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Western green lizards (*Lacerta bilineata*) do not select the composition or structure of the ecotones in Northern Italy

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Abstract. The conservation status of the Western green lizard (*Lacerta bilineata*) in Italy is probably not favourable. In the Po plain the species is rapidly declining outside of the protected areas, mainly because of the loss of hedges and natural vegetation in general. In this paper, we analysed the preference by Western green lizard on the ecotone features in a large population settled in Northern Italy, in order to detect the habitat characteristics of the ecotones that could explain the occurrence of the species. We monitored a Western green lizard population by using the line-transect method from May to September 2006-2007 in a regional park (24.000 ha) located along the Adda river, and we investigated species habitat requirements by comparing presence/absence plots through compositional analysis and multi-model inference. Out of the 25 variables considered, the only two differing between used and not used ecotones were related to soil type (litter soils were preferred) and wood layer (autochthonous natural woods were preferred), suggesting that Western green lizard used the ecotonal zones of the park irrespective of their structure and composition. This result has important implication on management and conservation of the species in Northern Italy, as the occurrence of the species appears to be favoured by the presence of ecotones itself rather than by their quality.

Keywords: habitat selection; compositional analysis; multi-model inference; management and conservation; *Lacerta bilineata*.

Introduction

The Western green lizard (*Lacerta bilineata*) is an ubiquitous species that inhabits open areas, and particularly ecotonal zones, i.e. the transition environments separating closed and open habitats, such as forests and grasslands (Nettman & Rykena 1984, Korsos 1984, Saint Girons et al. 1989, Boker 1990, Ioannidis & Bousbouras 1997, Strijbosh 2002, Schmidteler 2002). In Europe it is widespread in western regions, covering the Northern portions of Iberian peninsula, France, Switzerland and Western Germany (Gasc et al. 1997). In Italy it occurs in the whole peninsula and in Sicily, normally up to 600 m a.s.l., while it is absent from Sardinia (Schiavo & Venchi 2006). Despite the wide distribution, we still lack data on the actual consistence of the Western green lizard populations in Italy, nor do we have information on the population trends. However, the conservation status of the species is probably not favourable, since the ecotones have been progressively reduced, particularly with the extension of arable lands in Northern Italy (Scali & Schiavo 2004) such as the Po plain. For example, in the southern Lombardy (Lodi Province) the green lizard has nearly disappeared outside the natural protected areas, which maintain the last vital populations (Franzini 2008).

In order to make possible the effective management and conservation of the Western green lizard populations where human activities have a large and increasing impact on the environment, two main actions should be pursued: promoting long term monitoring programmes of green lizard populations consistence and increasing the knowledge of the habitat requirements of the species.

In Italy, *L. bilineata* has been reported to use ecotones between diverse kinds of habitats, especially those with eastern and western exposure (shortly reviewed in Schiavo & Venchi 2006). In general, the species does not appear to operate a marked selection on the habitats, since it has been found in a very wide spectrum of habitats such as edges of woods, irrigation canals, roads, edges of uncultivated fields or grasslands, vineyards and orchards, bushes in rocky areas and also remnant vegetation in urban areas (Rugiero 1993, Scali & Zuffi 1994, Schiavo 1994, Venchi 2000, Corti & Lo Cascio 2002, Caldonazzi et al. 2002, Scali & Schiavo 2004, Schiavo & Venchi 2006).

However, most of the information about habitat selection of the Western green lizards has been collected during atlas projects (e.g., Schiavo 1994, Venchi 2000, Scali & Schiavo 2004, Caldonazzi et al. 2002, Schiavo & Venchi 2006), which only report the habitats where lizards have been found, without considering their availability in the study area. To date, there are no studies that have analysed the habitat preference of the species at large scale by comparing use and availability of habitats, as well as no previous study has considered the effect of both structure and composition of the ecotones on the occurrence of the species. The only exceptions are the works of Rugiero (1993) and Scali and Zuffi (1994): the former studied the occurrence of the Western green lizard in three localities of the plain surrounding the city of Rome, whereas the latter analysed the reptile community in a suburban area northwards to the city of Milan. In both cases, only a general preference by the species for open habitats with low vegetation structure emerged, but a detailed use vs. availability analysis was not performed. Anyway, no analysis on the structure of ecotones has been yet performed.

In this paper, we analysed the habitat preference of the Western green lizard in a large population settled in a regional park of Southern Lombardy; our main objective was to detect the habitat features of the ecotones that could explain the occurrence of the species in order to supply detailed information useful to develop management and conservation programs.

Methods

Study area and data collecting

The study was carried out during May-September 2006-2007 in the Adda Sud Regional Park, which extends over 24.000 ha along the lower tract of the Adda river (Lombardy Region, Northern Italy, Fig. 1). The landscape is highly exploited by humans and is dominated by intensive agriculture (cereal crops). Natural habitats (woods and bushy areas) are confined to the river banks and three natural reserves included in the Natura 2000 network. Most woods are quite degraded or dominated by allochthonous locust trees (*Robinia pseudoacacia*), but autochthonous monospecific (*Quercus* spp), and mixed woods (e.g., *Quercus robur*, *Carpinus betulus*, *Fraxinus excelsior*, *Populus* spp.) are present along the river and, particularly, within natural reserves. Shrubs are quite variable in composition, and the dominant species are brambles (*Rubus* spp.), willows (*Salix* spp), elders (*Sambucus nigra*), which may form either monospecific or mixed assemblages, the latter in association with hawthorns (*Crataegus* spp.), sloe (*Prunus spinosa*), dogwood (*Cornus* spp.) and other small species.

Census methods

Lizards were searched by walking along ecotones, which in our study area correspond to the transition zones between woods or bushes and open areas (grassland and crops). We selected 54 transects equally distributed over the park and covering all the different kind of ecotones potentially exploitable by the species (Fig. 1). Depending on the habitat features (i.e. patch size and distance), transects greatly varied in length, ranging from 250 m up to 1 km. Despite this variability, transect length was randomly distributed over the study area (Moran I: -0.022 ± 0.014, $P = 0.83$), thus suggesting that sampling effort was equally distributed over the study area. The mean distance between two neighbouring transects was 364 m, ranging from 0 (two transects intersected or had the same origin) to 1509 m. Surveys were carried out from 10:00 to 17:00 during sunny days, and lizards were contacted on average within 5 m from the transect line. Lizards were not captured, and only sightings apart from at least 100 m were considered as different individuals. For this reason, each transect was checked only once in order to avoid pseudoreplication, and we were not able to assess the sex of all individuals. In addition, adult lizards were considered for this study since juveniles may be dispersing or may have not established fixed territories. The position of each individual was recorded using a Garmin GPS and digitized in a map using the ArcGIS 9.0 software.

Habitat variables

We walked along each transect and recorded the characteristics (extension and composition) of both soil and vegetation on a detailed map of the park (scale 1:10,000). The maps obtained by field observations were then improved using the satellite images available in GoogleEarth. Soil patches were classified according to four main texture categories: agricultural, natural with litter, natural with sand and natural with gravel. The structure and composition of the vegetation were assessed analysing grass, shrub and wood layers independently. The grass layer included four variables: tall herbs (more than 30cm high), small herbs (less than 30cm high) and areas lacking herbs; small herbs were then split in dense or sparse depending on they covered (or not) more than 50% of the patch extension. The shrub layer included the following seven patch types: dense and sparse brambles (as estimated for herbs), willows, elders, dense and sparse mixed bushes, and areas lacking shrubs. Finally, patches in the wood layer included the following categories: locust trees, poplar trees (*Populus nigra* or *P. alba*), monospecific woods with autochthonous species (*Quercus* spp.), mixed wood with autochthonous species (e.g., *Quercus robur*, *Carpinus betulus*, *Fraxinus excelsior*, *Populus* spp.), poplar groves and areas lacking wood cover. All wood patches but poplar groves were split in dense or sparse according to coverage, leading to 10 wood patch types. On the whole we defined 25 variables (see Tab. 1). Soil type and vegetation variables were digitized using the ArcGIS 9.1 software in four different shape files. Habitat selection by Western green lizards was then evaluated using the GIS software for measuring the percentage cover of the 25 variables within the 50m buffers centred on the points where lizard occurred and within a 50m buffer along all the 54 transects. The first set of values was used as an estimate of the habitats selected by the species, whereas the second one was interpreted as the habitat availability.

Statistical analyses

Being percentages, all habitat variables were arcsin-transformed to achieve normality. At first we used a oneway ANOVA to check for differences in soil and vegetation variables between point and transect buffers: in these models each environmental feature was in turn the dependent variable while the buffer type (points with green lizards vs transects) was the grouping variable. Since autocorrelation among variables was quite low, the highest correlations being within layer (Tab. 1), we used the compositional analysis (Aebischer et al. 1993) to separately rank soil and grass, shrub, and wood variables according to their importance in promoting (or disfavouring) Western green lizard occurrence. The Wilk's lambda, determined by randomization tests, was used to assess the significance of the ranking matrix (Aebischer et al. 1993).

Figure 1. The Adda Sud Park with the position of the transects used for the Western green lizard census.

In order to assess the potential effects of soil and vegetation variables on the occurrence of Western green lizards, logistic regression models applied to identify the most important variables, likely affecting lizard presence, were developed. Since variables were intercorrelated, we worked out all possible four-predictor models using one variable for soil type and one variable for grass, shrub and wood layers respectively, in a way that every variable within each environmental group entered the same number of models. We have preferred this procedure than selecting a set of few models including the most important variables because it was not possible by the simple correlation matrix to determine which variables were more effective in predicting the presence of species. Inference from models was made according to the Information-theoretic approach (Anderson et al. 2000, Anderson & Burnham 2002, Mazerolle 2006): for each of the models, we computed the differences with the minimum AIC (ΔAIC) and Akaike weights (wAIC), and we ranked models according to this last index. The relative importance of predictor variables was measured by the sum of the models Akaike weights (Σw) where each variable appeared (Burnham & Anderson, 2002). To quantify the effects of the predictor variables, the $\hat{\beta}$ (partial regression coefficients) were weighted and averaged on the models obtaining $\hat{\bar{\beta}}$. The unconditional sampling variance (var $\hat{\bar{\beta}}$) and 95% confidence intervals were computed for all predictors in order to assess their statistical significance (Burnham & Anderson 2002). Completely positive intervals means positive selection, completely negative intervals means negative selection, and negative and positive intervals means no selection.

All analyses were performed using the software R 2.10.1 (R Development Core Team 2009), and otherwise stated data reported are means and standard errors.

Results

Western green lizard distribution

Overall, we found 262 individuals, and no transect lacked lizard observation. The species was widespread within the Adda Sud Park (Fig. 2), and all fragments of natural (or semi-natural) vegetation were inhabited by the species. Lizard abundance was on average one individual every 560 m transect (i.e., 0.18 every 100 m of linear transect).

Habitat availability along transects

As expected, agricultural and litter soils represented the large majority of soil types (49% and 43% respectively), whereas natural sand soils were the rarest (1%), being present only in the transects bordering the Adda river. Only 28% of the area within the transect buffers showed grass cover, which was nearly wholly represented by sparse small herbs (81%) and tall herbs (16%). Similarly, most of the transect buffers had no shrub cover (93%), and, when present, shrubs were monospecific dense and sparse brambles (36%), and, more frequently, mixed assemblages of brambles with other species, like elders. Finally, wood patches covered 22% of the surveyed area, and mixed autochthonous (sparse and dense, 40%) and locust tree (sparse and dense, both 18%) woods were the most represented ones. The extension of poplar groves also was highly frequent along the transects, as they covered nearly 28% of the buffer.

Table 1. Correlation matrix (r_p) among soil and vegetation variables in the 316 buffers (262 centred on the points where Western green lizard occurred and 54 along the transects used to survey the species). Only relevant correlation (r_p > 0.25) are reported. Loc trees: Locust trees; Pop trees: Poplar trees; AMonW: Autochthonous monospecific woods; AMixW: Autochthonous mixed woods.

	Litter	Sand	Gravel	Tall herbs	Small herbs – dense	Small herbs – sparse	No herbs	Brambles – dense	Brambles – sparse	Willows	Elders	Mix bushes - dense	Mix bushes - sparse	No shrubs	Poplar groves	Loc trees - dense	Loc trees - sparse	Pop trees - dense	Pop trees - sparse	AMonW - dense	AMonW - sparse	AMixW - dense	AMixW - sparse	No woods
Agricultural	-0.79						0.35								0.34							-0.25		
Litter			-0.36			0.31									-0.29							0.34	0.27	-0.37
Sand																								
Gravel																								
Tall herbs					-0.36																			
Small herbs - dense							-0.76															0.45		-0.35
Small herbs - sparse																0.30	0.27							
No herbs																						-0.44		0.48
Brambles - dense														-0.42							0.28			
Brambles - sparse														-0.36		0.25								
Willows																								
Elders																								
Mix bushes - dense														-0.52										
Mix bushes - sparse														-0.50										
No shrubs																				-0.27				0.25
Poplar groves																								-0.32
Loc trees - dense																	0.31							-0.28
Loc trees - sparse																								
Pop trees - dense																								
Pop trees - sparse																								
AMonW - dense																								
AMonW - sparse																								
AMixW - dense																								-0.55
AMixW - sparse																								-0.26

Habitat selection by Western green lizards

Only four out of the 25 habitat variables significantly differed between buffers centered on Western green lizard occurrences and transects: the species was favoured by litter soil and disfavoured by agricultural soils and poplar woods with both sparse and dense coverage (Table 2).

The compositional analysis for the soil types generated a highly significant ranking matrix (Λ = 0.538, P < 0.0001), showing that litter and sand soils were preferred by lizards, whereas gravel and agricultural soils were significantly avoided (Table 3), thus confirming the previous univariate analysis. The ranking matrix was highly significant also in the case of the grass layer (Λ = 0.375, P < 0.0001). In this case, the analysis highlighted a gradient of increasing preference from areas with taller and denser herbs to areas with smaller sparse herbs or no herbs at all (Table 4). The com-

Figure 2. Distribution of green lizard observations within the Adda Sud Park.

Table 2. Comparison (ANOVA-one way) of mean values of the 25 soil and vegetation variables measured for Western green lizard sites (n = 262) and transects used during survey (n = 54). Values represent mean percentages.

Variable	Green Lizards		Transects		*F*	df	*P*
	Mean	SE	Mean	SE			
Soil type							
Agricultural	0.348	0.020	0.490	0.030	12.309	1,314	0.001
Litter	0.570	0.021	0.434	0.027	8.065	1,314	0.005
Sand	0.026	0.007	0.014	0.005	0.011	1,314	0.917
Gravel	0.057	0.011	0.062	0.019	0.462	1,314	0.497
Grass layer							
Tall herbs	0.074	0.011	0.048	0.015	0.121	1,314	0.728
Small herbs – dense	0.289	0.018	0.231	0.024	0.126	1,314	0.723
Small herbs – sparse	0.017	0.005	0.006	0.003	0.093	1,314	0.761
No herbs	0.620	0.018	0.715	0.025	3.327	1,314	0.069
Shrub layer							
Brambles – dense	0.019	0.005	0.013	0.005	0.327	1,314	0.568
Brambles – sparse	0.021	0.004	0.011	0.003	0.063	1,314	0.802
Willows	0.001	0.001	0.001	0.001	0.009	1,314	0.924
Elders	0.003	0.002	0.002	0.001	1.165	1,314	0.281
Mixed bushes - dense	0.027	0.007	0.019	0.007	0.127	1,314	0.722
Mixed bushes - sparse	0.036	0.006	0.020	0.004	0.284	1,314	0.594
No shrubs	0.893	0.011	0.934	0.010	0.000	1,314	1.000
Wood layer							
Poplar groves	0.063	0.010	0.062	0.015	1.778	1,314	0.183
Locust trees - dense	0.036	0.007	0.023	0.008	0.059	1,314	0.808
Locust trees - sparse	0.029	0.006	0.017	0.005	0.010	1,314	0.920
Poplar trees - dense	0.005	0.002	0.009	0.004	4.174	1,314	0.042
Poplar trees - sparse	0.008	0.002	0.017	0.007	7.926	1,314	0.005
Autochthonous monospecific woods - dense	0.014	0.006	0.002	0.001	0.292	1,314	0.589
Autochthonous monospecific woods - sparse	0.006	0.003	0.002	0.001	0.077	1,314	0.782
Autochthonous mixed woods - dense	0.117	0.016	0.063	0.015	0.381	1,314	0.538
Autochthonous mixed woods - sparse	0.064	0.010	0.028	0.007	0.164	1,314	0.686
No woods	0.657	0.019	0.777	0.023	3.427	1,314	0.065

Table 3. Ranking matrix of soil types.

	Sand	Litter	Gravel	Agricultural
Sand		n.s.	+ + +	+ + +
Litter	n.s.		+ + +	+ + +
Gravel	− − −	− − −		n.s.
Agricultural	− − −	− − −	n.s.	

Table 4. Ranking matrix of grass layer.

	Small herbs sparse	No herbs	Small herbs dense	Tall herbs
Small herbs - sparse		+ + +	+ + +	+ + +
No herbs	− − −		+ + +	+ + +
Small herbs - dense	− − −	− − −		n.s.
Tall herbs	− − −	− − −	n.s.	

positional analysis for the shrub layer produced a significant ranking matrix (Λ = 0.0067, P < 0.001), but the low value of the Λ statistic indicated that the selection carried out by the species was weak. However, willows and elders resulted as preferred by Western green lizards, whereas mixed shrubs were avoided (Table 5). In addition, shrub coverage did not appear to significantly affect lizard's habitat preference (Table 5). Similarly, the ranking matrix for woods was also significant, but the low Λ statistic (Λ = 0.0463, P < 0.001) suggested that Western green lizard carried out a weak selection as well on wood features. Natural dense woods were preferred while poplar groves avoided (Table 6). Locust tree woods and sparse natural woods had intermediate ranks in the matrix, suggesting that they were used in conformity with their availability (Table 5). The preference for poplar trees evidenced in this analysis contradicts the results of the previous ANOVA, which highlighted an underutilization of those habitats (see Table 2).

The multi-model selection approach confirmed that Western green lizards did not accomplish a strong selection on the 25 soil and vegetation variables selected. Indeed, the first eleven variables showed the heavier Akaike weight associated with a 95% confidence interval including zero (Table 7); i.e., these variables did not significantly affect the occurrence of the species in our study area.

The first variable showing a significant effect was the litter (Σw = 0.124), which was positively related with the species occurrence ($\hat{\bar{\beta}}$ = 8.26 ± 4.11, *95%CI*: 0.20 - 16.33), thus confirming the results of both ANOVA and compositional analysis. The autochthonous monospecific dense woods (Σw = 0.065) were also significantly preferred by lizards ($\hat{\bar{\beta}}$ = 4.06 ± 1.66, *95%CI*: 0.81 - 7.3), while locust trees with sparse coverage (Σw = 0.064), autochthonous mixed woods with both spare and dense coverage (Σw = 0.061 and Σw = 0.060 respectively), and poplar groves (Σw = 0.058), and gravel (Σw = 0.009) were significantly avoided (see Table 7 for $\hat{\bar{\beta}}$ coefficients and *95%CI*). These results also agreed with those obtained using compositional analysis for the wood layer.

Discussion

We found that the Western green lizard normally occurs in transition habitats (the ecotones) and

Table 5. Ranking matrix of shrub layer.

	Willows	Elders	Brambles sparse	Brambles dense	No shrubs	Mixed sparse	Mixed dense
Willows		+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Elders	− − −		+ + +	+ + +	+ + +	+ + +	+ + +
Brambles - sparse	− − −	− − −		+ + +	+ + +	+ + +	+ + +
Brambles - dense	− − −	− − −	− − −		n.s.	+ + +	+ + +
No shrubs	− − −	− − −	− − −	n.s.		+ + +	+ + +
Mixed - sparse	− − −	− − −	− − −	− − −	− − −		n.s.
Mixed - dense	− − −	− − −	− − −	− − −	− − −	n.s.	

Table 6. Ranking matrix of wood layer.

	Autoc. monosp. sparse	Autoc. monosp. dense	Poplar trees - dense	Locust trees - sparse	Poplar trees - sparse	Autoc. Mixed - sparse	Locust trees - dense	No woods	Autoc. Mixed - dense	Poplar groves
Autoc. monosp. sparse		+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Autoc. monosp. dense	– – –		+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Poplar trees - dense	– – –	– – –		+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Locust trees - sparse	– – –	– – –	– – –		+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Poplar trees - dense	– – –	– – –	– – –	– – –		n.s.	n.s.	n.s.	+ + +	+ + +
Autoc. Mixed - sparse	– – –	– – –	– – –	– – –	n.s.		n.s.	n.s.	+ + +	+ + +
Locust trees - dense	– – –	– – –	– – –	– – –	n.s.	n.s.		n.s.	+ + +	+ + +
No woods	– – –	– – –	– – –	– – –	n.s.	n.s.	n.s.		+ + +	+ + +
Autoc. Mixed - dense	– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –		+ + +
Poplar groves	– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –	

Table 7. Multi model-inference on models parameters and relative importance of the 25 soil and vegetation variables used for analysing habitat selection by *L. bilineata*.

Variable	Σw	$\hat{\bar{\beta}}$	SE($\hat{\bar{\beta}}$)	Lower CI95%	Upper CI95%
Agricultural soil	0.859	-76.349	288.979	-642.7	490.050
No herbs	0.303	-8.861	11.503	-31.407	13.685
Poplar trees - sparse	0.285	-52.215	100.492	-249.179	144.749
Small herbs - dense	0.261	-5.084	5.655	-16.168	6.000
Tall herbs	0.219	1.638	1.625	-1.547	4.823
Small herbs - sparse	0.217	0.779	1.471	-2.104	3.662
Elders	0.187	-34.137	35.176	-103.082	34.808
Brambles - sparse	0.182	-16.295	16.307	-48.257	15.667
Brambles - dense	0.176	-14.145	13.693	-40.983	12.693
No woods	0.138	-6.360	5.644	-17.422	4.702
Poplar trees - dense	0.128	-21.567	17.615	-56.092	12.958
Litter soil	0.124	8.262	4.115	0.197	16.327
No shrubs	0.117	1.713	1.126	-0.494	3.920
Mixed bushes - sparse	0.116	-2.442	1.592	-5.562	0.678
Mixed bushes - dense	0.114	-2.246	1.463	-5.113	0.621
Willows	0.109	1.209	2.760	-4.201	6.619
Locust trees - dense	0.085	-5.130	2.648	-10.320	0.060
Autochthonous monospecific woods - dense	0.065	4.060	1.659	0.808	7.312
Locust trees - sparse	0.064	-2.433	0.968	-4.330	-0.536
Autochthonous mixed woods - sparse	0.061	-1.467	0.586	-2.616	-0.318
Autochthonous mixed woods - dense	0.060	-0.836	0.354	-1.530	-0.142
Poplar groves	0.058	-0.611	0.306	-1.211	-0.011
Autochthonous monospecific woods - sparse	0.056	-0.396	0.757	-1.880	1.088
Gravel soil	0.009	-0.214	0.022	-0.257	-0.171
Sand soil	0.008	0.041	0.032	-0.022	0.104

does not generally use internal portions of open or wooded patches (Nettman & Rykena 1984, Saint Girons et al. 1989, Strijbosh 2002, Schmidteler 2002). Our results further show that lizard don't have habitat preference within the ecotone. Indeed, in our study area the Western green lizards did not operate a marked selection on the features of the ecotones, as they apparently used the ecotonal zones of the park irrespective of their structure and composition. Indeed, the only variables that significantly differed between the areas used by the species and the general availability along the transects were related with the soil types (litter was preferred whereas agricultural soils were avoided) and wood layer (autochthonous natural woods were preferred whereas poplar groves were avoided). The Western green lizards apparently did not operate any relevant selection within the grass and shrub layers, which are the vegetation components that more intensely affect the occurrence of the species at larger scale (Nettman & Rykena 1984, Saint Girons et al. 1989, Strijbosh 2002, Schmidteler 2002). The preference for the litter vs. the agricultural soils was not surprising, and probably reflected the higher probability of finding the species in more naturalized areas. A similar indication came from the preference for natural vegetation, which is positively associated with litter soil (see Table 1). So, the main indication that we can obtain from our data, is that Western green lizards occur more frequently in the ecotones associated with better conserved environments.

Previous works have showed that Western green lizards actually select the macrohabitat, and clearly prefer open areas, natural and well developed vegetation, and are markedly associated with transition habitats, such as the borders between woods and grassland or cultivated fields, vegetation stripes along canals or ditches and the vegetation bordering secondary roads (reviewed for Italy in Schiavo & Venchi 2006). In this scenario, our data show that at lower scale (i.e., within ecotonal areas suitable for settlement) Western green lizards operate much less discrimination on both composition and structure of the vegetation. This probably occurs because the species is exigent concerning sun conditions, being strictly thermophilic (Saint Girons et al. 1989, Schiavo & Venchi 2006), but quite generalist for other traits of the life history (Angelici et al. 1997, Donev et al. 2005). Therefore, the thermal demand is probably the main pressure shaping the habitat selection by Western green lizards, leading to the preference for well-exposed ecotones with low vegetation (Rugiero 1993, Scali & Zuffi 1994); given the thermal conditions, any other features of ecotones are probably less relevant for settlement.

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