

A case of massive infestation of a male green lizard *Lacerta viridis/bilineata* by castor bean tick *Ixodes ricinus* (Linnaeus, 1758)

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Abstract. Infestation by ticks affects several vertebrate groups, including reptiles. Castor bean tick *Ixodes ricinus* is the most widespread tick species. Here we report an impressive tick infestation of a male green lizard *Lacerta viridis/bilineata* found in 2012 in the vicinity of Bilpa cave in the Kolpa valley, Slovenia. Lizards as tick hosts can play an important role in the life cycle of *I. ricinus* and may also be potential vectors of Lyme disease.

Key words: *Lacerta viridis/bilineata*, *Ixodes ricinus*, tick, host, Slovenia

Izvleček. Primer močne zaparazitiranosti pri samcu zelenca *Lacerta viridis/bilineata* z gozdnimi klopi *Ixodes ricinus* (Linnaeus, 1758) – Zaparazitiranost s klopi je pogost pojav pri večini skupin vretenčarjev, tudi pri plazilcih. Najbolj razširjena vrsta klopa je gozdni klop *Ixodes ricinus*. Pri samcu zelenca *Lacerta viridis/bilineata*, ki smo ga ujeli leta 2012 v bližini jame Bilpa v dolini Kolpe, Slovenija, smo opazili izjemno močno zaparazitiranost z gozdnimi klopi. V splošnem so kuščarji gostitelji klopov in igrajo pomembno vlogo v življenjskem krogu vrste *I. ricinus*, hkrati pa so tudi potencialni vektorji borelije.

Cljučne besede: *Lacerta viridis/bilineata*, *Ixodes ricinus*, klop, gostitelj, Slovenija

Introduction

In Slovenia, two species of green lizards are currently recognised: *Lacerta viridis* (Laurenti, 1768) and *Lacerta bilineata* (Daudin, 1802) (Böhme et al. 2006, Krofel et al. 2009), but the new revision of their genetic status is currently under review (Marzahn et al. 2013). Adult individuals of these two species are difficult to distinguish in the field (Krofel et al. 2009, Breg et al. 2010). Their general characteristics are: adults mainly green with black speckles, most pronounced in females (Breg et al. 2010); in the breeding season, males display prominent blue and yellow chests and throats, with some females also having throats with

vibrant yellow and some blue, although this is not as pronounced as in males (Václav et al. 2007); adults can grow up to 45 cm from head to tip of the tail (Breg et al. 2010).

A total of 16 tick species (Acarina: Ixodina) have been reported for Slovenia (Trilar 2004), with the most widespread species among them being castor bean tick *Ixodes ricinus* (Linnaeus, 1758). *Ixodes ricinus* needs three hosts to complete its life cycle (larva, nymph, adult) and that takes at least three years to complete (Wall & Shearer 1997, Gryczyńska-Sięmiątkowska et al. 2007). Adults of this species are red-brown and grow 2.5–4 mm in length on average, but females can reach even up to 10 mm in length (Wall & Shearer 1997). Mammals, birds and lizards are the three most important hosts (Wall & Shearer 1997, Majláthová et al. 2006, Gryczyńska-Sięmiątkowska et al. 2007). Tovornik & Brelih (1980) suggest that lizards mainly represent a supplementary food source for ticks, playing a key role in cases when endothermic hosts are either temporally or locally unavailable in the environment. In some cases, lizards can act as the principal host for larva and nymphs (e.g. Slovak Karst – southeastern part of Slovakia, Majláthová et al. 2006, Václav et al. 2007).

Tick infestation in lizards is becoming a more frequent study subject owing to a higher number of tick-borne diseases that can affect humans (Gryczyńska-Sięmiątkowska et al. 2007). In lacertid lizards, male-biased tick infestation has already been demonstrated in several studies and there are several hypotheses to explain this bias: increased level of testosterone – testosterone-implanted males increased their tick load (Salvador et al. 1996), and larger home ranges – there is a positive correlation between bigger lizards and their home ranges area (Perry & Garland 2002). Consequently, these animals will probably move more to defend their territory; therefore they could be more exposed to ticks (Bauwens et al. 1983, Gryczyńska-Sięmiątkowska et al. 2007). Infestation of lizards by ticks may alter its blood parameters and therefore affect the lizard performance promoting shifts in physiology and behaviour (Salvador et al. 1996). Nonetheless, ticks parasiting lizards exceed the pure scientific interest since they are recognised as potential vectors for *Borrelia* spirochetes causing Lyme disease, i.e. a vector-borne human disease in the temperate zone of the Northern Hemisphere (Földvári et al. 2009). Wherefore lizards can also play an important role in the life cycle of *I. ricinus* and therefore *Borrelia* spirochetes.

Material and methods

On 18. 5. 2012, the second author caught by a noose (Garcia-Muñoz & Sillero 2010) an adult male of *L. viridis/bilineata* (Tab. 1, still not analysed with genetic markers) in the vicinity of Bilpa cave in the Kolpa valley, Slovenia (Gauss Krüger coordinates: x = 497408, y = 40941, 200 m a.s.l.). The landscape was characterized by bushy vegetation on gravel back yard of a house under construction. A small stream that is a tributary of the Kolpa river flows nearby, while the surroundings are overgrown with mixed forest.

Table 1. Green lizard *Lacerta viridis/bilineata* biometric measurements. Standard biometric measurements of the male green lizard *Lacerta viridis/bilineata* caught in the vicinity of Bilpa cave, southern Slovenia.

Tabela 1. Biometrične meritve zelenca *Lacerta viridis/bilineata*. Standardne biometrične meritve samca zelenca *Lacerta viridis/bilineata*, ujetega v bližini jame Bilpa, južna Slovenija.

Body measurement / Telesna mera	Length (mm)
Snout-vent length / dolžina glave in trupa	120.4
Head length / dolžina glave od konice gobca do ovratnika	44.6
Pileus length / dolžina pileusa	28.4
Head width / širina glave	21.9
Head height / višina glave	14.9

Results and discussion

We noticed many ticks on the body of the lizard and counted a total of 84 ticks. The majority of ticks were collected and stored in ethanol by the second author. This number of ticks is higher than previously reported (Václav et al. 2007 – maximum number 64 ticks/host in males, Gryczyńska-Sięmiątkowska et al. 2007 – maximum number of 38 ticks/host, Földvári et al. 2009 – maximum number 47 ticks/host), except for Cafuta (2005) in Slovenia, where the author counted 104 nymphs on an individual of *L. viridis/bilineata*. We found nymphs almost on the entire body: top of the head, mouth, ears and eyes, between the ears and legs, behind front legs, near the cloaca and around hind legs (Fig.1). Although the animal was severely infested with ticks, it showed no sign of being sick (i.e. normal movements, not too thin, the skin in good condition and the colouration normal).

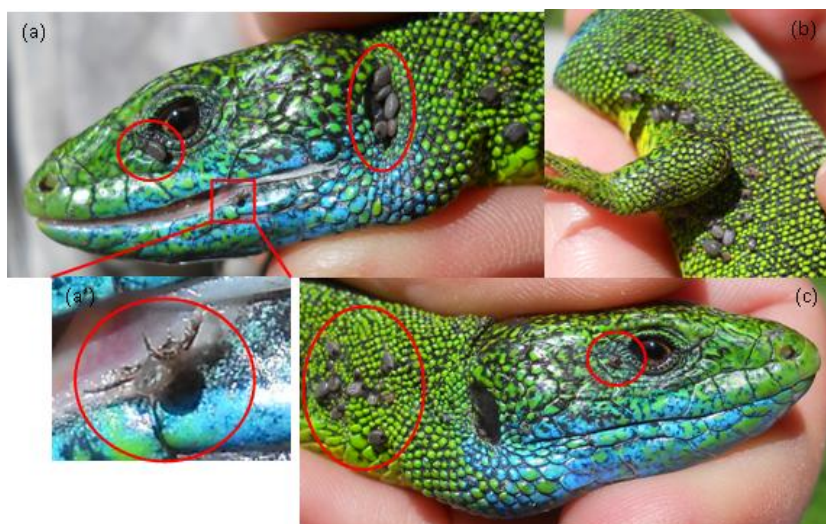


Figure 1. *Lacerta viridis/bilineata* captured during the fieldwork in the vicinity of Bilpa cave, southern Slovenia. (a) Nymphs of *Ixodes ricinus* attached next to the eye, inside the ear and near the mouth (a'); (b) great number of nymphs attached in the area around the front left limb; (c) nymphs attached near the front right limb and near the eye.

Slika 1. *Lacerta viridis/bilineata*, ujet med terenskim delom v bližini jame Bilpa, južna Slovenija. (a) Nimfe gozdnega klopa (*Ixodes ricinus*) pritrjene blizu očesa, v ušesu okoli bobniča in ob ustih (a'); (b) veliko število nimf pritrjenih okoli sprednje leve noge; (c) nimfe pritrjene blizu sprednje desne noge in ob očesu.

In the comparison study of infestation of lacertids by Cafuta (2005), the species with the highest prevalence and intensity of infestation by *I. ricinus* was the *L. viridis/bilineata*. Tovornik & Brelih (1980) also reported infestation of this lizard species with *I. ricinus* at three different localities, while on a site at Postojna the ticks were identified as *Haemaphysalis punctata* (Canestrini & Fanzago, 1878). The highest number of ticks found on a single individual of *L. viridis/bilineata* was 10 for *H. punctata*, and four for *I. ricinus* (Tovornik & Brelih 1980). This is yet another report that confirms incidental observation suggesting that in Slovenia the infestation of *I. ricinus* nymphs on the *L. viridis/bilineata* is a frequent event and that this reptile host plays an important role for the parasite. Nevertheless, mammals and birds tend to be more parasitized by *I. ricinus* than lizards (Bauwens et al. 1983, Gryczynska-Siemiatkowska et al. 2007, Gwiazdowicz & Filip 2009), which confirms that they tend to represent subsidiary hosts. However, increased infestation rates in lacertid lizards associated with the presence of ungulates have recently been reported (Pafilis et al. 2013). Further studies should investigate eventual links between the abundance of wild ungulates in Slovenian forests (Stergar et al. 2009) and the high levels of parasitisation by ticks of the lacertid communities inhabiting the same environments (Cafuta 2005), and whether they may act as an effective reservoir for *Borrelia* (Gryczynska-Siemiatkowska et al. 2007, Majláthová et al. 2013).

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