



Research article

## A new species from Turkey: *Eleocharis divaricata* (Cyperaceae) and a note for *E. atropurpurea*

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### Abstract

In this study, a new species, *Eleocharis divaricata*, is introduced to science. It is easily separated from other species by its short and divaricate stems, blackish-purple achenes, and amphicarpic proliferation. Also, the presence of *E. atropurpurea* in Turkey is discussed. Finally, a new identification key is proposed for all *Eleocharis* species in Turkey.

**Keywords:** *Eleocharis atropurpurea*; *E. divaricata*; new species; sedge family; Turkey

### 1. Introduction

The sedge family, or *Cyperaceae*, is the third-largest monocot family, consisting of an estimated 5.000 species in 104 genera. The largest genera with approximate numbers of species are *Carex*, 2000 sp., *Cyperus*, 550 sp. and *Eleocharis*, 200 sp. (Goetghebeur, 1998; Simpson and Inglis, 2001).

The genus *Eleocharis* is characterized by the leafless stem, achene type, and toothed perianth bristles.

Almost all species of *Eleocharis* are quite similar to the untrained eye. Further, their natural habitats are similar, with a preference for creekside, swampy, semi-marshy areas, or ponds.

In Turkey, the genus is represented by seven species (*E. quinqueflora* (Hartmann) O. Schwarz, *E. acicularis* (L.) Roemer & Schultes, *E. atropurpurea* (Retz.) C. Presl, *E. palustris* (L.) Roemer & Schultes, *E. mitracarpa* Steudel, *E. uniglumis* (Link) Schultes and *E. carniolica* W.D.J. Koch) according to Flora of Turkey (Tan, 1985).

### 2. Materials and methods

On a social networking site an interesting specimen was shared as *E. atropurpurea* with detailed photographs by the

second author who is a citizen scholar, but this identification was doubted by the first author who is authoring the genus *Eleocharis* for Turkey's Flora.

Later, samples were collected and subjected to scientific examination, leading to a conclusion that, they are not *E. atropurpurea*, and they belong to a new species close to *E. atropurpurea* (Retz.) C. Presl, and *E. geniculata* (L.) Roem. & Schult.

### 3. Results

#### 3.1. The genus *Eleocharis* in Turkey

##### 3.1.1. A new species for science from Turkey

*Eleocharis divaricata* M.Keskin sp. nov. (Fig. 1).

**Holotype:** Turkey, Antalya: Konyaaltı, Boğa çayı vicinity, 4.xii.2020, D.Merrick (Holo NGBB)

**Diagnose:** It is related to *E. atropurpurea* (Retz.) C. Presl and *E. geniculata* (L.) Roem. & Schult. It is easily separated from them by its achenes having a greenish stylopodium, amphi-

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**Table**A comparison of *E. atropurpurea*, *E. geniculata* and *E. divaricata* (\*\*\*)=not any knowledge)

	<i>E. atropurpurea</i>		<i>E. geniculata</i>		<i>E. divaricata</i>
	Blake, 1939	Svenson, 1929	Cosewic, 2009	Menapace, 2020	in this study
<b>Stem</b>	filiform, at most 0.3 mm wide	filiform, strict or bent	thin or filiform, c.1 mm at base; 0.5-0.6 mm wide at the tip	0.2-1 mm	thin or filiform, caespitose, c.1 mm at base; 0.5-0.6 mm wide at tip; ampicarpic proliferation
<b>Glumes</b>	1-1.3 mm	***	1.5 - 2 mm	0.8-3 mm, ovate to elliptic	1.7-2.0 mm
<b>Stamen</b>	1	1-3	***	***	2
<b>Achenes</b>	0.6-0.65	0.5 mm	0.7–1.1 mm	brown ripening to black, biconvex, orbicular to obpyriform, 0.5–1.1 stramineous to whitish, umbonate to subconic, 0.2–0.4 × 0.2–0.5 mm, apex rounded to acute	1 mm, blackish purple, stipitate, orbicular to obpyriform
<b>Stylopodium</b>	very short, depressed, white	markedly flattened, or absent	with a flat and fairly wide tubercle, green		deltoid narrow than wide of achenes, usually light green
<b>Bristles</b>	4-6, thin, white, transparent, shortly spinose or smooth; shorter than achenes or sometimes absent; shorter than achenes or equal	thin, transparent, usually stubby or wanting; shorter than achenes or equal	thin, purplish-brown, equal to achenes	(0–)4–8, typically 7, red-brown, rarely whitish, vestigial to much-exceeding tubercle, typically equaling achene,	(6-)7, white, spinose at upper parts or completely, longer than achenes

carpic proliferation, long and wide glumes, and white perianth bristles longer than the achenes (Table).

**Description:** Plants annual or short-lived perennial with ampicarpic proliferation. Stems 7-10 cm, thin or filiform, caespitose, c.1 mm at base, 0.5-0.6 mm wide at the tip, shiny dark green.

Leaf sheaths 1 or 2, reddish or mauve, obliquely truncate. Inflorescences 4-8 mm ovate-deltoid, obtuse at apex; many-flowered; flowers densely imbricate.

Lower glumes 2, equal and sterile, large green carina on the back, 3-nerved and longer than others, each glume covering up to half the spikelets. Glumes 1.7-2.0 x 1.1-1.3 mm, median nerve green and carinate, brown outward toward the edge, outer parts transparent, membranous, obscurely veined.

Stamens 2; filaments longer than achenes and bristles, anthers 0.8-1.1 mm. Stigma 2, hairy. Perianth bristles (6-)7, white, spinose on the upper parts or completely, longer than achenes.

Achenes obpyriform; thickly bordered at the edge, 1 mm long, widest at the middle, striate, blackish-purple, stipitate at the base; stylopodium deltoid narrower than the achene, usually light green or sometimes whitish.

### 3.2. A note on the presence of *E. atropurpurea* in Turkey

*E. atropurpurea* is known from a single gathering in Turkey (Tan, 1985):

Muğla: Köyceğiz, Dalyan, Sülüngür Lake, Uotila 30598!

The species, widespread in the tropics and subtropics, is introduced in Europe, and the specimen in Edinburgh Herbarium was investigated by the first author.

Consequently, the single specimen from Turkey is certainly not *E. atropurpurea* due to its general structure being long-rhizomatous, perennial, long and thick-stemmed, and the achenes not being black.

It is equal to abnormal form of *E. palustris* (L.) Roemer & Schultes with small inflorescence that is the one that is very common in Turkey. For this reason, *E. atropurpurea* has been removed from the list of Turkey's Flora (Fig. 2.).

### 3.3. A new identification key

1. Achenes blackish-purple *E. divaricata*
1. Achenes usually brownish
  2. Stylopodium absent *E. quinqueflora*
  2. Stylopodium present
    3. Achenes tri-faced with longitudinal and transverse veins *E. acicularis*
    3. Achenes two-faced, never longitudinally and transversely veined
    4. Stylopodium as broad as achenes, always broader than long *E. mitracarpa*
    4. Stylopodium at most as wide as, but usually narrower than, the achenes
    5. Bristles 6-8 and longer than achenes *E. carniolica*
    5. Bristles usually 4-6 and at most equal to the achenes
    6. Lowest glume of spikelet sterile, encircling the spikelet base; achenes minutely tuberculate-striate or smooth *E. uniglumis*
    6. Lowest two glumes sterile, each half-encircling the spikelet base; achenes usually smooth *E. palustris*

### 4. Discussion

While seven *Eleocharis* species were reported in Flora of Turkey (Tan, 1985), *E. atropurpurea* was removed from the list

for being misidentified and not actually being present in Turkey.

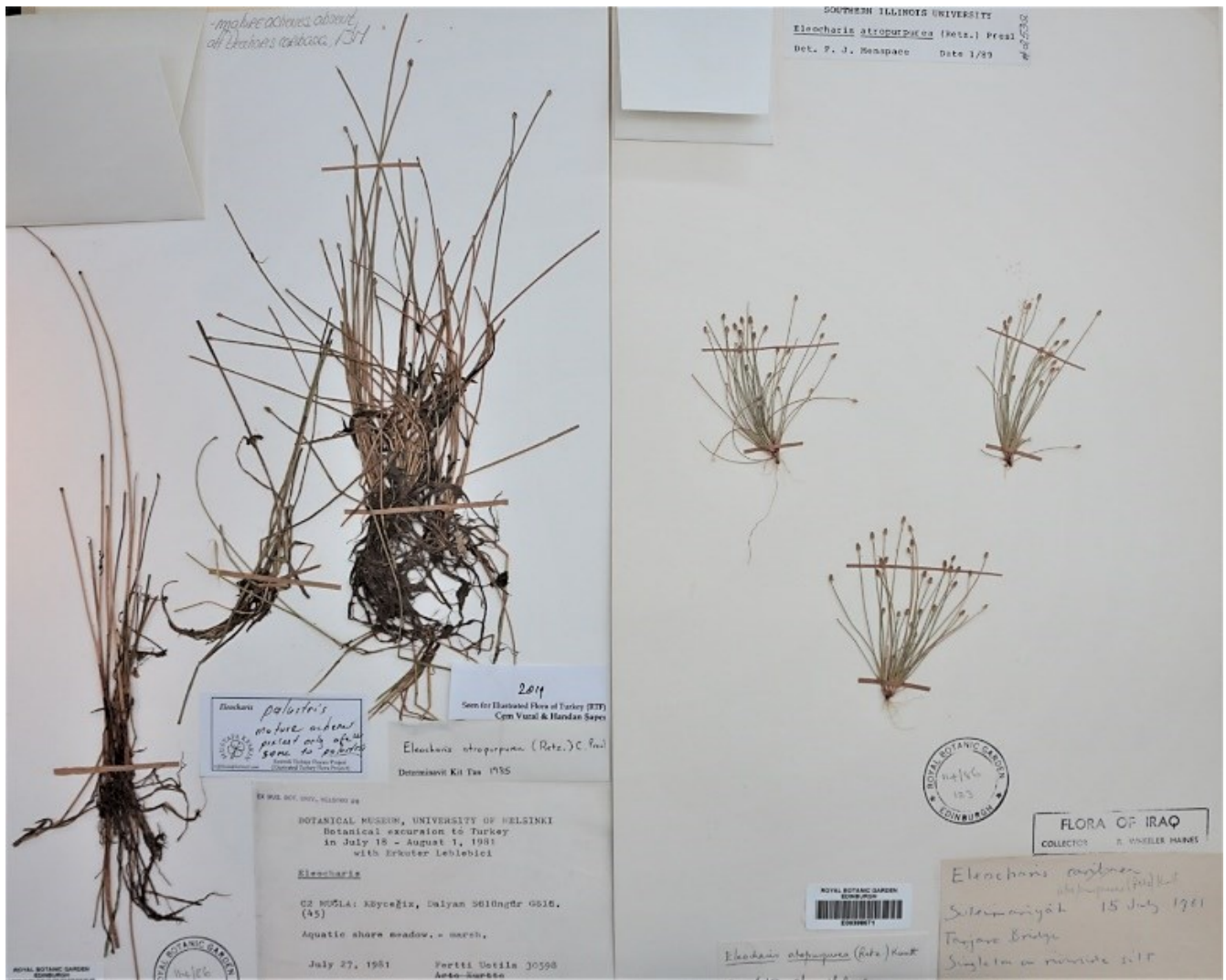
An interesting specimen of *Eleocharis* was collected from Antalya. It is understood that this collected plant differentiates from all other species of *Eleocharis* by its blackish-purple achenes, long bristles, amphicarpic proliferation, long and wide glumes. For this reason, this specimen is introduced to the

scientific world as *E. divaricata*. A new key for Turkish *Eleocharis* has been prepared to identify species in Turkey.

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**Fig. 1.** *Eleocharis divaricata* M.Keskin sp.nov. (1) Habitus, (2) General view, (3) Close up from the base, (4) A single plant, (5) A spikelet, (6) Achenes. (The arrow indicates amphicarpic shoots, all scale bars 1 mm).



**Fig. 2.** A visual comparison for (left) the *E. palustris* identified as *E. atropurpurea* in Flora of Turkey, Uotila 30598 and (right) real *E. atropurpurea*.

**Conflict of interest:** The authors declare that they have no conflict of interests.

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**Informed consent:** This manuscript did not involve human or animal participants; therefore informed consent was not collected.

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