Acta entomologica serbica, 1997, 2(1/2): 77-85 UDC 595.42 (497.111)

TICKS (ACARI: IXODIDAE, ARGASIDAE) OF THE BELGRADE AREA

M. MILUTINOVIĆ[1], N. ALEKSIĆ-BAKRAĆ[2] AND I. PAVLOVIĆ[3]

[1] Institute for Medical Research, Dr Subotića 4, P.O. Box 721, YU-11000 Beograd
[2] Faculty of Veterinary Medicine, JA 18, YU-11000 Beograd
[3] Scientific Veterinary Institute of Serbia, Vojvode Toze 14, YU-11000 Beograd

The paper presents the results of faunistic and ecological investigations concerning ticks in the Belgrade area in the period 1994 through 1996. The six species of ticks of the Ixodidae family were detected in the investigated area, namely: *Ixodes ricinus, Rhipicephalus sanguineus, Haemaphysalis punctata, Haemaphysalis inermis, Dermacentor marginatus* and *Dermacentor pictus*. We should stress first finding of the last species on dogs in the Belgrade area. Two species of the Argasidae family: *Argas persicus* and *Argas reflexus* were also detected. The research involved: the faunistic composition, relative abundance, population dynamics and sex ratio of the detected species.

KEY WORDS: Acari, relative abundance, population dynamics, sex ratio, *Borrelia burgdorferi*.

INTRODUCTION

In research of fauna and ecology of ticks, as haematophagous arthropods, it is of great importance zoogeographic distribution, namely, eventual presence of the species which appears as indicator species for that region and disease. From biomedical and veterinary significance, the role of these arthropods as vectors and reservoirs of infective agents of human and animal, i.e. the importance of recorded tick species, especially in parasite-host relationship.

A considerable number of free-living mammals and birds settle in the area of Belgrade, including foxes, badgers, gulls, pheasants and pigeons. Moreover, a

pheasant population has been breeding in the great pheasanerias in the locality of Pančevački Rit (Kovilovo and Padinska Skela) (PAVLOVIĆ, 1991). Furthermore, the presence of a great number of poultry on private holdings enables cross-infestation with ectoparasites, especially from the *Ixodidae* and *Argasidae* families (PAVLOVIĆ *et al.*, 1990). Ia addition, numerous stray dogs, often infected with ticks, are a permanent source of infection for hunting dogs and other appropriate hosts, including man.

The research of ticks in inhabited places is of undoubtable significance in epidemiology and epizootiology of parasitic and viral diseases, since the degree of contact between these vectors of diseases and man is very high. Besides, in settlements, especially arboviruses can circulate among rodents and ticks. It is also known that domestic animal quarters are quite an appropriate place for the development and survival of various rodents, especially mice and rats.

MATERIAL AND METHODS

The collection and processing of ticks and the identification of tick specimens have been described in an earlier paper (MILUTINOVIĆ *et al.*, 1989).

RESULTS

In the period 1994 through 1996 the tick fauna was surveyed on a total of 1900 animals of different species (foxes, badgers, dogs, poultry and pigeons) in the Belgrade area (Pančevački Rit, Zvezdara, Košutnjak, Ušće, Avala). The collected specimens - a total 1310 - were adults males and females. The majority of the examined animals were foxes, followed by stray dogs, hunting dogs, sheep, badgers, pigeons and finally pheasants, until the most tick-infested were foxes and both stray and hunting dogs.

Six tick species from the Ixodidae family were detected, namely: *Ixodes ricinus, Rhipicephalus sanguineus, Haemaphysalis punctata, Dermacentor marginatus, Haemaphysalis inermis, Dermacentor pictus* and two species from the Argasidae family: *Argas persicus* and *Argas reflexus*.

Relative abundance analysis revealed the following: The species *Ixodes ricinus* was absolutely dominant in the (1994-1996) period (47%), followed by *Rhipicephalus sanguineus* (23%), *Haemaphysalis punctata* (16%), *Dermacentor marginatus* (10%), *Haemaphysalis inermis* (3%) and finally *Dermacentor pictus* (1%) (Fig. 1).

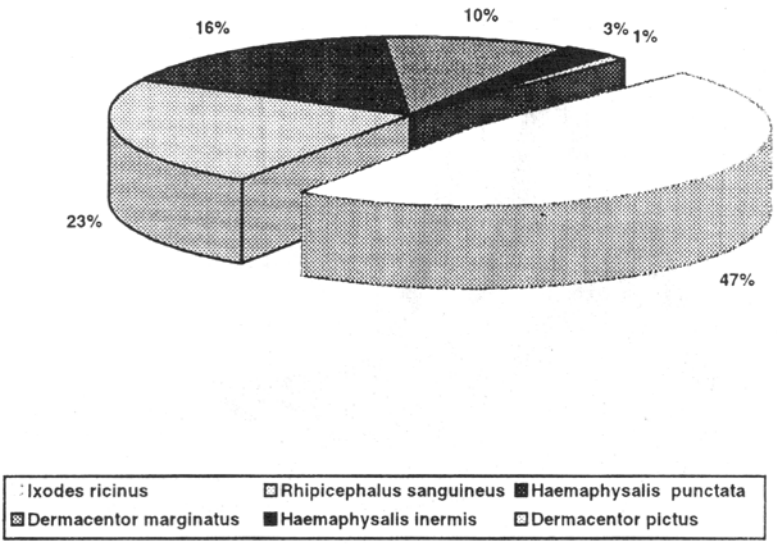

Fig. 1. Relative abundance of tick species in the Belgrade area.

In the follow up of the population dynamics of the six species detected in the Belgrade area within the period 1994-1995. it was noted that the inctrease of abundance commenced in March for all species. April was the month of population maximum relating to three species: *Haemaphysalis punctata, Dermacentor marginatus* and *Haemaphysalis inermis*. The species *Ixodes ricinus* was the only one which had its population maximum in May, while *Rhipicephalus sanguineus* and *Dermacentor pictus* reached their maxima in June. The autumn population maximum only occurred with three species: *Ixodes ricinus* and two species of the genus *Haemaphysalis* - *punctata* and *inermis* (Fig. 2).

As to the sex ratio, within individual species, females were predominant in *Ixodes ricinus, Haemaphysalis punctata* and *Haemaphysalis inermis* in contrast to the two species of the genus *Dermacentor* - *marginatus* and *pictus* and *Rhipicephalus sanguineus* which exhibited male prevalence (Fig. 3).

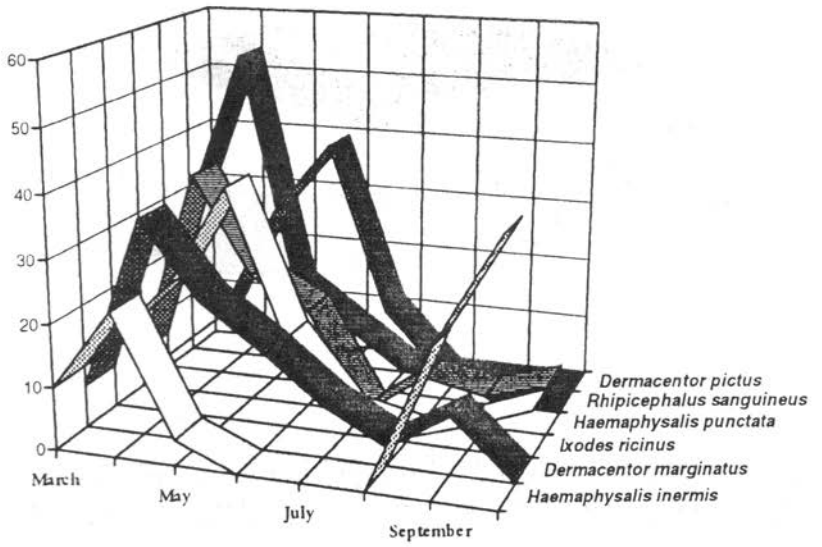

Fig. 2. Population dinamycs of tick species in the Belgrade area.

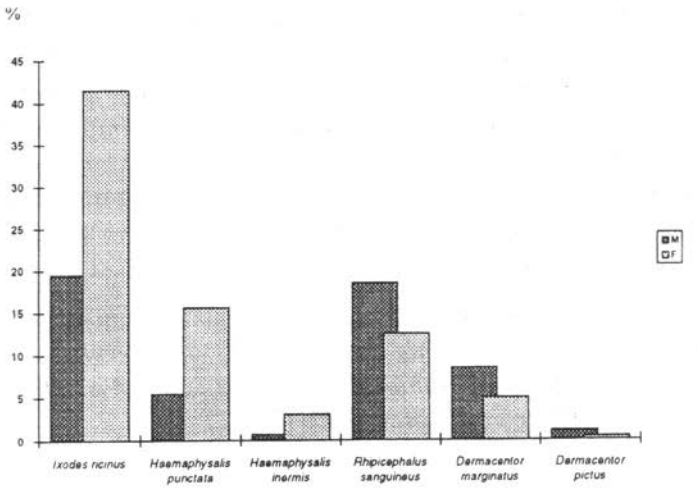

Fig. 3. Sex ratio within individual tick species in the Belgrade area.

Over research period in the investigated region a total of 1310 adult tick specimens were collected, out of which 536 or 41% were males and 774 or 59% females.

In the most numerous species, *Ixodes ricinus, Borrelia burgdorferi* was accounted for 10% of the total number of collected specimens.

Two species of the Argasidae family were detected: *Argas persicus* and *Argas reflexus*. *Argas persicus* was found in great abundance in poultry - houses, on poultry, on the trees on which they sleep, in cracs of tree bark and on the branches. The species was also found on pheasants and pigeons.

Argas reflexus is present in towns where pigeons are present in good number; sometimes it invades houses.

DISCUSSION

Out of the six ixodid tick species encountered within the area of Belgrade, the species *Ixodes ricinus* was the most abundant in the period 1994-1996. The second species, regarding abundance, was *Rhipicephalus sanguineus*, followed by *Haemaphysalis punctata, Dermacentor marginatus, Haemaphysalis inermis* and finally *Dermacentor pictus*.

Out of all the species of the Ixodidae family, the species *Ixodes ricinus* is one of the most widely distributed in Yugoslavia.

The species *Ixodes ricinus* was also predominant in Northeast Serbia (MILUTINOVIĆ *et al.*, 1987), but this tick was the second most abundant species following *Haemaphysalis sulcata* in West Serbia and in the third place, regarding the abundance in East and Southeast Serbia, where the majority of the examined animals were sheep, followed by cattle and goats, followed *Dermacentor marginatus* and *Rhipicephalus bursa* (MILUTINOVIĆ, 1992). In our investigation the majority of specimens of *Ixodes ricinus* was taken from foxes, followed by sheep, pheasants and poultry. The finding of this species on deer (*Dama dama*) and chamois (*Capreolus capreolus*) in Italy, as well as about population maximum on heathes in June, July and in October was reported by RIVOSECCHI *et al.* (1979), and also on nine species of small mammals in Strasbourg by PEREZ (1987). *Ixodes ricinus* is the most abundant species on migratory birds overwintering in the Mediterranean (MANILLA, 1985), on wild and domestic animals in Spain (GRANDES, 1986) and also on migratory birds in Northern Italy (WALTER & MASSA 1987). Our investigations showed that the spring maximum of this species predominated in comparison with the autumn. A two-phase seasonal fluctuation, i.e. the appearance of two generations was confirmed (PETROVIĆ *et al.*, 1955b; TOVORNIK, 1976).

The sex ratio in *Ixodes ricinus* showed female prevalence. The female prevalence was reported by MILUTINOVIĆ *et al.* (1987) in Northeast Serbia and in East, Southeast and West Serbia (MILUTINOVIĆ *et al.*, 1995).

The species *Rhipicephalus sanguineus* was the second most abundant species, regarding the abundance (23.28%). This species was in the fifth place (8.91%) regarding the abundance in East and Southeast Serbia and in the sixth place (3.06%) in West Serbia. In our research *Rhipicephalus sanguineus* was the most abundant species on foxes and both on hunting and stray dogs in the period April-September. It reached a maximum in June. Therefore, we consider *Rhipicephalus sanguineus* is summer tick species as was also detected by other authors (TOVORNIK, 1976; MILUTINOVIĆ *et al.*, 1996b; MILUTINOVIĆ, 1992). Here, we would point out the investigations of RIVOSECCHI *et al.* (1980), which are related to seasonal dynamics of *Rhipicephalus sanguineus* in the outskirts of Rome. This species appeared on dogs in the period March - April, reached its maximum in May, then slightly decreased in June and July. In August abundance of this species increased, when the predominance of nymphs was present. Finding of great number of *Rhipicephalus sanguineus* larvae in outskirts of Rome was also reported by STELLA & KHOURY (1980).

The species *Haemaphysalis punctata* was in the third place regarding abundance in the area of Belgrade. Out of total number of collected tick specimens in West Serbia it followed *Haemaphysalis sulcata* and *Ixodes ricinus*, and it was in the fourth place in East and Northeast Serbia (MILUTINOVIĆ *et al.*, 1995). The spring and the autumn maximum of this species correspond to the results of investigations in other parts of Serbia (PETROVIĆ *et al.*, 1955b; MILUTINOVIĆ, 1992). The dominant place belongs to female, as it was in West, East, Northeast and Southeast Serbia (MILUTINOVIĆ *et al.*, 1996). Findings of this species on small rodents in the mountains of Krim was reported by SOSNNINA (1969), on migratory birds in Italy (MANILLA, 1985; WALTER & MASSA, 1987) and on wild and domestic animals in Spain (GRANDES, 1986).

In the area of East and Southeast Serbia *Dermacentor marginatus* is the most numerous species, in Northeast Serbia it follows *Ixodes ricinus*, and in West Serbia follows *Haemaphysalis sulcata, Ixodes ricinus* and *Haemaphysalis punctata* (MILUTINOVIĆ, 1992). *Dermacentor marginatus* came fourth according to the distribution over the investigated region. In papers dealing with *Haemaphysalis punctata*, data about *Dermacentor marginatus* can also be found, because of their related biology and seasonal dynamics.

PETROVIĆ (1979) stated that *Haemaphysalis inermis* was found on the same places where *Haemaphysalis punctata* (what was confirmed by our results) in the

area of South Banat to Macedonia. Data of this species were given by PETROVIĆ & BORDJOŠKI (1955a) for continental and Mediterranean part of Montenegro, by MILUTINOVIĆ (1992) for West, East and Southest Serbia, by SOSNNINA (1969) for Krim and by GEORGIEV *et al.* (1971) for Bulgaria.

We stress the first determination of *Dermacentor pictus* on dogs in the extended area of Belgrade. PETROVIĆ (1979) mentioned finding of this species on cattle and horses in West parts of Serbia, what was confirmed by the results of MILUTINOVIĆ (1992). SOSNNINA (1969) found it on small rodents in mountainous woods of Krim, ROPAC & STOJANOVIĆ (1986) in Croatia and OLSUFIEV (1987) emphasised the frequent finding of *Dermacentor pictus* in South part of the Moscow area.

The determination of *Argas persicus* and *Argas reflexus*, i.e. the abundance of these species and their hosts, are similar to the results of examinations in the other parts of Serbia (PAVLOVIĆ *et al.*, 1992).

REFERENCES

GEORGIEV, B., B. ROSICKY, P. PAVLOV, M. DANIEL & D. ARNAUDOV, 1971. The ticks on the natural focus of tick-borne encephalitis o sheep and man in the Rhodopo Mountains (Bulgaria). *Folia Parasitol.* 18(3): 267-273.

GRANDES, A.E., 1986. Ticks of the Province of Salamanca (central) NW Spain. *Ann. Parasitol. Hum. Comp.* 61(1): 95-107.

MANILLA, G., 1985. On the role of the birds in the spread and circulation of tickborne viruses. *Rivista Parasitol.*, 2: 11.

MILUTINOVIĆ, M., 1992. *Ecological investigations of ticks (Acarina, Ixodoidea, Ixodidae) of Serbia.* Doctoral dissertation, Beograd.

MILUTINOVIĆ, M., N. ALEKSIĆ, B. BOBIĆ & Z. MIŠČEVIĆ, 1996b. A study of the sex ratio of the ticks (Acari: Ixodidae) of Serbia. *Acta Vet.*, 46: 147.

MILUTINOVIĆ, M., Z. MIŠČEVIĆ & S. KATIĆ-RADOJEVIĆ, 1995. Ticks (Acarina, Ixodoidea, Ixodidae) of Serbia: Fauna and Ecology. *Acta Vet.* 45 (1): 37-48.

MILUTINOVIĆ, M., Z. PETROVIĆ & Z. MIŠČEVIĆ, 1987. Fauna and Ecology of Ticks (Acarina, Ixodoidea, Ixodidae) northeast of Serbia. *V jug. kongres infektol.*, Portorož, *Zbornik del*, 140.

MILUTINOVIĆ, M., Z. PETROVIĆ, Z. MIŠČEVIĆ & Lj. BIŠEVAC, 1989. Dynamics of sandfly (Diptera, Phlebotomidae) and ticks (Acarina, Ixodidae) populations in the endemic foci of visceral leishmaniasis in Yugoslavia. *Acta Vet.* 39 (2-3): 143-154.

OLSUFIEV, N.G., 1987. The tick Dermacentor pictus Herm. and the antropogenic effect on its population and associated meadow-field focus of tularemia *Med. Parasitol. Paraz. Bolezni*, 3: 16-20.

PAVLOVIĆ, I., 1991. *Ecto and endoparasites of pheasants in intensive breeding and their control.* M.S. Thesis, Beograd.

PAVLOVIĆ, I., B. HUDINA, V. BLAŽIN, Ž. ILIĆ & B. MILJKOVIĆ, 1990. The role of pigeons in tansmission of parasitoses on poultry and pheasants in intensive breeding. *Zbornik radova. VI simp. "Male životinje, urbana sredina i ekologija"*, Sarajevo, 141-144.

PAVLOVIĆ, I., D. NEŠIĆ, D. VALTER, V. KATIĆ & B. JORDANOVIĆ, 1992. On the role of arthropods in parasitological problems in breeding of pheasants. *Zbornik radova. V savetovanje veterinara Srbije*, Kopaonik, 98-99.

PEREZ, C., 1987. La fauna des tiques le foyer Alsacien d encephalite a tiques. Faune des tiques endophiles et exophiles de Strasbourg. *Acarol.* 28 (1): 43-47.

PETROVIĆ, Z., 1979. Ticks fauna (Ixodidae) in Serbia. *Arh. Biol. Nauka* 28 (1-2): 69-72.

PETROVIĆ, Z & A. BORĐOŠKI, 1955a. Contribution to the knowledge of ticks fauna in Montenegro. *Acta Vet.* 5 (2): 37-41.

PETROVIĆ, Z., Č. SIMIĆ & V. NEVENIĆ, 1955b. Contribution to the knowledge of ticks fauna of Ključ district, Serbia. *Acta Vet.* 5 (4): 13-19.

RIVOSECCHI, I., C. KHOURY, C. CAVALLINI & E. STELLA, 1979. Artropodi ematofagi delle aree naturali da proteggere. Nota III Lipoptena cervi (Diptera, Hippohoscidae) ed altri ectoparassiti (Ixodidae) associati a daini e caprioli nella tenuta di Castel Potziano. Estratto del Vol. degli Atti dell *VII Simposio Nazionale Organizzato dell Instituto di Zoologia dell Universita di Bari sulla Conservazione della Natura*, (26-18 Aprile 1979), 183-185.

RIVOSECCHI, I., C. KHOURY & DELL UOMO G. LEZZERINI, 1980. Osservazioni su Rhipicephalus sanguineus (Ixodidae) nella periferia di Roma.: *Riv. Parassitol.* 41, (2): 273-276.

ROPAC, D. & R. STOJANOVIĆ, 1986. Contribution to the knowledge of ticks fauna in some biocenoses of Croatia and Slovenia. *Vet. Arh* 56 (3): 149-157.

SOSNNINA, E.F., 1969. Murids as the hosts of Ixodid ticks in the mountain of the Crimea. *Parazitol.*, 3-6: 505-509.

STELLA, E. & C. KHOURY, 1980. Nuove osservazioni su alcuni Ixodidi dei dintorni di Roma. *Riv di Parassitol.* 41 (2): 145-154.

TOVORNIK, D., 1976. Seasonal and diurnal periodicity of the tick Ixodes ricinus L. in Pannonian tick-borne encephalitis focus (Stara Ves) *JAZU, Razred za medicinske znanosti*, 99-103.

WALTER, G. & R. MASSA, 1987. Ein Beitrag zur Ektoparasitenfauna der Zugvogel in Norditalien. *J. App. Entomol.* 103 (5): 523-527.

КРПЕЉИ (ACARI: IXODIDAE, ARGASIDAE) БЕОГРАДА

М. МИЛУТИНОВИЋ, Н. АЛЕКСИЋ-БАКРАЧ И И. ПАВЛОВИЋ

Извод

У раду су приказани резултати фаунистичко-еколошких истраживања крпеља на подручју Београда у периоду 1994-1996. Од 14 врста крпеља из фамилије Ixodidae у Србији, шест врста је установљено на истраживаном подручју. Установљене су и две врсте из фамилије Argasidae. Истичемо први налаз врсте *Dermacentor pictus* на псима, као и детекцију *Borrelia burgdorferi* у 10% сакупљених примерака врсте *Ixodes ricinus*.

Received October 2, 1997
Accepted December 8, 1997