

Psephellus turcicus sp. nov. (Asteraceae), a new chasmophyte species from central Anatolia, Turkey

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A new species, *Psephellus turcicus* A.Duran & Hamzaoglu (Asteraceae) in sect. *Psephelloidei* (Boiss.) Wagenitz & Hellwig is described and illustrated from Anatolia, Turkey. The species grows on limestone crevices in Kazankaya Canyon (A5 Yozgat) in central Anatolia. A neo-endemic confined to Kazankaya Canyon, it is closely related to *Psephellus psephelloides* (Freny & Sint.) Wagenitz. Diagnostic morphological characters from closely similar taxa are discussed, and arranged in a key of Turkish similar *Psephellus* Cass. The ecology, biogeography and conservation status of the species are also presented. Achene surface morphology of *P. turcicus* and *P. psephelloides* are examined by SEM. The geographical distribution of the new species and other related species is mapped. © 2005 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2005, 148, 495–500.

ADDITIONAL KEYWORDS: Cardueae – Compositae – taxonomy.

INTRODUCTION

Recently, *Centaurea* has been divided in two genera by Wagenitz & Hellwig (2000). One of these is *Psephellus* Cass., which has 75–80 species and a distribution with a centre in East Anatolia, the Caucasus and north-west Iran; only a few species occur outside this area (Wagenitz & Hellwig, 2000).

In Wagenitz & Hellwig (2000), 12 sections that had been included in the genus *Centaurea* were transferred to the genus *Psephellus*. Some of these species occur only in Turkey. The former sections of the genus *Centaurea* were: sect. *Psephelloideae*, *Psephellus*, *Hyalinella*, *Aetheopappus*, *Amblyopogon*, *Heterolophus*, *Czerniakovskya*, *Odontolophoideae*, *Odontolophus*, *Xanthopsis*, *Uralepis* and *Sosnovskya*. New combinations under the genus *Psephellus* are provided for these sections and 35 species, especially from Turkey and Iran. In this article, we have preferred the latest system in generic classification.

The genus *Centaurea* was previously revised by Wagenitz (1975) for the *Flora of Turkey*. In the *Flora of*

Turkey, 172 plus six imperfectly known species of *Centaurea* were accepted (Wagenitz, 1975). Since then, six species have been described: *Centaurea mykalea* Hub.-Mor., *C. iconiensis* Hub.-Mor., *C. cariensiformis* Hub.-Mor., *C. nydeggeri* Hub.-Mor., *C. yozgatensis* Wagenitz and *C. hadimensis* Wagenitz, Ertugrul & Dural (Davis, Mill & Tan, 1988; Güner, 2000). One species (*C. amplifolia* Boiss. & Heldr.) was added as a new record for Turkey (Davis *et al.*, 1988). In addition to these, three new species have been identified by Duran & Duman (2002), and Türkoğlu, Akan & Civelek (2003) from Turkey.

While working on the *Flora of Kazankaya Canyon* in summer 1999, in the north of Aydıncık district of Yozgat province, the authors came across a striking chasmophytic *Psephellus* species. This specimen did not have flowers when it was first collected. The specimens with flowers were collected from the same locality in 2000. The specimens were not referable to any known *Psephellus* species. Studying the specific descriptions of *Psephellus* in Wagenitz (1975), Dostal (1976), Davis *et al.* (1988), Wagenitz, Ertugrul & Dural (1998), Wagenitz & Hellwig (2000), Güner (2000), Duran & Duman (2002) and Türkoğlu *et al.* (2003) as well as comparison with specimens in the

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Herbaria ADO, KNYA, ANK, GAZI and B showed that the specimens represent a novel species. The specimens of *P. turcicus* were examined and compared with specimens of the related species *P. psephelloides* in Turkey. Examined representative specimens of *P. psephelloides* from two localities are cited below. The authors of plant names were checked from Brummitt & Powell (1992).

DESCRIPTION

***PSEPHELLUS TURCICUS* A.DURAN & HAMZAOĞLU
SP. NOV. (FIG. 1)**

SECT. *PSEPHELLOIDEI* (BOISS.) WAGENITZ &
HELLWIG.

Type: Turkey. A5 Yozgat: Aydıncık, Kazankaya town, Kazankaya Canyon passes, 750–950 m, crevices of limestone rocks, 28.vi.2000, *A.Duran* 5461 & *Hamzaoglu* (holotype: KNYA, isotypes: GAZI, ANK, HUB, GOET).

Diagnosis: Affinis *P. psephelloides*, sed foliis basalibus anguste lineari-lanceolatis, 3–7 × 0.2–0.6 cm (nec lanceolatis nec oblongis nec lyratis, 6–12 × 0.8–2 cm), involucris 13–17 × 8–12 mm (nec 17–24 × 15–23 mm), appendicibus 2–5 × 2–4 mm (nec 4–10 × 3.5 mm), phyllariis floccosis-tomentosis (nec glabris nec asperatis), acheniis 4–4.8 mm longis (nec 6–8 mm) differt.

Description: Perennial with woody rootstock, many-stemmed, forming tufts with numerous sterile shoots. STEM erect, ± sparsely floccose-tomentose, 5-striate, 25–40 cm long, unbranched, 1–1.3 mm diameter at base. LEAVES mostly basal, floccose-tomentose, decreasing in number and size to capitula; basal and lower cauline leaves linear to linear-lanceolate, almost unlobed, mostly entire, rarely irregularly 1–2 toothed per side and 1–4 (–5) mm long, 3–9 × 0.2–0.6 cm (inc. petiole), gradually attenuating towards the base; median and upper cauline leaves linear to linear-lanceolate, entire or rarely 1 toothed per side, subsessile or sessile. Capitula solitary, radiant, 18–26 × 16–21 mm (inc. flowers), erect. Involucre 13–17 × 8–12 mm, obovate to cup-shaped. Phyllaries imbricate, with scarious margins, abaxial surface floccose-tomentose to sparsely pilose; outer phyllaries oblong, 1–2 × 1.5–2 mm, appendages 3–3.5 × 4–4.5 mm; median phyllaries oblong, 5–7 × 2–2.5 mm, appendages 4–5 × 3.5–4 mm; inner phyllaries linear-oblong to linear-lanceolate, 7–9 × 1–2 mm, appendages 4.5–6 × 1–1.5 mm. Appendages concealing most of basal part of phyllaries, ± not decurrent, ovate to triangular, hyaline, straw-coloured to brownish in centre, phyllary appendages with cilia, 1–1.5 mm long, 8–15 cilia on

each side, ending in a slender 1–1.5 mm spinule. COROLLA pink. Marginal florets longer than central florets and radiating, 17–22 mm long, with staminode and infundibular limb and 5–6 linear-lanceolate lobes, lobes 5–7 mm long; style 8–11 mm, longer than staminode, central flowers hermaphrodite, 13–16 mm long, with 5 lobes, lobes c. 5 mm long. ANTHERS of central florets equal to corolla, style longer than corolla. ACHENES 4–4.8 mm long, straw-coloured, smooth and shiny, glabrous or few hairs; pappus 4–6 mm, barbelate, brownish to dark purplish or rarely straw-coloured, biseriate, outer series up to 6 mm long, inner series scale-like, 2–3 mm long.

Phenology: Fl. June, and fr. July.

Type: (see above).

Paratypes: Turkey. A5 Yozgat: Aydıncık, Kazankaya town, Kazankaya Canyon passes, 750 m, crevices of limestone rocks, 16.vii.1999, *A.Duran* 4910 (KNYA); *ibid.*, 10.vi.2001, *Hamzaoglu* 2699 (KNYA).

Representative specimens examined: *Psephellus psephelloides*: [Turkey]. B7 Erzincan: Divriği-Kemaliye arası, Taşyol, ilk tünelden sonra, 980 m, 30.v.2003, 39°19.492'N, 38°25.313'E, kalker kayalıklar, *A.Duran* 6128, *Hamzaoglu* & *Sağiroğlu* (KNYA, GAZI); Erzincan: Egin (Kemaliye), in parietibus rupium ad Szanduk, 27.v.1980, *Sintenis* 2268 (type B, photo KNYA! GAZI!).

Distribution and suggested conservation status Endemic to central Anatolia (Yozgat province) of Irano-Turanian element. The specimens are collected only in A5 Yozgat where the species seems to be very rare and local (Fig. 6). It should be graded as Critically Endangered (CR) (IUCN, 2001), because of its local distribution and rather a small population size.

Ecology: *Psephellus turcicus* grows as a chasmophyte species in crevices of limestone rocks with *Inula anatolica* Boiss., *Draba rigida* Willd. var. *rigida*, *Micromeria cristata* (Hampe) Griseb. ssp. *cristata*, *Minuartia anatolica* (Boiss.) Woron. var. *polymorpha* McNeill, *Micromeria myrtifolia* Boiss. & Hohen., *Onosma isauricum* Boiss. & Heldr., *Thymus leucotrichus* Hal. var. *leucotrichus*, *Silene chlorifolia* Sm., *Scrophularia libanotica* Boiss. ssp. *libanotica* var. *pontica* R.Mill., *Arenaria kotschyana* Fenzl ssp. *kotschyana*, *Euphorbia herniariifolia* Willd. var. *herniariifolia*, *Polygala pruinosa* Boiss. ssp. *pruinosa*, *Anthemis tinctoria* L. var. *discoidea* (All.) DC., *Melica ciliata* ssp. *ciliata*, *Gypsophila sphaerocephala* Fenzl. ex Tchihat. var. *cappadocica* Boiss. and *Scorzonera ekimii* A.Duran. 750–950 m altitude, hemicyptophyte.

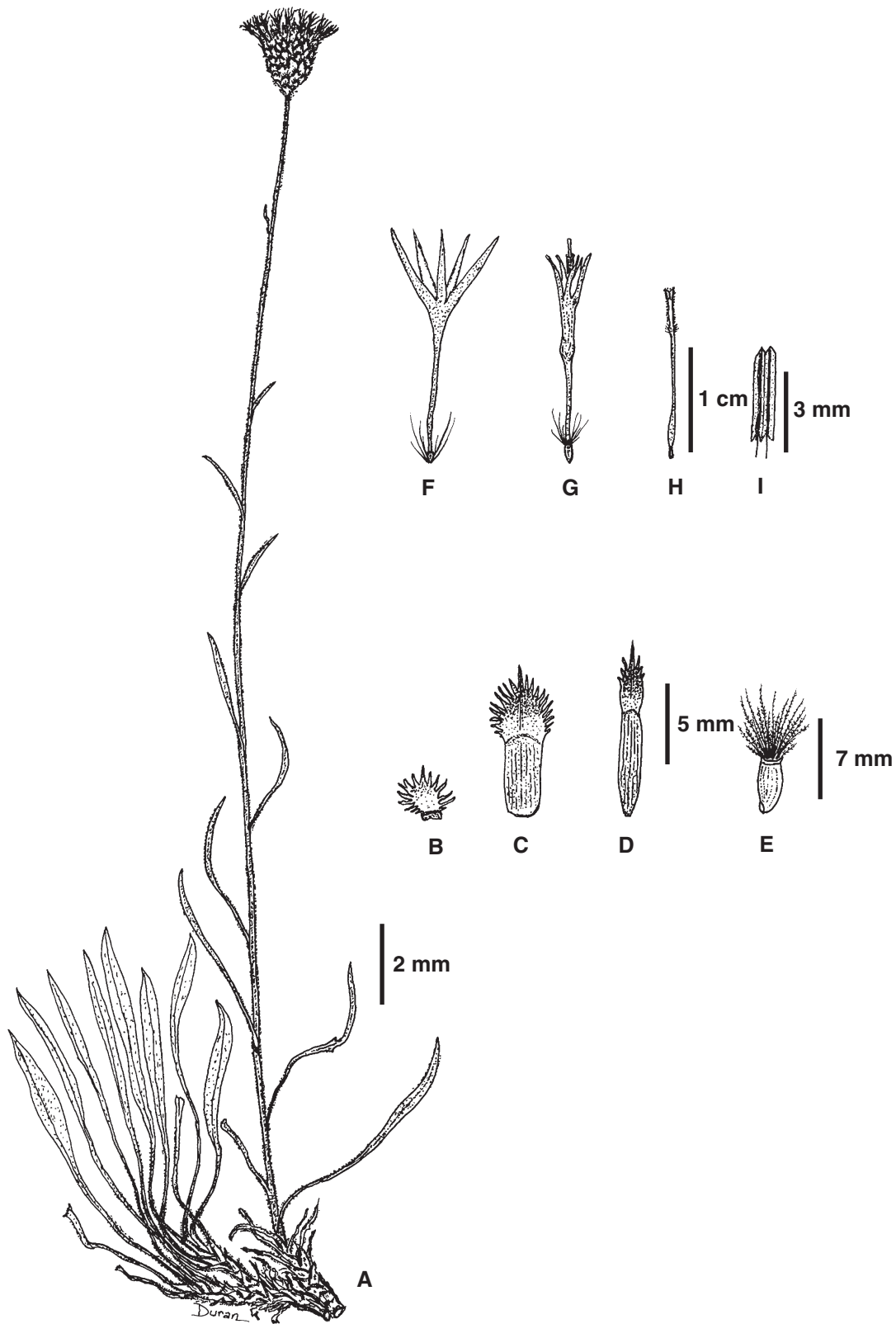
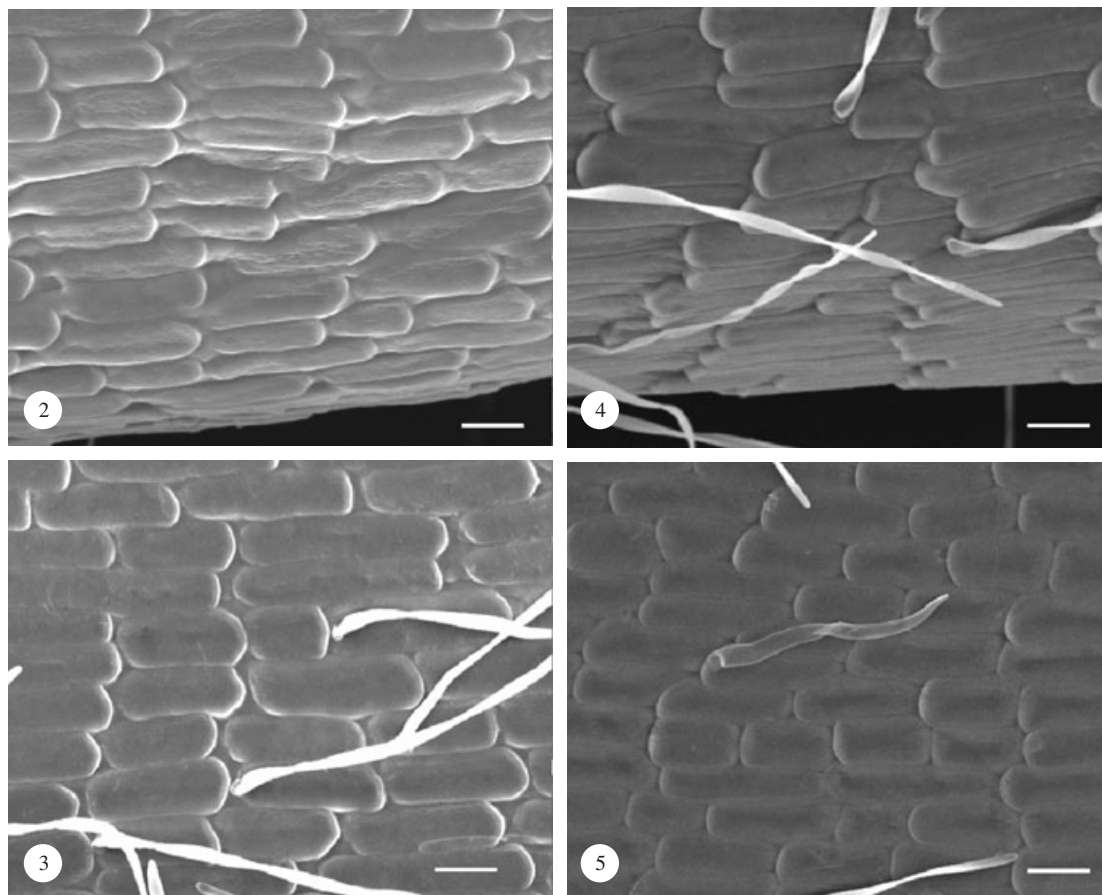


Figure 1. *Psephellus turcicus* A. Duran & Hamzaoğlu (from the holotype). A, habit; B, outer phyllary; C, median phyllary; D, inner phyllary; E, achene and pappus; F, radiant marginal sterile floret; G, hermaphrodite tubular floret; H, style of hermaphrodite tubular floret; I, anther cylinder of hermaphrodite tubular floret.



Figures 2–5. SEM images of the achene surface of *Psephellus turcicus* and *P. psephelloides*. *P. turcicus*. Fig. 2. Dorsal surface. Fig. 3. Lateral surface. *P. psephelloides*. Fig. 4. Dorsal surface. Fig. 5. Lateral surface. Scale bars = 20 μ m.

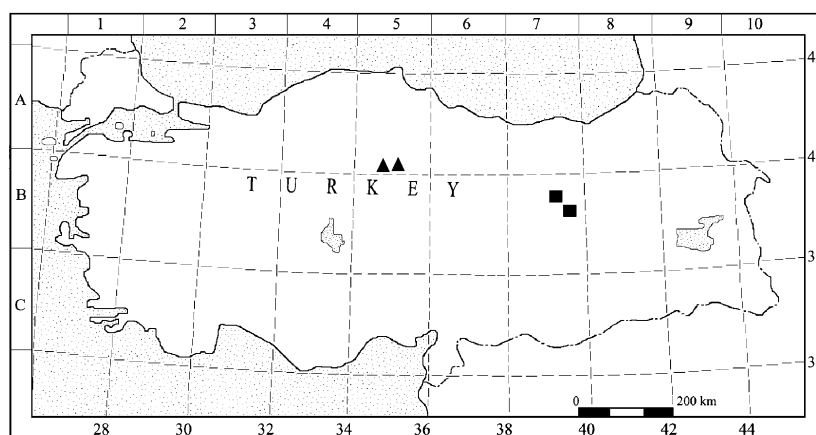


Figure 6. Distribution map of *Psephellus turcicus* (triangles) and *P. psephelloides* (squares).

Achene surface characteristics: Achene surface of *Psephellus turcicus* and *P. psephelloides* were studied by SEM, and show different micromorphological characteristics. The surface ornamentation in both is reticulate, with cells in rectangular shape. There is some distance between the cells of *P. turcicus* (specimen no: *A.Duran* 5461), but there is no distance between the cells of *P. psephelloides* (specimen no: *A.Duran* 6128) (Figs 2–5).

DISCUSSION

Psephellus turcicus is included in sect. *Psephelloidei*, which has 13 species. From this section, *P. hadimensis* and *P. yildizii* (Ş. Civelek, İ. Türkoğlu & H. Akan) Greuter are lately described from Turkey, and all of them are endemic (Wagenitz, 1975; Wagenitz *et al.*, 1998; Wagenitz & Hellwig, 2000; Greuter, 2003; Türkoğlu *et al.*, 2003).

Psephellus turcicus is closely related to *P. psephelloides*, which occurs in the Karasu valley (Kemaliye, Erzincan province), East Anatolia (Fig. 6). It mainly differs from *P. psephelloides* because it has narrowly linear leaves, 30–70 × 2–6 mm, and smaller involucre, 13–17 × 8–12 mm (not lanceolate to

oblong, 6–12 × 0.8–2 cm and larger involucre, 17–24 × 15–23 mm). In addition, it has leaves entire or rarely irregularly 1–2 toothed per side (not usually lyrate, irregularly 1–6 toothed per side or rarely entire), appendages 2–5 × 2–4 mm (not 4–10 × 3–5 mm), phyllaries floccose-tomentose (not glabrous or asperous) and achenes 4–4.8 mm long (not 6–8 mm long) (Table 1).

Palaeopalynological data show that Anatolia had a dense vegetation cover in the last interglacial period. The topography of Turkey has since changed many times, introducing different microclimates in the tectonic valleys. During this period, several species of Mediterranean origin migrated beyond the Karadeniz Mountains (Gemici, 1993). The Kazankaya canyon has a microclimate, in which some of the Mediterranean phytogeographical region plants have been preserved, although the canyon occurs in the Irano-Turanian phytogeographical region. This canyon is approximately 10 km long, and composed of block limestone. *Scorzonera ekimii* A.Duran and *Astragalus duranii* Hamzaoglu & L.Kurt have recently recognized as new species from the Kazankaya Canyon (Duran, 2002; Hamzaoglu & Kurt, 2002).

KEY TO CLOSELY RELATED *PSEPHELLUS* SPECIES

1. Lower leaves undivided or lyrate; cilia of appendage 0.5–1.5 mm
 2. Leaves very narrow, linear to linear-lanceolate, 2–6 mm wide; involucre 8–12 mm wide, appendages 2–5 mm.... 1. *P. turcicus*
 2. Leaves lanceolate to oblong, 8–20 mm wide; involucre 15–23 mm wide, appendages 4–10 mm..... 2. *P. psephelloides*
1. Lower leaves pinnatifid with 2–3 pairs of obtuse segments; cilia of appendage 3–3.5 mm 3. *P. eugenii*

Table 1. A comparison of *Psephellus turcicus* with *P. psephelloides*

Character	<i>P. turcicus</i>	<i>P. psephelloides</i>
Basal leaves	narrowly linear to linear-lanceolate, 3–7 × 0.2–0.6 cm, unlobed, entire or rarely irregularly 1–2 toothed per side	lanceolate to oblong, 6–12 × 0.8–2 cm, usually lyrate, irregularly 1–6 toothed per side or rarely entire
Leaves lobes	up to 5 mm long	up to 8 mm long
Involucre	13–17 × 8–12 mm	17–24 × 15–23 mm
Appendages	2–5 × 2–4 mm	4–10 × 3–5 mm
Phyllaries	floccose-tomentose to sparsely pilose	glabrous or asperous
Inner phyllaries	7–9 mm long	10–12 mm long
Spinule and cilia	1–1.5 mm long	0.5–1 mm long
Central flowers	13–16 mm long	12–13 mm long
Achenes	4–4.8 mm long	6–8 mm long

Psephellus turcicus and *P. psephelloides* grow in areas distant from one another, but in similar habitats with respect to ecology, geology and climate. Kazankaya Canyon and Karasu valley (Kemaliye) are formed within vertically bedded limestones. The rivers pass through the canyons. These areas seem to contain some elements of the Mediterranean phytogeographical region. During the last glacial period, some species of Mediterranean origin migrated into the tectonic valleys, and in the last glacial period were protected from the effects of cold climate in these valleys on south-facing slopes (Duran & Hamzaoglu, 2002). These conditions are clearly seen in Kazankaya canyon and Karasu valley (Kemaliye).

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