

Tick infestation (*Ixodes*) on the Eurasian Otter (*Lutra lutra*) – a long-term study

Axel Christian

Senckenberg Museum für Naturkunde Görlitz, Postfach 300 154, 02806 Görlitz, Germany

e-mail: axel.christian@senckenberg.de

Abstract

Over a period of 21 years, 541 otters mostly killed on the roads were investigated. Three species of ticks (*Ixodes hexagonus*, *I. canisuga*, *I. ricinus*) were found to infest the Eurasian otter (*Lutra lutra*) in Germany. The most common tick species on the otters was *I. hexagonus*. The prevalence (= infestation extensity; proportion of infested animals) was 8.8%. The average infestation intensity (number of ticks per infested animal) was 7.9 ticks per infested otter. Two species of ticks were only found on two otters. The highest infestation intensity of *I. hexagonus* found on one otter was 72 larvae plus 3 nymphs and 2 females. The average infestation intensity by the stages of *I. hexagonus* was 2.0 females, 4.9 nymphs and 8.3 larvae per infested otter. In Upper Lusatia, Germany, the otter has been proven to be a frequent host for *I. hexagonus*. The common wood tick, *I. ricinus*, parasitized on only one otter.

Keywords: ticks, ectoparasites, *Ixodes hexagonus*, *Ixodes ricinus*, Otter, *Lutra lutra*, Germany

1. Introduction

The Eurasian otter, *Lutra lutra* Linne, 1758 was originally distributed throughout Europe and Asia. The otter is associated with diverse aquatic and riparian habitats. However, by obstruction and draining of waters, deforestation of riparian vegetation and pollution of the water the otter is endangered, especially in Central Europe, and is extinct in large areas. Although extensive research on the biology and the protection of the otter has been conducted in the past decades, its parasitism by ticks is not yet widely known. The aim of this long-term study was to investigate the prevalence (infestation extensity) and infestation intensity of ticks on the Eurasian otter in a vital population of this rare mustelid species in Germany.

2. Investigation area, materials and methods

The investigation area was Upper Lusatia, located in the federal state of Saxony (Germany), and comprised a territory of 4,500 square kilometres between the towns Görlitz, Kamenz, Weißwasser and Zittau (latitude 51° 17' N, longitude 14° 31' E; with about 40 km in radius). Over a period of 21 years, from 1990 to 2010, a total of 541 otter were collected in this area (Fig. 1) and investigated at the Senckenberg Museum of Natural History Görlitz and the Museum of Western Lusatia, Kamenz. The studied otters were killed on roads, were drowned in fish traps or died in other ways. In the preparation laboratory each otter was examined

for ticks with tweezers and a comb. The collected ticks were preserved in 70% ethanol. Determination of adults and nymphs was carried out under a stereomicroscope. Larvae were macerated in a mixture of glycerol and acetic acid, embedded in a gumarabic mixture on slides and determined under a DIC-light microscope.

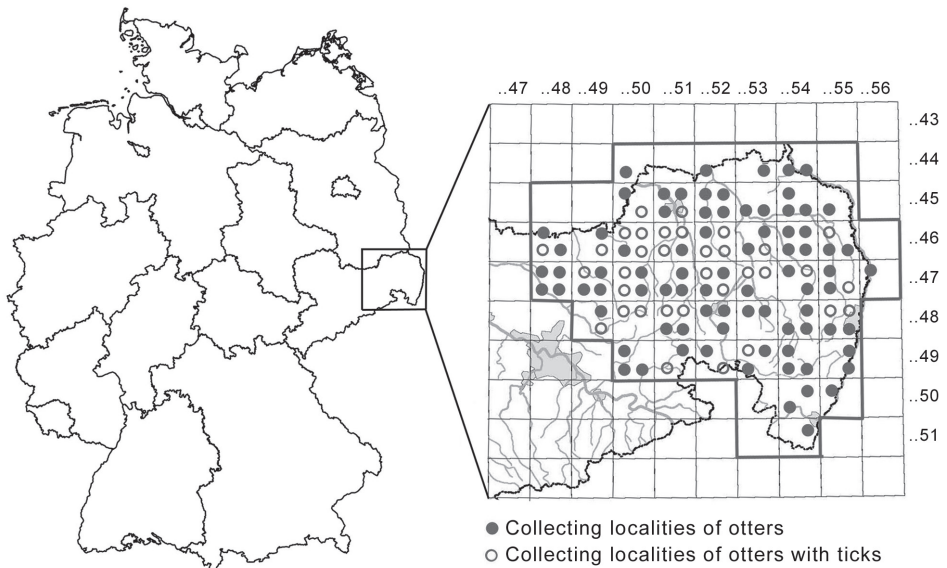


Fig. 1 Germany and detail map of Upper Lusatia with collecting localities of otters. Each square represents a topographical map and is divided into 4 quadrants (each quadrant with one dot) for presentation of more details of collecting localities.

3. Results

3.1. Prevalence (infestation extensity) of ticks on Eurasian otter

An unknown period of time always passes between the death of an otter and its placement into plastic bags for investigation and tick examination. Therefore, the detected number of ticks must be regarded as a minimum. The majority of ticks were found in the head and neck areas of the otters, especially on the ears. Among the 541 collected otters, 48 (27 males, 21 females) were infested with ticks. This corresponds to a prevalence (infestation extensity) of 8.8 % of the examined otters. There was no correlation to sex or age of the otter. Furthermore there were no correlations between parasitized otters and seasons.

For further studies on infestation intensity, the ticks from 29 otters, distributed over the entire study area were available. The ticks of the other otters from the Museum of Western Lusatia could not be used for the further study, because this material was only separated for the evaluation of the prevalence of the otters and was not included in the collection.

3.2. Tick species parasitizing the otter

Three species of ticks were found to infest the Eurasian otter in Upper Lusatia: *Ixodes (Ph.) hexagonus* Leach, 1815, *I. (Ph.) canisuga* Johnston, 1849 and *I. ricinus* Linne, 1758. The tick

I. hexagonus was found on the majority of the infested otters (27 of 29 animals). On 25 otters *I. hexagonus* was the only tick species found and *I. (Ph.) canisuga* was the only detected tick species on two otters. Only two otters were infested with two tick species: one otter with *I. (Ph.) hexagonus* and *I. (Ph.) canisuga* and one otter with *I. (Ph.) hexagonus* and *I. ricinus*. Only one larva of the ubiquitously common wood tick *I. ricinus* was found.

3.3. Infestation intensity of ticks

A total of 229 ticks were found on 29 infested otters. The average infestation intensity consisted of 7.9 ticks per infested animal and ranged from 1 to 77 ticks. The two otters parasitized by two species of ticks had only 3 and 6 ticks per otter. In Upper Lusatia, *I. hexagonus* was the most common tick on Eurasian otter. This tick species was found in 215 individuals on 27 infested otters, an average of 8.0 *I. hexagonus* individuals per otter. These 215 individuals of *I. hexagonus* consisted of no males, 22 females (10%), 93 nymphs (43%) and 100 larvae (47%).

The variability of infestation intensity was large, with a maximum of 72 larvae plus 3 nymphs plus 2 females of *I. hexagonus* on one otter. More details of the variation in infestation intensity of *I. hexagonus* stages is shown in Fig. 2. There is no change recognizable in the intensity of infestation in the past 20 years.

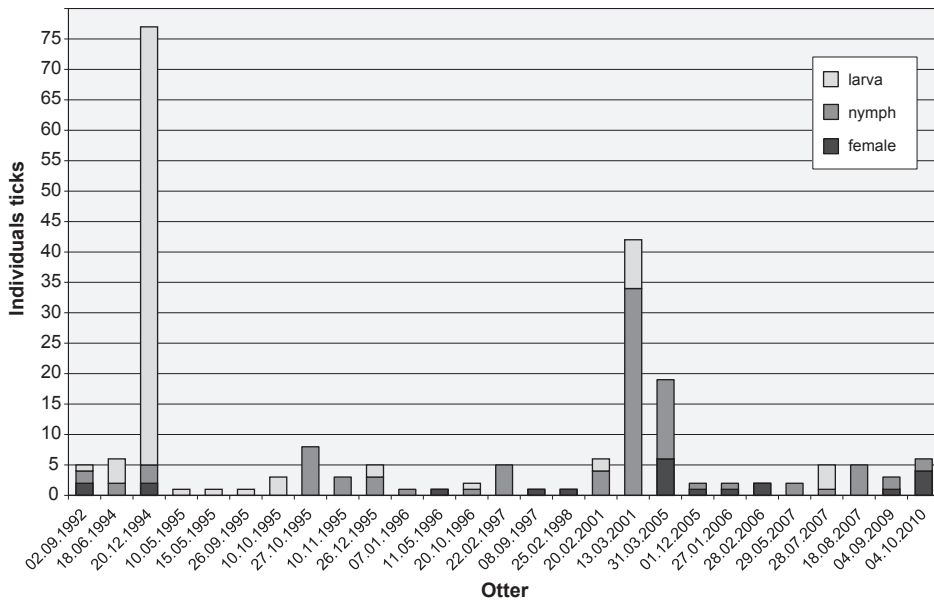


Fig. 2 Infestation intensity of *I. hexagonus* on otters during the entire study period in Upper Lusatia, Germany.

3.4. Frequency distribution of infestation intensities of *I. hexagonus* stages

The frequency distribution of infestation intensities (assembled into groups) of different *I. hexagonus* stages on otters showed that the infestation intensity by females (average of 2.0 female *I. hexagonus* per otter) was lower than that by nymphs (average of 4.9 nymphs per

otter), which again was lower than the infestation intensity by larvae (average of 8.3 larvae per otter). Females of *I. hexagonus* fed on 41% of the infested otters, nymphs on 70% and larvae on only 44% of the infested otters (Tab. 1). Females or nymphs or both, but no larvae fed exclusively on 51% of the infested Eurasian otters.

Tab. 1 Frequency distribution of infestation intensities of different *I. hexagonus* stages on otters.

Ticks per otter (grouped)	Otter with tick females	Number of tick-females	Otter with tick nymphs	Number of tick-nymphs	Otter with tick larvae	Number of tick-larvae
1	6	6	5	5	5	5
2	3	6	5	10	2	4
3–5	1	4	6	23	3	11
6–10	1	6	1	8	1	8
11–50			2	47		
51–100					1	72
Total number of ticks		22		93		100
Total number of otters with ticks	11		19		12	
Average number of ticks per otter		2.0		4.9		8.3

In Upper Lusatia, the Eurasian otter is a frequent host for *I. hexagonus*, both regarding prevalence (infestation extensity) and infestation intensity. The frequent common-wood tick, *I. ricinus*, parasitized only one otter with one larva.

4. Discussion

In many mammalogical papers, ticks are not mentioned as ectoparasites on Eurasian otter (Jürgenson 1974, Chanin 1985, Stubbe 1989a, Schröpfer et al. 1992, Reuther 1993, Hauser 1995, Kruuk 1995, Mitchell-Jones et al. 1999, Spitzenberger 2001, Braun & Dieterlen 2005, Baagoe & Jensen 2007, Bihari et al. 2007, Hauer et al. 2009). Only Stubbe (1989b) listed *I. hexagonus* as a parasite of the otter and Krumbiegel (1955) cited Schulze (1941): ‘... *adults of I. hexagonus* parasitizing mole, otter, fox ...’.

In the acarological and parasitological literature, Nuttall & Warburtun (1911), Zumpt (1944), Starkoff (1958) and Filippova (1977) mentioned the Eurasian otter as a host of *I. hexagonus*. Two species of ticks were reported by Arthur (1963) and Haitlinger & Lupicki (2009) – *I. hexagonus* and *I. ricinus* – and by Gilot & Aubert (1985; citing Roman et al. [1973]) and Christian (1997) – *I. hexagonus* and *I. canisuga*. No data on the otter as a host of ticks are given in Schulze (1929), Bouvier (1956), Babos (1964), Aeschlimann et al. (1965),

Eichler (1968), Černý (1972), Nosek & Sixl (1972), Liebisch & Walter (1986) and Toutoungi et al. (1991). In many publications, unfortunately, only the hosts of a tick species are listed, without details on the evidence. It is assumed that such notes are often based only on single observations (Haitlinger & Lupicki 2009). The study of a larger series of tick parasitism on the Eurasian otter seems to be the exception (Christian 1997). Therefore a critical discussion of the parasitism of the otter with ticks is difficult.

Up to now 3 species of ticks have been observed on the otter in Europe: *I. hexagonus*, *I. canisuga*, *I. ricinus*. All these tick species could also be detected on the otter in Upper Lusatia, Germany. The tick species *I. canisuga* and *I. ricinus* are very rare parasites of the otter in Europe, especially the frequent common-wood tick.

The prevalence of ticks on otters in Upper Lusatia (8.8%) is lower than the detected prevalence on the North American river otter, *Lutra canadensis* (Schreber, 1776), which showed a prevalence of 21% (Polechla 1996). Polechla examined ectoparasites on only 24 otters and found 5 otters infested with ticks. In Europe only one study of 180 otters exists, reporting a prevalence of 10.5% (Christian 1997). A comparison of prevalences of the two semi-aquatic water-martens in Europe, otter and feral mink *Neovison vison* (Schreber, 1777), also shows the low parasitism of the Eurasian otter by ticks. The recorded prevalence on wild mink in central Germany (45%: Christian 2010) is similar to the prevalence on mink in England and Wales (40%: Page & Langton 1996), but is higher than the prevalence on the otter (8.8%).

The infestation intensity of the most common tick on otter and mink, *I. hexagonus*, shows small differences: Sherrard-Smith detected 7.2 *I. hexagonus* per host on otter (personal communication, 2011); in the present study the infestation intensity was 8.0 *I. hexagonus* per otter. On mink, 10.9 *I. hexagonus* per host were detected in central Germany (Christian 2010). The infestation intensity of *I. hexagonus*-stages on otter is similar to that on mink in Germany, but is quite different to that on the mink in England and Wales. In the present study, a maximum of 72 larvae plus 3 nymphs and 2 females of *I. hexagonus* was detected on one otter and, in central Germany, a maximum 43 larvae plus 7 nymphs of *I. hexagonus* on one mink was observed (Christian 2010). Page & Langton (1996) reported from England and Wales a maximum of infestation intensity of more than 500 larvae of *I. hexagonus* on one mink.

It seems that *I. hexagonus* is the most frequent tick on Eurasian otter in Europe. The same tick species is the most frequent tick on the mink (*N. vison*) in Germany (Christian 2010). Both mammalian species are associated with diverse aquatic habitats and live in burrows in the soil of the embankment of running or standing waters. In these burrows, the tick *I. hexagonus* apparently finds good conditions for development. In contrast, the pine marten, which does not use burrows, is mainly parasitized by the common wood tick, *I. ricinus*, and *I. hexagonus* parasitizes only a few pine marten individuals (Christian 2002). In the two decades of investigation there were no significant changes in the otter population and no increasing or decreasing trends in parasitism of otters by ticks was ascertained.

5. Acknowledgments

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