

Centaurea wagenitziana (Asteraceae: Centaureinae), a new species from the Eastern Balkans

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Abstract. *Centaurea wagenitziana* Bancheva & Kit Tan from SE Bulgaria and NW Turkey is described as a species new to science. Its chromosome number of $2n = 30$ is a first report. It closely resembles *C. amplifolia* with which it had been misidentified; the latter is endemic to the Peloponnese in southern Greece and is lectotypified in this paper.

Key words: Asteraceae (Centaureinae), Bulgaria, *Centaurea*, chromosome number, endemism, Greece, new species, *Rhaponticoides*, Turkey

In a recent paper published in *Pl. Syst. Evol.*, 267: 13–23 (online 8 August 2007) a new species of *Rhaponticoides* Vaill. was described from SW Anatolia together with a key to, and distribution map of, all *Rhaponticoides* species in Turkey (Eren 2007). The specimen cited to represent *Rhaponticoides amplifolia* (Boiss. & Heldr.) M.V. Agab. & Greuter (\equiv *Centaurea amplifolia* Boiss. & Heldr.) is from Aydos Dağı in the vilayet (province) of Istanbul. It proved identical to a species which was first reported for the Bulgarian flora by the Czech botanist J. Podpera (1902). The plant was later found by the Bulgarian botanist D. Jordanov (1929) but not seen again in Bulgaria for nearly forty years. The plants in Bulgaria and Turkey were both determined as *Centaurea amplifolia* in the Floras of Bulgaria and Turkey. *Centaurea amplifolia* is a taxon originally described from the Peloponnese in southern Greece. The disjunction between the Greek and Bulgarian-Turkish species is interesting and thought worthy of further investigation.

Aydos Dağı is a low hill (peak *ca.* 500 m) situated on the Anatolian side of the vilayet of Istanbul. It lies 3–4 km north of the towns of Kartal and Pendik. It is a popular excursion spot and the 662-hectare protected area provides an important green “lung” for visitors from the heavily over-populated city of Istanbul. The drier southeastern slopes are mainly covered with macchie and garigue with *Arbutus andrachne*, *Phillyrea latifolia*, *Cistus creticus* and *Erica manipuliflora* in abundance. *Hypericum calycinum* is dominant in the herb layer. *Pinus maritima* and *P. nigra* regenerate vigorously to a height of 4–7 m and *P. pinea* occurs locally on the lower slopes. *Rosa canina*, *Quercus pubescens* and *Populus tremula* are rare.

Centaurea amplifolia was reported for the first time in Bulgaria from “Sakar bei Kavaklij” (Topolovgrad, Tundzha Hilly Country floristic region in SE Bulgaria). Later D. Jordanov found the species in the oak forests at Bakarlaka, a locality west of the town of Sozopol and in the vicinity of the village of Mandra in the

Burgas district (Black Sea floristic region). The species is included in the *Red Data Book of Bulgaria* under an “endangered” threat category (Ninova 1984) and listed in the Bulgarian Law on Biological Diversity (Annexes 2 and 3). It has not been seen for nearly forty years and was considered extinct because its habitat had been greatly affected by agricultural and building activities, mainly tourist complexes.

During the summer of 2005 while working on the *NATURA 2000* project in the area north of the village of Golyam Derwent in the Municipality of Elhovo, Stoyan Stoyanov, our Bulgarian colleague, found a tall composite in full flower. It had conspicuous large pinnatisect leaves and capitula with pale pinkish-mauve florets. It matched the material originally determined as *C. amplifolia* housed in the herbarium of the Bulgarian Academy of Sciences, Sofia (SOM, see list of specimens from Bulgaria). Thus in the same year Svetlana Bancheva undertook a careful investigation of the population within the framework of the project on *Red Lists of the Bulgarian vascular plants and fungi* with the intention of incorporating the information into a new edition of the *Red Data Book of Bulgaria*. The population was monitored until June 2007 when a few more herbarium specimens were prepared and three living plants collected. At Kit Tan’s request, freshly harvested achenes, photographs of the plant (and later a plant), were sent to her and she confirmed Bancheva’s suspicion that the Bulgarian plant was indeed not identical to the Greek taxon but, together with its Turkish counterpart, represented a new species which is here formally described.

***Centaurea wagenitziana* Bancheva & Kit Tan, sp. nova** (Figs. 1–4).

Holotype. Bulgaria: Tundzha Hilly Country, Municipality of Elhovo, north of the village of Golyam Derwent, 348 m, 42°01’N, 26°43’E, 26 July 2006, coll. S. Bancheva & S. Stoyanov SB-07-06 (SOM-163690!; **Isotype** C! GAZI! PAL!).

Diagnosis. Ex affinitate *Centaureae amplifoliae* Boiss. & Heldr., differt foliis basalibus grandioribus, segmentis terminalibus ellipticis-lanceolatis (non orbicularibus-obovatis), nec non acheniis minoribus, tantum 6–7 mm longis (non 8–10 mm).

Description. Herbaceous perennial with woody, vertical, 60–100 cm long rootstock. Stem single, erect, 80–150 cm, sulcate below, puberulent, with several lax, one-capitulate branches in upper part. Leaves mostly basal, pinnatisect, subcoriaceous, shiny mid-green,

subglabrous to puberulent on upper surface, puberulent to weakly pilose on veins beneath; lower leaves broadly elliptic-ovate in outline, 35–45 × 25–30 cm (incl. petiole), with 4–6 pairs of elliptic-lanceolate, 15–18 × 5–6.5 cm, coarsely acute-serrate, sometimes decurrently winged segments; cauline leaves similar but smaller, 12–25 × 6–15 cm, with 5–9 pairs of lanceolate, 4–13 × 1–3 cm, acute-serrate segments. Capitula few, 25–35 mm. Involucre broadly ovoid, 15–20 × 12–15 mm; phyllaries subcoriaceous, glabrous. Middle phyllaries ca. 5 mm broad, oblong to lanceolate, pale green, with dark brown apex margin and 5–6 blackish-green nerves, 3 of them entering the appendage. Appendages flame-shaped, semi-orbicular or broadly lunate, forming an entire, erose or irregularly lacerate scarious margin 2–5 mm broad. Florets ca. 2 cm, pale pink to white, with 5 distinct violet veins; marginal florets longer, radiant, sterile, with linear laciniae ca. as long as tube; anther tube of fertile florets exerted, pinkish-violet. Achenes asymmetrically subcylindrical-truncate, 6–7 × 3–3.5 mm, yellowish- to blackish-brown, transversely wrinkled in upper part, pale cream to yellowish and smooth towards base. Pappus multiseriate, 7–9 mm long, finely scabridulous, yellowish turning pale or dark brown.

Etymology. The species is named in honour of Prof. Dr Gerhard Wagenitz at the University of Göttingen, the distinguished, gentle and unassuming expert on *Centaurea*, to whom this paper is modestly dedicated on the occasion of his retirement from academic duties.

Phenology. Flowering from mid-June to early August, setting fruit till October.

Other specimens examined from Bulgaria (sub *Centaurea amplifolia*): Tundzha Hilly Country, 5 km north of the village of Golyam Derwent, 20 June 2005, coll. S. Stoyanov (SOM-162720! 162721! 162722! 162723!).

Specimens examined from NW Turkey (sub *Centaurea amplifolia*): A2(A) Istanbul: Kartal, Yakacık, NW ridge of Aydos Tepe, in macchie, 330 m, 40°56’N, 29°14’E, 4 November 1978, coll. E. Tuzlacı (ISTE 41710)! loc. ibid., 2 July 1974, coll. E. Tuzlacı & Y. Dođantan (ISTE 30115! E); loc. ibid., 31 July 1952, coll. A. Berk 4150 (ISTE!); Aydos Dađı, ann. 1993, coll. N. Özhatay (ISTE 69760)! Alemdar to Kurtköy, S slopes of Ömerli Baraj (Dam), SW of Pařaköy, rocky ridges, dry grassland, 11 June 1995, coll. A.J. Byfield & R. Fitzgerald (ISTE 69639)!



Fig. 1. *Centaurea wagenitziana* Bancheva & Kit Tan, sp. nova (Holotype at SOM).



Fig. 2. *Centaurea wagenitziana*: capitula.



Fig. 3. *Centaurea wagenitziana*: phyllaries (a, outer; b, middle; c, inner).

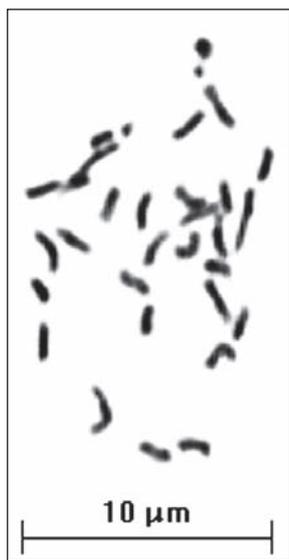


Fig. 4. *Centaurea wagenitziana*: mature achenes.

Chromosome number

Chromosome counts were made on somatic metaphases using the squash technique. Root tips were obtained from the three plants collected in the *locus classicus*. Samples were pretreated with 8-hydroxyquinoline for 30 min, then fixed in acetic alcohol (1:3) for 24 h at 4°C, hydrolysed in 1 M HCl for 15 min at 60°C, stained with haematoxylin after Gomori (Melander & Wingstrand 1953) for 30 min at 60°C, squashed and mounted in 45% acetic acid. The karyotype was determined on the basis of seven metaphase plates, following the scheme of Levan & al. (1964).

The chromosome number of $2n = 2x = 30$ was constant in all seven cells examined. According to our data, this is the first count for the species. The basic chromosome number $x = 15$ is the same as that for most of the species of *Centaurea* sect. *Centaurea*. The



chromosomes are mostly small (1–2 μm) and their morphology unclear. However, metacentric and submetacentric types are dominant in the complement. One pair of large chromosomes (ca. 3 μm) and one pair of SAT chromosomes are included in the karyotype (Fig. 5).

Fig. 5. *Centaurea wagenitziana*: microphotograph of metaphase plate ($2n = 30$).

Pollen morphology

Pollen from the holotype was examined using light microscopy and scanning electron microscopy (SEM). Preparation of the pollen grains for study followed the procedure of Huttunen & Laine (1983). The pollen grains are spheroidal with a polar axis/equatorial diameter ratio of 1.0 (Fig. 6a). The exine ornamentation is spinose, the length of spines being ca. 5 μm (Fig. 6b). The pattern is typical of the *Centaureium*-type as defined by Wagenitz (1955).

Habitat and distribution

In Bulgaria, *C. wagenitziana* is now known for certainty from only one population in the Tundzha Hilly

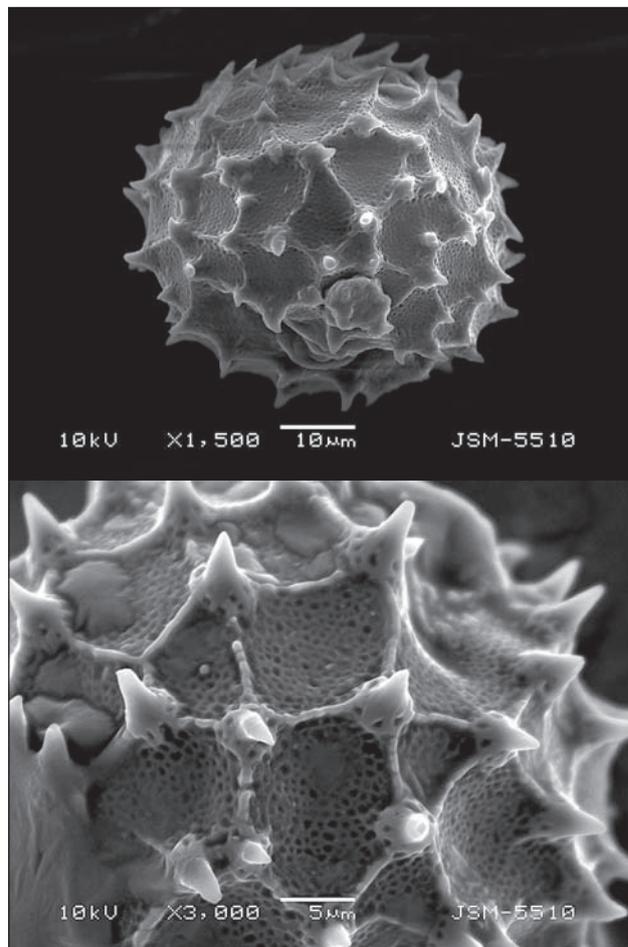


Fig. 6. *Centaurea wagenitziana*: pollen (a, single grain; b, exine ornamentation).

Country and is considered extinct in the other two reported localities. It was growing at an altitude of ca. 350 m, at the edge of shady meadows in xerophilous forests dominated mainly by *Q. cerris* (Turkey oak) and *Quercus frainetto* (Hungarian oak) (Fig. 7). The area falls within the Continental Mediterranean climate zone which is typically characterized by mean January temperatures of 1°C, mean July temperatures of 23°C and annual precipitation of 500 mm with an autumn-winter maximum (Nikolova & al. 2002). According to the FAO soil classification (Food and Agricultural Organisation of the United Nations 1988), Chromic Luvisols (LVx) are predominant in the investigated area (Ninov 2002). The Derventski hills are regarded as a site of “community importance” and part of the European Ecological Network *Natura 2000*. *C. wagenitziana* was found in the habitat type, “Pannonian-Balkan Turkey oak forests – 91M0,” which is included in Annex 1 of the Habitat Directive 92/43/EEC.



Fig. 7. *Centaurea wagenitziana* in its natural habitat.

The population comprises *ca.* 450 individuals distributed in several small groups occupying an area of *ca.* 2 square km. The germination rate is low (*ca.* 20% under laboratory conditions) and the achenes of at least 50% of the capitula suffered some form of insect-larvae attack which surely affects the dispersal capability and long-term survival of the species.

In Turkey, *C. wagenitziana* has only been found in two localities, one of them being the classic one on Aydos Dağı near Istanbul. On a recent visit by Mecit Vural to the southeastern slopes in mid-July 2007, the plant was not located; it is, however, believed still to exist on the more humid northwestern slopes.

The related species *C. amplifolia* Boiss. & Heldr. in Boiss., Diagn. Ser. 2(3): 68 (1856) (Fig. 8).

Lectotype (designated here by Kit Tan & al.): Greece, Peloponnese: in monte Ziria (Kyllene) Peloponnesi prope Flambouritsa (rarissime!), fl. June, 915–1220 m [3000'–4000'], 17/29 June 1851, *Orphanides* Fl. Graec. Exs. 125 (C!; **Iso-lectotype**: G, GB! K, LD, WU!).

The Greek botanist Theodoros Orphanides (1817–1886) visited Mt Killini in northern Peloponnese on several occasions especially in the 1850s, and made a number of remarkable discoveries including *Acer heldreichii*, *Adonis cyllenea*, *Astragalus drupaceus*, *Biebersteinia orphanides*, *Chaerophyllum heldreichii*, *Cicer graecum*, *Crataegus pycnoloba*, *Galium cylleneum*, *Geocaryum divaricatum*, *Scrophularia myriophylla* and *Viola mercurii*. His contemporary, Theodor von Heldreich (1822–1902) explored the flora of Mt Killini on several independent expeditions, notably in 1848, 1871 and 1887, collecting several of the same species and adding some discoveries of his own such as *Asperula boissieri*, *Convolvulus libanoticus*, *Dianthus mercurii*, *Galium thymifolium*, *Hieracium heldreichii*, *Linaria peloponnesiaca*, *Podocytisus carmanicus* and *Verbascum cylleneum*. Most of the new species were described together with Boissier in the series *Diagnoses Plantarum Orientalium Novarum*. *Centaurea amplifolia* was described from two localities: “in faucibus umbrosis regionis abietinae montis Kyllenes (Ziria), 915–1220 m”, *Heldreich* (G), *Orphanides* [125] (C! G, GB! K, LD, WU!) and “in monte Gymnvouno prope Trikala”, *Heldreich* (G). Recent investigation by Dimopoulos & Constantinidis in July 1993 revealed only one flowering plant in the Flambouritsa gorge although 4–5 individuals were observed growing in sunny and semi-shaded stony meadows at the base of calcareous rocks in openings of *Pinus nigra* subsp. *pallasiana* and *Abies cephalonica* forests at altitudes of 1300 to 1400 m (Phitos & al. 1995). They concluded the species was close to extinction in Greece although evidence of its occurrence in Bulgaria, Albania and Turkey was encouraging. We have now clarified the status of the Bulgarian and Turkish plants; it remains to be seen whether the Albanian plant may also represent another taxon, possibly a new species.

Centaurea wagenitziana and *C. amplifolia* differ from the other *Centaureinae* taxa in Turkey in having phyllaries with broad, erose or lacerate, scarious appendages, reddish or pink florets less than 2.5 cm long, and an outer pappus less than 10 mm long. They differ from each other in several small but consistent morphological features.

Centaurea amplifolia seems to be a plant with fewer one-capitulate branches, fewer capitula and leaves.

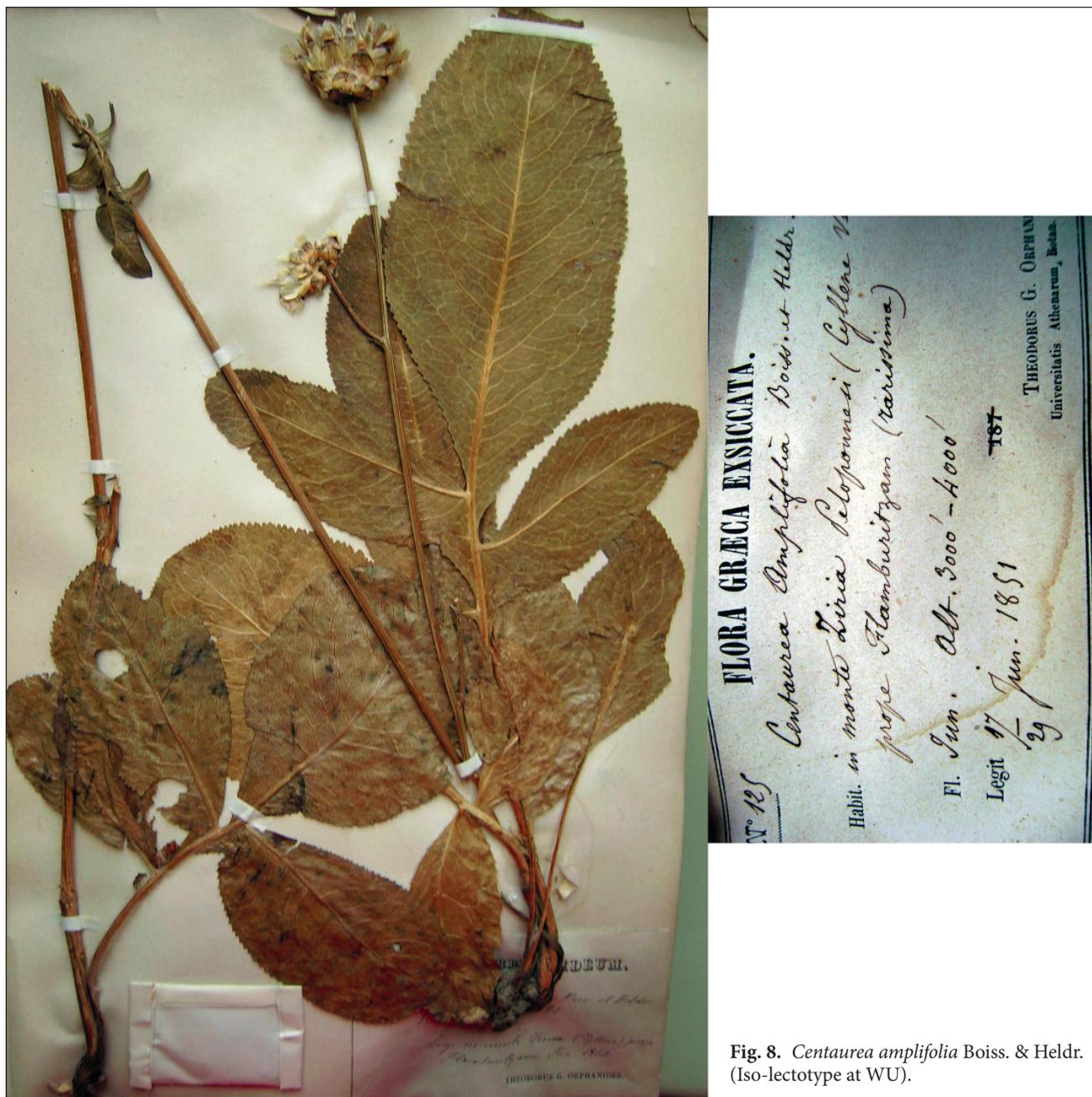


Fig. 8. *Centaurea amplifolia* Boiss. & Heldr. (Iso-lectotype at WU).

The basal leaves, obovate in outline, are smaller, being 20–25 × 11–20 cm and with only 2–3(–4) pairs of segments of which the lower pairs are very much smaller than the upper ones. The terminal leaflet is orbicular-obovate, 15–16 (–20) × 10–14 cm, and conspicuously rounded at the apex in comparison with *C. wagenitziana* which has elliptic-lanceolate, ca. 15 × 4 cm, subacute terminal segments.

The involucre is much larger in *C. amplifolia* being 20–26 × 15–20 mm as compared to 15–20 × 12–15 mm in *C. wagenitziana*. The middle phyllaries are thus correspondingly longer, being 18–25 ×

5–6 mm including a much broader, 6–8 mm scarious margin. The blackish-green veins on the back of the phyllaries are more numerous, (5–)7–8 being the norm, with usually 5 of them extending to the appendage.

Mature achenes of *C. amplifolia* are golden-ferruginous and larger (8–10 × ca. 4 mm), and thus appear proportionally more elongate than mature achenes of *C. wagenitziana* (6–7 × 3–3.5 mm). Both species have the characteristic transverse wrinkles on the upper part of the achene body as occurring in other related species.

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