

A new species of *Capparis* (Capparaceae) from Cambodia

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Abstract

Capparis glabrata, a new species belonging to sect. *Monostichocalyx*, is described from the Kampong Cham and Takeo Provinces of Cambodia. The new species is a shrub characterized by glabrous twigs, straight or slightly recurved stipular thorns, glabrous leaf blade with apex acute or rounded, serial flowers in supra-axillary rows, yellow petals, and ellipsoid, puberulous ovaries with a knob-shaped stigma. It is related to *C. echinocarpa*, a species occurring in Thailand and northern Laos. The affinities of the new species to related taxa are discussed and a key is provided for all species of *Capparis* known from Cambodia. The conservation status is provisionally assessed as vulnerable (VU).

Keywords *Capparis* sect. *Monostichocalyx* · conservation status · diversity · ecology

Introduction

Capparis L. is the largest genus of family Capparaceae Juss., comprising about 150 species (POWO, 2022) of shrubs, small trees and climbers broadly distributed in a wide range of habitats from paleotropical and subtropical regions, with outliers in central Asia and the Mediterranean region (Souvannakhoummane et al., 2020). The genus is characterized by simple leaves, stipules that are often thorny, zygomorphic flowers in inflorescences of fascicles, sub-umbels, racemes or supra-axillary rows, or in some cases solitary, with four sepals (rarely 2), four petals, of which the dorsal pair are usually asymmetrical and with connivent bases, stamens 6–50 (to ca. 200), gynophores usually present, and 1–6-locular ovaries forming baccate fruits

or pepos (Kers, 2002). *Capparis* has historically been regarded as a pantropical genus and subdivided into various sections, each restricted either to the Old or the New World (de Candolle, 1824; Pax, 1891; Pax & Hoffman, 1936), but its circumscription has undergone a number of changes during the past decades, due to the morphological and genetic distinctions revealed between the species occurring in the Americas, traditionally included in this genus, and the Old World ones. Kers (2002) pointed out that the species from the two areas differ in several characters, suggesting an ancient geographical separation. Based on plastid DNA sequence data, Hall (2008) confirmed that the genus, as traditionally circumscribed, is diphyletic, with a New World and an Old World lineage. Subsequently, all Neotropical species formerly placed in *Capparis* have been transferred to several distinct and exclusively American genera (Cornejo & Iltis, 2008; Cornejo, 2017, 2018). As a result of these treatments, the distribution of the genus *Capparis* is now limited to the Old World.

Research carried out during the last decades in Southeast Asia and the western Pacific has provided new data on the distribution and diversity of *Capparis*, leading to the description of several new species and intraspecific taxa from Thailand (Srisanga and Chayamarit, 2004), Vietnam (Sy et al., 2013, 2015, 2016, 2018, 2020), Laos (Fici et al., 2018, 2020, 2022a; Souvannakhoummane et al., 2018, 2020; Fici and Souvannakhoummane, 2020), Malaysia (Julius, 2022) Indonesia (Fici, 2012, 2021), the Philippines (Fici, 2016), and New Caledonia (Fici, 2017a, b). The Indochinese Peninsula

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can be regarded as a major center of speciation for *Capparis*, including several endemic species (Jacobs, 1965; Ho, 1999; Ban & Dorofeev, 2003; Newman et al., 2007; Cho et al., 2016). With regard to Cambodia, nine species belonging to the genus were reported by Fici (2023), while the neighboring countries show a higher diversity, with 37 species recorded from Vietnam (Fici et al., 2022b), 26 from Thailand (Chayamarit, 1991; Srisanga and Chayamarit, 2004), and 22 from Laos (Fici, 2023). Furthermore, the genus is well represented in other tropical and subtropical areas of Asia, in particular in China and India, where 37 and 35 species were recorded, respectively (Zhang & Tucker, 2008; Maurya et al., 2020).

During a recent study of collections of *Capparis* at RUPP (the Herbarium of the Royal University of Phnom Penh), unidentified material collected in Kampong Cham and Takeo Provinces was found to differ from other species known from the Indo-Pacific area. This material turned out to belong to a new species of sect. *Monostichocalyx* Radlk., characterized by the glabrescence of its vegetative parts and by the features of the stipular thorns, leaves and flowers. The new species is here described and illustrated, its affinities are discussed, and a key to the species of *Capparis* now known from Cambodia is provided.

Materials & Methods

Herbarium investigations were carried out on the collections of *Capparis* at RUPP, coupled with studies of historical collections at P. Digital images of type specimens of related taxa were also examined through *JSTOR Global Plants* (JSTOR, 2023). The new species described here was first observed and collected by one of us (Y.P.) during field investigations undertaken in Kampong Cham Province in December 2009, and later in Takeo Province in December 2010.

The description and illustration are based on herbarium material. We employed a species concept for *Capparis* which follows that proposed by Jacobs (1965) in his revision of the genus from the Indus to the Pacific. The terminology for vegetative and reproductive structures, as well as the main diagnostic characters within the genus, are based on the same treatment; in particular, the term “innovation” refers to the very young twigs with leaves as well as the young inflorescences, while “serial flowers” refers to the serial multiplication of flowers in a basal direction in supra-axillary rows (Jacobs, 1965). The herbarium acronyms follow Thiers (2023 & continuously updated), while names and authors of plants are based on IPNI (2020). The data concerning the related taxa, reported in Table 1, are based on Jacobs (1960, 1965)

and Fici (2023). The conservation status was provisionally assessed according to *IUCN Red List Categories and Criteria* (IUCN, 2012).

Taxonomic Treatment

***Capparis glabrata* Fici, Peou & Lao, sp. nov.** TYPE: Cambodia, Srangae Cheung village, Srangae commune, Prey Chho District, Kampong Cham Province, 10 Dec 2009 (fl.), Y. Peou 11 (holotype: RUPP [!]). Fig. 1.

Diagnosis. Related to *Capparis echinocarpa* Pierre ex Gagnep. by the habit, absence of cataphylls, length of the petiole, glabrescence of the leaves, and size and pubescence of the petals, but differing by the twigs glabrous (vs. pubescent when young), leaf blade up to 4.4(–4.7) cm long and chartaceous (vs. up to 8.5 cm long and subcoriaceous,), the apex acute or rounded (vs. shortly acuminate), pedicels (5–)6–8(–9) mm long (vs. 10–20 mm long), sepals pubescent within (vs. pubescent without), petals yellow (vs. white to pink or red), stamens ca. 10–15, (vs. (4–)7–10), filaments 0.7–1.1 cm long (vs. 1.2–1.9(–2.4) cm long), and ovaries ellipsoid, 2–2.5×1.2–1.8 mm, puberulous (vs. pear-shaped, 1.8–2×1–1.2 mm, pubescent), with knob-shaped stigmas (vs. markedly beaked).

Description. Shrubs 1.5–3 m tall. Twigs zig-zag, glabrous. Stipular thorns straight or slightly recurved, 3–5 mm long, yellowish. Petioles (3.5–)4–7 mm long, glabrous; leaf blades elliptical, lanceolate or narrowly ovate, chartaceous, 1.5–2.2 times as long as wide, (2.9–)3.6–4.4 (–4.7)×(1.5–)1.8–2.5(–2.8) cm, with margins often undulate; base rounded, obtuse or acute; apex acute or rounded, often mucronulate; surfaces glabrous; secondary veins in 3–4 pairs, thin. Flowers serial, 2–3(–5) in supra-axillary rows, rarely solitary; pedicels (5–)6–8(–9) mm long, glabrous; sepals ovate to elliptic, acute, (4.5–)5.3–6.2(–6.8)×(2.5–)2.8–3.3(–3.5) mm, pubescent within, ciliate at margins; petals elliptic, yellow, with obtuse or rounded apex, (5–)5.5–6.5(–7.5)×(1.8–)2–2.5 mm, pubescent without, mostly on the lower half; stamens ca. 10–15, with filaments 0.7–1.1 cm long and anthers basifix, 1.5–2 mm long; gynophore ca. 1.2–1.4 cm long, glabrous; ovary ellipsoid, 2–2.5×1.2–1.8 mm, puberulous, ribbed, with knob-shaped stigma. Fruits unknown.

Distribution and habitat. The new species is known so far from two close locations in the Kampong Cham Province, at 12°4'22.8504"N, 105°11'25.5948"E and at 12°2'10.7952"N, 105°9'43.2468"E, and from a third one in the Takeo Province, at 10°58'12.2592"N, 104°59'30.0912"E (Fig. 2). With regard to the habitat, it has been observed at the margins of rice fields, on black and sandy soils, in communities with *Borassus flabellifer* L. (Arecaceae), *Abutilon*

Table 1 Diagnostic characters among *Capparis glabrata* and related taxa.

Traits	<i>C. glabrata</i>	<i>C. echinocarpa</i>	<i>C. tenera</i>	<i>C. bivalvulae</i>	<i>C. florida</i>	<i>C. micracantha</i> subsp. <i>micracantha</i>	<i>C. pyrifolia</i>	<i>C. zeylanica</i>	<i>C. radula</i>
Habit	shrub	shrub	shrub or climber	climber	shrub	shrub, small tree or climber	shrub, small tree or climber	shrub or climber	shrub
Height (m)	1.5–3	up to 2	up to c. 3	2–15	up to 2.5	up to 6	1.5–4	up to 5–10	up to 3–4
Indumentum of twigs	glabrous	pubescent when young	glabrous or early glabrescent	glabrous	glabrous	pubescent or puberulous when young	pubescent when young	densely pubescent glabrous, warty when young	
Cataphylls at base of twigs	absent	absent	absent	absent	absent	present	absent	absent	present
Stipular thorns									
Length (mm)	3–5	2–4	up to 4	1–3	c. 1–3	(1.5) 2–4 (–7)	up to 3 (–4)	2.5–6	2–4.5
Shape	straight or slightly recurved	recurved	recurved or wanting	straight or wanting	straight or wanting	straight, slightly recurved	recurved	recurved	recurved
Length of petiole (mm)	(3.5) 4–7	3–7	(2.5)–4–6	4–7 (–10)	(6) 7–10 (–11)	6–10 (–15)	4–6	7–10 (–20)	4–6
Leaf blade									
Size (cm)	(2.9)–3.6–4.4 (–4.7)×(1.5–) 1.8–2.5(–2.8)	2–8.5×1.5–3.5 (–11.5)×(1.3–) 2–4(–6)	(3)–4.5–8 (–11.5)×(1.3–) 4.5(–8)	6–13 (–23.5) ×(1.5)–22.5 –4.5(–8)	(10)–10.5–14 ×(5)– 5.5–8(–8.7)	(8)–10–24 (–32.5)× (–15)× 4–10 (–12.5)	(4)–5–9.5 ×(2.5–) 4.5(–6.5)	4–10 (–18)× (2.1)–3– 5.5(–9)	(3.5)–4.5–8.7 ×(1.5–) 2.2–4.8(–6.5)
Length/width ratio	1.5–2.2	1.5–2.5(–3)	(1.4)–1.8–3	(2.2)–2.4–4(–5)	(1.4)–1.5–2.1(–2.4)	(1.6)–1.7–2.9(–4.1)	(1.2)–1.7–2.5(–3)	(1.2)–1.5–2.7(–3)	(1.2)–1.5–2.1
Pubescence	glabrous	glabrous	glabrous	glabrous	glabrous	upper surface glabrous, lower glabrescent, or hairy	upper surface glabrous, lower glabrescent or hairy	upper surface glabrous, lower glabrescent or hairy	upper surface glabrous
Leaf base	rounded, obtuse or acute	rounded	rounded, obtuse or subcordate	rounded or acute	rounded, sometimes rounded, obtuse, subcordate or acute	rounded, obtuse	rounded, obtuse	rounded, obtuse	rounded, obtuse or rounded or acute
Leaf apex	acute or rounded, often mucronulate	acute, shortly acuminate, mucronulate	acuminate	acute or slightly acuminate, mucronulate	acute or slightly acuminate, mucronulate	acute, often with rigid mucro	acute, often with rigid mucro	acute, often with rigid mucro or acute, sometimes mucronate	acute, rounded, retuse with rigid mucro or acute, sometimes mucronate
Number of secondary veins	3–4	4–6	(3)–4–6	(4)–6–9	ca. 6–8	5–7 (–10)	4–7	(3)–4–7 (–8)	4–6
Pedicel length (mm)	(5)–6–8(–9)	10–20	(5)–10–30(–35)	10–30(–40)	(6)–8–15(–16)	4–10(–20)	(7)–9–20(–25)	4–20(–30)	(7)–8–13(–20)

Table 1 (continued)

Traits	<i>C. glabrata</i>	<i>C. echinocarpa</i>	<i>C. tenera</i>	<i>C. bivalvulae</i>	<i>C. florida</i>	<i>C. micracantha</i> subsp. <i>micracantha</i>	<i>C. pyrifolia</i>	<i>C. zeylanica</i>	<i>C. radula</i>
Sepals Size (mm)	(4.5)–5.3–6.2 (–6.8)×(2.5–) 2.8–3.3(–3.5)	4–5×2–4 (–5.5)×(1.5–) 2–2.5	(2.5)–3–4.5 (–5.5)×(1.5–) 2–2.5	3–5×2–3 slightly ciliate on margins	(6)–7–10×3–3.5 pubescent within, and on margins	3–10(–13)× 1.5–4(–5.5)	4–5×(2)–2.5–4 pubescent or pubes- cent without, pubescent on margins	(5)–6–11(– 1.5)×(3)–4– 7(–9)	(6)–7–11(– 1.2)×3–5–
Pubescence	pubescent within, cili-pubescent without ate on margins	and on margins					pubescent or gla- brous	pubescent without pubescent on margins	
Petals Size (mm)	(5)–5.5–6.5(– 7.5)×(1.8)–2–2.5	5–8×2 (3.5)–4–5(– 7)×1.7–2.3	4–6×2–3 pubescent, mostly tomentose on both surfaces	(11)–12–18(– 22)×(3)–4–5(–6)	9–20(–25)×2–6(–7) (5)–5.5–8×(1.5– 2)–4	(7)–7.5–12(– 19)×(3)–3.5– 5(–8)		(9)–10– 14×(3)–3.5– 5(–6)	
Pubescence	pubescent without without		ciliate surfaces	woolly	glabrous or puberu- lous without and on margins	without pubescence or glabres- cent without within at base			
Color	yellow	white to pink or red	white	white	white	white	white	white	white
Number of stamens	ca. 10–15	(4)–7–10 1.2–1.9(–2.4)	7–21 ca. 1.5	20–30 ca. 2	ca. 47–61 (2)–2.5–3.5	10–35(–75) (1.5)–2–3	ca. 20–25(–27) 1.4–2.3	30–45(–70) 2–3.5(–5)	30–40 1.5–2
Length of filaments (cm)	0.7–1.1								
Gynophore									
Length (cm)	ca. 1.2–1.4	(1.2)–1.5–2	(1)–1.3–2 glabrous	(2)–2.5–3.4 glabrous	(1.5)–1.8–3(–3.5) glabrous	(1)–1.2–2.3(–2.5) glabrous	(2)–3.5–5(–6.5) glabrous	(1)–1.6–2.3 pubescent at base glabrous	
Ovary Size (mm)	2–2.5×1.2–1.8	1.8–2×1–1.2	ca. 1.5×0.5	ca. 1.5×1	1.5–2×1	1.5–3×1.5–2	1–1.2×0.5–0.7 2	1.5–2.5×1–1.5 2	(2.5)–3–4×1.5–
Shape	ellipsoid	pear-shaped	pear-shaped or ovoid	ellipsoid	pear-shaped or ovoid	ovoid or ellipsoid	ovoid or ellipsoid	ovoid or ellipsoid	
Pubescence	puberulous	pubescent	glabrous	glabrous	glabrous or puberu- lous	glabrous	glabrous	glabrous	glabrous

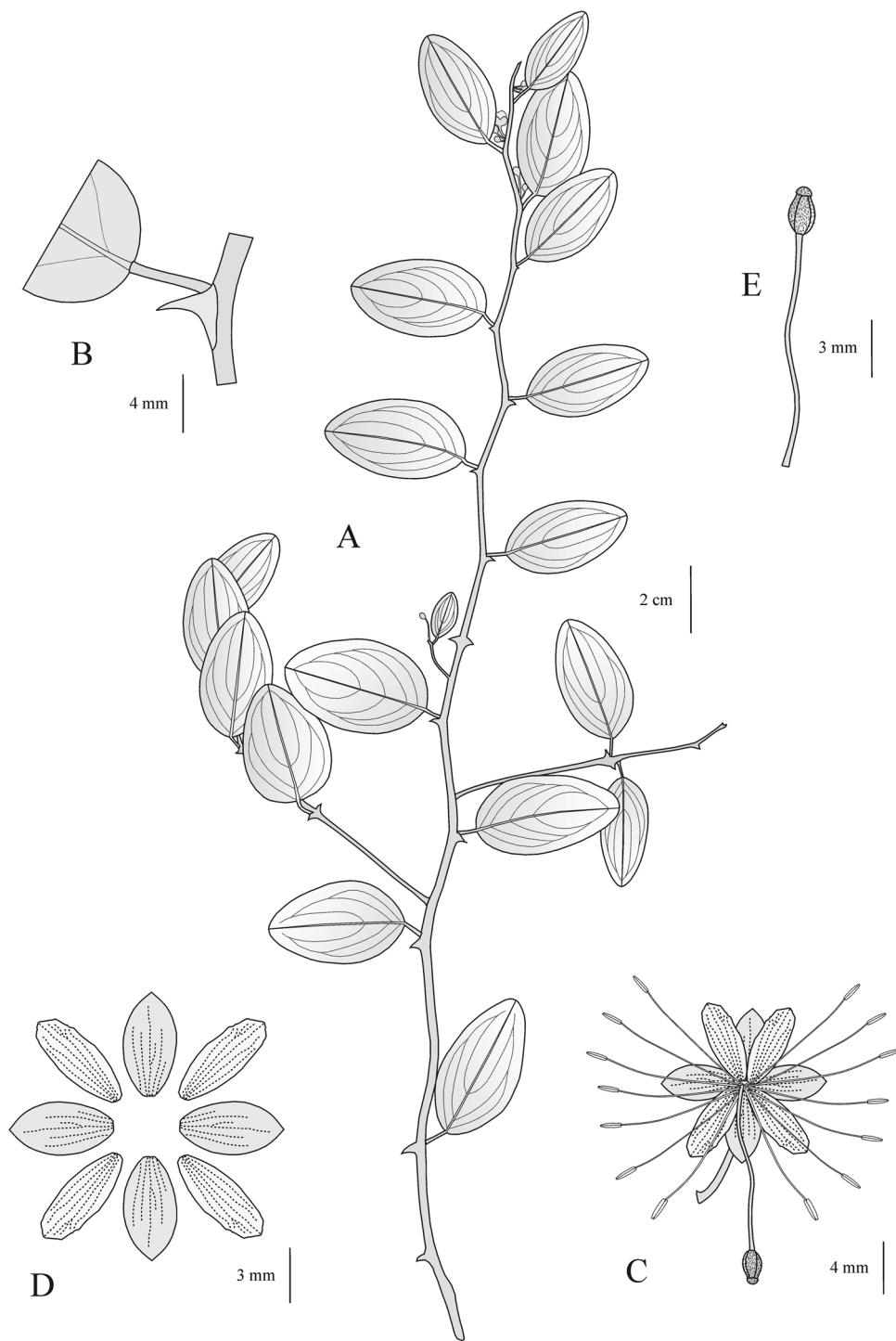


Fig. 1 *Capparis glabrata*. **A.** Flowering branch. **B.** Leaf base with stipular thorn. **C.** Flower. **D.** Dissected flower showing sepals and petals. **E.** Gynophore and ovary. (All from the holotype, illustrated by Silvio Fici).

indicum (L.) Sweet (Malvaceae), *Ziziphus mauritiana* Lam. (Rhamnaceae), *Syzygium* sp. (Myrtaceae), and *Calamus* sp. (Arecaceae), and at elevations of 4–17 m.

Phenology. Flowering specimens have been collected in November and December.

Common name. Khmer: Thmenh trei (*Y. Peou 11*).

Preliminary conservation status. The new species is known so far from only three locations, with a total area of occupancy (AOO) of less than 10 km², where a few individuals were observed, and all locations are subject to



Fig. 2 Known distribution of *Capparis glabrata*. [“Cambodia location map.svg” by NordNordWest (https://commons.wikimedia.org/wiki/File:Cambodia_location_map.svg), used under the Creative Commons Attribution-Share Alike 3.0 unported license; red dots added to the original].

the effects of human activities linked with paddy cultivation. Following the *IUCN Red List Categories and Criteria* (IUCN 2012), we suggest that the new species should be assessed as Vulnerable (VU) according to criterion D2.

Additional specimens examined. **CAMBODIA.** **Kampong Cham Province:** Memeang village, Lvea Commune, Prey Chho District [12°2'10.7952"N, 105°9'43.2468"E], 1 Nov 2009, S. Lim s.n. (RUPP). **Takeo Province:** Angkor Borie Commune, Angkor Borie District [10°58'12.2592"N, 104°59'30.0912"E], 12 Dec 2010, Y. Peou 5 (RUPP).

Key to the species of *Capparis* in Cambodia

1. Flowers in supra-axillary rows.
2. Shoots without cataphylls.
 3. Innovations glabrous *C. glabrata*
 3. Innovations tomentose with stellate, often reddish or brownish hairs.
 4. Apex of leaf blade acuminate, with acumen 0.7–1.5 cm long, tip not mucronate *C. pyrifolia*
 4. Apex of leaf blade rounded or acute, with rigid mucro up to 4 mm long *C. zeylanica*
2. Shoots with cataphylls at the base.
 5. Twigs initially pubescent or puberulous, later glabrous, smooth; petiole 0.6–1(–1.5) cm long *C. micracantha*
 5. Twigs glabrous, densely warty; petiole 4–6 mm long *C. radula*

1. Flowers solitary or in subumbels.
6. Flowers axillary, solitary.
 7. Petiole (2–)3–4(–7) mm long; petals ca. 8–9 mm long; stamens 6–12 *C. flavicans*
 7. Petiole (4–)6–10(–13) mm long; petals (13–)20–25(–27) mm long; stamens ca. 36–46 *C. siamensis*
6. Flowers in subumbels.
 8. Leaf blade coriaceous; twigs glabrous; petals 7–9 mm long *C. pranensis*
 8. Leaf blade herbaceous; twigs firstly pubescent, later glabrescent; petals up to 6(–7.5) mm long *C. sepia*
 9. Gynophore mostly puberulous at base; ovary 1.5–2 mm long; fruit (3–)4–10(–12) mm diameter *C. sepia*
 9. Gynophore glabrous; ovary 1.1–1.5 mm long; fruit 11–18 mm diameter *C. thorelii*

Discussion

Capparis glabrata belongs to sect. *Monostichocalyx*, which includes several species widespread from Africa to southern Asia, Australia and the Pacific (Jacobs, 1965; Fici, 2017b, 2023). Within this section Jacobs (1965) had recognized some “tentative” groups, distinguished by inflorescence and flower features, among which *C. glabrata* belongs to the Seriales-Group, comprising species characterized by small to medium-sized flowers, with sepals 3–15 mm long, serial in supra-axillary rows. Recently Maurya et al. (2023), based on the results derived from three plastid markers, found five distinct clades within the whole genus *Capparis*; among them, the clade labeled “Section V” comprises species characterized by serial flowers that were formerly included by Jacobs (1965) in the Seriales-Group.

The new species is a shrub characterized by glabrous twigs, strong, straight or slightly recurved stipular thorns, elliptic, glabrous leaf blades, short pedicels, sepals that are pubescent within but petals that are pubescent without, and puberulous ovaries with knob-shaped stigmas. As reported in the diagnosis, within the Seriales-Group the new species shows affinities with *Capparis echinocarpa* Pierre ex Gagnep. (a species recorded from Thailand and Laos) through its habit, absence of cataphylls, length of petioles, leaf glabrescence, and size and pubescence of the petals; the latter species, however, differs by the pubescence of the young twigs, the subcoriaceous leaf blade with apex shortly acuminate, the longer pedicels, sepals that are pubescent without, petals that are white to pink or red, a lower number of stamens with longer filaments, and the smaller, pubescent ovary (Table 1). The new species is also related to *C. tenera* Dalzell, a shrub or climber widespread from tropical Africa to southern Asia, extending eastward to Thailand and Laos. This species differs (Table 1) in its leaf blades, which are up to 8(–11.5) cm long, with top acuminate, pedicels (5–)10–30(–35) mm long, sepals (1.5–)2–2.5 mm wide, glabrous within, petals white, tomentose on both surfaces, and its pear-shaped or ovoid ovaries, which are ca. 1.5 × 0.5 mm and glabrous (Fici, 2023). *Capparis glabrata* shows also some resemblances in its vegetative

parts with *C. rigida* Jacobs, a poorly known species endemic to southeastern Annam (Vietnam), but this species is clearly differentiated by the occurrence of cataphylls at the base of the twigs, weak thorns present only on the innovations and lacking on the older branches, petiole 8–12 mm long, leaf blade ca. 5.5–7.5 × 2.2–3.7 cm, and secondary veins in 6–7 pairs (Jacobs, 1965). Among the other species belonging to the Seriales-Group, a few are similar to the new species in being characterized by complete glabrescence of all vegetative parts (Jacobs, 1965). Of these, *C. buwaldae* Jacobs, reported from Borneo and Pulau Laut, can be easily distinguished from *C. glabrata* (Table 1) being a climber up to 15 m long, as well as by the acuminate leaf blade up to 13(–23.5) cm long, secondary veins in (4–)6–9 pairs, pedicels (10–)30–40 mm long, white petals, 20–30 stamens with filaments ca. 2 cm long, and ovaries ca. 1.5 mm long and glabrous, whereas *C. cucurbitina* King, a poorly known species endemic to Perak, Malaysia, differs in its obovate, acuminate leaf blades ca. 9–18.5 × 3.5–7.5 cm, with 6–8 pairs of secondary veins, pedicels 20–30 mm long, sepals 4 mm long, and stamens numbering ca. 20 (Jacobs, 1960, 1965). *Capparis florida* Fici & Souvann., a species with serial flowers recently described from central Laos, is glabrous in all the vegetative parts, differing (Table 1) from the new species in its stipular thorns up to 3 mm long or absent, leaf blades (10–)10.5–14(–15) × (5–)5.5–8(–8.7) cm with ca. 6–8 pairs secondary veins, white and woolly petals (11–)12–18(–22) × (3–)4–5(–6) mm, stamens numbering ca. 47–61 with filaments (2–)2.5–3.5 cm long, gynophores (2–)2.5–3.4 cm long, and pear-shaped or ovoid, glabrous ovaries 1.5–2 × 1 mm, with slender styles (Fici, 2023).

With regard to the geographic range, *Capparis glabrata* is known from only two areas of central and southeastern Cambodia (in Kampong Cham and Takeo Provinces), approximately 115 km apart (Fig. 2). We assume there are populations of the new species between these localities. It is also noteworthy that, based on the information available, the flowering period of the new species is differentiated from the related taxa: November–December in *C. glabrata* vs. January–August in *C. echinocarpa* (Chayamarit, 1991) and February–May in *C. tenera* (Jacobs, 1965).

All species of *Capparis* that occur in Cambodia belong to sect. *Monostichocalyx*. Of the nine species formerly reported from the country, three are to be referred to Jacobs' (1965) Seriales-Group (*C. micracantha* DC., *C. pyrifolia* Lam. and *C. zeylanica* L.), three to the Subumbellates-Group (*C. pranensis* (Gagnep.) M. Jacobs, *C. sepiaria* L. and *C. thorelii* Gagnep.) and three to the Brevispina-Group (*C. flavicans* Kurz, *C. radula* Gagnep. and *C. siamensis* Kurz). As mentioned above, the diversity of the genus in Cambodia is quite low compared to neighbouring countries (Jacobs, 1965; Chayamarit, 1991; Ho, 1999; Srisanga and Chayamarit, 2004; Ban and Dorofeev, 2003; Newman et al., 2007; Cho et al., 2016; Fici et al., 2022b; Fici, 2023). Based on the available data, *C. glabrata* is to be regarded as the only species of the genus endemic to Cambodia, since all the other species reported from the country show more or less wide distributions across southern Asia and/or the Indochinese peninsula.

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Declarations

Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

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