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DISTRIBUTION OF THE IXODID TICK *HYALOMMA MARGINATUM* (IXODOIDEA, IXODIDAE) IN UKRAINE

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Distribution of the Ixodid Tick *Hyalomma marginatum* (Ixodoidea, Ixodidae) in Ukraine. Akimov I. A., Nebogatkin I. V. — The Northern boundary of the current distribution range of *Hyalomma marginatum* Koch in Ukraine that passes along the North of Odesa, Mykolayiv, Kirovograd, Dnipropetrovsk, Zaporizhia, Donetsk and Luhansk Oblasts has been specified. The natural habitat is mapped according to different possibilities for mass reproduction. Regular findings of *H. marginatum* inhabited unusual places may contribute to the spreading of diseases dangerous to humans and animals to new areas, where the latter may be treated as a biological threat of large epidemics and epizootics. Natural habitat of the Ixodidae species has been mapped in consideration of feeding types and the ability of it hosts to travel. Only the areas where all stages are regularly found were included what corroborates Ixodidae species establishing in new areas.

Key words: ixodid ticks, *Hyalomma marginatum*, natural habitat, biological

Распространение иксодового клеща *Hyalomma marginatum* (Ixodoidea, Ixodidae) в Украине. Акимов И. А., Небогаткин И. В. — Уточнена северная граница современного ареала *Hyalomma marginatum* на территории Украины, которая проходит по северу Одесской, Николаевской, Кировоградской, Днепропетровской, Запорожской, Донецкой и Луганской областей. Представлена карта с дифференцированным по возможности массовых размножений ареалом. Регулярные находки *H. marginatum* на несвойственных местах проживания играют роль в распространении возбудителей болезней опасных для человека и животных на новые территории, где последние могут представлять угрозу широких эпидемий и эпизоотий. Составлена карта ареала этого иксодового клеща с учетом типа питания и возможности хозяев к перемещению. В него включены только территории, где периодически находили все стадии развития, чем подтверждено укоренение вида на новых участках.

Ключевые слова: иксодовые клещи, *Hyalomma marginatum*, ареал, биологическая угроза, Украина.

Introduction

The northern habitat boundary of two tick species of the genus *Hyalomma*, namely *H. marginatum* and *H. scupense* P. Schulze goes through Ukraine (Акимов, Небогаткин, 1998; Kolonin, 2009). Species of this genus are polymorphic (Filippova, 1997) and presented by some subspecies (Kolonin, 2009). Taking into consideration that *H. marginatum* is the mass species in the southern part of Ukraine and throughout the whole natural habitat it serves a primary vector and keeper for the Crimean-Congo hemorrhagic fever (CCHF) pathogen, clarification of the modern ranges of its distribution in Ukraine is necessary and urgent issue.

Material and methods

To check up on the *H. marginatum* habitat range in Ukraine we used our material collected from 1977 to 2009 in the Autonomous Republic of Crimea, 22 Oblasts (regions) and some big cities (Kyiv, Mariupol,

Sevastopol). Totally, we examined about 12,000 ticks collected by dragging with a flag as well as by examining about 2.4 thousand individuals of cattle and small cattle, domestic animals, and birds. We also used materials of short-term (half a year) forecasts and surveys by the 25 regional Sanitary epidemiology stations (SES) as well as the city SES of Kiev, Alushta, Mariupol, and Sevastopol and the private archive of E. F. Litvinenko and E. M. Emchuk (1960) since 1953. Totally, except for our findings, more than 1.4 million ticks were examined. To prepare distribution maps, the formally administrative and territorial method was used, in which we used an administrative unit (Raion) as an elementary zoogeographical unit within which certain group of species was found (Dubrovskiy et al., 1980). We preferred this method as compared to the method of the formal grid fields when the size of square side, depending on working objectives, is chosen from 5–10 km to some grades of grid (Neronov, 1976; Dubrovskiy et al., 1980), because Raions and Oblasts of the administrative division of Ukraine are evenly distributed over the territory, and Raion area averages 1.11±0.04 thousand sq. km. When analyzing this material, we used the following quantitative measures: index of abundance (IA) and index of occurrence (IO) (Tularemia, 1954).

Results and discussion

In our collections, 78% of adult ticks *H. marginatum* were collected by dragging with a flag and only 22% from hosts. The highest indices of abundance by dragging with a flag were registered on pastures, in mountainous woodlands, field-protecting forest plantations, uncultivated areas with weed vegetation, natural and artificial spots of forest plantations inhabited by rooks along the Black Sea and Azov coasts.

Immature stage of development were extremely rare: collected with flag, taken from cattle, dogs, hare (*Lepus europaeus* Pall.*)*, hedgehogs (*Erinaceus concolor* Mart), from rooks (*Corvus frugilegus* L.*)*, blackbird (*Turdus merula* L.), and mistle thrush (*Turdus viscivorus L.)* (table 1).

In 1999, abundance of attached ticks in the rooks colony near Mariupol town in Donetsk Oblast was studied (table 2).

Our findings may support the fact that the nymphal stages of this tick with two hosts mainly parasitize birds and very rarely domestic animals, hares and hedgehogs. Nymphs were found on cattle because of attacking the main host.

In Ukraine this species is found along Black Sea and Azov coasts, in Steppe and the Crimea (fig. 1). The ticks species distribution has been more or less permanent during

Table 1. Immature stages of development of *H. marginatum* collected in Ukraine
Таблица 1. Неполовозрелые стадии *H. marginatum* отловленные в Украине

Object	Number of ticks	N	L	IO
On flag	13	12	1	–
Large cattle	2	2		0.1
Dog	1	1		0.6
Rook	86	86		69.4
Mistle thrush	1	1		33.3
Blackbird	1	1		20.0
Hedgehog	6	4	2	3.9
Hare	1	1		4.0
Total	111	108	3	

Table 2. Research on the abundance of *H. marginatum* found on rooks near Mariupol
Таблица 2. Учеты численности *H. marginatum* на грачах в г. Мариуполе

Date	Number of birds examined	Number of birds with ticks	Ticks				
			imago	nymphs	IA imago	IA nymphs	IO
18.05.1999	3	2	2	8	0.7	4.0	66.7
19.05.1999	8	6	3	21	0.4	3.5	75.0
20.05.1999	12	10	1	32	0.1	3.2	83.3
21.05.1999	8	4		19		4.8	50.0
Total	31	22	6	80	0.2	3.6	71.0

the whole observation time. In Ukraine, the range of H. marginatum natural habitat runs along the following border: Krasni Okny, Ananiev, Lyubashev districts of Odessa Oblast; Vradiev, Domanev, Arbuzyn, Bratsk districts of Mykolaiv Oblast; Bobrynets, Ustyniv districts of Kirovograd Oblast; Kazankiv district of Mykolaiv Oblast; Shyrokiv, Apostoliv, Nikopol, Tomakiv districts of Dnipropetrovsk Oblast, Zaporizhia, Volnyany, Novomykolaivsk districts of Zaporizhia Oblast; Vasylkiv, Petropavlivsk districts of Dnipropetrovsk Oblast, Alexander, Slaviansk, Krasnolymansk districts of Donetsk Oblast; Kremensk, Starobelsk, Belovodsk districts of Luhansk Oblast.

Inside Ukraine, this natural habitat may be divided into three zones:

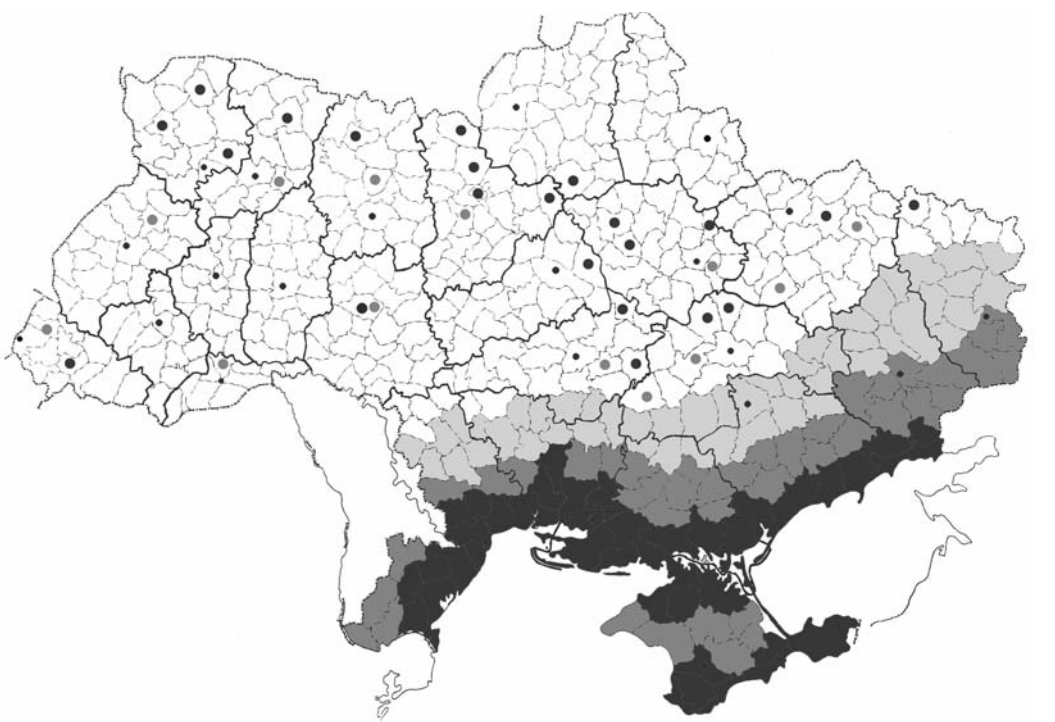
— areas, where this tick is abundant with places of periodic outbreaks of mass reproduction;

— areas, where this tick is common, however its mass reproduction are very rare and due to natural and anthropogenic reasons;

— areas, where this tick is found regularly: once per 2–3 years, and its mass reproduction was not recorded even under favorable conditions.

Such division is important to study biology of this tick species, its effective control as mass cattle parasite, as well as for determining natural nidi of infections and removal areas during epizooties.

A particular feature of *H. marginatum* is that very few nymph individuals are found in the nature, all the rest being adults (there is only one nymph specimen in our material collected with a flag on the border between Kiev and Obukhiv Raion of Kiev Oblast), and mainly in areas outside the range of its natural habitat, mainly on paths of migratory birds (fig. 1). Apparently this happens due to the nymphal stages development being transported by birds to new areas, where this species, even managed to grow into an adult, can not get acclimatized. There was the only case in the southern Germany when



Where — archival findings and literature data findings of the authors

Fig. 1. Natural habitat of *Hyalomma marginatum* in Ukraine.

Рис. 1. Ареал *Hyalomma marginatum* в Украине.

female of this species attacked the man (Kampen, Poltz and it, 2007), though the authors do not exclude the possibility of carrying the tick already on the human from Spain.

Exceptions are the data from E. F. Litvinenko's archive, from Zhytomyr Oblast (Olevsky Raion), where adult ticks were taken from the cattle in three consecutive years 1969–1970. (IA — 2.7; 5.3, 0.53, IO — 8, 12.5, 4). Transition to the cattle stall confinement resulted in disappearing of not only *H. marginatum*, but also a number of other Ixodidae species. According to our data, this species was not registered on cattle outside its habitat range before 1969 and after 1970. Data above show the possibility of establishing and fairly long (2–3 years) existence of sporadic temporary nidi of reproduction of *H. marginatum* outside its habitat range.

In our opinion, the habitat ranges of Ixodidae ticks should be corrected taking into account their biological features, and especially feeding types and the ability of hosts to travel. Thus, only the areas where all stages of development are regularly found should be considered a part of the habitat. Such regular findings may corroborate Ixodidae species establishing in new areas. Potentially endangered areas should be constantly monitored.

Regular findings of *H. marginatum* inhabited unusual places may contribute to the spreading of diseases dangerous to humans and animals to new areas, where the latter may be treated as a biological threat of large epidemics and epizootics.

Conclusions

1. The northern boundary of the present range of H. marginatum on the territory of Ukraine runs along the following border: Krasni Okny, Ananiev, Lyubashev districts of Odessa Oblast; Vradiev, Domanev, Arbuzyn, Bratsk districts of Mykolaiv Oblast; Bobrynets, Ustyniv districts of Kirovograd Oblast; Kazankiv district of Mykolaiv Oblast; Shyrokiv, Apostoliv, Nikopol, Tomakiv districts of Dnipropetrovsk Oblast, Zaporizhia, Volnyany, Novomykolaivsk districts of Zaporizhia Oblast; Vasylkiv, Petropavlivsk districts of Dnipropetrovsk Oblast, Alexander, Slaviansk, Krasnolymansk districts of Donetsk Oblast; Kremensk, Starobelsk, Belovodsk districts of Luhansk Oblast.

2. Natural habitat ranges of Ixodidae species should be designated taking into account their biological traits, especially their feeding types and the ability of their hosts to travel, including only the areas where all stages are regularly found which thus corroborates Ixodidae species establishing in new areas.

3. Regular findings of *H. marginatum* inhabited unusual places may contribute to the spreading of diseases dangerous to humans and animals to new areas, where the latter may be treated as a biological threat of large epidemics and epizootics.

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