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Preliminary report on a reptile community ecology in a suburban habitat of northern Italy

STEFANO SCALI
Museo Civico di Storia Naturale (Sezione di Zoologia dei Vertebrati)
c.so Venezia 55, I-20121 Milano (Italy)

MARCO ZUFFI*
Università di Pisa, Museo di Storia Naturale e del Territorio (Sezione di Zoologia e Anatomia comparata)
via Roma 103, I-56011 Calci (Pisa) (Italy)

ABSTRACT

In 1988 and 1989 we investigated the ecology of a reptile community inhabiting a suburban area altered by human activity. Recent changes in and partial destruction of diversified habitats have been directly involved in the faunistic paucity of all the area, where only three lizard and three snake species have been found, but only four of which are really common. The known thermal preference of every species has been confirmed, and some differences among taxa have been observed in lizard sex-ratio and snake biometry. Available and suitable habitats are discontinuous in the area, which probably explains the different observed distribution of the reptile community.

KEY WORDS: Reptile community - Thermal ecology - Habitat alteration - Northern Italy - Reptilia - Sauria.

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*To whom correspondence should be addressed

INTRODUCTION

Reptile communities have been studied mainly in seminatural or natural habitats (Avery, 1978; Strijbosch *et al.*, 1980; Ouboter, 1981; Di Palma, 1984; Barbault & Mou, 1986; Ortega *et al.*, 1986; Mou, 1987a, b; Saint Girons *et al.*, 1989); however, no information about adaptive and ecological traits, if any exist, is available for populations living in areas altered by human activities or in suburban habitats. The present study aims at establishing faunistic composition, thermal preference, and frequency of recorded observations per month, and to describe, as well, the different use of habitat of the whole community.

MATERIALS AND METHODS

The study area lies around Cesana Brianza (province of Como, northern Italy; Istituto Geografico Militare map, sheet 32 II NW) and has an area of 24.74 ha: 82% of which is composed of cultivated and grass fields. Roads and a large canal go along three sides; the fourth, southern, side is open to fields. This area can be divided into two parts: the first is characterized by a small hill without vegetation, and by a little pond and some short streams; the second part contains garbage heaps, some farms and several houses (Fig. 1). Periodical burning of vegetation occurs and many amphibians, reptiles and small mammals are killed by cars along the roads. Originally this area was characterized by a typical *Carpinion* association: *Carpinus betulus, Ulmus campestris, U. minor, Acer campestre, Platanus hybrida, P. hyspanica, Fraxinus excelsior, Quercus petraea, Alnus glutinosa, Sambucus nigra, Corylus avellana, Crataegus monogyna, Robinia pseudacacia, Rubus* sp. At present, due to human activity, this association has been markedly altered, since the last two species (*Robinia pseudacacia* and *Rubus* sp.) which are considered poor and invading, are the most abundant.

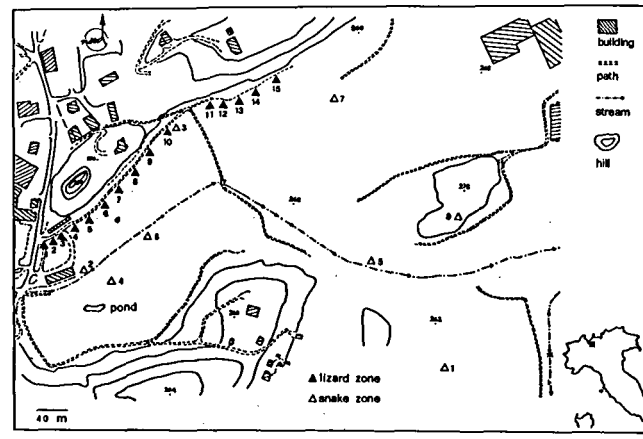

Fig. 1 - Distribution of reptile zones within the study area.

The census of reptiles was carried out three days a week (7.30 a.m.-7.30 p.m.) from spring to autumn in 1988 and 1989, using a random-walk technique during repeated sampling periods. Lizards were studied in 1989 along a dry south-facing wall, 420m long; this habitat was divided into 15 zones (Fig. 1). Every time a specimen was recorded, it was sexed by sight with the aid of binoculars but not captured. Snakes were captured whenever possible, then marked as

in Spellerberg & Prestt (1977). Thermal parameters describe a «thermal activity area» *sensu* Saint Girons (1977). The community diversity was established according to the Shannon-Wiener index (Pielou, 1983), and non-parametric statistics (Mann-Whitney, Kruskal-Wallis and χ^2 tests) were used.

RESULTS

Faunistic composition

Three lizard species were recorded [*Anguis fragilis* (Linnè, 1758), the slow-worm; *Lacerta viridis* (Laurenti, 1768), the green lizard; *Podarcis muralis* (Laurenti, 1768), the wall lizard] and three snake species [*Natrix natrix* (Linnè, 1758), the grass snake; *Elaphe longissima* (Laurenti, 1768), the Esculapian snake; *Coluber viridiflavus* (Lacépède, 1789), the European whip snake]. Table I shows, within a given species, the number of observations per age and sex class; the slow-worm and the Esculapian snake were scarce and were not considered for most ecological aspects. The whole community appeared scarcely diversified (H' = 0.33).

TABLE I - *Total observations per species and sex classes.*

	Lizard species			Snake species		
Sex	Wl	Gl	Sw	Gs	Ews	Es
Males	219	22	1	6	6	1
Females	118	22	1	10	10	
Juveniles	74	6		1	3	
Unsexed ad.	173	23		16	33	
Total	584	73	2	33	52	1

(Wl = Wall lizard; Gl = green lizard; Sw = slow worm; Gs = grass snake; Ews = European whip snake; Es = Esculapian snake).

Thermal preference (Lizards)

The green lizard (Gl) was observed at temperatures (°C) relatively higher than those of the wall lizard (Wl) (mean ± SE):

Gl_{air} = 17.78 ± 0.53, n = 44; Wl_{air} = 16.58 ± 0.21, n = 334
Gl_{ground} = 18.90 ± 0.52, n = 37; Wl_{ground} = 17.97 ± 0.18, n = 292

(Mann-Whitney U test, z = 0.03 for both variables).

Activity and habitat (Lizards)

Lizard activity was highly dependent on very good meteorological conditions (Gl, χ^2 = 54.04, 3 df, P < 0.001; Wl, χ^2 = 246.34, 3 df, P < 0.001) and absence of wind (Gl, χ^2 = 87.64, 3 df, P < 0.001; Wl, χ^2 = 129.64, 3 df, P < 0.001). The monthly frequency of observation decreased during the summer (Table II and III; Saint Girons & Saint Girons, 1956; Avery, 1978; Seva & Escarre, 1980; Ouboter, 1981; Foà *et al.*, 1992). The green lizard sex-ratio (male/female) was 1, as in Saint Girons *et al.* (1989), while that of the wall lizard was 2, in conformity with that of Edsman (1986), but different from Barbault & Mou (1988). For both lacertid species a higher frequency of observations was recorded during sunny and calm days (Wl, 35.07%, χ^2 = 85.92, P < 0.001; Gl, 38.46%, χ^2 = 152.36, P < 0.0005). In zone 11, recordings generally decreased (Wl) or completely stopped (Gl). Lizard species were observed mainly in March-April and September, with a significant decrease in frequency during the summer months (Tables II and III) (Kruskal-Wallis, P < 0.05). The green lizard was generally observed on well-exposed grasslands, with bushes, and sometimes around canals or calm waters; its presence around buildings was scarce. The wall lizard, on the other hand, was recorded in most available habitats, also around buildings and garbage heaps, where many favourable places for basking are available. It appears to choose xeric and sunny areas as does the green lizard.

Thermal preference (Snakes)

The European whip snake (Ews) had higher body temperatures than those of the grass snake (Gs) (mean ± SE):

$Ews_{cloacal}$ = 26.57±0.74, n = 15; $Gs_{cloacal}$ = 24.36±0.79, n = 11
Ews_{air} = 19.61±0.51, n = 37; Gs_{air} = 19.60±0.51, n = 22
Ews_{ground} = 20.89±0.97, n = 25; Gs_{ground} = 21.58±0.67, n = 13

European whip snake cloacal temperatures are highly correlated with ambient ones (air, r = 0.7622; P < 0.01; ground, r = 0.79, 0.01 < 0.02), a correlation not found in the grass snake.

Activity and habitat (Snakes)

A sex-ratio (male/female) of 0.6 was recorded for both species, while the frequency of observation for snakes and lizards was similar. The European whip snake generally inhabited xeric areas with dry walls and/or piles of stones, very often with dense herbaceous vegetation. Individuals of this species were captured along the garbage heap and buildings, too; they probably wintered in area 8, where 40% of observations were made from September 1988 through April 1989, and 51.4% in September and October 1989 (cf. Table IV, Fig. 1); in this area from which they moved away just after the mating period, a decreasing frequency of recordings, mainly in July and August, was found, and an increase in the number of observations in early autumn. No significant differences were recorded among sex-class biometry (mean ± SD):

TABLE II - *Monthly frequency of wall lizard recordings, and totals per month and zone (1989).*

	Zone															
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
2		2		3	5	12		4	5	2						33
3	11	11	16	7	10	14	4	12	24	22	6	12	7	3	11	170
4	8	8	9	1	9	13	12	7	7	8	2	2	1	4	6	97
5	5	3	14	5	9	8	8	5	1	5	6		3			72
6	2	2	5	4	9	7	6	2		2	2				1	42
7	1	1	1		1	1	2		1							8
9	7	7	11	3	6	13	4	3	4	3	3	1	2	2	2	71
10		1	5	2	1	2	3		1	2	2					19
Total	34	35	61	25	50	70	39	33	43	44	21	15	13	9	20	

TABLE III - *Monthly frequency of green lizard recordings and totals per month and zone (1989).*

	Zone															
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
2																
3	3	3	2	12	2			1	2	2						27
4		2		7	3	1		2	1							16
5		1	1		2	1		1	1							7
6		2	1	2			1	2								8
7																
9		2		6	6	13	4	3								34
10		1	5	2	1	2	3									14
Total	3	11	9	29	14	17	8	9	4	2						

	n	weight	length
males	6	235.44 ± 81.60	105.10 ± 13.90
females	10	163.60 ± 49.60	92.70 ± 9.10
		NS	NS

	n	weight	length
males	6	65.60 ± 14.30	69.76 ± 10.70
females	10	187.50 ± 49.80	90.63 ± 7.10
		P<0.005	P<0.05

The grass snake is relatively common in the area; males and small-sized females live in wet and humid habitats (i.e., canals and the pond), while large females were often captured in dry habitats, far away from the pond or streams. This is related to the typical trophic ecology of larger females (Dolce, 1983), mainly feeding upon the common toad (*Bufo bufo*), a prevalent terrestrial species. Wintering sites seemed partly to overlap those used by the European whip snake (Table IV). Little difference was recorded among sex-class biometry (mean ± SD):

DISCUSSION

This community, made up of warm eurythermic and generalist species, is lacking in more specialized taxa such as *Emys orbicularis, Podarcis sicula, Coronella austriaca* and *Vipera aspis*, while *Elaphe longissima* was observed very rarely. These species are instead common in many natural areas of Northern Italy (Pozzi, 1982). The slow-worm and the esculapian snake were ex-

TABLE IV - *Snake recordings per zone (1988-1989).*

	Ews		Gs		Total two years	
Zone	1988	1989	1988	1989	Ews	Gs
1		1			1	
2	1	4	1	1	5	2
3		4		1	4	1
4		1		1	1	1
5			2	3		5
6		1	4	7	1	11
7		4		7	4	7
8	2	33		4	35	4
Total	3	48	7	24	51	31

tremely rare, their typical habitat being scarce or absent now within the study area. Along all the ecotones around areas used by man, lizards are in general less frequent than elsewhere. Most of the differences in the lizard community distribution were noted at zone 11, where strong changes in environmental features have surely occurred and prey abundance has probably varied. Moreover, a longer period of shade was noted there than in zones 1 through 10, due to tall bushes and different insolation.

The grass snake population was not so dimorphic as was expected (Dolce, 1983); we think that very large females migrate to dry areas in order to catch terrestrial prey more often than do small-sized females and males (C. Donà & A. Gentilli, personal communication, 1991). The European whip snake and the grass snake are relatively common and frequent, especially when anthropic disturbance is discontinuous in time (personal observation). In addition it is highly probable that the area examined is too small with respect to the typical size of a female grass snake home range (Madsen, 1984) and a European whip snake home range (Ciofi & Chelazzi, 1991); this area is, evidently, not large enough to allow observation of the same individuals during their whole activity cycle.

Possible predators were *Martes foina, Vulpes vulpes, Canis lupus familiaris, Felis catus, Milvus migrans, Falco tinnunculus, Corvus corone cornix, Passer domesticus italiae,* but they were never observed in attacking reptiles; moreover we believe it would be hazardous describe the observed differences in the lizard community distribution as the direct consequence of a predator activity; moreover dogs and cats were observed near the western zones, where lizards were found as abundant, and never around eastern areas. We believe that the heavy reduction of wood coverage, increased anthropic disturbance, and the profound changes that have involved many habitats have surely been determinant for the general paucity and the non-homogeneous distribution of the reptile fauna.

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