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Taxonomic composition and morphological diagnostic characters of *Silene L.* species in the Fergana Valley

Farg'ona vodiysidagi *Silene L.* turlarining taksonomik tarkibi va morfologik diagnostik belgilariТаксономический состав и морфологические диагностические признаки видов *Silene L.* в Ферганской долине**BAKHRIDDINOVA Durdona Yodgorbek qizi^{1*} , KHABIBULLAYEVA Mohlaroy Forkhodali qizi¹ ,
HOSHIMOV Hushbaht Rustamjon ugli² **¹ Namangan State University, Namangan, Uzbekistan² Namangan Regional Branch of the Academy of Sciences of the Republic of Uzbekistan, Namangan, Uzbekistan* Corresponding author: urdonabaxriddinova5@gmail.com**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****BAKHRIDDINOVA Durdona Yodgorbek qizi^{1*} , KHABIBULLAYEVA Mohlaroy Forkhodali qizi¹ , HOSHIMOV Hushbaht Rustamjon ugli² **¹ Namangan State University, Namangan, Uzbekistan² Namangan Regional Branch of the Academy of Sciences of the Republic of Uzbekistan, Namangan, Uzbekistan

Abstract. This study evaluates the taxonomic composition and morphological diagnostic characters of *Silene L.* in the Fergana Valley. Based on literature, herbarium material, regional floras, and taxonomic sources, 32 species were assigned to 12 sections. Sect. *Sclerocalycinae* was the most species-rich section with eight species (25.00%), followed by sect. *Holopetalae* with six species (18.75%). The principal characters used to distinguish sections were calyx shape and venation, degree of calyx inflation, division of the petal limb, structure of the petal claw, anthophore pubescence, inflorescence type, and selected vegetative traits. The results provide a concise taxonomic framework for identification of *Silene* species in the Fergana Valley and a basis for subsequent ecological, biogeographical, and conservation studies.

Keywords: *Silene*; Caryophyllaceae; Fergana Valley; taxonomy; section; taxonomic composition; morphological diagnosis; diagnostic characters; flora

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Annotatsiya. Ushbu tadqiqotda Farg'ona vodiysidagi *Silene L.* turkumining taksonomik tarkibi va morfologik diagnostik belgilari baholandi. Adabiyotlar, gerbariy materiallari, mintaqaviy floralar va taksonomik manbalar asosida 32 tur 12 seksiyaga ajratildi. Turlarga eng boy seksiya — sect. *Sclerocalycinae* (sakkiz tur; 25,00%), undan keyin sect. *Holopetalae* (olti tur; 18,75%). Seksialarni farqlashda asosiy belgilar sifatida kosachaning shakli va tomirlanishi, kosachaning shishganlik darajasi, gultoiji plastinkasining bo'linishi, gultoiji tirnoqchasining tuzilishi, antoforming tukliligi, to'pgul turi hamda ayrim vegetativ belgilar xizmat qildi. Natijalar Farg'ona vodiysida *Silene* turlarini aniqlash uchun ixcham taksonomik asos beradi va keyingi ekologik, biogeografik hamda muhofaza tadqiqotlari uchun zamin yaratadi.

Kalit so'zlar: *Silene*; Caryophyllaceae; Farg'ona vodiysi; taksonomiya; seksiya; taksonomik tarkib; morfologik diagnostika; diagnostik belgilar; flora

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РУССКИЙ

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Аннотация. В исследовании оценены таксономический состав и морфологические диагностические признаки рода *Silene* L. в Ферганской долине. На основе литературы, гербарных материалов, региональных флор и таксономических источников 32 вида отнесены к 12 секциям. Наиболее богатой видами оказалась секция *Sclerocalycinae* (восемь видов; 25,00%), за ней следует секция *Holopetalae* (шесть видов; 18,75%). Основными признаками для разграничения секций служили форма и жилкование чашечки, степень её вздутости, рассечённость пластинки лепестка, строение ноготка лепестка, опушённость антофора, тип соцветия и отдельные вегетативные признаки. Результаты дают компактную таксономическую основу для определения видов *Silene* в Ферганской долине и базу для последующих экологических, биогеографических и природоохранных исследований.

Ключевые слова: *Silene*; Caryophyllaceae; Ферганская долина; таксономия; секция; таксономический состав; морфологическая диагностика; диагностические признаки; флора

1. INTRODUCTION

The genus *Silene* L. is one of the largest, most widely distributed, and taxonomically complex genera of Caryophyllaceae Juss. Its major centres of diversity are associated with the Mediterranean region, Western Asia, and the mountainous areas of Central Asia (Greuter 1995, Oxelman and Lidén 1995, Lazkov 2006). Pronounced morphological polymorphism, diversity of life forms and reproductive systems, and broad ecological amplitude make the genus important for floristic, taxonomic, and evolutionary research.

Generative morphology is particularly informative for species and sectional delimitation in *Silene*. Diagnostic characters commonly include calyx shape, structure, venation and inflation; degree of division of the petal limb; morphology of the petal claw; anthophore pubescence; and inflorescence architecture. These characters have also been widely used in floristic treatments and identification keys for Central Asia.

The Fergana Valley is characterised by complex orography, steep elevational gradients, heterogeneous substrates, and diverse microclimatic conditions, all of which contribute to high floristic diversity (Belolipov et al., 2013; Sennikov & Khasanov, 2017). Recent studies have also highlighted its floristic and conservation importance through new plant records and the recognition of priority areas such as the Shorsuv and Yozyovon massifs (Tojibaev & Hoshimov, 2024; Tojibaev et al., 2025, 2026). Against this background, an updated assessment of the regional *Silene* flora is needed to clarify species composition, sectional affiliation, and key morphological diagnostic characters.

Accordingly, this study aimed to (1) determine the taxonomic composition of *Silene* in the Fergana Valley, (2) analyse the distribution of species among sections, and (3) summarise the principal morphological characters useful for distinguishing these sections.

2. MATERIALS AND METHODS

The study focused on species of *Silene* L. (Caryophyllaceae) occurring in the Fergana Valley. The taxonomic dataset was compiled from regional floristic literature, herbarium material, taxonomic treatments, and identification manuals.

Species circumscription and sectional placement followed the taxonomic approaches used in Lazkov's treatment of Caryophyllaceae, *Flora of the USSR, the Key to Plants of Central Asia*, and the study cited in the source manuscript as Edalatiyan et

al. (2010) (Lazkov 2006, Kovalevskaja 1971). Nomenclature, sectional affiliation, and morphology were compared across sources. Diagnostic assessment considered both generative and vegetative characters, with primary emphasis on calyx shape, inflation and venation, calyx teeth, division of the petal limb, presence or absence of auricles on the petal claw, and anthophore pubescence. Inflorescence type, stem and leaf pubescence, leaf shape, and life form were treated as supplementary characters.

Section-specific features were also considered where informative. These included needle-like or filiform leaves in sect. *Spergulifoliae*, linear-tubular grass-like leaves in sect. *Graminiformes*, variation in caudex and leaf morphology in sect. *Holopetalae*, narrow few-flowered inflorescences and glandular-sticky pubescence in sect. *Chloranthae*, and dichotomous or racemose inflorescences in sect. *Auriculatae*. Species counts and proportional representation were then calculated for each section.

3. RESULTS

3.1. Taxonomic composition of *Silene* in the Fergana Valley

A total of 32 *Silene* species were recognised in the flora of the Fergana Valley and assigned to 12 sections (Table 1). The sections differed markedly in species richness, ranging from one to eight species.

Table 1

Taxonomic composition of *Silene* L. species in the Fergana Valley by section

No.	Section	No.	Species
1	Auriculatae Boiss.	1	<i>Silene nevskii</i> Schischk.
		2	<i>Silene guntensis</i> (B.Fedtsch.) B.Fedtsch. ex Schischk.
2	Chloranthae Rohrb.	3	<i>Silene neoladyginae</i> Lazkov
		4	<i>Silene gavrillovi</i> (Krasn.) Popov
3	Conoimorpha Otth in DC.	5	<i>Silene conoidea</i> L.
		6	<i>Silene coniflora</i> Nees ex Otth
		7	<i>Silene conica</i> L.
4	Holopetalae Schischk.	8	<i>Silene kungessana</i> B.Fedtsch.
		9	<i>Silene schischkini</i> (Popov) Vved.

No.	Section	No.	Species
		10	<i>Silene trajectorum</i> Kom.
		11	<i>Silene schugnanica</i> B.Fedtsch.
		12	<i>Silene obovata</i> Schischk.
		13	<i>Silene fetisovii</i> Lazkov
5	Inflatae Boiss.	14	<i>Silene vulgaris</i> (Moench) Garcke
6	Melandriiformes Boiss.	15	<i>Silene fedtschenkoana</i> Preobr.
		16	<i>Silene noctiflora</i> L.
7	Odontopetalae Schischk.	17	<i>Silene samarkandensis</i> Preobr.
		18	<i>Silene nana</i> Kar. & Kir.
8	Sclerocalycinae (Boiss.) Schischk.	19	<i>Silene longicalycina</i> Kom.
		20	<i>Silene pugionifolia</i> Popov
		21	<i>Silene praelonga</i> Ovcz.
		22	<i>Silene fedtschenkoi</i> Bondarenko & Vved.
		23	<i>Silene eviscosa</i> Bondarenko & Vved.
		24	<i>Silene schmalhauseni</i> Popov
		25	<i>Silene tachtensis</i> Franch.
		26	<i>Silene obtusidentata</i> B.Fedtsch. & Popov
		27	<i>Silene brahuica</i> Boiss.
		28	<i>Silene kuschakewiczii</i> Regel & Schmalh.
9	Spergulfoliae Boiss.	29	<i>Silene korshinskyi</i> Schischk.
		30	<i>Silene turkestanica</i> Regel
10	Stenonychium Bunge	31	<i>Silene nutans</i> L.
11	Viridiflorae Boiss.	32	<i>Silene graminifolia</i> Othl
12	Graminiformes Lazkov		

Species richness was highest in sect. Sclerocalycinae (8 species; 25.00%), followed by sect. Holopetalae (6 species; 18.75%). Sect. Conoimorpha and sect. Spergulfoliae each contained three species (9.38%). Four sections—Auriculatae, Chloranthae, Melandriiformes, and Odontopetalae—were represented by two species each (6.25%), whereas Inflatae, Stenonychium, Viridiflorae, and Graminiformes were represented by one species each (3.13%) (Table 2).

Table 2Distribution of *Silene* L. species among sections in the Fergana Valley

No.	Section	Number of species	Proportion (%)
1	Sclerocalycinae	8	25.00
2	Holopetalae	6	18.75
3	Conoimorpha	3	9.38
4	Spergulfoliae	3	9.38
5	Auriculatae	2	6.25
6	Chloranthae	2	6.25
7	Melandriiformes	2	6.25
8	Odontopetalae	2	6.25
9	Inflatae	1	3.13
10	Stenonychium	1	3.13
11	Viridiflorae	1	3.13
12	Graminiformes	1	3.13
Total		32	100.00

3.2. Morphological diagnostic characters of the sections

Sectional delimitation was supported by a combination of floral and vegetative characters. The most informative traits were calyx shape, degree of inflation and vein number; pubescence of the calyx teeth; division of the petal limb; presence or absence of auricles on the petal claw; and anthophore pubescence (Lazkov 2006, Kovalevskaja 1971). Vegetative characters were particularly useful in selected groups, including needle-like or filiform leaves in sect. Spergulfoliae, grass-like linear-tubular leaves in sect. Graminiformes, and variation in caudex and leaf morphology in sect. Holopetalae.

In the Fergana Valley, sect. Auriculatae is represented by *S. nevskii* and *S. guntensis*. It is characterised by perennial life forms, glandular or eglandular pubescence on the stems and calyces, dichotomous to racemose inflorescences, cylindrical-clavate calyces, and an auriculate expansion near the upper part of the petal claw. Sect. Chloranthae, represented by *S. neoladyginae* and *S. gavrillovii*, is distinguished by glandular-sticky pubescence, narrow few-flowered inflorescences, elongate-clavate glandular calyces, bifid petal limbs, and non-auriculate claws.

Sect. Conoimorpha comprises *S. conoidea*, *S. coniflora*, and *S. conica*. Its members are annual herbs with dichasial inflorescences, ovoid to conical-tubular calyces with 15–30 parallel veins, emarginate or bifid petal limbs, and claws that are auriculate toward the apex. The less species-rich sections are nevertheless morphologically distinctive: *S. vulgaris* (sect. Inflatae) has an inflated calyx; *S. turkestanica* (sect. Stenonychium) has a long calyx and narrow petal claw; *S. nutans* (sect. Viridiflorae) is characterised by greenish flowers; and *S. graminifolia* (sect. Graminiformes) by grass-like leaves.

4. DISCUSSION

The recognition of 32 species in 12 sections demonstrates substantial infrageneric diversity of *Silene* in the Fergana Valley. The uneven sectional distribution is especially evident in the predominance of sect. Sclerocalycinae and sect. Holopetalae. The relatively high representation of Sclerocalycinae may be associated with the prevalence of dry, rocky habitats in the valley and adjacent foothill and mountain areas, environments in which Caryophyllaceae are well represented in Central (Lazkov 2006, Kovalevskaja 1971). This ecological interpretation, however, should be tested with explicit habitat and distribution data.

Morphological evidence indicates that sectional identification is most reliable when several characters are evaluated together rather than individually. Calyx morphology is particularly informative,

but similar states may occur in different sections. Consequently, characters of the petal limb and claw, anthophore pubescence, inflorescence architecture, leaf morphology, and indumentum provide important complementary evidence. This combined-character approach is consistent with the taxonomic complexity of *Silene* highlighted by Greuter (Greuter 1995), while molecular studies of Sileneae (Oxelman and Lidén 1995) further indicate that morphology-based sectional boundaries should ultimately be evaluated in a phylogenetic framework.

The present synthesis therefore provides a practical regional framework for species identification and sectional comparison, while also identifying a clear next step: integration of morphological evidence with georeferenced distributional, ecological, and molecular data. Such integration would allow the taxonomic patterns documented here to be tested in biogeographical and conservation contexts.

5. CONCLUSION

The Fergana Valley flora contains 32 recognised species of *Silene* assigned to 12 sections. Sect. *Sclerocalycinae* is the most species-rich (8 species; 25.00%), followed by sect. *Holopetalae* (6 species; 18.75%). Sectional delimitation is supported mainly by a combination of calyx and petal characters, supplemented by anthophore pubescence, inflorescence type, and vegetative morphology. These results establish a taxonomic basis for future ecological, biogeographical, phylogenetic, and conservation studies of *Silene* in the Fergana Valley.

DECLARATIONS

Author contributions CRedit

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

The study was based on literature data, herbarium material and regional floras of plants only; no human participants or animals were involved, and no ethics committee approval was required.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

The data obtained in the study are presented in the tables of this article; the primary records are available from the authors on reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI (Claude, Anthropic) was used in the editorial preparation of this article: for language editing, translation of the title, abstract and keywords between Uzbek, Russian and English, preparation of the extended English summary from the authors' text, and formatting of the reference list. No data, results or conclusions were generated by AI. The authors are responsible for the content of the publication.

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