

Central European ticks - a zoogeographical review (*Acari: Ixodida*)

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ABSTRACT. The geographical ranges and basic data on tick habitats are discussed. In Central Europe there are 27 native tick species and 2 species which probably occur in Central Europe; 6 species are certainly or probably introduced in Central Europe. The native species : *Argas polonicus*, *A. reflexus*, *A. persicus*, *A. vespertilionis*, *Ixodes trianguliceps*, *I. uriae*, *I. arboricola*, *I. crenulatus*, *I. hexagonus*, *I. lividus*, *I. rugicollis*, *I. caledonicus*, *I. frontalis*, *I. simplex*, *I. vespertilionis*, *I. apronophorus*, *I. laguri*, *I. persulcatus*, *I. redikorzevi*, *I. ricinus*, *Haemaphysalis inermis*, *H. punctata*, *H. concinna*, *H. parva*, *Dermacentor reticulatus*, *D. marginatus*, *Rhipicephalus bursa*. Species whose occurrence in Central Europe may be expected are: *I. kaiseri*, *R. rossicus*. Introduced species: *I. festai*, *R. sanguineus*, *R. turanicus*, *Hyalomma aegyptium*, *Hl. marginatum* and it is quite possible that *I. eldaricus* is also introduced. Most of the presented tick species are Palaearctic. Species occurring also in other zoogeographical regions are: *A. persicus*, *A. vespertilionis*, *I. uriae*, *I. simplex*, *I. vespertilionis*, *I. redikorzevi*, *R. sanguineus*, *Hl. marginatum*.

Key words: acarology, zoogeography, *Ixodida*, Europe.

INTRODUCTION

Monographic studies on ticks (*Ixodida*) of Poland (SIUDA 1991, 1993) were possible thanks to the kind advice and great help of Professor Jan RAFALSKI. Also thanks to the Professor's encouragement, work on the monograph of the tick fauna of Central Europe including data from the territories of Poland, Germany, Czech, Slovakia, Hungary and Austria is in progress.

The World fauna of ticks (*Ixodida*) includes about 850 species (KEIRANS 1992). 27 valid species of *Ixodida*, 4 of the family *Argasidae* and 23 of the family *Ixodidae* occur in Central Europe. The occurrence of two species may be also expected. Moreover, cases of introduction of five species of *Ixodidae* have been reported. There is also a probability of introduction of one more species (NOSEK et al. 1972, SIUDA 1993 and others).

ZOOGEOGRAPHICAL REVIEW

A. PERMANENT ELEMENTS OF CENTRAL EUROPEAN FAUNA.

Family *Argasidae* MURRAY, 1877

1. *Argas (Argas) polonicus* SIUDA, HOOGSTRAAL, CLIFFORD et WASSEF, 1979

Species reported in Poland only from Kraków; type locality: the Strażnica Tower of St. Mary Church (SIUDA et al. 1979). Apart from this reported from several localities in the Czech Republic and Slovakia (DUSBÁBEK & ROSICKÝ 1976, DUSBÁBEK 1985, KRUMPÁL et al. 1995). The distribution of this species is probably much wider, including south eastern territories of Europe.

Burrow-nest dwelling parasite. Occurs mostly in synanthropic and semi-synanthropic habitats in towers and attics of buildings (mostly churches) where its main host is domestic pigeon (*Columba livia dom.* GMELIN) (SIUDA et al. 1979, SIUDA 1991, 1993, DUSBÁBEK 1985, KRUMPÁL et al. 1995). Attacks on humans have been also reported. Probably, in the warmer parts of its range *Argas (A.) polonicus*, like most other members of the subgenus *Argas s. str.*, dwells in natural shelters next to places where large numerous birds nest or spend the night.

2. *Argas (Argas) reflexus* (FABRICIUS, 1794)

Before the taxonomic position of *Argas (A.) reflexus* was revised by HOOGSTRAAL & KOHLS (1960 a, b) and FILIPPOVA (1966) *Argas (A.) reflexus* was confused with several other species occurring in various parts of the world.

The actually known continuous geographical range of this species includes Western, Southern, Central Europe, from the British Isles and Spain to Poland, Czech, Slovakia, Hungary, Romania and Greece. There are also records from Crimea, Israel and Egypt (ARTHUR 1963; ČERNÝ, 1972; DUSBÁBEK & ROSICKÝ 1976; FEIDER 1965; FILIPPOVA 1966; HOOGSTRAAL 1985; HOOGSTRAAL & KOHLS 1960 a; MANILLA 1986 a, b; NOSEK et al. 1972; RAFALSKI 1956; RAGEAU 1972; SIUDA 1993; SIXL et al. 1971; THOMPSON 1968 and others).

Argas (A.) reflexus is a burrow-nest dwelling parasite. All known Central European localities are synanthropic and semisynanthropic habitats (lofts, attics of churches,

buildings, houses and pigeon houses) i.e. places where pigeons, its main hosts, are present. Sporadic cases of infestation of other bird species. It often attacks humans (BUCZEK & SOLARZ 1993, HOOGSTRAAL 1985, SIUDA 1991, 1993, and others)

3. *Argas (Persicargas) persicus* (OKEN, 1818)

Continuous distribution range of this species covers the area from Spain in the West through Corsica and Balkan countries to the southern areas of Slovakia, Moldavia, Ukraine and south-western part of Russia in the North, till north western territories of China, India and Pakistan in the east and through Central Asia, Middle East, Arab Peninsula and Northern Africa in the south (DUSBÁBEK & ROSICKÝ 1976; FILIPPOVA 1966; HOOGSTRAAL 1985; KOHLS et al. 1970; MANILLA 1986a, b; NOSEK et al. 1980 and others).

Many earlier (prior to 1966) records of *A.(P.) persicus* were actually based on other species (HOOGSTRAAL 1985). The Persian poultry *Argas* as the poultry parasite had been commonly known and considered to occur all over the world. It spread widely in the warm part of the world with poultry in North and South America, Africa (south of Sahara), Australia (HOOGSTRAAL 1972) and the lack of precise research resulted in confusing it with other, local, species.

The Persian poultry *Argas* is xerophilous, burrow-nest dwelling, ornithophilous parasite. In natural conditions, in hot and warm regions of Central Asia it inhabits desert, steppe and forest steppe zones where its usual habitats are cracks and crevices in trees and wooden structures and ground cracks close to the tree roots. It occurs often in or near human habitations but attacks humans very rarely.

This argasid species has adapted to parasitism on hens and other domestic birds; most of its populations inhabit poultry-houses and similar places not only in the regions of their natural occurrence (Central Asia) but most of all where they were introduced with domestic birds.

4. *Argas (Carios) vespertilionis* (LATREILLE, 1802)

The species is widely distributed in the Ethiopian region, with scattered localities in the Palaearctic from the British Isles in the west to Korea and Japan in the east, and to northern Sweden in the north; there are also records from the Oriental region (India) (ARTHUR 1963, BABOS 1964, DUSBÁBEK & ROSICKÝ 1976, EICHLER et al. 1968, FILIPPOVA 1966, HOOGSTRAAL 1956, 1958, 1985, JAENSON et al. 1994, MANILLA 1986a, b, RAFALSKI 1956, SIUDA 1993, THEILER & ROBINSON 1954, WALTER & KOCK 1985, YAMAGUTI et al. 1971 and others).

Burrow-nest dwelling parasite of bats (attacks on humans were reported - HOOGSTRAAL 1985) in natural, semisynanthropic habitats. Its natural habitats are crevices of walls, buildings and caves and tree hollows inhabited by bats. These argasids were also found under piles of guano. They tolerate a wide range of temperature and humidity (HOOGSTRAAL 1956, FILIPPOVA 1966). This species occurs in the northern most regions - in the South of Sweden (JAENSON et al. 1994).

Family Ixodidae Murray, 1877**1. *Ixodes (Exopalgiger) trianguliceps* BIRULA, 1895**

Reported from almost all Europe including the British Isles, except for the southern areas (Iberian, Apennine and southern parts of Balkan Peninsulas) and north eastern territories of Scandinavia and northern Russia. In the east its range is divided in two parts running more or less latitudinally: a larger part, more to the north, extends along the middle and southern taiga areas and the area of deciduous forests up to the upper Yenisey River in Russia. Further to the east several islands of occurrence next to Baikal Lake have been reported. A smaller and shorter strip of the eastern range extends from the Trans-Carpathia in western Ukraine, through Crimea to Armenia (FILIPPOVA & PANOVA 1988, KOLONIN 1981 and others).

This species has a wide range of vertical distribution, from sea level (SIUDA 1993) up to 2300 m a.s.l. (DJAPARIDZE 1960, HAITLINGER 1980, ČERNÝ 1972, TOVORNIK 1988).

I. (E.) trianguliceps is a polyphagous parasite dwelling outside nests, its main hosts are small mammals, less often birds feeding on the ground and lizards. It dwells in moderately humid habitats, mostly in shady deciduous and mixed forests. It does not occur in marshy forests with very humid soil and in dry forests with poor, thin litter or on open meadows. (LACHMAJER 1962, FILIPPOVA 1977, SIUDA 1993 and others).

2. *Ixodes (Ceratoixodes) uriae* WHITE, 1852

synonym *Ixodes putus* (PICARD-CAMBRIDGE, 1878).

Species described as bipolar. Its distribution range, divided into two main areas, covers Subpolar parts of Northern and Southern Hemisphere, extending on the Northern Hemisphere to the northern regions of temperate climate zones and on the Southern Hemisphere to the subtropical regions. In Europe it occurs mostly in the northern part. It has been also reported from Bretagne in France and North Sea coast in Germany (KOLONIN 1981, JAENSON et al. 1994 and others). Nest and burrow-dwelling parasite of birds, living in bird colonies at sea coasts and islands (ARTHUR 1963, EVELEIGH & THREFFALL 1974, FILIPPOVA 1977, KOLONIN 1981, JAENSON et al. 1994 and others).

3. *Ixodes (Pholeoixodes) arboricola* SCHULZE et SCHLOTTKE, 1929

Continuous distribution range of this species covers Europe from the Pyrenees to Latvia, Byelorussia, Ukraine (excluding the northern parts of the United Kingdom, Scandinavia and southern parts of Apennine and Balkan Peninsulas) and reaches the Trans-Caucasia. Records from Egypt, Middle East, Central Asia and the southern parts of Far East in Russia are known (CLIFFORD & HOOGSTRAAL 1965, KOLONIN 1981, JAENSON et al. 1994 and others).

Burrow nest dwelling parasite, strictly ornithophilous, associated with birds inhabiting tree holes and nesting boxes, less often in burrows in the ground. In Europe inhabits mostly deciduous or mixed forests and parks, particularly holes and nesting boxes inhabited by birds during consecutive years.

4. *Ixodes (Pholeioxodes) crenulatus* KOCH, 1844

synonym *Ixodes canisuga* JOHNSTON, 1849

The geographical range of this species extends latitudinally from Great Britain, Ireland and France in the west to Primorskiy Kray in Russia (KOLONIN 1981 and others).

In the western parts of its range it penetrates the areas of lowland forests and mountain deciduous forests. In the Asian and Eastern European part of the range it inhabits mostly various kinds of lowland and mountain steppe habitats reaching 3600 m a.s.l. in Tian Shan. It also occurs in steppe forests, subalpine meadows, semi-deserts and deserts (FILIPPOVA 1977 and others).

Burrow nest dwelling parasite of homoiothermic vertebrates, inhabiting deep burrows of rodents and predatory mammals. It has been also reported from caves (SIUDA 1993). Attacks on humans have been recorded (FILIPPOVA 1977).

5. *Ixodes (Pholeioxodes) hexagonus* LEACH, 1815

The geographical range of this species covers almost all Western, Central and Southern Europe and north-western Africa - it extends from the British Isles and Atlantic Coast and Morocco in the west to Poland, western Ukraine, Romania, Greece in the east, reaching south-western parts of Scandinavia (ARTHUR 1963, EMCHUK 1960, FEIDER 1965, FILIPPOVA 1977, KOLONIN 1981, JAENSON et al. 1994, SIUDA 1993 and others).

Typical burrow nest dwelling parasite. Inhabits various kinds of hollows including buildings, caves and rock shelters, reported from 1000 m a.s.l. Many localities are semisynanthropic habitats, the tick probably inhabits dog kennels. It attacks mostly hedgehogs and predatory mammals. Attacks on humans and other mammals have been reported.

6. *Ixodes (Pholeioxodes) lividus* KOCH, 1844

synonym *Ixodes plumbeus* LEACH, 1815.

Continuous distribution range of this species covers Europe (except south-western parts and northern areas of Scandinavian Peninsula) through Central Asia up to Mongolia. There are several records from Japan and Russian Far East (KOLONIN 1981 and others). It occurs in a wide range of climatic conditions from taiga through the deciduous forests, steppe forests to steppes.

Burrow nest dwelling parasite, strictly ornithophilous, strictly associated with the colonies of *Riparia riparia* (L.). It belongs to a rare group of species with strict total host specificity (HOOGSTRAAL & AESCHLIMANN 1982, SIUDA 1991, 1993).

7. *Ixodes (Pholeioxodes) rugicollis* SCHULZE et SCHLOTTKE, 1929

The geographical range of this species is not yet well known, recently it has been reported from the localities in north-western France, Brandenburg in Germany, vicinities of Wrocław in Poland and Arad in Romania (BABOS 1964, FEIDER 1965, MOREL & AUBERT 1975, SCHULZE & SCHLOTTKE 1929).

Burrow nest dwelling parasite of predatory mammals, inhabits tree holes, nesting boxes, cervices in rocks and ground burrows.

8. *Ixodes (Scaphioxodes) caledonicus* NUTTALL, 1910

At present known from few localities scattered from Great Britain to Russian Far East (KOLONIN 1881). In Central Europe recorded from Germany and Pomerania in Poland (SCHULZE 1944, SIUDA 1993).

Burrow nest dwelling parasite, ornithophilous, attacks birds dwelling and nesting in rock shelters, both natural and in buildings.

9. *Ixodes (Trichotoixodes) frontalis* (PANZER, 1798)

It occurs in Western and Central Europe and trough south-east European territories reaches Trans-Caucasia and Turkmenistan and Iran (KOLONIN, 1981, SIUDA 1993, WALTER et al. 1979 and others). Besides, isolated localities are known along the African coast of the Mediterranean Sea and from Cyprus (KAISER et al. 1974 and others).

Parasite dwelling outside nests, strictly ornithophilous, associated with shady, humid habitats in deciduous forests and on wooded banks of rivers or other water bodies, near nests of birds feeding on the ground.

10. *Ixodes (Pomerantzevella) simplex* NEUMANN, 1906

The localities of this species are scattered in the Palearctic, Ethiopian, Oriental and Australian regions (KOLONIN 1981, ROBERTS 1970, YAMAGUTI et al. 1971 and others). In Central Europe it was reported from Germany, Poland, former Czechoslovakia and Hungary (BABOS 1964, ČERNÝ 1972 HAITLINGER & RUPRECHT 1985, WALTER & KOCK 1985 and others).

Burrow and nest dwelling parasite of bats, inhabiting caves especially where there are summer colonies of *Miniopterus schreibersi* - which is supposed to be its main host.

11. *Ixodes (Eschatocephalus) vespertilionis* KOCH, 1844

Species with a wide distribution range in Europe, Africa and Asia. The European range covers almost all the continent (except Scandinavia and north-western territories) and the British Isles.

Oligoxenous parasite of bats. Inhabits caves, dungeons and similar bat shelters. During non-parasitic phase it lives mostly in dark, humid (above 60%) parts of shelters, usually far from the entrances. Recognition of this species as the cave animal remains controversial (BEAUCOURNU 1967). Unquestionably in non-parasitic phase the ticks inhabit only caves where engorged specimens drop off the host, females lay eggs, and males dwell there permanently.

12. *Ixodes (Ixodes) apronophorus* SCHULZE, 1924

The geographical range of this species extends roughly between 43° and 63° 30' in Karelia and 60° 58' in western Siberia, from the south of Great Britain and France to the upper basin of the Ob River in Russia (FILIPPOVA 1977, KOLONIN 1981 and others).

Burrow nest dwelling parasite, distinctly hygrophilous, occurs on wet, overgrown banks of water bodies, muddy rivers and creeks, islands and islets, on marshes and drainage areas overgrown by sedge. It inhabits nests and burrows of small mammals and sporadically nests of birds located close to the water.

13. *Ixodes (Ixodes) laguri* OLENEV, 1929

The geographical range of this species covers territories from Slovakia, Hungary and Romania in the west through Ukraine, Moldavia, Turkey, south-western parts of Russia where, west of the Caspian Sea, it splits in two strips running longitudinally: a northern, larger and broader, running through southern Lower Volga areas, Kazakhstan to Mongolia, and a southern, reaching through the Caucasus and Trans-Caucasia to the western parts of Turkmenistan (ČERNÝ 1990, EMCHUK 1960, FILIPPOVA 1977, KOLONIN 1981 and others).

Burrow nest dwelling parasite of mammals (cases of attacking humans working in the ground by immature stages were reported by FILIPPOVA 1977). Inhabits mostly steppes and mountain steppes where it can be found at 1500 m a.s.l. Less often it was recorded from semi-desert and desert habitats and bushy vegetation and forests close to steppe. It was also reported from cultivated lands (fallows, grasslands etc.). It lives in both dry and humid habitats (EMCHUK 1960, FILIPPOVA 1977).

14. *Ixodes (Ixodes) persulcatus* SCHULZE, 1930

The continuous geographical range of the taiga tick extends as a large strip along the southern part of central and southern taiga and steppe forest from north-eastern Europe to the south of Kamchatka and to Japan in the east. Its western

distribution border extends from Karelia and south-eastern territories of Finland through Estonia, eastern coasts of Riga Bay, eastern territories of Lithuania, then to the east. In more temperate climate of north-eastern parts of Europe the range of *Ixodes (Ixodes) persulcatus* is more northwards reaching 63°N latitude. In the Asian part of its range it moves southwards to ca. 60°N latitude and to 52-54°N latitude in Far East. The southern border of continuous range in Eastern Europe and Western Siberia runs more or less along 56°N latitude, and east of Irtysh it moves more to the south below 50°N latitude, and down below 40°N latitude in North Korea (KORENBERG 1985). In Central Asia (Kirgizia) it was recorded from 3000 m a.s.l.

In Central Europe localities outside the continuous distribution range were reported i.e. from Poland (Białowieża and Upper Silesia) and from Hungary (BABOS 1964, KADULSKI et al. 1996, LACHMAJER 1967, 1977, SCHULZE 1944).

A parasite dwelling outside nests, polyphagous. Like *Ixodes (I.) ricinus* it is not host specific. Its hosts are birds, mammals, reptiles and amphibians, it often attacks humans. It is a higrophilous species, but with a clear ecological plasticity. For instance in northern parts of its geographical range the tick inhabits drained and warm places, in southern parts it prefers more humid habitats (KORENBERG & KOVALEVSKY 1985).

15. *Ixodes (Ixodes) redikorzevi* OLENEV, 1927

The geographical range of this species extends with a broad strip from Austria, Hungary, Bulgaria and Greece in the west through south western territories of Europe. Caucasus, Trans-Caucasia, Turkey, Cyprus, northern Egypt, Israel, Iraq, north of Iran to Central Asia, Afghanistan, northern Pakistan and probably Nepal in the east (BABOS 1964, EMCHUK 1960, FILIPPOVA 1977, KOLONIN 1981 and others). The range of vertical occurrence extends from the sea level (Crimea) to 3330 m a.s.l. in the Himalayas (FILIPPOVA 1977, HOOGSTRAAL 1979).

A polyphagous parasite. Its hosts are mainly small mammals. It dwells in moderately humid deciduous forests and in different types of steppe habitats close to forests in mountains or on banks of water basins. The tick occurs also on fallows and fields, in hedges, hayracks and among low alpine vegetation. It has been also reported from subtropical forests in western Georgia and from deserts of central Asia.

In forest habitats it is a parasite dwelling outside nests, in steppes and deserts it dwells in burrow nests.

16. *Ixodes (Ixodes) ricinus* (LINNAEUS, 1758)

The continuous geographical range of this species covers almost all Europe (except northern, north-eastern and south-eastern woodless areas), north-west Africa, Asia Minor, south-western territories of Turkmenistan and north of Iran (ARTHUR 1963, CORNELY & SCHULTZ 1992, FILIPPOVA 1977, KOLONIN 1981, JAENSEN et al. 1994, EICHLER et al. 1968, SIUDA 1993 and many others). Besides, numerous scattered localities of *I.(I.) ricinus* are known in western Siberia (FILIPPOVA 1977).

A polyphagous parasite dwelling outside nests, often attacks humans. *I. (I.) ricinus* is one of the most common tick species in Central Europe, with a high ecological plasticity. In Central Europe it inhabits adequately humid habitats (about 80-100% RH) in deciduous and mixed forests. Within its range *I.(I) ricinus* occurs unevenly - displaying the so called mosaic distribution (SIUDA 1993 and others).

17. *Haemaphysalis (Alloceraea) inermis* BIRULA, 1895

The geographical range of this species covers southern territories of Europe (from Portugal and Spain), north-western parts of Asia Minor, Trans-Caucasia and northern Iran. In Central Europe it was recorded from Austria, south of Slovakia and Hungary (BABOS 1964, KOLONIN 1978, ČERNÝ 1972 and others).

H.(All.) inermis is a polyphagous parasite dwelling outside nests; it also attacks humans. It dwells in humid habitats with mild winter e.g. sea coasts and river valleys covered with mixed or deciduous forests. In Slovakia it lives in steppe forest areas (NOSEK 1973).

18. *Haemaphysalis (Aboimisalis) punctata* CANESTRINI et FANZAGO, 1877

The geographical range of this species covers almost all Europe (except its north-western parts), northern Africa, Asia Minor, through Trans-Caucasia and north of Iran it reaches Central Asia.

Haemaphysalis (Aboimisalis) punctata is a member of the genus *Haemaphysalis* with the northernmost occurrence (KOLONIN 1978 and others).

A parasite dwelling outside nests. It attacks also humans. It inhabits seashores, bushes, open forests, forest borders, semi-deserts and steppe forests. It does not penetrate inside the humid forests of temperate climate zone. On the territories with continental climate in Central Asia *H. (Ab.) punctata* occurs in irrigated cultivated areas in river valleys and terraces. (EMCHUK 1960, HOOGSTRAAL & KIM 1985, NOSEK 1973, POMERANTZEV 1950).

19. *Haemaphysalis (Haemaphysalis) concinna* KOCH, 1844

This species occurs in most areas of Eurasia with temperate climate, roughly between 38° and 56° N from France in the west and Far East and Japan in the east (HOOGSTRAAL & KIM 1985, KOLONIN 1978, LEBEDEVA & KORENBERG 1981, NOSEK 1971, YAMAGUTI et al. 1971 and others). Its distribution range is discontinuous, of relict character. KOLONIN (1978) specifies four main occurrence areas:

- a) European - Caucasian (from France to Trans-Caucasia and Iran). The occurrence of *H.(H.) concinna* has been reported from all Central European countries.
- b) Central Asian (Uzbekhistan, Kirgisia, Eastern Kazakhstan).
- c) Siberian (Altai, South of Krasnoyarsk Territory)
- d) Far Eastern (Primorsky Kray, Khabarovskiy Kray, Amurska oblast, China, Korea, Japan).

H.(H.) concinna is most abundant in the Far East where it makes about 85% of all *Ixodidae*. On the remaining territories it doesn't occur in such numbers and in some places is even a rare species. (LEBEDEVA & KORENBERG 1981).

A polyphagous parasite dwelling outside nests, attacking also humans. It inhabits well exposed, opened, humid deciduous and mixed forests with well developed scrubby litter, steppe forests and humid steppe habitats in lakelands and river valleys. It occurs mostly on forest borders, felling areas inside forests etc. (LACHMAJER et al. 1956, NOSEK 1971, SIXL 1973, LEBEDEVA & KORENBERG 1981, author's own observations and others).

20. *Haemaphysalis (Segalia) parva* NEUMANN, 1897

synonym *Haemaphysalis otophila* SCHULZE, 1918

The geographical range of this species covers the territories from Libya and Italy in the west, Balkan Countries, Hungary, Moldavia, Southern Ukraine, Asia Minor, northern areas of Middle East, Caucasus to Turkmenistan in Central Asia (Kolonin, 1978). In Central Europe it was reported from the south of Hungary (BABOS 1964).

A polyphagous parasite, dwelling outside nests, in steppe habitats and forests of lower mountain zone (POMERANTZEV 1950).

21. *Dermacentor (Dermacentor) reticulatus* (FABRICIUS, 1794)

synonym: *Dermacentor pictus* (HERMANN, 1804).

The geographical range of this species lies in the temperate climate zone and runs latitudinally from England, France and Spain in the west to the upper Yenisey basin in Siberia in the east. The range is separated in two areas: the so called west European including the localities in England, Switzerland, south-western Germany. Central European localities from Germany, Austria, Czech, Slovakia and Hungary and also those from the former Yugoslavia, Romania and Moldavia should be also included in this area. The occurrence of this tick in the above countries is probably limited to the valleys of the Danube River and its tributaries. Another area, the so called eastern or Russian extends from the north-eastern parts of Poland and through the vicinities of Kaliningrad, Lithuania, Byelorussia, Ukraine to the eastern distribution border in the Yenisey Basin (IMMLER 1973, KULIK & VINOKUROVA 1983, SZYMAŃSKI 1986, KOLONIN 1984 and others). The occurrence of *D. (D.) reticulatus* in that area is associated with the southern parts of taiga, mixed and deciduous forests and along river valleys where the species penetrates into steppes (FILIPPOVA & PANOVA 1989).

Beside these two large areas, insular localities of *D. (D.) reticulatus* are known from mountain and submontane parts of Crimea, northern Caucasus, east Trans Caucasia, Kapet-Dogu, western Altai Plateau and Saura, Diungarsky Ata - Tau in Tian Shan. Isolated localities were reported from low altitudes to desert zone in

Central Asia (ESTRADA-PEÑA 1990, FILIPPOVA & PANOWA 1989, KULIK & VINOKUROVA 1983).

It is a polyphagous parasite dwelling outside nest burrows, immature stages occur in small mammal burrows and burrow corridors. In Central Europe this tick occurs mostly in tree-covered river valleys, creeks or drainage ditches in marshy mixed forests, peatbogs, glades and meadows, cut-covers and tree covered pastures. Wintering adult ticks often gather in hayracks left in field over the winter (SZYMAŃSKI 1986).

22. *Dermacentor (Serdjukovia) marginatus* (SULZER, 1776)

The geographical range of this species extends as a broad belt from north western areas of Africa and south western Europe through the islands on the Mediterranean Sea, south European countries and southern areas of Central Europe, than along the steppe zone up to the rivers Tom and Katun in the former USSR in the east and through Asia Minor, northern areas of Middle East, Afghanistan, Mongolia to China (Xinjiang). It occurs from lowlands up to 3500 m a.s.l. (ESTRADA-PEÑA 1990, FILIPPOVA & PANOWA 1989, GUO GU et al. 1984, KOLONIN 1984, WALTER et al. 1986 and others).

A polyphagous parasite dwelling outside nests, attacking also humans. In the eastern part of its range it inhabits steppe forests, steppes and semi-deserts where it lives in more humid habitats in ground hollows, river valleys and ravines. In Western Europe the species penetrates the forest zone along the stepping areas. In southern, warmer part of its range it occurs almost exclusively in the mountains where it inhabits mainly forest habitats (KOLONIN 1984). In the south of Central Europe it lives in open habitats, mostly in undulating terrain with mostly xerothermic vegetation and on the edges of oak forests. It can be found also in habitats used as pastures from where it expands on fallows, shrubby hills among fields, field roads but never penetrates ploughlands (NOSEK 1972).

23. *Rhipicephalus (Digenes) bursa* CANESTRINI et FANZAGO, 1877

The geographical range of this species extends from north west Africa, Portugal and Spain and through the Mediterranean and Balkan Countries, Asia Minor, northern areas of Middle East, southern Ukraine, South European regions of Russia reaches the Trans Caucasian Countries, Turkmenistan and western parts of Kazakhstan. It was also recorded from China (Xinjiang) (EMCHUK 1960, GUO GU et al. 1984, MANILLA 1986b, POMERANTZEV 1950 and others). In Central Europe of *R. (D.) bursa* is known from Hungary (BABOS 1964).

A parasite dwelling outside nests, attacking big mammals, mainly domestic cattle, rarely humans. It lives mostly in warm, moderate humid habitats, exposed to light: opened forests, shrubby vegetation, steppes. It was also reported from semi-deserts. It inhabits plains, lower and medium mountain zone (KOLONIN 1984 and others).

B. SPECIES OF HIGH PROBABILITY OF OCCURRENCE IN CENTRAL EUROPE

Family Ixodidae MURRAY, 1877.**1. *Ixodes (Pholeoixodes) kaiseri* ARTHUR, 1957**

The geographical range of this species is incompletely known. It was recorded from Moldavia, Romania, southern Ukraine, northern Caucasus, Georgia, Azerbaijan, Kazakhstan, Iran, Israel and Egypt (FILIPPOVA 1977, KOLONIN 1981, REKK 1976).

The probability of occurrence of this species in south-eastern parts of Central Europe is high. A burrow nest dwelling parasite, associated mainly with predatory mammals. It inhabits host's burrows on the edge of deciduous forests, also in steppe and semi-desert zones in shrubby vegetation of terrain hollows and river and spring valleys (FILIPPOVA 1977 and others).

2. *Rhipicephalus (Rhipicephalus) rossicus* JAKIMOV et KOHL-JAKIMOVA, 1911

The geographical range of this species covers the countries next or between the Black and Caspian Seas: Bulgaria, Romania, Moldavia, southern Ukraine, southern European parts of Russia, roughly from the Volga-Don Channel to the Caucasus, Georgia, Armenia, Azerbaijan, north eastern Turkey, Turkmenia, Western Kazakhstan, Uzbekistan, north eastern Iran. Isolated findings of *R.(R.) rossicus* on Sinai Peninsula and a single case of introduction in south-eastern Poland were reported (BERDYEV 1980, EMCHUK 1960, FEIDER 1965, HOOGSTRAAL 1979, KOLONIN 1984, FELDMAN-MUHSAM 1960, SIUDA 1993).

A polyphagous parasite of mammals, often attacking humans and dwelling outside nests. It inhabits steppes, steppe forest zones, semi-deserts, mountain steppes where it lives in more humid habitats like river valleys, ravines, glens covered with trees or bushes.

There is a possibility of occurrence of *R.(R.) rossicus* in south-eastern areas of Central Europe, because it is the northernmost spread member of the genus *Rhipicephalus* (SIUDA 1993, and others).

C. SPECIES INTRODUCED IN CENTRAL EUROPE

Family Ixodidae MURRAY, 1877.**1. *Ixodes (Ixodes) festai* RONDELLI, 1926**

Localities of this species are known from France, Corsica and north western Africa (GILOT & PEREZ 1978, KOLONIN 1981, RAGEAU 1972).

Cases of introduction of this species in Central Europe by migrating birds were reported from northern Germany (Helgoland Island) (WALTER et al. 1979) and Northern Poland (Hel Peninsula) (SIUDA & SZYMAŃSKI 1991).

A parasite dwelling outside nests, attacking mostly birds that feed on the ground. Only females are known.

2. *Rhipicephalus (Rhipicephalus) sanguineus* LATREILLE, 1806

A primary, natural geographical range of *R. (R.) sanguineus* covered probably Africa, Mediterranean countries, Black Sea coast of Ukraine, Trans-Caucasia, Western Turkmenistan and Iran, Middle East (BERDYEV 1980, ESTRADA-PEÑA personal communication), HOOGSTRAAL 1956, 1979, KOLONIN 1984, LESSON 1951, PEGRAM et al. 1987a, b and others).

At present *R. (R.) sanguineus* is very widely distributed, its range covering all the continents and many islands in warm and hot parts of the World. It is assumed that these are areas located between 35° S and 50° N latitude, however in Europe the northern distribution border runs much more south - around 45° N latitude (KOLONIN 1984, PEGRAM et al. 1987a, b). Such a wide range of this species result from its aptitude to parasitize on dogs with which it was introduced all over the world.

In Europe it is frequently introduced with dogs in the northern areas beyond its continuous range. Such cases were reported from Germany, Poland, Czech and Austria in Central Europe (CENTURIER et al. 1979, GOTHE 1968, ČERNÝ 1985, 1989, SZYMAŃSKI 1979, 1980, ŻUKOWSKI 1985, SIXL 1972).

An oligophagous parasite, attacking birds, mostly dogs, and rarely humans. Within its primary continuous range a parasite dwelling outside nests, outside this area it is burrow nest dweller. Within its primary range it lives in natural habitats, mostly steppe and semisynanthropic habitats. Beyond this range the tick occurs mostly in synanthropic and semisynanthropic habitats like farm yards, farm buildings, animal husbandries, animal asylums and houses. Its occurrence beyond the primary distribution range is always associated with the presence of dogs (CENTURIES et al. 1979, HOOGSTRAAL 1956, 1972, HOOGSTRAAL et al. 1981, ČERNÝ 1985, 1989, SIXL 1972, SZYMAŃSKI 1979, KOLONIN 1984 and others).

3. *Rhipicephalus (Rhipicephalus) turanicus* POMERANTZEV, 1940

A species closely related to *R. (R.) sanguineus*. Its geographical range extends from Morocco, Portugal and Spain in the west, through North Africa, Southern Europe, Asia Minor, Middle East, foothills of Caucasus, Trans-Caucasia to Central Asia (Afghanistan, India, Nepal, China). In the mountains it reaches 3000 m a.s.l. (KOLONIN 1984, POMERANTZEV 1950 and others).

A polyphagous parasite of mammals dwelling outside nests. It inhabits semi-deserts, dry brushwood of xerothermic bushes, penetrates deserts (KOLONIN 1984).

Cases of occurrence of *R. (R.) turanicus* in Central Europe were reported from Tyrol in Austria (SIXL 1972). It was probably a case of introduction since the ticks collected on two occasions were found on the same dog.

4. *Hyalomma (Hyalomma) aegyptium* LINNAEUS, 1758

The geographical range of this species extends from north western parts of Africa, through Apennine Peninsula, Balkans, Asia Minor, eastern coasts of the Black Sea, Trans - Caucasus, northern part of Middle East, Iran to Afghanistan and Pakistan in Central Asia (HOOGSTRAAL 1956, DJAPARIDZE 1960, FEIDER 1965, KOLONIN 1983 and others). Probably it is often introduced with turtles of the genus *Testudo* to Central Europe. Confirmed cases of such introduction were reported from Austria (SIXL 1971), Poland (SIUDA 1993) and Germany (EICHLER et al. 1968).

A parasite dwelling outside nests; its main hosts are turtles of the genus *Testudo* and agamas (*Agama*). It inhabits steppes and deserts, mostly steppe with the xerothermic vegetation (FEIDER 1965, BERDYEV 1980 and others).

5. *Hyalomma (Euhyalomma) marginatum* KOCH, 1844

synonym *Hyalomma plumbeum* (PANZER, 1795)

The species includes four subspecies, of which *H. (E.) marginatum marginatum* Koch, 1844 occurs in Southern Europe. The geographical range of *H. (E.) m. marginatum* covers the Mediterranean countries (except Libya and western part of Egypt), south-eastern Europe (Bulgaria, Romania, Moldavia, southern Ukraine, south-western parts of Russia), eastern coasts of the Caspian Sea, Turkmenistan and northern part of Middle East (Palestine, Syria, Iraq, Western Iran) (DJAPARIDZE 1960, ESTRADA-PEÑA pers. com., HOOGSTRAAL 1956, 1979, EMCHUK 1960, KOLONIN 1983, MANILLA 1986b, SIUDA 1993 and others).

Probably every year many specimens of *Hl. (E.) m. marginatum* reach Central and Northern Europe with migrating birds, but do not establish local, reproducing populations. Such cases were reported from Germany, Poland, Czech, Slovakia and Hungary in Central Europe (BABOS 1964, ČERNÝ 1972, ČERNÝ & BALÁT 1957, EICHLER et al. 1968, NOSEK et al. 1982, SIUDA & DUTKIEWICZ 1979, SIXL 1971, WALTER et al. 1979).

H. (E.) m. marginatum is a polyphagous parasite dwelling outside nests. Adults often attack humans. It lives in steppe, foothill steppe or steppe forest habitats of the Mediterranean climatic zone; often found on old fallows.

D. SPECIES PROBABLY INTRODUCED IN CENTRAL EUROPE

Family *Ixodidae* MURRAY, 1877.

1. *Ixodes (Ixodes) eldaricus* DJAPARIDZE, 1950

Morphologically the females of this species are very similar to the females of *I. (I.) festai*.

The geographical range of this species extends from Crimea and Cyprus through Middle East (Israel, Iraq), south of European Russia, Caucasus, Trans-Caucasia to Central Asia (Turkmenistan, Kazakhstan, Uzbekistan, Tadjikistan, Kirghizia) (BERDYEV 1980, DJAPARIDZE 1960, FILIPPOVA 1977, KAISER et al. 1974, KOLONIN 1981).

Introduction of this tick with migrating birds from the eastern Mediterranean territories may be expected as the species was collected from migrating birds on Cyprus during their spring passage (KAISER et al. 1974).

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