } \% < 60$$
$$15 > \text{silt } \% < 30$$

The quantity of clay is very low. It varies between 6 and 22 %.

2. *pH and motherrock*: The pH's of the soils in the Beynam Forest are strongly alkaline. They generally vary between 7,7–9,8.

3. *Saturation*: This shows a variation between 40–180 %, hence a moderate saturation.

4. *Salinity*: It has been determined that the soils lack in salinity.

Vegetation And Its Relation with The Enviroment

Method

1. *In the field*

A. *Sampling* - In order to describe the vegetation of the Beynam Forest, 40 sample quadrates of various vegetation types were

laid out. The quadrate were prepared with inventory formulas of previously coded environmental factors. The dimensions of the quadrates were set by means of the minimal area method as 1000m^2 for forest vegetation and 400 m^2 for river vegetation.

2. *In the laboratory* - After establishment of the quadrates we utilized the Braun-Blanquet method to interpret and compare the vegetation types of the regions.

According to this floristic method the vegetation types of Beynam Forest may be considered in three main groups.

a. Forest vegetation: *Pinus nigra subsp. pallasiana* and *Quercus pubescens.*

b. River vegetation: *Salix alba*

c. Steppe vegetation: *Astragalus microcephalus, Silene rusci-folia.*

The main factor in the classification of the vegetation types is the water content of the station. Temperature and biotic factors play a secondary role.

I. Pinus nigra Arnold. subsp. pallasiana community

Pinus nigra subsp, pallasiana covers great areas of Turkey, but has not yet been studies in terms of floristic and ecological proporties. In this investigation, we have examined a blackpine forest found as a relic in the steppe region. The black-pine group in Turkey is distributed in climates ranging from rainy to cold and semi-arid that is regions where annual precipitation varies from 1000 to 350 mm.

The plant group under consideration in our research belongs to a cold or very cold climate. In Central Anatolia the black-pine is not found in the places where the annual precipitation is below 350 mm.

The *Pinus nigra subsp. pallasiana* community is shown in Table I. This community is described by means of 12 quadrarts. Almost all of these quadrates are taken from pure black-pine forest. The community develops on the brown forest soils on serpentine motherrock.

Vegetation

Physiognomy and structure

The forest is in a partially degraded condition. The entire plant cover varies from 30 to 80 %, and black-pine from 5 to 80. The structure of the forest has a structure of 3 layers.

The uppermost layer is made of trees 3–5 m. in height usually *Pinus pallasiana*, *Lonicera etrusca* accompanies it as climbing plant.

The second layer consists of 1–3 m. height shrubbery, generally intermingled *Quercus pubescens*, *Juniperus oxycedrus* and sometimes *Cistus laurifolius* and *Amelanchier rotundifolia ssp. integrifolia.*

The third is a layer of shrubs and grass, 25 cm. - 1 m. in height, *Genista albida*, *Chamaecytisus pygmeus*, *Poa nemoralis.*

The vegetation varies at different levels. There are usually two layers under pure black-pine groves: the grass and tree layers. In the degraded areas of the forest, however, the situation is more complex.

Since the *Pinetum nigrae* community has developed wholly on serpentine motherrock in the region studied, its floristic composition is relatively poor.

Biological spectrum	%
Phanerophyte	: 6
Nanophanerophyte	: 25
Chamaephyte	: 12
Hemicryptophyte	: 36
Therophyte	: 15
Geophyte	: 6

As shown in sociological table, some of the species that belong to *Pinus pallasiana* are characteristic a of normal humidity. These species begin to disappear as the weather gets warmer with the advent of summer: *Poa nemoralis*, *Silene italica*, *Carex divisa*, *Campanula lyrata.* Another group of them is resistant to the summer drought: *Hieracium auriculoides subsp. leioculoides*

TABLE I.

Pinus nigra Arnold Subsp. pallasiana community

Life-form	No. of quadrat	18	7	3	6	11	16	8	19	9	17	12	1	Presence	Class of presence
	Area m^2	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Altitude m.	1400	1440	1280	1350	1360	1450	1420	1450	1400	1450	1350	1480		
	Slope %	20	50	20	10	20	1	25	45	35	1	2	80		
	Exposition	E	W	W	N	N	—	W	N	W	—	—	W		
	Motherrock	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.		
	HCL reaction of the motherrock	—	—	—	—	—	—	—	—	—	—	—	—		
	Humidity of the station	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.	Nor.		
	Erosion	No	No	No	No	No	No	No	No	No	No	No	No		
	HCL reaction of the upper horrizon	—	—	—	—	—	—	—	—	—	—	—	—		
	Coverage %	80	85	75	75	75	80	100	90	65	65	80	80		
	Tress and Shrubs														
P	Pinus nigra ssp. pallasiana	45	45	45	45	44	44	55	45	44	44	45	45	12	V
NP	Quercus pubescens	22	12	+	+	12	22	22	22	+	12	+	22	12	V
P	Lonicera etrusca var. etrusca	.	+	+	+	+	+	+	+	+	+	.	.	9	IV
NP	Amelanchier rotundifolia ssp. integrifolia	+	+	+	+	+	.	+	+	.	.	.	+	8	IV
NP	Rosa canina	.	+	.	.	.	+	+	+	.	+	.	.	5	III
NP	Cistus laurifolius	.	.	.	.	+	+	.	12	.	+	.	.	4	III
NP	Juniperus oxycedrus ssp. oxycedrus	+	+	.	.	.	.	.	.	.	.	.	.	2	II
NP	Cotonaester nummularia	+	.	+	.	.	.	.	.	.	.	.	.	2	II
NP	Populus tremula	.	.	.	.	.	.	.	21	.	.	.	.	2	II
	Herbs														
Th	Poa nemoralis	21	+	+	+	+	21	21	21	+	+	21	+	12	V
H	Silene italica	+	+	+	+	+	+	+	.	+	.	.	+	9	IV
H	Galium verum	+	+	+	.	+	.	+	+	.	.	+	.	7	IV
Ch	Chamaecytisus pygmaeus	+	+	.	+	+	+	+	.	.	.	.	.	6	III
G	Orchis mascula	+	+	+	+	.	+	+	.	.	.	.	.	6	III
Ch	Genista albida	+	+	.	+	+	+	.	.	.	.	.	.	5	III
H	Chrysanthemum poteriifolium	.	.	.	.	+	+	.	.	+	+	+	.	5	III
H	Carex divisa	11	+	+	+	.	.	.	.	.	.	.	+	5	III
Th	Dactylis glomerata	+	.	+	.	+	+	.	.	.	+	.	.	5	III
H	Campunula lyrata	.	.	+	+	.	.	+	+	.	.	.	.	4	III
Ch	Alyssum murale ssp. murale var. murale	+	.	.	.	.	+	+	.	.	.	+	.	4	III
G	Muscari racemosum	.	+	.	.	+	.	+	.	.	11	.	.	4	III
H	Fibigia clypeata	+	.	.	+	.	+	.	+	.	.	.	.	4	III
H	Hieracium auriculoides ssp. leioculoides	11	.	.	.	.	.	+	+	.	.	+	.	4	III
H	Hieracium auriculoides ssp. nudescens	+	.	.	.	.	.	.	+	+	.	+	.	4	III
H	Erysimum crassipes	+	.	+	.	.	.	+	.	.	.	.	.	3	II
Ch	Polygala anatolica	+	+	+	.	.	.	.	.	.	.	.	.	3	II
Th	Poa bulbosa f. vivipara	.	.	+	+	.	.	.	.	.		.	.	3	II
H	Hieracium pannosum ssp. pannosum	+	.	.	.	.	.	.	+	.	.	.	.	2	II
Th	Vincetoxicum tmoleum	+	.	+	.	.	.	.	.	.	.	.	.	2	II
H	Anthemis tinctoria	.	.	+	.	+	.	.	.	.	.	.	.	2	II
H	Turritis laxa	.	.	.	+	.	.	.	.	.	+	.	.	2	II
H	Hieracium hoppaeanum ssp. isauricum	+	+	.	.	.	.	.	.	.	.	.	.	2	II

Abrevations

Srp Serpentine — Rir : River — Dry : Dry — Mal : Marl — Nor : Normal — No : Not

++: very strang

+: strong

——: very negligible

—! negligible

H. pannosum, Chamaecytisus pygmaeus, Alyssum murale, Chrysanthemum poteriifolium.

Utilization - The *Pinus nigra subsp. pallasiana* forest at Beynam is a forest preserve and wildlife conservation area. Rather than being used for lumbering or other commercial purposes, it serves recreational purposes, wildlife conservation and management may be appreciated from this point of view.

Degraded black-pine forest: The black-pine forest is entirely surrounded by steppe; for this reason, the steppe vegetation intermingles with the open places and competes with the forest vegetation. The open places are unfavorable for the woods. Most of the plants of the steppe, e. g. *Thymus, Astragalus, Salvia, Stipa, Teucrium* and *Centaurea*, are found in this region. This is because the edaphic conditions (water holding capacity, structure) are deranged.

II. Quercus Pubescens Willd. Community.

Quercus pubescens is accepted as a climax vegetation of Central Anatolia. It is found in the Beynam forest not as tree but as a shrub. As a group it characterises a variable climate with a cold winter.

This community is shown in Table II. It is characterized in 7 quadrates. It develops on the various motherrocks of the brown forest soil.

Vegetation

Physiognomy and structure

Pure *Quercus pubescens* forest, generally surrounds the black-pine forest in a strip. Its total situation ranges from 20 to 70 %. The oak portion vries from 45 to 70 %.

Although it appears to have only one layer, there is also a second layer containing a few species.

The upper layer is composed of 2–4 m. shrub, mainly *Quercus pubescens* with an admixture of *Colutea arborescens, Pyrus eleagnifolia, Prunus insititia, P. spinosa.*

TABLE II.

Quercus pubescens Willd. Community

Life-form	No. of quadrat	30	34	29	10	38	31	27	Presence	Class of presence
	Area m²	400	400	400	500	400	400	400		
	Altitude m.	1380	1280	1359	1540	1340	1350	1350		
	Slope %	15	15	2	45	10	10	6		
	Motherrock	Mrl.	Mrl.	Srp	Srp.	Mrl.	Mrl.	Srp.		
	Exposition	N	N	N	N	N	N	N		
	HCL reaction of the Motherrock	+	+	—	—	+	+	—		
	Humidity of the Station	Nor	Nor	Nor	Nor	Nor	Nor	Nor		
	Erosion	No	No	No	No	No	No	No		
	HCL reaction of the upper horizon	++	++	—	—	++	++	—		
	Coverage %	80	95	90	80	80	95	90		
	Tress and Shrubs									
NP	*Quercus pubescens*	45	55	54	55	55	55	55	7	V
NP	Colutea cilicica	+	+	.	+	+	+	.	5	VI
NP	Juniperus oxycedrus ssp. oxycedrus	+	.	+	+	.	.	.	3	III
P	Prunus domestica ssp. insititia	+	+	.	.	.	+	.	3	III
P	Pyrus elaeagnifolia	+	.	+	.	.	.	+	3	III
P	Crataegus orientalis	+	+	.	.	.	+	.	3	III
P	Prunus spinosa	.	.	+	.	.	.	.	1	II
	Herbs									
H	Coronilla varia ssp. varia	11	11	+	11	+	22	+	7	V
H	Vicia cracca var. stenophylla	1	11	.	+	+	12	+	6	IV
H	Silene alba var. eriocalycina	+	+	11	.	+	+	.	5	IV
Th	Lathyrus digitatus	+	+	+	.	+	+	.	5	IV
H	Asyneuma limonifolium	+	+	+	+	+	.	+	5	IV
Th	Phleum montanum	+	+	+	+	+	.	.	5	IV
H	Dianthus anatolicus	+	.	.	+	+	.	+	4	III
Th	Trifolium pannnocicum ssp. elongatum	+	+	.	.	+	.	+	4	III
Th	Galium verum	+	+	+	+	.	.	.	4	III
Th	Galium aperine	+	+	+	+	.	.	.	4	III
Ch	Astragalus campylosema ssp. campylosema	+	+	.	.	.	+	.	3	III
H	Stachys cretica ssp. anatolica	+	+	.	.	.	+	.	3	III
H	Onobrychis armena	+	+	.	.	.	+	.	3	III
Ch	Jasminum fruticans	+	.	+	.	+	.	.	3	III
H	Ballota nigra	+	+	.	.	+	.	.	3	III
G	Iris kerneriana	.	+	+	+	.	.	.	4	III
Ch	Dorycnium pentophyllum ssp. orientale	.	.	+	+	+	.	.	3	III
Ch	Alyssum murale ssp. murale var murale	.	.	+	+	.	.	.	3	III
Th	Filipendula vulgaris	.	.	+	+	+	.	.	3	III

TABLE III.

Salix alba L. community

Life-form	No. of quadrat	13	14	20	21	33	Presence	Class of presenae
	Area m^2	200	200	200	200	200		
	Altitude m.	1100	1240	1350	1380	1300		
	Slope %	4	4	20	20	25		
	Motherrock	Srp.	Srp.	Srp.	Srp.	Srp.		
	Exposition	NE	NE	N	N	NE		
	HCL reaction of the motherrock	—	—	—	—	—		
	Humidity of the station	Riv.	Riv.	Riv.	Riv.	Riv.		
	Coverage %	95	90	100	80	70		
	Trees and Shrubs							
P	Salix lba	23	22	33	12	+		V
NP	Salix capraea	12	11	22	11	11	5	V
NP	Salix viminalis	33	23	11	12	+	5	V
NP	Salix pedicillata	11	12	12	22	+	5	V
NP	frangula alnus	11	+	+	+	11	5	V
NP	Ligustrum vulgare	1	+	+	+	+	5	V
NP	Viburnum lantana	11	11	+	11	+	5	V
NP	Evonymus europaeus	+	+	+	+	+	5	V
NP	Sorbus umbellata var. umbellata	+	+	+	+	+	5	V
P	Pyrus amygdaliformis var. amygdaliformis	+	+	+	+	+	5	V
HH	Phragmites communis	+	+	11	+	+	5	V
NP	Pyracantha coccinea	+	+	.	+	+	4	IV
P	Rubus tereticaulis	+	+	+	.	+	4	IV
NP	Crataegus monogyna ssp. monogyna	+	.	+	.	+	3	IV
NP	Dipsacus laciniatus		+	+	.	.	3	IV
P	Prunus spinosa	+	+	.	+	.	3	IV
P	Prunus avium	.	.	.	+	+	2	III
P	Vitis vinifera	.	12	+	.	.	2	III
	Herbs							
Cr	Eupatorium cannabium	+	+	+	+	.	4	IV
Hr	Carex punctata	+	+	12	+	.	4	IV
H	Carex vulpina	+	+	+	+	.	4	IV
Th	Lathyrus pratensis	11	+	+	+		4	IV
Cr	Tussilago farfara	+	+	11	.	+	4	IV
H	Rubia tinctoria	+	.	+	.	+	3	IV
Th	Inula cordata	11	+	+	.	.	3	IV
Th	Geranium palustre	+	+	+	.	.	3	VI
Th	Agrimonia eupatoria	+	+	+	.	.	3	IV
Th	Poa nemoralis	11	+	+	.	.	3	IV
H	Carex hordeistichos	+	+	+	.	.	3	IV
H	Veronica anagallis-aquatica	+	+	+	.	.	3	IV
H	Juncus glaucus	+	+	+	.	.	3	IV
T	Silene alba ssp. eriocalycina	+	+	.	.	.	2	III
Cr	Geum urbanum	+	+	.	.	.	2	III
Th	Brachypodium silvaticum	+	.	+	.	.	2	III
Th	Lysimachia vulgaris	.	.	+	.	+	2	III
Cr	Epilobium angustifolium	.	+	+	.	.	2	III
G	Orchis iberica	.	.	+	+	.	2	III
Th	Medicago lupulina	+	+	.	.	.	2	III
Gr	Lythrum salicaria	+	+	.	.	.	2	III
Th	Vicia narbonensis var. narbonensis	+	+	.	.	.	2	III
Th	Medicago sativa	+	.	+	.	.	2	III

The second layer consists of shrubs or grass, 0,5–1 m., mostly *Coronilla varia*, *Vicia cracca var. stenophylla*, *Asyneuma limonitolium*, Lathyrus digitatus.

Its soil condition resembles that of black- pine forest. Its floristic composition is not rich. Most of the species that belong to the community are those which show a predilection for shade.

Biological spectrum	%
Phanerophyte	: 14
Nanophanerophyte	: 23
Chamaephyte	: 20
Therophyte	: 13
Hemicryptophyte	: 23
Geophyte	: 7

III. Salix Alba L. Community

This community can also be called *Salix viminalis* community. It may be encountered at various of Anatolia, but its floristic composition varies with the local precipitation and temperature factors and the condition of the land. Here a semi-arid, semi-continental climate is under consideration.

This community is described with 6 quadrates. It has a relatively homogeneous structure. Its characteristic is a very high humidity. Temperature plays a secondary role.

Vegetation

Physiognomy and structure

This community develops in the small brooks which originate from the various springs on Kuyrukçu Mountain.

Its whole plant cover is within the ranges of 50–100 %; as *Salix alba* and *Salix pedicillata*, it varies from 5 to 30 %.

The structure of the community consists of three layers:

The first layer is composed of herbs. Its varies between 10–80 cm. Cover situation varies from 10 to 80 %.

The second layer is the shrub layer. Its height varies between 1–2 m. Cover varies from 5 to 50 %.

The third layer is the tree layer which has a height varying between 3–12 m. and is composed of *Salix alba* and *Salix pedicillata*. *Populus alba* sometimes intrudes into this layer. Cover is from 5 to 100 %.

The floristic composition of this community is different from that of the *Salix alba* community found by Rıza Çetik in the Yeşilırmak River vegetation. Although some of the species are the same, most of them are not present in our table. This is because the environmental factors are different (topography, edaphic factors, temperature), as we have discribed above. The river vegetation of Çetik was determined in the Black sea area.

Biological spectrum %

Phanerophyte	: 15
Nanophanerophyte	: 30
Hemicryptophyte	: 22
Cryptophyte	: 14
Geophyte	: 19

IV. Astragalus microcephalus Willd. Community

The plant groups of the Turkish steppe are very numerous and complicated. Investigation of these communities is time consuming and difficult.

The *Astragalus microcephalus* community is widespread in Central Anatolia but, has not yet been examined sociologically.

This community develops in the mountain steppes of Central Anatolia where summer aridity predominates.

The edaphic factors are unfavourable at the places where this community develops; the percentage vegetation cover is low,

TABLE IV.

Astragalus microcephalus Willd. community

Life-form	No. of quadrat	40	39	41	25	24	23	26	22	32	Presence	Class of presence
	Area m^2	400	400	400	400	400	400	400	400	400		
	Altitude m.	1150	1250	1350	1300	1290	1270	1340	1200	1240		
	Slope %	15	20	30	15	40	35	10	30	45		
	Motherrock	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.		
	Exposition	N	N	N	N	N	N	N	N	N		
	HCL reaction of the motherrock	—	—	—	—	—	—	—	—	—		
	Humidity of the station	Dry.	Dry.	Dry.	Dry.	Dry.	Dry.	Dry.	Dry.	Dry.		
	Erosion	—	—	—	—	—	—	—	—	—		
	Coverage %	90	95	90	90	85	90	95	90	95		
Ch	Astragalus microcephalus	44	44	44	34	34	34	34	33	33	9	V
Ch	Astragalus baibutensis	22	11	11	22	12	23	22	22	11	9	V
Th	Bromus tomentellus	21	21	11	11	11	22	12	12	22	9	V
Th	Koeleria kristata	22	22	1	22	22	11	22	22	22	9	V
Th	Festuca ovina	22	22	12	12	22	22	11	12	22	9	V
Ch	Phlomis herba-venti	+1	+1	+1	+	+1	+	+	+1	+	9	V
H	Phlomis armeniaca	+1	+	11	+	+	+	11	+1	+1	9	V
Ch	Salvia cryptantha	11	22	11	+	+	+	+	+	+	9	V
Ch	Teucrium polium	+	+	+	+	+	+	+	+	+	9	V
Ch	Ajuga salicifolia	+1	11	11	+	+	+	+1	+	+1	9	V
PH	Inula montbretiana	+1	+	+	+	+	+	+	+	+	9	V
Ph	Euphorbia tinctoria	+	+	+	+1	1	11	+	+	+	9	V
Ch	Centaurea squarrosa	+	+	+	+	+	+	+	+	11	9	V
Ch	Acantholimon echinus	+	+	.	+	+	+	+	+1	+1	8	V
Ch	Thymus sipyleus var. punctatus	+1	12	11	+	+	+	+	+	.	8	V
Ch	Marrubium parviflorum var. oligodon	+	+1	1	+	+	+	.	+	+	8	V
PH	Globularia trichosantha	+	+1	+	+	.	+	+	.	+	7	V
PH	Veronica multifida	+	+	+1	+1	+	+	+	.	.	7	V
Ch	Echinaria capitata	+	+	+	+	+	+	+	.	.	7	V
Th	Stipa barbata	+	+	+	+	+	+	+	.	.	7	V
Th	Bromus tectorum	+	+1	+1	+	+1	+	.	+	.	7	V
Ch	Causinia brandiana	+	+	+1	+	+	+	.	+	.	7	V
PH	Anthemis tinctoria	+	+	+	.	+	+	+	.	+	7	V
PH	Scutellaria orientalis	+1	22	+1	.	+	+	+	.	+	7	V
H	Galium coronatum	+	+	+	.	+	+	.	+	+	7	V
H	Morina persica	+	+	.	.	+	+	+	.	+	6	IV
Th	Trigonella ficheriana	+	+	+	+	+	+	.	.	.	6	IV
Ch	Eryngium campestre	+	+	+	.	+	+	.	+	.	6	IV
Th	Trigonella monantha ssp. monantha	+	+	+	.	+	+	.	+	.	5	IV
Ch	convolvulus lineatus	+	+	+	+	+	+	.	.	.	6	IV
Ch	Centaurea drabifolia var. detansa	+	+	+	+	.	.	+	.	+	6	IV
Ch	Sichorium intybus	+	+	+	.	+	+	+	+	.	6	IV
PH	Centaurea urvillei		+	+	+	+	+	+	.	.	6	IV
Ch	Astragalus setulosus	.	+1	.	+	+	+1	.	.	+	5	IV
Ch	Pimpinella tragium ssp. polyclada	+	+	+	+	+	.	.	.	.	5	IV
Ch	Verbascum cheiranthifolium	+	.	.	+	+	+	.	+	.	5	IV
Ch	Polygala pruinosa	+	+	+	+	.	.	+	.	.	5	IV
Th	Medicago rigidula var. rigidula	+	+	+	.	+	+	.	.	.	5	IV
Ch	Alyssum pateri ssp. pateri	+	+	+	.	+	+	.	.	.	5	IV
Ch	Galium incanum ssp. elatius	+	+	+	+	.	.	+	.	.	5	IV
Ch	Onosma taurica	+	+	+	+	.	.	+	.	.	5	IV
Ch	Astragalus plumosus var. plumosus	.	.	.	+1	.	+	12	+	+1	5	IV
PH	Stachys cretica	.	+	+	.	+	+	.	+	.	5	IV
Th	Plantago logopus	+	+	.	+	.	+	.	.	.	4	IV
PH	Stachys lavandulifolia	+	.	+1	+	.	.	.	.	+1	4	IV
PH	Helianthemum canum	+	12	+1	.	.	+	.	.	..	4	IV
PH	Salvia rosifolia	+	.	+	+	.	+	.	.	.	4	IV
Ch	Astragalus angustifolius	.	+	.	.	+	.	+	.	+	4	IV
Ch	Teucrium chamaedrys	.	.	.	+	+	+	.	+	+	3	III
Ch	Globulaira orientalis	+	.	.	+	.	.	+	.	.	3	III
Ch	Alyssum murale ssp. murale var. murale	+	+	.	.	+	.	.	.	.	3	III
G	Ranunculus argyreus	+	+	.	+	.	.	.	.	.	3	III
Th	Jurinea pontica	.	.	+	+	+	.	.	.	.	3	III
Ch	Artemisia fragrans	+	.	.	.	+	.	+	.	.	3	III
G	Allium rotundum	+	.	.	.	.	.	+	.	+	3	III
PH	Onobrychis armena	+1	+1	+1	.	.	.	.	.	.	3	III
PH	Paronchia kurdica var. kurdica	+	.	.	+	.	.	+	.	.	3	III
PH	Turgenia latifolia	+	+	+	.	.	.	.	.	.	3	III
Th	Caucalis leptophylla	+	+	+	.	.	.	.	.	.	3	III
Ch	Genista aucheri	.	.	.	+	+	+	.	.	.	3	III
Ch	Thymus jankae	.	.	.	+1	+1	.	+	.	.	3	III
Ch	Astragalus amoenus	.	.	+	+	.	+	.	.	.	3	III

its content of organic matter reduced greatly and its structure is lost. For this reason the *Astragalus microcephalus* community commonly develops on slopes and it is effective in *restraing* erosion. With its large hemispherical crown it protects the land, to a great extent, from the heavy precipitations which occur at the Central Anatolia.

Because of aridity, *Astragalus microcephalus* has a well developed root system; its root depth is more than 3 m. This community is a Gramineae steppe rather than a Chamaephyte steppe. Its floristic composition is rich.

Vegetation

Physiognomy and structure

Astragalus microcephalus community is described in 9 quadrates. Its overall cover varies from 10 to 60 %. The structure of the community consists of a single layer of a height varying from 25 to 40 cm.

The dominating plants of this single layer are *Astragalus microcephalus* and *A. baibutensis*.

This community occurs in Beynam Forest, especially outside the fenced-in area at the lower parts of the mountain, between 1200 and 1300 m. That is to say, it develops below the series of *Pinus pallasiana* vegetations.

Astragalus microcephalus community was investigated for the first time by R. Çetik at Ankara's Çubuk dam (1963). There is a great resemblance between that community and the are in Beynam forest. Many of the some species have been found in both of these communities.

Biological spectrum %

Chamaephyte	: 48
Protohemicryptophyte	: 27
Therophyte	: 22
Geophyte	: 3

V. Silene ruscifolia (Hub-Mor. et Reese). Hub. -Mor. Community

This community develops in the mountain steppe of Central Anatolia where the motherrock appears. This community develops under very unfavourable edaphic condition on the partly separated motherrock, formed after the complate removal of the soil by erosion; but it contains a very well developed root system. The Chamaephytes are predominant. Its floristic composition is poor.

Vegetation

Physiognomy and structure

Silene ruscifolia community is described 6 quadrates. Overall cover varies from 10 to 40 %. The structure of the community consists of single layer as *Astragalus microcephalus* community of a height varying from 20 to 30 cm.

The dominating plants of this single layer are *Silene ruscifolia*, *Asperula glomerata*, *Aethionema armenum*, *Globularia orientalis* and *Concolvulus compactus*. These plants too, have a very well developed root system. This could be a seperate subject of research in the future.

Biological spectrum %	
Chamaephyte	: 47
Hemicryptophyte	: 34
Protohemicryptophyte	: 6
Therophyte	: 9
Geophyte	: 3

DISCUSSION AND CONCLUSION

In the differentiation of Beynam Forest under semi-continental conditions into steppe, forest and river vegetation types, rainfall and temperature are of primary importance, and biotic factory secondary.

The *Pinus nigra subsp. pallasiana* community is widespread in Turkey, but has been studied from the point of view of plant

TABLE V.

Silene ruscifolia (Hub-Mor. et Reese) Hub-Mor. Community.

Life-form	No. of quadrat	42	44	43	45	5	4	Presence	Class of presence
	Area m^2	200	200	200	200	200	200		
	Altitude m.	1250	1280	1300	1300	1400	1350		
	Slope %	10	10	4	4	10	3		
	Motherrock	Srp.	Srp.	Srp.	Srp.	Srp.	Srp.		
	Exposition	E	W.	S	N	E	E		
	HCL reaction of the motherrock	—	—	—	—	—	—		
	Humidity of the station	Dry.	Dry.	Dry.	Dry.	Dry.	Dry.		
	Erosion	++	++	++	++	++	++		
	HCL reaction of the upper horizon	—	—	—	—	—	—		
	Coverage %	50	45	55	50	40	50		
Ch	Silene ruscifolia	23	12	12	11	+	12	6	V
Ch	Asperula glomerata	12	12	12	11	+	12	6	V
PH	Minuartia anatolica	11	+	+	+	+	+	6	V
Ch	Helianthemum canum	+	+	+	12	+	+	6	V
Ch	Globularia orientalis	+	+	+	+	+	+	6	V
Ch	Centaurea urvillei	+	+	+	+	+	+	6	V
Th	Bromus tomentellus	11	+	+	+	+	+	6	V
H	Anthemis montana var. linneana	+	+	11	+	+	+	6	V
Ch	Fumana aciphylla	11	+	12	+	+	+	6	V
H	Paronichia kurdica var. kurdica	+	+	+	+	+	11	6	V
H	Centaurea drabifolia var. detansa	+	+	+	+	+	+	6	V
Ch	Aethionema armenum	12	.	11	+	+	+	5	V
Ch	Alyssum pateri ssp. pateri	11	+	12	+	+	.	5	V
PH	Morina persica	+	+	+	+	.	+	5	V
Ch	Salvia candidissima	+	+	+	+	+	.	5	V
Ch	Alyssum thymops	+	+	+	+	.	.	4	IV
Ch	Stachys lavandulifolia	11	+	+	+	.	.	4	IV
Ch	Astragalus lydius	11	+	+	+	.	.	4	IV
Ch	Astragalus vulneraria	+	+	+	.	.	.	3	IV
Ch	Acantholimon echinus	+	+	+	.	.	.	3	IV
G	Ornithogalum armeniacum	+	+	+	.	.	.	3	IV
H	Bungea trifida	+	+	+	.	.	.	3	IV
Th	Bromus tectorum	+	+	.	.	+	.	3	IV
Th	Poa bulbosa f. vivipara	+	+	.	+	.	.	3	IV
H	Convolvulus lineatus	11	+	+	.	.	.	3	IV
Ch	Vonvolvulus compactus	+	+	+	.	.	.	3	IV
Ch	Fumana procumbens	.	.	.	+	+	+	3	IV
H	Centranthus longiflorus	12	.	.	+	.	.	2	III
H	Salvia acetabulosa	11	.	.	+	.	.	2	III
Ch	Thymus jankae	+	+	.	.	.	.	2	III
H	Centaurea triumfetti var. cana	.	+	+	.	.	.	2	III
H	Silene chloraefolia	.	.	+	+	.	.	2	III
H	Seseli tortuosum	.	.	.	.	+	+	2	III
H	Minuartia juniperina	.	.	+	+	.	.	2	III
H	Linum mucronatum ssp. armenum	+	+	.	.	.	.	2	III
H	Hernaria incana	+	+	.	.	.	.	2	III
H	Balanthus minuartioides	+	+	.	.	.	.	2	III
Ch	Silene spergulifolia	.	.	.	.	+	+	2	III

sociology only in the Amanus Mountains in the Mediterranean region (Y. Akman, 1969). There is thus not much oppurtunity for comparison. The climatic conditions of this natural division in central Anatolia differ from those in the Amanus Mountains. The floristic composition is thus also different in the black-pine communities in the two regions. Morover, because the black-pine community in Beynam Forest has developed only over serpentine methorrock, the number of species forming the community is rather small. Another special feature is that Beynam Forest is a relic surrounded by steppe; Wherever the woods are destroyed, steppe plants become established. İn addition, it sould be mentioned that Beynam Forest is the furthest advance of black-pine in Central Anatolia and is at its climatic limit.

The *Quercus pubescens* community is well established at various points in Central Anatolia and in my opinion is a subclimax vegetation following the destruction of *Pinus nigra subsp. pallasiana*. As with the preceding community this one has not been investigation from the plant sociological point of view. This community surrounds the Kuyrukçu Mountain blackpine community in the form of a belt. Despite its proximity to the blackpine community, its floristic composition differs considerably (see the plant sociology Tables I and II). The soil conditions are good in comparison to those of black-pine; the reason for this is the broad rapid seperation of the broad leaves of the oak.

The *Astragalus microcephalus* community is very well adapted to the steppe conditions of Central Anatolia and is widespread in shallow soils on both gentle steppe slopes. This community was first studied in Central Anatolia (Çubuk dam by R. Çetik). The floristic composition is rather same in two community. It's a Chamaephyte steppe; for this reason is rather rich chamaephytic plants as *Astragalus baibutensis*, *A. plumosus*, *A. angustifolius*, *Teucrium polium*, *Centaurea squarosa*, *C. urvillei*, *Salvia cryptantha*, *S. rosifolia*, *Thymus sipyleus var. punctatus*. *T. jankae*, *Acantholimon echinus* etc. These plants have also a strong root system.

The *Silene ruscifolia* community is determined for the first time by the author. It develops especially on serpentine motherrock at the Kuyrukçu mountain. It is rather interesting that this

community has a root system which penetrates deep layers and forms a hemispheric crown, for this reason it is protective againts erosion. We have no means of comparison as its geographic distribution is unknown and because there is no previous study of this community. All we know is that it develops on rocky places.

Study of the river vegetation is not new. There are many works on river vegetation. The first works on river vegetation in Turkey studied are by Scwarz and R. Çetik. The floristic composition of this community is different from that *Salix alba* community found by R. Çetik in the Yeşilırmak River vegetation. Although some of the species are the same, most of them are not present in our Table. This is because the environmental factors are different (Topography, edaphic factors, temperature), as we have described above. The study of river vegetation by Çetik was carried out in the Black Sea area.

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ÖZET

Yarı-karasal bir iklimin etkisi altında bulunan Beynam ormanının büyük bir kısmını serpantin anakaya üzerinde gelişen kahverengi orman toprağı örter. *Braun-Blanquet* floristik metoduna göre Beynam ormanının vejetasyonu başlıca 3 grupta mütalâa edilmiştir: a) Orman vejetasyonu: *Pinus nigra* subsp. *pallasiana* ve *Quercus pubescens*, b) Dere vejetasyonu: *Salix alba*, c) Step vejetasyonu: *Astragalus microcephalus*, *Silene ruscifolia.*

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