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# *AGONUM SCITULUM* DEJEAN, 1828 (COLEOPTERA, CARABIDAE) – NEW DATA ON A RARE CARABID BEETLE SPECIES IN CROATIA

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**Brigić, A., Šoštarić, R., Sedlar, Z. & Vujčić-Karlo, S.: *Agonum scitulum* Dejean, 1828 (Coleoptera, Carabidae) – new data on a rare carabid beetle species in Croatia. Nat. Croat., Vol. 25, No. 2., 279–285, Zagreb, 2016.**

The western Palaearctic carabid beetle *Agonum scitulum* has been found at the fen in Mt Žumberak (NW Croatia). This second Croatian record represents the south westernmost distribution point for this rare species in Europe. *Agonum scitulum* is an extremely hygrophilous species, recorded on humid alkaline soil in the vicinity of the Jarak Stream, in the successional phase of common reed and willow surrounding the basophilous Jarak fen. During two years of systematic sampling at this locality using different methods only two macropterous specimens of *A. scitulum* were collected with pitfall traps, leading to the conclusion that this species is probably rare in the area.

**Keywords:** hygrophilous ground beetles, basophilous fen, Mt Žumberak, new record

**Brigić, A., Šoštarić, R., Sedlar, Z. & Vujčić-Karlo, S.: *Agonum scitulum* Dejean, 1828 (Coleoptera, Carabidae) – novi podaci o rijetkoj vrsti trčka u Hrvatskoj. Nat. Croat., Vol. 25, No. 2., 279–285, Zagreb, 2016.**

*Agonum scitulum* je zapadnopalearktička vrsta zabilježena na bazofilnom cretu Jarak koji se nalazi na području Žumberka (sjeverozapadna Hrvatska). Drugi nalaz u Hrvatskoj predstavlja najjugozapadniju točku rasprostranjenja ove rijetke vrste u Europi. Ova higrofilna vrsta zabilježena je na vlažnom i blago alkaličnom tlu u neposrednoj blizini potoka Jarak, unutar sukcesijskog stadija trske i vrbe koji okružuje cret Jarak. Tijekom dvogodišnjeg sistematičnog sakupljanja različitim metodama na ovom lokalitetu zabilježene su svega dvije makropterne jedinke metodom lovnih posuda, što implicira da je ova vrsta rijetka na istraživanom području.

**Ključne riječi:** higrofilni trčci, bazofilni cret, Žumberak, novi nalaz

## INTRODUCTION

*Agonum scitulum* (Dejean, 1828) is a Western Palaearctic species, discontinuously distributed from England to Romania (Löbl & Smetana, 2003), including the European part of Russia, where it was recently recorded (Schmidt & Benedikt, 2010). It is a very rare species both at the range edges (Horvatovich, 1994; Luff, 2007) and in the core area of distribution (Schmidt & Benedikt, 2010). So far, it is not completely clear whether this

species extended its range from Atlantic coast to southward and to the east or whether it remained as a glacial relict in southeastern parts of Europe (Schmidt & Benedikt, 2010).

In the Western Balkans, this species was recently recorded for Croatia and Slovenia (Schmidt & Benedikt, 2010), but with no data on habitat description for either country. The first locality in Croatia is located on Ivanščica Mountain near Ivanec, dating back from the beginning of June 2003; leg. Krause, 1 specimen (Schmidt & Benedikt, 2010). In the past, *A. scitulum* was misidentified as two widespread species – *A. micans* Nicolai, 1822 and *A. fuliginosum* Panzer, 1809 (Anderson *et al.*, 2000; Paill, 2010; Schmidt & Benedikt, 2010). Both of these widespread species were previously recorded for Croatia (Schlosser-Klekovski, 1877; Bregović, 1985; Drovenik & Peks, 1999; Bušnja, 2007). However, due to taxonomical uncertainties, these records should be taken with caution.

Overall, data on the ecology of this rare species are scarce. Therefore, the objectives of this paper are: (1) to document the second record of *A. scitulum* in Croatia and (2) to give further information on its habitat.

## MATERIAL AND METHODS

### Study area

The basophilous fen Jarak (N 45°45'46.44", E 15°22'1.2") is located near Sošice village on Žumberak Mountain (Žumberak – Samoborsko gorje Nature Park), in the northwestern mountainous part of Croatia at an altitude of 690 m. It is situated in a gorge whose slopes are overgrown with beech forest (*Luzulo luzuloidi – Fagetum* Meusel, 1937) on one side and a planted black pine forest (*Pinus nigra* Arnold) on the other (Fig. 1a). The Jarak fen covers an area of only 1 ha, with the small Jarak Stream running through it.

The fen vegetation belongs to ass. *Eriophoro latifolii-Caricetum paniceae* Horvat 1962 ex Trinajstić 2002. It is well formed and fen-specific plant species, such as broad-leaved cotton grass (*Eriophorum latifolium* Hoppe), Host's sedge (*Carex hostiana* DC.) and greater tussock-sedge (*C. paniculata* L.), dominate the area. However, the fen is seriously threatened by the aggressive common reed [*Phragmites australis* (Cav.) Trin. ex Steud.] which is overgrowing the fen from the south side (Šoštarić *et al.*, 2012).

The first successional phase of the vegetation (Figure 1b) is composed of dense stands of common reed, grey willow (*Salix cinerea* L.), purple willow (*Salix purpurea* L.) and common butterbur [*Petasites hybridus* (L.) P.Gaertn., B.Mey. and Schreb.]. The second successional phase of the vegetation is represented by young forest—a mixture of willows and different woody and herbaceous species. Common reed, common butterbur, purple willow [*Salix purpurea* L. (G)] and common aspen [*Populus tremula* L. (G)] dominate the area. Specific fen plant species were rare at both successional habitats.

The beech forest is situated on a slope west of the fen. Vegetation belongs to ass. *Luzulo luzuloidi – Fagetum* and it is dominated by European beech (*Fagus sylvatica* L.). This acidophilous association was characterised by a very poor herbaceous layer and a deep leaf litter layer.

### Sampling & identification

Sampling was conducted at four habitats: in the fen, in the 1st successional phase of vegetation, in the 2nd successional phase of vegetation and in the beech forest. *Agonum scitulum* was collected together with other soil arthropods with pitfall traps. Within each

**Fig. 1.** a) Jarak fen (Žumberak – Samoborsko gorje Nature Park); b) 1st successional phase of vegetation surrounding the fen area.

habitat type 5 pitfall traps were installed, placed 5 m apart. The traps (polythene cups 8.5 cm wide and 12.0 cm deep) were partially filled with saturated salt solution and a drop of neutrally-smelling detergent was added to reduce the surface tension of the liquid. A Styrofoam roof was placed above each trap to protect it from rain. The trapping period spanned two growing seasons (2008-2009), from the end of April to the beginning of December. Samples were collected once a month. In addition, we applied other field sampling methods, e.g. knock-down method, leaf-litter extraction and hand collecting. First two methods were applied 2 times (once in June and September) every growing season, while carabids were hand collected monthly each time in the field.

Specimens of *A. scitulum* were identified according to Schmidt in Müller-Motzfeld (2006). All collected specimens are deposited in the collection of the first author A.B. (Department of Biology, Faculty of Science, Zagreb).

## Vegetation analysis

Vegetation of the studied area was represented with phytosociological relevés, which were made in accordance with standard Central European methodology (Braun-Blanquet, 1964). Plant nomenclature follows Flora Europaea (Tutin *et al.*, 1964-1980; Tutin *et al.*, 1993).

## Soil analysis

Soil moisture was measured using the gravimetric method (Reynolds, 1970), from core samples collected monthly at each sampling site (d = 10 cm, h = 2 cm). The same soil sample was used to measure pH in water with a ratio of 1:2.5 (w/v) (10 g substrate / 25 mL $H_2O$) using WTW pH 330i meter. Average values of soil moisture and pH were calculated.

# RESULTS AND DISCUSSION

*Agonum scitulum* was collected with pitfall traps in the Jarak fen on June 18, 2009 and July 12, 2009, thus this record in northern Croatia, represents an extension of its distribution range to the southwest (Fig. 2). Both specimens of *A. scitulum* were found inside the 1st successional phase of common reed and willow that surrounds the fen (Fig. 1b). Vegetation height was around 130 cm. In the 1st successional phase of common reed and willow some parts of the ground were unshaded. Soil was flooded in spring and moist

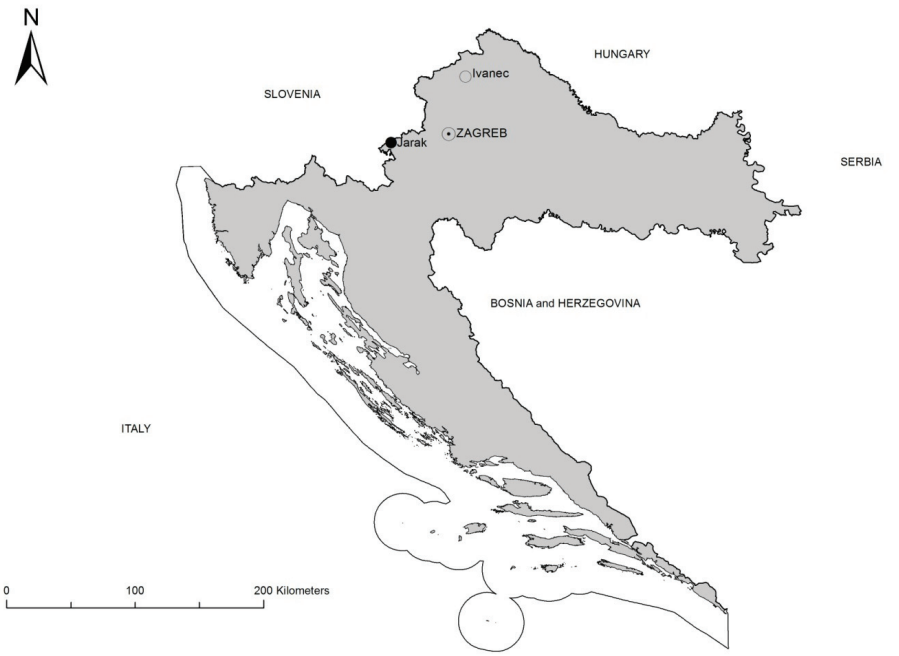


**Fig. 2:** Distribution of *Agonum scitulum* Dejean, 1828 in Croatia. Legend: ○ – finding from Schmidt & Benedikt, 2010; ● – finding from current study.

through the whole season (season mean ± SD: 2008 – 57.71% ± 14.73; 2009 – 49.95 ± 3.28). Soil pH was slightly alkaline (7.42 ± 0.15).

*Agonum scitulum* was collected in the Žumberak area together with other *Agonum* species: *A. fuliginosum* Panzer, 1809; *A. hypocrita* Apfelbeck, 1904; *A. lugens* Duftschmid, 1812; *A. sexpunctatum* Linné, 1758 and *A. viduum* Panzer, 1796. Most of the species of the genus *Agonum* are hygrophilous and can be found in the proximity of water (Schmidt in Müller-Motzfeld, 2006; Wachmann *et al*., 1995). Similarly, *A. scitulum* is an extremely hygrophilous species that has been found along river and stream banks with both sparse and thick vegetation (Assmann, 1991; Koch, 1989; Paill, 2010). Additionally, it occurs in wet shaded meadows, ditches overgrown with *Carex* sp. and *Phragmites* sp., fens and carrs (Luff, 2007; Luka *et al*., 2009; Paill, 2010). However, this species was not recorded at the other studied peatlands in Croatia (e.g. Dubravica bog, Plaški fen, Đon močvar bog) (Brigić, unpublished).

During the two consecutive years sampling, *A. scitulum* was collected only by pitfall traps. However, we did not collect it with other applied sampling techniques. Both collected specimens were macropterous. Low activity density indicates that this species is rather rare in the studied area, which could be related to methodological ambiguities. *Agonum scitulum* represents a methodological edge species, which is not easily sampled by the method used (*sensu stricto* Longino *et al*., 2002). Moreover, Paill (2010) recently found *A. scitulum* in higher abundances at several locations in south Austria, but all specimens were hand collected (sampling effort: 20 m along water margin, in 30 minutes time). Therefore, it is possible that this species was overlooked in previous studies since most of the ecological studies of carabids in riparian habitats in Croatia were conducted using pitfall traps (Kučinić *et al*., 1996; Durbešić *et al*., 1998; Vujčić-Karlo & Durbešić, 2004; Vujčić-Karlo, 2006, 2007; Tallósi, 2008; Brigić *et al*., 2014).

Additionally, riparian habitats and wetlands were less represented in southern Europe in targeted carabid research. Implementation of alternative sampling techniques (frequent hand collecting) in future studies could give further information on this rare species.

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## SUMMARY

## *Agonum scitulum* Dejean, 1828 (Coleoptera, Carabidae) – novi podaci o rijetkoj vrsti trčka u Hrvatskoj

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*Agonum scitulum* je izrazito rijetka vrsta disjunktnog areala. Rasprostranjena je od Engleske pa sve do Rumunjske, uključujući i Europski dio Rusije. Schmidt & Benedikt (2010) navode kako nije jasno da li je ova vrsta u ekspanziji te se od zapada širi prema istoku ili se radi o vrsti koja je na južnim dijelovima areala ostala kao glacijalni relikt. U prošlosti je vrsta bila zamijenjena s dvama srodnim vrstama *A. micans* i *A. fuliginosum* (Paill, 2010), te je moguće kako je rasprostranjenija nego što se misli. Podaci o rasprostranjenju, a posebice ekologiji vrste su malobrojni.

Prije ovog istraživanja, vrsta *A. scitulum* je zabilježena samo jednom za faunu trčaka Hrvatske, međutim nisu navedeni podaci o staništu na kojem je pronađena (Schmidt & Benedict, 2010). Stoga ovaj nalaz predstavlja drugi nalaz za Hrvatsku i ukazuje na proširenje areala vrste prema jugozapadu. Vrsta je skupljena metodom lovnih posuda tijekom dvogodišnjeg istraživanja na bazofilnom cretu Jarak (Sošice, Park prirode Žumberak-Samoborsko gorje). Istraživanjem su obuhvaćena četiri tipa staništa: cret, prvi sukcesijski stadij, drugi sukcesijski stadij i bukova šuma, a na svakom je postavljeno pet lovnih posuda. Usprkos tome što su u istraživanju obuhvaćeni različiti tipovi staništa i primijenjene različite metode lova, ulovljene su svega dvije jedinke. Obje jedinke ulovljene su u prvom sukcesijskom stadiju creta obraslom trskom i vrbama. Visina vegetacije iznosila je oko 130 cm, tlo je bilo vlažno i blago alkalno.

Vrsta *A. scitulum* je pronađena u zajednici s drugim vrstama ovog roda: *A. fuliginosum*, *A. hypocrita*, *A. lugens*, *A. sexpunctatum* i *A. viduum*. Zanimljivo je istaknuti kako vrsta nije utvrđena na drugim cretovima u Hrvatskoj (Dubravica, Plaški, Đon močvar) (Brigić, neobjavljeno). Nalaz potvrđuje prisustvo ove rijetke vrste *A. scitulum* za faunu trčaka Hrvatske. Čini se da *A. scitulum* predstavlja metodološki rubnu vrstu (*sensu stricto* Longino *et al*., 2002), koja se očito teže lovi metodom lovnih posuda. Naime, Paill (2010) je nedavno zabilježio vrstu *A. scitulum* s većim brojem jedinki na nekoliko lokacija u južnoj Austriji, međutim, sve su jedinke sakupljene rukom. Stoga je moguće da je ova vrsta previđena u prijašnjim istraživanjima u Hrvatskoj, jer je većina ekoloških istraživanja vlažnih staništa provedena metodom lovnih posuda (Brigić *et al*., 2014; Durbešić *et al*., 1998; Kučinić *et al*., 1996; Tallósi, 2008; Vujčić-Karlo, 2006, 2007; Vujčić-Karlo & Durbešić, 2004).