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Vegetation of screes of the montane and colline zones in the Pamir-Alai Mts in Tajikistan (Middle Asia)

Die Schuttvegetation der montanen und kollinen Zone des Pamir-Alai-Gebirges in Tadschikistan (Mittelasien)

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Abstract

This paper is the continuation of a survey of the scree vegetation in alpine landscapes of western Pamir-Alai Mts in Tajikistan. In total, 105 phytosociological relevés were collected in the colline and montane belt in 2012–2014, applying the Braun-Blanquet method. Phytocoenoses inhabiting mobile or fairly stabilised screes of different sizes of rock particles in the montane and colline zone are herein described. A hierarchical syntaxonomic synopsis of scree communities in the western Pamir Alai Mts is provided. The collected vegetation samples represent the majority of the variations among the phytocoenoses of gravel, pebble, cobble and rock block slides and screes. As a result of field survey and numerical analyses, eight associations – *Cousinietum corymbosae*, *Eremostachyetum tadschikistanicae*, *Cousinietum refractae*, *Caccinietum dubiae*, *Eremuretum sogdiani* (with two subassociations: *E. s. typicum* and *E. s. delphinietosum decolorati*), *Feruletum kuhistanicae*, *Zygophylletum atriplicoidis* and *Corydalidetum kashgaricae* – have been described. Because of their floristic composition, all of these communities have been assigned to a new alliance *Alceion nudiflorae* within the *Sileno brahuicae-Scutellarietalia intermediae* order and *Artemisio santolinifoliae-Berberidetea sibiricae* class. The main factors determining the species composition of the classified associations seem to be scree mobility, rock particle size, elevation above sea level and slope inclination. Saxicolous vegetation in Tajikistan reveal an extraordinary diversity and richness in terms of species composition and beta diversity along the main environmental gradients in this mountaionous areas. A further geobotanical survey is needed, especially in eastern Pamir and adjacent areas to fully recognize the chasmophytic plant communities of this rocky land.

Keywords: *Artemisio-Berberidetea*, chasmophytes, colluvial cones, phytosociology, Tadzhikistan

Erweiterte deutsche Zusammenfassung am Ende des Artikels

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1. Introduction

The landscape of Tajikistan is dominated by mountain ridges and vast areas of screes, taluses, colluvial cons, fans and aprons as well as glaciers and morreins in the upper subnival belt. The Pamir-Alai ranges cross the western part of the country, Tian Shan enter its territory from the north while eastern outskirts are the bareland of the subnival Pamirian Plateau. Almost half of the country's area is made up of bare, rocky and often deserted land dominated by rupicolous habitats. The country is located in Middle Asia, surrounded by ridges of the Karakorum, Hindu Kush, Kunlun and Tian Shan Mts. Because of its considerable biogeographical separateness, diverse climatic conditions and various geology and geomorphology, Tajikistan is very rich in plant species and vegetation types. According to the ten-volume flora of the former Soviet Socialist Republic of Tajikistan, ca 4,550 vascular plant species occur in the country (RASULOVA 1991). This number was supplemented recently by some new records of Tajik flora (e.g. NOBIS 2011a, NOBIS & NOWAK 2011, NOBIS et al. 2014a, b, 2015). Some species new to science have been described from this country in the past few years (e.g. NOBIS 2011b, 2013, NOBIS et al. 2013). Rocky, chasmophytic habitats in Tajikistan, probably because of their high degree of isolation and influences of the Irano-Turanian, Boreal and Indo-Chineesian floras, act as a hotspot and refuge for many stenochoric plant species. Approximately 30% of the vascular plant species are considered as endemics of the country. More than half of them inhabit screes and rocks. Scree phytocoenoses also harbour the highest portion of endemics being exclusive to this type of vegetation (NOWAK et al. 2011). Because of this considerable floristic richness, the mountains of Middle Asia have been recognized as being among the world's top 34 biodiversity hotspots (MITTERMEIER et al. 2005), and as one of the 11 most important focal points of scientific studies and conservation efforts (GIAM et al. 2010).

Vegetation of screes has attracted the attention of several geobotanists in recent decades, mainly in Europe and south-western Asia. Studies on mountain colluvial habitats has been conducted in the Carpathians (e.g. KOSIŃSKI 2001, CHYTRÝ 2009, SANDA et al. 2008), the Alps (e.g. ENGLISCH et al. 1993), and mountains of the Mediterranean province (MUCINA et al. 1990, MOTA POVEDA et al. 1991, DIMOPOULOS et al. 1997, DEIL et al. 2008, ORTIZ & RODRIGUEZ-OUBIÑA 1993). For Europe as a whole, a general view of scree vegetation syntaxonomy is presented in the valuable work of VALACHOVIČ et al. (1997). In Africa, only few studies concerning rupicolous vegetation have been published (e.g. DEIL & HAMMOUMI 1997). In south-west Asia, the Taurus (HEIN et al. 1998, PAROLLY 1998, EREN et al. 2004), Alborz (NOROOZI et al. 2014) and Caucasus (ERMOLAEVA 2007, GOLUB et al. 2009, BELONOVSKAYA 2012, BELONOVSKAYA et al. 2014) primarily attracted researchers. Hovewer, there is still a lack of comprehensive studies devoted to scree vegetation in Middle (mainly Kyrgyzstan, Tajikistan and Uzbekistan) and Central Asia (NE China, Mongolia; for details, see COWAN 2007), notwithstanding some first insights into this topic presented by ERMAKOV et al. (2006). For a long period, a few contributions to the scree flora of the Hissar Mts (DZHURAEV 1970, 1972a, b) have been the only studies on scree vegetation in Tajikistan. The first phytosociological work based on the Braun-Blanquet method was presented by NOWAK et al. (2015). This research was devoted to the scree vegetation of the alpine and subnival belt.

Despite its enormous uniqueness in terms of floristic diversity Tajikistan still waits for a comprehensive and detailed description of vegetation units and their distribution patterns and habitat characteristic. A geobotanical survey aiming at a precise presentation of Tajik vegetation was initiated in 2006. Segetal and littoral phytocoenoses were the first being described according to the Braun-Blanquet approach (e.g. NOWAK & NOWAK 2013, NOWAK A. et al. 2013, NOWAK S. et al. 2013a, b). Also for forest and aquatic habitats several syntaxonomic units have been proposed (e.g. NOWAK & NOBIS 2012, 2013). Recently, the petrophytic vegetation of rock faces, crevices and ledges in the alpine and colline zones has been classified (NOBIS et al. 2013, NOWAK A. et al. 2014a, b, c, d).

Despite some floristic similarities between *Asplenietea trichomanis* communities and scree vegetation in Middle Asia, there are some crucial differences in environmental conditions and consequently in the species composition. Thus, in order to establish a complete syntaxonomic system for the rupicolous vegetation of Tajikistan, the scree of colluvial deposits must be studied in detail. This paper presents the first attempt to classify the scree vegetation inhabiting the colline and montane belts of Pamir-Alai. We aimed at addressing the following questions in our study: (1) What is the diversity of the scree vegetation of colline and montane zones in the Pamir Alai Mts? (2) What are the habitat conditions of the described plant communities? (3) What is their species composition and structure? (4) Which species have important diagnostic value for the described syntaxa?

Considering our former studies devoted to rock vegetation (e.g. NOWAK A. et al. 2014a, b) the final aim of the project is to establish a syntaxonomic classification of all chasmophytic habitats of Middle Asia (at least Pamir-Alai and Tian Shan Mts).

2. Methods

2.1. Study area

Tajikistan is located in Middle Asia between 36°40′–41°05′ E and 67°31′–75°14′ N and covers ca 143,500 km^2 (Fig. 1). It is a mountainous country, with more than 50% of the area located above 3,000 m and more than 93% above 1,000 m a.s.l. As part of the Eurasian highland belt, Tajikistan encompasses a vast area covered by stony wasteland with diversified colluvial and diluvial deposits in terms of exposition, inclination, vertical zonation and particle size (blocks, cobbles, pebbles, coarse and fine gravels). The southern part of Tajikistan is influenced by a subtropical climate, while the northern part is situated in the temperate climate zone (VLADIMIROVA 1968). Generally, the area is characterised by high solar radiation (2,090–3,160 sunshine hours), a low percentage of cloud cover, a high amplitude of annual temperatures, low humidity and low precipitation. In subtropical regions of Tajikistan, average temperatures in June are around 30 °C. In the temperate zone, in Tajikistan comprising mainly the high mountains, the climate is much harsher, with average temperatures in July between 9.7 °C and 13.5 °C. Annual precipitation ranges from ca. 70 mm in the eastern Pamir to ca 600 mm in the Hissar Range (in some locations up to ca. 2,000 mm). In the western part of the country, the lower limit of perpetual snow is at an altitude of 3,500–3,600 m a.s.l.; in its eastern regions, at 5,800 m (LATIPOVA 1968, NARZIKULOV & STANJUKOVICH 1968, SAFAROV 2003).

The investigated area falls generally into the colline and montane zones of several mountain ranges with typical rugged topography: the Zeravshan, Hissar, Hazratishoh, Darvaz, Vanch, Turkestan, Peter I and Karateginian Mts (Fig. 2). All of them belong to the Pamir-Alai mountain system, which stretches westwards from the Pamir plateau. Only few sample plots were located in the hilly landscape of south-western Tajikistan or reach the alpine belt in Zeravshan Mts. Alongside all mountain ridges and walls, a considerable number of colluvial cones have developed, generally in the bottoms of the V-shaped valleys of streams and brooks, due to frost erosion and gravitational forces. These cones consist of different types of heterogeneous and generally unsorted parent material that have moved down the slope. Rock particles are sharp and angular and of various sizes (ranging from blocks, cobbles, pebbles, and coarse- and fine-grain gravel to sandy silt and clay). The studied scree differs also in terms of exposition, inclination, bedrock type and altitude. The studied vegetation plots were located between 359 m and 2,420 m a.s.l. (mean ca 1,600) on rock substrates with pH ranging from 6.5 to 8.8.

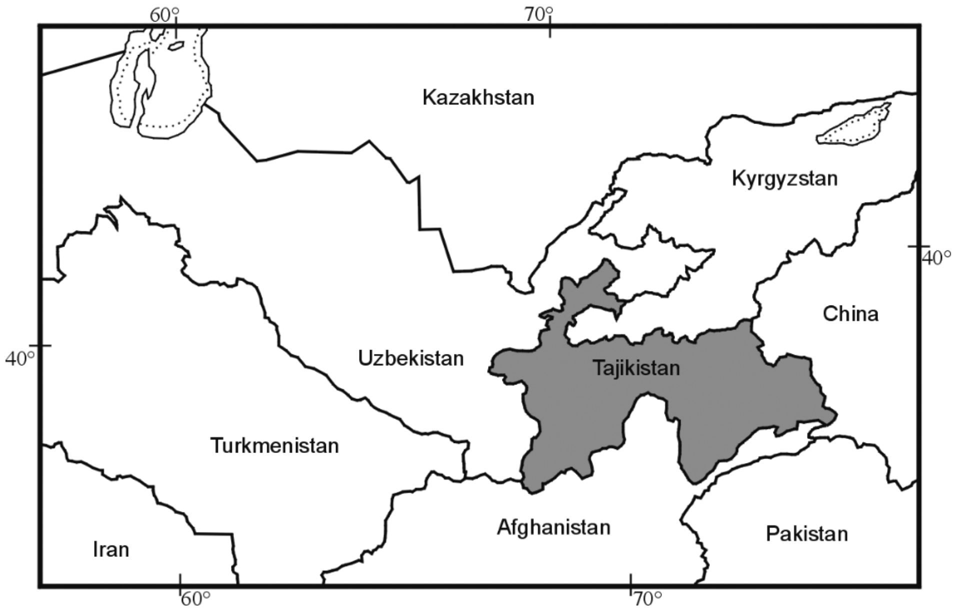


Fig. 1. The location of Tajikistan in Middle Asia.

Abb. 1. Die Lage Tadschikistans in Mittelasien.

The geological structure of the study area is very complex, with outcrops of rocks formed from the Precambrian to the present age. Only few geological studies have been published for Tajikistan (e.g. NEDZVEDSKIY 1968). The middle and higher parts of the Hissar Mts are largely composed of extrusive rocks, mainly granite, granitoid and syenite. Some igneous outcrops also occur in the Darwaz and Kuraminian Mts and in the western Pamir ranges. In the Zeravshan and Turkestan Mts, Cambrian and Silurian sediments predominate. The rocks here are generally limestone (micritic, bitumic, marly and dolomitic coral limestone), dolomite, dolomitic shale clay shale and conglomerates. Several kinds of metamorphic rocks are also present within the study area. The most common are migmatic gneiss, marble, phyllitic schists, argillaceous slates and metamorphic mudstones.

2.2. Data sampling and analyses

The main research season was conducted in 2014, however, several samples were also gathered in 2010, 2011 and 2012. Approximately 250 relevés were collected in screes in the Pamir-Alai Mts with 105 in colline and montane belts. The montane zone extends in western Pamir-Alai system from approx. 900 m to 2,000–2,500 m a.s.l. depending on mountain range and slope exposition. The upper limit of this belt is related to the tree line and is generally marked by juniper forests (*Juniperus turkestanica*, *J. zeravshanica*). The colline zone starts from ca 400 m a.s.l. and is mainly characterized by azonal riverside forests of *Populus pruinosa*, grasslands, thermophilous swards and shrubs. The plot size was generally 30 m^2 except for communities with *Corydalis kashgarica* where a plot size of 5 m^2 was applied due to different community physiognomy. In each relevé, all vascular plant species were recorded using the seven-degree cover-abundance scale of Braun-Blanquet (WESTHOFF & VAN DER MAAREL 1973). Cryptogams were not recorded because of their negligible abundance and importance in the scree communities in the study area. The aim of the survey was to cover a broad range of habitats in relation to altitudinal range, size of rock debris, exposition and inclination. Following the field research, we selected 105 relevés to present the scree vegetation of the colline and montane zone in western Tajikistan. For each plot, geographical coordinates were measured with the help of a GPSMAP 60CSx

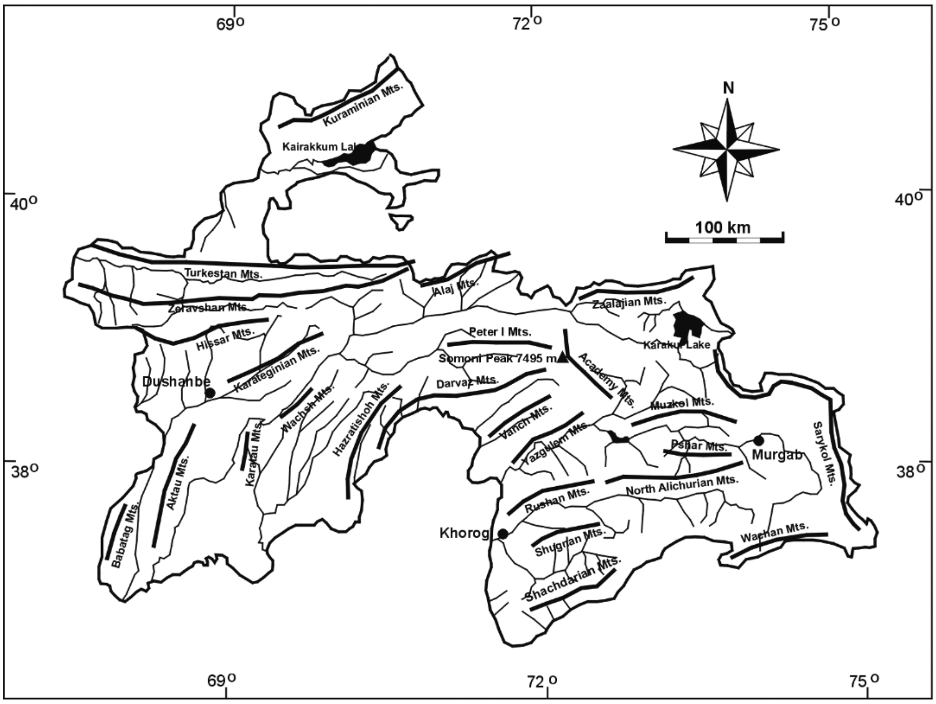


Fig. 2. Topographic characterisation of the study area with main mountain ranges, rivers and cities.

Abb. 2. Topographischer Überblick des Untersuchungsgebiets mit den wichtigsten Gebirgszügen, Flüssen und Städten.

device with an accuracy of ±5 m, using the WGS84 reference frame. In the tables, latitude and longitude are given in degrees, minutes and seconds. Rock type was determined through an analysis of lithology, pore geometry, mineralogical components, texture, permeability, hardness and pH, performed by a professional geologist (see acknowledgments). Hydrogen ion concentrations were measured in an aqueous rock solution using an Elmetron CP-105 pH meter.

Data were stored in the JUICE program (TICHÝ 2002). A modified TWINSPAN classification (ROLEČEK et al. 2009) provided an initial idea of data structure and resolution. We applied pseudospecies cut levels of 0%, 2%, 5% and 10%. A Detrended Correspondence Analysis (DCA) was performed using the floristic data set (no downweighting of rare species) to check the floristic-sociological classification and to highlight the relationship between groups. CANOCO for Windows 4.5 was used for this ordination (TER BRAAK & ŠMILAUER 2002). The species composition data showed a clear unimodal response, with a total gradient length of ca 9 for the complete data set.

Vegetation classification followed the sorted table approach of BRAUN-BLANQUET (1964). A synoptic table with the percentage frequencies of diagnostic species is given in Table 1. For newly-described associations, the International Code of Phytosociological Nomenclature was adhered to (WEBER et al. 2000). The class concept follows PIGNATTI et al. (1995), with general habitat features and a common set of geographically distinct character species as key traits defining the class. As the most significant attributes of the habitat, we considered spatial structure and environmental characteristics, mainly the presence of moving rock or gravel deposits creeping down the slope. When analysing the possible class assignment of the associations, we considered mainly the *Thlaspietea rotundifolii* Br.-Bl. 1948, as a syntaxon comprising the scree vegetation of Europe; the *Heldreichietea* Quezel ex Parolly 1995, which include scree vegetation of the east Mediterranean region; the *Lamio tomentosi-Chaerophylletea humilis* Belonovskaya, Mucina et Theurillat 2014 reported from screes in Caucasus

(BELONOVSKAYA et al. 2014) and the *Artemisio santolinifoliae-Berberidetea sibiricae*, which have been proposed for vegetation types of scree and rocky slopes of Central Asia (ERMAKOV et al. 2006). All of these syntaxa are climax, stable vegetation types inhabiting extreme environments, with relatively few species per plot.

Species nomenclature followed mainly CHEREPANOV (1995) and the Plant List (http://www.theplantlist.org; accessed 15 May 2015). Plant material collected during field studies was deposited in the Herbarium of Middle Asia Mountains, hosted in OPUN (Opole University, Poland) and KRA (Jagiellonian University, Poland).

3. Results

The number of taxa recorded in the relevés totals 198, with 78 exceeding 5% constancy and 42 exceeding 10%. To the group of vascular plant species with highest frequency belong: *Bromus tectorum* (54 occurrences), *Centaurea squarrosa* (54), *Alcea nudiflora* (47), *Trichodesma incanum* (41), *Artemisia persica* (32), *Pulicaria salvifolia* (29), *Origanum tyttanthum* (26), *Piptatherum songaricum* (26), *Callipeltis cucullaris* (25), *Sanguisorba alpina* (24), *Salvia sclarea* (20), *Galium spurium* (19), *Glaucium elegans* (19), *Hypericum scabrum* (19), *Scariola orientalis* (19) and *Scrophularia scabiosiifolia* (19). Several species contributing to the surveyed plant communities are endemics of the Pamir-Alai, restricted in most cases to the territory of Tajikistan, e.g. *Eremostachys mogianica*, *E. tadschikistanica*, *Allium crystallinum*, *Astragalus varzobicus*, *Cousinia butkovii*, *C. corymbosa*, *C. outichaschensis*, *C. pseudoshisakensis*, *C. refracta*, *Delphinium decoloratum*, *Eremurus comosus*, *E. olgae*, *E. pubescens*, *Ferula equisetacea*, *F. koso-polianskyi*, *F. sumbul* and others. The extreme uniqueness of the scree flora of the study area (NOWAK et al. 2011) results in almost no floristic affinities with European or south-western Asian mountainous regions. Among the diagnostic species no plants occurring both in Pamir-Alai and those regions were found. Even at the genus level, only few are common to the scree vegetation of Middle Asia and SE Asia or Europe (e.g. *Papaver* sp., *Poa* sp., *Allium* sp., *Veronica* sp., *Cerastium* sp.; VALACHOVIČ et al. 1997, BELONOVSKAYA et al. 2014).

Not all of the species noted in relevés are typical for scree vegetation. In the studied plots some ruderal species or plants typical for nitrophilous and often anthropogenic habitats were noted, sometimes with considerable abundance and frequency: *Bromus tectorum*, *Poa bulbosa*, *Descurainia sophia*, *Capparis spinosa*, *Koelpinia linearis*. Species typical for agrocoenoses have also been noted (*Avena trichophylla, Setaria pumila*, *S. viridis, Strigosella africana*, *Vaccaria hispanica* or *Lactuca serriola*) as well as plants typical of xerothermophilous swards (e.g. *Hordeum bulbosum*, *Pimpinella puberula*, *Handelia trichophylla*, *Achillea biebersteinii*, *Elytrigia trichophora* or *Aphanopleura capillipes*). A few tall herb species enter the scree communities of Tajikistan (e.g. *Tragopogon krashennikovii*, *Ligularia thompsoni*, *Prangos pabularia* or *Rumex paulsenianun*), forest plants (*Poa pratensis*) or species typical for steppe vegetation (*Erodium oxyrrhynchum*). Astonishingly, no species with the optimum in rocky habitats were recorded, despite the insignificant occurrence of *Artemisia rutifolia*, *Carex koshevnikovii* and *Poa relaxa*.

As a result of the numerical classification, 11 groups were distinguished (Fig. 3). The two classes presented in the syntaxonomic scheme correspond to the first division in the TWINSPAN classification. The cluster 1 comprised the *Corydalidetum kashgaricae* of the *Parietarietea judaicae* class. The cluster 0 accommodated all other communities. It was divided into cluster 0–1, which included the driest habitats (*Zygophylletum atriplicoides* and community with *Echinops nanus*), and cluster 0–0, representing the moderately humid, typi-

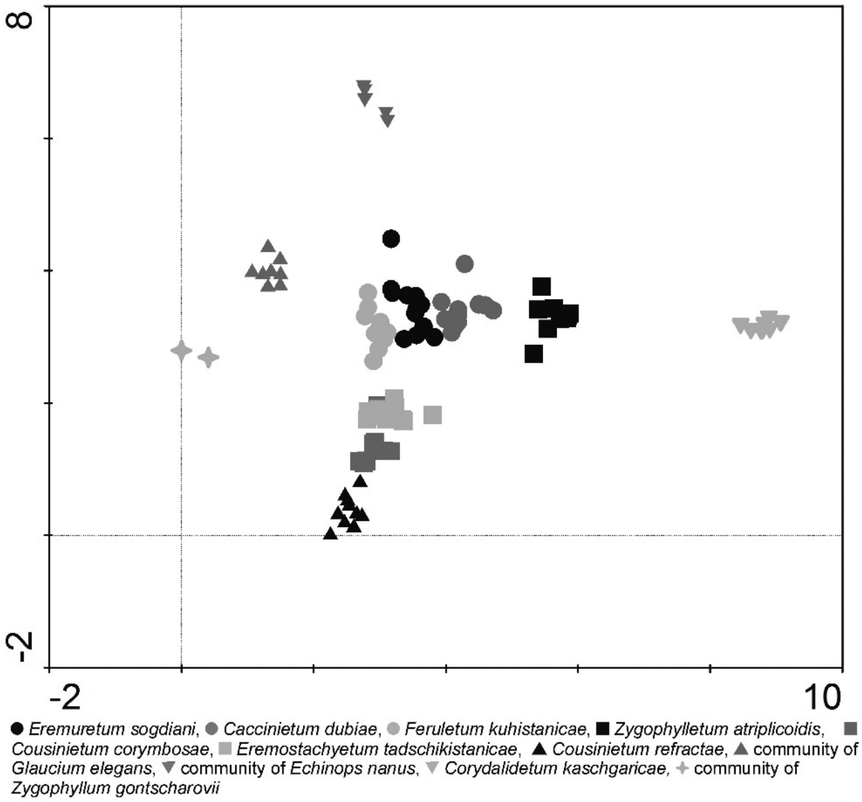


Fig. 3. DCA ordination of all samples of *Alceion nudiflorae* communities (n = 105).

Abb. 3. DCA-Ordination aller Aufnahmen des Verbands *Alceion nudiflorae* (n = 105).

cal screes of the montane zone. The third level of division was mainly related to substrate a-cidity. Within cluster 0–0–1, communities preferring strongly alkaline habitats were grouped (*Eremuretum sogdianae*, *Caccinietum dubiae* and community of *Glaucium elegans*). Cluster 0–0–0 was mainly composed of relevés from calcifuge substrates (*Cousinietum corymbosae*, *Eremostachyetum tadschikistanicae* and *Cousinietum refractae*). This distinction according to alkalinity, however, was not so clear because the last cluster included also the calcicole *Feruletum kuhistanicae* and community with *Zygophylletum gontscharovii*. Both associations were separated from the calcifuge ones at the fourth level of division.

According to habitat differences and floristic distinctiveness, eight groups have been identified as associations and defined by original diagnosis based on species composition. Within the calcifuge group, which occupies the central part of the DCA graph (Fig. 3), *Cousinietum corymbosae*, *Eremostachyetum tadschikistanicae* and *Cousinietum refractae* have been distinguished. The group of calcicole communities consists of *Caccinietum dubiae*, *Eremuretum sogdiani* (with subassociation of *delphinietosum decoloratae*), *Feruletum kuhistanicae*, *Zygophylletum atriplicoidis* and *Corydalidetum kashgaricae.* On the ordination graph, also plots dominated by *Echinops nanus*, *Glaucium elegans* and *Zygophyllum gontscharovii* are shown (Fig. 3). Because of scarcity of data and doubts about their development stage or habitat affinity, these groups have only been assigned as communities with-

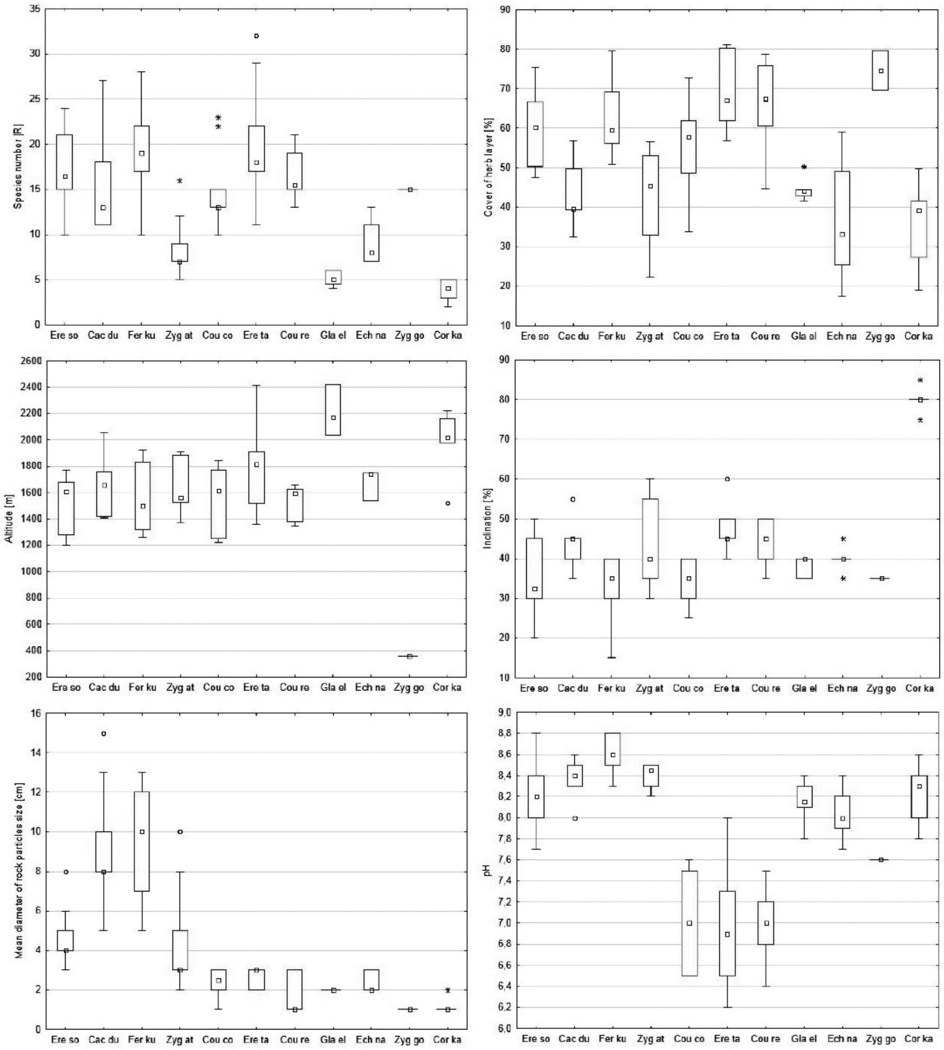


Fig. 4. Box-whisker plots of the species richness, cover of the herb layer, altitudinal distribution, inclination, pH and size of the rock particles of screes of the researched communities: *Eremuretum sogdiani* (Ere so), *Caccinietum dubiae* (Cac du), *Feruletum kuhistanicae* (Fer kuh), *Zygophylletum atriplicoidis* (Zyg at), *Cousinietum corymbosae* (Cou co), *Eremostachyetum tadschikistanicae* (Ere ta), *Cousinietum refractae* (Cou re), communities of *Glaucium elegans* (Gla el), *Echinops nanus* (Ech na), *Zygophyllum gontscharovii* (Zyg go) and the *Corydalidetum kashgaricae* (Cor ka).

Abb. 4. Box-Whisker-Plots mit Artendiversität, Deckung der Krautschicht, Seehöhe, Hangneigung, pH-Wert und Größe der Gesteinsbruchstücke in den untersuchten Gesellschaften: *Eremuretum sogdiani* (Ere so), *Caccinietum dubiae* (Cac du), *Feruletum kuhistanicae* (Fer kuh), *Zygophylletum atriplicoidis* (Zyg at), *Cousinietum corymbosae* (Cou co), *Eremostachyetum tadschikistanicae* (Ere ta), *Cousinietum refractae* (Cou re), *Glaucium elegans*-Gesellschaft (Gla el), *Echinops nanus*-Gesellschaft (Ech na), *Zygophyllum gontscharovii*-Gesellschaft (Zyg go) und *Corydalidetum kashgaricae* (Cor ka).

out rank. The same is true for plots with *Chondrilla gibbirostris*, which forms rather monospecific stands along road verges, and *Prangos pabularia*, which has its ecological optimum in forb vegetation. Further research is needed to find the final syntaxonomic position of these communities.

The habitat characteristics and species composition suggests to classify most of the phytocoenoses into the class *Artemisio santolinifoliae-Berberidetea sibiricae*, which includes shrubby, species poor vegetation on mobile screes in Central Asia. This syntaxonomic assignment is justified by comparison of the life form proportions within particular plots. As in communities of the *Artemisio-Berberidetea* (Ermakov et al. 2006), we observed a considerable share of dwarf shrubs and shrubs. Small shrubs like *Artemisia* spp., *Krashennikovia ceratoides* or *Gontscharovia popovii* had a absolute cover up to 16% (average approx. 3%) and higher shrubs (e.g. *Rosa* spp., *Berberis* spp., *Ephedra* spp., *Cerasus verrucosus* or *Atraphaxis pyrifolia*) reached an average absolute cover of approx. 4% (maximum 40%) in our plots. However, in all vegetation types the perennials clearly dominated (approx. 80% on average) with some contribution of annuals and hemicryptophytes. Considerably different in terms of floristic composition was the *Corydalidetum kashgaricae*. The occurrence of nitrophilous species and the generally low cover of the herb layer are important features of that type vegetation. These plots were classified into the *Parietarietea judaicae* Oberd. 1977.

4. Description of the syntaxa

We propose the following classification of the colline and montane scree vegetation of the Pamir-Alai Mts in Tajikistan:

Class: *Artemisio santolinifoliae-Berberidetea sibiricae* Ermakov et al. 2006
- Order: *Sileno brahuicae-Scutellarietalia intermediae* nom. prov.
  - Alliance: *Alceion nudiflorae* all. nova
    - Calcifuge group:
      1. *Cousinietum corymbosae* ass. nova
      2. *Eremostachyetum tadschikistanicae* ass. nova
      3. *Cousinietum refractae* ass. nova
    - Calcicole group:
      4. *Caccinietum dubiae* ass. nova
      5. *Eremuretum sogdiani* ass. nova
         - 5.1. *E. s. typicum*
         - 5.2. *E. s. delphinietosum decolorati* subass. nova
      6. *Feruletum kuhistanicae* ass. nova
      7. *Zygophylletum atriplicoidis* ass. nova
      8. Community with *Echinops nanus*
      9. Community with *Glaucium elegans*
      10. Community with *Prangos pabularia*
      11. Community with *Zygophyllum gontscharovii*
      12. Community with *Chondrilla gibbirostris*

Class: *Parietarietea judaicae* Oberd. 1977
- Order: *Tortulo-Cymbalarietalia* Segal 1969
  - Alliance: *Parietarion judaicae* Segal 1969
      13. *Corydalidetum kashgaricae* ass. nova

Alliance: *Alceion nudiflorae* all. nova

Nomenclatural type: *Eremuretum sogdiani* holotypus hoc loco
Diagnostic species: *Alcea nudiflora*, *Trichodesma incanum*, *Piptatherum songaricum*, *Pulicaria salvifolia*

Distribution and ecology: The *Alceion nudiflorae* alliance was recorded in western Pamir-Alai Mts, mainly in Zeravshan, Hissar, Hazratishoch, Peter I, Turkestan, Darwaz and Vachsh ranges. It occurs at (350–)1,200–1,900(–2,400) m a.s.l. The phytocoenoses of *Alceion nudiflorae* are moderately rich in species with somewhat higher species number per plot compared to the alpine and subnival scree phytocoenoses of the *Ferulo foetidissimae-Vicion kokanicae* (NOWAK et al. 2015). The communities are developed on various rock substrata (generally limestone, marble, dolomite, schists and granite) of different size (cobbles, pebbles, coarse and fine grained gravel). A considerable portion of species composing the alliance have the Irano-Turanian distributional type. All diagnostic taxa are distributed throughout Middle Asia (generally Pamir-Alai and Tian Shan Mts), Iran, northern Afghanistan and Pakistan, western Himalayas and China (KOCHKAREVA 1986, OVCHINNIKOV 1957, KINZIKAEVA 1988). Apart from the taxa diagnostic for the alliance, scree species with higher frequencies are *Artemisia persica*, *Callipeltis cucullaris*, *Sanguisorba alpina*, *Salvia sclarea*, *Hypericum scabrum*, *Lactuca orientalis* and *Scrophularia scabiosiifolia* (Tables 1–3).

1. *Cousinietum corymbosae* ass. nova

Typus relevé: Supplement S1, rel. 2, holotypus hoc loco
Diagnostic species: *Cousinia corymbosa*, *Ferula equisetacea*

The phytocoenoses of *Cousinietum corymbosae* have been found in several location in Hissar Mts, mainly on western and south-western slopes in Varzob, Takob and Romit River Valleys (Fig. 6, 7). *Cousinia corymbosa* is a narrow endemic of Hissar Mts, scattered on few locations near Maychura, Varzob, Khokhu and Romit villages on gravel deposited at hillslope base, at elevations 2,000–2,400 m a.s.l. (RASULOVA 1991). The altitudinal distribution of the association is not fully compliant with this amplitude. The samples have been taken in colline and montane zone at the elevation from 1,230 to 1,850 m a.s.l. (mean approx. 1,600; Fig. 4, Supplement S1). The association prefers granite, relatively loose and fine-grained screes (pH 6.5–7.4). The *Cousinietum corymbosae* was found mainly on western and south-western expositions with inclinations of mean value approx. 35º (Fig. 5). The association is characterised by a moderate vegetation cover. The total cover of the herb layer was close to 60% on average (Supplement S1, Fig. 4). The phytocoenosis is characterised by a moderate number of species as scree vegetation is concerned, having in one relevé from 10 to 23 taxa (mean value approx. 13). Among the vascular plants the highest values of constancy and abundance within sampled plots have: *Alcea nudiflora*, *Bromus tectorum*, *Callipeltis cucullaris*, *Hypericum scabrum*, *Impatiens parviflora*, *Origanum tyttanthum*, *Scrophularia scabiosiifolia*, *Sanguisorba alpina* and *Piptatherum songaricum*.

2. *Eremostachyetum tadschikistanicae* ass. nova

Typus relevé: Supplement S1, rel. 14, holotypus hoc loco
Diagnostic species: *Eremostachys tadschikistanica*

Eremostachys tadschikistanica is a narrowly distributed rupicolous species, considered as endemic of Hissar Mts (KOCHKAREVA 1986). During our studies the association of *Eremostachys tadschikistanica* was found in several locations along the Takob and Honaka

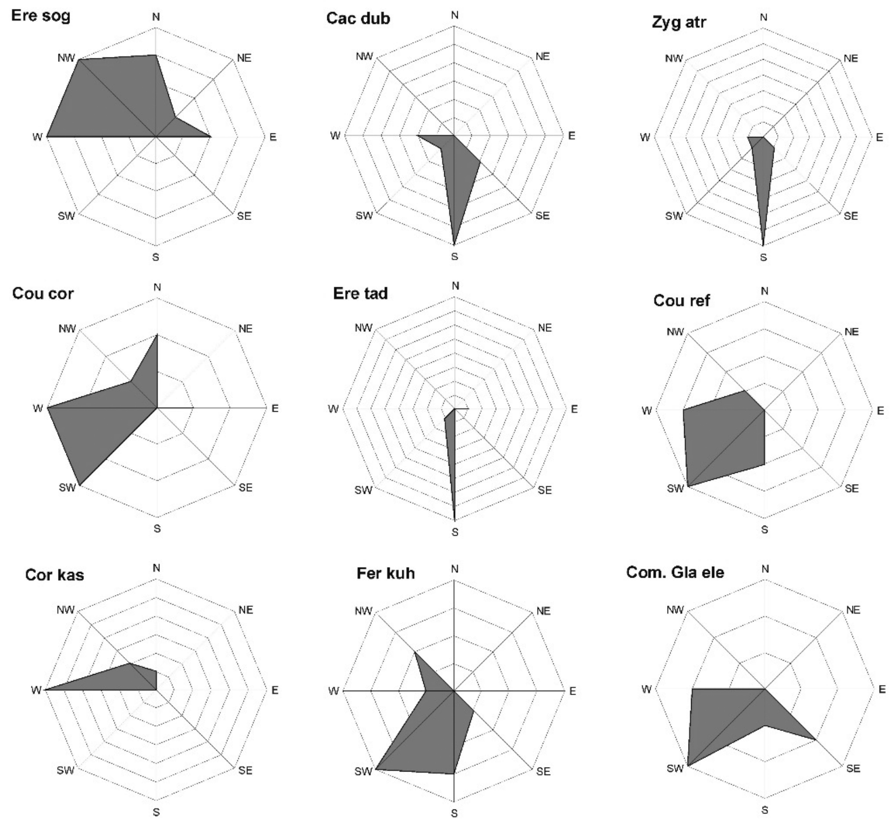
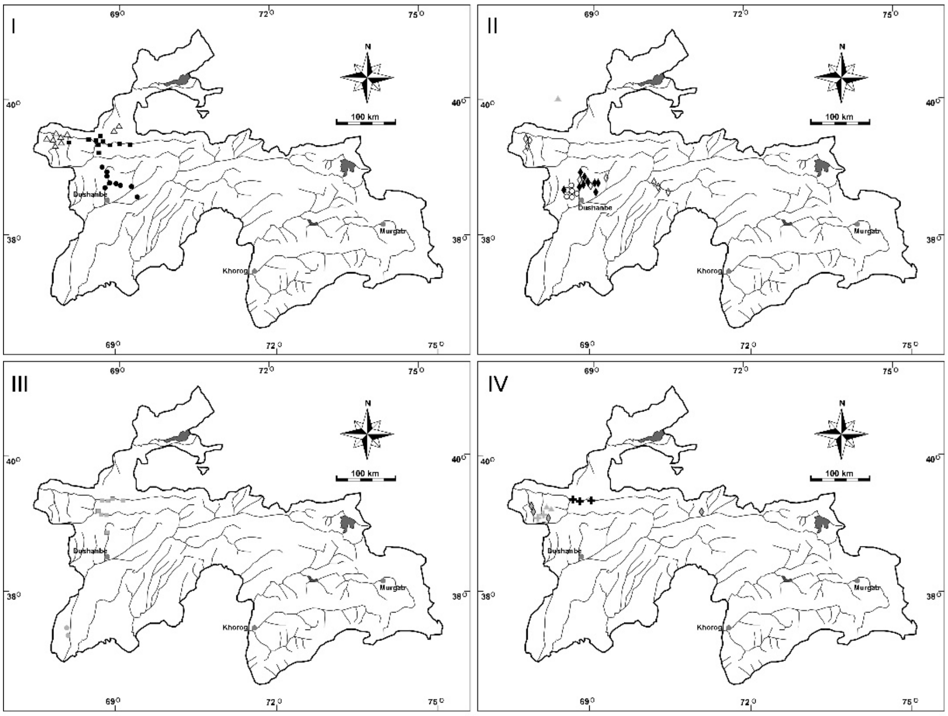


Fig. 5. The exposition preferences of the researched plant communities.

Abb. 5. Die Expositionsverteilung in den untersuchten Gesellschaften.

Rivers on southern faces of Hissar Range (Fig. 6). The phytocoenosis have been found mainly on granite and schist screes with some admixture of dolomites creeping downslope from upper rock ridges (pH 6.0–7.2). The association inhabits screes with fine- or coarse gravels with insignificant soil amount. The phytocoenosis develops on relatively high elevations within the range of montane belt (mean ca. 1,800 m a.s.l) with some plots entering also alpine zone (Fig. 4). The community develops on fairly steep screes with mean inclination of approx. 45º. *Eremostachyetum tadschikistanicae* is strictly related to southern expositions with very high solar radiation. The mean cover of the herb layer is almost the highest among the montane scree communities with about 65%, ranging from 60 to 80% (Fig. 4, Supplement S1). The most abundant and constant vascular plant species are: *Alcea nudiflora*, *Bromus danthoniae, B. tectorum*, *Callipeltis cucullaris*, *Centaurea squarrosa*, *Eremurus comosus*, *Hypericum scabrum*, *Origanum tyttanthum*, *Sanguisorba alpina*, *Trichodesma incanum* and *Veronica intercedens*.



Explanations: I: ● Cousinietum corymbosae, ■ Caccinietum dubiae, △ Eremuretum sogdiani, II: ♦ Eremostachyetum tadschikistanicae, O Cousinietum refractae, ◊ Feruletum kuhistanicae, III: ■ Zygophylletum atriplicoidis, ● Comm. with *Zygphyllum gontscharovii* IV: ◊ Comm. with *Glaucium elegans*, ▲ Comm. with *Chondrilla gibbirostris*, ✚ Comm. with *Echinops nanus*, ✚ Comm. with *Prangos pabularia*

Fig. 6. Distribution of the associations of montane and colline screes in Tajikistan.

Abb. 6. Verbreitung der Assoziationen der montanen und kollinen Schuttvegetation in Tadschikistan.

3. *Cousinietum refractae* ass. nova

Typus relevé: Supplement S1, rel. 21, holotypus hoc loco
Diagnostic species: *Cousinia refracta*

Cousinia refracta is a stenochoric species with a range restricted to screes and slopes in south-western Tajikistan, mainly in Hissar, Aktau and Karatau Mts (RASULOVA 1991). The association was found in the montane zone on the warmest slopes in close contact with xerothermophilous swards and shrubs. The association develops in Honaka and Khondara River valleys and near Gusgarf (Fig. 6). It was found exclusively on granite screes of moderately compact structure (pH 6.4–7.5). In comparison to other plant communities a considerable amount of clayey soils were noted in research plots. The rock particles were relatively fine and compact here. The phytocoenosis develops on relatively low elevations in the colline zone with warm microclimate. The observed altitudinal range was between 1,350 and 1,650 m a.s.l. (mean approx. 1,600). The community develops on moderately steep screes with the mean inclination value for the samples of approx. 35º, ranging from 30º to 50º (Fig. 4). *Cousinietum refractae* inhabits generally south-western expositions (Fig. 5). The mean cover of the herb layer was among the highest and was close to 70%, ranging from 45 to 80% (Fig. 4). The plots of vegetation were moderately rich in vascular species. As a co-dominant species within the sampled plots *Alcea nudiflora*, *Centaurea squarrosa* and *Salvia*

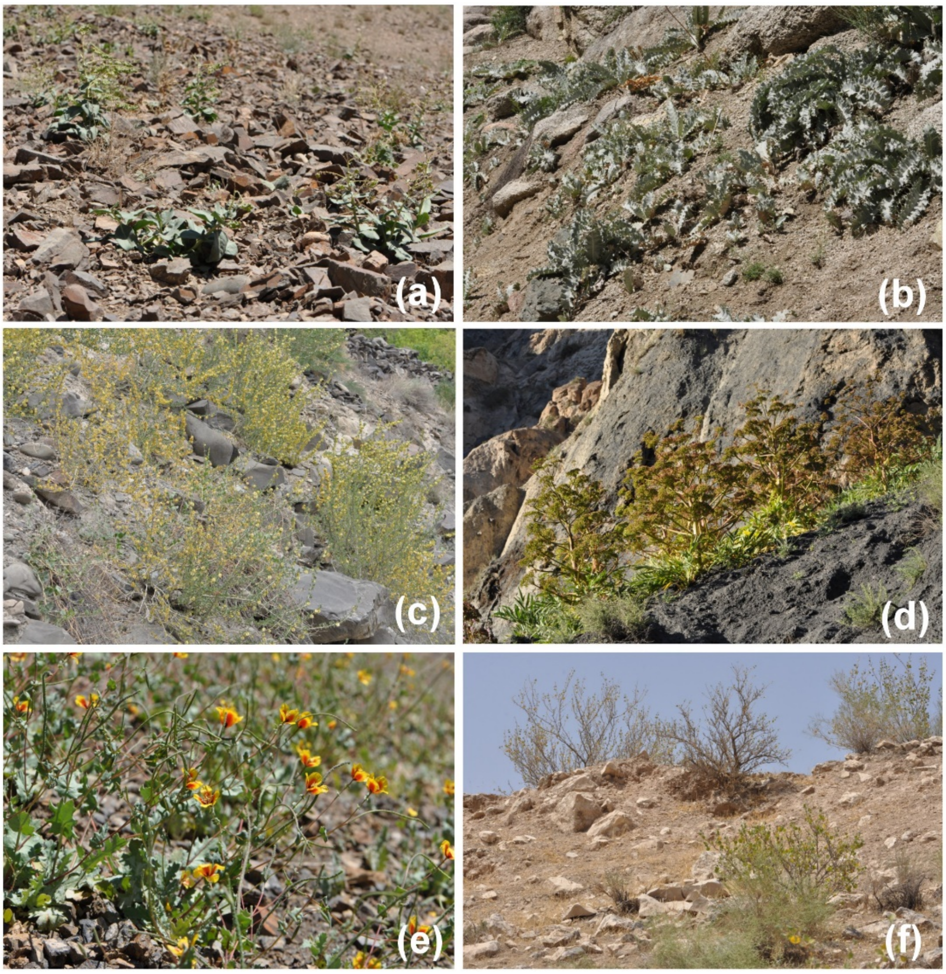


Fig. 7. (a) *Caccinietum dubiae* on a pebble steep scree near Zerabad in Zeravshan Mts; **(b)** *Cousinietum refractae* on a granite fine scree in Varzob valley in Hissar Mts; **(c)** *Zygophylletum atriplicoidis* on southern slopes of Turkestan Mts in Zeravshan River Valley near Zasun; **(d)** *Feruletum kuhistanicae* on apron cobbles in Seven Lake valley near Nofin; **(e)** plot with dominance of *Glaucium elegans* on a fine gravel scree near Sarytog; **(f)** community with *Zygophyllum gontscharovii* in south-western Tajikistan near Garavuti.

Abb. 7. (a) *Caccinietum dubiae* auf einer steilen Geröllhalde nahe Zerabad im Serafschan-Gebirge; **(b)** *Cousinietum refractae* auf einer feinen Granithalde im Varzob-Tal im Hissargebirge; **(c)** *Zygophylletum atriplicoidis* auf südexponierten Hängen der Turkestankette im Tal des Serafschan bei Zasun; **(d)** *Feruletum kuhistanicae* auf Vorfeld-Blöcken im Sieben-Seen-Tal bei Nofin; **(e)** Fläche mit Dominanz von *Glaucium elegans* auf einer Feinkies-Halde nahe Sarytog; **(f)** Gesellschaft mit *Zygophyllum gontscharovii* in Südwest-Tajikistan bei Garavuti.

sclarea were found. Other fairly frequent species contributing to this association were *Aegilops triuncialis*, *Astragalus varzobicus*, *Avena trichophylla*, *Eremurus olgae*, *Hordeum bulbosum*, *Pimpinella puberula*, *Sanguisorba alpina* and *Trichodesma incanum*.

4. ***Caccinietum dubiae*** **ass. nova**

Typus relevé: Supplement S1, rel. 31, holotypus hoc loco
Diagnostic species: *Caccinia dubia*

Caccinia dubia is a species of broader distribution in Middle Asia, known from screes of Pamir-Alai and Tian Shan Mts (Fig. 1, 7). In Tajikistan the species is known from northernmost ranges (Kuraminian, Turkestan and Zeravshan) from montane and lower alpine elevations (CHUKAVINA 1984; Fig. 6). The association was found mainly on schists and shales of alkaline reaction (pH 8.0–8.6). However, field observations and literature confirms also occurrence of *Caccinia dubia* on neutral or acidic substrates (CHUKAVINA 1984). The association prefers screes almost deprived of any soil ingredient with relatively large rock pebble and cobble colluvial slides (Fig. 4). The community inhabits the driest areas at moderate elevations in montane zones, within the altitudinal range between 1,400 and 2,050 m a.s.l. (mean approx. 1,700). Plots of *Caccinietum dubiae* develops on fairly steep screes, with the mean inclination value approx. 45º, ranging from 35º to 55º. The phytocoenosis inhabits generally southern expositions (Fig. 4, 5). The cover of the herb layer is relatively low, ranging from 30 to 55% (mean approx. 40%; Fig. 5). The most abundant and constant species are: *Alcea nudiflora*, *Bromus tectorum*, *Centaurea squarrosa*, *Cousinia ferganensis*, *Echinops chloroleucus*, *Nepeta olgae*, *Pulicaria salvifolia*, *Lactuca orientalis* and *Trichodesma incanum.*

5. ***Eremuretum sogdiani*** **ass. nova**

Typus relevé: Supplement S1, rel. 43, holotypus hoc loco
Diagnostic species: *Eremurus sogdianus*

Eremurus sogdianus is commonly distributed along the foothills of south-western Tian Shan and northern Pamir-Alai. Only in Zeravshan Mts the species enters the northern valleys more deeply (OVCHINNIKOV 1963, KOVALEVSKAYA 1971). The distribution of the association is restricted to lower sections of northern valleys of Turkestan and Zeravshan ranges (Fig. 6). The research conducted in this area confirms that the species builts its own association developing on alkaline rock debris (pH 7.7–8.8), mainly on dolomite and limestone screes. The community inhabits colluvial deposits with coarse gravels with mean particle size of approx. 4 cm (Fig. 4). The association prefers elevations in montane zone (Fig. 4), within the altitudinal range between 1,200 and 1,800 m a.s.l. (mean approx. 1,600). The community develops on gently sloping screes with mean inclination close to 30º; Fig. 4). Unlike other plant communities from the *Alceion nudiflorae, Eremuretum sogdiani* prefers generally north-western and western, somewhat shadowed expositions (Fig. 5). Within the sampled plots, between 10 and 24 taxa were noted (mean approx. 16), so as the majority of the rupicolous vegetation in Tajikistan, the association should be classified as moderately rich in species. Also the cover of the herb layer is moderate and reaches up to 75% with the mean value of approx. 60% (Fig. 5). Among the species occurring within the association with higher constancies are *Alcea nudiflora*, *Artemisia persica*, *Bromus tectorum*, *Cousinia radians*, *Crambe kotschyana*, *Koelpinia linearis*, *Perovskia virgata*, *Lactuca orientalis*, *Scutellaria intermedia* and *Trichodesma incanum*.

5.1. *Eremuretum sogdiani typicum* subass. nova

Type relevé: Supplement S1, rel. 43, holotypus hoc loco
Diagnostic species: *Eremurus sogdianus*
Constant species: the same as for the association

The subassociation *typicum* is characterised by higher share of xerothermophilous sward species and slightly more arid microhabitat. It seems that the *E. s. typicum* prefers sites with long and intensive solar radiation on gentle slopes of wide valleys. The range of the typical subassociation encompass whole Middle Asia. In comparison to *Eremuretum sogdiani delphinietosum decolorati* plots of subassociation *typicum* are more frequently entered by *Alyssum desertorum*, *Cousinia ferganensis*, *Taeniatherum crinitum*. The habitat characteristic, diagnostic species and floristic composition of this subassociations are the same as for the association.

5.2. *Eremuretum sogdiani delphinietosum decolorati* subass. nova

Type relevé: Supplement S1, rel. 54, holotypus hoc loco
Diagnostic species: *Delphinium decoloratum*

This subassociation was found sporadically in the lower section of the Seven Lake valley in the western part of Zeravshan Mts (Fig. 6). The association is distributed in the montane zone at moderate altitudes from 1,650 to 1,770 m (Fig. 4). It prefers coarse-grained, mo-derately compact gravel screes. The community was observed on limestone debris with pH 8.0–8.4. The subassociation occurs generally on eastern and northern expositions with sloping rate of approx. 30º–45º (Fig. 4, 5). *Eremuretum sogdiani delphinietosum decolorati* inhabits shadowed sites in narrow gorges of Zeravshan range. The total cover of the herb layer was moderate, between 50 and 65%. The phytocoenosis is characterised by fairly high species richness with the mean value of ca. 23. Among the vascular plants contributing to the herb layer, apart from the diagnostic species, the most constant and abundant are e.g.: *Bromus tectorum*, *Impatiens parviflora* and *Reseda lutea*.

6. *Feruletum kuhistanicae* ass. nova

Type relevé: Supplement S2, rel. 5, holotypus hoc loco
Diagnostic species: *Ferula kuhistanica*

The main diagnostic species of the association commonly occurs in Tajikistan except the northern outskirts of the country (CHUKAVINA 1984). *Ferula kuhistanica* grows also in Tian Shan and northern Afghanistan. The plots of *Feruletum kuhistanicae* were found in several locations in the valleys of the Varzob, Takob, Sarday-Myena and Obihingou River valleys, and in Seven Lake valley (Fig. 6, 7). The community was found in the montane belt at moderate altitudes from 1,250 to 1,800 m a.s.l. (mean approx. 1,500 m). The association inhabits dolomite, limestone and schist screes with pH 8.3–8.8. The deposits are generally fairly mobile, however also plots on compact debris with soil layer were found. The community develops mainly on south-western and southern aspects of gently sloping colluvial cones and aprons built by large stones and cobbles (Fig. 4). The approximate mean inclination was ca. 35º, ranging from 15º to 40º. The plots of *Feruletum kuhistanicae* are relatively rich in species (mean 19 taxa per plot). The association is characterised by a moderate cover of the herb layer, ranging between 50 and 80%, with mean value of approximately 60% (Supple-

Table 1. Synoptic table of the scree communities of the montane and colline zones in western Pamir-Alai Mts, Tajikistan. Values are percentage constancies. Only diagnostic species are shown. 1: *Cousinietum corymbosae*; 2: *Eremostachyetum tadschikistanicae*; 3: *Cousinietum refractae*; 4: *Caccinietum dubiae*; 5: *Eremuretum sogdiani*; 6: *Eremuretum sogdiani delphinietosum decolorati*; 7: *Feruletum kuhistanicae*; 8: *Zygophylletum atriplicoidis*; 9: *Corydalidetum kashgaricae*.

Tabelle 1. Synoptische Tabelle der montanen und kollinen Schuttvegetation in Tadschikistan. Die Zahlen geben die prozentuelle Stetigkeit an. Nur diagnostische Arten sind dargestellt. Syntaxa s. o.

Syntaxonomical unit	1	2	3	4	5	6	7	8	9
Number of relevés	10	10	10	11	10	4	11	10	9
Av. species number per relevé	15	20	16	15	15	23	19	8	4
TWINSPAN level 1	0	0	0	0	0	0	0	0	1
TWINSPAN level 2	0	0	0	0	0	0	0	1	
TWINSPAN level 3	0	0	0	1	1	1	0		
TWINSPAN level 4	1	1	1				0		
Cousinietum corymbosae									
Cousinia corymbosa	100	.	.	.	.	.	.	.	.
Ferula equisetacea	30	.	.	.	.	.	9	.	.
Eremostachyetum tadschikistanicae									
Eremostachys tadzhikistanica	.	100	.	.	.	.	18	.	.
Cousinietum refractae									
Cousinia refracta	.	.	100	.	.	.	.	.	.
Caccinietum dubiae									
Caccinia dubia	.	.	.	100	.	.	.	.	.
Eremuretum sogdiani									
Eremurus sogdianus	.	.	.	45	100	75	.	.	.
Eremuretum sogdiani delphinietosum decolorati									
Delphinium decoloratum	.	.	.	.	.	100	.	.	.
Feruletum kuhistanicae									
Ferula kuhistanica	.	.	.	9	.	.	100	.	.
Zygophylletum atriplicoidis									
Zygophyllum atriplicoides	.	.	.	.	.	.	.	100	.
Alceion nudiflorae									
Alcea nudiflora	60	60	80	82	90	75	45	.	.
Trichodesma incanum	.	100	60	73	80	50	64	.	.
Pulicaria salvifolia	30	20	.	82	30	50	.	50	33
Piptatherum songaricum	80	40	.	27	30	75	45	.	.
Chondrilla gibbirostris	.	.	.	9	.	.	9	.	44
Sileno brahuicae-Scutellarietalia intermediae									
Scutellaria intermedia	.	.	.	.	70	75	36	.	.
Silene brahuica	.	.	.	.	.	.	36	.	.
Artemisio santolinifoliae-Berberidetea sibiricae									
Centaurea squarrosa	40	80	80	91	70	75	27	40	56
Artemisia persica	10	50	.	18	80	75	45	.	.
Callipeltis cucullaris	50	80	.	9	.	.	73	10	11
Sanguisorba alpina	70	60	90	.	.	.	18	.	.
Hypericum scabrum	50	70	70	.	.	.	.	.	.
Salvia sclarea	10	20	90	.	.	50	55	.	.
Lactuca orientalis	.	.	.	73	40	50	18	30	.
Echinops chloroleucus	.	.	.	73	40	25	18	20	.
Scrophularia scabiosifolia	60	20	.	.	40	25	55	.	.
Galium spurium	.	30	30	.	40	75	45	.	.
Nepeta olgae	40	20	.	45	.	.	45	.	.
Crambe kotschyana	.	.	.	45	40	75	18	.	.
Veronica intercedens	30	60	10	.	.	.	36	.	.

Syntaxonomical unit	1	2	3	4	5	6	7	8	9
Verbascum songaricum	60	50	20	.	.	.	.	.	.
Eremurus olgae	.	.	70	9	.	.	36	.	.
Melica inaequiglumis	.	.	.	18	30	50	36	.	.
Eremurus comosus	.	70	.	.	.	.	36	.	.
Ziziphora pamiroalaica	40	10	20	.	.	.	36	.	.
Stipa orientalis	.	.	.	27	20	.	.	60	.
Cousinia ferganensis	.	.	.	55	40	.	.	.	.
Atraphaxis pyrifolia b	.	10	.	9	.	25	36	.	.
Vicia kokanica	.	.	.	.	.	.	82	.	.
Papaver pavoninum	30	.	10	.	.	75	.	.	.
Lindelofia macrostyla	.	.	.	.	.	75	27	.	.
Erodium oxyrrhynchum	.	.	.	18	.	.	.	70	.
Cousinia radians	.	.	.	.	60	50	.	.	.
Pimpinella puberula	.	10	60	.	.	.	.	.	.
Polygonum polycnemoides	.	30	10	.	.	.	27	.	.
Rheum maximoviczii	.	.	.	.	20	25	36	.	.
Cousinia mulgediifolia	20	.	50	.	.	.	.	.	.
Ziziphora interrupta	.	.	.	.	.	.	45	.	.
Cephalorhynchus songaricus	10	.	.	9	.	.	.	.	22
Rhinopetalum bucharicum	.	.	50	.	.	.	.	.	.
Astragalus varzobicus	.	.	50	.	.	.	.	.	.
Rubia tibetica	.	.	.	9	.	25	27	.	.
Linaria popovii	.	.	.	27	.	25	.	.	.
Pachypterygium brevipes	.	.	.	.	.	50	.	30	.
Cousinia butkovii	.	.	.	36	.	.	.	.	.
Colutea paulsenii b	.	.	.	18	.	.	18	.	.
Eremurus pubescens	.	.	10	.	.	25	18	.	.
Scandix stellata	.	.	.	.	.	75	9	.	.
Tetrataenium olgae	.	.	.	.	10	50	9	.	.
Chesneya ternata	.	.	.	.	.	.	27	.	.
Marrubium vulgare	20	.	.	.	.	25	.	.	.
Glaucium fimbrilligerum	.	20	10	.	.	25	.	.	.
Ephedra heterosperma b	.	.	.	9	.	.	.	20	.
Stipa caucasica	.	.	.	.	.	.	.	10	.
Glaucium squamigerum	.	.	.	.	.	.	.	.	33
Cousinia pseudoshisakensis	10	.	.	.	.	.	.	.	.
Scutellaria adenostegia	30	.	.	.	.	.	.	.	.
Seseli lehmannianum	.	.	.	9	.	.	.	.	.
Incarvillea olgae	20	.	.	.	.	.	.	.	.
Geranium regelii	.	20	.	.	.	.	.	.	.
Rochelia cardiosepala	.	20	.	.	.	.	.	.	.
Ampelopsis viciifolia	.	.	20	.	.	.	.	.	.
Lappula drobovii	.	.	.	18	.	.	.	.	.
Lagochilus zeravschanicus	.	.	.	9	.	.	9	.	.
Corydalidetum kashgaricae									
Corydalis kashgarica	.	.	.	.	.	.	.	.	100
Parietarion judaicae									
Parietaria judaica	.	.	.	.	.	.	.	20	100
Tortulo-Cymbalarietalia & Parietarietea judaicae									
Capparis spinosa	.	.	.	45	30	.	.	50	.
Asplenietea									
Carex koshevnikovii	30	.	.	.	.	.	.	.	.
Artemisia rutifolia	.	.	.	.	.	.	18	.	.
Spiraea baldshuanica b	20	.	.	.	.	.	.	.	.
Poa relaxa	10	.	.	.	.	.	9	.	.
Stipa zeravschanica	.	.	.	.	.	.	.	20	.

ment S1). The most frequent species co-occurring within the association plots were *Bromus tectorum*, *Callipeltis cucullaris*, *Nepeta olgae*, *Piptatherum songaricum*, *Scrophularia scabiosiifolia*, *Trichodema incanum*, *Vicia kokanica* and *Origanum tyttanthum*.

7. *Zygophylletum atriplicoidis* ass. nova

Typus relevé: Supplement S2, rel. 12, holotypus hoc loco
Diagnostic species: *Zygophyllum atriplicoides*

The *Zygophylletum atriplicoidis* has been spotted sporadically in the central section of Jagnob and Zeravshan River valleys on southern slopes of Turkestan and Zeravshan Mts (Fig. 6, 7). The diagnostic species has an Irano-Turanian distributional type and is known from Caucasus foothills, Iran, northern Afghanistan, Tajikistan and western Kyrgyzstan (OVCHINNIKOV & KINZIKAEVA 1981). The association prefers the driest sites in the colline and montane altitudinal zones at elevations of ca. 1,550 m a.s.l. (Fig. 4). The *Zygophylletum atriplicoidis* occurs on coarse-gravel and pebble deposits with very scarse soil ingredient. Plots of the association were found on open, higly radiated and warm habitats. The community inhabits the limestone and dolomite screes of alkaline reaction (pH 8.2–8.5). It was observed generally on southern expositions with very steep inclinations (mean approx. 40º). The species constituting the vegetation plots are generally scarce. The cover of the herb layer generally was between 20 and 55% with mean value of approx. 45%. The association is characterised by a low number of species in comparison to other scree vegetation in Tajikistan, having from 5 to 16 species in one relevé (mean value ca. 7). The vascular plants with the highest values of constancy and abundance are: *Capparis spinosa*, *Erodium oxyrrhynchum, Krashennikovia ceratoides*, *Salsola gemmascens* and *Stipa orientalis*.

8. *Corydalidetum kashgaricae* ass. nova

Typus relevé: Supplement S2, rel. 42, holotypus hoc loco
Diagnostic species: *Corydalis kashgarica*

Corydalis kashgarica is a widely distributed scree plant across the whole Middle Asia (Pamir-Alai, Tian Shan, Kunlun Mts; OVCHINNIKOV 1975). In Tajikistan the species was found on steep conglomerate screes in the central section of Zeravshan range in Pastruddaria and Jagnob River valleys (Fig. 6). The association is distributed in the upper montane zone at elevations of approx. 1,500–2,200 m a.s.l. (mean. ca. 2,000 m; Fig. 4). It was found on conglomerate steep and compact screes of undercutted colluvial cones. We found the community on limestone and dolomite debris of alkaline reaction (pH 7.8–8.6). The association inhabits generally the western expositions with almost vertical inclinations of approx. 75–85º (Fig. 4). *Corydalidetum kashgaricae* is relatively species poor with 2 to 5 species per plot (mean approx. 4). In line with species scarcity is the total herb cover with values not exceeding 50% and mean less than 40%. Among the species occurring with higher constancy only *Parietaria judaica* is worth mentioning as the co-dominating plant typical for this kind of vegetation.

Several plots have not been assigned to any of the above listed associations, nor were they included in the classification scheme. This was because we could not find a well suited species diagnosis for them as the plots were almost monospecific s (e.g. *Glaucium elegans*), or in our opinion they were underdeveloped during sampling (*Chondrilla gibbirostris*). Some plots may rather be related to anoher type of vegetation, but due to still poor knowledge about tall forbs or xerothermophilous swards we could not be sure. It is possible that communities with contribution of *Echinops nanus* belong to xeric swards and plots with *Prangos pabularia* should be classified to tall herbs. However, these opinions are only based on visual observations and should be supported in further thorough phytosociological surveys. In the case of the community with *Zygophyllum gontscharovii* we are almost sure that this species pattern is stabile and also present in other locations, however, the scarce phytosociological material and the usuitable date of sampling during the dormancy period of some species in subtropical areas of SW Tajikistan makes considerable reservations towards the classification of that community. To facilitate the further research, we put all plots in the tables and show them in the syntaxonomic synopsis (Table 1).

5. Discussion

Unlike the scree plant associations of the alpine and subnival belt in Tajikistan (NOWAK et al. 2015), the communities of the colline and montane zones could be divided into two groups of calcifuge and calcicole vegetation. However, the difference in terms of floristic composition is not so evident and many species occurr in both types, so it seems to be not allowed to establish separate alliances and orders as it is for European scree and rock vegetation (*Thlaspietalia rotundifolii* versus *Androsacetalia alpinae* for scree vegetation or *Potentilletalia caulescentis* versus *Androsacetalia vandelii* for rock communities). In Tajikistan alkaline and acidic substrates are inhabited by an array of common species like *Alcea nudiflora*, *Bromus tectorum*, *Centaurea squarrosa*, *Callipeltis cucullaris*, *Galium spurium*, *Hypericum scabrum* and others. Obiously there are also species distinct for both habitats like *Scutellaria intermedia* for base rich and *S. adenostegia* for acidic habitats. However, the difference seems not to be strong enough to justify the establishment of separate syntaxa. Further research is needed to define at least the suballiances. This feature seems to be typical for chasmophytic vegetation of Tajikistan dominated by the quarternary outcrops of alkaline rocks. In typical rock plant communities (*Asperulo-Poion*, *Caricion koshevnikovii*), despite some evident distinction between physico-chemical characteristic of the rock substrata, the main discrimination factors influencing the species composition were altitude, crevice size and soil amount (NOWAK A. et al. 2014a, b, c). The remarkable altitudinal amplitude in Tajikistan of more than 7,000 m causes enormous differences in microclimatic conditions and consequently in erosion type, denudation dynamic and adaptation possibilities for extreme temperatures and solar radiation. In consequence, the most important discriminating factor for species composition is the altitudinal gradient (Nowak et al. 2015). This is a fairly common pattern as we know from other studies where the altitude, bedrock type and mobility of scree material are the main factors determining species composition (VALACHOVIČ et al. 1997, PAROLLY 1998, ERMAKOV et al. 2006). That is why we propose to divide the syntaxa during our pioneer research of scree vegetation in Pamir-Alai according to their altitudinal zonation. The scree vegetation of lower mountainous elevations differs remarkably from that in alpine and subnival zones (Nowak et al. 2015). In higher elevation no acidophilous screes occur and the rock particle sizes are generally larger due to younger development stages of colluvial cones. So, apparently the species composition is also different. For *Alceion nudiflorae* we can indicate many species with considerable fidelity, occurring only or almost exclusively in communities of the colline and montane altitudinal zones. There is a range of other taxa closely related to that alliance and simultanously diagnostic for associations e.g. *Cousinia corymbosa*, *C. refracta*, *Eremostachys tadschikistanica*, *Eremurus* *sogdianus*, *Zygophyllum atriplicoides* and others. Against our expectations we did not find species typical for rock communities of the *Caricion koshevnikovii* in considerable constancy or abundancy (NOWAK et al. 2014c). A few exceptions are *Artemisia rutifolia* and *Carex koshevnikovii*. As we supposed earlier, *Scutellaria adenostegia* should rather be excluded from the typical rock communities, because it frequently occurs in both habitats – petrophytic and scree. It is worth mentioning that in lower, colline altitudes we observed a considerable share of xerothermophilous sward species, making the difference against rock vegetation even stronger. Several taxa like *Pimpinella puberula*, *Achillea biebersteinii*, *Aphanopleura capillipes*, *Avena trichophylla*, *Gontscharovia popovii*, *Heliotropium olgae*, *Hordeum bulbosae*, *Linum corymbulosum* and *Phlomis canescens* are frequently entering the scree vegetation, especially if the denudation processes protect some soil ingredient inbetween rock particles of colluvial deposits.

The altitudinal distribution of the *Alceion nudiflorae* species is concentrated between 1,200 and 1,900 m a.s.l., while the species constituting the *Ferulo foetidissimae-Vicion kokanicae* generally inhabit the alpine zone between 1,900 and 3,600 m a.s.l. (NOWAK et al. 2015). Although we explored only a relatively narrow altitudinal zone of the 7,000 m of Tajiks vertical landscape, the particular associations reveal some differences in their elevation affinity. The highest plots were sampled for community with *Glaucium elegans*. Sites of the *Corydalidetum kashgaricae* were also relatively highly elevated. Considering the range of *Corydalis kashgarica*, which comprises the arid areas of highly elevated plateaus and mountain slopes in western China, eastern Tajikistan and southern Kyrgyzstan, as well as the remarkable distinction of the species composition and habitat conditions of that association, its distinct position in the syntaxonomical system is justified. However, it is possible that the final position of the community in vertical zonation can change. The classification into the montane belt is based on the microhabitat features of the found plots in Tajikistan and partially also on the literature data from other countries. In China the species is known from altitudes of approx. 1,200–1,800 m (Flora of China; www.efloras.org.) and from Kyrgyzstan from maximum elevation of ca. 2,100 m (PACHOMOVA 1974). So, despite the considerably high altitude of the sampled plots and the assigned range of the species in Tajikistan up to 2,400 m a.s.l. (OVCHINNIKOV 1975) we decided to include the association in the montane group. Further studies in whole Middle Asia should clarify the vertical range of *Corydalidetum kashgaricae* as well as other types of scree vegetation of the eastern, arid Pamirian geobotanical subregion. Our first insights on screes around Khorogh, Murgab and Kara-Kul Lake revealed a significant uniqueness of this area in terms of species composition of scree phytocoenoses. As examples of abundant species inhabiting the colluvial cones of eastern Pamir *Acantholimon diapensioides*, *A. velutinum*, *Artemisia fedtschenkoana*, *A. hedini*, *A. kuscha-kewiczii*, *Astragalus alichurii*, *A. chomutovii*, *Braya pamirica*, *Hackelia murgabica*, *H. popovii* and several others might be mentioned. These taxa probably constitute considerably different, species poor associations of high and deserted areas of Tibet, Kunlun Mts and southern Tian Shan.

The lowest locations and narrow altitudinal amplitude was found for community of *Zygophyllum gontscharovii*. This is the endemic plant community of south-western Pamir-Alai, probably comprising the borderland of three states: Tajikistan, Uzbekistan and Afghanistan. Further sampling is needed to find the relation of this phytocoenosis to subtropical scree and shrub vegetation in Afghan mountains and check the final position of that community in the syntaxonomic system. The other associations are generally distributed in the typical montane zone as far as the western Pamir-Alai mountains are concerned with only few plots ascending to the alpine belt (e.g. from *Eremostachyetum tadshikistanicae*) or descending to the colline belt (e.g. *Eremuretum sogdianae* or *Cousinietum corymbosae*).

With exclusion of the *Corydalidetum kashgaricae*, due to the species composition, the described alliance and all communities have been classified within the *Sileno brahuicae-Scutellarietalia intermediae* and *Artemisio satolinifoliae-Berberidetea sibiricae.* As discussed in NOWAK et al. (2015), the most suitable and comprehensive solution for the classification of alpine scree vegetation in Tajikistan is to include it into the Central Asian class of screes proposed by ERMAKOV et al. (2006). Examples of common species occurring in both areas are *Artemisia persica*, *A. santolinifolia*, *A. dracunculus* and *Stipa orientalis*. Other possibilities like *Thlaspietea rotundifolii* designated for Europe, *Lamio tomentosi-Chaerophylletea humilis* for Caucasus or *Heldreichietea* proposed for Taurus Mts in Turkey have to be rejected as they are remarkably distinct in species composition with almost no common species or even genera shared with Tajk's vegetation (VALACHOVIČ et al. 1997, QUEZEL 1973, PAROLLY 1998, BELONOVSKAYA 2012, BELONOVSKAYA et al. 2014). However, the southern Siberian screes, despite some microhabitat and climatic similarities (climate continentality, considerable fluctuations in temperature, aridity of the steppe and forest-steppe), are sufficiently distinct to consitue a separate order *Sileno brahuicae-Scutellarietalia intermediae*. This vegetation unit is defined by a considerable abundance of species of Irano-Turanian distributional types and consists of several *Apiaceae* genera (e.g. *Ferula* sp., *Angelica* sp., *Semenovia* sp., *Seseli* sp., *Aulacospermum* sp., *Tetrataenium olgae*, *Mediasia macrophylla* and others), *Asteraceae* (e.g. *Cousinia* sp.), *Amarylidaceae* (*Allium* sp.), dwarf shrubs (e.g. *Artemisia* sp.) and shrubs (e.g. *Rosa* sp., *Ephedra* sp., *Cerasus* sp., *Atraphaxis* sp., *Berberis* sp.). Important components of Pamir-Alai scree vegetation also include taxa of the *Rheum*, *Euphorbia*, *Piptatherum*, *Scutellaria*, *Scrophularia* and *Zygophyllum* genera.

Mountains and rocky habitats are often centres of vascular plant endemism due to ecological separateness, high speciation rate and specific and diversified microhabitat conditions (MÉDAIL & VERLAQUE 1997, NOROOZI et al. 2008, 2011, SPEZIALE & EZCURRA 2012). This habitat and floristic uniqueness considerably influences the diversification of plant communities. This results in floristically well-defined syntaxa of regional distribution with characteristic species combinations of high fidelity (VALACHOVIČ et al. 1997, DEIL et al. 2008). As we observed in Middle Asia, the number of defined syntaxa among rock vegetation is five-fold higher that in segetal plant communities (NOWAK S. et al. 2013a, b, NOWAK S. & NOWAK A. 2013). The separateness of scree habitat is also fairly high in Tajikistan due to extreme draughtness, very harsh microclimate in higher elevation, unstable ground and frequent stone avelanches destructive to plants. Therefore, it is not surprising that on screes in Tajikistan many endemic species ocurr, e.g. *Allium crystallinum*, *Astragalus varzobicus*, *Cousinia butkovii*, *C. corymbosa*, *C. outichaschensis*, *C. pseudoshisakensis*, *C. refracta*, *Delphinium decoloratum*, *Eremurus olgae*, *E. comosus*, *E. pubescens*, *Ferula equisetacea*, *F. koso-polianskyi*, *Lagochilus kschtutensis*, *Rhinopetalum bucharicum* and others. This results in narrow distributional ranges of the scree plant communities of the montane and colline belt in Tajikistan. Several of them, mainly *Eremostachyetum zeravschanicae*, *Cousinietum corymbosae* and *Cousinietum refractae* are stenochoric within the country. Probably also the community with *Zygophyllum gontscharovii* is fairly restricted to the south-western part of Tajikistan or marginally reaches northern Afghanistan and south-eastern Uzbekistan.

6. Concluding remarks

The present survey increases the knowledge about scree vegetation of the western Pamir Alai Mts. On the basis of floristic composition and habitat features we were able to describe seven new associations, two subassociation and one alliance. Insights into screes of eastern Pamir and maybe some highly elevated sections of Vanch, Rushan, Huf, Yazgulem and Iskashim valley may further enrich the syntaxonomic system of scree vegetation in Middle Asia. These areas require further geobotanical research. The distinctiveness of the eastern Pamirian flora, especially from *Hackelia*, *Lappula*, *Nepeta*, *Acantholimon* and *Astragalus* genera, should have reflection in the diversity of scree vegetation, so the phytosociological study in this area of Tajikistan must be continued.

Erweiterte deutsche Zusammenfassung

Einleitung – Tadschikistan ist ein Gebirgsland, das von alpinen Landschaften mit riesigen Schuttflächen, Schwemmkegeln, Gletschern und Moränen geprägt ist. Im vorliegenden Beitrag wird ein erster Versuch unternommen, die Vielfalt der Schuttgesellschaften in der kollinen und montanen Stufe des Pamir-Altai-Systems zu klassifizieren. Wir möchten damit folgende Fragen beantworten: (1) Welche Pflanzengesellschaften können auf diesen Standorten unterschieden werden? (2) Was sind die Standortsbedingungen der gefundenen Gesellschaften? (3) Was ist ihre Artenzusammensetzung und Struktur? (4) Welches sind ihre diagnostischen Arten? Wie schon unsere früheren Studien über Felsspaltenvegetation (NOWAK A. et al. 2014a, b) stellt diese Arbeit einen Beitrag zu einem Projekt dar, an dessen Ende die syntaxonomische Klassifikation der gesamten Fels- und Schuttvegetation Mittelasiens (oder zumindest des Pamir-Alai- und Tian-Shan-Gebirges) stehen soll.

Untersuchungsgebiet – Die pflanzensoziologischen Aufnahmen erfolgten im westlichen Teil Tadschikistans im Pamir-Alai-Gebirge (Abb. 1 und 2). Tadschikistan liegt in Mittelasien auf einer östlichen Länge von 36°40′–41°05′ und einer nördlichen Breite von 67°31′–75°14′. Es hat eine Fläche von ca. 143.500 km^2. Mehr als 50 % der Landesfläche liegen oberhalb von 3.000 m Seehöhe, und mehr als 93 % liegen oberhalb von 1.000 m. Der südliche Teil Tadschikistans wird vom subtropischen Klima beeinflusst, während der nördliche Teil in der temperaten Klimazone liegt. Das Gebiet ist durch starke Sonneneinstrahlung, große jahreszeitliche Temperaturunterschiede und geringe Niederschläge gekennzeichnet.

Methoden – In den Jahren 2010 bis 2014 wurden insgesamt 105 Vegetationsaufnahmen in Schuttgesellschaften der kollinen und montanen Stufe des Pamir-Alai-Gebirges durchgeführt. Die Flächengröße betrug 30 m^2 mit Ausnahme der Bestände mit *Corydalis kashgarica*, wo aufgrund der abweichenden Physiognomie Flächen von 5 m^2 aufgenommen wurden. Um einen ersten Überblick über die Datenstruktur zu erhalten, wurden die Aufnahmen mit dem modifizierten TWINSPAN-Algorithmus (ROLEČEK et al. 2009) klassifiziert. Zusätzlich wurde eine DCA-Ordination durchgeführt, um die Klassifikation zu überprüfen und die Beziehungen zwischen den Einheiten herauszuarbeiten. Die Nomenklatur der Arten folgt hauptsächlich CHEREPANOV (1995) sowie Plant List (http://www.theplantlist.org; accessed 15 May 2015).

Ergebnisse und Diskussion – Es konnten acht Assoziationen unterschieden werden: *Cousinietum corymbosae*, *Eremostachyetum tadschikistanicae*, *Cousinietum refractae*, *Caccinietum dubiae*, *Eremuretum sogdiani* (mit den Subassoziationen *typicum* und *delphinietosum decolorati*), *Feruletum kuhistanicae*, *Zygophylletum atriplicoidis* und *Corydalidetum kashgaricae* (Abb. 3–6, Tab. 1, Beilage S1–2). Aufgrund ihrer floristischen Zusammensetzung fassen wir alle Gesellschaften mit Ausnahme der letztgenannten in einem neuen Verband *Alceion nudiflorae* zusammen, welchen wir zu der provisorischen Ordnung *Sileno brahuicae-Scutellarietalia intermediae* innerhalb der Klasse *Artemisio santolinifoliae-Berberidetea sibiricae* stellen. Diese Klasse wurde aus Südsibirien beschrieben (ERMA-

KOV et al. 2006) und ist durch eine Häufung von Arten mit Irano-Turanischer Verbreitung gekennzeichnet. Hierzu zählen krautige Arten der *Apiaceae*, *Asteraceae* und *Amarylidaceae* sowie Zwergsträucher (z. B. *Artemisia* sp.) und Sträucher (z. B. *Rosa* sp., *Ephedra* sp., *Cerasus* sp., *Atraphaxis* sp., *Berberis* sp.). Wichtige Komponenten der Schuttvegetation im Pamir-Alai sind außerdem Vertreter der Gattungen *Rheum*, *Euphorbia*, *Piptatherum*, *Scutellaria*, *Scrophularia* und *Zygophyllum*.

Die Artenzusammensetzung der untersuchten Gesellschaften scheint hauptsächlich durch die folgenden Faktoren gesteuert zu werden: Mobilität und Größe der Schuttpartikel, Seehöhe und Hangneigung. Im Gegensatz zur Schuttvegetation der alpinen und subnivalen Stufe Tadschikistans (vgl. NOWAK et al. 2015) können die Gesellschaften der kollinen und montanen Stufe nach dem Chemismus des Substrats in eine calcifuge und eine calcicole Gruppe unterteilt werden. Allerdings ist diese Untergliederung nicht sehr scharf, und viele Arten treten in beiden Gruppen auf, so dass es nicht möglich scheint, diese auf höherem syntaxonomischen Niveau zu trennen, analog zur europäischen Schutt- und Felsspaltenvegetation (*Thlaspietalia rotundifolii* versus *Androsacetalia alpinae, Potentilletalia caulescentis* versus *Androsacetalia vandelii*). Das Zentrum der Verbreitung des Verbands *Alceion nudiflorae* liegt zwischen 1.200 und 1.900 m Seehöhe, während der alpine Verband *Ferulo foetidissimae-Vicion kokanicae* meist zwischen 1.900 und 3.600 m auftritt (NOWAK et al. 2015).

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Supplements

Supplement S1. Communities of screes of the montane and colline zones in western Pamir-Alai Mts in Tajikistan. Part 1: *Cousinietum corymbosae*, *Eremostachyetum tadschikistanicae*, *Cousinietum refractae*, *Caccinietum dubiae*, *Eremuretum sogdiani*, *Eremuretum sogdiani delphinietosum decolorati*.

Beilage S1. Die Gesellschaften der montanen und kollinen Schuttvegetation in Tadschikistan. Teil 1.

Supplement S2. Communities of screes of the montane and colline zones in western Pamir-Alai Mts in Tajikistan. Part 2: *Feruletum kuhistanicae*, *Zygophylletum atriplicoidis*, comm. with *Echinops nanus*, comm. with *Glaucium elegans*, comm. with *Prangos pabularia*, comm. with *Zygphyllum gontscharovii*, comm. with *Chondrilla gibbirostris*, *Corydalidetum kashgaricae*.

Beilage S2. Die Gesellschaften der montanen und kollinen Schuttvegetation in Tadschikistan. Teil 2.

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Supplement S1. Communities of screes of the montane and colline zones in western Pamir-Alai Mts in Tajikistan.
Part 1: *Cousinietum corymbosae* (Cc), *Eremostachyetum tadschikistanicae* (Et), *Cousinietum refractae* (Cr), *Caccinietum dubiae* (Cd), *Eremuretum sogdiani* (Es), *Eremuretum sogdiani delphinietosum decolorati* (Esd).

Beilage S1. Die Gesellschaften der montanen und kollinen Schuttvegetation in Tadschikistan.
Teil 1: *Cousinietum corymbosae* (Cc), *Eremostachyetum tadschikistanicae* (Et), *Cousinietum refractae* (Cr), *Caccinietum dubiae* (Cd), *Eremuretum sogdiani* (Es), *Eremuretum sogdiani delphinietosum decolorati* (Esd).

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55						
day	30	30	30	1	1	1	1	1	1	1	30	30	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30	30	1	1	24	24	24	24	24	27	27	27	24	30	24	24	24	25	25	25	25	23	23	25	25	25	25	25	25						
Date: month	6	6	6	7	7	7	7	7	7	7	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6						
year	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2011	2011	2014	2014	2014	2014						
Aspect	SW	SW	W	NW	W	N	N	W	SW	E	S	S	S	S	S	S	SW	E	S	S	W	NW	W	W	SW	SW	S	S	SW	SW	S	S	S	SE	SE	S	S	S	W	SW	W	W	W	W	NW	NW	W	N	N	NW	NW	E	NE	E	N						
Inclination (degrees)	35	35	40	40	35	30	25	30	35	40	45	45	50	60	45	45	40	40	45	50	45	50	50	50	40	45	35	40	45	45	45	40	35	45	45	45	55	45	45	40	40	50	50	25	20	20	50	35	30	30	35	45	30	40	30						
Altitude (m)	1846	1770	1788	1225	1233	1710	1725	1249	1255	1517	2385	2416	1865	1913	1820	1810	1359	1380	1515	1527	1639	1655	1585	1613	1379	1346	1444	1360	1600	1625	1415	1420	1410	1435	1428	1658	1746	1975	1756	2055	1760	1430	1435	1276	1280	1280	1200	1716	1716	1642	1575	1770	1665	1678	1650						
Cover of shrub layer (%)	-	-	-	-	-	5	0,5	-	-	-	-	-	5	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,5	5	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-						
Cover of herb layer (%)	40	90	75	65	60	30	60	60	70	40	60	95	70	70	95	85	100	100	80	75	100	95	95	100	100	95	70	60	70	65	45	60	45	60	60	50	80	65	50	60	35	80	85	100	100	95	100	70	75	80	60	80	90	70	40						
Relevé area (m^2)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	35	35	30	30	30	30	30	30						
pH	6,8	6,5	6,7	7,5	7,2	7,6	7,6	6,5	6,5	7,2	8,4	8,2	8,4	8,2	8,4	8,4	7,5	7,5	7,6	7,6	8	8,4	8,2	7,8	7,6	7,6	7	7	7,8	7,8	8	8,4	8,5	8,6	8,6	8,5	8,3	8	8.4	8,5	8.4	7,9	8	8,3	7,7	8	8,8	8,4	8,4	-	-	8,4	8,2	8,4	8						
gravel (cm)	2	2	2	3	3	3	3	2	3	1	3	3	2	2	3	3	2	3	3	3	3	3	1	1	3	2	1	1	1	1	13	10	8	5	8	10	6	8	10	10	15	6	8	5	4	4	4	5	5	4	5	3	4	3	4						
Number of species	10	13	13	15	13	13	13	23	22	14	22	19	15	11	18	18	29	32	18	17	15	16	13	13	17	20	19	21	15	15	12	15	11	11	11	12	13	23	27	16	18	10	14	14	16	16	15	17	18	18	15	21	24	22	24						
Association/Community	Cc	Cc	Cc	Cc	Cc	Cc	Cc	Cc	Cc	Cc	Et	Et	Et	Et	Et	Et	Et	Et	Et	Et	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cd	Cd	Cd	Cd	Cd	Cd	Cd	Cd	Cd	Cd	Cd	Es	Es	Es	Es	Es	Es	Es	Es	Es	Es	Esd	Esd	Esd	Esd						
Diagnostic species																																																														
Ass. Cousinietum corymbosae																																																														
Cousinia corymbosa	3	4	3	3	2	2	3	2	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	-	-	-	-	-
Ferula equisetacea	.	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-
Ass. Eremostachyetum tadschikistanicae																																																														
Eremostachys tadzhikistanica	.	.	.	.	.	.	.	.	.	.	3	4	2	3	2	3	4	3	4	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	V	-	-	-	-
Ass. Cousinietum refractae																																																														
Cousinia refracta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	3	4	2	3	3	3	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	V	-	-	-
Ass. Caccinietum dubiae																																																														
Caccinia dubia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	2	2	2	2	2	2	2	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	V	-	-
Ass. Eremuretum sogdiani																																																														
Eremurus sogdianus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	+	+	2	2	3	2	3	2	2	2	3	3	.	1	+	+	-	-	-	III	V	3
Subass. delphinietosum decolorati																																																														
Delphinium decoloratum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	3	2	-	-	-	-	-	4
All. Alceion nudiflorae																																																														
Alcea nudiflora	+	1	+	.	.	.	.	1	1	+	.	.	1	1	1	+	1	2	.	.	1	2	.	.	3	2	2	1	1	1	1	1	1	1	1	.	.	+	+	1	1	2	3	.	1	+	2	2	1	2	1	1	1	.	+	III	III	IV	V	V	3
Trichodesma incanum	.	.	.	.	.	.	.	.	.	.	+	+	1	1	2	1	1	1	+	+	1	+	+	1	1	.	+	.	.	.	1	1	.	.	1	.	2	1	1	1	+	+	1	1	.	+	+	1	1	+	.	+	.	.	+	.	V	III	IV	IV	2
Piptatherum songaricum	1	1	+	+	+	+	+	+	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	.	.	+	.	.	.	.	+	.	+	.	.	.	+	.	1	+	.	1	IV	II	-	II	II	3
Pulicaria salvifolia	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	2	2	.	+	.	1	1	+	.	1	.	.	.	.	.	.	+	+	.	.	+	+	II	I	-	V	II	2
Sporadic: *Chondrilla gibbirostris* 38(1); *Ferula kuhistanica* 33.																																																														
O. Sileno brahuicae-Scutellarietalia intermediae																																																														
Scutellaria intermedia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	3	2	1	1	.	+	1	1	.	+	-	-	-	-	IV	3
Cl. Artemisio santolinifoliae-Berberidetea sibiricae																																																														
Centaurea squarrosa	.	.	.	.	.	1	2	1	+	.	.	+	3	2	2	1	.	+	1	2	2	1	2	2	1	1	1	1	.	.	1	1	+	1	+	+	.	1	1	+	+	.	.	2	2	1	3	1	1	2	.	1	.	+	+	II	IV	IV	V	IV	3
Sanguisorba alpina	1	1	1	1	+	.	.	+	1	.	.	.	+	1	1	1	1	2	.	.	+	1	1	1	1	1	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	III	V	-	-	-
Hypericum scabrum	+	1	2	.	.	.	.	+	1	.	+	.	+	+	+	+	+	1	.	.	.	+	.	.	3	2	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	IV	IV	-	-	-
Artemisia persica	.	.	.	.	.	.	.	+	.	.	1	1	.	.	+	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	1	.	+	+	1	1	+	.	.	+	1	1	+	.	2	+	I	III	-	I	IV	3
Salvia sclarea	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	+	.	1	.	.	3	.	1	2	2	2	+	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	I	I	V	-	-	2
Callipeltis cucullaris	+	.	+	+	.	.	.	+	+	.	+	.	.	+	+	1	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	IV	-	I	-	-
Lactuca orientalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	.	.	+	+	+	.	+	.	.	.	+	+	+	.	.	+	.	.	+	-	-	-	IV	II	2
Echinops chloroleucus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	1	1	1	1	+	1	+	+	.	.	.	.	.	.	+	1	+	.	.	.	-	-	-	IV	II	1
Scrophularia scabiosifolia	+	1	+	+	.	.	.	+	+	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	+	+	.	+	.	.	III	I	-	-	II	1
Verbascum songaricum	.	+	+	+	1	.	.	1	+	.	.	.	1	+	+	+	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	III	I	-	-	-
Galium spurium	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	1	+	.	+	-	II	II	-	II	3
Crambe kotschyana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	1	+	.	+	.	.	2	2	2	1	.	.	.	.	+	1	.	+	-	-	-	III	II	3
Nepeta olgae	.	.	.	2	3	.	.	1	+	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	-	III	-	-
Cousinia ferganensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	.	.	.	1	.	.	+	2	2	.	.	.	.	.	.	1	+	.	.	.	.	-	-	-	III	II	-
Veronica intercedens	.	.	.	.	.	+	+	+	.	.	.	+	.	.	1	+	1	1	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	III	I	-	-	-
Eremurus olgae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	1	1	+	1	1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	IV	I	-	-
Cousinia radians	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	+	1	1	1	.	.	.	+	+	.	-	-	-	-	III	2
Eremurus comosus	.	.	.	.	.	.	.	.	.	.	1	+	.	.	3	2	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	IV	-	-	-	-
Cousinia mulgediifolia	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	1	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	III	-	-	-
Ziziphora pamiroalaica	.	.	.	.	.	+	+	.	1	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	I	-	-	-
Pimpinella puberula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	2	1	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	III	-	-	-
Melica inaequiglumis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	2	1	+	.	.	.	+	.	+	-	-	-	I	II	2
Papaver pavoninum	.	.	.	+	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	II	-	I	-	-	3
Rhinopetalum bucharicum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	+	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	III	-	-	-
Astragalus varzobicus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	III	-	-	-
Stipa orientalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	1	.	+	.	.	.	.	.	+	.	.	.	.	.	.	-	-	-	II	I	-
Cousinia butkovii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-
Polygonum polycnemoides	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	II	I	-	-	-
Glaucium fimbrilligerum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	-	I	I	-	-	1
Linaria popovii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	-	-	-	II	-	1
Atraphaxis pyrifolia b	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	-	I	-	I	-	1
Lindelofia macrostyla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	+	-	-	-	-	-	3
Rheum maximoviczii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	+	.	.	.	-	-	-	-	I	1
Scandix stellata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	-	-	-	-	-	3
Scutellaria adenostegia	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-
Marrubium vulgare	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	I	-	-	-	-	1
Tetrataenium olgae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	-	-	-	-	I	2
Cephalorhynchus songaricus	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	I	-	-
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Colutea paulsenii b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	I	-	-
Rubia tibetica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	-	-	-	I	-	1
Incarvillea olgae	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-
Geranium regelii	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
Rochelia cardiosepala	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
Ampelopsis viciifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	I	-	-	-
Lappula drobovii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	I	-	-
Erodium oxyrrhynchum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	I	-	-
Pachypterygium brevipes	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	-	-	-	-	-	2
Sporadic: *Allium popovii* 54; *Chondrilla maracandica* 1; *Cousinia pseudoshisakensis* 1; *Ephedra heterosperma* b 38(1); *Erigeron podolicus* 52; *Ferula koso-poljanskyi* 36; *Filago hurdwarica* 39; *Hedysarum denticulatum* 11; *Hyoscyamus pusillus* 36; *Lagochilus zeravschanicus* 40; *Minuartia meyeri* 53(1); *Rosa fedtschenkoana* b 54(1); *Seseli lehmannianum* 32(1); *Thymus zeravshanicus* 19.																																																														
Other species																																																														
Bromus tectorum	.	+	1	.	.	+	+	+	1	+	.	.	+	1	1	1	.	+	1	1	.	.	+	.	.	.	.	+	.	.	1	1	+	+	+	.	+	1	+	1	.	1	+	2	2	1	1	+	1	1	+	+	1	1	+	IV	IV	I	V	V	4
Origanum tyttanthum	.	1	2	.	+	+	1	1	1	+	+	.	.	.	.	+	1	+	+	1	1	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	III	II	I		-
Koelpinia linearis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	1	.	.	1	1	+	+	+	+	+	.	-	I	-	I	III	3
Perovskia virgata	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	1	1	.	1	2	1	1	+	.	+	.	I	-	-	-	IV	2
Impatiens parviflora	.	+	.	+	+	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	1	2	1	1	III	-	-	-	I	4
Haplophyllum acutifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	1	.	.	+	.	-	-	II	I	II	1
Pyrethrum parthenifolium	.	.	.	1	+	+	.	.	+	1	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	I	II	-	-	-
Alyssum desertorum	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	+	1	+	.	+	1	.	.	.	.	.	.	I	I	I	I	III	-
Poa bulbosa	.	.	.	.	.	.	+	+	+	+	+	+	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	II	I	-		-
Avena trichophylla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	+	+	+	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	IV	-	-	-
Taeniatherum crinitum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	+	+	+	.	.	.	+	+	.	.	.	.	-	I	-	I	III	-
Hordeum bulbosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	1	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	IV	-	-	-
Plantago lanceolata	.	.	.	.	.	.	.	.	.	.	1	2	+	.	.	.	+	+	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	III	II	-	-	-
Linum corymbulosum	.	.	.	.	+	+	.	1	+	.	.	.	.	.	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	II	-	-	-	-
Bromus danthoniae	.	.	.	.	.	.	+	.	.	.	+	.	+	+	+	1	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	IV	-	-	-	-
Capparis spinosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	+	.	+	.	+	.	.	.	+	.	+	.	.	.	.	.	.	-	-	-	III	II	-
Glaucium elegans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	1	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	-	-	-	III	I	1
Reseda lutea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	1	1	1	+	-	-	-	-	II	4
Trifolium repens	.	.	.	.	.	.	.	.	.	.	1	2	+	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	III	I	-	-	-
Aegilops triuncialis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	1	+	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	III	-	-	-
Setaria viridis	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	+	+	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	I	-	-	-
Sisymbrium brassiciformae	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	I	-	-	-
Velezia rigida	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	III	-	-	-
Geranium divaricatum	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	+	.	1	-	I	-	-	I	2
Convolvulus arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	II	-	-	-
Bromus oxyodon	+	.	.	.	.	.	.	+	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	-	-	-	-
Echium biebersteinii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	II	I	-	-
Salsola gemmascens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-
Handelia trichophylla	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	I	-	-	-	-
Chenopodium botrys	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	II	-	-
Prangos pabularia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	-	-	II	-	I	-
Andrachne rotundifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	-	-	-	II	I	-
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Clematis songarica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	2	.	.	.	-	-	I	-	I	1
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Eremopyrum bonapartis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	I	-	-
Anagallis foemina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	1	.	.	.	.	.	.	.	.	.	-	-	-	I	I	-
Phlomis canescens	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	II	-	-	-	-
Krashennikovia ceratoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-
Lactuca serriola	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	+	.	.	-	-	-	-	I	1
Ranunculus muricatus	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
Ailanthus altissima	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-
Spiraea baldshuanica b	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-
Achillea biebersteinii	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
Ligularia thompsoni	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
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Vaccaria hispanica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	I	-	-	-
Arenaria serpyllifolia	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-
Medicago sativa	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
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Rumex paulsenianus	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
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Verbena officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-
Ziziphora tenuior	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	I	-	-	-
Setaria pumila	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	I	-	-
Sporadic: *Adonis aestivalis* 11; *Amygdalus bucharica* b 22(1); Apiaceae sp. 13; *Astragalus turkestanus* 22; *Cichorium intybus* 15; *Convolvulus lineatus* 20; *Descurainia sophia* 38; *Echinops nanus* 43(1); *Elytrigia trichophora* 32(1); *Eremodaucus lehmanniana* 39; *Eremopyrum distans* 23; *Euphorbia szovitziana* 53(1); *Lepyrodiclis stellarioides* 4; *Phaecasium pulchrum* 54; *Poa relaxa* 2; *Strigosella africana* 20; *Torilis arvensis* 3; *Trigonella geminiflora* 28; *Tulipa praestans* 2; *Tussilago farfara* 19; *Valerianella turkestanica* 48; *Vulpia persica* 17.																																																														

Locations of samples: 1 - Maychura valley (684555,9; 385928,3); 2 - Varzob valley (684543,1; 385825,3); 3 - Varzob valley (684544,9; 385828,5); 4 - near Takob (684906,1; 384920,5); 5 - near Takob (684911,6; 384924,4); 6 - between Safedorak and Takob (685623,6; 385011,1); 7 - between Safedorak and Takob (685624,9; 385014,1); 8 - to the N from Romit (681843,3; 384429,7); 9 - to the N from Romit (681844; 384428,3); 10 - near Khokhu (691640,5; 385347,7); 11 - Takob (690008,8; 385111,4); 12 - Takob (690010,8; 385114,4); 13 - Safedorak (691928,3; 384536,5); 14 - 384536,5 (691930,7; 384539,5); 15 - between Safedorak and Takob (685742,8; 385011,2); 16 - between Safedorak and Takob (685740,5; 385008,7); 17 - near Ardzhanak (683626,9; 384347,5); 18 - near Ardzhanak (683625,3; 384349,2); 19 - near Takob (685423,3; 385019,4); 20 - near Takob (685427,4; 385021,5); 21 - near Ardzhanak (683531,8; 384506,5); 22 - near Ardzhanak (683534,8; 384509,3); 23 - near Ardzhanak (683616,4; 384454,9); 24 - near Ardzhanak (683541,7; 384458,3); 25 - near Ardzhanak (683635,2; 384329,4); 26 - near Ardzhanak (683627,8; 384332,5); 27 - Gusgarf (684627,2; 384439,2); 28 - Khondara (684815,8; 384843,7); 29 - Ardzhanak (683541,7; 384453,4); 30 - Ardzhanak (683539,7; 384460); 31 - near Ayni (682628,5; 392656,1); 32 - near Ayni (682627,5; 392655,7); 33 - near Iskadar (682628,4; 392656,9); 34 - near Zerabad (682751; 392620,4); 35 - near Zerabad (682751,8; 392619,8); 36 - near Rarz (685033,5; 392310,5); 37 - near Veshab (685719,5; 392416,7); 38 - Shamtuch (690314,2; 392437); 39 - to the N from Khushikat (683236,2; 392636,8); 40 - Takfon (684513,3; 391126,6); 41 - to the N from Khushikat (683237; 392636,2); 42 - Szink (682819,1; 392641,9); 43 - Szink (682821,2; 392642); 44 - near Novihomok (674630,9; 391855,8); 45 - near Novihomok (674632,8; 391857,4); 46 - near Novihomok (674632; 391859,2); 47 - Novihomok (674602,3; 392119,9); 48 - to the S to Vishkent (682111,6; 392535,9); 49 - to the S to Vishkent (682112,5; 392536,7); 50 - to the S from Shakhristan (684603,4; 394345,9); 51 - Shakhristan (684716,9; 394521,7); 52 - 1 Lake (674837,1; 391211,5); 53 - near Szing (674800,8; 391259,9); 54 - 1 Lake (674801,1; 391257,6); 55 - near Szing (674801,5; 391300,8).

Supplement S2. Communities of screes of the montane and colline zones in western Pamir-Alai Mts in Tajikistan.
Part 2: *Feruletum kuhistanicae* (Fk), *Zygophylletum atriplicoidis* (Za), comm. with *Echinops nanus* (En), comm. with *Glaucium elegans* (Ge), comm. with *Prangos pabularia* (Pp), comm. with *Zygphyllum gontscharovii* (Zg), comm. with *Chondrilla gibbirostris* (Cg), *Corydalidetum kashgaricae* (Ck).

Beilage S2. Die Gesellschaften der montanen und kollinen Schuttvegetation in Tadschikistan.
Teil 2: *Feruletum kuhistanicae* (Fk), *Zygophylletum atriplicoidis* (Za), comm. with *Echinops nanus* (En), comm. with *Glaucium elegans* (Ge), comm. with *Prangos pabularia* (Pp), comm. with *Zygphyllum gontscharovii* (Zg), comm. with *Chondrilla gibbirostris* (Cg), *Corydalidetum kashgaricae* (Ck).

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50								
day	25	25	30	30	5	5	7	7	16	16	5	30	30	27	27	27	27	27	30	30	30	29	29	29	29	29	29	22	22	20	20	20	22	25	25	20	20	1	1	21	21	18	18	2	2	18	18	23	23	21								
Date: month	6	6	6	6	7	7	7	7	8	8	7	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	6	6	6	6	7	7	6	6	6	6	6								
year	2014	2014	2014	2014	2014	2014	2014	2014	2013	2013	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2011	2011	2012	2012	2011	2011	2010	2010	2014								
Aspect	W	NW	S	S	SW	NW	SW	SW	S	SE	SW	W	SW	S	SE	S	S	S	S	S	S	W	W	W	W	SW	SW	SW	SW	S	SE	SE	SW	W	W	S	SE	SE	SE	NW	SE	NW	N	NW	W	W	W	W	W	W								
Inclination (degrees)	40	35	40	40	40	40	30	30	20	15	35	35	40	35	35	40	50	30	55	60	60	40	35	40	40	40	45	35	35	40	40	40	35	40	40	5	10	35	35	25	30	80	75	80	75	80	80	85	85	80								
Altitude (m)	1835	1840	1785	1810	1325	1923	1265	1263	1499	1480	1319	1370	1380	1539	1541	1525	1580	1645	1891	1885	1912	1735	1750	1750	1750	1538	1540	2035	2035	2420	2420	2420	2040	2170	2170	2540	2531	359	359	2016	1778	2220	2200	2161	2155	1985	1980	1520	1522	2016								
Cover of shrub layer (%)	5	15	-	-	-	-	5	5	5	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-	-	-	-	-	-	0,5	-	-	-	0,5	5	5	-	-	-	-	25	-	-	-	-	-	-	-	-	-								
Cover of herb layer (%)	60	70	100	95	85	85	55	55	95	80	65	55	60	35	50	65	55	50	50	25	60	60	55	30	25	95	35	50	40	35	30	35	35	40	35	100	95	100	100	65	75	40	30	40	40	40	50	25	40	55								
Relevé area (m^2)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	5	5	5	5	5	5	5	5	5								
pH	8,3	8,6	8,8	8,8	8,5	8,3	8,6	8,6	8,8	8,6	8,5	8,5	8,5	8,5	8,5	8,5	8,4	8,4	8,3	8,2	8,2	7,7	8,4	8	8,2	8	7,9	7,8	8,2	8,1	8,1	8,1	8,2	8,4	8,4	8,6	8,6	7,6	7,6	8,3	8,5	8	8	7,8	7,8	8	8,2	8,1	8,1	8								
gravel (cm)	5	7	10	10	12	10	13	13	11	12	12	3	5	10	8	5	2	2	3	3	3	2	2	3	2	2	3	2	2	2	2	2	2	2	2	2	2	1	1	1	2	1	21	2	1	1	1	1	2	1								
Number of species	14	17	19	22	19	28	17	19	24	18	10	16	12	5	7	9	7	7	5	7	8	7	8	8	7	13	11	6	5	4	4	6	6	5	5	14	11	15	15	10	16	5	5	3	2	4	5	4	3	5								
Association/Community	Fk	Fk	Fk	Fk	Fk	Fk	Fk	Fk	Fk	Fk	Fk	Za	Za	Za	Za	Za	Za	Za	Za	Za	Za	En	En	En	En	En	En	Ge	Ge	Ge	Ge	Ge	Ge	Ge	Ge	Pp	Pp	Zg	Zg	Cg	Cg	Ck	Ck	Ck	Ck	Ck	Ck	Ck	Ck	Ck								
Diagnostic species
Ass. Feruletum kuhistanicae
Ferula kuhistanica	3	3	3	4	3	2	3	3	3	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	-	-	-	-	-	-	-
Ass. Zygophylletum atriplicoidis
Zygophyllum atriplicoides	.	.	.	.	.	.	.	.	.	.	.	3	3	2	3	3	2	2	3	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	V	-	-	-	-	-	-
Comm. with *Echinops nanus*
Echinops nanus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	1	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	6	-	-	-	-	-
Comm. with *Glaucium elegans*
Glaucium elegans	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	3	3	3	3	3	3	3	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	2	V	-	-	-	-
Comm. with *Prangos pabularia*
Prangos pabularia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	4	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	2	-	-	-
Comm. with *Zygphyllum gontscharovii*
Zygphyllum gontscharovii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Comm. with *Chondrilla gibbirostris*
Chondrilla gibbirostris	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	+	.	.	.	+	+	.	.	1	I	-	-	-	-	-	2	III
All. Alceion nudiflorae
Pulicaria salvifolia	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	+	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	+	.	.	.	-	III	2	-	-	-	-	II
Trichodesma incanum	.	1	2	1	1	+	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	IV	-	-	-	-	-	1	-
Alcea nudiflora	.	.	+	1	2	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	-	-	I	-	-	-	-
Piptatherum songaricum	1	+	.	.	+	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	-	-	-	-	-	-	-
Eremostachys tadzhikistanica	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Ferula equisetacea	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
O. Sileno brahuicae-Scutellarietalia intermediae
Scutellaria intermedia	.	.	.	.	.	1	.	.	1	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	II	-	-	I	-	-	1	-
Silene brahuica	.	1	+	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	2	I	-	-	-	-
Cl. Artemisio santolinifoliae-Berberidetea sibiricae
Centaurea squarrosa	.	.	+	.	+	.	.	+	.	.	.	+	+	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	+	.	+	+	1	+	+	.	.	+	+	.	.	+	II	II	-	I	2	1	2	III
Artemisia persica	.	.	.	.	+	+	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	+	2	1	2	1	+	.	.	.	.	+	1	.	1	1	.	.	1	2	.	.	.	.	.	.	.	.	.	III	-	5	II	2	-	2	-
Callipeltis cucullaris	.	1	1	+	1	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	+	.	.	IV	I	-	I	-	-	2	I
Vicia kokanica	1	1	1	+	+	1	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	-	-	I	-	-	-	-
Atraphaxis pyrifolia b	1	1	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	II	-	-	II	-	-	1	-
Erodium oxyrrhynchum	.	.	.	.	.	.	.	.	.	.	.	+	1	1	+	1	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	IV	-	-	-	-	-	-
Piptatherum songaricum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	1	+	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	6	I	-	-	-	-
Echinops chloroleucus	.	+	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	.	.	.	.	I	I	-	-	-	-	2	-
Stipa orientalis	.	.	.	.	.	.	.	.	.	.	.	1	1	.	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	III	-	-	-	-	-	-
Salvia sclarea	.	.	+	+	.	.	+	1	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	-	-	-	-	-	-	-
Scrophularia scabiosifolia	+	+	.	.	1	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	-	-	-	-	-	-	-
Ziziphora interrupta	.	.	+	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	III	-	-	-	1	-	-	-
Lindelofia macrostyla	.	.	.	.	.	+	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	II	-	-	-	-
Galium spurium	+	+	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	-	-	I	-	-	-	-
Nepeta olgae	.	.	3	2	+	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	-	-	-	-	-	-	-
Melica inaequiglumis	1	1	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	1	-	-	-	-	-
Lactuca orientalis	.	.	.	+	.	+	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	-	-	-	-	-	-
Rheum maximoviczii	.	.	1	.	2	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Ziziphora pamiroalaica	.	.	.	.	.	.	.	+	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Lagochilus kschtutensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	4	-	-	-	-	-
Eremurus comosus	.	.	1	1	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Eremurus olgae	.	.	.	+	1	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Chesneya ternata	.	.	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	1	-
Veronica intercedens	.	.	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Polygonum polycnemoides	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	I	-	-	-	-
Stipa caucasica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	2	-	-	-	-	-
Rubia tibetica	+	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Cephalorhynchus songaricus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	+	+	.	-	-	-	-	-	-	1	II
Glaucium squamigerum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	+	-	-	-	-	-	-	-	II
Pachypterygium brevipes	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	II	-	-	-	-	-	-
Papaver pavoninum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-	-	-
Cerasus verrucosa b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	-	-	-	I	-	-	1	-
Eremurus pubescens	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Colutea paulsenii b	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Ephedra heterosperma b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-	-	-
Hypericum scabrum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	2	-	-	-
Sanguisorba alpina	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Gypsophila intricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	2	-	-	-	-	-
Eryngium macrocalyx	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	2	-	-	-
Dianthus tetralepis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Crambe kotschyana	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Cousinia pseudoshisakensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-	-	-
Piptatherum laterale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	-	-	-	I	-	-	1	-
Cousinia laniceps	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-	-	-
Gontscharovia popovii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Sporadic: *Astragalus nobilis* 91(1); *Cousinia outichaschensis* 90; *Echinops maracandicus* 92(1); *Ephedra intermedia* b 57(1); *Helichrysum mussae* 87; *Lagochilus zeravschanicus* 61; *Lappula tadshikorum* 75; *Linaria kulabensis* 95; *Linaria popovii* 81; *Linum macrorhizum* 86; *Marrubium vulgare* 91; *Myosotis refracta* 64; *Pimpinella puberula* 94; *Piptatherum kokanicum* 96; *Rosa ecae* b 91(1); *Scandix stellata* 62; *Serratula sogdiana* 88; *Seseli lehmannianum* 91; *Tetrataenium olgae* 56(1); *Tragacantha chodzha-bakirganica* 91.
Ass. Corydalidetum kashgaricae
Corydalis kashgarica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	3	3	2	3	2	3	2	-	-	-	-	-	-	-	V
All. Parietarion judaicae
Parietaria judaica	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	1	1	+	2	2	1	1	3	-	I	-	-	-	-	1	V
O. Tortulo-Cymbalarietalia & Cl. Parietarietea judaicae
Capparis spinosa	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	1	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	III	-	-	-	-	-	-
Cl. Asplenietea
Artemisia rutifolia	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	1	-	-	-
Stipa zeravschanica	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-	-	-
Poa relaxa	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Other species
Bromus tectorum	1	.	+	+	+	1	+	.	.	.	+	1	+	.	.	.	.	.	.	+	1	.	.	+	+	1	+	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	IV	II	4	-	-	-	2	-
Krashennikovia ceratoides	.	.	.	.	.	.	.	.	.	.	.	1	+	+	1	2	1	+	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	V	-	-	-	-	-	-
Poa bulbosa	.	.	.	.	.	.	.	.	2	1	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	2	1	.	.	.	.	.	.	.	.	.	.	.	I	I	1	-	1	2	-	-
Origanum tyttanthum	.	.	1	+	.	1	1	+	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	-	-	-	-	-	-	-
Bromus squarrosus	.	.	.	+	.	.	+	1	.	+	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	-	-	-	-	-	-
Stipa turkestanica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	-	-	4	-	-	-	1	-
Salsola gemmascens	.	.	.	.	.	.	.	.	.	.	.	+	1	1	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	III	-	-	-	-	-	-
Eremopyrum bonapartis	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	.	.	.	.	.	1	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	I	3	-	-	-	-	-
Salsola vvedensky	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	4	-	-	-	-	-
Geranium divaricatum	1	+	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Plantago lanceolata	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	1	1	-	-
Botriochloa ischaemum	.	.	1	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Dodartia orientalis	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	-	-	-	-	-	-
Lathyrus mulkak	.	.	.	.	+	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Linum corymbulosum	.	.	.	.	.	.	1	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Reseda lutea	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	I	-	-	-	-
Setaria viridis	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	-	-	-	-	-	-	-
Aphanopleura capillipes	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Bromus oxyodon	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Anabasis truncata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Lycium ruthenicum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Eremurus stenophyllus	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Perovskia virgata	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	-	I	-	-	-	-	1	-
Heliotropium olgae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Potentilla orientalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	2	-	-	-
Artemisia dracunculus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	2	-	-	-
Avena trichophylla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Aegilops triuncialis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Impatiens parviflora	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Ziziphora tenuior	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	-	-	-	-	-	-	-
Arnebia decumbens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	-	-	-
Bromus scoparius	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	II	-	-	-	-
Velezia rigida	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	-	-	-	-	-	2	-	-
Trigonella geminiflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	-	-	1	-	-	-	1	-
Sporadic: *Alyssum desertorum* 93(1); *Arenaria serpyllifolia* 94; *Bunium persicum* 64; *Bupleurum exaltatum* 84; *Carex pachystylis* 92(1); *Descurainia sophia* 61; *Echium biebersteinii* 93; *Eremostachys mogianica* 81(1); *Euphorbia sogdiana* 96; *Lappula consanguinea* 65; *Tragopogon krashennikovii* 81; *Veronica rubrifolia* 62.

Locations of samples: 56 - 2 Lake (674905,3; 391155,1); 57 - 2 Lake (674904,3; 391157,8); 58 - Takob (685725,3; 385016,4); 59 - Takob (685724,6; 385019,3); 60 - to the E from Varzob (685053,6; 384527); 61 - near Takob (685712,3; 384954,4); 62 - near Romit (691714,8; 384535,7); 63 - near Romit (691714,3; 384534,9); 64 - Childara (701316,8; 384813,5); 65 - Childara (701315,2; 384814,8); 66 - to the E from Varzob (685054,5; 384625,7); 67 - to the S from Shishkat (680246,3; 392254,7); 68 - to the S from Shishkat (680245,8; 392255,5); 69 - Rarz (683930; 392309,6); 70 - Rarz (683933,2; 392308,2); 71 - to the E from Ayni (683934,2; 392302,2); 72 - Pahurd (683939,2; 392301,3); 73 - Pahurd (685031,5; 392310,4); 74 - between Anzob and Takfon (684140,3; 391142); 75 - between Anzob and Takfon (684138,3; 391141,2); 76 - between Anzob and Takfon (684115,2; 391132,1); 77 - Zasun (684301,7; 392331,9); 78 - Zasun (684302,3; 392332,8); 79 - Zasun (684300,2; 392330,7); 80 - Zasun (684300,2; 392330,7); 81 - near Sangistan (684300,2; 392330,7); 82 - near Sangistan (684300,9; 392332,4); 83 - near Kante (682616,6; 391337,5); 84 - near Kante (682616,6; 391337,5); 85 - Sarytag (682001,4; 390323,2); 86 - Sarytag (682001,4; 390323,2); 87 - Sarytag (682001,4; 390323,2); 88 - near Kante (682616,6; 391337,5); 89 - 5 Lake (675138,2; 390835); 90 - 5 Lake (675139,9; 390835,5); 91 - Kashkuytal (681939,5; 390133,1); 92 - Kashkuytal (681939,5; 390133,1); 93 - near Garavuti (683244,2; 373712,3); 94 - near Garavuti (683243,1;373716,2); 95 - I-Daria Valley (682512,7; 390656,4); 96 - Iskander-Daria Valley (682945,1; 390921,2); 97 - Iskander-kul (682353,4; 390538,4); 98 - Iskander-kul (682354,2; 390538,1); 99 - Margeb (685414,5; 391102,7); 100 - Margeb (685414,7; 391102); 101 - Narvad (682443; 390635,4); 102 - Narvad (682444,2; 390635,8); 103 - to the S from Sangiston (683310,9; 392021,7); 104 - to the S from Sangiston (683310; 392022,5); 105 - Narvad (682512,7; 390657).