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Some general features of the Bolshoi Balkhan flora

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(Mit 2 Tafeln)

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The mountain range Bolshoi Balkhan (about 2000 m. above sea-level) is situated in the western part of Turkmenistan, in vicinity of the east coast of the Caspian sea. The outer west spurs of the range nearly reached the Balkhan Bay of the sea that existed just forty years ago. At present, the sea has moved far from the spurs, and the range resembles a mountain island surrounded on all sides by argillo-arenaceous plains of the desert. The sandmantled space and the ancient dried-up river-bed of Uzboi, the vast saline now half-covered with sands stretching for hundreds of kilometres and skirting the Bolshoi Balkhan on three sides, separate it from the nearest mountain ridges: the low (900 m. above sea-level) ridge Maly Balkhan which is also of an island type, and the Kopet-Dagh ridge which in its northwestern part bears the name of Kjuren-Dagh. Since the Kopet-Dagh itself is the extreme north-east range of the Turkmen-Khorasan mountains, Bolshoi Balkhan really is the outlying north-west part of this system, its last mountain island; if one goes beyond that island to the north-west he will only find the spacious Krasnovodskoye desert plateau. Owing to such geographical location, Bolshoi Balkhan has turned out to be one of the remotest northern border-lines which had been reached by the waves of the „Iranian flora".

The main types of vegetation of the Bolshoi Balkhan are "tipchak" (*Festuca sulcata*) and feathergrass steppes which gradually, with the mountains' ascent, supersede the desert vegetation. In this area the upper boundary of the desert zone of vegetation goes pretty high. For instance, *Haloxylon aphyllum* with the accompanying Salsolas and ephemeral plants go up the southern slopes to 800 m. above sea-level. The Balkhan steppes possess a very poor flora: *Festuca sulcata*, *Stipa szovitsiana* and *S. lessingiana* are predominant here with a few species of herbs and grasses, what lends them a somewhat monotonous aspect. The Bolshoi Balkhan is extremely poor in bulbous plants, therefore even in spring-time the steppes are not particularly picturesque. The split-stone slopes and the summits of low hills of the plateau are occupied

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Table 1

Plant families	Bolshoi Balkhan (Proskuriakova, 1964—1967)			Maly Balkhan (Tarassov, 1954)			West Kopet-Dagh (Linchevski, 1935)			Central Kopet-Dagh (Nikitin, 1965)		
	number of species	%	place in floral list	number of species	%	place in floral list	number of species	%	place in floral list	number of species	%	place in floral list
Gramineae	68	14,5	1	30	9,8	2	118	12,7	1	165	11,0	2
Compositae	47	10,2	2	29	9,4	3	118	12,7	1	212	14,1	1
Cruciferae	34	7,4	3	30	9,8	2	52	5,6	3	118	7,9	4
Leguminosae	31	6,7	4	23	7,4	4	93	10,0	2	145	9,6	3
Chenopodiaceae	26	5,6	5	45	14,6	1	25	2,7	8	75	5,0	5
Labiatae	20	4,3	6				48	5,1	4	54	3,6	8
Umbelliferae	17	3,6	7				39	4,2	6	48	3,2	9
Boraginaceae	15	3,2	8	17	5,5	5	21	2,2	9	41	2,7	10
Liliaceae	12	2,6	9				44	4,7	5	65	4,3	7
Euphorbiaceae	11	2,4	10				18	1,9	10	24	1,6	12
Rosaceae							30	3,2	7	38	2,5	11
Caryophyllaceae							25	2,7	8	70	46,6	6
Polygonaceae												
Total number of species in the flora	460	100		307	100		926	100		1500	100	

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by *Artemisia badhysi*, which enters the steppe communities on shallow soils. On rock outcrops, in gorges and ravines, on northern steep slopes, and limestone outcrops of steppe hills open groves of old „archa" trees (*Juniperus turcomanica*) give a characteristic and specific aspect to the landscape.

The Bolshoi Balkhan vegetation is quite peculiar in its structure, composition and outlook, and does not repeat that of Kopet-Dagh, even in cases, when communities are dominated by the same species.

The vascular flora of the Bolshoi Balkhan proper (not including the plants of the surrounding desert plains) numbers 460 species (PROSKURIAKOVA, 1964—1967). The flora of the Bolshoi Balkhan developed in conditions of severe ecological and spatial isolation which led to the isolation of a number of endemic species. The Bolshoi Balkhan flora includes 17 endemical species: *Allium eugenii* VVED., *Oxytropis bobrovii* B. FEDTSCH., *Astragalus balchanensis* BORISS., *Eremostachys subspicata* M. POP., *Lagochilus balchanicus* E. CZERN., *Reutera bobrovii* G. WORON., *Scaligeria korovini* BOBR., *Eryngium balchanicum* G. WORON., *Asperula balchanica* BOBR., *Acantholimon balchanicum* EUG. KOR., *A. korovini* E. CZERN., *Artemisia balchanorum* N. KRASCH., *Cousinia centauroides* F. et M., *C. leptocephala* F. et M., *Echinops spiniger* ILJIN, *Jurinea spissa* ILJIN, *Onosma leucocarpum* M. POP. The contact with other mountain floras, and in particular with Kopet-Dagh, existed, however, in some periods. Surely an immediate contact with the Iranian floral centre — probably through the Elburs did exist too. A prove of this may be seen in the presence of some Iranian species in the Bolshoi Balkhan area (*Conringia persica* BOISS., *Veronica rubrifolia* BOISS.), which have not been found in Kopet-Dagh.

Domination of grasses in the floras of all Turcomanian arid mountains is a characteristic feature, and for the Bolshoi Balkhan area this feature is fairly evident. In the Bolshoi Balkhan area large territories are occupied by tipchak and feather-grass steppes and *Artemisia* patches; therefore it may be said that the grasses and the *Compositae* constitute here also the basis of the vegetation cover. Even in the lower desert zone and at the foothills as well as on close-to-mountain plains, *Poa bulbosa* and the numerous grass ephemers represent a permanent component of desert or semidesert communities. Half of the grass species of Bolshoi Balkhan (34 species) are annuals.

The Bolshoi Balkhan flora contains 40 grass genera (*Lasiagrostis*, *Eremopoa* and *Eremopyron* viewed as separate genera). *Stipa* holds the first place with 8 species, *Bromus* (7 spp.) and *Agropyron* (6 spp.) follow. Except of *Bromus inermis* LEYSS., all other *Bromus* species are annual.

Agropyron trichophorum (LINK.) RICHT. is widely spread over the whole Middle Asia, the Caucasus and over the South-European part of the USSR; in Kopet-Dagh it forms part of the grass steppes (with *Stipa* etc.) and there it usually dominates. In the Bolshoi Balkhan in this type of vegetation *A. trichophorum* is replaced by *A. desertorum*. *A. trichophorum* is here very rare. As E. G. BOBROV (1935) did not record it at all we may suppose that this species is a recent newcomer.

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Plant families	Badkhyz (Linchevski, 1935)			Lower Reaches of Atrek (Nardina, 1954)			North-West Turkomania (Nechayeva, 1954)			South Ust-Urt (Kogan 1954),			Middle Asia (Grossheim, 1936)
	number of species	%	place in floral list	number of species	%	place in floral list	number of species	%	place in floral list	number of species	%	place in floral list	%
Gramineae	64	11,5	2	56	15,5	1	16	8,0	5	23	7,8	4	6,4
Compositae	69	12,4	1	45	12,4	2	21	9,1	3	28	9,5	3	15,8
Cruciferae	47	8,4	3	30	8,3	4	24	10,4	2	36	12,3	2	
Leguminosae	40	7,2	5	28	7,7	5	18	7,8	4	22	7,5	5	11,7
Chenopodiaceae	43	7,7	4	41	11,3	3	52	22,6	1	60	20,3	1	3,8
Labiatae	14	2,5	10	2									4,4
Umbelliferae	30	5,4	4	10	2,7	7							7,6
Borginaceae	21	3,8	9	10	2,7	7				15	5,4	6	
Liliaceae	28	5,0	7	6	1,6	8				11	3,7	7	4,7
Euphorbiaceae	10	1,8											
Rosaceae	4	0,7											
Caryophyllaceae	22	3,9	8										4,5
Polygonaceae										11	3,7	7	
Total number of species in the flora	554	100		361	100		230	100		294	100		100

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Among grasses we should note a particular group of species with a very limited distribution within the Bolshoi Balkhan area: *Enneapogon persicum* BOISS., *Melica persica* KUNTH, *Pennisetum orientale* RICH., *Elymus multicaulis* KAR. et KIR., *Parapholis incurva* (L.) HUBB. These species only grow on the Southern slope of the range never penetrating deep into the mountains and entirely avoiding the plateau and the northern slope. The first three species are plants of sunny, hot and arid areas; they grow on split-stone slopes, in crevices of rocks or in dried-up river-beds on stony alluvium, not going too far up the mountains; they are widely spread in Iran and in the southern part of the Soviet Middle Asia: Pamiro-Alai, Kopet-Dagh and partly Western Tian-Shan. Their extremely limited distribution in the Bolshoi Balkhan may hardly be explained by ecological reasons. The low range cut by deep gorges cannot possibly be an unsurmountable ecological barrier for them. Besides, the ecological conditions of the southern, western and northern foothills of the range are fairly similar. One may suppose, that the spreading out of these grass species is yet going on. *Elymus multicaulis*, common all over Middle Asia but in the Bolshoi Balkhan found only on southern slopes close to rivulets, and *Parapholis incurva* (main area in Eastern Caucasus) probably also should be regarded as the same type of species with expanding area.

On the other hand, the Bolshoi Balkhan flora lacks a number of grass species widely distributed in Middle Asia, as for instance *Imperata cylindrica* (L.) BEAUV. (in Kopet-Dagh very common and ascending sometimes up to 1300 m), *Erianthus ravennae* (L.) BEAUV. (in Kopet-Dagh going even up to 1800 m. and growing yet in the Maly Balkhan), *Bothriochloa ischaemum* (L.) KENG. and even *Dactylis glomerata* L. and *Echinochloa crus galli* (L.) ROEM. et SCHULT.

The Bolshoi Balkhan flora also lacks a number of families represented in the mountains of Middle Asia (including Kopet-Dagh) such as, for instance, the *Araceae*, *Orchidaceae*, *Juglandaceae*, *Ulmaceae*.

Bolshoi Balkhan is extremely poor in trees; it has 3 species only: *Salix excelsa* GMEL. (a few trees along the northern springs), *Ficus carica* L. along the southern springs, and "archa" — *Juniperus turcomanica* B. FEDTSCH. which is the main plant of the landscape. The archa trees usually form extremely thinned-out stands but in spots with greater soil moistening nearly closed-up groves can be met with. In such humid places trees are sometimes up to 15 meters high and up to 1,7 metres in diameter.

It may be admitted that *Juglans regia*, which grows wild in western Kopet-Dagh, does not grow in the Bolshoi Balkhan area on account of the climate, but it is hard to imagine, that where *Ficus carica* grows there could not be growing *Acer turcomanicum* or *Celtis caucasica*: these last species are xerophilous enough and comparatively more coldresistant, than the fig-tree.

Although *Leguminosae* represent but 6,7% of the flora, their role in the vegetation cover is considerable, since *Caragana grandiflora* forms a compact community and in some places even a sort of narrow vegetation zone. The

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same may be stated with regard to *Labiatae*. *Stachys turcomanica* forms vast brushes here and there in ravines. The role of other plant families in the vegetation cover is still less prominent.

Rosaceae are represented by seven species only. *Rosa*, *Rubus*, *Amygdalus*, *Crataegus* are perfectly lacking in the Bolshoi Balkhan. Even *Hulthemia* so common all over Middle Asia is not to be found here. This, again, can hardly be explained by ecological reasons only, especially because in the adjacent lower and drier Maly Balkhan we find *Amygdalus turcomanica* Lincz. Bulbous *Liliaceae* are an important element in the plant cover of Kopet-Dagh, Badkhyz and other areas of Turkomania. But there are only 12 species of *Liliaceae* in Bolshoi Balkhan, and only a half of these species are bulbous. Genera widely spread in Kopet-Dagh: *Tulipa*, *Ornithogalum*, *Muscari*, *Bellevalia*, *Sternbergia*, *Colchicum*, *Fritillaria*, *Crocus*, *Polygonatum* and even *Eremurus* — have not been recorded from the Bolshoi Balkhan.

This is particularly surprising as the adjacent dry and low Maly Balkhan possesses *Eremurus kopetdagensis* M. Pop., *Tulipa hoogiana* B. Fedtsch. and *T. sogdiana* Bge. These facts again make us think that the peculiarities of the Bolshoi Balkhan flora are determined not so much by present ecological situation as by historical causes.

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The plateau of the Bolshoi Balkhan with old "archa" tree (*Juniperus turcomanica*).

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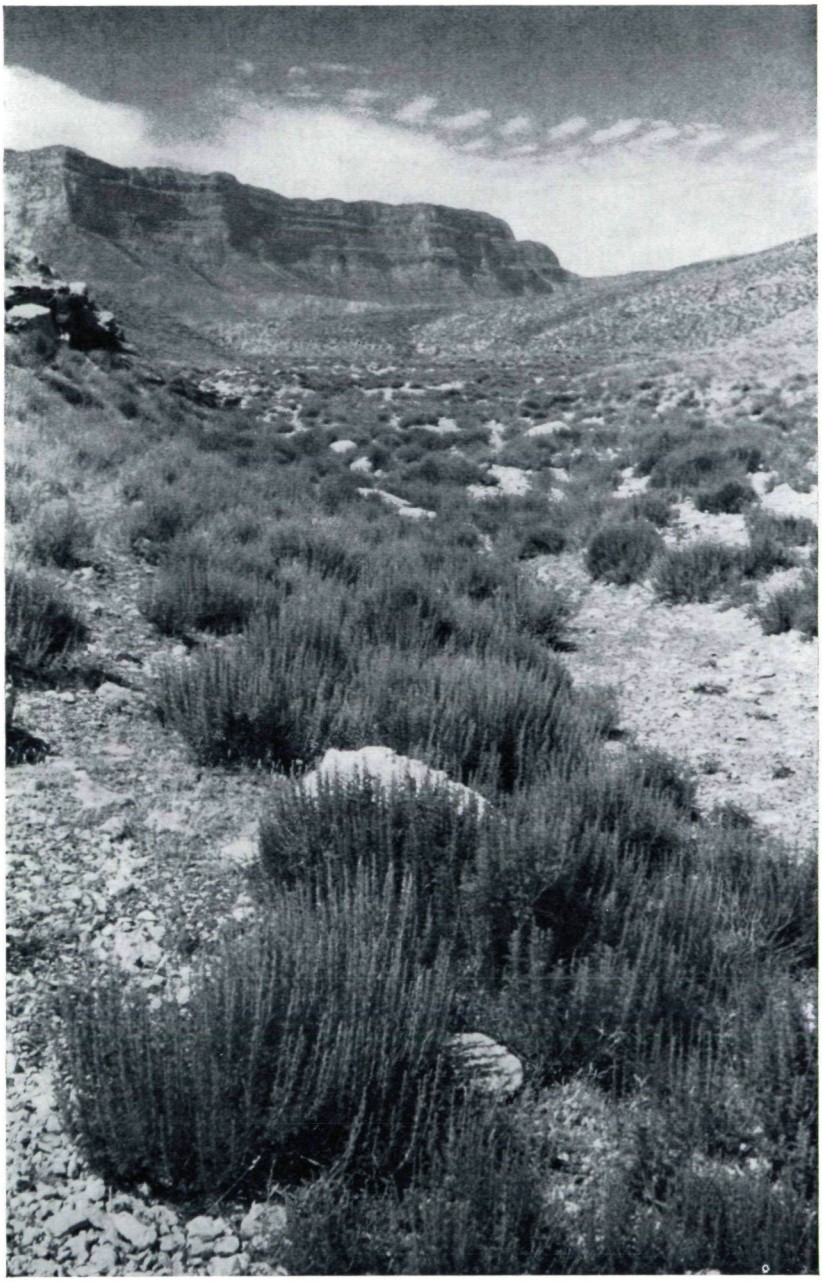

Artemisia balchanorum in the foothills of the Bolshoi Balkhan.

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