ACTA BIOLOGICA SLOVENICA
LJUBLJANA 2010 Vol. 53, Št. 2: 5–12

Juncus atratus Krock. (*Juncaceae*) rediscovered in Slovenia

Temnocvetni loček (*Juncus atratus* Krock., *Juncaceae*) ponovno najden v Sloveniji

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Abstract: *Juncus atratus* Krock. of the *Juncaceae* family is a Central European- Southern Siberian wet-meadow species. In Central Europe, the species is very rare and threatened. In Slovenian Red Data List, it is listed among unsufficiently known species (K). The only record of the species in Slovenian territory (Prem near Ilirska Bistrica, SW Slovenia) is over 100 years old and has never been confirmed afterwards. In May 2010, the species was found in Goričko (NE Slovenia), were it thrives on a wet meadow near Kobilje village. The article discusses the recent finding of the species in Slovenia in broader context, its distribution, habitat and threat factors. The aim of the study was also to provide bases for nature-conservation of the species in Slovenia. According to recent finding and the results of the study, the authors suggest *Juncus atratus* to be regarded as 'endangered' (E) in the national red data list.

Key words: *Juncus atratus, Juncaceae,* nature-conservation, Slovenian flora, Goričko, Red Data List, wet meadows

Izvleček: Temnocvetni loček (*Juncus atratus* Krock.) iz družine ločkovk (*Juncaceae*) je srednjeevropsko-južnosibirska vrsta vlažnih travnikov. V Srednji Evropi je vrsta zelo redka in ogrožena. Na slovenskem rdečem seznamu je navedena med nezadostno znanimi vrstami (K). Edini podatek o uspevanju vrste za Slovenijo (Prem pri Ilirski Bistrici, Jugozahodna Slovenija) je star več kot 100 let in ga kasnejše raziskave niso uspele potrditi. Maja 2010 je bila vrsta najdena na Goričkem (Severovzhodna Slovenija), kjer raste na vlažnem travniku pri vasi Kobilje. Članek obravnava nedavno najdbo vrste v Sloveniji v širšem kontekstu, razširjenost vrste, habitat in faktorje ogrožanja. Namen raziskave je postaviti temelje za ohranjanje vrste v Sloveniji. Glede na nedavno najdbo in rezultate naše raziskave, avtorji predlagajo, da se vrsto *Juncus atratus* v slovenskem rdečem seznamu uvrsti med prizadete vrste slovenske flore (E).

Ključne besede: *Juncus atratus, Juncaceae*, naravovarstvo, slovenska flora, Goričko, rdeči seznam, vlažni travniki.

Introduction

Juncus atratus Krock. is a member of *Juncaceae* family. It is 40-120 cm tall perennial with a creeping, sparingly branched rhizome with 7- to 11-angled leaves and inflorescence of 15-50 clusters, each with distinctly dark brown flowers. It is a Central European - Southern Siberian wet-meadow species (Pignatti 1982), distributed in C and E Europe, northwards to Latvia (Snogerup 1980). In Central Europe, the species is very rare and also listed among Central European vascular plants requiring priority

conservation measures (Schnittler and Günther 1999).

Until recently, there was only one published (over 100 years old) record of the species from Slovenia of Pospichal (1897-99) from Submediterranean region (in upper valley of Reka river at Prem near Ilirska Bistrica, SW Slovenia) under synonim *J. melananthos* Rchb., with his remark, that the species probably thrives also in Brkini area nearby. The Pospichal's record (in 0351/4 MTB quadrant) is the only dot in distribution map of *Juncus atratus*, published in 'Materials for the Atlas of Flora of Slovenia' (Jogan et al. 2001), which is a key reference for distributional data of Slovenian vascular plants and where the distribution maps of most taxa are shown. However, the presence of the species on Pospichal's locality was not confirmed by other botanists afterwards, although the attempts were made to find *Juncus atratus* in this area in the last decade (Rozman B., personal communication). As seen in general distribution map of this species in

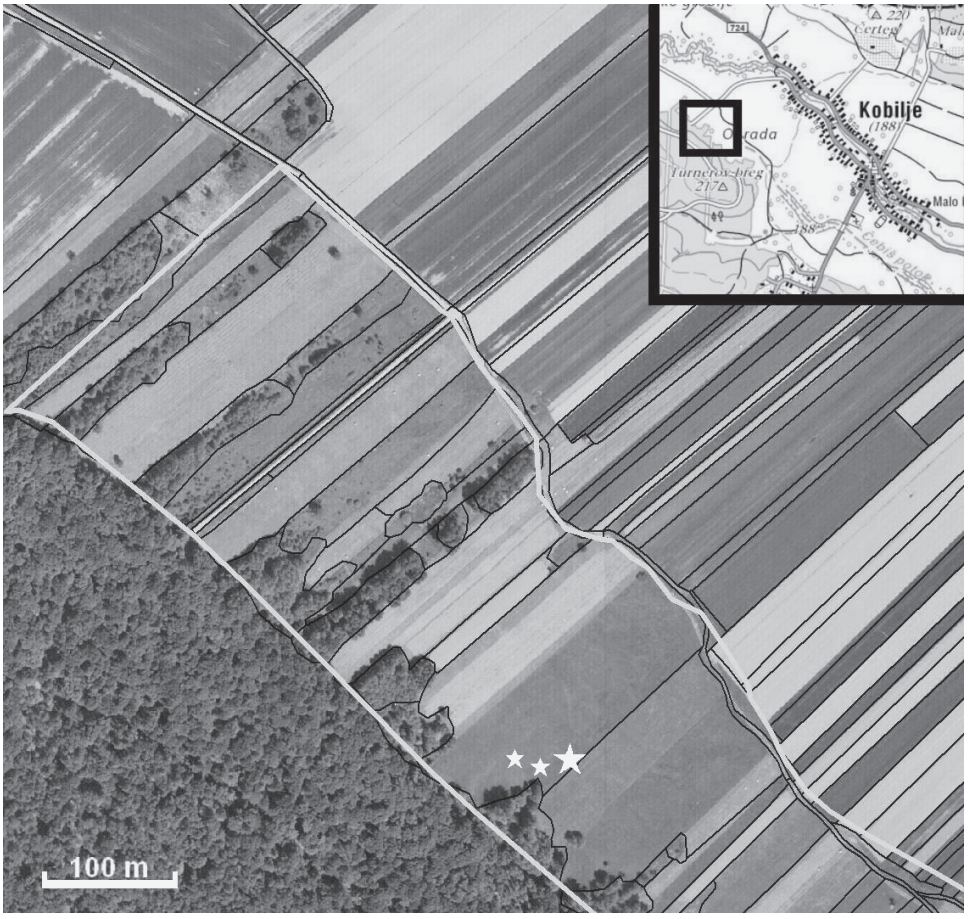


Figure 1: The locality of *Juncus atratus* near Kobilje (Goričko, Slovenia). Top righ corner: map of the vicinity of Kobilje with marked area, which is presented in bigger scale. Rest of the picture: aerial photo of the locality, depressions with *J. atratus* marked with white stars.

Slika 1: Nahajališče temnocvetnega ločka *Juncus atratus* pri Kobilju (Goričko, Slovenija). Zgoraj desno: zemljevid okolice Kobilja z označenim izsekom, povečanim na letalskem posnetku. Ostali del slike: zračni posnetek nahajališča, populacije *J. atratus* označene z belimi zvezdicami.

Meusel et al. (1965), the mentioned Pospichal's localities would lie on the western border of species' distribution range. Populations here could have been destroyed by severe changes of wetland habitat types in the last century but without available voucher material also a misdetermination could not be excluded.

During a field excursion in Goričko (Subpannonian phytogeografical region), in May 2010 first author of the present paper discovered the dark-flowered *Juncus* plants, somewhat similar to *Juncus articulatus*, but distinctly taller, in wet-meadow near Kobilje village. Later, the plants were unambiguously determined as *Juncus atratus*.

The article discusses the recent finding of the species in Slovenia. Since deficient knowledge about distribution, ecology and threat factors of species can cause serious problems in considerations and judgments when proposing nature-conservation strategies and composing red data lists, the article focuses on the issues mentioned above and discusses the broader context of the finding. The aim of the study was also to provide bases for nature conservation of the species in Slovenia.

Methods

The study included 3 field-work days during vegetation season, on 30th May, 2nd July and 17th August 2010. The field-work was carried out in Kobilje in Goričko region (Fig. 1). In the locality of *Juncus atratus* the approximate size of the population was assesed from number of flowering shoots and vascular plants on the locality were mapped. They were determined using standard floristic literature (mostly Martinčič et al. 2007 and Fischer et al. 2008).

After the field work, revision of the available herbarium material was done in LJU (Department of Biology, University of Ljubljana), which is the biggest herbarium collection with Slovenian plants. The revision included also related *Juncus* taxa to detect possible misdeterminations. Where necessary, characters were observed and measured using a stereomicroscope.

For the preparation of the distribution map we checked all available distribution data for Slovenia: literature records, herbarium data from LJU, unpublished data stored in the database 'Flora Slovenije' at the Centre for Cartography of Fauna and Flora (CKFF), where also the distribution maps were produced. Distribution patterns are presented in MTB grid (Niklfeld 1971). In distribution map, we used the biogeographic division of Slovenia by M. Wraber (1969), which was also adopted by the authors of the Slovenian floristic reference work *Mala flora Slovenije* (Martinčič et al. 2007).

Results

The newly discovered locality of *J. atratus* is situated about 700 m southwest from Kobilje village, 190 a.s.l.. It lies in Regional park Goričko. NE Goričko was recognized as important for the conservation of Natura 2000 habitat types with qualificatory vegetion types of Molinion (6410) and Ranunculo-Alopecuretum (6510) (Jogan et al. 2004) and as such included in SI3000221 SCI with 7 qualificatory habitat types including the mentioned two (Naravovarstveni atlas, http://www.naravovarstveni-atlas.si/ISN2KJ/)

The area of extensively maintained meadows at Kobilje is also 'natural value of state importance' (Kobilje - ekstenzivni travniki: 7298). Despite that, land owners' management is not completely under nature-conservation control, which results in several negative impacts as digging ditches, applying fertilizers, filling up wet depressions with rubbish, earth or waste building materials.

In the locality, the population thrives in 3 shallow depressions of the wet meadow, the larger beeing about 400 m^2 large, while the two smaller depressions of cca. 200 m^2. The maximum depth of the depressions is cca. 0.5 m. The distances between the three depressions are approximately 30 m. The depressions are much damper than the adjoining parts of the meadow and after rainfall the water can persist in them for several consequent days.

The population of *J. atratus* in the largest depression counts about 30 - 40 flowering individuals, while the approximate number of flowering shoots in the two smaller depressions is up to 10.



Figure 2: *Juncus atratus* in the recently found locality near Kobilje (Goričko, Slovenia). **a**: flowering cluster detail with distinctly blackish tepals; **b**: compound inflorescence; **c**: locality with *J. atratus.* Photos: T. Lainšček.
Slika 2: Temnocvetni loček (*Juncus atratus*) na novoodkritem nahajališču pri Kobilju (Goričko, Slovenija). **a**: delno socvetje z razločno črnorjavimi cvetnimi listi; **b**: celotno socvetje; **c**: rastišče *J. atratus*. Posnetki: T. Lainšček.

The meadow is mowed twice to three times in vegetation period, in June, August and October.

At the locality (Fig. 2), besides *J. atratus*, the following vascular plants were recorded: *Agrostis stolonifera, Agrostis canina, Alopecurus pratensis, Carex vulpina, Eleocharis carniolica, Gratiola officinalis, Holcus lanatus, Iris pseudacorus, Juncus articulatus, Juncus effusus, Lysimachia nummularia, Lythrum salicaria, Myosotis scorpioides, Peplis portula, Polygonum minus, Ranunculus flammula*. That type of vegetation fits well into Natura 2000 qualifying habitat type *Ranunculo-Alopecuretum* (6510). For more precise description of the site ecological conditions a phyto-sociological analysis should be done, but that was beyond our scope.

Of the above mentioned species, *Eleocharis carniolica, Gratiola officinalis* and *Peplis portula* are wetland species, considered vulnarable (V) in Slovenian Red Data List (Anon. 2002). From nature-conservation point of view, *Eleocharis carniolica* is particularly important, as it is one of the Natura 2000 plants, listed among strictly protected plant species included in Appendix 1 of the Bern Convention on the conservation of European wildlife and natural habitats (Bern, 19th September 1979) and in Annex 2 of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

The revision of *Juncus* material in LJU revealed that at present there is no available material for *Juncus atratus* in Slovenia. The distribution map (Fig. 3) includes only two records for

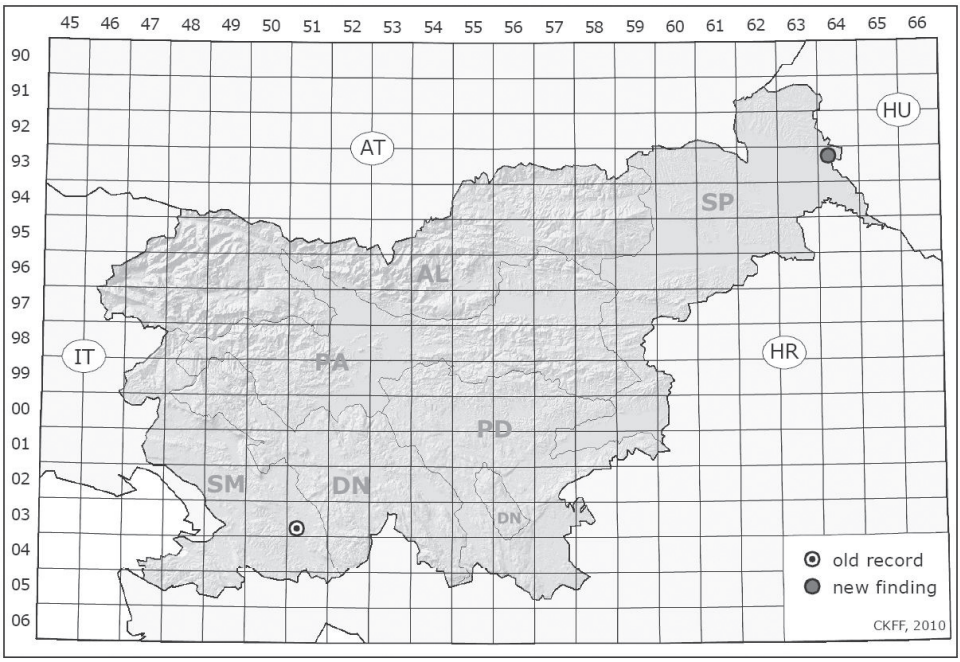


Figure 3: The known distribution of *Juncus atratus* in Slovenia.
Slika 3: Znana razširjenost vrste *Juncus atratus* v Sloveniji.

Slovenia: Pospichal's record for Prem (0351/4) and first author's record for Goričko (9364/1).

Discussion

J. atratus is a well characterised species, but can be somewhat similar to *J. articulatus*, since the jointed rush is very variable in habit. In the field, the two can be easily distinguished, since *J. atratus* is usually much higher, up to 120 cm, it has characteristically blackishbrown tepals (not just brown as in *J. articulatus,* but character not easily comparable and quite variable). Leaves are (5-) 7- to 11-angled and this character is apperent in fresh or dry state of the material. In contrary, the leaves of *J. articulatus* (as well as *J. acutiflorus* and *J. alpinoarticulatus*) are not angled, just slightly ridged when dry. However, there is another character which should be taken into account: the leaves of *J. articulatus, J. alpinoarticulatus and J. acutiflorus* have very distinctive transverse septa, while in *J. atratus* leaves, the septa are present, but inconspicuous. Descriptions followed Fischer et al. (2008) and Kirschner (2002).

As mentioned in Introduction, in Central Europe, *Juncus atratus* is very rare and also endangered (Schnittler and Günther 1999). The species is threatened also in neighbouring Austria. It is considered 'vom Aussterben bedroht' - 'in risk of extinction' by Niklfeld and Schratt-Ehrendorfer (1999) and is known to thrive in only one locality in Niederössterreich (Marchfeld) (Fischer et al. 2008). In Italy, the species is considered to be very rare, with only one known locality (near Verona) (Pignatti 1982). There are no records for Croatia. In Hungarian Red Data List the species is listed among 'near threatened' (NT) (Király 2007), distributed in several localities, but scattered (Simon 2002). In Czech, *J. atratus* is considered 'criticaly endangered taxon' (CR) (Kubát, 2002) and in Germany 'strongly endangered' (Haeupler and Muer, 2000).

Besides our record, there are no recent reports on the species for Slovenia and Pos-

pichal's observation remained unconfirmed. The fact, that there are no other records of *J. atratus* in Slovenia can not be attributed to misdeterminations or neglect by botanists during the fieldwork, as we saw, that the species is easily recognizable in the field. Therefore we can conclude, that *J. atratus* is indeed extremely rare in Slovene territory, as in Europe. According to Oberdorfer (1990) the species is charasteristic of Cnidio-Violetum of Cnidion alliance, which is subcontinental vegetation of temporarily inundated meadows. In Slovenia this type of vegetation is not known, but we can expect its occurence in most continental parts of Slovenia, which is Goričko region.

The habitat of *Juncus atratus* is endangered not only due to abandonment of mowing, which leads to gradual spontaneous reforestation, but particularly due to human influence on wet habitats, such as changing water regime, direct filling of depression or fertilizing. Maintaining of this type of vegetation should encounter regular mowing at least one per year with removing of the mown grass and enabling of regular inundation (Chytry et al. 2001).

In the Slovene red data book, *J. atratus* is categorized as unsufficiently known species (K; Wraber and Skoberne 1989, Anonymous 2002), but Bačič (2006) suggested *Juncus atratus* to be recategorized in Ex?, since the only, over 100 years old record was never confirmed, despite the attempts to find the plant in the locality. According to recent finding and the results of the study, the authors suggest *Juncus atratus* to be regarded as 'endangered' (E) in the national red list, since it is rare and its habitats are threatened because of human activity and natural succession.

Acknowledgement

The authors are grateful to dr. Peter Schönswetter and dr. Božo Frajman for confirmation of the determination of *Juncus* plants and for the valuable remarks on the finding and to Centre for Cartography of Fauna and Flora for producing the distribution map.

Povzetek

Temnocvetni loček *Juncus atratus* Krock. je predstavnik družine ločkovk (*Juncaceae)*. Je 40 -120 cm visoka trajnica s plazečim, le malo razvejeno koreniko, s 7- to 11-robimi listi and socvetjem, sestavljnim iz 15-50 klobk z izrazito črnorjavimi cvetovi. Ta srednjeevropsko-južnosibirska vrsta vlažnih travnikov (Pignatti 1982) je razširjena v Srednji in Vzhodni Evropi, severno pa sega njen areal do Latvije (Snogerup 1980). V Srednji Evropi je vrsta zelo redka in navedena med 'srednjeevropskimi vaskularnimi rastlinami, ki potrebujejo prednostna merila za ohranitev' (Schnittler and Günther 1999).

Do nedavnega edini podatek o uspevanju vrste v Sloveniji je star več kot 100 let. Gre za Pospichalovo (1897-99) navedbo za submediteransko fitogeografsko območje (zgornji del doline Reke pri Premu pri Ilirski Bistrici), avtor pa piše, naj bi vrsta verjetno uspevala tudi v bližnjih Brkinih. Prisotnost vrste na tej lokaliteti botaniki kasneje kljub trudu niso uspeli potrditi (Rozman B., osebno posvetovanje). Med terensko ekskurzijo na Goričko maja 2010 je prvi avtor na vlažnem travniku pri Kobiljem naletel na izrazito temnocvetne rastline ločka, ki so bile nekoliko podobne bleščečeplodnem ločku (*J. articulatus*), a precej višje. Kasneje so bile rastline določene za *J. atratus*.

Terenski del raziskave je potekal med vegetacijsko sezono 2010, v maju, juliju in avgustu. Na nahajališču smo ocenili velikost populacije ter popisali najpogostejše rastline, ki uspevajo ob temnocvetnem ločku. Sledila je revizija herbarijskega materiala v herbarijski zbirki LJU na Oddelku za biologijo Biotehniške fakultete Univerze v Ljubljani.

Novo odkrito nahajališče temnocvetnega ločka leži približno 700 m jugozahodno od vasi Kobilje na nadmorski višini 190 m. Območje je del Regijskega parka Goričko in predvsem del omrežja Natura 2000 (Goričko, SI5000009). Kljub temu pa upravljanje z zemljišči ni povsem pod nadzorom naravovarstva, kar ima lahko za posledico negativne vplive na habitate (kopanje izsuševalnih jarkov, uporaba gnojil, zasipanje mokrotnih depresij s smetmi, zemljo ali odpadnim gradbenim materialom itd.).

Na lokaliteti uspeva populacija v treh plitvih, med seboj približno 30 m oddaljenih depresijah na vlažnem travniku. Največja depresija je velika približno 400 m^2, drugi dve pa sta manjši, obsegata približno 200 m^2. Največja globina depresij je približno 0,5 m. Depresije so precej bolj mokrotne kot okolica in po deževjih v njih še nekaj dni zastaja voda.

Populacija v največji depresiji šteje okoli 30-40 cvetočih primerkov, v manjših dveh pa do 10.

Travnik kosijo dva do trikrat v vegetacijski sezoni, junija, avgusta in včasih tudi oktobra.

Na nahajališču smo zabeležili poleg temnocvetnega ločka še naslednje vrste: *Agrostis stolonifera, Agrostis canina, Alopecurus pratensis, Carex vulpina, Eleocharis carniolica, Gratiola officinalis, Holcus lanatus, Iris pseudacorus, Juncus articulatus, Juncus effusus, Lysimachia nummularia, Lythrum salicaria, Mysotis scorpioides, Peplis portula, Polygonum minus, Ranunculus flamula.*

Revizija ločkov v LJU je pokazala, da poleg naših primerkov zaenkrat ni na voljo nobenega herbarijskega materiala te vrste.

Na terenu je temnocvetni loček načeloma lahko prepoznaven, le nekoliko podoben vrsti *J. articulatus*. Od te se dobro loči po višini (do 120 cm visok, *J. articulatus* je navadno znatno nižji), po izrazito in značilno črnorjavih perigonovih listih (pri *J. articulatus* so ti le svetlejše rjavi), v času cvetenja pa iz cvetov molijo značilno škrlatne brazde (pri *J. articulatus* so belkaste). Pomemben razlikovalni znak je tudi oglatost listov. Ti so (5) 7- do 11-oglati, kar je očitno tako pri svežih kot pri posušenih rastlinah. Listi vrste *J. articulatus* (kot tudi bližnjih, a redkejših *J. acutiflorus* in *J. alpinoarticulatus*) v svežem stanju niso robati in le nekoliko izbrazdani, ko so suhi. V listih vrste *J. articulatus, J. alpinoarticulatus* in *J. acutiflorus* so izrazite prečne pregrade, vidne v posušenem stanju, ne da bi list vzdolžno prerezali. Tudi v listih *J. atratus* so prečne pregrade, vendar ne tako izrazite. Slednji znak je za opazovanje nekoliko neroden, če s temi vrstami nimamo predhodnih izkušenj.

Temnocvetni loček je v Sredni Evropi izjemno redek, še največ navedb je za Madžarsko (Simon 2002), a še tu se pojavlja le raztreseno. Kritično je ogrožen v sosednji Avstriji (Fischer et al. 2008), za Italijo obstala le ena sama navedba (Pignatti 1982), na Hrvaškem pa vrsta ne uspeva. V Sloveniji potrjeno uspeva le na enem samem nahajališču. Glede na to, da je vrsta dobro prepoznavna, je malo verjetno, da bi jo botanično oko na terenu spregledalo in bi bilo poznavanje njene razširjenosti iz tega razloga pomanjkljivo. Vrsta je kot kaže v resnici izjemno redka, poleg tega pa so njeni habitati zelo ogroženi. Po eni strani jih ogroža naravna sukcesija - spontano zaraščanje zaradi opuščanja košnje, posebej nevaren pa je vpliv človeka - spreminjanje vodnega režima, zasipanje vlažnih depresij in gnojenje. Za ohranjanje takšne vegetacije je treba na območjih uvesti oz. ohraniti košnjo vsaj enkrat letno, z odstranjevanjem pokošenega materiala in dopustiti redno poplavljanje (Chytry et al. 2001).

V slovenskem rdečem seznamu (Wraber in Skoberne 1989, Anonymous 2002) je temnocvetni loček obravnavan med nezadostno znanimi vrstami (K), pred leti pa je bila že predlagana uvrstitev med domnevno izumrle vrste - Ex? (Bačič 2006). Glede na nedavno najdbo in rezultate te raziskave, avtorji predlagajo, da se vrsto uvrsti v kategorijo ‚prizadeta vrsta' (E).

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