

Plants of Central Asia

Plant collections from China and Mongolia

Volume 2

Chenopodiaceae

V.I. Grubov



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Publisher's Note

The publisher has gone to great lengths to ensure the quality of this book but points out that some imperfections from the original may be apparent.

NOTE

This is the second volume of the illustrated list of Central Asian plants (within the People's Republics of China and Mongolia) published by the Botanical Institute of the Academy of Sciences of the USSR on the basis of Central Asian collections of leading Russian travellers and naturalists (N.M. Przewalsky, G.N. Potanin and others) as well as of Soviet expeditions, which are preserved in the Herbarium of the Institute.

This volume pertains solely to the family Chenopodiaceae, which plays a leading role in the formation of the vegetal cover of the deserts of Central Asia and represents one of the most abundant constituents of its flora.

The publication is intended for botanists (taxonomists, horticulturists, geobotanists and phytogeographers), geographers and soil scientists.

Editorial Board

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INTRODUCTION

The present, second, volume of *Plants of Central Asia* is wholly devoted to the family Chenopodiaceae. Among higher plants of Central Asia, this family enjoys a particularly important status and is of the utmost interest from the viewpoint of phytogeography and the evolution of flora.

Firstly, Chenopodiaceae is among the five largest families of the Central Asian flora. In Central Asia, outside the (former) USSR alone (covered in this publication), this family comprises 37 genera and 166 species. For the Central Asian territory as a whole, i.e., including the Soviet part of Central Asia, the family comprises 43 genera and 221 species. The most common genera are: *Salsola* 23 species, *Chenopodium* 18 species, *Suaeda* 17 species and *Atriplex* 16 species.

Secondly, the members of this family play a significant role in the composition of the vegetal cover of desert territories that prevails here. The most important edificators enjoying massive and extensive distribution and the plants comprising the landscape of the Central Asian desert belong to this family and are primarily responsible for its visual appearance. Among them, mention may be made in the first instance of *Haloxylon ammodendron*, *Anabasis brevifolia*, *A. aphylla*, *A. salsa*, *Salsola laricifolia*, *S. arbusculiformis*, *S. passerina*, *S. abrotanoides*, *S. arbuscula*, *S. rigida*, *Sympegma regelii*, *Iljinia regelii*, *Nanophyton erinaceum*, *Krascheninnikovia ceratoides*, *K. compacta* and *Atriplex cana*. At the same time, this family occupies here an extremely divergent ecological status: it is represented at almost all altitudes, from the most arid and hot submontane deserts (*Iljinia regelii*) to the cold high altitude deserts (*Krascheninnikovia*) and wet alpine belt (*Microgynoecium tibeticum*), from solonchak bogs (*Chenopodium glaucum* and *Suaeda*) to exposed sand (*Agriophyllum pungens*) and rocks (*Sympegma regelii*). The species of this family, however, do not figure anywhere in the composition of closed coenoses and hence stand excluded from true steppes, meadows and forests.

Thirdly, this is the oldest and largest of native, primary desert families of Central Asian plants. It comprises a whole series of archaic relics and endemics with extensive and specialised distribution, both extinctive and progressive in character. Along with old genera, such as *Iljinia*, which stand as though frozen in their evolutionary process, having escaped the processes of morphological change, there are others, such as *Krascheninnikovia*, which are undoubtedly ancient but yet in the stage of intense morphological change. The taxonomic composition of this family and the

characteristics of the geographic distribution of its genera and species should undoubtedly reflect quite clearly and completely the basic stages in the evolutionary development of Central Asian arid flora and its relation to the flora of neighbouring arid countries. The independence and position of Central Asian flora among several other flora of the ancient Mediterranean can be judged from this relation. Without going into a detailed analysis of the taxonomic composition and geographic distribution of the taxa of this family for Central Asia, this being a major and special problem in itself, some very obvious conclusions directly emerging from the treatment of factual data and highly objective comparisons can be drawn.

1) An overwhelming number of genera (30 out of 37) and more than one-half of the goosefoot species (75 out of 158) are common to the Mongolian and Junggar-Turan provinces.

2) The goosefoot flora in the Mongolian province are fewer and less indigenous than even in the adjoining region of Junggar, not to speak of Junggar-Turan province as a whole. There are 105 species in the Mongolian province as against 132 in Junggar and 187 in Junggar-Turan province as a whole. Not even one strictly endemic genus and only 11 native species are found in Mongolia while Junggar has six genera and 57 species (12 genera and 112 species for the province as a whole) which are not encountered in the former; of these, six genera and 36 species are endemic or almost so in the province. Adding to this the eight genera and 13 species that are characteristic of the Junggar-Turan province and those seen only in adjoining Mongolia rarely and over a limited range as relics (*Nanophyton*, *Petrosimonia*, *Londesia*, *Ceratocarpus* and *Camphorosma* in north-western Mongolia; *Arthrophyton*, *Climacoptera* and *Borszczowia* in northern Kashgar), the number of genera and species differentiating non-Soviet Junggar from the Mongolian province is 14 and 70 respectively. In the Mongolian province, however, there are only 29 species not encountered in Junggar and only one genus (*Sympegma*) and five species (*Sympegma regelii*, *Anabasis brevifolia*, *Salsola abrotanoides*, *S. laricifolia* and *Kochia melanoptera*) which can be regarded as native to Mongolia but entering eastern Junggar, including the adjoining USSR territory.

Thus, taking into consideration these species, the Mongolian province differs from the non-Soviet Junggar only in one genus and 34 species.

3) None of the 14 genera or 70 species found in the non-Soviet Junggar province is endemic in that region; all of them are encountered even farther westward, in the Soviet part of Junggar-Turan province. But then, the spread of these genera and species eastward is strictly confined to the Adzhi-Bogdo meridian mountain range (see the maps of distribution ranges), which the author has adopted as the eastern border of the Junggar-Turan province for purposes of division.

Thus non-Soviet Junggar does not differ from the neighbouring Semi-reche region with respect to the flora of Chenopodiaceae and the border

mountain ranges of Junggar-Tarbagatai system cannot be regarded as a natural phytogeographic border between Kazakhstan and Central Asia, as emphasised in the works of Yunatov (1960) and Lavrenko (1926b; Lavrenko and Nikol'skaya, 1963)¹; contrarily, Junggar differs greatly in this respect from the Mongolian province and stands sharply demarcated.

4) The Chenopodiaceae of the Tibetan province are extremely few comparatively as well as absolutely. Only 36 species and 16 genera are found here, of which only one genus (*Microgynoecium*) and eight species may be regarded as Tibetan, but of these only three (*Corispermum*) are strictly confined within this province while the rest, including *Microgynoecium tibeticum*, extend into the high-altitude region adjoining Qaidam, Kashgar and Tien Shan. All native Tibetan species are undoubtedly young and non-endemic.

The occurrence of three species of the genus *Arthrophytum* (*A. balchashense*, *A. iliense* and *A. longibracteatum*), characteristic of the Junggar-Turan desert zone, in a small section west of northern Kashgar, is a particularly interesting feature of the geographic distribution of goosefoot in Central Asia. These species evidently bear the same relict character as Junggar-Turan genera (*Nanophyton*, *Petrosimonia*, *Londesia*, *Camphorosma* and *Ceratocarpus*) occurring similarly in the Bas. Lakes and Khobdos region of north-western Mongolia and probably share a common ancestry. They may have penetrated into Kashgar at a time when genuine deserts were already formed and not all the mountain ranges of Eastern Tien Shan rose to form a continuous chain. This may have occurred not earlier than the beginning of the Pliocene and not later than its end since the Tien Shan mountains had already formed by the beginning of the quaternary and almost reached their present height (Sinitsyn, 1962). The same explanation is evidently applicable even to the unexpected stray occurrence of Junggar-Turan genera and species in the northern part of eastern Kashgar: *Borszczowia aralocaspica* and *Climacoptera roborowskii* (scarcely distinguishable from *C. affinis*) in Khami basin and *Salsola soda* in Turfan. There were evidently gaps in the chain of Eastern Tien Shan in the Pliocene epoch through which these species penetrated from Junggar but later disappeared as a result of Quaternary orogenesis.

The isolated occurrence of such western Middle Asian species as *Suaeda arcuata* and *S. turkestanica* in western and north-western Kashgar call for a different explanation. These species, regarded to date as endemic in the Near East and Middle Asia, undoubtedly represent littoral-solonchak species according to their genesis and ecology. *S. turkestanica* is an extremely typical large annual subshrub; *S. arcuata* too attains large size with very long leaves. Their occurrence in Kashgar is evidently the heritage of a

¹For bibliography, see Vol. 1.

bygone epoch, namely the last Oligocene transgression of the so-called Tadjik sea which formed the Kashgar bay here. *Halopeplis pygmaea*, found in Lobnor, and *Suaeda crassifolia*, distributed more widely in Kashgar, are also nearly similar in genesis.

Their stray occurrence in Kashgar of two more solonchak species, *Atriplex fera* in Uchturfan region and *Salsola zaidamica* in Turfan region and Transaltay Gobi are enigmatic. The disposition of the first species is 1300 km away from the nearest point of its main range in Mongolia and that of the second species too is as distant from the then-known only site in eastern Qaidam. These reports can hardly be regarded as random occurrences. Do they not reflect the ancient links of Tarim with the Huang He basin as detected in the ichthyofauna of these rivers?

In conclusion, with the availability now of more complete and accurate data on the composition of the goosefoot family in Central Asia, it would be appropriate to compare them with the data for Northern and Central Sahara (see [Table 1](#)) taken from *Flore du Sahara Septentrional et Central* (Ozenda, 1958) in the manner done by Lavrenko (1962a) for the Gobi part of the Mongolian People's Republic.

Thus, there are 17 genera in Northern and Central Sahara and 34 in Central Asia, among which ten are common genera (underscored in [Table 1](#)), and 31 and 143 species respectively, of which only four are common (*Chenopodium murale*, *Ch. vulvaria*, *Atriplex dimorphostegia* and *Halocnemum strobilaceum*). If Junggar is eliminated from the reckoning, the following are the figures: 17 and 27 genera with nine common and 26 and 88 species, of which three are common. It should be emphasised, however, that the area of the Central Asian territory under comparison is far less than that of the Sahara which has been included in Ozenda's *Flore* ...

Thus, it can be seen that there is little commonality among the goosefoot flora under comparison. At the level of genera, it is mainly due to those distributed in all the continents: *Chenopodium*, *Atriplex*, *Bassia*, *Suaeda*, *Salicornia* and *Salsola*. Only two oligotypical genera—*Halocnemum* (one species) and *Halogeton* (two species)—are specific to the Mediterranean. Such a narrow commonality with respect to the most important desert family does not permit, in our view, combining the deserts of Sahara and Central Asia into a single Sahara-Gobi phytogeographic region, as suggested by Lavrenko (1960, 1962b). It would be more appropriate to refer only to the commonality of the flora within the framework of the entire ancient Mediterranean as a kingdom (region), as suggested by Popov (1972b).

The scheme of phytogeographic division of Central Asia, the sequence of listing the regions and abbreviations of their names adopted in the first volume of this series remain unchanged. Only minor modifications have been made in citing the general distribution of the species.

Table 1

Sl. No.	Genus	Northern and Central Sahara	Desert plains of Central Asia
1	<i>Beta</i>	1	–
2	<i>Chenopodium</i>	2	16
3	<i>Atriplex</i>	2	13
4	<i>Eurotia</i>	–	3
5	<i>Ceratocarpus</i>	–	2
6	<i>Camphorosma</i>	–	1
7	<i>Pandera</i>	–	1
8	<i>Karilowia</i>	–	1
9	<i>Londesia</i>	–	1
10	<i>Bassia</i>	1	3
11	<i>Kochia</i>	–	7
12	<i>Corispermum</i>	–	7
13	<i>Agriophyllum</i>	–	2
14	<i>Kalidium</i>	–	5
15	<i>Halopeplis</i>	–	1
16	<i>Halostachys</i>	–	1
17	<i>Halocnemum</i>	1	1
18	<i>Salicornia</i>	1	1
19	<i>Arthrocnemum</i>	1	–
20	<i>Suaeda</i>	2	16
21	<i>Borsczowia</i>	–	1
22	<i>Salsola</i>	6	23
23	<i>Climacoptera</i>	–	9
24	<i>Horaninowia</i>	–	2
25	<i>Girgensohnia</i>	–	1
26	<i>Anabasis</i>	6	6
27	<i>Fredolia</i>	1	–
28	<i>Arthrophytum</i>	–	4
29	<i>Iljinia</i>	–	1
30	<i>Hammada</i> ¹	2	–
31	<i>Haloxylon</i>	–	2
32	<i>Nanophyton</i>	–	1
33	<i>Halogeton</i>	1	1
34	<i>Micropeplis</i>	–	1
35	<i>Agathophora</i>	1	–
36	<i>Cornulaca</i>	1	1
37	<i>Traganum</i>	1	–
38	<i>Nucularia</i>	1	–
39	<i>Petrosimonia</i>	–	5
40	<i>Halimocnemis</i>	–	3
41 ²	<i>Sympegma</i>	–	1
		31	144

¹Species of *Haloxylon* in Ozenda's 'Flore... in fact are of genus *Hammada* Iljin.

²In this table four small genera, which are present in Central Asia and absent in Sahara, have been left out through oversight: *Aellenia* (1 species) *Axyris* (4), *Microgynoecium* (1) and *Spinacina* (1). As a result, the total number of Chenopodiaceae genera in Central Asia is 38 instead of 34. However this omission does not significantly alter the ratio between Sahara and Central Asia (in the favour of the latter) in the number of genera and species and does not alter the conclusion about a small floristic similarity between these regions.

For greater clarity and convenience in studying the distribution characteristics of species outside the limits of the non-Soviet part of Central Asia adopted here, the sequence of listing the regions of the common distribution of species, from this volume onwards, has been modified such that the regions of the USSR territory falling in Central Asia with respect to phytogeographic features are shown first (shown in italics in the list below), followed by the rest of the areas in the sequence that established earlier:

Aral-Casp., Balkh. reg., Jung.-Tarb., Nor. Tien Shan, Cent. Tien Shan, East. Pam.; Arct. (Eur. and Asian), Europe, Mediterr., Balk.-Asia Minor, Near East, Caucasus, Middle Asia, West. Sib. (Altay), East. Sib. (Sayans), Far East, Nor. Mong. (Hubs. Reg., Hent., Hang., Mong.-Daur.), China (Altay, Dunbei, Nor., Nor.-West., Cent., East., South-West., South., Hainan, Taiwan), Himalayas (west., east., Kashmir), Korea, Japan, Indo-Malay, Nor. Amer., South Amer., Afr., Austral., N. Zealand, panbor., cosmopolit.

In this volume, the plates of drawings were prepared by T.N. Shishlova, artist, and distributional maps by O.I. Starikova, senior laboratory assistant, and N.I. Nikol'skaya, laboratory assistant (for species *Salsola laricifolia*, *Iljinia regelii*, *Nanophyton erinaceum* and *Sympegma regelii*).

The manuscript of the present volume was scrutinised by V.P. Botschantzev, specialist in the goosefoot family and senior scientist at the Herbarium of V.L. Komarov Botanical Institute of the Academy of Sciences of the USSR. The compiler expresses his gratitude to him for several valuable suggestions which improved this volume.

TAXONOMY

SPECIAL ABBREVIATIONS

Abbreviations of the Names of Collectors

A. Reg.	— A. Regel
Bar.	— V.I. Baranov
Chaff.	— J. Chaffanjon
Chet.	— S.S. Chetyrkin
Ching	— R.C. Ching
Chu	— C.N. Chu
Divn.	— D.A. Divnogorskaya
Glag.	— S.A. Glagolev
Grombch.	— B.L. Grombchevsky
Grub.	— V.I. Grubov
Gus.	— V.A. Gusev
Ik.-Gal.	— N.P. Ikonnikov-Galitzky
Ivan.	— A.F. Ivanov
Kal.	— A.V. Kalinina
Klem.	— E.N. Klements
Krasch.	— I.M. Krascheninnikov
Kryl.	— P.N. Krylov
Lad.	— V.F. Ladygin
Ladyzh.	— M.V. Ladyzhensky
Lavr.	— E.M. Lavrenko
Lee	— A.R. Lee (1959)
Li et. al.	— S.H. Li et al. (1951)
Lis.	— V.I. Lisovsky
Mois.	— V.S. Moiseenko
Nov.	— V.F. Novitski
Pal.	— I.V. Palibin
Pavl.	— N.V. Pavlov
Petr.	— M.P. Petrov
Pob.	— E.G. Pobedimova
Pop.	— M.G. Popov
Pot.	— G.N. Potanin
Przew.	— N.M. Przewalsky

Pias.	— P.Ya. Piasezki
Rhins	— J.L. Dutreuil de Rhins
Rob.	— V.I. Roborowsky
Sap.	— V.V. Sapozhnikov
Serp.	— V.M. Serpukhov
Shishk.	— B.K. Shishkin
Shukh.	— V.N. Shukhardin
Shum.	— E.M. Shumakov
Sold.	— V.V. Soldatov
Tug.	— A.Ya. Tugarinov
Wang	— K.C. Wang
Yun.	— A.A. Yunatov
Zab.	— D.K. Zabolotnyi
Zam.	— B.M. Zamatkinov

Abbreviations of the Names of Herbaria

A	— Arnold Arboretum: U.S.A., Jamaica Plain, Mass.
BM	— British Museum of Natural History; Great Britain, London
E	— Royal Botanic Garden: Edinburgh, Scotland: Great Britain
K	— The Herbarium, Royal Botanic Gardens: Great Britain, Kew, Surrey
Linn.	— The Linnean Society of London: Great Britain, London
PE	— Peiping (Peking (Beijing)) Inst. Bot. Ac. Sci.: China
TAK	— University Herbarium, Taschkent (Tashkent), USSR

Family 40. CHENOPODIACEAE Less.

1. Plants succulent and jointed; intact on drying (only young branches disintegrate in the case of *Halostachys*), glabrous; leaves absent, if present short and cylindrical; flowers embedded, solitary or in spicate inflorescences.....2.
- + Flowers not embedded. Plants mostly foliate; if segmented and aphyllous, with hairs in joints; year-old branches readily disintegrating on drying.....6.
2. Annuals.....3.
- + Shrubs or semishrubs4.
3. Branches opposite..... 20. **Salicornia** L. (*S. europaea* L.).
- + Branches alternate17. **Halopepls** Bunge (*H. pygmaea* (Pall.) Bunge).
4. Branches and leaves alternate..... 16. **Kalidium** Moq.
- + Branches opposite, leaves absent..... 5.

5. Fairly large, erect shrub with lax branches; branches verruculose; inflorescences stalked 18. **Halostachys** C.A. Mey. (*H. caspica* (M.B.) C.A. Mey.).
+ Procumbent, highly branched semishrub forming flat round beds; tender shoots glabrous; inflorescences sessile..... 19. **Halocnemum** M.B. (*H. strobilaceum* (Pall.) M.B.).
6. Plants jointed, readily disintegrating at joints on drying, with hairs in joint axils, branches opposite; leaves absent or cylindrical. Trees or shrubs and semishrubs 7.
+ Plants not jointed, not disintegrating on drying; sometimes entire inflorescences and young branches (*Iljinia* Korov.) shedding at joints during autumn; in that case, leaves alternate..... 9.
7. Trees or fairly tall shrubs with distinct trunk; leaves not developed or squamiform. Flowering branches appearing only on mature shoots of preceding year; flowers single, opposite in pairs, on lower nodes of branches, sometimes on upper ones. Seeds horizontal, fruits with extended perianth wings 31. **Haloxylon** Bunge.
+ Highly branched small, semishrub without distinct main trunk, with short warped trunk or caudex; leaves usually developed, cylindrical. Flowering branches appearing on green shoots of same year; flowers on upper nodes. Perianth wings set upwards, sometimes extended..... 8.
8. Fruits horizontal; all five perianth lobes forming extended wings near fruit. Anthers with appendage. Flowers single 29. **Arthrophytum** Schrenk.
+ Fruits vertical; all five or only three perianth lobes forming wings near fruit, or perianth totally apterous. Anthers without appendage. Flowers single or in 2s or 3s 28. **Anabasis** L.
9. Leaves flat (many times broader than thick), usually petiolate with distinct 1-3-ribbed blade, rounded and broadly triangular to lanceolate; if linear, thin and pubescent, like whole plant 10.
+ Leaves cylindrical, semicylindrical, subulate, cylindrical or squamiform, mostly sessile, less frequently petiolate; flat leaves filiform or linear, if thick, glabrous like whole plant; leaf only slightly broader than thick..... 23.
10. Plants pubescent with branched, stellate or bushy hairs..... 11.
+ Plants totally glabrous or with farinaceous bloom or covered with simple hairs 15.
11. Pubescence due to stellate hairs. Fruits concealed in connate bracteoles or in free perianth lobes, in which case shedding readily; not flat..... 12.
+ Pubescence due to branched or bushy hairs. Fruits flat or planoconvex, open, shedding readily; perianth lobes very small, scarious 14.