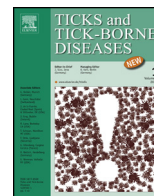




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# Ticks and Tick-borne Diseases

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Original article

## Seasonal dynamics of tick species in an urban park of Rome



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### ARTICLE INFO

#### Article history:

Received 5 October 2012

Received in revised form 18 June 2013

Accepted 25 June 2013

Available online 17 October 2013

#### Keywords:

Urban park

Rome

Italy

*Rhipicephalus turanicus*

*Rhipicephalus bursa*

*Ixodes ricinus*

*Dermacentor marginatus*

*Haemaphysalis punctata*

### ABSTRACT

Regular collections were obtained in the Natural Reserve of the Insugherata of Rome during 2011 in order to obtain the tick species composition and the respective seasonal dynamics of the area. A total of 325 ticks was collected in selected sites by means of drag sampling. Among the identified species, *Rhipicephalus turanicus* was the most abundant (72.3%), followed by *Ixodes ricinus* (19.7%), *Dermacentor marginatus* (6.5%), *Haemaphysalis punctata* (1.2%), and *Rhipicephalus bursa* (0.3%). *R. turanicus* occurred mainly in pastures, showing a mono-modal seasonal activity pattern from spring to early summer. Questing *I. ricinus* were prevalent in woodland from October to May, and the seasonal trend of specimens showed a weak peak in winter. Although adult *D. marginatus* exhibited seasonal dynamics similar to *I. ricinus*, with an activity period from October to April, this species occurred in a different environment (pasture) and with considerably lower densities. *Haemaphysalis punctata* and *R. bursa* were rare, with an apparent autumn and autumn-winter seasonal activity, respectively. While the species diversity recorded appears as an unequivocal consequence of the natural state of the park, the remarkable *R. turanicus* density could be a direct effect of the recent introduction of wild boar, as carriers, from the close Veio Park. The presence of the species, a proven vector of various diseases in humans and domestic animals, is discussed in the light of the possible risk of tick-bite exposure of park workers and visitors.

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### Introduction

In recent decades, many urban areas have been created for the conservation of natural heritage. Although suburban territories once supporting wild environments have been surrounded or occupied by human settlements, several members of flora and fauna have managed to survive and to develop inside the changing synanthropic situations (Alekseev et al., 2008). In particular, town parks and suburban green zones, where sometimes a great variety of livestock and wild animals may live together, represent local hot spots of recreational activity in urban areas, but at the same time offer suitable environments for the introduction and/or spread of bloodsucking arthropods, for example ticks. In such areas, ticks can survive, feed on different vertebrate hosts, and develop often becoming infected with several pathogens. The role played by ticks as vectors of diseases in (sub)urban conditions is widely studied especially in northern Europe (Bašta et al., 1999; Gray et al.,

1999; Junntila et al., 1999; Wielinga et al., 2006; Földvári et al., 2011; Schorn et al., 2011). In Italy, although many investigations have been conducted in wild environments, few studies exist on tick occurrence in urban and periurban parks used for recreational activities (Rivosecchi et al., 1980; Cacciapuoti et al., 1985; Corrain et al., 2012).

Since a proper understanding of tick ecology is pivotal in predicting tick-borne pathogen transmission risk in a given area and in order to bridge this gap, a series of surveys carried out in different rural and urban ecosystems of central Italy have been planned. From this extensive research, we report here the findings of an acarological investigation undertaken in an urban park of Rome, during 2011.

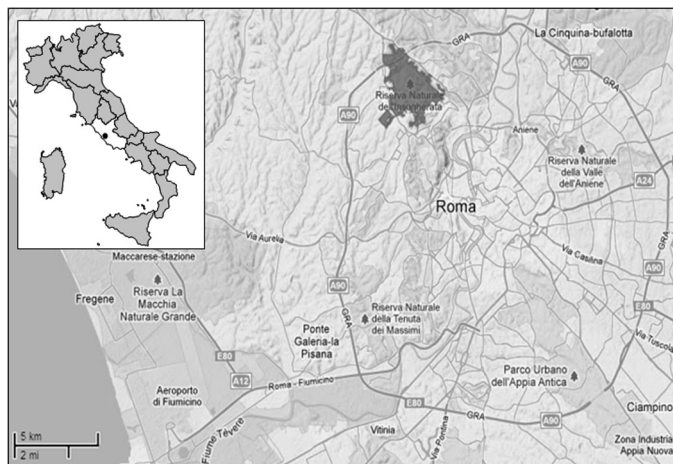
### Materials and methods

#### Study area

The Insugherata Natural Reserve (41°57'17" N, 12°25'35" E), so called for the presence of cork oaks (*Quercus suber*), was founded in 1997 and spans 740 ha (Fig. 1). The park is situated in the north-western sector of Rome, which is characterized by woods and bush strips in contrast to the south-eastern sector of the city, where

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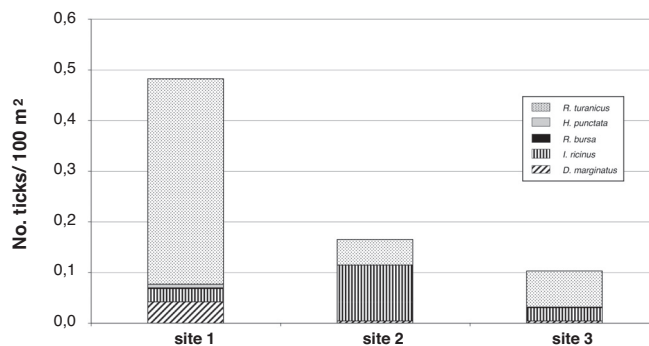


**Fig. 1.** The Insugherata Natural Reserve is situated in the north-western sector of Rome, Lazio Region, central Italy (map modified from <http://www.parks.it/riserva.insugherata/map.php>).

pastures and uncultivated areas are prevalent. Together with other urban natural areas (Acquatraversa, Monte Mario, Monti della Farnesina, Pineto, and Infernaccio Parks), the Insugherata belongs to a weakly connected woody belt, which is still linked with the green zones outside the urban band (Anzalone, 1953; Celesti-Gradow and Fanelli, 1991). The reserve, with its Mediterranean climate hosts a rich fauna and flora. The sunny slopes of the hills harbor several oaks (*Q. suber*, *Quercus pubescens*, *Quercus cerris*, *Quercus frainetto*, and *Quercus ilex*), while a deciduous wood extends on the shadier slopes, including species such as hornbeams (*Carpinus betulus*), ashes (*Fraxinus ornus*), English oaks (*Quercus robur*), field maples (*Acer campestre*), Spanish chestnuts (*Castanea sativa*), and hazels (*Corylus avellana*). Along the valleys and the streams, willows (*Salix alba*), poplars (*Populus alba*), and several ferns occur. Foxes, weasels, and porcupines are very common, while badgers occur only sporadically. Many small mammals (*Apodemus sylvaticus*, *Microtus savii*, *Suncus etruscus*, *Erinaceus europaeus*, *Talpa europaea*, and *Muscardinus avellanarius*) and a great variety of birds, reptiles, and amphibians complete the wild fauna of the reserve. Only in the past few years, wild boar have spread from northern boundaries of the park. Although characterized by a significant biodiversity with different natural biotopes, also with wheat cultivation and sheep pasture, the park represents an important area for human recreation for many inhabitants of Rome.

#### Tick collections

After two exploratory surveys carried out in June and July 2010, tick collections were conducted in three selected sites within the park twice a month from January to December 2011, along transects of 100 m each for a total of 12 fixed transects covered per visit. Site 1 was characterized by wheat fields and pasture for sheep flocks and rare horses. Site 2 was a deciduous mixed wood with mainly oaks reflecting the typical vegetation formation of the natural Roman area (Anzalone, 1953; Blasi, 1984). Ecotonal areas with bushy glades and sporadic trees surrounding small lawns, pastures, and uncultivated fields distinguished site 3. Questing ticks were collected in all sites by dragging a 1-m<sup>2</sup> woolen blanket through the vegetation. Collection sessions were performed by 2 investigators between 8:00 and 12:00 in the morning. Because collection efficiency may vary individually, collectors were systematically changed in each site. The number of ticks on the cloth was counted and picked up every 10 m, and tick abundance was calculated as



**Fig. 2.** Species composition by site in the Insugherata Natural Reserve.

the number of ticks collected per 100 m<sup>2</sup>. During each sampling, daylight (h) was assessed and temperature (*T*) and relative humidity (RH) were recorded using a portable thermo-hygrometer. The samples were identified according to morphological characters (Manilla, 1998), and stored at –80 °C.

#### Statistical analysis

Chi-square test was used to assess the association between species composition and sampling site and between species activity and environmental parameters like temperature and humidity. A *p* value <0.05 was considered statistically significant. Statistical analyses were processed by Stata 11 software.

#### Results

During 2010–2011 surveys, a total of 325 ticks was collected in selected sites: *Rhipicephalus turanicus* Pomerantzev, 1940, was the most abundant species (72.3%) with 112 males, 106 females, and 17 nymphs, followed by *Ixodes ricinus* (Linnaeus, 1758) (19.7%) with 33 males and 31 females, *Dermacentor marginatus* (Sulzer, 1776) (6.5%) with 10 males and 11 females, *Haemaphysalis punctata* Canestrini and Fanzago, 1877 (1.2%), with one male and 3 females, and *Rhipicephalus bursa* Canestrini and Fanzago, 1877 (0.3%), with one female.

Chi-square test showed a significant association between species composition and collection site and between species dynamics and environmental parameters, *T* and RH. Species composition by site is shown in Fig. 2. Seasonal dynamics of the tick populations from all sites were calculated and are reported in Fig. 3.

During the beginning of spring, ixodid tick abundance showed a dramatic increase which led to 2 remarkable abundance peaks during this season, mainly due to the *R. turanicus* activity. At the end of spring, the decreasing trend was followed by an absence of ticks from our collections during the whole summer period, while the occurrence of specimens was always constant during the autumn and winter months, even if at low densities and fluctuating. About 67% of the whole tick sample was collected in site 1, 20% in site 2, and the remaining specimens in site 3.

Although widespread in all sites, *R. turanicus* significantly occurred in site 1 (*p* < 0.05). All specimens of this species were found from the end of March to the beginning of July, with average temperatures ranging between 14 and 25 °C. *R. turanicus* reached highest densities on 21st of April and 20th of May with 7.42 and 3.33 specimens/100 m<sup>2</sup>, respectively, in correspondence with the lowest relative humidity values during that period (59% RH). Moreover, almost identical numbers of males and females were collected (sex ratio 1.05:1.0), while all nymphs were found in a single survey (20th of May) in site 1. During 2 sporadic surveys carried out

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