

Aspects of Plant Diversity Conservation If Taking as a Sample Area Black Sea and Kazakh Steppes in the Rostov Region

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Abstract: In the article the assessment of the fitodiversity of the Don Basin steppe performed. The research defined 37 plant associations of 6 alliances, 4 orders and 4 classes of eco-floristic classification communities that are represented in the Black Sea Steppe and Kazakh Steppe vegetation of Don Basin. Steppe community classified as *Festuco-Brometea*; petrophytic vegetation represents a class *Helianthemo-Thymetea*; psammophyte communities were related to the class *Festucetea vaginatae*; halophyte vegetation of solonetz grounds and hemi-halophyte derivative communities were related to the class *Festuco-Puccinellietea*.

Key words: Syntaxonomy of the steppe vegetation • Don River Basin • Biodiversity conservation

INTRODUCTION

All the Rostov Region, within which are the steppe of basin of Don river, is situated in the steppe zone of Eurasia, at the south of Eurasia. (Fig. 1). The Region includes steppes of the Don River Basin. Yet this study area is in the temperate continental climate zone but the climate conditions significantly vary throughout the area. Major botanical and geographic borders cross the Rostov Region. Here are two steppe provinces of Black Sea Steppe and Volga Left Bank – Kazakh Steppe [1]. In the Region the Black Sea Steppe ends and the Kazakh Steppe begins.

For long time natural resources of Don Basin Region have been exploited irregularly thus making the large steppe areas by now almost destroyed. Covering about 90% of the Region and being Region dominant area in the past the steppe has been totally ploughed. Intact steppe fragments now take 16.6 to 17.3% of the Region and are used as natural pastures that vary in stages of pascual digression. After long human transformation these steppe fragments became anthropogenic modifications of steppe vegetation that are “semi-natural” community combinations with many weed and alien species [2-4]. However, some unique communities and landscapes in the basin of Don have survived. These are petrophyte plant communities of the Don Ridge, Donetsk Ridge and Azov highland, psammophyte vegetation of

large sandy areas in Don Basin, arid saline areas of the Southern Yergeni and ancient valley of the Western Manych.

Main objective of this research is to define syntaxonomy for Don Basin steppe vegetation using eco-floristic criteria in the Rostov Region.

Classification Steppe Vegetation of the Don Basin: In terms of eco-floristic classification authentic multi-grass, bunch and gramineae communities; bunch-gramineous communities; desertified semi-shrub and bunch-gramineous communities were classified as communities of a single class *Festuco-Brometea* Br.-Bl. et Tx. 1943; petrophyte vegetation was related to the class *Helianthemo-Thymetea* Romashchenko, Didukh et Solomakha 1996; psammophyte communities were related to the class *Festucetea vaginatae* Soo em. Vicherek 1972; halophyte vegetation of alkali or solonetz grounds and hemi-halophyte derivative communities were related to the class *Festuco-Puccinellietea* Soü ex Vicherek 1973 [5-7].

Syntaxonomy analysis was performed using the experience of Central European, Ukrainian and Russian phytocenology [8-12].

As shown in Table 1 below the *Festuco-Brometea* class encloses all communities of steppe type vegetation. In total, top taxonomic entities of this class includes 1 order, 2 alliances and 4 suballiances.

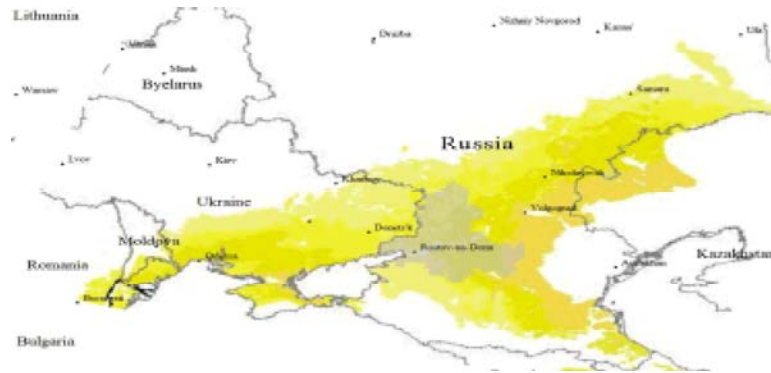


Fig. 1: Don River Basin in the Rostov Region (Russia)

Table 1: Syntaxons of *Festuco-Brometea* class

Association No.*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of descriptions	67	21	39	23	72	27	17	23	26	26	32	11	16	64	35	24	34
Association indicator species																	
<i>Stipa tirsia</i>	V	I	II	III	.	+	.	+	.	IV	.	+	+	.	.	.	.
<i>Trifolium alpestre</i>	V	III	+	+	+	.	II	.	.	I	.	.	.	.	+	.	.
<i>Stipa capillata</i>	III	V	III	.	II	III	IV	III	III	II	IV	II	II	+	+	II	II
<i>Rosa sp.</i>	I	IV	+	.	+	+	II	II	I	II	+	.	.	.	.	.	.
<i>Polygala comosa</i>	I	III	+	.	.	.	.	.	I	.	.	.	.	.	.	.	.
<i>Artemisia marschalliana</i>	III	III	V	II	.	II	III	.	II	I	.	.	.	+	.	+	+
<i>Helichrysum arenarium</i>	II	II	IV	.	+	I	II	.	I	I	.	+	+	.	.	.	.
<i>Jurinea cyanoides</i>	I	+	IV	.	.	+	.	.	.	+	.	.	.	.	.	.	.
<i>Astragalus varius</i>	+	+	IV	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gypsophila paniculata</i>	I	I	III	I	+	+	.	.	+	+	+	+	+	.	.	.	+
<i>Pulsatilla patens</i>	+	+	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pulsatilla pratensis</i>	+	I	III	.	.	.	+	.	.	.	.	.	.	.	.	.	.
<i>Bellevia sarmatica</i>	I	I	.	V	III	I	+	III	III	II	II	II	II	III	IV	II	.
<i>Pedicularis physocalyx</i>	.	.	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Peucedanum ruthenicum</i>	I	II	II	V	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salvia stepposa</i>	II	II	.	V	.	.	+	.	.	+	.	+	I	.	.	.	.
<i>Achillea submillefolium</i>	I	+	I	V	+	.	.	.	.	.	+	+	.	.	.	.	.
<i>Xanthoxylum alsaticum</i>	+	I	+	III	.	.	+	+	I	.	+	+	.	.	.	.	.
<i>Stipa lessingiana</i>	+	II	.	.	V	III	II	IV	V	III	V	III	IV	III	IV	V	IV
<i>Oxytropis pilosa</i>	+	.	.	.	III	+	.	.	II	II	III	I	I	.	.	.	.
<i>Viola ambigua</i>	I	I	.	+	III	I	.	II	III	I	II	+	.	.	.	.	.
<i>Cephalaria uralensis</i>	I	.	II	.	II	IV	II	.	+	I	+	.	.	.	.	.	.
<i>Thymus dimorphus</i>	.	.	.	.	.	III	+	+	I	+	.	.	.	.	.	.	.
<i>Cleistogenes bulgarica</i>	.	.	.	.	+	III	I	+	I	.	.	.	.	.	.	.	.
<i>Linum czerniaevii</i>	.	.	.	.	I	III	+	.	I	.	.	.	.	.	.	.	.
<i>Jurinea stoechadifolia</i>	.	.	.	.	.	III	.	.	+	.	.	.	.	.	.	.	.
<i>Scleranthus annuus</i>	.	.	.	.	.	.	V	.	.	.	.	.	.	.	.	.	.
<i>Berteroa incana</i>	I	+	+	.	+	I	III	.	.	+	.	+	I	.	.	.	+
<i>Stipa zaleskii</i>	+	.	.	.	I	II	II	V	I	II	III	.	.	+	II	I	+
<i>Bothriochloa ischaemum</i>	.	.	.	.	+	+	+	II	+	+	.	.	.	.	.	.	.
<i>Stipa pulcherrima</i>	.	.	.	.	.	+	.	V	V	V	IV	.	.	.	.	.	.
<i>Centaurea orientalis</i>	I	II	+	.	II	II	I	+	V	II	I	.	.	.	.	.	.
<i>Inula aspera</i>	.	.	.	.	+	+	+	.	III	+	.	.	.	.	.	.	.
<i>Plantago urvillei</i>	IV	IV	+	V	IV	II	III	I	III	V	III	II	III	.	.	.	.
<i>Centaurea adpressa</i>	II	I	II	I	+	+	+	I	.	III	.	I	II	.	.	.	+
<i>Stachys atherocalyx</i>	.	.	.	.	I	+	I	I	I	III	I	.	.	.	.	.	+
<i>Campanula macrostachya</i>	.	.	.	.	.	.	.	.	.	II	.	.	.	.	.	.	.
<i>Astragalus ponticus</i>	.	.	.	.	.	.	.	.	.	.	IV	.	.	.	.	.	.
<i>Adonis wolgensis</i>	+	.	.	IV	+	I	.	+	+	I	IV	+	.	.	.	.	.
<i>Carduus nutans</i>	.	.	.	.	I	.	.	.	.	.	III	+	.	.	.	.	+
<i>Calophaca wolgarica</i>	.	.	.	.	.	.	.	II	.	.	III	.	.	.	.	.	+
<i>Verbascum ovalifolium</i>	.	.	.	.	I	.	.	.	I	.	II	.	.	.	.	.	.
<i>Festuca pseudovina</i>	.	.	.	.	+	I	.	+	.	.	+	V	II	+	III	II	III
<i>Ajuga orientalis</i>	.	.	.	.	.	.	.	.	.	.	II	III	.	.	.	.	.
<i>Astragalus asper</i>	.	.	.	.	.	.	.	+	.	+	.	IV	V	.	.	.	.
<i>Astragalus longipetalus</i>	.	.	.	.	.	.	.	.	.	.	I	II	.	.	.	.	.
<i>Tragopogon dasyrhynchus</i>	I	.	I	II	+	+	.	I	.	II	II	III	IV	II	I	I	+

Table 1: Continued

Association No.*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of descriptions	67	21	39	23	72	27	17	23	26	26	32	11	16	64	35	24	34
<i>Agropyron pectinatum</i>	.	.	.	.	.	+	+	II	+	.	III	+	I	IV	+	II	I
<i>Astragalus reduncus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	III	I	I	I
<i>Chenopodium album</i>	.	.	+	.	+	.	.	.	.	.	.	.	.	III	+	.	+
<i>Agropyron desertorum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	IV	I	II
<i>Cerastium sylvaticum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	I	IV	I	.
<i>Amoria retusa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	II	IV	+	.
<i>Vicia hirsuta</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	III	.	+
<i>Cruciata pedemontana</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.
<i>Stipa ucrainica</i>	.	.	.	.	.	III	II	III	II	III	I	+	+	II	III	V	I
<i>Artemisia lerchiana</i>	.	.	.	.	+	II	.	.	.	.	.	I	II	.	.	+	V
<i>Artemisia pauciflora</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	II
<i>Colchicum laetum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Ceratocephala testiculata</i>	.	.	.	.	.	+	.	.	.	.	+	+	.	+	.	+	II
<i>Festuco rupicola-Stipenion pennatae</i> suballiance indicator species																	
<i>Stipa pennata</i>	V	V	IV	IV	+	II	.	+	.	I	.	+	+	.	.	+	.
<i>Festuca rupicola</i>	IV	V	V	V	I	II	.	II	II	I	+	II	II	.	.	.	.
<i>Potentilla humifusa</i>	IV	IV	IV	IV	I	III	II	.	I	+	.	+	I	.	.	+	.
<i>Stipa dasyphylla</i>	III	III	V	V	.	I	II	.	.	II	.	.	.	.	.	.	.
<i>Trinia multicaulis</i>	III	II	II	IV	+	+	.	.	.	+	.	II	II	+	+	+	.
<i>Knautia arvensis</i>	II	+	+	II	.	.	+	.	.	.	.	.	.	.	.	.	.
<i>Ferulago galbanifera</i>	I	I	III	IV	.	+	+	.	.	I	I	+	+	.	.	.	.
<i>Inula hirta</i>	I	I	II	III	.	.	.	.	.	.	.	+	+	.	.	.	+
<i>Phlomis pungenis</i> suballiance indicator species																	
<i>Euphorbia stepposa</i>	+	II	.	.	III	III	+	+	V	II	.	I	+	.	.	.	.
<i>Orthanthella lutea</i>	I	I	I	.	+	II	II	+	I	I	.	+	I	.	.	.	.
<i>Galium octonarium</i>	V	IV	I	IV	III	II	II	IV	V	V	V	I	+	+	.	+	+
<i>Seseli tortuosum</i>	IV	IV	IV	III	II	III	.	I	I	III	IV	III	IV	+	.	+	+
<i>Stachys recta</i>	IV	IV	IV	V	IV	III	IV	II	IV	III	IV	II	II	.	.	+	.
<i>Bromopsis riparia</i>	IV	IV	III	II	IV	IV	III	III	V	V	V	II	I	.	.	+	+
<i>Veronica jacquinii</i>	IV	III	II	IV	III	II	II	II	III	IV	III	III	III	.	.	+	.
<i>Erysimum canescens</i>	I	II	II	.	III	II	IV	III	III	II	V	II	II	.	+	I	II
<i>Eryngium campestre</i>	V	V	IV	II	IV	IV	V	IV	III	IV	V	IV	V	II	II	IV	II
<i>Salvia tesquicola</i>	III	III	II	.	IV	II	III	III	III	IV	V	IV	IV	II	I	III	+
<i>Phlomis pungenis</i>	I	+	+	V	IV	III	II	III	IV	III	V	III	IV	II	III	III	II
<i>Goniolimon tataricum</i>	+	II	+	II	I	+	II	I	I	II	+	II	II	II	I	+	+
<i>Nepeta parviflora</i>	+	+	.	II	IV	I	.	I	III	I	IV	+	+	+	I	+	.
<i>Linum austriacum</i>	.	.	.	.	IV	II	I	IV	IV	II	V	I	I	II	II	II	II
<i>Tanacetum millefolium</i>	.	.	.	.	+	II	II	I	II	+	I	+	I	+	.	.	+
<i>Marrubium praecox</i>	.	.	.	.	IV	II	+	II	V	+	IV	.	.	.	.	+	+
<i>Festucion valesiaca</i> alliance indicator species																	
<i>Salvia nutans</i>	II	II	+	.	V	IV	IV	I	V	II	I	+	+	.	.	.	.
<i>Achillea stepposa</i>	V	V	II	.	V	III	III	III	IV	V	V	IV	III	+	.	I	+
<i>Thesium arvense</i>	III	III	II	I	II	III	II	I	+	II	I	III	III	.	+	+	I
<i>Limonium platyphyllum</i>	I	+	.	II	+	+	+	II	+	III	IV	II	III	.	.	+	.
<i>Astragalus onobrychis</i>	+	+	+	.	II	II	.	I	IV	+	I	+	+	.	.	+	.
<i>Astragalus ucrainicus</i>	.	+	.	.	III	III	.	II	II	.	+	II	II	+	.	+	+
<i>Astragalus austriacus</i>	.	.	.	.	III	I	+	.	IV	+	V	+	.	.	.	.	.
<i>Fragario viridis-Trifolion montani</i> alliance indicator species																	
<i>Elytrigia repens</i>	V	V	III	V	IV	II	II	V	IV	V	IV	IV	III	III	IV	III	I
<i>Amoria montana</i>	V	V	II	III	.	+	I	.	.	I	.	.	.	.	.	+	.
<i>Fragaria viridis</i>	V	V	II	+	+	+	+	.	+	+	.	.	.	.	.	.	+
<i>Filipendula vulgaris</i>	IV	IV	II	V	+	+	+	II	+	II	.	.	.	.	.	.	+
<i>Cichorium intybus</i>	II	III	+	.	I	I	.	II	I	II	+	II	+	+	.	+	+
<i>Centaurea pseudomaculosa</i>	II	III	+	.	I	+	I	+	+	+	.	II	II	+	.	.	.
<i>Genista tinctoria</i>	II	III	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Poo bulbosae-Caricion stenophyllae</i> alliance indicator species																	
<i>Poa bulbosa</i>	.	+	III	.	I	III	II	II	I	I	+	+	+	V	V	V	V
<i>Carex stenophylla</i>	+	+	.	.	+	.	I	+	.	.	.	.	.	+	III	II	III
<i>Tanacetum achilleifolii-Artemision santonicae</i> alliance indicator species																	
<i>Tanacetum achilleifolium</i>	.	.	.	.	+	+	.	+	.	.	I	I	I	V	IV	III	IV
<i>Artemisia santonica</i>	.	+	+	.	.	+	+	.	.	.	+	+	+	V	IV	II	III
<i>Serratula erucifolia</i>	.	+	.	I	+	+	+	I	.	II	III	II	II	V	V	II	I
<i>Bromus squarrosus</i>	+	.	I	.	I	I	II	II	+	.	IV	II	II	IV	IV	III	V
<i>Leymus ramosus</i>	.	.	.	.	.	.	.	.	.	.	.	I	I	II	III	II	I
<i>Crepis tectorum</i>	.	.	.	.	I	+	+	.	.	.	.	+	.	III	IV	II	II
<i>Phlomoidea puberula</i>	.	.	.	.	+	.	.	.	.	.	+	.	.	II	III	II	+

Table 1: Continued

Association No.*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of descriptions	67	21	39	23	72	27	17	23	26	26	32	11	16	64	35	24	34
<i>Trifolium diffusum</i>	.	.	.	.	+	.	.	.	.	+	.	.	.	II	III	+	+
<i>Ranunculus oxyspermus</i>	.	.	.	.	.	.	.	+	.	.	+	.	.	III	I	III	II
<i>Tulipa gesneriana</i>	.	.	.	.	.	+	.	+	.	.	+	.	.	III	III	II	II
<i>Prangos odontalgica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	III	III	+	I
<i>Trifolio arvensis-Limonienion sareptani</i> suballiance indicator species																	
<i>Trifolium arvense</i>	+	.	+	.	.	.	II	.	.	+	.	.	.	IV	V	III	+
<i>Limonium sareptanum</i>	.	.	.	.	.	+	.	+	.	.	.	.	.	III	IV	II	+
<i>Ventenata dubia</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	+	III	+	.
<i>Vicia villosa</i>	.	.	.	.	.	.	.	+	.	+	.	.	.	III	IV	I	.
<i>Pastinaca clausii</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	III	III	+	.
<i>Lepidium perfoliatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	II	III	II	+
<i>Festucetalia valesiacae</i> order indicator species and <i>Festuco-Brometea</i> class indicator species																	
<i>Koeleria cristata</i>	IV	V	IV	+	IV	V	IV	IV	IV	V	V	III	V	II	III	V	IV
<i>Galium verum</i>	IV	V	IV	V	+	I	IV	II	I	III	II	IV	IV	+	III	II	+
<i>Poa angustifolia</i>	IV	V	II	V	IV	I	I	III	III	V	V	III	II	.	+	I	+
<i>Euphorbia virgata</i>	IV	IV	III	.	I	II	II	IV	+	III	I	I	+	.	+	I	+
<i>Falcaria vulgaris</i>	IV	IV	II	IV	IV	II	II	IV	V	V	V	IV	V	III	III	IV	II
<i>Galatella villosa</i>	IV	II	III	V	III	IV	III	IV	IV	IV	V	III	V	IV	V	II	II
<i>Medicago romanica</i>	III	IV	II	III	V	IV	IV	V	V	V	IV	IV	V	II	+	III	I
<i>Convolvulus arvensis</i>	III	IV	I	II	IV	II	IV	IV	III	III	III	III	III	+	.	II	.
<i>Thymus marschallianus</i>	III	III	II	IV	III	II	IV	IV	V	V	V	I	I	+	+	II	+
<i>Nonea rossica</i>	III	I	+	+	II	III	II	+	II	I	+	II	II	.	.	+	.
<i>Artemisia austriaca</i>	II	III	III	+	III	II	IV	IV	II	IV	IV	IV	IV	IV	V	V	V
<i>Festuca valesiaca</i>	II	IV	I	III	V	V	V	IV	IV	V	V	IV	IV	IV	IV	IV	V
<i>Galium humifusum</i>	II	II	.	.	II	I	I	III	+	II	I	III	III	+	+	II	I
<i>Odontites vulgaris</i>	II	I	+	.	III	+	I	IV	II	II	+	II	I	+	.	+	.
<i>Euphorbia seguieriana</i>	I	I	III	.	II	IV	III	III	II	+	V	I	+	.	+	IV	III
<i>Phlomoideis tuberosa</i>	I	I	+	IV	+	I	I	I	I	III	II	I	+	+	.	.	.
<i>Linaria maeotica</i>	I	+	+	.	II	I	+	III	+	II	I	III	III	.	+	II	I

Notes *Associations: 1. *Trifolio alpestris-Stipetum tirsae*, 2. *Stipetum capillatae*, 3. *Artemisia marschallianae-Stipetum dasyphyllae*, 4. *Bellevalio sarmaticae-Stipetum pennatae*, 5. *Stipetum lessingianae*, 6. *Cephalario uralsensis-Thymetum dimorphi*, 7. *Sclerantho annui-Stipetum capillatae*, 8. *Medicago romanicae-Stipetum zaleskii*, 9. *Plantagini stepposae-Stipetum pulcherrimae*, 10. *Plantagini urvillei-Stipetum tirsae*, 11. *Astragalo ponticae-Brometum squarrosi*, 12. *Ajugo orientalis-Festucetum pseudovinae*, 13. *Astragalo asperi-Stipetum lessingianae*, 14. *Agropyri pectinati-Poetum bulbosae*, 15. *Amorio retusae-Cerastietum syvaschici*, 16. *Eryngio campestris-Stipetum ucrainicae*, 17. *Artemisio lerchiana-Stipetum lessingianae*

At this level of syntaxonomy analysis we understand a new alliance of *Tanaceto achilleifolii-Artemision santonicae* as a part of *Festucetalia valesiacae* order. This new alliance represents Volga Left Bank – Kazakh desertified steppe on low salinity soils at the Southern Yergeni and ancient valley of Western Manych. On one hand, the indicator combination for this alliance is close to the alliance of *Poo bulbosae-Caricion stenophyllae* Saitov 1989. On the other hand, in physical space and syntaxonomy space this new alliance borders with the alliance of *Agropyron pectinati* V.Golub et Uzhametkaja 1991.

Within the researched area petrophyte or semifrutex (timyannik, Steppae petrophile) steppe include three lithological subdivisions: calcium petrophytes, psammopetrophytes and xero-petrophytes.

Psammopetrophyte and xeropetrophyte steppe (Steppae petrophile) of Azov area and Donetsk ridge area are included in *Phlomenion pungentis* suballiance (Table 1, association 6, 7, 8).

Calcium steppe syntaxons on the Middle-Russia Highland extensions (Don chalk ridge and Kalach highland) are included in *Bupleuro*

falcati-Gypsophilenion altissimae suballiance of *Festucion valesiacae* alliance (Table 2, associations 1, 2). At this syntaxonomy level calcium petrophyte steppes of Azov area and Donetsk ridge flat slopes are compared with a new preliminary alliance of *Cleistogeno bulgaricae-Jurinenion stoechadifoliae* that represents transitional grass semifrutex-shrub-turf-gramineous communities (Table 2, association 3, 4). According to its indicator species array these alliances are adjacent to syntaxons of *Euphorbio cretophilae-Thymion cretacei* alliance of *Helianthemo-Thymetea* class. On the other hand, these alliances border suballiance *Phlomenion pungentis* of *Festuco-Brometea* class. Special features of these communities are their noticeable features of calcium-petrophyte genesis, original species array and also they often have halophyte and transitive features. Therefore, these communities may be understood as a separate sub-type of Steppae creta-petrophile. Following above defined syntaxons the steppe type calcium-petrophyte communities on skeleton soils that are formed on tertiary loose limestone and marlstone and older solid limestone and marlstone should be described as hemi-petrophytes.

Table 2: Petrophyte communities of semifrutex timyannik steppes and other timyannik areas

Association No. *	1	2	3	4	5	6	7	8	9	10	11
Number of descriptions	18	6	27	13	11	7	11	4	5	10	8
Association indicator species for <i>Festuco-Brometea</i> class											
<i>Astragalus albicaulis</i>	V	.	.	.	.	.	II	.	II	.	V
<i>Agropyron pectinatum</i>	IV	.	+	.	.	.	I	.	I	.	.
<i>Krascheninnikovia ceratoides</i>	III	.	.	.	.	.	+	.	.	.	.
<i>Echinops ruthenicus</i>	II	.	.	.	.	.	+	.	.	.	.
<i>Elytrigia trichophora</i>	.	V	.	.	.	.	.	.	.	+	.
<i>Aster amellus</i>	I	IV	.	II	.	.	.	.	.	+	.
<i>Verbascum marschallianum</i>	I	V	+	.	.	.	.	.	.	.	.
<i>Origanum vulgare</i>	.	III	+	.	.	.	.	.	.	+	.
<i>Anemone sylvestris</i>	.	II	.	.	.	.	.	.	.	+	.
<i>Thymus dimorphus</i>	.	.	V	II	.	.	.	.	.	.	.
<i>Artemisia lerchiana</i>	II	.	III	.	.	.	I	.	I	I	I
<i>Gypsophila glomerata</i>	.	.	III	I	.	.	.	.	.	.	.
<i>Convolvulus lineatus</i>	I	.	I	V	.	.	.	.	.	.	II
<i>Vincetoxicum maeoticum</i>	.	.	+	V	.	.	.	.	.	.	.
<i>Caragana scythica</i>	.	.	+	II	.	.	.	.	.	.	.
<i>Asperula montana</i>	.	.	+	IV	.	.	.	.	.	.	.
<i>Poterium polygamum</i>	.	.	.	II	.	.	.	.	.	.	.
<i>Bupleuro falcati-Gypsophilenen altissimae</i> suballiance indicator species											
<i>Gypsophila altissima</i>	IV	IV	+	II	V	.	III	V	V	II	V
<i>Salvia nutans</i>	IV	V	V	V	IV	II	.	.	.	.	.
<i>Medicago lupulina</i>	III	V	III	IV	.	II	.	.	.	I	.
<i>Agrimonia eupatoria</i>	II	V	I	II	.	.	+	.	.	I	.
<i>Centaurea pseudomaculosa</i>	II	II	.	.	.	.	.	.	.	I	.
<i>Jurinea arachnoidea</i>	II	.	III	.	.	.	.	.	.	.	.
<i>Polygala sibirica</i>	I	.	.	.	.	.	.	.	.	.	.
<i>Cleistogeno bulgaricae-Jurinenion stoechadifoliae</i> suballiance indicator species											
<i>Jurinea stoechadifolia</i>	.	.	V	V	IV	.	.	.	.	.	.
<i>Cleistogenes bulgarica</i>	.	.	IV	IV	.	.	.	.	.	.	I
<i>Galatella villosa</i>	III	.	IV	IV	I	.	+	.	.	.	I
<i>Meniocus linifolius</i>	+	.	III	III	II	.	.	.	.	.	.
<i>Hyacinthella pallasiana</i>	.	.	IV	V	III	.	.	.	.	.	.
<i>Linum tenuifolium</i>	.	.	II	IV	V	.	.	.	.	.	I
<i>Linum czerniaevii</i>	.	.	V	V	III	.	.	.	.	.	.
<i>Microthlaspi perfoliatum</i>	.	.	II	III	III	.	.	.	.	.	.
<i>Alyssum calycinum</i>	.	.	I	II	.	II	.	.	.	.	.
<i>Dianthus pseudarmeria</i>	.	.	II	III	.	.	.	.	.	.	.
<i>Scorzonera mollis</i>	.	.	IV	I	.	.	.	.	.	+	.
<i>Festucion valesiaca</i> alliance indicator species											
<i>Thesium arvense</i>	III	V	III	V	I	IV	+	V	I	II	II
<i>Astragalus onobrychis</i>	II	IV	II	+	.	IV	.	.	.	+	.
<i>Astragalus austriacus</i>	.	.	II	I	.	.	.	.	.	.	.
<i>Festucetalia valesiaca</i> order <i>Festuco-Brometea</i> class indicator species											
<i>Festuca valesiaca</i>	II	III	V	V	I	V	.	III	I	.	.
<i>Artemisia austriaca</i>	III	.	I	III	I	IV	.	.	.	.	.
<i>Koeleria cristata</i>	II	IV	V	IV	.	V	.	II	.	.	.
<i>Euphorbia seguieriana</i>	III	I	V	III	I	.	+	.	I	+	V
<i>Campanula sibirica</i>	II	IV	III	.	III	.	.	II	.	+	.
<i>Plantago urvillei</i>	II	IV	II	II	I	.	.	.	.	.	.
<i>Stipa capillata</i>	V	III	IV	V	II	.	.	.	I	+	II
<i>Festuca rupicola</i>	II	V	II	III	.	.	.	.	.	+	.
<i>Convolvulus arvensis</i>	+	III	I	I	.	V	.	.	.	+	.
<i>Galium verum</i>	III	II	.	.	.	.	+	.	.	I	.
<i>Medicago romanica</i>	.	.	+	.	I	V	.	.	I	II	.
<i>Asperula cynanchica</i>	+	.	+	II	.	IV	.	.	.	.	.
Association indicator species for <i>Helianthemo-Thymetea</i> class											
<i>Artemisia salsoloides</i>	II	.	.	.	V	.	III	V	V	.	IV

Table 2: Continued

Association No. *	1	2	3	4	5	6	7	8	9	10	11
Number of descriptions	18	6	27	13	11	7	11	4	5	10	8
<i>Genista scythica</i>	.	.	II	IV	V	.	.	.	.	.	.
<i>Reseda lutea</i>	I	.	II	II	V	II	+	.	.	II	I
<i>Onosma tanaitica</i>	III	I	+	.	V	.	+	.	.	.	II
<i>Alyssum tortuosum</i>	.	.	III	.	V	V	.	.	.	.	.
<i>Leontodon biscutellifolius</i>	.	.	I	I	IV	.	.	.	.	.	.
<i>Hedysarum grandiflorum</i>	.	.	I	+	IV	.	.	.	.	.	.
<i>Centaurea ruthenica</i>	.	.	.	.	IV	.	.	.	.	.	.
<i>Erucastrum armoracioides</i>	.	.	.	.	III	.	.	.	.	.	.
<i>Linum hirsutum</i>	+	.	+	.	II	.	.	.	.	.	.
<i>Diptotaxis tenuifolia</i>	+	.	.	.	II	.	.	.	.	.	.
<i>Hyssopus officinalis</i>	.	.	.	.	.	V	.	.	.	.	.
<i>Silene borysthenica</i>	.	.	.	.	.	V	.	.	.	.	.
<i>Bromus squarrosus</i>	I	I	I	II	.	V	.	.	I	.	.
<i>Achillea leptophylla</i>	.	.	I	.	.	V	.	.	.	.	.
<i>Elytrigia stipifolia</i>	.	.	.	.	.	IV	.	.	.	.	.
<i>Alyssum turkestanicum</i>	.	.	III	.	.	IV	.	.	.	.	.
<i>Xeranthemum annuum</i>	.	.	I	.	.	IV	.	.	.	.	.
<i>Anisantha tectorum</i>	.	.	.	.	.	IV	.	.	.	.	.
<i>Salvia verticillata</i>	.	.	+	I	.	IV	.	.	.	.	.
<i>Echium vulgare</i>	.	.	+	.	.	IV	.	.	.	+	.
<i>Festuca pratensis</i>	.	.	.	.	.	IV	.	.	.	+	.
<i>Matthiola fragrans</i>	+	I	+	.	.	.	V	.	.	.	III
<i>Asperula tephrocarpa</i>	.	.	II	.	IV	.	V	.	.	+	IV
<i>Melilotus officinalis</i>	II	IV	.	.	.	.	V	.	.	IV	.
<i>Atraphaxis frutescens</i>	.	.	.	.	.	.	III	.	.	.	.
<i>Silene cretacea</i>	.	.	.	.	.	.	II	.	.	.	.
<i>Hedysarum cretaceum</i>	.	.	.	.	.	.	.	V	.	.	.
<i>Melica transilvanica</i>	.	I	.	.	I	.	+	V	.	.	.
<i>Artemisia absinthium</i>	.	.	.	.	.	.	.	V	.	.	.
<i>Poa angustifolia</i>	I	IV	+	+	.	.	I	V	.	.	.
<i>Poa compressa</i>	I	II	II	.	.	III	.	V	II	III	.
<i>Lepidium meyeri</i>	.	.	.	.	.	.	.	.	V	.	.
<i>Scrophularia cretacea</i>	.	.	.	.	.	.	.	III	V	II	II
<i>Festuca cretacea</i>	.	.	.	.	.	.	I	.	II	V	.
<i>Erysimum cretaceum</i>	.	.	.	.	.	.	.	.	.	II	.
<i>Artemisia hololeuca</i>	.	.	.	.	.	.	.	.	.	.	V
<i>Linum ucranicum</i>	I	.	.	.	.	.	.	.	.	.	V
<i>Plantago salsa</i>	+	.	.	.	.	.	II	.	.	+	IV
<i>Silene supina</i>	+	.	.	IV	.	.	II	.	.	.	IV
<i>Orphanthella lutea</i>	I	II	III	.	I	.	.	.	.	II	IV
<i>Euphorbia cretophilae-Thymion cretacei</i> alliance indicator species											
<i>Thymus calcareus</i>	II	.	.	V	V	V	II	.	.	.	V
<i>Euphorbia cretophila</i>	.	.	III	V	V	.	.	.	.	.	.
<i>Erucastrum cretaceum</i>	.	.	.	.	I	.	.	.	.	+	.
<i>Centaureo carbonatae-Koelerion talievii</i> alliance indicator species											
<i>Centaurea carbonata</i>	III	.	.	V	.	.	.	.	I	.	I
<i>Koeleria talievii</i>	.	.	.	.	.	.	+	III	I	+	.
<i>Teucrium polium</i>	III	I	V	V	V	V	.	.	.	.	.
<i>Artemisio hololeuca-Hyssopion cretacei</i> alliance indicator species											
<i>Polygala cretacea</i>	I	I	+	.	II	.	.	.	.	II	I
<i>Helianthemo-Thymetea</i> class indicator species and <i>Thymo cretacei-Hissopetalia cretacei</i> order indicator species											
<i>Pimpinella tragium</i>	II	I	IV	V	V	V	V	V	V	V	V
<i>Cephalaria uralensis</i>	III	.	V	V	IV	IV	IV	III	IV	+	V
<i>Hyssopus cretaceus</i>	.	.	.	.	.	.	V	V	V	III	V
<i>Bupleurum falcatum</i>	+	.	.	.	.	.	II	.	.	+	.

Notes Associations*: 1 - *Astragalo albicaulis-Stipetum capillatae*; 2 - *Astro amelli-Elytrigetum trichophorae*; 3 - *Cephalario uralensis-Thymetum dimorphi*; 4 - *Convolvulis lineati-Vincetoxietum maeotici*; 5 - *Genisto scythicae-Artemisietum salsoloidis*; 6 - *Sileno borysthenicae-Hyssopetum angustifolii*; 7 - *Matthiolo fragransi-Atraphaxietum frutescens*; 8 - *Hedysaro cretacei-Melicetum transilvanicae*; 9 - *Lepidio meyeri-Scrophularietum cretacei*; 10 - *Erysimo cretacei-Festucetum cretacei*; 11 - *Artemisio hololeuca-Polygaletum cretaceae*.

Table 3: Psammophyte communities of *Festucetea vaginatae* class

Associations*	1	2	3	4	5	6
Number of descriptions	24	42	12	33	38	5
Association indicator species						
<i>Potentilla arenaria</i>	IV	I	II	I	.	.
<i>Hieracium echiooides</i>	IV	II	I	I	I	.
<i>Scirpoides holoschoenus</i>	+	V	II	I	+	.
<i>Calamagrostis epigeios</i>	III	V	I	II	II	.
<i>Potentilla argentea</i>	III	V	+	I	.	.
<i>Galium verum</i>	II	V	II	+	.	I
<i>Myosotis micrantha</i>	II	V	II	+	+	I
<i>Verbascum phoeniceum</i>	I	V	.	+	.	.
<i>Genista sibirica</i>	.	V	.	+	+	.
<i>Eryngium planum</i>	.	IV	.	.	.	.
<i>Silene chlorantha</i>	I	IV	I	.	.	.
<i>Asparagus officinalis</i>	+	IV	.	+	.	.
<i>Hypericum perforatum</i>	+	IV	.	+	+	.
<i>Chondrilla graminea</i>	II	II	V	III	I	.
<i>Anisantha tectorum</i>	I	.	V	+	+	I
<i>Agropyron fragile</i>	+	I	IV	II	+	.
<i>Syrenia montana</i>	II	.	IV	I	+	I
<i>Plantago arenaria</i>	.	.	III	.	.	.
<i>Xanthium californicum</i>	.	.	III	.	.	I
<i>Anthemis ruthenica</i>	+	.	III	+	.	I
<i>Astragalus borysthenticus</i>	.	.	II	.	.	.
<i>Centaurea gerberi</i>	+	.	I	V	.	.
<i>Agropyron tanaiticum</i>	I	I	II	V	I	.
<i>Rumex acetosella</i>	III	+	+	V	I	.
<i>Salix rosmarinifolia</i>	.	I	+	IV	+	.
<i>Dianthus squarrosus</i>	.	.	.	+	III	.
<i>Linaria dulcis</i>	.	.	.	II	III	.
<i>Cleistogenes squarrosus</i>	II	.	II	.	.	V
<i>Allium atroviolaceum</i>	.	.	.	.	.	V
<i>Scorzonera mollis</i>	.	.	.	.	.	V
<i>Potentilla astracana</i>	.	+	.	.	.	V
<i>Iris pumila</i>	+	.	.	.	.	IV
<i>Alyssum turkestanicum</i>	+	.	I	II	+	V
<i>Bromus squarrosus</i>	I	+	+	+	.	IV
<i>Carex praecox</i>	.	.	.	.	.	IV
<i>Filago arvensis</i>	.	.	.	+	.	IV
<i>Chamaecytisus borysthentici-Artemisienion arenariae</i> suballiance indicator species						
<i>Artemisia arenaria</i>	+	II	+	V	V	V
<i>Tragopogon tanaiticus</i>	I	+	+	V	IV	.
<i>Leymus racemosus</i>	+	.	+	II	III	.
<i>Asperula graveolens</i>	+	.	I	III	III	.
<i>Chamaecytisus borysthenticus</i>	.	.	I	IV	II	.
<i>Festucion beckeri</i> alliance indicator species						
<i>Festuca beckeri</i>	IV	+	IV	V	V	V
<i>Thymus pallasianus</i>	III	II	IV	IV	III	V
<i>Koeleria sabuletorum</i>	V	I	IV	V	II	III
<i>Achillea micrantha</i>	IV	I	V	IV	II	I
<i>Jurinea cyanooides</i>	IV	+	V	II	II	III
<i>Seseli tortuosum</i>	IV	V	I	II	+	.
<i>Linaria genistifolia</i>	III	III	I	+	.	IV
<i>Carex colchica</i>	III	III	III	V	IV	.
<i>Scabiosa ucranica</i>	II	V	I	I	+	.
<i>Senecio borysthenticus</i>	III	IV	+	I	+	.
<i>Scorzonera ensifolia</i>	II	+	II	+	.	.
<i>Agropyron lavrenkoanum</i>	II	+	+	.	.	.

Table 3: Continued

Associations*	1	2	3	4	5	6
Number of descriptions	24	42	12	33	38	5
<i>Festucetalia vaginatae</i> order indicator species						
<i>Secale sylvestre</i>	I	III	IV	IV	I	.
<i>Astragalus varius</i>	IV	II	IV	.	+	V
<i>Anchusa popovii</i>	II	.	+	+	.	.
<i>Taeniopetalum arenarium</i>	I	.	.	.	.	.
<i>Festucetea vaginatae</i> class indicator species						
<i>Artemisia marschalliana</i>	V	V	V	II	+	I
<i>Stipa borysthentica</i>	V	III	V	I	I	III
<i>Euphorbia seguieriana</i>	V	III	II	V	V	III
<i>Helichrysum arenarium</i>	V	II	V	V	III	V
<i>Silene borysthentica</i>	III	.	I	II	+	II
<i>Gypsophila paniculata</i>	II	I	V	II	II	IV
<i>Chondrilla juncea</i>	I	.	.	.	.	.

Notes Associations*: 1 - *Hieracio echiooidis-Stipetum borysthenticae*; 2 - *Scirpoido holoschoenii-Genistaetum sibiricae*; 3 - *Secalo-Stipetum borysthenticae*; 4 - *Centaureo gerberi-Agropyretum tanaiticae*; 5 - *Artemisio arenariae-Dianthetum squarrosi*; 6 - *Artemisio arenariae-Potentilletum astracanae*.

Syntaxons of *Helianthemo-Thymetea* class is otherwise represented by azonal steppe type petrophyte vegetation or Petrophyton that grows on various rock outcrops, or semifrutex timyannik sites (Table 2, associations 5 to 11) which are also azonal.

Unlike the steppe type hemi-psammophyte communities (Steppae ammophile) communities of Psammophyton on large sandy areas in the Don valley and its tributary valleys represent azonal vegetation. Therefore they are included in syntaxons of *Festucetea vaginatae* class (Table 3). Wet conditions and succession stage are most important to make distinction between variable in syntaxonomy sand cenoses.

Syntaxons of *Festuco-Puccinellietea* Sou ex Vicherek 1973 class represent azonal halophytic vegetation on alkali soils and are included in the halophyton or salineta.

CONCLUSION

Our research presented above is first that defines syntaxonomy of Don basin steppes thus enabling for new understanding of the division scale applicable for dividing the continuum into discrete types of vegetation.

Inference: In total, our research defined 37 plant associations of 6 alliances, 4 orders and 4 classes of eco-floristic classification communities that are represented in the Black Sea Steppe and Volga Left Bank – Kazakh Steppe vegetation of Don Basin.

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