

Composition of the reptile communities in five urban protected areas of different isolation degrees

Zusammensetzung der Reptiliengemeinschaften in fünf urbanen Schutzgebieten unterschiedlichen Isolationsgrades

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KURZFASSUNG

Der Autor untersuchte zwischen März 2001 und Juli 2002 die artliche Zusammensetzung von Reptiliengemeinschaften von fünf Schutzgebieten im Stadtgebiet von Rom (Italien). Diese Gebiete bedeckten Flächen zwischen 204 und 774 Hektaren und waren in verschiedenem Ausmaß von benachbarten natürlichen Lebensräumen isoliert. Die beobachteten Reptiliengemeinschaften bestanden aus 8 bis 13 Arten und waren regelmäßig durch einige besonders anpassungsfähige Formen dominiert, und zwar von den Echsen *Lacerta bilineata*, *Podarcis muralis*, *P. sicula* und *Chalcides chalcides* sowie der Schlange *Hierophis viridiflavus*. Schildkröten und die meisten Schlangenarten waren in den einzelnen Untersuchungsgebieten selten aber zumindest in einem lebte eine reproduzierende Population der in ihrem Bestand gefährdeten Schildkrötenart *Testudo hermanni*. Flächenausdehnung, Isolationsgrad und das Vorhandensein von Waldgebieten scheinen bedeutende Faktoren für das Überleben von Reptiliengemeinschaften in diesen innerstädtischen Schutzgebieten zu sein.

ABSTRACT

From March 2001 to July 2002, the author investigated the composition of the reptile communities of five protected areas situated in the urban area of Rome (Italy). These study areas ranged from 204 to 774 hectares in size and were isolated from adjacent natural habitats to different degrees. The reptile communities observed were composed of 8 to 13 species, and constantly dominated by some very adaptive forms, i.e. the saurians *Lacerta bilineata*, *Podarcis muralis*, *P. sicula* and *Chalcides chalcides*, and the snake *Hierophis viridiflavus*. Tortoises and most of the snake species were rare in the various study areas, but at least in one reserve there was a reproductive population of the vulnerable species *Testudo hermanni*. Size, isolation degree and presence of woodlands seemed to be important factors for the survival of reptile communities in these urban protected areas.

KEY WORDS

Reptilia; reptile communities, urban protected areas, fragmentation, isolation, ecology, conservation, Rome, Italy

INTRODUCTION

Many factors are known to influence considerably the animal populations inhabiting areas situated inside great cities. Among these factors are worth mentioning the environmental diversity and the degree of conservation, as well as the surface area and the degree of isolation (MASSA & INGEGNOLI 1999). The metropolitan area of Rome includes several "green areas", mostly of small size. Besides the historical urban parks which usually present a low conservation degree of the environment and are heavily visited by people (Villa Borghese, Villa Ada, Villa Doria Pamphili, and other smaller), there are other areas which resemble natural sites more closely, why they were protected by law during the nineties. Most

of these areas are just a few hundreds of hectares in size and quite isolated from other "green areas". Because of these characteristics, they may represent interesting case studies as for the management of small and fragmented portions of natural zones inside a very anthropogenically influenced territory.

Reptiles were selected in order to evaluate the integrity level of these reserves. In this paper I present the results of an investigation on the composition of the reptile communities in five protected areas in the city of Rome. These five areas are supposed to be representative of the most interesting environments found in Rome with regard to both "green" surface and isolation.

STUDY AREAS AND METHODS

Natural reserve "Tenuta dei Massimi" is an agricultural area with bushed sectors (mainly *Quercus suber* or *Qu. cerris* and *Qu. frainetto* woodlands). The grassy pastures are interspersed with bushes, mainly *Rubus ulmifolius*. Mediterranean scrubs, mainly bushes of *Spartium junceum*, are often found along the edges of *Qu. suber* woods. Stream banks are covered with hygrophilus tree species, mainly *Salix alba*, but also *Populus nigra*, *P. tremula* and *Robinia pseudoacacia*, and long tracts with cane-breds.

Park "Pineto" has wide grassy areas, with remnants of woodland (mainly *Qu. suber*) or Mediterranean scrub with bushes of *S. junceum*, *Cistus salvifolius* and *Erica arborea*. Bushy zones with *R. ulmifolius* mixed with *Pteridium aquilinum* and *Sambucus* spp. are also present. In the park there is also a wet area with small marshes and streams.

Natural reserve "Valle dell' Aniene" consists of the urban tract of the river Aniene, and, consequently, is of very elongated and narrow shape. The vegetation of

the river banks is the most important habitat of the reserve, with *S. alba*, *P. nigra*, *P. alba*, *Ulmus minor* and *R. pseudoacacia* as the most common tree species. Inside the reserve there is a small wet area ("Cervelletta"), characterized by swamps linked to small streams, where the water quality is better than in the rest of the reserve. I made most of the surveys in this latter zone. Vegetation here includes *Iris pseudacorus*, *Typha latifolia*, *Phragmites australis*, *Matricaria camomilla*, *Sambucus nigra*, *Conium maculatum*.

Natural reserve "Monte Mario" is a hilly area characterized by woodlands, mainly *Qu. ilex* and *Qu. suber*, but also *Qu. cerris*, *Qu. frainetto*, *Qu. pubescens* and *Fraxinus ornus* (BLASI 2000). Some areas include Mediterranean scrub with *Pistacia lentiscus*, *Phillyrea latifolia*, *S. junceum*, *C. salvifolius*, and *Osyris alba*, *Asparagus acutifolius*, *Foeniculum vulgare*, *Brachypodium rupestre* (BLASI 2000).

Natural reserve "Insugherata" comprises elevated terrain and narrow valleys, with

Table 1: Characteristics of five study areas situated in the municipal territory of the city of Rome (Italy). AC - portion of the study area's circumference bordered by adjacent natural habitats (%); DIM - surface (in hectares); ETD - research days totally devoted to extra-transect observations; TR - research days devoted to transect observations; TD - total number of research days. In each of the study areas, the total length of the four transects was 1,200 m.

Tab 1: Merkmale und Untersuchungsafwand der fünf Untersuchungsgebiete im Stadtbereich von Rom (Italien). AC - Anteil der Grenzen des Untersuchungsgebietes, an den außerhalb naturnahe Lebensräume anschließen (%); DIM - Flächengröße (in Hektaren); ETD - Anzahl Begehungstage außerhalb der Transekte; TR - Anzahl Begehungstage entlang der Transekte; TD - Gesamtzahl von Begehungstagen. In jedem der Untersuchungsgebiete betrug die Gesamtlänge der Transekte 1200 m.

Study area / Untersuchungsgebiet	DIM (ha)	General Description / Allgemeine Beschreibung	AC (%)	TR	ETD	TD
"Massimi"	774	High percentage of agricultural zones and remnant woodlands (<i>Qu. suber</i> , <i>Qu. cerris</i>) / Hoher Anteil landwirtschaftlich genutzter Flächen und Waldreste (<i>Qu. suber</i> , <i>Qu. cerris</i>)	52	15	2	17
"Pineto"	243	Grassy zones and residual portions of Mediterranean scrub / Grasbewachsene Zonen und Restflächen mediterranen Buschwerks	0	15	2	17
"Aniene"	620	Banks of the River Aniene, as far as its confluence into the River Tiber / Ufer des Aniene-Flusses bis zur Mündung in den Tiber	23	15	6	21
"Monte Mario"	204	Hilly area, with woodlands / Hügeliges Gebiet mit Wäldern	0	15	3	18
"Insugherata"	697	Hydrographic basin of the stream "Acqua Traversa", narrow valleys with woodland / Einzugsgebiet des Flusses "Acqua Traversa", schmale Täler mit Wäldern	31	14	14	28

woodlands and pastures. Thermophilous woodlands (*Qu. suber*) are common and often associated with *Qu. pubescens* or *Qu. frainetto*, and *U. minor*, *Crataegus monogyna*, *S. junceum*. *Quercus cerris* is frequently associated with *Qu. frainetto* in some sectors of the reserve (BLASI 2000). There are slopes which present mixed mesophilous woodlands with *Castanea sativa*, *Carpinus betulus*, *F. ornus*, *Qu. cerris*, *Qu. robur*. Wet areas are also present.

Surveys were carried out from March 2001 to July 2002. In total, 101 man-days were spent in the field (table 1). I used transects which crossed typical habitats of the various study areas (table 1). In every study area four transects were laid. Every transect was sampled by walking very slowly and only once in each research day, and recording all the reptile sightings. However, I oppor-

tunistically collected data which came from sites outside the transects. This was done in days devoted to transect samplings as well as in the days entirely devoted to extra-transect observations (table 1). To avoid unnecessary loss of time, saurians were not captured because of their very high frequency. Snakes were marked by scale-clipping, and tortoises by notching one or more carapace plates, and by recording potential peculiarities (deformities, injuries) of the plates.

To estimate the degree of isolation of the five study areas, the proportion of adjacent natural habitats was calculated for each of them. For this purpose I circumscribed a quadrilateral around each reserve and determined the proportion of either natural landscape or urban structures (houses) along its sides in a linear fashion (table 1).

RESULTS AND DISCUSSION

The composition of the reptile communities appeared to be similar in all five study areas. The communities were made up of 8 to 13 species, and were constantly

dominated by some very adaptive forms, i.e. the saurians *Lacerta b. bilineata* DAUDIN, 1802, *Podarcis muralis nigriventris* BONAPARTE, 1836, *P. sicula campestris*

Table 2: Reptile species recorded from each of five study areas situated in the municipal territory of the city of Rome (Italy). Frequencies observed along transects in parentheses; e - observed outside of transects; b - cited in BOLOGNA (1999) but not found during the present study; * - cited in BOLOGNA et al. (2003) but not in BOLOGNA (1999) and not found during the present study.

Tab. 2: Die in fünf Untersuchungsgebieten im Stadtbereich von Rom (Italien) festgestellten Reptilienarten. In Klammern die Beobachtungshäufigkeiten entlang der Transekte; e - außerhalb der Transekte beobachtet; b - Vorkommen in BOLOGNA (1999) erwähnt aber im Rahmen der vorliegenden Untersuchung nicht gefunden; * - Vorkommen in BOLOGNA et al. (2003) aber nicht in BOLOGNA (1999) erwähnt und im Rahmen der vorliegenden Untersuchung nicht gefunden.

Species / Art	Study area / Untersuchungsgebiet				
	"Massimi"	"Pineto"	"Aniene"	"Monte Mario"	"Insugherata"
<i>Podarcis muralis</i>	(> 190)	(> 50)	(> 200)	(> 110)	(> 130)
<i>Podarcis sicula</i>	(> 10)	(> 230)	(< 10)	(> 110)	(> 20)
<i>Lacerta bilineata</i>	(> 130)	(> 200)	(> 110)	(> 50)	(> 120)
<i>Chalcides chalcides</i>	(> 20)	(> 80)	> 20 e	(> 60)	(> 30)
<i>Anguis fragilis</i>	b	1 e	-	b	b
<i>Tarentola mauritanica</i>	2 e	b	*	11 e	*
<i>Hemidactylus turcicus</i>	*	b	*	-	*
<i>Hierophis viridiflavus</i>	(16) + 10 e	(19) + 7 e	(17) + 7 e	(14) + 8 e	(23) + 26 e
<i>Natrix natrix</i>	b	(2)	(2) + 3 e	-	(2) + 2 e
<i>Elaphe longissima</i>	(2)	1 e	(1)	-	(4)
<i>Elaphe quatuorlineata</i>	-	-	*	-	b
<i>Vipera aspis</i>	2 e	b	*	-	(3)
<i>Testudo hermanni</i>	b	-	-	(1)	(4) + 10 e
<i>Emys orbicularis</i>	-	-	b	-	-
Σ species	12	11	12	8	13

Table 3: Comparative inventory of the reptile species found in relatively undisturbed (Natural Reserve Decima Malafede) and undisturbed (Regional Park of Canale Monterano; Regional Park of Monti Lepini) areas of the province of Rome. References are CORSETTI & CAPULA 1992; BOLOGNA 1999; CAPULA & LUISELLI 2000; FILIPPI & LUISELLI 2003).

Tab. 3: Vergleichende Angaben zur Zahl der Reptilienarten in relativ ungestörten (Naturreservat Decima Malafede) und ungestörten (Regionalpark Canale Monterano; Regionalpark Monti Lepini) Gebieten in der Provinz Rom. Die Angaben stammen aus CORSETTI & CAPULA 1992; BOLOGNA 1999; CAPULA & LUISELLI 2000; FILIPPI & LUISELLI 2003).

	Decima Malafede	Canale Monterano	Monti Lepini
<i>P. muralis</i>	*	*	*
<i>P. sicula</i>	*	*	*
<i>L. bilineata</i>	*	*	*
<i>C. chalcides</i>	*	*	*
<i>A. fragilis</i>	*	*	*
<i>T. mauritanica</i>	*	*	*
<i>H. turcicus</i>	*	*	*
<i>H. viridiflavus</i>	*	*	*
<i>N. natrix</i>	*	*	*
<i>N. tessellata</i>	-	*	*
<i>E. longissima</i>	*	*	*
<i>E. quatuorlineata</i>	*	*	*
<i>C. austriaca</i>	-	*	*
<i>C. girondica</i>	*	*	*
<i>V. aspis</i>	*	*	*
<i>T. hermanni</i>	*	*	*
<i>E. orbicularis</i>	*	*	*
Σ species	15	17	17

DE BETTA, 1857 and *Chalcides ch. chalcides* (LINNAEUS, 1758), and the snake *Hierophis v. viridiflavus* (LACÉPÈDE, 1789) (table. 2).

The reserves “Insugherata” and “Tenu-ta dei Massimi” housed 13 and 12 species, respectively. Among the various areas, these two reserves were the largest and least isolated, and presented the highest proportion of woodland territory (22 % and 18 %, respectively; BLASI 2000). “Aniene” had also a considerable number of species, but this was caused by its position as a natural corridor with the exterior of the town rather than its good conservation status.

The effects of habitat loss and fragmentation in these areas, due to their posi-

tion inside the town, have produced a considerable reduction in biodiversity. This is evident when we compare the numbers of reptile species observed with those found in undisturbed and relatively undisturbed areas of the province of Rome (see table 3). Seventeen is the maximum number of reptile species present in the province of Rome. *Coronella a. austriaca* LAURENTI, 1768, *C. girondica* (DAUDIN, 1803), and *Natrix t. tessellata* LAURENTI, 1768 were absent from the five study areas in Rome, and *E. quatuorlineata*, (LACÉPÈDE, 1789) *V. aspis*, *Testudo h. hermanni* GMELIN, 1789, and *Emys orbicularis galloitalica* FRITZ, 1995 were found in only a few urban areas where they are rare and endangered.

Apart from *H. viridiflavus*, snakes were rarely encountered in the various study areas. *Elaphe l. longissima* LAURENTI, 1768 was probably less rare than it appeared to be, due to its highly elusive habits (NAULLEAU 1993; FILIPPI 1995; CAPIZZI et al. 1996). *Natrix natrix helvetica* (LACÉPÈDE, 1789) observations were linked to wet habitats, and *V. aspis* was found only in wooded areas. The latter is consistent with the fact that, in the region of Rome, the presence of *V. aspis* seems to correlate directly with that of woodlands (FILIPPI 2000), and coastal evergreen scrub (FILIPPI & LUISELLI 2001), which is not found in the study areas. Although there are two records of *E. quatuorlineata* from “Insugherata” (BOLOGNA 1999), this species was not found during my surveys.

Testudo hermanni, a vulnerable species which is included in Appendix II of the 92/43/CEE directive, deserves particular attention. The status of its populations around and inside urban areas may be difficult to assess because of the accidental release of many captive specimens, which in turn may cause the diffusion of pathologies in the indigenous population as well as genetic impairment. The single specimen found in “Monte Mario”, however, prevents me from stating anything on the status of this species in this reserve. On the other hand, at “Insugherata”, more tortoises were found (including two juveniles, with carapace lengths of 3 and 5.9 cm), and this fact demonstrates that there is a reproductive population in this reserve.

ACKNOWLEDGEMENTS

For the precious informations and the materials on the study areas I would like to thank BRUNO CIGNINI, VITO CONSOLI, FRANCESCA D' ANGELO, RANIERO DE FILIPPIS, LAURA FEDELE, GIOVANNI HERMANIN (all from Roma). LUCA LUISELLI (Roma) commented on a previ-

ous draft of the manuscript, and helped me with the English version. The research was financially supported by RomaNatura – Ente Regionale per la Gestione del Sistema delle Aree Naturali Protette nel Comune di Roma.

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DATE OF SUBMISSION: May, 09th, 2003

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Zeitschrift/Journal: [Herpetozoa](#)

Jahr/Year: 2004

Band/Volume: [16_3_4](#)

Autor(en)/Author(s): Rugiero Lorenzo

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