Journal of Biological Research-Thessaloniki **12**: 211 – 220, 2009
J. Biol. Res.-Thessalon. is available online at http://www.jbr.gr
Indexed in: WoS (Web of Science, ISI Thomson), SCOPUS, CAS (Chemical Abstracts Service) and DOAJ (Directory of Open Access Journals)

Diversity patterns and conservation management of the lizard community in a Mediterranean reserve (Cyprus)

GEORGIOS MICHAELIDES and VASSILIKI KATI*

Department of Environmental and Natural Resources Management, University of Ioannina, Seferi 2, 30100 Agrinio, Greece

Received: 4 May 2009 Accepted after revision: 14 September 2009

The current study explores the diversity patterns of the lizard species assembly found on the Mediterranean island of Cyprus with the broader aim of providing guidelines for the conservation management of these types of Mediterranean species communities. We sampled lizards in eight quadrats of 10 ha each, located in the Xeros Potamos protected area (SW Cyprus), and recorded 16 environmental parameters for each quadrat. We identified eight lizard species, five of which are protected under European legislation (*Ablepharus budaki*, *Chalcides ocellatus*, *Laudakia stellio*, *Mediodactylus kotschyi*, *Ophisops elegans*), and one that is listed as endangered (*Acanthodactylus schreiberi*) based on IUCN assessments. The microhabitats used by the resident lizard community in the study area were defined best by substrate, bush cover, humidity, altitude and inclination (RDA). Traditionally cultivated land with hedges harbored the highest lizard diversity. The typical habitat for the endangered species *A. schreiberi* consisted of humid sandy river banks with bush cover, a habitat currently threatened by the Xeros Potamos River channelization. Immediate action should involve the establishment of a control mechanism for the protection of the sandy riverbeds from illegal deposit of construction debris, the removal of embankments, and the sustainable use of water so as to maintain the natural flow regimes of the river.

Key words: *Acanthodactylus schreiberi*, ecology, NATURA 2000, reptiles, river channelization.

INTRODUCTION

Reptilian taxa are declining worldwide for a number of reasons including habitat loss and fragmentation, climate change, introduced invasive species, environmental contamination, disease or unsustainable use (Gibbons *et al.,* 2000; Araújo *et al.*, 2006). Furthermore, reptiles can be sensitive indicators of human-induced environmental changes stemming from intensified grazing (Read, 2002), shifts in forest management practices (McLeod & Gates, 1998; Greenberg & Waldrop, 2008), burning regimes (Wilgers & Horne, 2006), or general human land use. The need to acquire a more detailed understanding of their ecological preferences is a prerequisite for developing efficient conservation management plans and monitoring schemes.

Corresponding author: tel.: +30 26410 74193, fax: +30 26410 33716, e-mail: vkati@cc.uoi.gr, info@cbcd.eu

This need is even more pronounced in biodiversity hotspots, such as the Mediterranean Basin, which harbours both exceptional concentrations of endemic species, while experiencing severe habitat loss or degradation (Myers *et al.*, 2000). Cyprus is the third largest island in the Mediterranean and hosts a special fauna and flora, as it lies at the crossroads of Europe, Asia and Africa (Blondel & Aronson, 1999). While the island of Cyprus is included in the top ten regional biodiversity hotspots in the Mediterranean in regard to plant endemism (Médail & Quézel, 1999), its herpetofauna is not particularly important in terms of species richness and endemics (Corti *et al.*, 1999; Grenyer *et al.*, 2006). Furthermore, the distribution of the herpetofauna of Cyprus is poorly studied, and this lack of knowledge is even more pronounced for the proposed NATURA 2000 network of protected areas.

This study aims to fill some of these knowledge gaps by investigating the herpetofauna of the “Xeros

Potamos" reserve in Cyprus, which constitutes a proposed Site of Community Interest (pSCI) and additionally has been proposed as a Special Protection Area for birds (SPA) (European Union Directives 92/43 EEC and 79/409 EEC, respectively). Specifically, our objectives were to: (a) investigate the diversity patterns of the lizard community in Xeros Potamos, (b) evaluate their habitat preferences, with a special emphasis on protected taxa and (c) provide guidelines for applied conservation management of the local lizard community. Insights produced from this study may be applicable to other Mediterranean areas (beyonf the studied site) with respect to conservation management.

MATERIALS AND METHODS

Study area

The study area is situated in south-western Cyprus (34°71′-34°85′ N, 32°53′-32°67′ E), about 2 km away from the coast and covers an area of ~41 km^2. The local climate is Mediterranean, with long, dry and hot summers and mild winters; the dry season expands for over 7 months, while the mean annual temperature is 27.3°C and the mean annual rainfall is 418.5 mm. The study area centers on the valley formed by the Xeros Potamos River, an intermittently flowing Mediterranean river that has been designated as a priority habitat for conservation according to European legislation (Annex I, 92/43 EEC). The construction of a dam in the lower part of the river in 1980 resulted in the formation of an artificial lake, and disrupted the natural flow of water to the river estuary. Study site elevations range from 30 to 700 m. The study area includes nine European habitat types (European Commission, 2003) and one assigned only to Cyprus (reedbed CY02), and includes mainly phryganas (38%), Mediterranean pine forests (17%) and pseudo-steppes with grasses and annuals (16%) (Fig. 1).

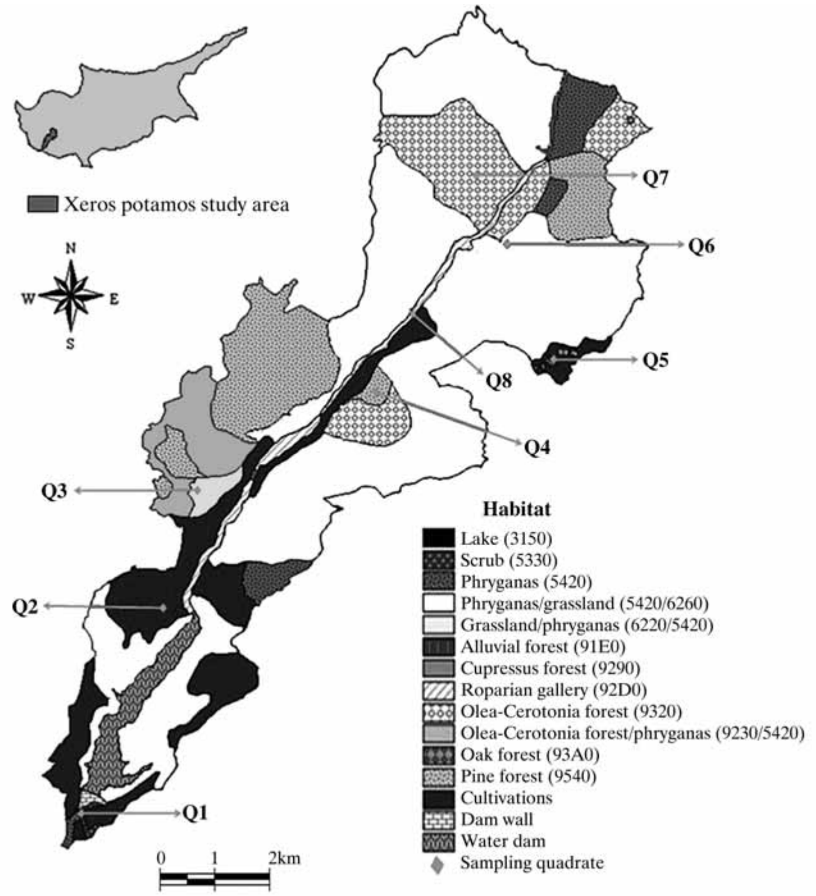

FIG. 1. Study area of Xeros Potamos in Cyprus and location of sampling quadrats (Q). The habitat codes used refer to the European habitat typology (see European Commission, 2003).

Sampling

We randomly placed eight quadrats of 10 ha each to represent the habitat types in the study area. We divided each quadrat in ten sub-quadrats and noted the average cover of high and low bushes, grasses, soil, and stony substrate for each quadrat, with the help of 1:100 aerial photographs and *in situ* ground-truthing (Table 1, Fig. 1). During a 120 min systematic transect sample of each quadrat we recorded all individual lizards encountered. We repeated the sampling four times during one year period (in April, June, July and October of 2006). To standardize sampling efficiency we conducted each sampling during the morning hours when ambient temperatures ranged between 25 and 29 °C.

To describe lizard microhabitats we also collected for each quadrat the following 16 environmental parameters: altitude, soil humidity, shade, inclination, aspect, microhabitat vegetation (four parameters), and microhabitat substrate (six parameters). For soil humidity measurement, we used humidity counter apparatus (Trime-Fm-Imko) to take samples at 50 cm soil depth (October), at 5 randomly selected locations in each quadrat and then calculated plot averages. At a finer scale, we described the microhabitat around a circle of 0.5 m radius for each lizard encountered. We estimated the proportion of microhabitat shade (%), and inclination (%) and used eight categories for aspect. We used the following four parameters relating to microhabitat vegetation: absence of vegetation, presence of tall bushes (1.6-7 m), presence low bushes (0.3-1.5 m) and presence of grasses. We also used six qualitative parameters in regard to microhabitat substrate: the presence of rocks (> 50 cm), stones (> 0.2 cm), gravel (< 0.2 cm), dry hard soil, loose soil and sand. Finally, we noted the substrate on which each animal was encountered (under/on stones, under/on leaves-grasses, under/on tree-bushes, on rocks, on the road).

Data analysis

We calculated the Chao 1 and the abundance-based coverage estimator (ACE) using Estimate S software (Colwell, 2006). These estimators are non-parametric tools (independent of the species community distribution model) that estimate the actual number of species present in the study area and hence evaluating sampling efficiency, based on the frequency of rare species in the sample (Magurran, 2004). We created the rank/abundance of Whittaker plot ($\log_{10}$ scale) and we estimated species diversity of the quadrats on the basis species richness (S), number of individuals (N) and the reciprocal of Simpson's index (1/D) (Magurran, 2004). We also created a hierarchical tree of the quadrats on the basis of reptile community composition, using Ward's hierarchical clustering method and the option of x^2 coefficient of similarity (Legendre & Legendre, 1998) (SPSS software, version 14). We also conducted a constrained ordination to identify the environmental parameters influencing species presence, using microhabitat data collected in the field (CANOCO software: ter Braak & Smilauer, 2002). The species dataset presented a linear response to environmental parameters (Detrended Correspondence Analysis – DCA). We used therefore the Redudancy Analysis (RDA) to find those environmental parameters that regulated significantly ($p < 0.05$) lizard species distribution, and that did not suffer from collinearity (1000 permutations in a Monte Carlo test).

RESULTS

We recorded 848 individual lizards belonging to eight species, and four families (Agamidae, Gekkonidae, Lacertidae and Scincidae), out of the 11 lizard species of Cyprus. The three species not recorded in the study area were: *Chamaeleo chamaeleon*, *Hemidactylus turcicus*, and *Eumeces schneideri*. Five of the species sampled (*Ablepharus budaki*, *Chalcides ocellatus*, *Laudakia stellio*, *Mediodactylus kotschyi*, *Ophisops elegans)* have been afforded legal protection in Europe (Appendix IV, 92/43 EEC). One species, *Acanthodactylus schreiberi*, is considered endangered according to the Red List of threatened species (Hraoui-Bloquet *et al.*, 2006) (Table 2). Our sampling was exhaustive, given that the species richness estimation was between 8 and 8.58 (Chao 1 and ACE estimators respectively).

Ecological structure

Ward's clustering procedure distinguished three clusters of quadrats (Fig. 2). The first cluster grouped together the mosaic-character sites (Q1, Q8) which combined several vegetation types and were additionally characterized by an important stony substrate along the riverbeds (Q8) or the lakeshore (Q1) (Table 1). Open habitats with grassy or low bush undergrowth, located either in cultivations, phrygana or pinewoods formed the second cluster (Q2, Q3, Q4, Q6). The third cluster included two quadrats that

TABLE 1. Quadrat description and species diversity of the lizard community

Q	Natura code	Habitat description	Topography		Vegetation			Ground			Species Diversity		
			Alt (m)	Exp	TB	LB	Gr	So	St	H	S	N	1/D
1	5420 X 3150 X 5330 X Cult. X CY02	phrygana X lake X pre-desert scrub X cultivations X reedbeds	50	W	2	2	2	2	3	12	5 (3)	90	3.12
2	Cult.	cultivations with hedges	150	SE	2	1	2	3	2	12	8 (5)	97	2.25
3	6220* X 5420	xerophile grassland X phrygana	150	SE	2	1	3	2	1	13	4 (2)	69	1.63
4	9540	semi-open pine wood	250	N	2	4	1	2	1	10	3 (2)	72	1.85
5	Cult. X 93A0*	vineyard with hedges X oak wood	650	NW	3	2	2	2	1	13	5 (3)	152	1.90
6	5420 X 6220*	phrygana X xerophile grassland	350	SE	2	1	3	3	1	13	4 (2)	80	1.80
7	9320	olive grove with tall bushes	450	E	3	3	3	2	1	10	5 (3)	146	2.13
8	92D0 X 5420 X 6220* X 9540	river bed X phrygana X xerophile grassland X pine wood	250	SW	2	1	2	2	4	14	2 (2)	142	1.41

Topography: Alt: altitude, Exp: exposure (N: north, E: east, W: west, NW: north-west, SE: south-east, SW: south-west); **Vegetation:** TB: tall bushes (1.6-7 m), LB: low bushes (0.3-1.5 m), Gr: grass; **Ground:** So: bare soil, St: stony substrate, H: humidity; **Species diversity:** S: number of species, (numbers in parentheses indicate protected species of 92/43 EEC or endangered), N: number of individuals, 1/D: Simpson reciprocal index. Categories of vegetation and ground: 1: <5%, 2: 6-25%, 3: 26-50%, 4: 51-75%, 5: >75%.

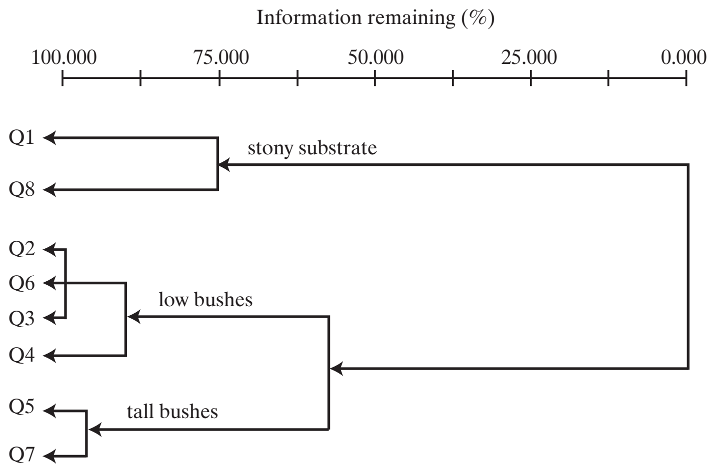

FIG. 2. Ward's hierarchical tree based on the similarity of species communities across the quadrats sampled.

TABLE 2. Abundance matrix of lizard species across the quadrats sampled. Cell value refers to the overall number of individuals recorded and species names follow Fauna Europaea (2004)

Species	**Quadrats**								**Total**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Ablepharus budaki *	0	3	0	4	2	0	0	0	9
Acanthodactylus schreiberi E	30	3	0	0	0	0	9	117	159
*Chalcides ocellatus**	0	1	0	0	0	0	0	0	1
Euprepis vittatus	1	4	1	0	0	0	0	0	6
Phoenicolacerta troodica	0	8	0	18	37	7	8	0	78
*Laudakia stellio**	23	13	11	0	8	13	26	0	94
*Mediodactylus kotschyi**	1	2	4	0	1	2	7	0	17
*Ophisops elegans**	35	63	53	50	104	58	96	25	484

* species listed under the Appendix IV of 92/43 EEC, E: Endangered species (IUCN, 2007)

were located at higher altitudes and contained extensive cover of tall bushes and low trees (Q5, Q7) (Fig. 2, Table 1).

Eight environmental parameters influenced significantly the distribution patterns of lizard species assemblage (31% of dataset variability explained) (Fig. 3). The first axis reflected a gradient from microhabitats of higher altitudes and with tall bush cover to localities at lower altitudes, with greater humidity, and sandy substrate. The second axis was a gradient from microhabitats with softer soil to more bare microhabitats with greater inclination and stony to rocky substrates (Fig. 3). The presence of humid sandy substrate was the main factor that was associated positively with the presence of *A. schreiberi*, whereas higher altitudes and the presence of tall bushes defined the presence of *Ophisops elegans* and *Phoeni-*

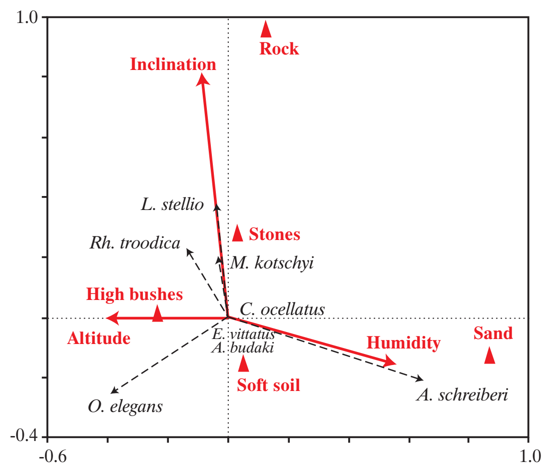

FIG. 3. Environmental parameters affecting significantly ($p < 0.05$) the lizard species distribution using Redundancy Analysis (RDA). Species located in the center are not significantly influenced.

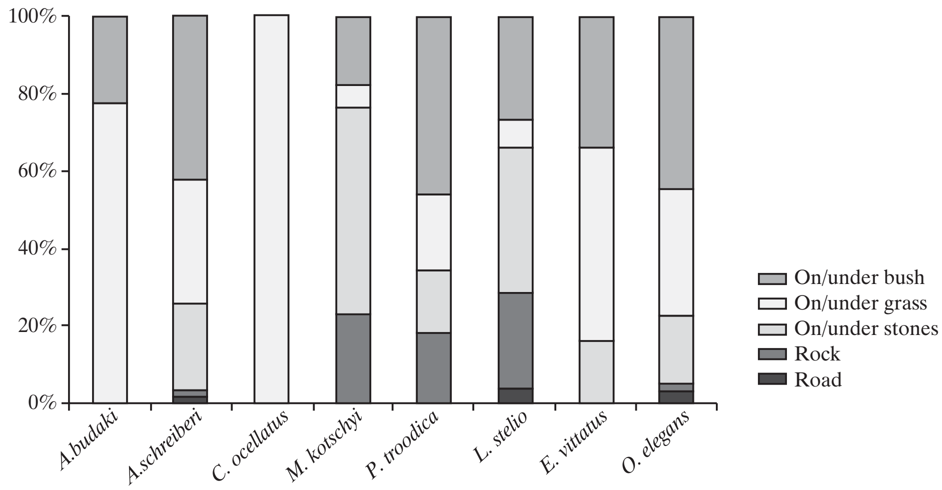

FIG. 4. Frequency (%) of species encountered in different substrates and total number of individuals per species.

colacerta troodica. Presence of stony substrate was associated with the presence of *Mediodactylus kotschyi, Laudakia stellio* and also *P. troodica.* Neither of these environmental parameters was significantly associated with the presence of those species positioned in the center of the RDA diagram (*C. ocellatus*, *E. vittatus*, *A. budaki).*

Type of substrate

We recorded lizards mostly under/on bushes (41%), grasses or leaves (29%), and stones (21%), whereas only rarely under/on rocks (6%) and on the road (2%) (Fig. 4). *Chalcides ocellatus* (encountered only once), *A. budaki* and *E. vittatus*, were mostly recorded under grasses and leaves. On the other hand, *M. kotschyi*, *P. troodica* and *L. stellio* were found on a diversity of substrates, but most frequently on rocky or stony ground or under bushes. The two most abundant species in the study area, *O. elegans* and *A. schreiberi*, were encountered on a diversity of substrates, but very frequently (42-43%) under bushes.

Diversity

The most important quadrat in terms of species-richness, supporting all the species of the study area, were the cultivations (Q2), consisting in agricultural fields of cereals separated with hedges (Table 1). Three more quadrats were quite species-rich as they included five species, three of which were of conservation importance: a mosaic of habitats including phrygana and cultivations (Q1), a vineyard at higher altitude (Q5) and an olive grove with bush undergrowth (Q7). The quadrats Q1, Q2 and Q7 had also in descending order the greatest evenness of relative abundance distribution among species, as indicated by the reciprocal of Simpson's index (1/D) and by the rank/abundance plot (Table 1, Fig. 5). The least species-rich quadrat with the least evenness of relative abundance among species was mosaic Q8, including river bed, phrygana, grassland and pine wood habitats (Table 1, Fig. 5). Although it supported only two species, its conservation value was high, as it supported a dominant population of the endangered *A. schreiberi*, with relative abundance varying between 12 and 56 individuals per quadrat in April and October, respectively. Notably, among the various habitats contained in Q8, we encountered *A. schreiberi* exclusively in the stony river bed, as well as the associated sandy humid river banks and their important cover of low bushes (Table 1).

DISCUSSION

Ecological structure

We found that degree of humidity, type of substrate (sand, soft soil, or stones-rock), as well as the altitude, inclination and the presence of tall bushes were the most important factors defining the lizard communities in our study area. Some of these parameters determine important reptile habitats in other Mediterranean areas as well (e.g. Strijbosch *et al.*, 1989; Ioannidis & Bousbouras, 1997; Kati *et al.*, 2007; Soares & Brito, 2007). The α-diversity of the reptile community is mainly determined by the presence of appropriate microhabitats on a small scale, rather than by the

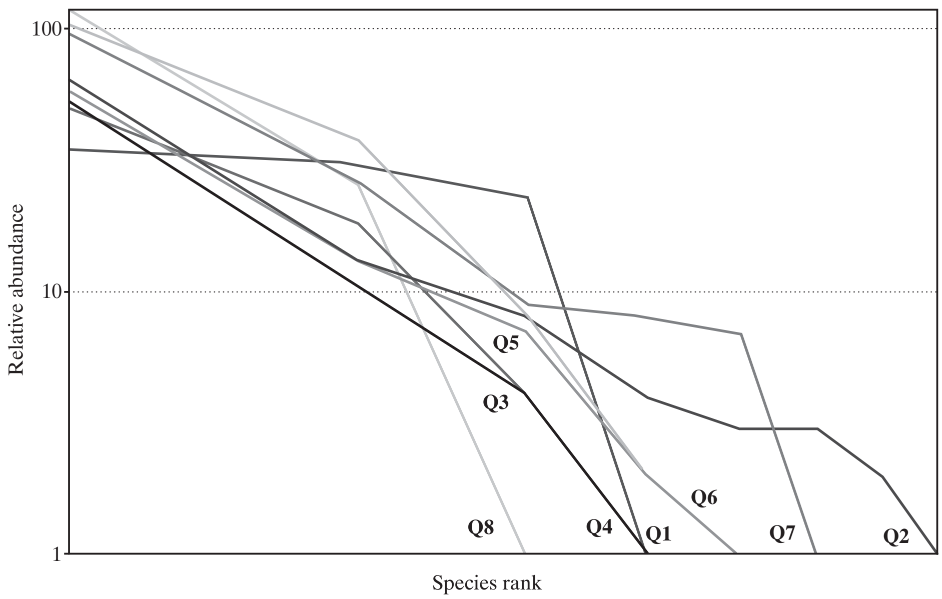

FIG. 5. Relative abundance curves for lizard species on the eight quadrats. Curves represent the relative abundances of species on a logarithmic scale ($\log_{10}$) plotted in sequence from most to least abundant.

general composition of the dominant vegetation types (Block & Morrison, 1998), landscape heterogeneity (Atauri & De Lucio, 2001), or degree of fragmentation at larger scales (Jellinek *et al.*, 2004).

According to Ward's dendrogram, the lizard community is structured into three ecological clusters, on the basis of similarities in species composition across quadrats. These clusters did not correspond to the hierarchical European habitat typology, which is developed after the composition of dominant plant species and vegetation physiognomy. Therefore, at least for this study area, standard European habitat types should not be used as predefined management units for lizard community conservation.

Ecological requirements of protected species

Ablepharus budaki

While Budak's Snake-Eyed Skink is a species of conservation concern in Europe (92/43 EEC) it is quite common on Cyprus, and is classified as a taxon of Least Concern by IUCN criteria (Lymberakis *et al.*, 2006). Nonetheless, we had only nine observations of the species in our study area, although this most likely attributable to cryptic behaviour rather than actual rarity. We mostly encountered this lizard in leaf litter and grass duff, both of which are considered typical habitats for the species, and more rarely under bushes.

Acanthodactylus schreiberi

Schreibers' fringe fingered lizard is currently listed as endangered due to its serious population decline (more than 50%), the limited extent of its occurrence and area of occupancy, and its fragmented distribution (Hraoui-Bloquet *et al.*, 2006). We recorded this lizard in great abundance in the study area but only within specific habitats: it was found almost exclusively along the river banks as well as within the dry riverbed of Xeros Potamos (Q8), in humid microhabitats with sandy and less stony substrate, and with an important cover of low bushes of ~40 cm height. According to RDA results, its presence is tied to low altitude, high humidity and sandy substrate sites. Within these locations it was recorded in a diversity of substrates such as under bushes, on/under grasses/leaves, or stones. Although its typical habitat has been described as coastal sand dunes (Hraoui-Bloquet *et al.*, 2006) all of the plots where we encountered it were away from the sea (> 2 km).

Chalcides ocellatus

The Ocellated skink is a species of European conservation concern (92/43 EEC). This species is very rare on our study site with a single record from grass litter substrate.

Laudakia stellio

The Rough-tailed agama is a species of European conservation concern (92/43 EEC). It is quite widespread and abundant in the study area (94 observations). We recorded it in a diversity of habitats such as cultivations, phrygana, olive grooves, scrubs and grasslands. Its presence was associated with localities of greater inclination. In particular it was tied to the occurrence of stones and rocks (RDA), and was encountered in a diversity of substrates including rocks, stones and bushes.

Mediodactylus kotschyi

Kotschy's Gecko is a species of European conservation concern (92/43 EEC). It is quite widespread in the Xeros Potamos protected area but is not very abundant (17 observations). In our study area it was generally sympatric with the Rough-tailed agama. Its typical habitat is dry stony localities covered with scrub vegetation (Valakos *et al.*, 2008).

Ophisops elegans

The Snake-eyed Lizard is a species of European conservation concern (92/43 EEC). It was the most widespread and abundant species in the Xeros Potamos protected area occurring in all quadrats sampled. The species occurs typically in open phrygana, but also in bare or stony land (Valakos *et al.*, 2008). We recorded it on all substrates, including roads, rocks, stones, grasses and bushes. Nonetheless its presence appeared to be tied to three particular factors: higher altitude, cover of tall bushes and presence of soft soil (RDA).

Diversity conservation

Cultivated land is the most important habitat for conserving lizard diversity, because it supports a healthy community of lizards, including all the species of the reserve with even abundance distribution among them. It consists mainly of traditionally cultivated agricultural plots with cereals and plots of lemon trees. Typically, hedges of low or occasionally taller bushes are used to separate the plots. Such hedgerows, interspersed between cultivations increase habitat heterogeneity at a small scale, providing a diversity of microhabitats with variable bush cover or substrate type suitable for different lizard species. The ecological value of traditional agricultural landscapes containing hedgerows has been shown to be considerable for a diversity of taxonomic groups such as the breeding birds (Hinsley & Bellamy, 2000), mammals (MacDonald *et al.*, 2007), or plants (Garcia Del Barrio *et al.*, 2006). Hence, this study provides additional evidence supporting the European common agricultural policy (CAP) towards the maintenance of this type of landscape in the Mediterranean region.

The river bed of Xeros Potamos was the poorest in terms of species richness and with a great population dominance of one species. However, the dominant species was the resident *A. schreiberi* and therefore the humid sandy river banks of Xeros Potamos dotted with low bushes represented its typical habitat should be considered to be high value habitat for the conservation of this species. This species suffers locally from habitat loss due to lack of sustainable water management, illegal debris deposit and river channelization. The latter is currently carried out through high (> 170 cm) artificial embankments built up in several parts along the river, to increase water supply in the artificial lake of the dam (Fig. 1). This activity will eventually result in the eventual loss of the fingered lizard population, given the disruption of the natural water flow of the river, and the prevention of sandy sediment deposition that forms its habitat. Natural rivers and their fringing riparian zones are considered among the most threatened ecosystems worldwide (Tockner & Stanford, 2002). One of the main threats is river channelization damaging the riverside habitats and threatening several other taxa, such as riparian arthropods, fish or plant communities (e.g. Paetzold *et al.*, 2008). Immediate conservation measures should involve the establishment of control mechanism for the protection of the sandy riverbeds from illegal debris deposit, the removal of embankments, the restoration of natural species habitats and finally the sustainable water use so as to maintain the natural ecological flow pattern of the river and to retain adequate humidity conditions. The latter measure is also important for the restoration of Xeros Potamos estuary zone.

Unsustainable water management in the area cuts off any freshwater supply to Xeros Potamos estuary, resulting in erosion, severe alteration of its vegetation physiognomy and in amphibian population decrease. Further research is however needed to assess current population status of the species in the estuary zone as well.

Herpetofaunal diversity is an important component of the overall biodiversity in Mediterranean regions and should be considered in general to be an independent group for inventorying and monitoring in European protected areas (Tuberville *et al.*, 2005). The future management plan and monitoring scheme of the Xeros Potamos site as a part of the NATURA 2000 network should include lizard community and develop independent management actions, adapted to each species apart, with emphasis on the five protected species of the area.

ACKNOWLEDGEMENTS

We are grateful to Y. Ioannidis for field support and to J. Foufopoulos and P. Maragou for their helpful comments that greatly improved this manuscript.

REFERENCES

Araújo MB, Thuiller W, Pearson RG, 2006. Climate warming and the decline of amphibians and reptiles in Europe. *Journal of biogeography*, 33: 1712-1728.

Atauri JA, De Lucio JV, 2001. The role of landscape structure in species richness distribution of birds, amphibians, reptiles and lepidopterans in Mediterranean landscapes. *Landscape ecology*, 16: 147-159.

Block WM, Morrison ML, 1998. Habitat relationships of amphibians and reptiles in California oak woodlands. *Journal of herpetology*, 32: 51-60.

Blondel J, Aronson J, 1999. *Biology and Wildlife of the Mediterranean Region*. Oxford University Press, New York, USA.

Colwell RK, 2006. *Estimate S: Statistical Estimation of species richness and shared species from sample. Version 8.2. User's Guide*. Available via http://viceroy.eeb.uconn.edu/EstimateSPages/EstSUsersGuide/EstimateSUsersGuide.htm

Corti C, Masseti M, Delfino M, Perez-Mellado V, 1999. Man and herpetofauna of the mediterranean islands. *Revista espanola de herpetologia*, 13: 83-100.

European Commission, 2003. *Interpretation Manual of European Union Habitats (EUR25).* European Commission, Brussels, Belgium.

Fauna Europaea, 2004. *Fauna Europaea version 1.1*. Available via http://www.faunaeur.org

Garcia Del Barrio JM, Ortega M, Vazquez De La Cueva A, Elena-Rossello R, 2006. The influence of linear elements on plant species diversity of mediterranean rural landscapes: Assessment of different indices and statistical approaches. *Environmental monitoring assessment*, 119: 137-159.

Gibbons JW, Scott DE, Ryan TJ, Buhlmann KA, Tuberville TD, Metts BS, Greene JL, Mills T, Leiden Y, Poppy S, Winne CT, 2000. The global decline of reptiles, déjà vu amphibians. *Bioscience*, 50: 653-666.

Greenberg CH, Waldrop TA, 2008. Short-term response of reptiles and amphibians to prescribed fire and mechanical fuel reduction in a southern Appalachian upland hardwood forest. *Forest ecology and management*, 255: 2883-2893.

Grenyer R, Orme CDL, Jackson SF, Thomas GH, Davies RG, Davies TJ, Jones KE, Olson VA, Ridgely RS, Rasmussen PC, Ding T-S, Bennett PM, Blackburn TM, Gaston KJ, Gittleman JL, Owens IPF, 2006. Global distribution and conservation of rare and threatened vertebrates. *Nature*, 444: 93-96.

Hinsley SA, Bellamy PE, 2000. The influence of hedge structure, management and landscape context on the value of hedgerows to birds: A review. *Journal of environmental management*, 60: 33-49.

Hraoui-Bloquet S, Sadek R, Werner Y, Lymberakis P, Tok V, Ugurtas I, Sevinç M, Böhme W, 2006. *Acanthodactylus schreiberi*. In: *2008 IUCN Red List of Threatened Species.* Available via: www.iucnredlist.org

Ioannidis Y, Bousbouras D, 1997. The space utilization by the reptiles in Prespa National Park. *Hydrobiologia*, 351: 135-142.

Jellinek S, Driscoll DA, Kirkpatrick JB, 2004. Environmental and vegetation variables have a greater influence than habitat fragmentation in structuring lizard communities in remnant urban bushland. *Austral ecology*, 29: 294-304.

Kati V, Foufopoulos J, Ioannidis Y, Papaioannou H, Poirazidis K, Lebrun Ph, 2007. Diversity, ecological structure and conservation of herpetofauna in a Mediterranean area (Dadia National Park, Greece). *Amphibia-reptilia*, 28: 517-529.

Legendre P, Legendre L, 1998. *Numerical Ecology. Developments in Environmental Modelling 20*. Elsiever Science, Amsterdam, The Netherlands.

Lymberakis P, Crochet P-A, Tok V, Ugurtas I, Sevinç M, Hraoui-Bloquet S, Sadek R, 2006. *Ablepharus budaki*. In: *2008 IUCN Red List of Threatened Species*. Available via: www.iucnredlist.org

MacDonald DW, Tattersall FH, Service KM, Firbank LG, Feber RE, 2007. Mammals, agri-environment schemes and set-aside; what are the putative benefits? *Mammal review*, 37: 259-277.

Magurran AE, 2004. *Measuring biological diversity*. Blackwell Publishing, USA.

McLeod RF, Gates JE, 1998. Response of herpetofaunal communities to forest cutting and burning at Chesapeake Farms, Maryland. *American midland naturalist*, 139: 164-177.

Médail F, Quézel P, 1999. Biodiversity hotspots in the Mediterranean Basin: setting global conservation priorities. *Conservation biology*, 13: 1510-1513.

Myers N, Mittermeier RA, Mittermeier CG, da Fonseca AB, Kent J, 2000. Biodiversity hotspots for conservation priorities. *Nature*, 403: 853-858.

Paetzold A, Yoshimura C, Tockner K, 2008. Riparian arthropod responses to flow regulation and river channelization. *Journal of applied ecology*, 45: 894-903.

Read JL, 2002. Experimental trial of Australian arid zone reptiles as early warning indicators of overgrazing by cattle. *Austral ecology*, 27: 55-66.

Soares C, Brito JC, 2007. Environmental correlates for species richness among amphibians and reptiles in a climate transition area. *Biodiversity and conservation*, 16: 1087-1102.

Strijbosch H, Helmer W, Scholte PT, 1989. Distribution and ecology of lizards in the Greek province of Evros. *Amphibia-reptilia*, 10: 151-174.

ter Braak CJF, Smilauer P, 2002. *CANOCO reference manual and canoco draw for windows user's guide: software for canonical community ordination (version 4.5).* Microcomputer Power Ithaca, New York, USA.

Tockner K, Stanford JA, 2002. Riverine flood plains: present state and future trends. *Environmental conservation*, 29: 308-330.

Tuberville TD, Willson JD, Dorcas ME, Gibbons WJ, 2005. Herpetofaunal species richness of southeastern national parks. *Southeastern naturalist*, 4: 537-569.

Valakos ED, Pafilis P, Sotiropoulos K, Lymberakis P, Maragou P, Foufopoulos J, 2008. *The Amphibians and reptiles of Greece*. Chimaira, Frankfurt, Germany.

Wilgers DJ, Horne EA, 2006. Effects of different burn regimes on tall grass prairie herpetofaunal species diversity and community composition in the Flint Hills, Kansas. *Journal of herpetology*, 40: 73-84.