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Altitudinal distribution and habitat use of the common wall lizard *Podarcis muralis* (Linnaeus, 1768) and the Horvath's rock lizard *Iberolacerta horvathi* (Méhely, 1904) in the Kočevsko region (S Slovenia)

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Abstract. The study reports on the distribution and habitat use of two lizard species in the Kočevsko region: Horvath's rock lizard and common wall lizard. Extensive sampling across an altitudinal span of 200 to 1,100 m a.s.l. in the study area revealed 62 localities with populations of both or either species. At 11 of these localities (18%) species occurred in syntopy, at 42 locations (68%) only common wall lizards were found, while at 9 locations (14%) only Horvath's rock lizards were recorded. Both species occurred across the entire altitudinal span but exhibited an opposite pattern of relative abundances and frequencies, which increased with increasing altitude in Horvath's rock lizard and with decreasing altitude in common wall lizard. The habitat use of common wall lizard was more general (it was found in seven habitat types) than Horvath's rock lizard that was registered only in three habitat types with rocks.

Key words: *Podarcis muralis*, *Iberolacerta horvathi*, altitudinal gradient, habitat use, Kočevsko region, Slovenia

Izvleček. Višinska razširjenost in raba prostora pozidne kuščarice *Podarcis muralis* (Linnaeus, 1758) in velebitske kuščarice *Iberolacerta horvathi* (Méhely, 1904) na Kočevskem (J Slovenija) – V raziskavi smo pridobili skupno 62 novih podatkov o razširjenosti dveh vrst kuščaric na Kočevskem: za pozidno kuščarico (*Podarcis muralis*) in velebitsko kuščarico (*Iberolacerta horvathi*). Od vseh 62 lokacij sta se vrsti pojavljali sintopično na 11 lokacijah (18 %), na 42 lokacijah (68 %) je bila zabeležena le pozidna kuščarica, na 9 lokacijah (14 %) pa izključno velebitska kuščarica. Obe vrsti sta na Kočevskem razširjeni čez celotni višinski gradient, ki se razteza med 200 m n.m. v dolini reke Kolpe do 1100 m n.m. na najvišjih vrhovih planot. Vendar pa se vrsti pojavljata v višjih relativnih gostotah na različnih nadmorskih višinah, in sicer je velebitska kuščarica pogostejša v višjih legah, pozidna kuščarica pa v nižjih. Kar zadeva rabo prostora, smo ugotovili, da je pozidna kuščarica nagnjena bolj k splošni rabi prostora kot velebitska kuščarica. Pozidna kuščarica je bila najdena v sedmih različnih habitatnih tipih, medtem ko je bila velebitska kuščarica najdena le v treh, in sicer: v naravnih in umetnih ostenjih in presvetljenem gozdu.

Ključne besede: *Podarcis muralis*, *Iberolacerta horvathi*, višinski gradient, raba prostora, Kočevsko, Slovenija

Introduction

Horvath's rock lizard (*Iberolacerta horvathi* (Méhely, 1904)) and the common wall lizard (*Podarcis muralis* (Laurenti, 1768)) are small lacertid lizards that exhibit a sympatric distribution, where the distribution range of *I. horvathi* overlaps completely with the range of *P. muralis* (Sillero et al. 2014) and have similar life-history traits and ecology (heliothermy, diet, habitat use, activity, etc. (review in Žagar 2016)). Horvath's rock lizard is one of the eight species currently recognized in the genus *Iberolacerta* Arribas, 1997 (Mayer & Arribas 1996, Odierna et al. 1996, Arribas 1999a, 1999b, Almeida et al., 2002, Mayer & Arribas, 2003, Arribas & Carranza 2004, Carranza et al. 2004, Crochet et al. 2004, Arribas et al. 2006, Arnold et al. 2007, Galán et al. 2007, Mayer & Pavlicev 2007). Seven of these species live in the Pyrenees and in the northern and central mountains of the Iberian Peninsula, while one, Horvath's rock lizard, occurs in Central and South-eastern Europe (Gasc et al. 1997, Arnold et al. 2007, Sillero et al. 2014). Today, the distribution of Horvath's rock lizard is restricted to a relatively small range extending across the eastern Alps, pre-Alps and northern Dinaric Mountains (Bischoff 1984, Sillero et al. 2014, Žagar et al. 2014). It occurs in at least four countries: Italy (Lapini & Dolce 1983, De Luca 1989, Lapini et al. 1993, 2004, Lapini & Dal Farra 1994, Rassati 2010), Austria (Grillitsch & Tiedemann 1986, De Luca 1989, Tiedemann 1992, Grillitsch et al. 2001, Cabela et al. 2002, 2004, 2007), Slovenia (Brelih 1954, Brelih & Džukić 1974, De Luca 1989, Tome 1996, Mršić 1997, Tome 2001, Žagar et al. 2007, 2013, Žagar 2008a, 2008b, Krofel et al. 2009, Cafuta 2010) and Croatia (Méhely 1904, Karaman 1921, Arnold 1987, De Luca 1989, Tvrtković & Veen 2006, Kryštufek et al. 2008, Jelić 2014). It likely occurs also in Bosnia and Hercegovina, but has not been discovered there yet (Žagar et al. 2014). The report on the population found in Karwendel Gebirge in south Germany (Capula & Luiselli 1990) was strongly disputed (Bischoff 1991, Faberl & Faberl 1991, Tiedemann 1992, Capula & Luiselli 1993, Franzen et al. 1993, Schmidtler & Schmidtler 1996) and has not been re-confirmed (Cabela et al. 2004).

The common wall lizard has the largest distributional range of all species of the genus *Podarcis* Wagler, 1830 (Gasc et al. 1997, Sillero et al. 2014). Previous studies revealed that this species originated from multiple glacial refugia (Gassert et al. 2013, Salvi et al. 2013), and multiple lineages were identified within three Mediterranean peninsulas (Iberian, Apennine and Balkan; Salvi et al. 2013). Its widespread distribution expands across most of Central Europe, the northern part of Iberian Peninsula, large parts of the Apennine and the Balkan Peninsulas and stretches to the east into North Turkey (Gasc et al. 1997, Sillero et al. 2014). The northernmost native distribution is probably still unresolved because results from a recent genetic study suggested that the population on Jersey (Channel Islands, UK) and in the Chausey archipelago may be of native origin (Michaelides et al. 2015), while in the past it has been believed that the species distribution does not extend beyond the Netherlands and that common wall lizards found in UK were introduced (Arnold 1995). In Slovenia, it is relatively common and widespread (Tome 1996, Mršić 1997, Tome 2001, Krofel et al. 2009).

Syntopic populations of *I. horvathi* and *P. muralis* have been most frequently found at low and middle altitudes in Slovenia (Brelih 1954, Žagar et al. 2007, Žagar 2008a) as well as elsewhere (Bischoff 1984, Arnold 1987, De Luca 1989, Lapini et al. 1993, Richard & Lapini 1993, Grillitsch et al. 2001, Cabela et al. 2002, 2007, Lapini et al. 2004, Rassati 2010).

The species tandem studied here is not unique, since other *Iberolacerta-Podarcis* species pairs with completely or partly attitudinally segregated distributional patterns have been observed also in the Iberian Peninsula, where other species of *Iberolacerta* occur (e.g. Moreira et al. 1999, Arribas et al. 2006, Monasterio et al. 2010).

In several parts of the species range, *I. horvathi* populations tend to be denser at higher altitudes (e.g. De Luca 1989), while density in *P. muralis* follows an opposite trend (e.g. Krofel et al. 2009, Žagar et al. 2013). In general, both species are found on rocky substrates with sparse vegetation (Arnold 1987; Arnold & Ovenden, 2004; Arnold et al. 2007; Cabela et al. 2007; Žagar et al. 2013), except that Horvath's rock lizards are more associated with rocks, while common wall lizards occur in a wider variety of different habitats (Arnold & Ovenden 2004).

In this study, an extensive sampling across an altitudinal span of 200 to 1,100 m a.s.l. was conducted in the Kočevsko region in order to comprehensively recognise syntopic and allotopic occurrence, altitudinal distribution and habitat use of Horvath's rock lizard and common wall lizard.

Materials and methods

The study was limited to the Kočevsko region, where we collected data on the presence and relative abundances (using transect line counts) of the study species in the period between 2006 and 2015 (Fig. 1, Annex 1). Part of the data collected in the 2006–2008 period was obtained within the framework of a diploma thesis (Žagar 2008a) and was published in a study of habitat use of reptile community in the Kočevsko region (Žagar et al. 2013). Specifically, in that work we included information on the altitude, exposition, vegetation cover and habitat type of 10 reptile community members, from which we included for *I. horvathi* and *P. muralis* finds from 33 localities that are also included in this analysis. The data of the 2009–2015 period was collected within the framework of a PhD thesis (Žagar 2016). Species recognition was done by either coming very close to the lizard or photographing it, to inspect the position of scales on the head or colouration of the throat region. The species can readily be identified upon either of these characteristics (Tome 1999, Arnold & Ovenden 2004). We did not distinguish sex or age of individuals in this data set (Annex 1).

Locations were described as allotopic, when all visits of that location confirmed the presence of only one species, and syntopic, when both species were found at least once during the same visit. Transect line counts (Buckland et al. 1993) were conducted in one or up to three replicates (Annex 1). We summed all observations per transect and corrected for the number of times that we walked that transect (divided by number of replicates) to calculate the frequency of individuals recorded on each transect. We grouped transects into five altitudinal belts, each encompassing 200 m of altitude (Tab. 1). Thereupon, we determined the relative abundances for each altitudinal belt by summing up frequencies of individuals and dividing it by the summed length of transects inside each altitudinal belt.

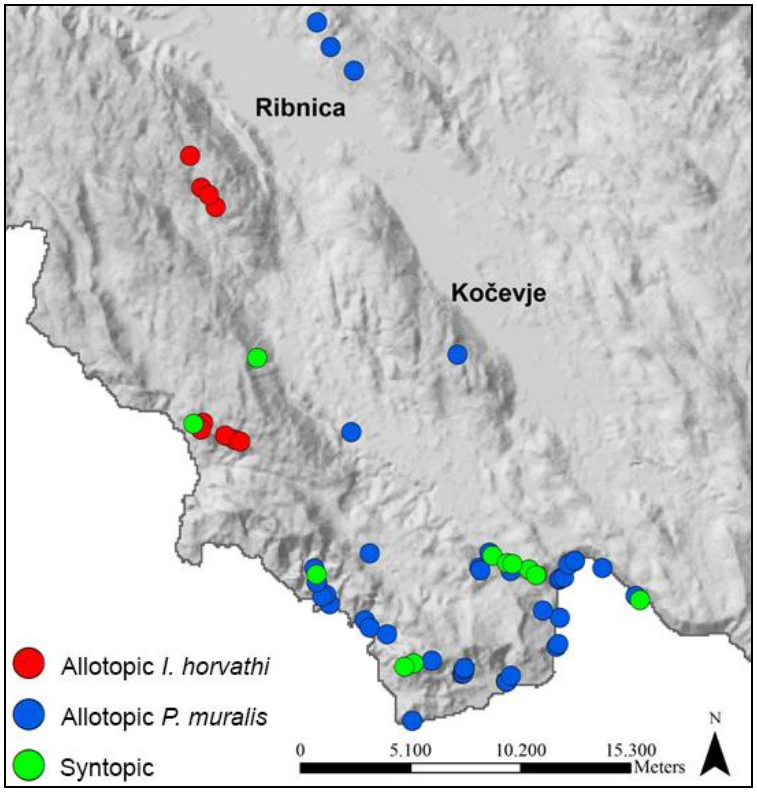

Figure 1. Map of the Kočevsko region with localities where one or both studied species, Horvath's rock lizard (*Iberolacerta horvathi*) and common wall lizard (*Podarcis muralis*), were found (N = 62) in the 2006–2015 period (see Annex 1).
Slika 1. Karta razširjenosti lokacij (N = 62) na Kočevskem, kjer je bila najdena ena ali obe preučevani vrsti, velebitska kuščarica (*Iberolacerta horvathi*) in pozidna kuščarica (*Podarcis muralis*), v obdobju 2006–2015 (glej Prilogo 1).

Table 1. Distribution of transects across five altitudinal belts with corresponding frequencies corrected for the replicated transect visits (No. of ind.) and calculated relative abundances of Horvath's rock lizard (*Iberolacerta horvathi*) and common wall lizard (*Podarcis muralis*) in the Kočevsko region.
Tabela 1. Razporeditev transektov v petih višinskih razredih in pripadajoče frekvence osebkov z upoštevanjem števila pregledov posameznega transekta (No. of ind.) in preračunane relativne gostote (ind./km) za vrsti velebitska kuščarica (*Iberolacerta horvathi*) in pozidna kuščarica (*Podarcis muralis*) na Kočevskem.

ALTITUDINAL BELT (m a.s.l.)	No. of transects	Total distance of transects (m)	*P. muralis*		*I. horvathi*	
			No. of ind.	Relative abundance (ind./km)	No. of ind.	Relative abundance (ind./km)
100–299	20	5430	50	9.21	3	0.55
300–499	10	3960	30	7.57	1	0.25
500–699	16	5470	26	4.75	4	0.73
700–899	6	2720	19	6.96	6	2.21
900–1099	10	2910	12	4.12	37	12.71
SUM	**62**	**20490**				

We compared the observed frequencies of lizards (corrected for replicated transect visits, Tab. 1) in five altitudinal belts with expected frequencies (if species were equally distributed across the altitudinal span in the study area corrected for the total distance of surveyed transects in each altitudinal belt) using the Chi square test.

For assessing habitat use, one of the seven different habitat types were assigned to each transect occupied by study species: (i) natural rock area, (ii) urban area, (iii) agricultural land, (iv) water bank, (v) road, (vi) artificial rock area, and (vii) open forest (Annex 1). Habitat types describe the typical areas where transects were located in the study area. Natural rock areas were naturally occurring rock cliffs and screes, urban area included backyards, cemeteries and house ruins, agricultural land included grasslands, pastures and crop fields, water banks were banks of rivers, streams or lakes, roads were gravel or asphalt roads, artificial rock areas comprised of any rocky ground or walls originating from human activities, and open forest were located in forests with <85% crown coverage (Žagar et al. 2013). We calculated the relative proportion of allotopic and syntopic populations in each habitat type to present it graphically (Fig. 2).

Results

Syntopic and allotopic occurrence

Results represent a dataset of 62 localities, at which one or both study species, Horvath's rock lizard and common wall lizard, were found in the Kočevsko region within the 2008–2015 period (Fig. 1, Annex 1). Both species were found to occur in syntopy at 10 localities (16%), common wall lizard was allotopic at 43 locations (69.5%) and Horvath's rock lizard at 9 locations (14.5%) (Fig. 1). Syntopic populations were found across the whole altitudinal span but with the majority of them located at middle altitudes (average altitude of syntopic populations (N = 10) was 620 m a.s.l., lower quartile range = 512 m a.s.l., upper quartile range = 813 m a.s.l., Annex 1). The lowest syntopic population was found at the entrance to Bilpa cave at 200 m a.s.l. and the highest at Kameni zid at 1,061 m a.s.l. (Annex 1).

Altitudinal distribution

The highest relative abundances of Horvath's rock lizard were determined for the highest altitudinal belt (900–1099 m a.s.l.) and relative abundances decreased with decreasing altitude (Tab. 1, Fig. 2). The opposite pattern was observed for the common wall lizard; relative abundance was highest at the two lowest altitudinal belts (100–299 and 300–499 m a.s.l.) and decreased with increasing altitude (Tab. 1, Fig. 2). Results of the Chi square test to compare observed frequencies of lizards (Tab. 1) in five altitudinal belts with expected frequencies (if species were equally distributed across the altitudinal span, see also Methods) showed significant differences between expected and observed frequencies for both species (for Horvath's rock lizard: $\chi^2 = 145.27$, df = 4, $P < 0.0001$); for common wall lizard: $\chi^2 = 11.31$, df = 4, $P = 0.0233$). Results of comparing altitudes from all finds of both species also showed a statistically significant difference between the species (Horvath's rock lizard, N = 71,

median = 948 m a.s.l., and common wall lizard, N = 205, median = 430 m a.s.l., Mann-Whitney U tests: U = 1425, Z = 10.10, P < 0.0001).

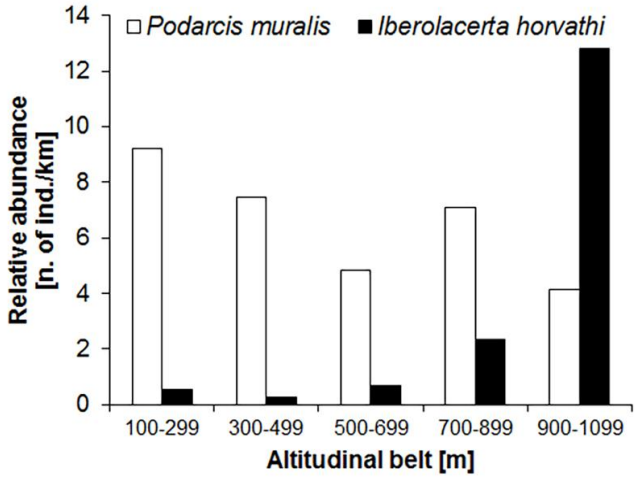

Figure 2. Relative abundances of the studied species across five altitudinal belts.
Slika 2. Relativne gostote preučevanih vrst v petih razredih nadmorskih višin.

Habitat use

The study species were found in seven different habitat types; Horvath's rock lizard in three and common wall lizard in seven of them (Fig. 3, Annex 1). Allotopic populations of common wall lizard were found in all seven habitat types, syntopic populations in all three habitat types where Horvath's rock lizard was found: in natural and artificial rocky habitats and in open forests (Fig. 2). These three habitat types occurred throughout the altitudinal range (artificial rock: 203–1058 m a.s.l. (min–max), natural rock: 208–1055 m a.s.l. (min–max), open forest: 336–1118 m a.s.l. (min–max); Annex 1). On the other hand, four habitat types exclusively occupied by common wall lizard (agricultural land, road, urban area, and water banks) were mostly limited to middle and lower altitudes (agricultural land: 588 a.s.l. (one location), roads: 204–612 a.s.l. (min–max), urban area: 229–959 a.s.l. (min–max), water banks: 204–274 m a.s.l. (min–max); Annex 1).

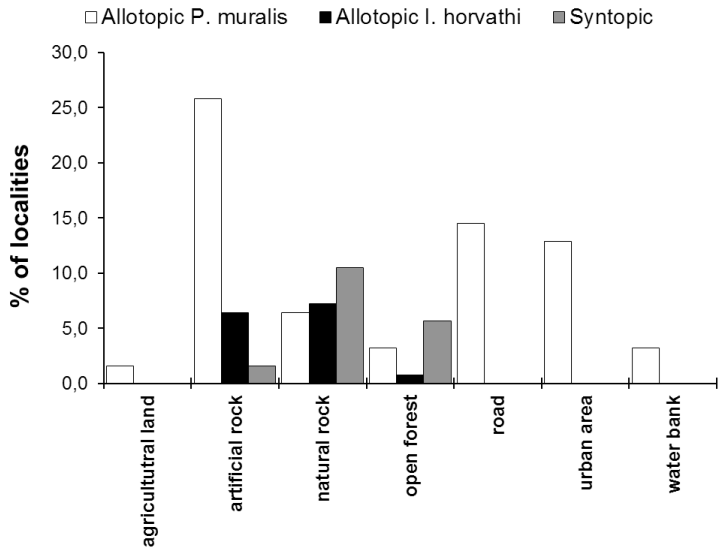

Figure 3. Relative proportion of allotopic and syntopic populations of Horvath's rock lizard (*Iberolacerta horvathi*) and common wall lizard (*Podarcis muralis*) in seven different habitat types in the Kočevsko region.
Slika 3. Relativni delež alotopičnih in sintopičnih populacij za vrsti velebitska kuščarica (*Iberolacerta horvathi*) in pozidna kuščarica (*Podarcis muralis*) v sedmih habitatnih tipih na Kočevskem.

To check whether the changes in relative abundance with altitude can be explained by observed differences in habitat use between the species due to changes in habitat availability across the altitude, we decided to repeat the comparison of altitudes between the species by including findings in only three habitat types that occurred throughout the altitudinal range and were used by both species (artificial and natural rock areas and open forest). Results showed that in these habitat types, too, Horvath's rock lizard was found at significantly higher altitudes (N = 71, median = 948 m a.s.l.) than common wall lizard (N = 113, median = 507 m a.s.l..; Mann-Whitney U tests: U = 815, Z = 9.09, P < 0.0001).

Discussion

In conclusion, we have found that in the Kočevsko region, Horvath's rock lizard and the common wall lizard – two lizard species, which exhibit a high resemblance in overall body plan and many ecological characteristics – occurred across the entire altitudinal span but exhibited an opposite pattern of relative abundances and frequencies, which increased with increasing altitude in Horvath's rock lizard and with decreasing altitude in common wall lizard. The observed pattern of habitat use suggests that the common wall lizard occupies here a more diverse array of habitat types than Horvath's rock lizard.

Jointly, the opposite pattern in relative abundances across the altitudinal span and wider use of habitat types of the common wall lizard compared to Horvath's rock lizard suggest that the species segregate to some extent in their spatial distribution and spatial niches in the Kočevsko region. However, compared to other studies of distribution of these two species (see introduction), our results showed an interestingly high altitudinal overlap in the distribution of the two species and relatively high proportion of syntopic populations (16%), as well as an overlap in three habitat types. Previous studies reported that syntopic populations of studied species occurred only in a limited zone of middle altitudes, while Horvath's rock lizard was found in allotopic populations at higher altitudes and the common wall lizard in allotopic populations at lower altitudes (De Luca 1989, Lapini et al. 1993, Richard & Lapini 1993, Lapini et al. 2004, Cabela et al. 2007, Rassati 2010). So far, this is the first observation of syntopic populations found across the entire altitudinal span of an area for these two species. This may be due to the specific topography of the Kočevsko region where altitudes do not exceed 1,100 m a.s.l. (Perko & Orožen Adamič 1998), whereas other study areas had higher altitude ranges (over 2,000 m a.s.l. in the Alpine region or up to 1,757 m a.s.l. at Velebit). Horvath's rock lizard was found there in places up to the highest peaks in Velebit (De Luca 1989) or up to 2,000 m a.s.l. in the Alps (De Luca 1989, Lapini et al. 1993, Richard and Lapini 1993, Lapini et al. 2004, Cabela et al. 2007, Rassati 2010).

The found between-species differences in altitudinal distribution, not only in the Kočevsko region but elsewhere, reinforce that Horvath's rock lizard is a high-altitude species that can also occur in lowlands but on rarer occasions, while the common wall lizards' populations are most abundant in lowlands and become less dense at higher altitudes. Recent research revealed that both species also exhibit differences in physiological characteristics and that Horvath's rock lizard has adaptations that are potentially advantageous in high-altitude areas that are climatically thermally more restrict (lower yearly average air temperatures and shorter activity periods for lizards) compared to lowlands. For example, the study species differ in seasonal variation of their preferred body temperatures in terms that Horvath's rock lizard exhibits a more accurate thermoregulation across the seasons than the common wall lizard (Osojnik et al. 2013). The differences between the species were also observed on the cellular level where Horvath's rock lizard had higher potential metabolic activity than the common wall lizard, which may be advantageous in thermally restrictive environment together with more precise thermoregulatory behaviour as exhibited by Horvath's rock lizard (Žagar et al. 2015).

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Annex 1. Locality descriptions with presence of studied species that were surveyed in the period between 2006 and 2015 in Kočevsko region and sorted by altitude. Surveys done in spring (before 30th June of the calendar year) are labelled with (1), while (2) corresponds to surveys done in summer (after 1st July of the calendar year). During each survey, we either made counts of individuals on a predetermined transect route or we only noted presence (P) or absence (/) of studied species. Maximum numbers of individuals counted are in bold. In cases when the maximum number of individuals was found more than once per location, only the first such count is in bold. Abbreviations: Alt. – average altitude, GKY and GKX = Y and X coordinates of the Gauss Krüger coordinate system, Sp. pres. – species presence, *P.m.* = Common wall lizard (*Podarcis muralis*) and *I.h.* = Horvath's rock lizard (*Iberolacerta horvathi*), A = Allotopic, S = Syntopic.

Priloga 1. Opisi lokacij v Kočevski regiji, kjer sta bili zabeleženi ena ali obe preučevani vrsti v obdobju raziskave med leti 2006 in 2015. Lokacije so razporejene po nadmorski višini. Najdbe, ki so bile zabeležene na popisih pred 30. junijem v koledarskem letu, so označene z (1) in tiste po1. juliju v koledarskem letu z (2). Na posameznem obisku lokacije smo prešteli osebke na predhodno določenem transektu (N) ali pa smo zabeležili le prisotnost vrste (P = vrsta prisotna, / = vrsta ni prisotna). Največje število osebkov iz transektnih popisov na posamezni lokaciji je poudarjeno (v primeru ponavljanja je poudarjeno le časovno prej zabeleženo največje število osebkov). Okrajšave: Alt. – povprečna nadmorska višina, GKY in GKX = Y in X koordinate Gauss Krügerjevega koordinatnega sistema, Sp.pres. – prisotnost vrste, *P.m.* = pozidna kuščarica (*Podarcis muralis*) in *I.h.* = velebitska kuščarica (*Iberolacerta horvathi*), A = alotopična populacija, S = sintopična populacija.

Locality	Alt. (m)	GKX GKY	Habitat type	Sp. pres.	*P.m.* 2006 (1)	*I.h.* 2006 (1)	*P.m.* 2007 (1)	*I.h.* 2007 (1)	*P.m.* 2007 (2)	*I.h.* 2007 (2)	*P.m.* 2008 (1)	*I.h.* 2008 (1)	*P.m.* 2008 (2)	*I.h.* 2008 (2)	*P.m.* 2010 (1)	*I.h.* 2010 (1)	*P.m.* 2011 (1)	*I.h.* 2011 (1)	*P.m.* 2011 (2)	*I.h.* 2011 (2)	*P.m.* 2012 (1)	*I.h.* 2012 (1)	*P.m.* 2012 (2)	*I.h.* 2012 (2)	*P.m.* 2013 (1)	*I.h.* 2013 (1)	*P.m.* 2013 (2)	*I.h.* 2013 (2)	*P.m.* 2014 (1)	*I.h.* 2014 (1)	*P.m.* 2014 (2)	*I.h.* 2014 (2)	*P.m.* 2015 (1)	*I.h.* 2015 (1)
med Žlebi in Grgeljem	203	495705 42336	artificial rock	**A - *P.m.***	**5**	**0**			0	0	5	0																						
med Bilpo in Lazami	204	497228 41041	road	**A - *P.m.***																	**12**	**0**							P	/			P	/
pri Žlebih	204	494406 42644	water bank	**A - *P.m.***	0	0			**1**	**0**	0	0																						
pri Gorenji Žagi	207	4936854 1801	artificial rock	**A - *P.m.***	**4**	**0**			0	0	3	0																					P	/
Bilpa	208	497441 40858	natural rock	**S**																	**6**	**3**							P	P	P	P	P	P
med Gorenjo Žago in Žlebi	215	493751 41851	road	**A - *P.m.***			**1**	**0**	0	0	1	0									0	0												
pri Gorenji žagi	215	493920 41899	artificial rock	**A - *P.m.***			**8**	**0**	5	0	3	0																					P	/
Žlebi	215	494412 42675	artificial rock	**A - *P.m.***			1	0	1	0	**2**	**0**									P	/												
med Kobilno jamo in Gorenjo Žago	219	494125 42501	artificial rock	**A - *P.m.***	1	0			0	0	**2**	**0**																					P	/
med Sapnikom in Brsnikom	226	493567 38681	artificial rock	**A - *P.m.***	2	0			1	0	**4**	**0**																					P	/
med Lobičem in Žlebi	228	494419 42673	natural rock	**A - *P.m.***	2	0			0	0	**5**	**0**																					P	/
Maverc	229	493728 40033	urban area	**A - *P.m.***					**2**	**0**	2	0	2	0																			P	/
Sapnik	230	493652 38810	urban area	**A - *P.m.***	0	0			0	0	**2**	**0**																						

Annex 1 / Priloga 1. Continued. / Nadaljevanje.

Locality	**Alt. (m)**	**GKX GKY**	**Habitat type**	**Sp. pres.**	***I.h.* 2015 (1)**	***P.m.* 2015 (1)**	***I.h.* 2014 (2)**	***P.m.* 2014 (2)**	***I.h.* 2014 (1)**	***P.m.* 2014 (1)**	***I.h.* 2013 (2)**	***P.m.* 2013 (2)**	***I.h.* 2013 (1)**	***P.m.* 2013 (1)**	***I.h.* 2012 (2)**	***P.m.* 2012 (2)**	***I.h.* 2012 (1)**	***P.m.* 2012 (1)**	***I.h.* 2011 (2)**	***P.m.* 2011 (2)**	***I.h.* 2011 (1)**	***P.m.* 2011 (1)**	***I.h.* 2010 (1)**	***P.m.* 2010 (1)**	***I.h.* 2008 (2)**	***P.m.* 2008 (2)**	***I.h.* 2008 (1)**	***P.m.* 2008 (1)**	***I.h.* 2007 (2)**	***P.m.* 2007 (2)**	***I.h.* 2007 (1)**	***P.m.* 2007 (1)**	***I.h.* 2006 (1)**	***P.m.* 2006 (1)**
pokopališče v Fari	238	491217 37083	urban area	**A -** ***P.m.***		P /											P /																3 0	
med Grivacom in Gladloko	245	486880 35251	road	**A -** ***P.m.***																														
pri Gladloki	245	486880 35251	artificial rock	**A -** ***P.m.***																													**1 0**	
Mirtoviči	260	483050 40666	urban area	**A -** ***P.m.***																														
Srobotnik	266	484664 39915	urban area	**A -** ***P.m.***																													**1 0**	
Mirtoviški potok	274	482871 41106	water bank	**A -** ***P.m.***																														
nad cerkvijo v Fari	288	491251 37067	road	**A -** ***P.m.***																													**3 0**	
pokopališče sv. Štefan	310	491452 37337	urban area	**A -** ***P.m.***																		P /											**12 0**	
pri Srobotniku	336	484894 39571	open forest	**A -** ***P.m.***																														
Kostel	348	492939 40372	urban area	**A -** ***P.m.***													P /																	
nad vasjo Planina zapuščen kamnolom	378	489201 37430	artificial rock	**A -** ***P.m.***																														
kamnolom v Podstenah	384	491440 42191	artificial rock	**A -** ***P.m.***		P /																												
od Planine na Planinsko steno	430	489253 37450	road	**A -** ***P.m.***																														
med Friškovo grabo in Dolenjim Potokom	435	489983 42358	road	**A -** ***P.m.***																														
pri Dolenjem Potoku	435	490044 42240	artificial rock	**A -** ***P.m.***																														
pot na Krempo	459	482701 41016	open forest	**A -** ***P.m.***																														
od vasi Podstene do sten	499	492289 42271	artificial rock	**S**																														
pod Podstenami	501	490457 43051	road	**A -** ***P.m.***		P /											P /																	
od Planine na Planinsko steno	506	489309 37690	road	**A -** ***P.m.***																														

Annex 1 / Priloga 1. Continued. / Nadaljevanje.

Locality	**Alt. (m)**	**GKX GKY**	**Habitat type**	**Sp. pres.**	***P.m.* 2006 (1)**	***I.h.* 2006 (1)**	***P.m.* 2007 (1)**	***I.h.* 2007 (1)**	***P.m.* 2007 (2)**	***I.h.* 2007 (2)**	***P.m.* 2008 (1)**	***I.h.* 2008 (1)**	***P.m.* 2008 (2)**	***I.h.* 2008 (2)**	***P.m.* 2010 (1)**	***I.h.* 2010 (1)**	***P.m.* 2011 (1)**	***I.h.* 2011 (1)**	***P.m.* 2011 (2)**	***I.h.* 2011 (2)**	***P.m.* 2012 (1)**	***I.h.* 2012 (1)**	***P.m.* 2012 (2)**	***I.h.* 2012 (2)**	***P.m.* 2013 (1)**	***I.h.* 2013 (1)**	***P.m.* 2013 (2)**	***I.h.* 2013 (2)**	***P.m.* 2014 (1)**	***I.h.* 2014 (1)**	***P.m.* 2014 (2)**	***I.h.* 2014 (2)**	***P.m.* 2015 (1)**	***I.h.* 2015 (1)**
pri Srobotniku	507	485700 39266	natural rock	**A -** ***P.m.***	2 0						**4 0**		3 0																					
na Podstenah 1	512	490601 42918	natural rock	**S**	1 1				0 0	**2 4**																						P P		
pod Planinsko steno	513	489248 37615	natural rock	**A -** ***P.m.***	1 0				1 0	**3 0**																								
na Podstenah 2	515	492625 42002	natural rock	**S**	0 1				**3 1**	0 1																								
na Podstenah 3	515	491281 42557	natural rock	**S**	0 1				**1 1**	0 0																						P P		
od vasi Podstene do sten	521	491514 42527	open forest	**S**	0 0				0 0	**2 1**																								
kamnolom pri Kočevski Reki	575	484048 48638	artificial rock	**A -** ***P.m.***				0	0 2	0 **5 0**												P /										P /		
pot na Krempo	588	482433 41682	agricultu -ral land	**A -** ***P.m.***				0	0	**1 0**	0 0																							
od Planine na Planinsko steno	612	489309 37690	road	**A -** ***P.m.***				**3 0**	2 0	3 0																								
na planinski poti na Krempo 1	615	482433 42036	open forest	**A -** ***P.m.***		**3 0**					1 0	0 0																						
med Gornjo Brigo in Borovcem pri Kočevski Reki	616	484898 43018	artificial rock	**A -** ***P.m.***	0 0				**1 0**	1 0																								
Planinska stena	652	487781 38035	artificial rock	**A -** ***P.m.***																		**3 0**										P /		
na planinski poti na Krempo 2	676	482339 42317	natural rock	**A -** ***P.m.***	0 0						**2 0**	0 0																						
območje Stevniki na Mali gori	681	484171 65412	artificial rock	**A -** ***P.m.***													P	/		**4 0**											P /	P /		
zahodno od Špičastega vrha na Mali gori	726	482454 67654	artificial rock	**A -** ***P.m.***													**11** 0	P	0	P	/	P	/	P	/	P	/	P	/	P	/	P /		
Gornje niše na Mali gori	760	483079 66525	artificial rock	**A -** ***P.m.***													P	/		**4 0**											P /	P /		
pod Kuželjsko steno	766	486949 37909	open forest	**S**	0 0				0 0	**1 1**																								
Kuželjska stena	813	486505 37768	natural rock	**S**	0 2				1 1								**2 4**				P	P	P		P	P	P	P						
na Žurgarski steni 1	828	476722 49022	natural rock	**S**	0 1					5 0	**4 1**						P	P																

Annex 1 / Priloga 1. Continued. / Nadaljevanje.

Locality	**Alt. (m)**	**GKX GKY**	**Habitat type**	**Sp. pres.**	***I.h.* 2015 (1)**	***P.m.* 2015 (1)**	***I.h.* 2014 (2)**	***P.m.* 2014 (2)**	***I.h.* 2014 (1)**	***P.m.* 2014 (1)**	***I.h.* 2013 (2)**	***P.m.* 2013 (2)**	***I.h.* 2013 (1)**	***P.m.* 2013 (1)**	***I.h.* 2012 (2)**	***P.m.* 2012 (2)**	***I.h.* 2012 (1)**	***P.m.* 2012 (1)**	***I.h.* 2011 (2)**	***P.m.* 2011 (2)**	***I.h.* 2011 (1)**	***P.m.* 2011 (1)**	***I.h.* 2010 (1)**	***P.m.* 2010 (1)**	***I.h.* 2008 (2)**	***P.m.* 2008 (2)**	***I.h.* 2008 (1)**	***P.m.* 2008 (1)**	***I.h.* 2007 (2)**	***P.m.* 2007 (2)**	***I.h.* 2007 (1)**	***P.m.* 2007 (1)**	***I.h.* 2006 (1)**	***P.m.* 2006 (1)**
pred Žurgarsko steno	899	477181 49089	artificial rock	**A - *I.h.***																	/ P				0 **6** 0								0 3	
na Žurgarski steni 2	948	477075 48768	natural rock	**A - *I.h.***						/ P										/ P					0 3 **0 13**								0 1	
Fridrikštajn	959	488966 52243	urban area	**A - *P.m.***						P /							**10 0**				P /													
Male Bele stene	976	476572 61464	artificial rock	**A - *I.h.***						/ P							/ P				/ P		**0 5**												
Taborska stena	991	478628 48293	natural rock	**A - *I.h.***																					0 0 0		**0 1**								
ob cesti pod Velikimi Belimi stenami	996	477087 59976	artificial rock	**A - *I.h.***						/ P							/ P				P /		/ P		**0 9**										
Kameni zid	1028	479672 52082	natural rock and open forest	**S**						P P							2 2				P /		**2 3**											
na Taborski steni 1	1029	478193 48482	natural rock	**A - *I.h.***																					0 **4** 0		1						0 3	
na Taborski steni 2	1055	478891 48207	natural rock	**A - *I.h.***																					0 1 0		0						**0 1**	
na ovinku pred Velikimi Belimi stenami	1058	477753 59090	artificial rock	**A - *I.h.***						/ P							**0 8**																	
Velike Bele stene na robu sten	1118	47744 59648	natural rock and open forest	**A - *I.h.***						/ P							**0 4**																	