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A New *Centaurea* L. (Asteraceae) Species from Turkey

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Abstract: A new *Centaurea* L. (Asteraceae) species from Turkey is described and illustrated. *Centaurea dursunbeyensis* Uysal & Köse exists on limestone crevices in ancient Dursunbey Forest (Balıkesir) in western Anatolia. It belongs to *C.* sect. *Phalolepis* (Cass.) DC., and taxonomically its closest relatives are *C. aphrodisea* Boiss. and *C. cadmea* Boiss. Diagnostic morphological characters from very similar taxa are provided, and a key is provided that includes related species of sect. *Phalolepis* from Turkey. The geographical distribution of the new species and species of other related taxa of the same section are mapped. The chromosome number of *C. dursunbeyensis*, $2n = 36$, counted in root tips, is also reported and illustrated.

Key Words: Endemic, sect. *Phalolepis*, taxonomy, chromosome, Turkey

Türkiye'den Yeni Bir *Centaurea* L. (Asteraceae) Türü

Özet: Türkiye'den yeni bir *Centaurea* L. türü betimlenmiş ve çizilmiştir. *Centaurea dursunbeyensis* Uysal & Köse Batı Anadolu'da antik Dursunbey (Balıkesir) ormanlarında kireçtaşı oyuklarda sınırlıdır. *Centaurea dursunbeyensis* *Phalolepis* (Cass.) DC. seksiyonuna aittir ve taksonomik olarak en yakın akrabası *C. aphrodisea* Boiss. ve *C. cadmea* Boiss. türleridir. Yakın biçimde benzer taksonlardan ayırtedici morfolojik karakterler sağlanmış ve benzer Türk *Phalolepis* türlerinin ilgili anahtarında düzenlenmiştir. Aynı seksiyonun yakın ilişkili türleriyle, yeni türün dağılımı haritalanmıştır. *Centaurea dursunbeyensis*'in kromozom sayısı kök uçlarından $2n = 36$ olarak sayılmış, aynı zamanda raporu ve resmi verilmiştir.

Anahtar Sözcükler: Endemik, *Phalolepis* seksiyonu, taksonomi, kromozom, Türkiye

Introduction

A broad redefinition of *Centaurea* L. (Asteraceae) has taken place in recent years, thanks to the generalised use of molecular methods. Comparison of DNA sequences finally demonstrated that the delineation of a monophyletic genus, *Centaurea*, was possible (Garcia-Jacas et al., 2000, 2001; Wagenitz & Hellwig, 2000). This new definition, however, does not change the important fact that Turkey is the main centre of *Centaurea* diversity (Wagenitz, 1986). Even excluding the species now placed in the genera *Psephellus* Cass. and *Rhaponticoides* Vaill., Turkey is home

to 166 species. In addition, as knowledge of this vast territory improves the number of species continues to grow; 13 new taxa have been described since the completion of Davis et al.'s *Flora of Turkey* (Wagenitz, 1975): *Centaurea mykalea* Hub.-Mor.; *C. cariensisiformis* Hub.-Mor.; *C. nydeggeri* Hub.-Mor.; *C. yozgatensis* Wagenitz; *C. hadimiensis* Wagenitz, Ertuğrul & Dural; *C. cankiriensis* A. Duran & H. Duman; *C. antalyense* H. Duman & A. Duran; *Centaurea yildizii* Türkoğlu & Akan; *C. marashica* E. Uzunh. et al.; *C. goeksunense* Aytaç & H. Duman; *C. ulrichiorum* Wagenitz et al.; *C. wernerii*

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Wagenitz et al.; *C. glabro-auriculata* Uysal et al. (Davis et al., 1988; Duran & Duman, 2002; Türkoğlu et al., 2003; Aytaç & Duman, 2005; Uzuncahisarcıklı et al., 2005; Wagenitz et al., 2006; Uysal et al., 2007). *Centaurea amplifolia* Boiss. & Heldr. was added as a new record for Turkey by Davis et al. (1988).

Centaurea specimens were collected during 2002-2005 while we were working on a revision of the section *Cheirolepis* (Boiss.) Hoffm. First, the specific descriptions of *Centaurea* in Davis and Wagenitz (1975) and Tutin et al. (1980) were checked, and then the undefined species were compared with some specimens of *C. cadmea* Boiss. (B: D 37905; GOET: *Boissier* (type); ESSE: YBK 1524) and *C. aphrodisea* Boiss. (GOET: *Boissier* (type); ESSE: YBK 1527). Ultimately, we concluded that we found a new *Centaurea* species from Turkey. Therefore, including the new species described herein, the total number of *Centaurea* species in Turkey has increased to 181. The

authors of the plant names used in this text are based on Brummitt and Powell (1992).

Species Description

Centaurea dursunbeyensis Uysal & Köse Sp. Nov. (Figures 1-4)

(Sect. *Phalolepis* (Cass.) DC.)

Type: Turkey. B2 Bursa; Dursunbey, Alaçam village, Eğriceöz slopes, 10.07.05, 39°21'296"N, 28°37'400"E, YBK 1535 (Holo KON; iso. ESSE);

Paratype: B2 Bursa, Dursunbey, Alaçam village, Eğriceöz slopes, 1390 m, open *Pinus brutia* Henry. forests on limestone, 30.06.2004, T. Uysal 561 (KON).

Diagnosis: Affinis *Centaurea aphrodisea*, involucrem ovoideo-oblongum, 7-10 mm longum × 5-7 mm latum. Appendices phyllorum ovale-oblongum, 1-5 × 0.5-4 mm, spinulis terminalibus longioribus ca. 0.5 mm.

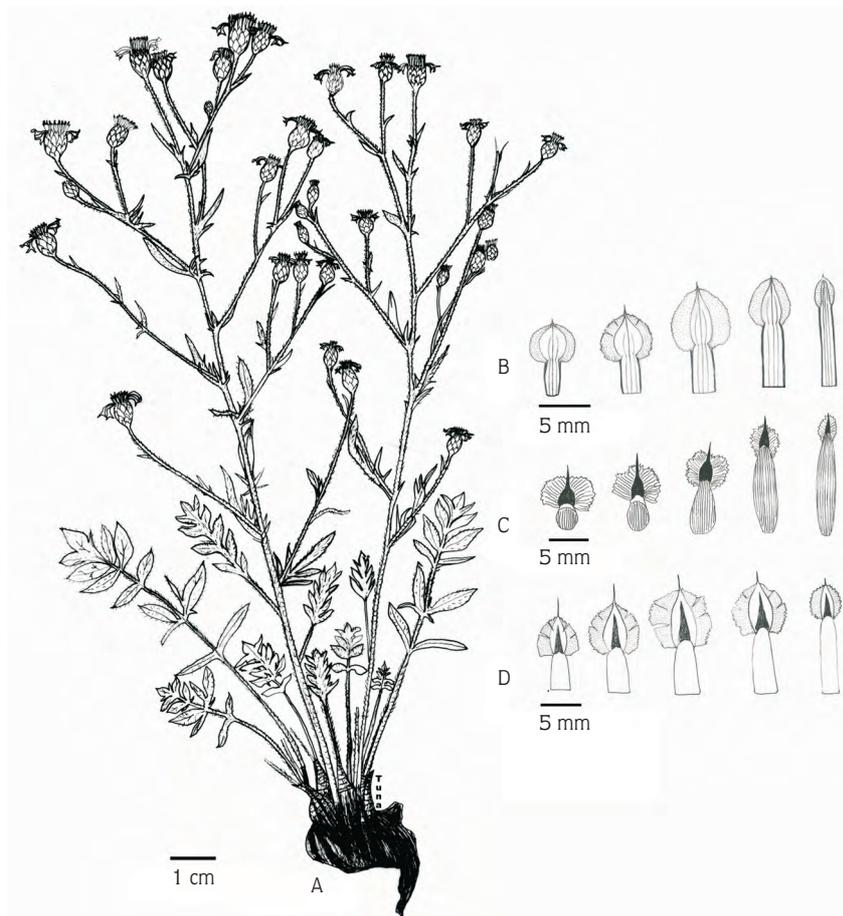


Figure 1. Habit and appendages of *Centaurea dursunbeyensis* (A and B, respectively), appendages of *C. aphrodisea* (C), and appendages of *C. cadmea* (D).

Description: Perennial herbs with woody rootstock and basal leaf rosette. Stems, several lateral erect to ascending, without striations, densely whitish, hairy, up to 40 cm, uninterruptedly branched from below, with (5-)10-20 capitula; branches 1-10 cm. All leaves densely tomentose; basal leaves 3-12 × 1-2.5 cm, 1-2 pinnatisect, ultimate segments 5-8 mm wide, terminal smaller than lateral, margins entire. Median leaves similar to basal leaves, upper leaves with 1-2 lateral lobes at base, or rarely simple. Involucres 7-10 × 5-7 mm, oblong, not funnel shaped at fruiting time. Phyllaries linear-oblong, striate, subglabrous and blackish in upper parts; outer phyllaries 5-7 mm long, median phyllaries 6-9 mm long, inner phyllaries 9-11 mm long (including appendages). Appendages entire or

sometimes with lacerate margins, concealing basal part of phyllaries, oblong to narrow ovate, decurrent, creamish, 1-5 × 0.5-4 mm terminal mucro very weak up to 0.5 mm long. Flowers rose-purple, marginal slightly radiant. Achenes creamish-brown, lanceolate, 3-4 × 2-2.5 mm, subglabrous with sparse hairs at apex. Pappus double, with scabrid setae, outer series 3-4 mm long, inner series ca. 0.5-0.8 mm long. Flowering in July, fruiting in August. Chromosome number: $2n = 36$.

Conservation Status: *Centaurea dursunbeyensis* is a rare and extremely localised species that should be classified as critically endangered (CR), according to IUCN (2001) categories. It has an area of occupancy of less than 10 km² and is known to exist at only one location (criterion

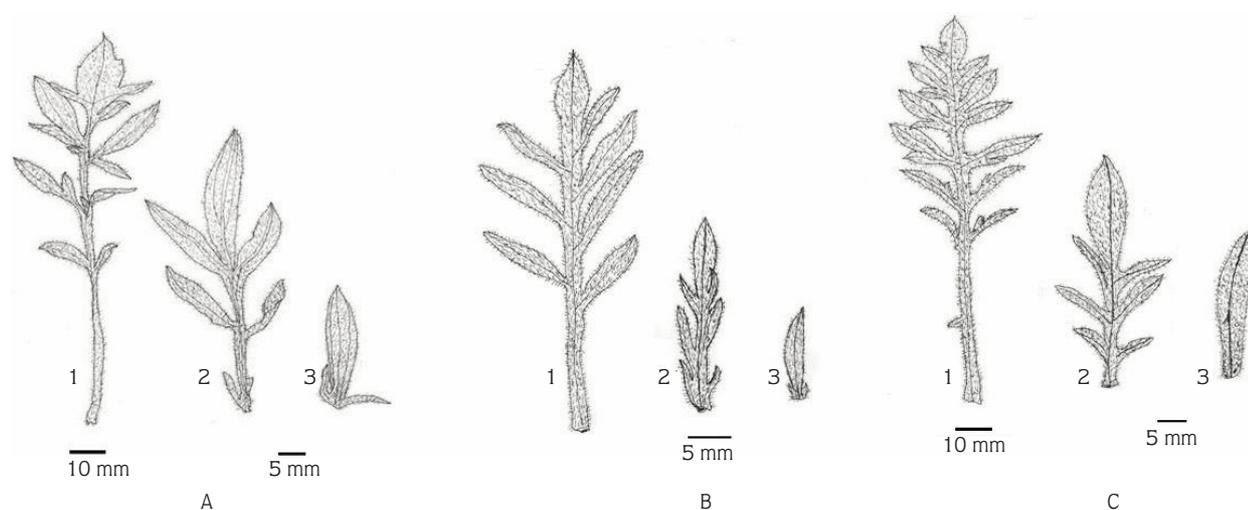


Figure 2. Leaves (1= basal, 2 = medial, and 3 = upper) of *C. dursunbeyensis* (A), *C. aphrodisea* (B), and *C. cadmea* (C).

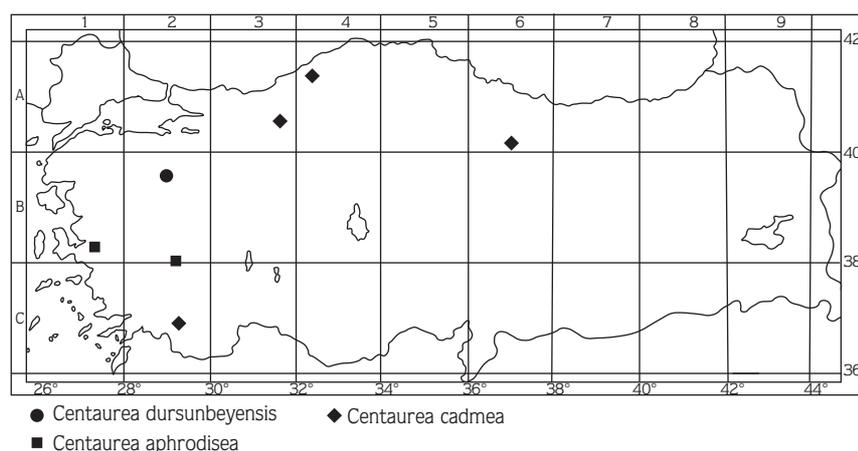


Figure 3. The known distribution of *Centaurea dursunbeyensis* and the related species *C. aphrodisea* and *C. cadmea*.



Figure 4. A chromosome metaphase plate of *C. dursunbeyensis* with $2n = 36$ (scale bar = 10 μm).

B2a). According to field observations we estimate that the total number of mature *C. dursunbeyensis* individuals does not exceed 250. This very small population does not ensure long-term survival of the species. The inaccessible area that *C. dursunbeyensis* occupies does offer some protection from human interference.

Ecology: The new species grows as a chasmophyte in the crevices of limestone rocks, with *Astragalus angustifolius* Lam., *Sedum acre* L., *Juniperus oxycedrus* L., *Pinus nigra* Arnold subsp. *pallasiana* (Lamb.) Holmboe, *Dianthus zonatus* Fenzl., *Anthemis tinctoria* L. var. *discoidea* (All.) Vahl., *Epilobium angustifolium* L., and *Salvia sclarea* L., at an altitude of 900-1000 m. Its distribution is very limited. It is endemic to western Turkey (Balıkesir province) (Figure 3). The specimens were collected in the Balıkesir area (B2) where the species seems to be localised.

Karyology: According to a search of the literature, there are no chromosomal reports for any Turkish *Centaurea* sect. *Phalolepis* species. There are some chromosomal reports from Greece that are relevant to species of sect. *Phalolepis* and the basic chromosome number was reported as $x = 9$ (Kalpoutzakis and Constantinidis, 2004). In the present work, mature *Centaurea dursunbeyensis* seeds were used for chromosomal counts. The constant chromosome number of $2n = 36$ was observed in all metaphase plates examined (Figure 3). The species is, therefore, tetraploid and based on $x = 9$.

The following key, an excerpt from the *Flora of Turkey*, contains those species that we consider related to *C. dursunbeyensis* (modified from Wagenitz, 1975).

Group D (p 471)

- 1-
- 1-
- 10. Appendage with distinct hyaline border
- 13. Appendage with a distinct terminal mucro more than 0.5 mm
- 14. Mucro 0.5- 1.5 mm
- 15. Basal and lower leaves entire or
 - lyrate 31. *lycia*
- 15. Basal and lower leaves pinnatifid or pinnatisecte
- 16. Appendages shortly decurrent,
 - firmer with straw yellow margins and a light brown central part, terminal mucro 0.8-1.2 mm long 29. *aphrodisea*
- 16. Appendages simple, creamish at central part and margins, terminal mucro up to 0.5 mm long. 29a. *dursunbeyensis*
- 14. Mucro 1.5-4 mm

Discussion and Conclusion

Centaurea dursunbeyensis is included in sect. *Phalolepis*, which comprises 10 species in Turkey, all of which are endemic.

Centaurea dursunbeyensis, also endemic to Turkey, is close to *C. aphrodisea*, another local endemic species. The main differences between *C. dursunbeyensis* and *C. aphrodisea* are found in the habit, and shape of the branches, capitula, and appendages (Table). *Centaurea dursunbeyensis* is shorter than *C. aphrodisea*, growing up to 40 cm (not up to 70 cm). Involucre of *C. dursunbeyensis* is smaller than that of relative species, 7-10 \times 5-7 mm (not 10-14 \times 5-10 mm or larger). Appendages of *C. dursunbeyensis* are simple and end at the most in a 0.5-

Table. Diagnostic characters of *Centaurea dursunbeyensis* sp. nov. and those of the related species, *C. aphrodisea* and *C. cadmea*.

Species▶ Character ▼	<i>C. dursunbeyensis</i>	<i>C. aphrodisea</i>	<i>C. cadmea</i>
Stem	20-40 cm, several lateral erect to ascending stems, uninterruptedly branched from the base to top, with (5-) 10-20 capitula.	28-71 cm, branched in upper part, with (2-) 5-15 capitula.	20-41 cm, erect to ascending stems, branched above with 2-12 (-20) capitula.
Basal leaves	1-2 pinnatisect, ultimate segments 5-8 mm wide, oblong lanceolate, acute, terminal segment smaller or larger.	1 pinnatipartite, ultimate segments 1.4-5 mm wide, linear lanceolate, all equal.	Basal and lower 1-2 pinnatisect, ultimate segments 3.5-7 mm broad, acuminate and terminal segment slightly larger.
Stem leaves	Median leaves pinnatisect, upper leaves with 1-2 lateral lobes at base.	Median pinnatipartite, upper simple.	Median leaves with 1-2 lateral lobes at base, upper simple.
Involucre	7-10 × 5-7 mm, ovoid-oblong.	10-14 × 5-10 mm, ovoid to cup shaped.	11-16 × 9-12(-15), ovoid to globose.
Appendage	Simple, hyaline with a straw yellow colour, margins slightly lacerate, cream colour; terminal mucro up to 0.5 mm long.	Shortly decurrent, hyaline with a firmer straw yellow or light brown colour at central part, margins irregularly denticulate, terminal mucro 0.8-1.2 mm long.	Not decurrent, with a broad straw to brown colour at central part, margins deeply lacerate, terminal mucro 1.5-3 mm long.
Achenes	Obovoid, cream-brown, with striations 3-4 × 2-2.5 mm, sub-glabrous (sparsely with hairy at apex).	linear-lanceolate, 2.9-3.9 × 1.2-1.9 mm, glabrous.	linear-lanceolate, dark brown, 2.3-3.2 × 1.1-1.4.
Pappus	Outer series 3-4 mm long, inner series c. 0.5 mm long.	Outer series 1.4-3.7 mm, inner series 0.2-1.3 mm.	Outer series 2.8-4.5 mm, inner series 0.4-0.8 mm cream.

mm mucro (not decurrent appendages and not ending in a 0.8-1.2-mm mucro). The branching in *Centaurea dursunbeyensis* begins from below the stem and continues without interruption upward, with (5-) 10-20 capitula (not branched in the upper part with (2-) 5-15 capitula). The capitula of the new species do not have a funnel shape at fruiting (in contrast to *C. aphrodisea*, whose capitula form a funnel at fruiting time).

Centaurea dursunbeyensis is also similar to *C. cadmea*. It differs from *C. cadmea* in that the branches have numerous capitula, ([5-]10-20, not 2-12[-20]), the involucre is smaller (7-10 × 5-7 mm) and ovoid-oblong

(not 11-16 × 9-12[-15] and ovoid to globose), the appendages are cream, without a longitudinally brownish spot (appendage is not longitudinally cream-brown with a dark brownish spot), the inner to outer phyllaries vary from oblong to ovate (not all ovate), the margins are entire or minutely lacerate (not deeply lacerate), and the terminal mucro is weak, ca. 0.5 mm long (without a weak mucro, mucro slender; 2-2.5 mm long).

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