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# THE ESTIMATION SCALE OF ENDANGERMENT WITH TICK ATTACKS ON RECREATIONAL TOWNS AREAS*

## SKALA ZAGROŻEŃ ATAKAMI KLESZCZY NA MIEJSKICH TERENACH REKREACYJNYCH

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STRESZCZENIE

W odpowiedzi na rosnące zagrożenie ze strony kleszczy z gatunków *Ixodes ricinus* i *Dermacentor reticulatus*, oraz związaną z nim potrzebę ostrzeżenia mieszkańców miast przed tym niebezpieczeństwem, podjęto próbę opracowania obiektywnej skali zagrożenia atakami w/w roztoczy. Skalę zagrożenia opracowano opierając się na podstawie naturalnego zagęszczenia kleszcza pospolitego *I. ricinus* na obszarach rekreacyjnych Warszawy. Roztocze odławiano stosując metodę flagogodziny w powtarzalnych warunkach – pora dnia, doświadczenie osoby łowiącej, ta sama flaga. Obszary, na których liczba złowionych kleszczy w ciągu godziny przekraczała 50 osobników zostały nazwane obszarami o bardzo dużym ryzyku, natomiast obszary, w których kleszczy było bardzo mało (1 – 3 osobników odłowionych w ciągu godziny) – obszarami o niskim ryzyku. Pomiędzy tymi wartościami wyróżniono jeszcze trzy obszary – o ryzyku wysokim, średnim oraz średnio niskim.

Opracowana skala może być przydatna dla celów epidemiologicznych, przy szacowaniu ryzyka zarażenia chorobami przenoszonymi przez kleszcze, a także dla dziennikarzy i autorów artykułów w pismach popularnonaukowych.

**Słowa kluczowe***: ataki kleszczy, Ixodes ricinus, Dermacentor reticulatus*

ABSTRACT

The 5-classed scale of threats with tick's attacks was modelled on the ground diversification of the number of tick collected. The areas above 50 ticks collected per hour, was named as the very high class, minimal level of endangerment (1 to 3 ticks) named low class, medium values were established: medium low class of endangerment, medium class of endangerment, high clas of endangerment respectively.

**Key words:** *ticks attacks; Ixodes ricinus; Dermacentor reticulatus*

## INTRODUCTION

It has been observed recently that the knowledge about the zoonoses transmitted by blood-sucking arthropods has improved. Within the past few years, the number of "new" human diseases associated with small-mammals as theirs reservoirs and blood-sucking arthropods as vectors has increased dramatically. The most important vectors of pathogens of these diseases are ixodid ticks. There are about 20 ixodid tick species in Poland, which are permanent components of Polish fauna (1); among them the main vectors of tick-borne pathogens are *Ixodes ricinus* and *Dermacentor reticulatus*. Another species - *Ixodes trianguliceps* and the ticks

from *Argasidae* family – don't play such important role (2,3), because they are not numerous, and attack human occasionally.

The occurence of *Ixodes ricinus* tick is not limited to natural forest complexes.

Over the recent years the presence of these species was documented on many areas of city agglomerations in Poland, principally on recreational terrains characterizing itself with the large afforestation and with the concentration of the bushy vegetation (4). The ticks collecting on urban areas is provided usually at the opportunity of epidemiological investigations, over their infection with pathogens dangerous for people - mostly *Borrelia burgdorferi*, *Anaplasma phagocytophilum* and the TBEV virus. The ecological data, such as the character of the floral community, the time of tick collection and the meteorological conditions were given rarely. In that case it is difficult to establish the general rules of the appearance of ticks under conditions of urban environment. Study over the occurrence of ticks in city parks were conducted on the area of the Gdańsk agglomeration (5, 6), Wrocław (7), Poznań (8, 9), Szczecin (10, 11), Lublin (12), Warszawa, Kraków and Katowice (13, 14, 15). Outside Poland, similar researches were conducted in Slovakia (14), Germany (16) and Ukraine (17).

The number of ticks collected is usually shown in publications. However, there are differences in the methods of ticks collection used by various authors so it is difficult to compare the data given and clearly estimate the level of tick attacks danger on people visiting recreational areas. As a result, the very important data about ticks presence in natural environment and its epidemiological risk is not used in practice. This work is the trial to adapt data collected during the field researches for practical use. Basing the presented scale, the information collected during many years investigations or monitoring conducted by bigger number of persons could be very useful for epidemiologists and journalist. Another methods to use the field study results are the posters in parks, informing about the endangerment with tick attacks, possibly with information how to preserve against that emergency and how to remove attached ticks.

## MATERIAL AND METHODS

The risk scale of tick's attacks was modelled on the ground diversifying of the number of ticks *Ixodes ricinus* in city parks and woodlands on the area of Warszawa agglomeration. The criteria for parks selection were: the presence of natural plant communities or completely antropogenical character, the low or high frequency of human visits, and the knowledge about ticks occurrence purchased during previous investigations. Ticks were collected from the vegetation using flagging method. Among many available methods of tick ratio estimation (all based on the number of ticks collected per one hour of flagging, or on the method of study fields) (18, 1, 19) the method of "one hour" was chosen. The reason for that choice is the behaviour of researcher, who during one hour of study is penetrating similar area as side seeing person. Moreover, it is possible to intentionally choose for study the places often visited by people. That way the results obtained are more appropriated to common human, than in the case of more improved methods.

Ticks were collected in 30 study areas, all located in the border of Warsaw agglomeration. The study was carried on the morning-peak of activity (8:00 - 12:00 am) usually from April to June of 2007. The ticks ratio was estimated on the base of the number of active ticks collected by one person per one hour of flagging, with white flag 1 m long and 0,75 m wide. To avoid affords during the study only the same two persons collected the ticks. Because the habitat of various parks differs, in various parks the various number of investigators were employed (from 2 to 4 persons) and in some cases the collection of ticks was conducted only once, the numbers of collected ticks were averaging, in order to establish the mean, comparable value.

## RESULTS

The presence of ticks was discovered in 21 location. The number of ticks collected per one hour by single person was very variable - from single specimens to 98. All active developmental stages were found, among them nymphs and adult females were the most present.

The occurrence of two dominant species of ticks in the Warszawa agglomeration was noticed: common tick *Ixodes ricinus* and ornate dog tick *Dermacentor reticulatus*. *I. ricinus* occur mostly in the greatest number in habitats being the rest of inherent forests – for example Lasek Bemowo and Lasek Bielański. They weren't found in environments characteristic of high anthropopression; for example: Park Łazienkowski, field of State-Horse-Races on Służewiec (Państwowe Tory Wyścigów Konnych Służewiec). *D. reticulatus* is common on open areas, for example around Jeziorko Czerniakowskie and on the fields in the Lasy Wawerskie. Practically it doesn't appear in dense forests (percent of heads of the trees concentration is more than 60%).

It is evident for Warsaw, that in some places (woodlands) ticks are very numerous although in another's - they're rare, or completely absent. There were a few

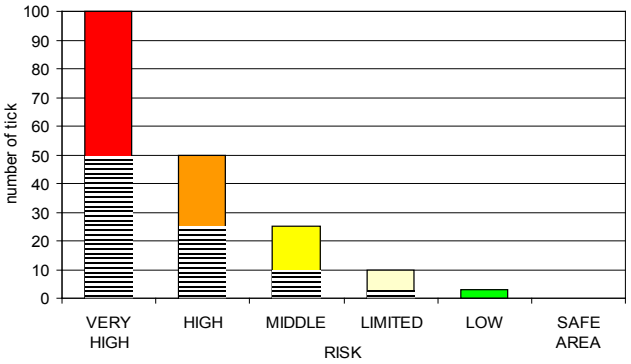
places were the number of ticks was very high (almost 98 ticks, nymphs and adults, found per one hour of flagging per one person in Lasek Bielański), and a lot of places where the ticks were absent. The first kinds of area was the place with very high risk of tick attack. The last kinds were safety areas, without any ticks.

We established the 5-classed scale of tick's risk on the base of ticks number calculated on the areas studied. The areas with the most numerous ticks population– above 50 ticks collected per hour, was named as the very high class of risk. As the minimal level of risk, named low class, were accepted areas were 1 to 3 ticks were collected during one hour. As the medium values were established: medium low class of risk, with 4-10 ticks collected per one hour; medium class of risk, with 11-25 ticks collected; high class of risk, with 26-50 ticks collected. Additionally, these areas were ticks were absent, were named safety.

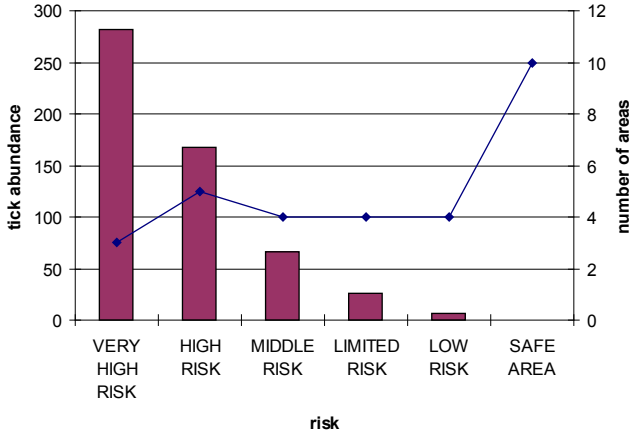
Table I. Proposal of segregate city parks to the class of endangerment with ticks attacks.
Tabela I. Propozycja podziału parków środmiejskich na klasy pod względem zagrożenia atakami kleszczy.

| risk degree (no. of ticks) | area | proposed colour |
|---|---|---|
| VERY HIGH RISK (> 50) | Las Bemowo (North side) | red |
| | Zoological Garden | |
| | Las Bielański | |
| HIGH RISK (26-50) | Las Młociny | orange |
| | Las Kabacki (North side) | |
| | Las Kawęczyn | |
| | Kampinoski National Park | |
| | Las Bemowo (South side) | |
| MIDDLE RISK (11-25) | Lasek na Kole | yellow |
| | Brama Północna –Kampinoski National Park protection zone | |
| | Las Kabacki (South side) | |
| | Lasek Bielański – meadow | |
| LIMITED RISK (4-10) | Las Kabacki (East side) | light beige |
| | Wood near Obrońców Tobruku Street | |
| | Las Morysin | |
| | Las near Tarchomin Terminus | |
| LOW RISK (1-3) | Lasy Wawerskie | green |
| | Wood Sulejówek - Grabina | |
| | Lasek Bielański – kids park | |
| | Las Jana III Sobieskiego | |
| SAFE AREA (no ticks) | Państwowe Tory Wyścigów Konnych Służewiec | white |
| | Park Matki Mojej | |
| | Olszynka Grochowska | |
| | Łazienki Królewskie | |
| | Park Saski | |
| | Pola Mokotowskie | |
| | Russian Soldiers Cemetery | |
| | Ogród Krasińskich | |
| | Park Morskie Oko | |

The range of numbered in the scale elaborated has progressive, not linear, character. The linear histogram doesn't represent the real dynamic of the tick's density in environment. During the trial of using this model, almost all areas were classified in one category, and there were no more possibility to segregate city parks to the class of risk (table I). There is no defect like this in the progressive model (ryc. 1).




Ryc. 1. Proposal of the scale of the risk depending of the tick abundance. Moreover, the diagram picture of scale proposed (fig 2.) agree with the histogram of conglomerate model of tick's distribution in the habitats. Number of ticks like in Table I.




Ryc 2. Diagram picture of scale of ticks attack endangerment proposed. Scale 0X shows risk degree; TICK ABUNDANCE the quantity of tick in the mass, collected by one hour of flagging per one person, on the area about the subscribed degree of risk (columns). NUMBER OF AREAS = the quantity of the area about the given degree of risk .

## DISCUSSION

The first trial of 5-classed scale of emergency made Korenberg (20) and Balashov (21), to establish the risk of ticks attack in the areas of Siberia woodlands. They calculated the number of ticks also using the popular

”one hour” method. However, their scale was strongly connected with the habitat type and great biodiversity of environments not disturbed by human activity.

It is not recommended to use scales mentioned above for environments changed by human activity. The habitats of city agglomeration characterise with high heterogenity (22), and are not so varied in types as primeval areas and in every case are under strong anthropopression. The studies in Warszawa were conducted in different forests ecosystems (23). It is obvious, that the results obtained show that the number of ticks collected has no connection with plants conglomerations and local microclimate, apart the very dry areas, lack with ticks (for example Las Jana III Sobieskiego). The specificity of city habitats makes the most important factors determining tick's occurrence of appropriate hosts and the ecological tunnels, connecting the city centre forests and forests around agglomeration. The biotopes and habitats character play the second role. The examples are Bielański Forest, Kabacki Forest and Bemowo Forest. These forests have different plants conglomerations; however they are equally rich with the ticks and their hosts. Thus, the join of habitat type to the ticks' scale of risk is not obligatory for the cities.

The next environmental factor in city forests is the strong anthropopression. In city centre parks there is the form of the scything of the grass and removing of forest bed**.** This cultivation dramatically decreases the number of ticks, and when has permanent character, is able to completely remove their population from the park. In Warszawa, all parks being cultivated belong to “safety” class, even when the microclimate and forest type are appropriate for ticks.

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