Larva of the tick *Ixodes ricinus* found attached in the oral cavity of a green lizard (*Lacerta viridis*)

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The Green lizard (*Lacerta viridis*) is a member of the family Lacertidae and is widely distributed throughout the central and south-eastern part of Europe from southern Greece up to central Germany and Poland (Sillero et al., 2014). This species inhabits mostly lowland south-facing slopes and prefers xerothermic areas with rather sparse vegetation. The Castor bean tick (*Ixodes ricinus*) is a common parasite of reptiles or other smaller vertebrates distributed from northern Africa to Scandinavia and from Ireland to central Russia (Gern & Humair, 2002). This note reports an *I. ricinus* larva found attached to the mucous membrane inside the oral cavity of *L. viridis*. Such a case has not been previously reported.

On 13 June 2015 around 12:00h local time, one of us (DK) found an adult male of *L. viridis* near the Šobes vineyards, Znojmo, southern Czech Republic. The individual was found basking on the border of a sparse pinewood and a low rocky slope near a busy cycle path (48.81669°N, 15.97550°E; 300 m a. s. l.) in the Dyje river valley. After capturing the individual, it was closely inspected. During manipulation of the lizard it demonstrated some defensive behaviour including defecation, attempts to bite and opening the mouth as a threat. With the individual's mouth open we noticed a significant dark spot inside its oral cavity (Fig. 1A). This spot proved to be an *I. ricinus* larva firmly attached to the lizard's mucous membrane (Fig. 1B). After removing the *I. ricinus* larva it proved to be alive and moving. Together with this larva we observed several more on the lizard's body, mainly around its forelimbs. As far as our knowledge goes, observation of *I. ricinus* parasitizing inside an oral cavity of a lizard has not been previously reported.

The distribution of ticks on their host's body seems to be mainly determined by finding a suitable spot with minimal disturbance (Nelson et al., 1975). The ticks seem to choose spots with thin skin providing more firm attachment (Bauwens et al., 1983). Ticks are usually found on a lizard's body around forelimbs, arm-pits and sides of their heads. These spots also offer ectoparasites to be partly protected from being scratched off by their host or being brushed against vegetation. The mucous membrane of oral cavity seems a very unusual spot for ticks to attach to. We assume this was a rather rare case with very poor chances of the tick's successful survival.

However, all stages of ticks are able to survive in extreme environmental conditions. The oral cavity is a wet and low oxygenated place. Although ability of anaerobic respiration of ticks has not been reliably proven yet, there are reports of resistance to hypoxia and anoxia (Fielden et al., 2011). It was also reported, that some ticks are able to survive quite a long time e. g. under water or even in the automatic washing machine (Cançado et al., 2006; Carrol, 2003; Smith, 1973). Fielden et al. (2011) reported that the American dog tick (*Dermacentor variabilis*) is able to utilise dissolved oxygen in the water. Oxygen is obtained via a plastron formed by the complex spiracular plates.

Figure 1. *L. viridis* male with an *I. ricinus* larva attached to its mucous membrane. **A** – wider view with noticable dark stain inside lizards oral cavity. **B** – close up view with a detail of *I. ricinus* larva.

However, even with the plastron disabled or in water with very low oxygen content, *D. variabilis* can still survive for several days. Mihalca et al. (2012) report the European pond turtle (*Emys orbicularis*), a predominantly aquatic species, as a host of *I. ricinus*.

Lizards play an important role in the life cycle of *I. ricinus* (Dantas-Torres, 2015; Földvári et al., 2009). Their infections by ticks is currently being investigated because of the large number of tick-borne diseases potentially able to affect humans (e. g. Gryczyńska-Semiątkowska et al., 2007, Majláthová et al., 2013). Many tick-borne diseases have shown a significant increase in parts of Europe in the last two decades (Jones et al., 2008) and therefore any new observations might have value.

ACKNOWLEDGEMENTS

We are very grateful to Tomáš Caska for taking and providing presented pictures and Tomáš Holer for help during field work. We would also like to thank Dr. Roger Avery and an anonymous reviewer for their valuable comments on a previous version of the manuscript.

REFERENCES

Bauwens, D., Strijbosch, H. & Stumpel, A.H.P. (1983). The lizards *Lacerta agilis* and *L. vivipara* as hosts to larvae and nymphs of the tick *Ixodes ricinus*. *Holarctic Ecology* 6: 32–40.

Carroll, J.F. (2003). A cautionary note: survival of nymphs of two species of ticks (Acari: Ixodidae) among clothes laundered in an automatic washer. *Journal of Medical Entomology* 40: 732–736.

Cançado, P.H.D, Chacón, S.C., Piranda, E.M., Paula, A.R. & Faccini, J.L.H. (2006). Efeito daimersão de larvas e ninfas ingurgitadas de *Amblyomma dubitatum* Neumann, 1899 (Acari: Ixodidae) em água destilada. *Revista Brasileira de Parasitologia Veterinarna* 15: 17-22.

Dantas-Torres, F. (2015). Climate change, biodiversity, ticks and tick-borne diseases: The butterfly effect. International Journal for Parasitology: *Parasites and Wildlife* 4: 452-461.

Fielden, L.J., Knolhoff, L.M., Villarreal, S.M. & Ryan, P. (2011). Underwater survival in the dog tick *Dermacentor variabilis* (Acari: Ixodidae). *Journal of Insect Physiology* 57: 21-26.

Földvári, G., Rigó, K., Majláthová, V., Majláth, I., Farkas, R. & Peťko, B. (2009). Detection of *Borrelia burgdorferi* sensu lato in lizards and their ticks from Hungary. *Vector-Borne and Zoonotic Diseases* 9: 331-336.

Gern, L. & Humair, P.F. (2002). Ecology of *Borrelia burgdorferi* sensu lato in Europe. In *Lyme borreliosis: Biology, Epidemiology and Control*, pp. 169-174. Gray, J., Kahl, O., Lane, R.S. & Stanek, G. (Eds.). Wallingford, Oxon, UK: CAB International.

Gryczyńska-Siemiątkowska, A., Siedlecka, A., Stańczak, J. & Barkowska, M. (2007). Infestation of sand lizards (*Lacerta agilis*) resident in the Northeastern Poland by *Ixodes ricinus* (L.) ticks and their infection with *Borrelia burgdorferi* sensu lato. *Acta Parasitologica* 52: 165-170.

Jones, K.E., Patel, N.G., Levy, M.A., Storeygard, A., Balk, D., Gittleman, J.L. et al. (2008). Global trends in emerging infectious diseases. *Nature* 451: 990–993.

Majláthová, V., Majláth, I., Hromada, M., Tryjanowski, P., Bona, M., Antczak, M., Vichová, B., Dzimko, S., Mihalca, A. & Peťko, B. (2013). The role of the sand lizard (*Lacerta agilis*) in the transmission cycle of *Borrelia burgdorferi* sensu lato. *International Journal of Medical Microbiology* 298: 161-167.

Mihalca, A.D., Dumitrache, M.O., Magdaş, C., Gherman, C.M., Domşa, C., Mircean, V., Ghira, I.V., Pocora, V., Ionescu, D.T., Sikó Barabási, S., Cozma, V. & Sándor, A.D. (2012). Synopsis of the hard ticks (Acari: Ixodidae) of Romania with update on host associations and geographical distribution. *Experimental and Applied Acarology* 58: 183-206.

Nelson, W.A., Keirans, J.E., Bell, J.F. & Clifford, C. M. (1975). Host-ectoparasite relationships. *Journal of Medical Entomology* 12: 143-166.

Sillero, N., Campos, J., Bonardi, A., Corti, C., Creemers, R., Crochet, P.-A., Crnobrnja Isailovic, J., Denoël, M., Ficetola, G.F., Gonçalves, J., Kuzmin, S., Lymberakis, P., de Pous, P., Rodríguez, A., Sindaco, R., Speybroeck, J., Toxopeus, B., Vieites, D.R. & Vences, M. (2014). Updated distribution and biogeography of amphibians and reptiles of Europe. *Amphibia-Reptilia* 35: 1-31.

Smith, M.W. (1973). The effect of immersion in water on the immature stages of the Ixodid ticks *Rhipicephalus appendiculatus* Neumann, 1901 and *Amblyomma variegatum* Fabricius. *Annals of Tropical Medicine and Parasitology* 67: 483-492.

Accepted: 12 October 2016