

Poa jubata (Poaceae), a rare Balkan species, first record for the Italian flora

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Abstract – *Poa jubata* A. Kern., an annual South-eastern European species, is reported for the first time from Italy. It is a therophyte linked to temporary ponds with soils flooded during the winter period. It is a very rare and enigmatic species, currently known only from a few localities of the Balkan Peninsula. Recently, it was surveyed in an Apulian wetland, near Brindisi, where it grows with several other annual hygrophytes. For its taxonomical isolation, it is included in a monospecific section, as *P. sect. Jubatae*. In addition to a detailed description, the chromosome complement ($2n = 14$) of this species is examined for the first time and a new iconography is provided.

Keywords: Apulia, chorology, Italy, karyology, morphology, *Poa*

Introduction

Poa L. is a large genus of Poaceae having a cosmopolitan distribution, with about 550 – 575 species recognized so far (Edmondson 1975, Gillespie and Soreng 2005, Soreng and Peterson 2012, Kavousi et al. 2015, Cabi et al. 2017, Ortega-Olivencia and Devesa 2018). According to molecular investigations (Gillespie and Soreng 2005, Gillespie et al. 2007, Mao and Huff 2012), *Poa* is a monophyletic genus, including several subgenera and sections. As concerns the Italian territory, the genus *Poa* is represented by 27 species (Banfi 2017, Bartolucci et al. 2018), of which only two are therophytes while the rest are perennials. The annual species are *Poa annua* L. and *Poa infirma* Kunth; the first is an allotetraploid with a hybrid origin, whose diploid parents are *Poa infirma* and *Poa supina* Schrad. (Tutin 1957, Mao and Huff 2012) and is considered an invasive weed with cosmopolitan distribution, while the second is linked to wetlands and semi-natural meadows. During floristic investigations carried out in Apulia, a very peculiar and enigmatic population of an annual *Poa* was collected in a temporary pond close to Brindisi, not previously reported for the Italian flora (Fiori 1923, Pignatti 1982, Banfi 2017). According to Edmondson

(1980, 1985) and Cabi et al. (2017), it was possible to identify the discussed grass as *Poa jubata* A. Kern., a very rare species having a scattered distribution in the Balkan Peninsula. It was described by Kerner (1873) from Kotor (Cattaro) in Montenegro, while later Hackel (1898) described it as *Poa grimburgii* nom. illegit. from Corfu (Kerkyra) in Greece. Therefore, based on the current knowledge, *Poa jubata* must be treated as a new record of the Italian vascular flora.

Materials and methods

The morphological analysis was carried out on specimens collected in a wetland of Bosco Preti (Brindisi, southern Apulia), as well as on herbarium materials (available online) kept in BM, CAT, E, P, W, WU (abbreviations follow Thiers 2015). For the identification of *Poa jubata* the morphological descriptions and the keys provided by Hackel (1898), Edmondson (1975, 1980, 1985) and Cabi et al. (2017) were used. Morphological comparisons of *Poa jubata* and the most related annual *Poa* species are given in Tab. 1.

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Tab. 1. Distinctive features between the European annual species of *Poa*. Numbers in parenthesis represent rare extreme values.

Characters	<i>Poa jubata</i>	<i>Poa annua</i>	<i>Poa infirma</i>	<i>Poa maroccana</i>
Habit	stem solitary to few together	caespitose, tufted, many-stemmed	caespitose, tufted, many-stemmed	tufted, many-stemmed
Stem	geniculate, erect, slender	geniculate, erect, ascending, decumbens	geniculate, erect, ascending, decumbens	geniculate, erect, ascending, decumbens
Stem size (cm)	12 – 40 (45)	2 – 30 (45)	5 – 25 (30)	10 – 40
Stem sheath covered	ca. 2/3	2/3 to almost totally	1/2 to almost totally	.
Stem node	usually 3	usually 1 (2 – 3)	1 – 2 (3)	.
Leaf sheath length (cm)	2 – 8.5, fused up to 1/2	1–6, slightly compressed, fused for 1/3	1.5 – 4, slightly compressed, fused for 1/3	.
Ligule (cm)	2 – 4 (5)	0.5 – 3 (5)	1 – 3	1
Ligule shape	lanceolate, acute, smooth	ovate-oblong, obtuse to truncate, irregularly denticulate margin	ovate-oblong, obtuse, blunt, erose	triangular-oblong, truncate
Leaf blade size (mm)	10 – 60 × 0.6 – 1	10 – 100 × 1 – 5	20 – 80 × 1 – 3	15 – 40 × 1.5
Leaf blade margin	sparsely scabrid	slightly scabrid	smooth to sparsely scabrid	slightly scabrous
Panicle size (cm)	2 – 7	1 – 7 (10)	2 – 10	up to 9
Panicle shape	erect, open, ellipsoid, pyramidal	erect, open, pyramidal to ovoid	erect, congested, ovoid-oblong	triangular-ovate to oblong-rhomboidal
Panicle branches per node	1 – 2 (3)	1 – 2 (3)	1 – 3	1 – 2
Panicle primary branches shape	ascending to spreading	spreading or reflexed, rar. ascending	ascending	spreading
Panicle branches indumentum	scabrous	glabrous	glabrous	glabrous
Spikelet length (mm)	3.5 – 6.0	3 – 5 (7)	2.8 – 4.8	5.5 – 6.5
Spikelet shape	broadly ovate	ovate to oblong	ovate to oblong	narrow ovate to oblong-linear
Spikelet number florets	4 – 6 (10), compact florets	2 – 6. compact florets	(2) 4 – 6 spaced florets	4, spaced florets
Spikelet rachilla	not exposed	usually not exposed	often exposed	usually exposed
Glumes	subequal to unequal	unequal	unequal	unequal
Lower glume length (mm)	2.3 – 3.0	1.5 – 2.2	1 – 1.5	1.5 – 2
Lower glume n.ribs	3-nerved	1.nerved	1-nerved	1-nerved
Lower glume shape	lanceolate to lanceolate-ovate	narrowly lanceolate to ovate, sickle shaped	Lanceolate	ovate-oblong
Lower glume apex	acute	obtuse	acute to obtuse	subacute
Upper glume length (mm)	2.5 – 3.5	1.5 – 2.5	1.8 – 2.5	1.4 – 2.5
Upper glume n° nerves	5-nerved	3-nerved	3-nerved	3-nerved
Upper glume shape	lanceolate-ovate	lanceolate to oblanceolate	elliptic	ovate-oblong to lanceolate
Upper glume apex	acuminate	obtuse to acute	acute to obtuse	obtuse to subacute
Lemma length (mm)	2.7 – 3.5	2.2 – 3.5	2 – 2.5	2.5 – 3.7
Lemma shape	obovate	broadly lanceolate to ovate	ovate to oblong	ovate
Lemma n.ribs	5, 3 prominent, 2 intermediate evanescent	5, all prominent	5, all prominent	5, all prominent
Lemma keel indumentum	densely and long villous-ciliate on lower 3/5	glabrous and hairy in the ribs in lower 1/2	densely villous	densely villous
Lemma lateral ribs indumentum	densely and long villous-ciliate on lower 3/5	crisply puberulent to long villous, rr. glabrous	densely villous	densely villous
Lemma intermediate ribs indumentum	Glabrous	crisply puberulent to long villous, rr. glabrous	densely villous	densely villous
Lemma apex	rounded	obtuse to acute	rounded	rounded to obtuse
Palea length (mm)	2.4 – 2.6	2 – 2.4	1.7 – 2.3	.
Palea keels indumentum	scabrous to shortly hairy and glabrous below	short to long villous, along all keels	long villous, along all keels	long villous, along all keels
Palea flanges	absent or very narrow and appressed	well developed and not appressed	well developed and not appressed	well developed and not appressed
Lodicules length (mm)	0.5	0.45 – 0.5	0.3	.
Lodicules shape	lanceolate, unlobed	broadly lanceolate to ovate, lobed	lanceolate, lobed	.
Anther length (mm)	0.7 – 1	0.6 – 1.1 (1.3)	0.2 – 0.5	0.7 – 1.2
Caryopsis length (mm)	1.5 – 1.7	1.6 – 1.8, 1.3 – 2.1, 1.5 – 2.3	1.1 – 1.4, 1.5 – 1.9	0.8 – 1.2
Caryopsis shape	fusiform, trigonus in cross section	ellipsoid, circular-compressed in cross section	ellipsoid, circular-compressed in cross section	ovate

The karyological analysis was performed on mitotic plates from root-tip cells of Petri-dish germinated seeds. Roots were pre-treated for 3 h with a 1-bromonaphthalene saturated aqueous solution, then fixed for 12 h in a freshly prepared mixture of absolute ethanol with glacial acetic acid (3:1) and stored in 70% ethanol. Treated root tips were hydrolyzed in 1 N HCl for 8 min at 60 °C and stained according to the Feulgen technique. The somatic chromosome number and complement were examined on at least 10 metaphase plates from 10 different germinated seeds. Chromosome measures and karyotype features were estimated following Brullo et al. (2014). All karyo-morphometric parameters are listed in Tab. 2. Vouchers of all examined material are kept in CAT.

Results

Poa jubata A. Kern., Oesterr. Bot. Z. 23: 6. 1873 (Fig. 1)

Lectotype – Dalmatia in sylvis et subdumetis in Zuppa pr. Cattaro, May 1872, T. Plicher s.n. (WU-Kerner 0061933!), designated by Cabi et al. (2017); isotypes (WU 0061932!, BM 001217079!).

Synonyms – *Poa grimburgii* Hack., Oesterr. Bot. Z. 48: 12. 1898. Lectotype – In arenosis submarinis prope ostium fluminis Potamos, Corcyra, 12 April 1897, K. Grinburg s.n. (W-Hackel 1916-0014329!), designated by Cabi et al. (2017); isotypes (US! fragmentary material of type specimen ex herb. Hackel, W!).

Description (based on Apulian material) – Annual, without rhizomes, unbranched or with intravaginal branching. Culms 15–30 cm tall, erect or weakly geniculate at base, solitary or rarely in pairs, slender, flexuous, terete, glabrous, with 2–3 nodes and internodes covered by sheaths only at the base. Leaves 2–3, with sheath usually longer than the blade, throat and collar smooth and glabrous; ligule 2.5–3.5 mm long, glabrous, lanceolate, acute at the apex; blade 1.5–5.5 cm long, 0.5–1.2 mm wide, smooth, sparsely scabrous at the margin. Panicle 2.5–7.0 cm long, rhomboid to pyramidal, erect, very lax, open, with 1–3 branches per node, spreading to subpatent after flowering, sparsely to moderately scabrous in the rachis and pedicel, branches 5–30 mm long. Spikelets 3.5–5.5 mm long, broadly ovate, laterally compressed, green to violaceous with (3)4–6(7) crowded florets. Glumes ovate-lanceolate, subequal, shorter than ad-

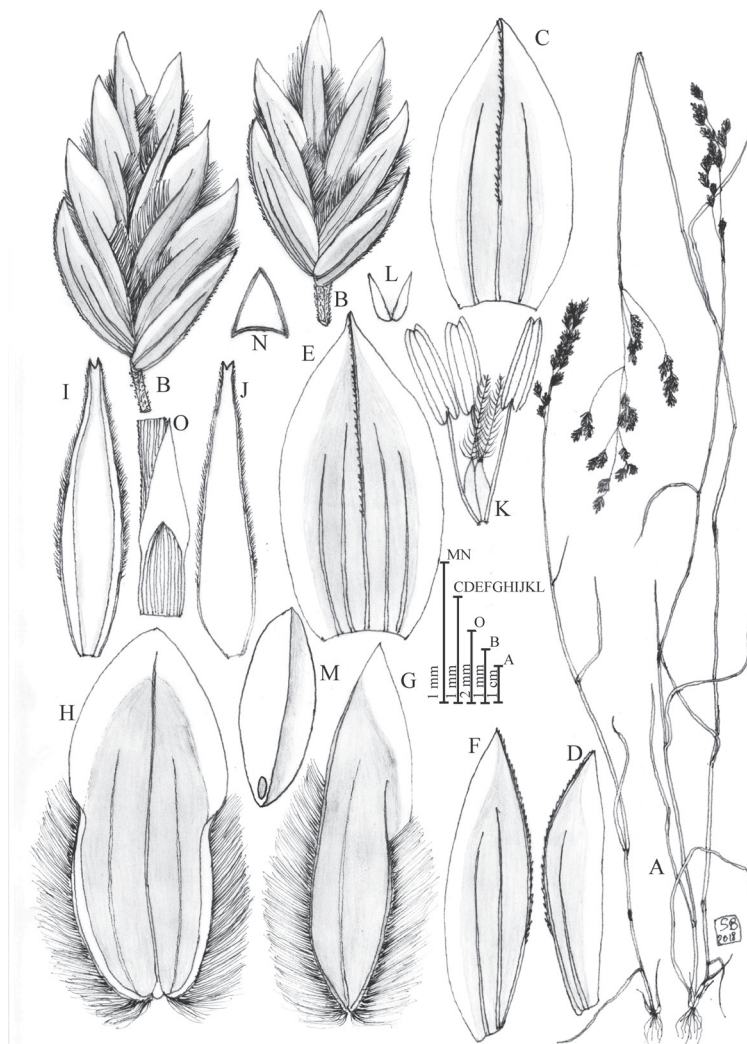


Fig. 1. Drawing of *Poa jubata* from living Apulian specimens: (A) habit; (B) spikelets; (C) lower glume dorsal view; (D) lower glume lateral view; (E) upper glume dorsal view; (F) upper glume lateral view; (G) lemma lateral view; (H) lemma ventral view; (I) palea ventral view; (J) palea dorsal view; (K) stamens and pistil; (L) lodicules; (M) caryopsis; (N) caryopsis cross section; (O) ligule.

Tab. 2. Karyomorphometric parameters and symmetry indices of *Poa jubata* from Apulian samples. Mean values come from 10 metaphase plates. LA – long arm; SA – short arm; SD – standard deviation; TAL – total absolute length; TRL – total relative length; AR – arm ratio; CI – centromeric index; Type – chromosome nomenclature; TCL – total chromosome length; MCL – mean chromosome length; D-value – difference between long and short chromosome arms; DRL% – difference of relative length; S% – Relative length of the shortest chromosome; MAR – mean arm ratio; MCI – mean centromeric index; CVCL – coefficient of variation of chromosome length; CVCI – coefficient of variation of centromeric index, m – metacentric, sm – submetacentric, msm – metacentric-submetacentric.

Pair	LA (μm) \pm SD	SA (μm) \pm SD	TAL (μm) \pm SD	TRL (%) \pm SD	AR	CI	Type
I	2.89 \pm 0.32	2.52 \pm 0.43	5.41 \pm 0.72	9.94 \pm 1.18	1.14	46.63	m
II	2.52 \pm 0.43	2.33 \pm 0.46	4.85 \pm 0.89	8.90 \pm 1.41	1.08	48.01	m
III	2.41 \pm 0.10	1.50 \pm 0.21	3.91 \pm 0.16	7.21 \pm 0.37	1.60	38.42	msm
IV	2.26 \pm 0.13	1.84 \pm 0.11	4.09 \pm 0.21	7.53 \pm 0.35	1.23	44.91	m
V	1.82 \pm 0.20	1.52 \pm 0.07	3.34 \pm 0.27	6.17 \pm 0.72	1.20	45.49	m
VI	1.49 \pm 0.33	1.30 \pm 0.27	2.79 \pm 0.60	5.14 \pm 1.12	1.15	46.54	m
VII	1.83 \pm 0.31	0.96 \pm 0.32	2.79 \pm 0.63	5.11 \pm 0.96	1.91	34.41	sm

TCL = 54.37 \pm 2.95; MCL = 3.88 \pm 1; D-value = 6.49; DRL% = 5.05; S% = 49.51; MAR = 1.27; MCI = 43.49; Stebbins' Cat. = 1B; CV_{CL} = 25.72; CV_{CI} = 11.20.

jacent lemmas, distinctively veined and keeled, keel slightly scabrous above, with surfaces smooth and broadly hyaline at the margins, acute at the apex; lower glumes 2.5–3.0 mm long, 3-veined; upper glumes 2.8–3.2 mm long, 5-veined. Lemmas 2.7–3.5 mm long, with well distinct keel and marginal nerves, densely villous –iliate on lower 3/5, with cilia 0.6–0.8 mm long, intermediate veins not well distinguished, glabrous, all veins not reaching the apex, which is broadly hyaline and obtuse. Palaea hyaline, 2.7–2.8 mm long, from subequal to shorter than the lemma, with keels shortly ciliate along the upper 2/3, bifid at the apex, with flanges absent or very narrow and appressed. Flowers bisexual; lodicules 0.5 mm long, lanceolate, unlobed, glabrous; anthers 0.7–1.0 mm long, yellow; styles 0.7–0.8 mm long, plumose. Caryopsis adherent to palaea, 1.3–1.5 mm long, fusiform, subtrigonal, hilum inconspicuous. Flowering time is from March to early May.

Karyology – All investigated material from Apulia showed a diploid chromosome number $2n = 2x = 14$ (Fig. 2A). This is the first report of chromosome count for *Poa jubata*. Overall, the karyotype displays two pairs of long chromosomes, three pairs of medium length and two pairs of small chromosomes, as also confirmed by the karyomorphometric values (Tab. 2). It is prevalently characterized by metacentric chromosomes (m), except one meta-submetacentric pair (msm, arm ratio more than 1.30) and one submetacentric pair (sm). No satellited chromosomes were detected. Thus, the karyotype formula can be resumed as $2n = 2x = 14: 10\text{ m} + 2\text{ msm} + 2\text{ sm}$ (Fig. 2B). The mean chromosome absolute length ranges from $5.43 \pm 0.7 \mu\text{m}$ of the longest chromosome to $2.69 \pm 0.7 \mu\text{m}$ of the smallest one, while the mean relative length varies from $9.98 \pm 1.14\%$ to $4.92 \pm 1.1\%$.

Habitat and ecology – In Apulia *Poa jubata* is very rare and occurs in temporary ponds, within cork oak woodlands on silty-sandy soils at an altitude of 50 m (Fig. 3). In these

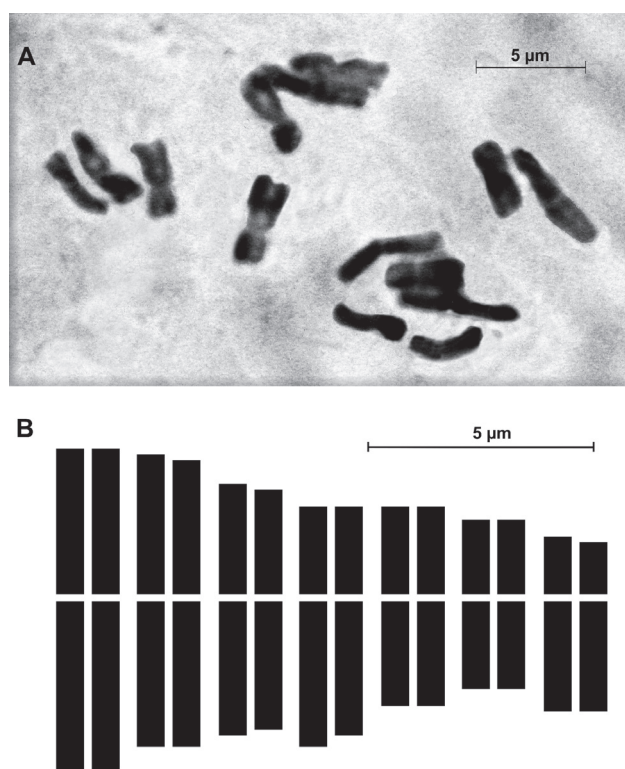


Fig. 2. Chromosome complement ($2n = 2x = 14$) of *Poa jubata*. (A) Mitotic metaphase plate from Apulian plants; (B) Idiogram.

winter flooded wetlands, it grows together with numerous hygrophilous microphytes, such as *Isoetes histrix* Bory, *I. sicula* Tod., *Centunculus minimus* L., *Anagallis parviflora* Hoffmanns. et Link., *Solenopsis laurentia* (L.) C. Presl, *Cicendia filiformis* (L.) Delarbre, *Lotus parviflorus* Desf., *L. angustissimus* L., *Polypogon subspatheus* Req., *Juncus bufonius* L., *Ranunculus sardous* Crantz, *Mentha pulegium* L., *Gaudinia*



Fig. 3. *Poa jubata*: (A) Apulian habitat; (B) Inflorescence.

fragilis (L.) P. Beauv., etc. From the phytosociological point of view, this species is a member of a plant community belonging to the alliance *Cicendio-Solenopsis laurentiae* Brullo et Minissale 1998 of the *Isoëto-Nanojuncetea* Br.-Bl. 1935 class (see Biondi et al. 2014).

Geographical distribution – as previously highlighted, *Poa jubata* occurs in several East European countries, such as Montenegro, Greece, European Turkey and Bulgaria, where it is reported as a rare and scattered species (Rohlena 1913, Hayek 1933, Buschmann 1942, Edmondson 1980, 1985,

Schuler 2007, Valdés and Scholz 2009, Assyov et al. 2012, Flora Ionica Working Group 2016, Cabi et al. 2017, GBIF Secretariat, 2017), while the occurrence in Croatia and Albania is doubtful (Bedalov et al. 2000, Nikolić 2015, Vangjeli 2015, Barina et al. 2018). Overall, due to the peculiar ecological requirements and the poor numerical consistency of the populations, the real distribution range of *Poa jubata* is probably underestimated and would deserve further investigation. This can be also said for Italy, where the species was observed only in one stand (Fig. 4).

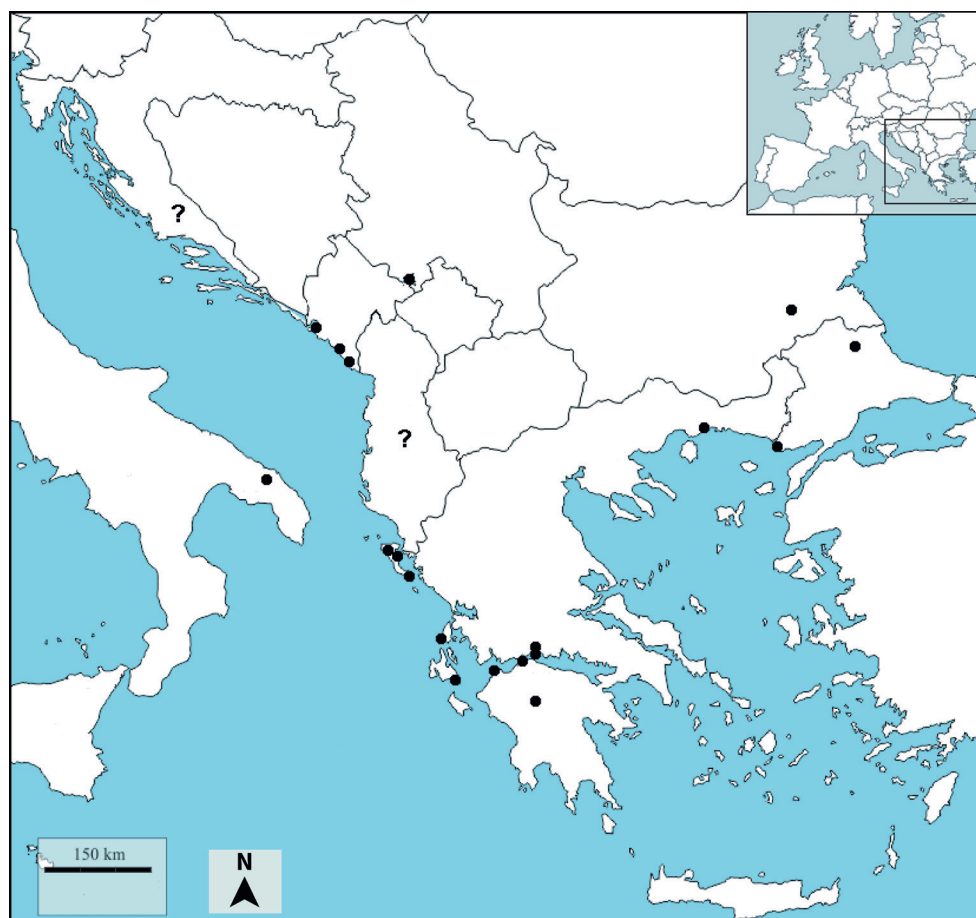


Fig. 4. General distribution map of *Poa jubata* based on herbarium and literature data (dots), the doubtful records are indicated with quest mark (?).

Conservation status – From literature data (Cabi et al. 2017), *Poa jubata* is a very rare species with a quite scattered distribution, occurring only in wet habitats severely threatened by human activities. According to EUNIS (2012), this habitat corresponds to “Temporary lakes, ponds and pools” (code C1.6). The Apulian stand is currently little disturbed and in a good conservation status. Previously, *Poa jubata* was considered by Ekim et al. (2000) as Endangered (EN), while recently it was evaluated by Cabi et al. (2017) as Critically Endangered (CR) under B1ab(i,ii,iii,iv) + 2ab(i,ii,iii,iv).

Specimina visa – Greece: Korfù, Strandweisen bei Potamos, 26 April 1911, Vierhapper s.n. (WU 0096764); In arenosis submarinis prope ostium fluminis Potamos, Corcyra, 12 April 1897, K. Grinburg s.n. (W-Hackel 1916-0014329, US) Lectotypus of *Poa grimbergii* Hack.; Korfu, Strandweisen bei Potamo, 11 April 1911, Watzl s.n. (WU 0096765);

Potamos, Corfù, 7 April 1902, Karl Grimes v. Grinburg s.n. (WU 0096766); Corfù, 20 April 1887, Gelmi s.n. (WU 0096768); Insula Corcyra, in arenosis maritimis ad ostia fluminis “Potamos” (*locus classicus*), April 1901, Rosa v. Gerold 4186 (P 03370491, WU 0096767).

Montenegro: Dalmatia in sylvis et subdumetis in Zuppa pr. Cattaro, May 1872, T. Plicher s.n. (WU-Kerner 0061933) Lectotypus of *Poa jubata* Kern.; idem isotypes of *Poa jubata* (WU 0061932, BM 001217079).

European Turkey: A1(E) Kirklareli: Derenkoy to Kirklareli 14 km to Kirklareli, 25 May 1975, Baytop 317803 (E 00367534).

Italy: Apulia, Bosco Preti near Brindisi, 50 m. a.s.l., in wet depressions inside a Cork woods 23 April 2018, Beccarisi L., Brullo S., Cambria S., Tomaselli V. s.n. (CAT).

Identification key to the annual species of *Poa* in the Euro-Mediterranean territory

- 1a. Stems solitary or rarely geminate; upper glume 5-nerved; lemma long villous-ciliate on keel and marginal veins with intermediate veins evanescent; palaea scabrous to shortly hairy in the upper part of keels; caryopsis fusiform-subtrigonus.....*P. jubata*
- 1b. Stems numerous; upper glume 3-nerved; lemma sparsely hairy on keel and marginal veins with intermediate veins prominent; palaea long villous along all keels; caryopsis ellipsoid-compressed2
- 2a. Panicle with lower branches patent or deflexed after anthesis; spikelets with crowded florets; lower glume 1.5–2.2 mm long.....*P. annua*
- 2b. Panicle with lower branches erect-patent after anthesis; spikelets with rather distant florets; lower glume 1–1.5 mm long3
- 3a. Spikelets 2.8–4.8 mm long; lower glume 1–1.5 mm long; lemma 2–2.5 mm long; anthers 0.2–0.5 mm long.....*P. infirma*
- 3b. Spikelets 5.5–6.5 mm long; lower glume 1.5–2 mm long; lemma 2.5–3.7 mm long; anthers 0.7–1.2 mm long*P. maroccana*

Discussion

According to literature (Watson and Dallwitz 1994), the genus *Poa* is mainly represented by perennial species, with caespitose habit and often provided with rhizomes, stolons or bulb-like swollen vegetative shoots, while annual species are quite rare. Among the annual species the following species can be mentioned: *Poa annua* L. (cosmopolitan), *Poa infirma* Kunth (Mediterranean-Irano-Turanian), *Poa maroccana* Nannf. (Mediterranean), and also *Poa jubata* A. Kern. (South-East European), whose taxonomic position and distribution have been examined by many authors (see Nannfeldt 1938, Chrtek and Jirásek 1962, Scholz 1968, 1993, 1996, Hernandez Cardona 1978, Edmondson 1975, 1980, 1985, Böhling and Scholz 2003, Vazquez Pardo and Garcia Alonso 2016, Gillespie et al. 2018, Ortega-Olivencia and Devesa 2018). As concerns their relationships, these species are arranged in different subgenera and sections, such as sect. *Micrantherae* Stapf (= sect. *Ochlopoa* Asch. et Graebn.) of the subgen. *Ochlopoa* (Asch. et Graebn.) Hyl. including *Poa annua*, *P. infirma* and *P. maroccana*, while *P. jubata*, formerly

considered as an *incertae sedis* species, has been recently referred to sect. *Jubatae* Cabi, Gillespie and Soreng (2005), a monotypic section whose attribution to a distinct subgenus is currently uncertain, as emphasized by Cabi et al. (2017). Indeed, *Poa jubata* is morphologically well differentiated from the aforementioned annual species by some relevant features, such as the mostly solitary culms, spikelets with all flowers bisexual, upper glume 5-nerved, lemma with keel and marginal veins densely and long villous-ciliate and intermediate veins evanescent and glabrous, palea with flanges absent or very narrow and appressed, caryopsis fusiform-subtrigonus (Cabi et al. 2017). All the other annual Euro-Mediterranean species of *Poa* are characterized by caespitose and many-stemmed habit, spikelets with upper flowers usually unisexual, upper glume 3-nerved, lemma with all 5 veins well distinct and more or less hairy and never long villous-ciliate, palea with flanges well developed and detached, caryopsis ellipsoid-compressed. The main morphological differences among these annual species of *Poa* are listed in Tab. 1.

As far as karyology is concerned, *Poa jubata* shows a diploid chromosome complement with $2n = 14$, not common among *Poa* species, which are usually high and variably polyploid (Joshi et al. 2017). Actually, this diploid complement seems shared by only a few species, such as *P. infirma*, also annual, as well as the perennial *P. supina* Schrad. and *P. trivialis* L.

Other annual *Poa* species were described from North America, such as *Poa bajatensis* Soreng (see Soreng and Pererson 2012) and many others from the Himalayan region (see Rajbhandari 1991, Nautiyal and Gaur 2017), but all morphologically well distinguished from those ones here examined. Actually, as highlighted by Guanghua et al. (2006), all non-European annual representatives were included in various sections of another subgenus, represented by the subgen. *Poa*.

From the phytogeographic point of view the occurrence of *Poa jubata* in Apulia is difficult to explain as an accidental introduction, since it has no food or fodder interest and it is absent in agricultural habitats as a weed. It should also be noted that this species of *Poa* shows very limited dispersal capacity, unlike species such as *Poa annua*, the seeds of which are dispersed by wind, water or attached to animal fur (Holm et al. 1997). Therefore the distribution of the species could be related to paleogeographic facts such as Apulian connections with the Balkans. Recently, Royden and Facenna (2018) stated that the Menderes-Taurus block (Western Turkey), formed the eastern extension of the Apulian

continental fragment including the current Apulia, Balkan Peninsula and Anatolia at least up to 30–25 million years ago in Oligocene (Stampfli 2005). On the basis of fossil evidences, Poaceae are dated back 55–70 myr, although widespread grass-dominated ecosystems can be dated only to the early/middle Miocene (25–15 myr) (Hodkinson 2018). Considering that *Poa jubata* is taxonomically quite isolated in comparison with the other *Poa* species, having ancestral characteristics, its origin and diffusion could be congruent to the geological time period in which the current Apulia was joined to the Balkans. An alternative explanation may refer to the glacial periods that led to a notable narrowing of the Adriatic with the emergence of the northern central part of the basin (Maselli et al. 2011), facilitating the spread of this and other amph-Adriatic species from the Balkans to Apulia or the Italian Peninsula (Di Pietro and Wagensommer 2014, Frajman and Schönswetter 2017, Kabaš et al. 2019). Mediterranean temporary ponds and woodlands, where it grows now, could be refugial habitats of a species evolved in a more humid climate (Monegato et al. 2015).

It should be noted that the discovery of *Poa jubata* in Apulia can be considered as fortuitous, since it is an ecologically highly specialized hygrophyte and therefore extremely rare. It is plausible to suppose that the species in Apulia had been previously unnoticed due its inconspicuous habit and that it could also occur in similar habitats of other localities.

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