




# First record of *Haemaphysalis concinna* (Acari: Ixodidae) in Lower Silesia, SW Poland

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## Abstract

*Haemaphysalis concinna* Koch is one of 19 species of the genus *Haemaphysalis* which has been reported in the Palearctic region. In Europe, the presence of *H. concinna* ticks has been reported in numerous countries. In Poland, to date, the precise occurrence of *H. concinna* was known only from one site in the north-western region. This paper shows that *H. concinna* ticks can be considered a typical example of the tick fauna occurring in Lower Silesia, SW Poland. Tick monitoring was conducted using a standard flagging method in 24 sites in the various forest types of Lower Silesia. Among 1622 host-seeking ticks collected, *H. concinna* accounted for 2.7%. From the collected *H. concinna* there were: 25 (58.1%) larvae, 15 (34.9%) nymphs, 1 (2.3%) female, and 2 (4.7%) males. The presence of *H. concinna* was confirmed in 6 out of 24 tested sites in fresh mixed broadleaf forests, fresh mixed coniferous forests and in pastures.

**Keywords** *Haemaphysalis concinna* · Poland · Geographical distribution · Ticks

## Introduction

*Haemaphysalis concinna* Koch, known as a Relict tick, is one of 19 species of the genus *Haemaphysalis* reported in the Palearctic region (Estrada-Peña et al. 2017). *Haemaphysalis concinna* is a non-nidicolous tick with a three-host development cycle which is usually completed within 3 years. The hosts of *H. concinna* are both wild and domestic animals, including small and medium-sized mammals, birds, and reptiles (Nowak-Chmura and Siuda 2012; Hornok et al. 2016; Meng et al. 2016; Rubel et al. 2018). Humans can be attacked by nymphs and adults (Nowak-Chmura and Siuda 2012). *Haemaphysalis concinna* can be found in different habitats, most often in well-lit deciduous and mixed forests with bushy undergrowth, forest clearings, lake shores, and river valleys, as well as forest steppes and wet steppe habitats (Nosek 1971; Siuda 1993; Nowak-Chmura and Siuda 2012; Rubel et al. 2018). The medical and veterinary significance of *H. concinna* is related

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to its proven vector role in the tick-borne encephalitis (TBE) virus and tularemia-causing bacteria *Francisella tularensis* (Rubel et al. 2018). Infection with other pathogens has also been detected, including severe fever with the thrombocytopenia syndrome virus (Meng et al. 2015), *Rickettsia* spp. (Igolkina et al. 2018) and *Babesia* spp. (Hamšíková et al. 2016; Rybářová et al. 2017).

*Haemaphysalis concinna* occurs in the temperate climate zone of a large part of Eurasia, between 28° and 64° north latitude, from Spain in the west to Japan and Kamchatka, Russia, in the east (Rubel et al. 2018). However, the range of its occurrence is discontinuous (Siuda 1993). In Europe, *H. concinna* has been reported in France, Germany, Belarus, Italy, Austria, the Czech Republic, Slovakia, Hungary, Romania, Moldova, Ukraine, Bulgaria, Croatia, Serbia, Spain, Bosnia-Herzegovina, Greece, and Poland. In Poland, according to Siuda (1993), the first occurrence of *H. concinna* dates from 1911; however, the records do not contain a precise location of the collection. The only well-known site of *H. concinna* in Poland, described in the 1950s, is located in the north-western part of the country in the West Pomeranian voivodship (in the locality of Troszyn), where one female was collected from the vegetation (Siuda 1993).

This paper shows, for the first time, that *H. concinna* ticks can be considered a typical example of the tick fauna occurring in Lower Silesia, SW Poland.

## Materials and methods

Host-seeking ticks were collected from March to September 2018 using a standard flagging method in 24 sites located in forested areas of Lower Silesia (Fig. 2). Each single site was flagged for at least 60 min, in daytime between 9 a.m. and 3 p.m., avoiding rainy and windy days. In two sites (10 and 11) 1 h flagging was repeated 6x, in 9 sites (1–9) it was repeated 3x, and only once in the remaining sites.

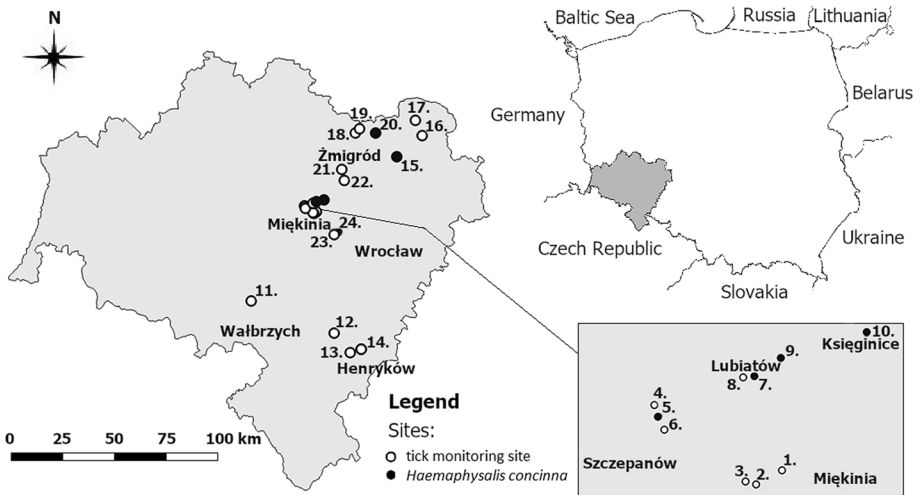
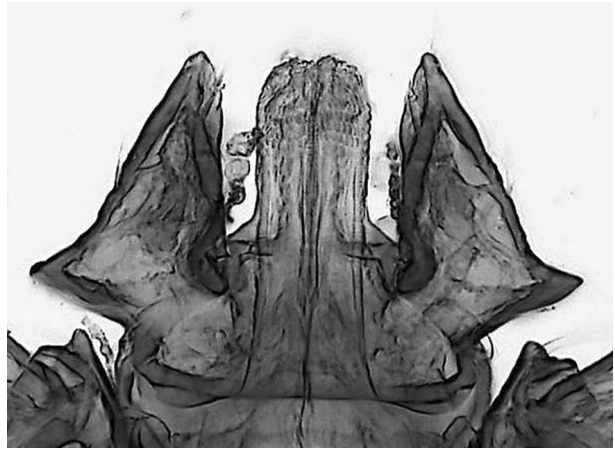
The dominant forest habitat type in particular study areas was determined on the basis of the Forest Data Bank (<https://www.bdl.lasy.gov.pl/portal/mapy>). The study included areas located in different forest types. The predominant forest type of the study areas is mixed broadleaf and coniferous forest. Some sites are also located in fresh coniferous forest, moist broadleaf forest, riparian forest, and pastures. In the forests where the research was carried out, the dominant tree species were pine (*Pinus sylvestris*), birch (*Betula pendula*), beech (*Fagus sylvatica*), common oak (*Quercus robur*), spruce (*Picea abies*) and larch (*Larix decidua*).

All collected ticks were identified to a species level according to the Ixodida identification key (Siuda 1993; Nowak-Chmura 2013; Estrada-Peña et al. 2017). To confirm the species identification of nymphs and larvae initially classified as *Haemaphysalis* sp., additional microscopic preparations were made from randomly selected specimens. The site was considered as positive for *H. concinna* occurrence when at least one specimen was found.

## Results

A total of 1622 host-seeking ticks were collected, including 1546 *Ixodes ricinus* (95.3%), 33 *Dermacentor reticulatus* (2.0%), and 43 *Haemaphysalis concinna* (2.7%). From the collected *H. concinna*, 25 (58.1%) were larvae, 15 (34.9%) were nymphs, 1 (2.3%) was

**Fig. 1** Morphology of gnathosoma of *Haemaphysalis concinna* larvae identified in Lower Silesia



**Fig. 2** Tick monitoring sites and *Haemaphysalis concinna* habitats located in Lower Silesia

female, and 2 (4.7%) were males (Fig. 1). The presence of *H. concinna* was confirmed in 6 out of 24 tested sites in fresh mixed broadleaf forest, fresh mixed coniferous forest and pasture land (Fig. 2; Table 1). All specimens of this species were collected from May to August, of which: females and males were collected only in May, nymphs from May to August, and larvae from June to August.

**Discussion**

In Europe, the presence of *H. concinna* has been reported from many countries. In Poland, to date, the precise occurrence of *H. concinna* was known only from one site in the north-western region (Siuda 1993; Nowak-Chmura and Siuda 2012). This study shows, for the

**Table 1** Number and density of *Haemaphysalis concinna* collected in six sites located in Lower Silesia, in 2018

Locality	Geographical coordinates	Forest type	Number of <i>H. concinna</i>			Density (num- ber/60 min)
			Larvae	Nymphs	Males	
5	51°12'19.44"N 16°38'35.16"E	Fresh mixed coniferous forest	–	1	–	0.3
7	51°13'15.96"N 16°41'42.36"E	Fresh mixed coniferous forest	–	1	–	0.3
9	51°13'42.24"N 16°42'42.84"E	Fresh mixed broadleaved forest	24	10	2	12
10	51°14'20.85"N 16°46'0.98"E	Pasture	–	1	–	0.16
15	51°24'41.13"N 17°12'48.36"E	Fresh mixed coniferous forest	–	–	1	1
20	51°30'32.61"N 17°3'48.34"E	Fresh mixed broadleaved forest	1	2	–	3
Total			25	15	2	

Locality numbers: see Fig. 2

first time, that *H. concinna* also occurs in the south-western part of Poland. The closest previously-known location of *H. concinna* to our site is in Germany. Among others, Rubel et al. (2014) found ticks at a site in the eastern part of Germany (Brandenburg), near the border with Poland, which can be seen on a geo-referenced map plotting over 2000 tick locations. This position is located about 190 km from the newly-recorded Lower Silesian location. The sites of *H. concinna* reported from the Czech Republic are located in Moravia, south of Brno (Rybářová et al. 2017), at a distance of about 245 km from our location.

Among 1622 host-seeking ticks we collected using flagging, *H. concinna* accounted for 2.7%. The most abundant tick species found was *I. ricinus* (95.3%). 2.0% of the ticks were *D. reticulatus*. In other European studies, the share of *H. concinna* among ticks collected from vegetation varies but is always smaller than the share of *I. ricinus*. In Slovakia, for example *H. concinna* comprised 1.3% of the tick collections while *I. ricinus* was 98.6% (Kazimířová et al. 2016), and in Hungary *H. concinna* was 17.8% and *I. ricinus* 78.6% (Hornok et al. 2014).

In the environment, all free-living stages of *H. concinna* quest for hosts climbing up vegetation. In our study, carried out using the flagging method, both adult ticks (female and males) and immature stages (larvae and nymphs) of *H. concinna* were present. The presence of all developmental stages of *H. concinna* in the tick population collected from vegetation is also recorded in other countries. In Slovakia, for example, among 82 *H. concinna* collected using dragging, larvae were 27%, nymphs 48%, and adults 25% (Kazimířová et al. 2016); in Hungary, among 437 ticks, the instances of larvae, nymphs and adults were 91, 5, and 4% respectively (Hornok et al. 2014); and in China, among a very large collection of almost 3000 questing specimens, larvae were 30%, nymphs 36%, and adults 34% (Meng et al. 2016).

In Central Europe, adult *H. concinna* ticks are chiefly active from May to July, nymphs from mid-April to mid-October, and larvae from late May to mid-October (Rubel et al. 2018). In our study, carried out from March to September, all specimens of *H. concinna* were collected from May to August, of which: adults were collected only in May, nymphs from May to August, and larvae from June to August. However, further systematic studies are necessary to precisely estimate the seasonal activity of *H. concinna* in SW Poland.

In our study, *H. concinna* was collected in fresh mixed broadleaf forest, fresh mixed coniferous forest and pasture land, and the habitat of *H. concinna* collected in NW Poland (the West Pomeranian voivodeship, Troszyn) was fresh mixed broadleaf forest near a lake (Siuda 1993). In temperate Eurasia, *H. concinna* is widely distributed both in wild, suburban and urban environments, including deciduous and mixed forests, relatively humid places, overgrown lake shores, and river basins (Nosek 1971; Hornok et al. 2014; Kazimířová et al. 2016; Rybářová et al. 2017). Thus, the habitats where *H. concinna* was found in Poland do not differ from the typical habitats recorded in other European countries.

Finding the host-seeking *H. concinna* ticks in 6 localities in Lower Silesia shows that this tick species can be considered as a typical element of the tick fauna in SW Poland. It also indicates the necessity for further systematic environmental monitoring of its occurrence, as well as the need to take *H. concinna* into account during research into the circulation of tick-borne pathogens in SW Poland.

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