ISSN 2518-1629 (Online),
ISSN 2224-5308 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ
Өсімдіктердің биологиясы және биотехнологиясы институтының

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН
Института биологии и биотехнологии растений

N E W S

OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
of the Institute of Plant Biology and Biotechnology

БИОЛОГИЯ ЖӘНЕ МЕДИЦИНА СЕРИЯСЫ

♦

СЕРИЯ БИОЛОГИЧЕСКАЯ И МЕДИЦИНСКАЯ

♦

SERIES OF BIOLOGICAL AND MEDICAL

2 (326)

НАУРЫЗ – СӘУІР 2018 ж.
МАРТ – АПРЕЛЬ 2018 г.
MARCH – APRIL 2018

1963 ЖЫЛДЫҢ ҚАҢТАР АЙЫНАН ШЫҒА БАСТАҒАН
ИЗДАЕТСЯ С ЯНВАРЯ 1963 ГОДА
PUBLISHED SINCE JANUARY 1963

ЖЫЛЫНА 6 РЕТ ШЫҒАДЫ
ВЫХОДИТ 6 РАЗ В ГОД
PUBLISHED 6 TIMES A YEAR

АЛМАТЫ, ҚР ҰҒА
АЛМАТЫ, НАН РК
ALMATY, NAS RK

«ҚР ҰҒА Хабарлары. Биология және медициналық сериясы».
ISSN 2518-1629 (Online),
ISSN 2224-5308 (Print)
Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.)
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 01.06.2006 ж. берілген **№5546-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік

Мерзімділігі: жылына 6 рет.
Тиражы: 300 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18, www:nauka-nanrk.kz / biological-medical.kz

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Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

«Известия НАН РК. Серия биологическая и медицинская».
ISSN 2518-1629 (Online),
ISSN 2224-5308 (Print)
Собственник: РОО «Национальная академия наук Республики Казахстан» (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№5546-Ж**, выданное 01.06.2006 г.

Периодичность: 6 раз в год
Тираж: 300 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел. 272-13-19, 272-13-18,
www:nauka-nanrk.kz / biological-medical.kz

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of biology and medicine.
ISSN 2518-1629 (Online),
ISSN 2224-5308 (Print)
Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of information and archives of the Ministry of culture and information of the Republic of Kazakhstan N 5546-Ж, issued 01.06.2006

Periodicity: 6 times a year
Circulation: 300 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://nauka-nanrk.kz / biological-medical.kz

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

B I O L O G Y

N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF BIOLOGICAL AND MEDICAL
ISSN 2224-5308
Volume 2, Number 326 (2018), 61 – 68

UDC 582.31 (574. 54)

S. M. Adekenov[1], A. N. Kupriyanov[2], D. T. Alibekov[1], E. M. Gabdullin[1]

[1]JSC International Research and Production Holding "Phytochemistry", Karaganda, Kazakhstan,
[2]Federal Research Center of Coal and Coal Chemistry of SB RAS, Kemerovo, Russia.
E-mail: phyto_pio@mail.ru; kupr-42@yandex.ru

ENDEMISM OF FLORA OF THE BOLSHIE BARSUKI SANDS

Abstract. The article presents the results of expeditions to the Bolshie Barsuki sands. The floral composition and life forms have been reviewed, specific locations of 11 endemic species according to herbarium materials are indicated.

Keywords: Bolshie Barsuki, flora, endemic species.

Introduction. The Bolshie Barsuki sands are one of the largest sand massifs of Northern Priaralye (an area North of the Aral Sea). They stretch as a strip about 24 km wide narrowing down in the central part up to several kilometers and expanding in the south up to 80 km, and the massif is spreading throughout 200–250 km from the Aral Sea to Shalkar city. The Bolshie Barsuki sands belong to psammophyte type of Northern and Central deserts and are related to the West-North Turansub-province of the North Turan province [1].

Study of flora of the Bolshie Barsuki sand massifs in the 18–19th centuries began with the first expeditions of the Russian natural scientists P. S. Palass, A. A. Bunge, A. Lehman, I. Borshchev [2]. At the beginning of the 20th century, an unprecedented in scale Project of botanical research in Russia was initiated. It was connected with Stolypin agrarian reforms and resettlement of poor peasants from the Central regions of Russia to Siberia and Central Asia. For this reason, the Resettlement Administration was created. To explore the soil and plant conditions in Siberia and Central Asia from 1908 to 1914, it had financed 86 expeditions covering practically all Asian part of Russia including the territory of Turgai region. Expeditions included many botanists working in the Bolshie Barsuki: V. P. Drobov, V. I. Lipsky, I. M. Krasheninnikov, V. F. Kapelkin, V.I. Smirnov [3], V. A. Dubyansky, B. A. Fedchenko [4]. At present, S. A. Aipeisova has been researching the flora of Aktobe region [5].

Wormwood vegetation of predominantly *Dracunculus* subgenus is common for the Northern part of the Bolshie Barsuki on sandhills: *Artemisia arenaria* DC., *A. quinqueloba* Trautv., *A. tomentella* Trautv. On slightly and strongly saline soils dominateworm wood communities such as *A. lerchiana* Weber, *A. pauciflora* Weber, *A. semiarida* (Krasch. & Lavrenko) Filatova, while at the Paleozoic clayoutcrops – *A. camelorum* Krasch. Psammophilous bushes and undershrubsare common for the central and southern parts of sands (variousspecies of *Calligonum*, *Ephedra*, *Ammodendron*, *Kraschenninnikovia ceratoides* (L.) Gueldenst., *Salsola arbuscula* Pall.), and also wormwood: *Artemisia santolina* Schrenk, *A. songarica* Schrenk, *A. terrae-albae* Krasch. Near sandhill territories we meet saltwort (*Anabasis salsa* (C.A.Mey.) Benth. ex Volkens, *Salsola arbusculiformis* Drob., S. *orientalis* S.G.Gmel., *Nanophyton erinaceum* (Pall.) Bunge) and wormwood (*Artemisia turanica* Krasch., *A. terrae-albae* Krasch.) communities [1, 6].

Despite the long history of research, flora of the Bolshie Barsukisand massifs and habitats of endemic plants have been insufficiently studied which stood to reason to undertake the given research.

Materials and research methods. Expeditions were conducted in May–June, 2017 along the Bolshie Barsuki sandmassif. Radial routes crossed sand massifs in the North-East and South-West (figure 2). The main types of vegetation were determined: saltwort-wormwood, psammophilous-cereal, psammophilous-wormwood, psammophilous-shrubby deserts, solonetzic soils, saline soils, solonetzic meadows.

Figure 1 – General view of the Bolshie Barsuki sands

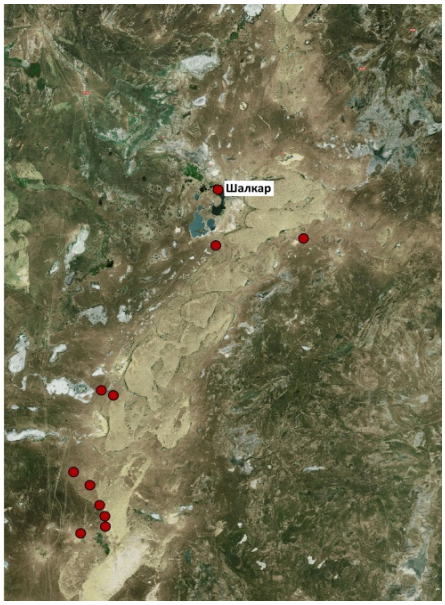

Figure 2 – Flora research locations

During the expedition over 600 herbarium sheets (KG, KUZ) were collected. According to the preliminary data, 287 plant species belonging to 39 families were found in the investigated territory. Eleven endemic species were determined. Floristic features were described and vital conditions estimated to characterize the habitat of each endemic species.

Results and discussion. *Artemisia albicerata* Krasch. 1946, Bot. mat. herb. BIN of Academy of Sciences of the USSR, 9:173; Filatova 1966, Fl. Kaz. 9: 110; Li, 1993, Opr. rast. of Sr. Asia, 10: 561.

The plant is similar to *A. arenaria* DC, widely spread in the Bolshie Barsuki, but differs from it bysimple leaves cut and far too extended leaf segments. Besides, stalks in the lower part of*A. albicerata* Krasch. have white hairswhile at *A. arenaria* DC has straw-coloredones.

N. S. Filatova [7] considered that *A. albicerata* Krasch. outspread on the sand massifs to the South from Lake Balkhash, upstream of the river Ili. A.D. Li [8] believed that it expandeditshabitat including Betpakdala, Priaral Deserts, lower reaches of the Chu and Sarysu rivers. Our research confirms the location of *A. albicerata* Krasch. in the Priaral sands. Itis the first time it has ever been found in the territory of Aktobe region [5].

The main habitats are crushed rock sands along the roads and sites trampled down by cattle.

Aktobe region, the Bolshie Barsukisands, in the vicinity of Baykadam village, plenty, 09 VI 2017, D. Alibekov, E. Gabdullin; same place, in the vicinity of Eset-Ata village, 13 VI 2017, D. Alibekov, E. Gabdullin; same place: Shalkar district, coast of Shalkar Lake, territory of Shalkar experimental station, 47 ° 50 °33' NL, 59 °34' EL, 173 m, 14 VI 2017, A. Kupriyanov.

A. albicerata Krasch. forms floristic complexes of psammophilous wormwoods which are common for the Northern part of Bolshie Barsuki. According to L.Y. Kurochkina [9] these floristic complexes are distinctive for a certain stage of syngenesis, overgrown wind-blown sands. It includes *Artemisia arenaria* DC, *Calligonum aphyllum* (Pall.) Guerke, *Ammodendron bifolium* (Pall.) Yakovlev, *Leymus racemosus* (Lam.) Tzvel., *Festuca beckeri* (Hack.) Trautv., *Koeleria glauca* (Spreng.) DC., *Euphorbia seguieriana*

Neck., *Syrenia siliculosa* (M.Bieb.) Andrz., *Hyalea pulchella* (Ledeb.) K.Koch, *Achillea micrantha* Willd., *Helichrysum maracandicum* M.Pop.

Artemisia aralensis Krasch. 1936, Spisok rast. Herb. Fl. USSR, 10: 105; Pavlov, 1938, Fl. Centr. Kaz., 3: 272; Nasimova, 1993, Opr. rast. Sr. Asia, 10: 569. (figure 4).

Figure 3 – *Artemisia aralensis* Krasch.

Figure 4 – *Artemisia quinqueloba* Trautv.

N. S. Filatova [10] refers*A. aralensis* Krasch. to the section *Sclerophyllum* Filat, Kazachstanicae Filat subsection. Twice-divided leaf blades are its characteristic feature. *A. aralensis* Krasch. is close to *A. camelorum* Krasch. but has higher and stronger stalks, insignificant stiffeningof the shootbases and longer leaf segments.

The plant is endemic and can be found in the far West of the Kazakh Melkosopochnik (Kazakh Uplands), in Turgai Hollow, the Caspian Depression, valley of the Syr Darya River.

The plant grows on the salted clay courses of temporary water currents, on clay slopes of precipices, ravines, in lowlands and on the edge of sandhills. This plant is quite rare on suburbs of sand massifs.

Aktobe region, the Bolshie Barsuki sands, on clay slopes, 17 VI 2017, D. Alibekov, E. Gabdullin.

A. aralensis Krasch. forms floristic complexes with *Atriplex cana* C.A.Mey., *Nanophyton erinaceum* (Pall.) Bunge, *Halimione verrucifera* (M.Bieb.) Aellen, *Halocnemum strobilaceum* (Pall.) M.Bieb., *Climacoptera* sp., *Limonium suffruticosum* (L.) Kuntze, *Frankenia pulverulenta* L., *Nitraria schoberi* L., *Artemisia pauciflora* Weber., *Leymus angustus* (Trin.) Pilg., *Glycyrrhiza korshinskyi* Grig., *Krascheninnikovia ceratoides* (L.) Gueldenst.

Artemisia camelorum Krasch. 1930, Mat. komis. eksped. issl. 26: 272; Filatova 1966, Fl. Kaz. 9: 126; Bakanova. 1993, Opr. rast. Sr. Asia, 10: 569.

The plant was described in the vicinityof Shalkar(former Czelkar) [11] and its originalhabitat covered exclusively desert regions of the Central Kazakhstan (Turgai, Shalkar, Kyzylorda) [12] which is supported by the numerous herbarium collections found in the West and North of the Bolshie Barsuki sand massif and stored in St. Petersburg (LE). Collections of the past decades (KG) show that *A. camelorum* Krasch. penetratesinto the territory of Kazakh Melkosopochnik through tertiary multicoloured clays [13].

Outcrops of tertiary carbonate clays are found on the outskirts of sand massifs.

Aktobe region, Shalkar district, coast of ShalkarLake, territory of Shalkar experimental station, clay outcrops 47 °50'335" NL, 59 °34'804" EL, 173 m, 16 VI 2017, A. Kupriyanov.

A. camelorum Krasch. forms plant communities on solonetzic soils including *Agropyron fragile* (Roth) P.Candargy, *Alhagi pseudalhagi* (M.Bieb.) Fisch., *Tanacetum achilleifolium* (M.Bieb.) Sch. Bip., *Atriplex cana* C.A.Mey., *Camphorosma monspeliaca* L., *Ceratocarpus utriculosus* Bluket, *Limonium macrorhizon* (Ledeb.) Kuntze, *Zygophyllum fabago* L., *Tragopogon dubius* Scop.

Artemisia halophila Krasch. 1930, Mat. komis. eksp.issl. 26: 272; Filatova, 1966, Fl. Kaz. 9: 117; Nasimova, 1993, Opr. rast. Sr. Asia, 10: 567.

N. S. Filatova [10] refers it to the numerous section of *Halophyllum* Filat., *Aralocaspicae* Filat subsection to which also belong the desert-Kazakh complex of wormwoods with twice- or thrice-divided leaf blades. It is characterized by juicy rollleaf segments.

The plant is endemic and grows in deserts of the Central and South Kazakhstan (Betpakdala, Priaral region, Muyunkum, Ustyurt, Mangyshlak, Kyzylkum, Karakum).

The plant is found on the salty gypsiferous clays, saline soils, temporary waterways and outskirts of springs and wells.

Aktobe region, the Bolshie Barsuki sands, in the vicinity of Zhanaturmys village, on temporary waterways, 12 VI 2017, D. Alibekov, E. M. Gabdullin; same place: Shalkar district, 50 km to the South from Shalkar village, on temporary waterways, saline soils. 47 °25'480" NL, 59 °14'220" EL, 337 m, A. Kupriyanov.

A. halophila Krasch. forms floristic complexes with *Elaeagnus angustifolia* L., *Salix caspica* Pall., *Halimodendron halodendron* (Pall.) Voss, *Tamarix hispida* Willd., *Phragmites australis* (Cav.) Trin. ex Steud., *Puccinellia distans* (Jacq.) Parl., *Achnatherum splendens* (Trin.) Nevski, *Glycyrrhiza glabra* L., *Plantago salsa* Pall., *Thalictrum flavum* L., *Ranunculus repens* L., *R. sceleratus* L., *Lepidium latifolium* L., *L. perfoliatum* L.

Artemisia quinqueloba Trautv. 1866, in Bull. Soc. Nat. Mosc. 1: 348; Filatova, 1966, Fl. Kaz. 9: 110; Adylov, 1993, Opr. rast. Sr. Asia, 10: 560.

This plant is neoendemic and its formation is associated with a climate aridization in the Holocene. It differs from a more widespread *A. arenaria* DC by a subshrub life-form with stiffening of shoots up to the middle of the stalk. Leaves of *A. quinqueloba* Trautv., unlike *A. arenaria* DC,are densely pressed hairy.It is an endemic plant of the Central and South Kazakhstan (Pribalkhash deserts, Priaral region, Embinskoe plateau, lower courses of the Chu and Sarysu Rivers).

On the barchan, wind-blown sands, it forms a core of the psammophilous-wormwood deserts of the Priaral region [1].

The Bolshie Barsuki sands, in the vicinity of Baykadam village, plenty, 09 VI 2017, D. Alibekov, E.M.Gabdullin; same place: Shalkarsky district, in the vicinity of Baykadam village, the Bolshie Barsuki sands, sand ringes , 47 °08'809" NL, 59 °14'930" EL, 190 m, 10 VI 2017, A. Kupriyanov.

A. quinqueloba Trautv. forms peculiar arenophilouscommunities including the following:*Calligonum aphyllum* (Pall.) Guerke, *Ammodendron bifolium* (Pall.) Yakovlev, *Leymus racemosus* (Lam.) Tzvel., *Syrenia montana* (Pall.) Klokov, *Isatis sabulosa* Stev. ex Ledeb., *Alyssum desertorum* Stapf, *Gypsophila paniculata* L., *Silene wolgensis* (Hornem.) Besser ex Spreng., *Chondrilla ambigua* Fisch. ex Kar. & Kir.,*Helichrysum arenarium* (L.) Moench.

Artemisia saissanica (Krasch.) Poljak. et Filat. 1963, in Tr. In-ta Bot. AN KazSSR 15: 234; Filatova, 1966, Fl. Kaz. 9: 127; Bakanova. 1993, Opr. rast. Sr. Asia, 10: 576.

In 1936, I. M. Krasheninnikov [14] described *Artemisia mongolorum* Krasch. This wormwood was described in Mongolia, later it was he again who distinguished subspecies *ssp saissanica*in Flora of Western Siberia [15] (Krasheninnikov in P. N. Krylov, 1949). N. S. Filatova raised the wormwood rank up tospecies *A. saissanica* (Krasch.) Poljak. et Filat.leaving itas an endemicof Zaysan hollow [16]. Nowadays, *A. saissanica*(Krasch.) Poljak. et Filat. is found in the Kazakh Melkosopochnik [14]

N. S. Filatova [10] placed *A. saissanica* (Krasch.) Poljak. et Filat. in the section *Halophylum* Filat., in a combined subsection *Mongolicae* Filat. This subsection hosts species with twice-, thrice-pinnately divided leaf blades, which are densely hairyat the beginning and lesshairy at the end of vegetation. *A. saissanica* (Krasch.) Poljak. et Filat. is rather close to *A. scopaeformis* Ledeb., but usually differs from it by twice-pinnatelydevided leaves and more compact panicle, more succulent segments of the lower stem leaves. *A. saissanica* (Krasch.) Poljak. et Filat. replaces the steppe *A. nitrosa* Weber.in a belt of Northern deserts.

Geographic range of *A. saissanica* (Krasch.) Poljak. et Filat. stretchesa narrow strip from the Zaysan hollow through the coast of BalkhashLake, the steppe rivers (Sarysu, Kon, Kulanotpes), up to Shalkar saline soils. The plant has been reported for Aktobe region for the first time on wet solonetzic soils and saline soils, salty riverbanks and lake coasts.

Aktobe region, Shalkar district, the coast of Shalkar Lake, the territory of Shalkar experimental station, sandy disrupted soils, 47 °50'335" NL, 59 °34'804" EL, 173 m, 14 VI 2017, A. Kupriyanov; same

place: 50 km to the South from Shalkar village, temporary waterway, saline soils, 47 °25'480" NL, 59 °14'220" EL, 337 m, 10. VI 2017, A. Kupriyanov.

The plant forms floristic complexes on the damp saline soils including*Tamarix hispida* Willd., *Phragmites australis* (Cav.) Trin. ex Steud., *Bassia sedoides* (Pall.) Asch., *Chenopodium album* L., *Salicornia europaea* L., *Camphorosma lessingii* Litv., *Artemisia lerchiana*, *A. austriaca* Jacq.*A. schrenkiana* Ledeb., *Aeluropus lagopoides* subsp. *repens* (Desf.) Tzvel. (*A. repens* (Desf.) Parl.), *Juncus jaxarticus* V. Krecz. & Gontsch., *Lepidium latifolium* L.

Artemisia tomentella Trautv. 1866, in Bull. Soc. Nat. Mosc. 39, 1: 351; Filatova, 1966, Fl. Kaz., 9: 108; Adylov, 1993, Opr. rast. Sr. Asia, 10: 562.

N. V. Pavlov [12] indicated a small endemic habitat of *A. tomentella* Trautv in the sands of Aktobe region. However, later even wider area of this wormwood in the territory of Kazakhstan wasdetected [16]. Two contrast habitats are favourablefor its growth: on the crushed rock and stony slopes of low mountains and on light sandy soils. In the Bolshie Barsuki sands itgrows in places with disrupted soil and vegetation cover as a result of cattle pasture. Outside sand massifs it is found in the Mugodzhar mountains.

Aktobe region, the Bolshie Barsuki sands, in the vicinity of Baykadam village, on sandy soils, plenty, 09 VI 2017, D. Alibekov, E. Gabdullin; same place: in the vicinity of Sarysay village, the Mugodzhar mountains, stony slopes. 48 °27'213" NL, 58 °30'812" EL, 337 m, 15 VI 2017, A. Kupriyanov.

In the Bolshie Barsuki sands *A. tomentella* Trautv. forms communities with*Calligonum aphyllum* (Pall.) Guerke, *Agropyron desertorum* (Fisch. ex Link) Schult., *Koeleria glauca* (Spreng.) DC., *Astragalus brachypus* Schrenk, *Ammodendron bifolium* (Pall.) Yakovlev, *Artemisia arenaria* DC., *Senecio subdentatus* Ledeb.

Echinops albicaulis Kar. et Kir.1842, Bull. Soc. Nat. Mosc. 15: 387; Goloskokov, 1966, Fl. Kaz. 9: 181; Li, 1993, Opr. rast. Sr. Asia, 10: 235.

It is an endemic plant of the Central and West Kazakhstan growing in the Northern deserts on sands, sabulous soils, often in spots where lands are subject to the intensive pasture, sometimes foundalongthe shoulders of steppe roads.

Aktobe region, the Bolshie Barsuki sands, in the vicinity of Eset-Ata village, 15 VI 2017, D. Alibekov, E. Gabdullin.

It forms peculiar psammophilous communities including the following: *Leymus racemosus* (Lam.) Tzvel., *Allium caspium* (Pall.) M.Bieb., *Scorzonera ensifolia* M.Bieb., *Artemisia arenaria, A. quinqueloba, A. lerchiana,Chondrilla ambigua* Fisch. ex Kar. & Kir., *Gypsophila paniculata* L., *Carex physodes* M.Bieb., *Allium turkestanicum* Regel, *Eremopyrum orientale* (L.) Jaub. & Spach, *Euphorbia seguieriana* Neck., *Ferula sibirica* Willd. (= *Soranthus meyeri* Ledeb.).

Jurinea xerophytica Iljin, 1962, Fl. USSR. 27: 716, 549; Fisyun, 1966, Fl. Kaz. 9: 287; Chern. and Tsukerv., 1993, Opr. rast. Sr. Asia, 10: 381.

Figure 5 – *Echinops albicaulis* Kar. et Kir.

Figure 6 – *Jurineaxerophytica*Iljin

It differs from the West Siberian species *Jurinea schischkiniana* Iljin by slightly curved and very twiggy stalks. Usually it grows on the inter-dune lowlands, risesonthe sand ringes, less frequently found near sandhills on the loamy salted soils. It is an endemic of Kazakhstan.

Aktobe region, in the vicinity of Shalkar village, on sandy soils, 09 VI 2017, D. Alibekov, E. Gabdullin.; same place: Shalkar district, in the vicinity of Beymbet village, the Bolshie Barsuki sands, sand ringes, 47 °08'809" NL, 59 °14'930" EL, 190 m, 10 VI 2017, A. Kupriyanov.

J. xerophytica Iljin forms psammophilous communities including *Agropyron desertorum* (Fisch. ex Link) Schult., *Acanthophyllum korolkowii* Regel et Schmalh., *Artemisia lerchiana* Weber., *Kochia prostrata* (L.) Schrad., *Euphorbia seguieriana* Neck., *Filago arvensis* L., *Chondrilla ambigua* Fisch. ex Kar. & Kir.

Tanacetum saxicola (Krasch.) Tzvel. 1961, Fl. USSR, 26: 342. – Vasil. 1966, Fl. Kaz., 9: 61; Koval., 1993, Opr. rast. Sr. Asia, 10: 613 – *Pyretrum kasakstanicum* ssp. *saxicola* Krasch. 1946, Bot. Mat. Herb. BIN of Academy of Sciences of the USSR, 9: 162.

This is an endemic of Kazakhstan, described in the Mugodzhar mountains: "Aktobe region, the Mugodzhar Hills, elevated ridge near the Boktubay mountain, in the vicinity of Berchogur village, 26 VI 1927, n°587, I. Krasheninnikov" (LE). The plant is morphologically close to the other endemic, *T. scopulorum* (Krasch.) Tzvel., but differs by shorter calathid legs and largelyspacedleaf segments. It grows near sand massifs on the saline clay soils, rarelyon the inter-dunelowlands in similar conditions.

Aktoberegion, the Bolshie Barsuki sands, in the vicinity of Baykadam village, on clay soils, 09 VI 2017, D. Alibekov, E. Gabdullin; same place: Shalkar district, in the vicinity of Baykadam village, the Bolshie Barsuki sands, the saline steppe. 47 °08'809" NL, 059°14'930" EL, 190 m, A. Kupriyanov.

T. saxicola (Krasch.) Tzvel. forms communities with participation of *Agropyron fragile* (Roth) P.Candargy, *Stipa capillata* L., *Leymus angustus* (Trin.) Pilg., *Ferula caspica* M.Bieb., *F. canescens* (Ledeb.) Ledeb., *Artemisia camelorum* Krasch., *Agropyron fragile* (Roth) P.Candargy, *Atriplex cana* C.A.Mey., *Camphorosma monspeliaca* L., *Ceratocarpus arenarius* L., *Limonium gmelinii* (Willd.) Kuntze.

Tragopogon dubjanskyi Krasch. & S.A.Nikitin. 1930, Otch. o rab. Pochv. Bot. otr. Kazakhst. eksped. Academy of Sciences of the USSR, 4, 2: 289; Pavl., 1938, Fl. Centr. Kaz., 3: 338; Tsagol., 1966, Fl. Kaz. 9: 436; Li, 1993, Opr. rast. Sr. Asia, 10: 223.

A.G. Borisova [17] referred*T. dubjanskyi* Krasch. & S.A.Nikitin to the section *Nikitinia* Boriss., which incorporated *Tragopogons* with not incrassated flower stalks and calathidstied on short flower stalks into compound panicle inflorescence. The plant was described from Kok-Dzhida sands on the Emba River [18]. N.V. Pavlov [12] considered it as an endemic of the West Kazakhstan sands.

Aktobe region, the Bolshie Barsuki sands, on sands, in the vicinity of Eset-Ata village, 13 VI 2017, D. Alibekov, E. Gabdullin; same place: in the vicinity of Beymbet village, the Bolshie Barsuki sands,

Figure 7 – *Tanacetum saxicola*(Krasch.) Tzvel.

Figure 8 – *Tragopogon dubjanskyi*Krasch. & S.A.Nikitin.

sand ringes, 47°08'809" NL, 59°14'930" EL, 190 m, 09 VI 2017, A. Kupriyanov; same place coast of Shalkar Lake, territory of Shalkar experimental station, sandy soils, 47 °50'335" NL, 59°34'804" EL, 17 m, 10 VI 2017, A. Kupriyanov.

The plant is anobligatory psammophyte, it can rather seldom be encountered on the undisrupted or slightlydamagedsand ridges. The communities formed by *T. dubjanskyi* Krasch. & S.A.Nikitin have few speciesincluding *Calligonum caput-medusae* Schrenk, *Ammodendron bifolium* (Pall.) Yakovlev, *Leymus racemosus* (Lam.) Tzvel., *Syrenia montana* (Pall.) Klokov, *Isatis sabulosa* Stev. ex Ledeb., *Silene olgiana* B. Fedtsch., *Dodartia orientalis* L., *Eremurus inderiensis* (Steven) Regel, *Euphorbia seguieriana* Neck.

Endemic elements can traditionally be subdivided into paleoendemics (regressive or relic endemics) and neoendemics (progressive endemics). Paleoendemics are usually represented by certain remains (relicts) from the previous development stages of the vegetation cover [19]. The presence of a large number of neoendemics in the floralcompositionproves the intensive speciation processes in this territory. Taxonomic isolation in modern flora is common forpaleoendemics, i.e. from the systematic viewpoint they are neatlyseparated from the immediate family members in this flora; they often have a discontinuous, relic area and grow on quite specific and rare habitats. In contrast, new (progressive) endemics have family relations with other species in the same territory; besides, sometimes it is also possible to reveal the progenitors of any given endemic among these related species. *Artemisia camelorum* Krasch., which bears small resemblanceto wormwoodswith habitats in the ancient Mediterranean [10] (*Artemisia gracilescens* Krasch. Et Iljin, *A. lerchiana* Weber*., A. pauciflora* Weber.), may be referred to paleoendemics of the Bolshie Barsukisands. The majority of neoendemics are closely related to the morphologically similarspecies growing in the territory of desert Kazakhstan; these endemics, as a rule, have formed rather recently in the interface zones of related species and are often represented by hybrid populations. Neoendemics usually tend to expandtheir habitatsduring the modern period. First and foremost,it is truefor the numerous endemic races of wormwoods of the subgenus *Dracunculus* (Bess.) Rybd.: *Artemisia albicerata* Krasch*., A. quinqueloba* Trautv*., A. tomentella* Trautv.. These wormwoods have a constantly extending area which is a sign of neoendemism [20]. *Artemisia aralensis* Krasch*., A. halophila* Krasch*., A. saissanica* (Krasch.) Poljak. et Filat., likelyformed after the regression of Turan Sea [21], shall also be referred to this group. Overall, endemism of the Bolshie Barsuki sands flora is 3,8% from the studied flora which can be explainedby the lack of isolation from the surrounding territory during the formation of sand massifs. On the other hand,more large-scale researchof this territoryis deemed necessary.

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С. М. Әдекенов[1], А. Н. Куприянов[2], Д. Т. Әлібеков[1], Е. М. Ғабдуллин[1]

[1]«Фитохимия» халықаралық ғылыми-өндірістік холдингі» АҚ, Қарағанды, Қазақстан,
[2]РҒА СБ «Көмір және көмір химиясы федералдық зерттеу орталығы», Кемерово, Ресей

ҮЛКЕН БОРСЫҚТАР ҚҰМДАРЫ ФЛОРАСЫНЫҢ ЭНДЕМИЗМІ

Аннотация. Мақалада үлкен борсықтар құмдарына ұйымдастырылған экспедицияның нәтижелері қарастырылады. Флоралық құрамы, тіршілік түрлері қарастырылған, кеппешөп материалдары бойынша 11 эндемикалық түрдің жиналған нақты орындары келтірілген.

Түйін сөздер: үлкен борсықтар, флора, эндемикалық түрлер.

С. М. Адекенов[1], А. Н. Куприянов[2], Д. Т. Алибеков[1], Е. М. Габдуллин[1]

[1]АО «Международный научно-производственный холдинг «Фитохимия», Караганда, Казахстан,
[2]Федеральный Исследовательский центр угля и углехимии СО РАН, Кемерово, Россия

ЭНДЕМИЗМ ФЛОРЫ ПЕСКОВ БОЛЬШИЕ БАРСУКИ

Аннотация. В статье рассматриваются результаты экспедиций в пески Большие Барсуки. Рассмотрен флористический состав, жизненные формы, приведены конкретные места сборов 11 эндемичных видов по гербарным материалам.

Ключевые слова: Большие Барсуки, флора, эндемичные виды.

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http://www.biological-medical.kz/index.php/ru/

Редактор *М. С. Ахметова, Т. М. Апендиев, Д. С. Аленов*
Верстка на компьютере *Д. Н. Калкабековой*

Подписано в печать 26.03.2018.
Формат 60x881/8. Бумага офсетная. Печать – ризограф.
9,4 п.л. Тираж 300. Заказ 2.