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Distribution, community characteristics, and classification of the *Stipa klemenzii* steppe

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Introduction

Stipa klemenzii steppe is a zonal vegetation type occurring in semi-arid regions of northern China and Mongolia. Using extensive field vegetation surveys during 2010 to 2016 and related published documents, we systematically studied eco-geographic distribution patterns, community characteristics, and classification of *S. klemenzii*.

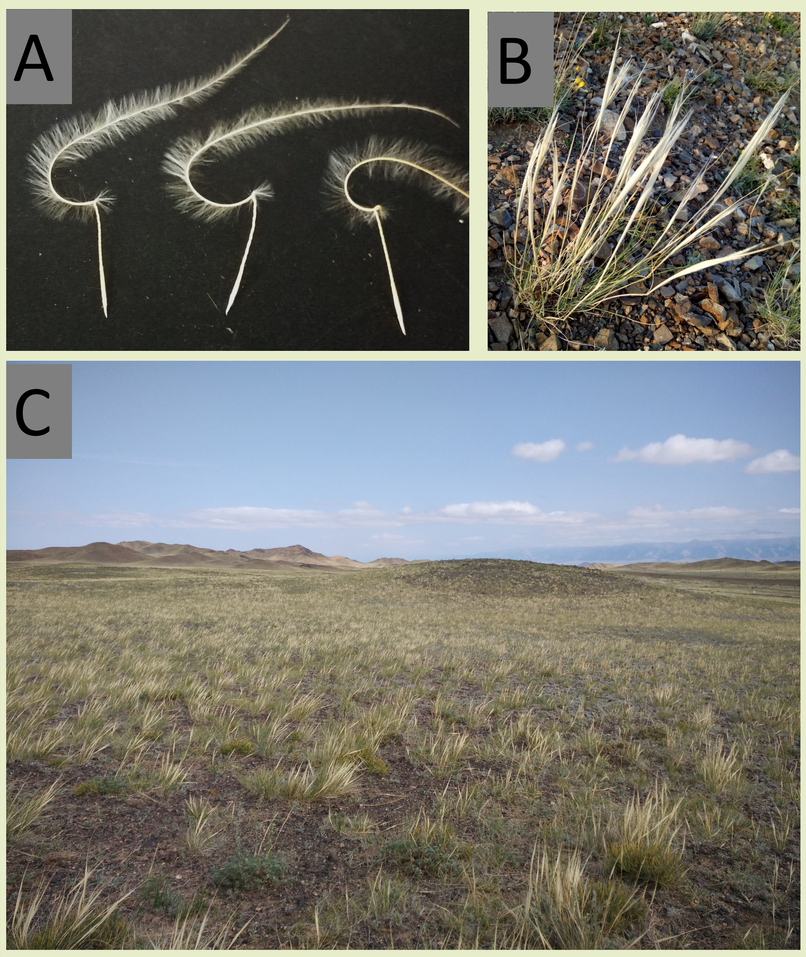

Fig.1 Morphological characters of *S. klemenzii* (A. anthecia with awns, B. general habit) and *S. klemenzii* steppe (C).

Results

➢ Distribution

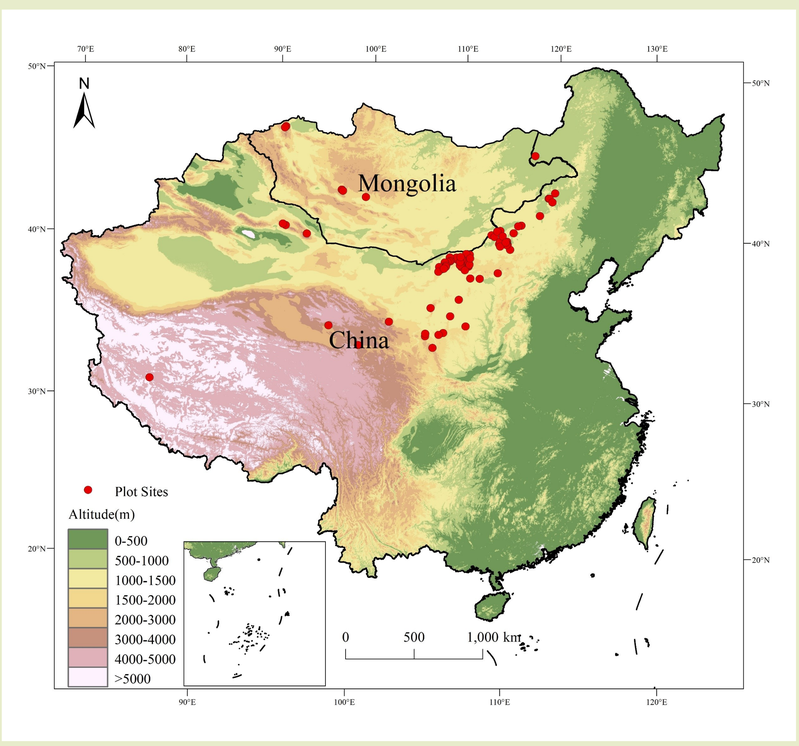

Fig.2 Distribution map of 79 *S. klemenzii* steppe plots sites.

➢ Community characteristic

Based on the data collected from 79 plots, the average height, cover, aboveground biomass and species richness of *S. klemenzii* are 14 cm, 19%, 60 g m^{-2} , and 8.5 taxa/m^2.

Results

➢ Species composition

Table 1 Families of the species in *S. klemenzii* steppe.

Families	Species (Genera)	Families	Species (Genera)
Asteraceae	30(17)	Apiaceae	2(2)
Poaceae	29(17)	Convolvulaceae	2(1)
Fabaceae	27(6)	Linaceae	2(1)
Chenopodiaceae	15(9)	Iridaceae	2(1)
Liliaceae	11(3)	Plumbaginaceae	1(1)
Rosaceae	8(3)	Plantaginaceae	1(1)
Cyperaceae	5(2)	Tamaricaceae	1(1)
Caryophyllaceae	5(3)	Asclepiadaceae	1(1)
Primulaceae	4(1)	Nitrariaceae	1(1)
Brassicaceae	4(3)	Geraniaceae	1(1)
Lamiaceae	3(3)	Ranunculaceae	1(1)
Boraginaceae	3(3)	Thymelaeaceae	1(1)
Euphorbiaceae	2(1)	Scrophulariaceae	1(1)
Zygophyllaceae	2(2)	Polygalaceae	1(1)
Ephedraceae	2(1)	Rutaceae	1(1)
Overall	169(90)		

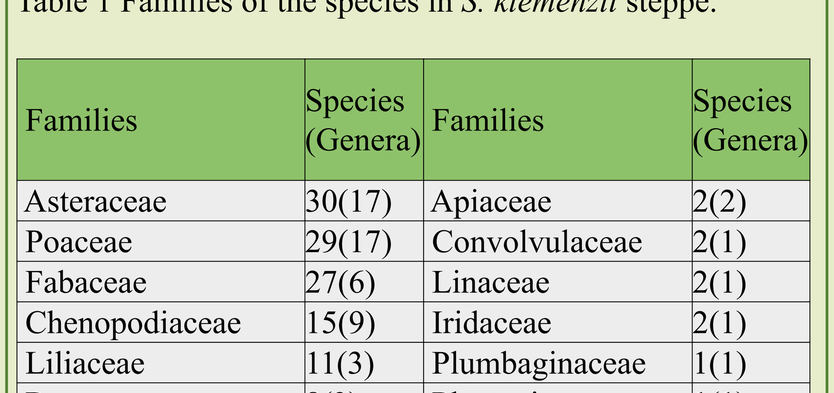

Fig.3 The frequency distribution of the species with different constancy. I. 0-20%, II. 20-40%, III. 40-60%, IV. 60-80%, V. 80-100%.

Fig.4 The frequency distribution of the species with different life forms. C. Chamaephytes, H. Hemicryptophytes, Cr, Cryptophytes, T, Therophytes.

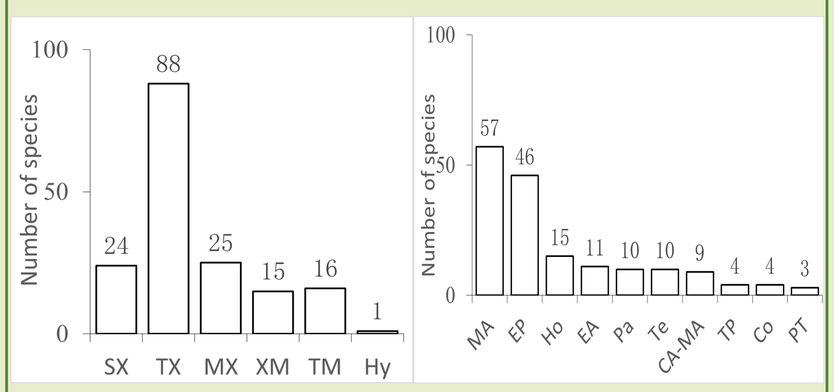

Fig.5 The frequency distribution of the species with different ecological types of water. SX, Super-Xerophytes, TX, Typical Xerophytes, MX, Meso-Xerophytes, XM, Xero-Mesophytes, TM, Typical Mesophytes, Hy, Hygrophytes.

Fig.6 The frequency distribution of the species with different geographical floristic elements. MA. Middle Asia, EP. East Palaearctic, Ho. Holarctic, EA. East Asia, Pa. Palaearctic, Te. Tethys, CA-MA. Central Asia to Middle Asia, TP, Tibetan Plateau, Co. Cosmopolitan, PT. Pan-Temperate.

Results

➢ Classification

Table 2 The classification of *S. klemenzii* steppe at association level based on life forms and dominance of species. Form. Ass-gr. and Ass. are abbreviations for Formation, Association-group and Association.

From. *S. klemenzii* steppe	Plots
Ass-gr. *S. klemenzii* + Prennial Bunchgrass steppe	
Ass. *S. klemenzii* + *Cleistogenes songorica* steppe	4
Ass. *S. klemenzii* + *S. breviflora* steppe	3
Ass. *S. klemenzii* + *S. krylovii* steppe	3
Ass. *S. klemenzii* + *Agropyron cristatum* steppe	2
Ass. *S. klemenzii* + *Cleistogenes squarrosa* steppe	2
Ass. *S. klemenzii* + *S.* sp steppe	2
Ass. *S. klemenzii* + *Agropyron mongolicum* steppe	1
Ass-gr. *S. klemenzii* + Prennial Rhizomatous grass steppe	
Ass. *S. klemenzii* + *Orinus thoroldii*	1
Ass-gr. *S. klemenzii* + Prennial Forbs steppe	
Ass. *S. klemenzii* + *Allium polyrhizum* steppe	7
Ass. *S. klemenzii* + *Convolvulus ammannii* steppe	4
Ass. *S. klemenzii* + *Haplophyllum dauricum* steppe	1
Ass. *S. klemenzii* + *Asparagus dauricus* steppe	1
Ass. *S. klemenzii* + *Iris tenuifolia* steppe	1
Ass. *S. klemenzii* + *Allium bidentatum* steppe	1
Ass. *S. klemenzii* + *Peganum harmala* steppe	1
Ass. *S. klemenzii* + *Oxytropis aciphylla* steppe	1
Ass. *S. klemenzii* + *Gypsophila licentiana* steppe	1
Ass. *S. klemenzii* + *Hedysarum brachypterum* steppe	1
Ass. *S. klemenzii* + *Saussurea petrovii* steppe	1
Ass. *S. klemenzii* + *Seriphidium terrae-albae* steppe	1
Ass-gr. *S. klemenzii* + Annuals steppe	
Ass. *S. klemenzii* + *Enneapogon desvauxii* steppe	7
Ass. *S. klemenzii* + *Salsola collina* steppe	3
Ass-gr. *S. klemenzii* - Shurbs *steppe*	
Ass. *S. klemenzii* - *Ajania achilloides* steppe	1
Ass. *S. klemenzii* - *Anabasis brevifolia* steppe	1
Ass. *S. klemenzii* - *Hippolytia trifida* steppe	1
Ass. *S. klemenzii* - *Kochia prostrata* steppe	1
Ass. *S. klemenzii* - *Krascheninnikovia ceratoides* steppe	1
Ass. *S. klemenzii* - *Reaumuria soongorica* steppe	1
Ass. *S. klemenzii* - *Salsola abrotanoides* steppe	1
Ass. *S. klemenzii* - *Salsola passerine* steppe	1
Ass-gr. *S. klemenzii* steppe	
Ass. *S. klemenzii*	22

Conclusions

- This research systematically synthesized the distribution, community characteristics and classification of *S. klemenzii* steppe on the basis of extensive field survey and plots data. It can provide data for the “Vegetation Monography of China ” which has been launched recently by Chinese vegetation scientists.
- A proper vegetation classification system which is not only suitable but also compatible with major international classification system needs to be proposed in China. Further research will be focused on the classification system.