

**Additions to the “Annotated Checklist of the Ticks of Germany”: *Ixodes acuminatus* and *Ixodes inopinatus***

Authors: Trevor N. Petney, Esther Moser, Nina Littwin, Miriam Pfäffle, Senta V. Muders, et. al.

Source: Systematic and Applied Acarology, 20(2) : 221-224

Published By: Systematic and Applied Acarology Society

URL: <https://doi.org/10.11158/saa.20.2.9>

---

BioOne Complete ([complete.BioOne.org](http://complete.BioOne.org)) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-o-use](http://www.bioone.org/terms-o-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Correspondence

http://zoobank.org/urn:lsid:zoobank.org:pub:0A7CEE7C-8BDD-4770-82CF-20F7C56960E8

## Additions to the “Annotated Checklist of the Ticks of Germany”: *Ixodes acuminatus* and *Ixodes inopinatus*

TREVOR N. PETNEY<sup>1</sup>, ESTHER MOSER, NINA LITWIN, MIRIAM PFÄFFLE, SENTA V. MUDERS & HORST TARASCHEWSKI

Department of Ecology and Parasitology, Karlsruhe Institute of Technology, Kornblumenstrasse 13, 76131 Karlsruhe, Germany

<sup>1</sup>Corresponding author. E-mail: trevor.petney@kit.edu

### Abstract

Since the publication of “An annotated checklist of the ticks of Germany” in 2012, the list now includes two additional ixodid species. *Ixodes acuminatus* is endemic in several countries bordering Germany. Sufficient specimens have now been found in southwestern Germany to show that this species is also native there. The other species, *Ixodes inopinatus*, has its main area of distribution in the western Mediterranean, and it is not yet clear whether the two females and one male found in Rhineland-Palatinate were accidental introductions or are part of a viable population.

Although it is only two years since our checklist of the ticks of Germany was published (Petney *et al.* 2012), two species have now been recorded that were not identified previously in this country; one is already known for other Central European countries, while the other is newly described (Estrada-Peña *et al.* 2014).

### *Ixodes acuminatus* Neumann, 1901

There is some debate about whether the eastern Palearctic species *Ixodes redikorzevi* Olenov, 1927, is a synonym of *I. acuminatus*. Along with Guglielmone *et al.* (2014) we consider that this is not the case until a comparison of types has been carried out. However, should the synonymy be confirmed, then the range of this species would be extended to include parts of Eastern Europe, China, the eastern Mediterranean and the Middle East.

Small mammals hosted numerous larvae and nymphs of this species over three years of collection so that *I. acuminatus* is now confirmed as endemic to Germany.

**Distribution:** This species is widely distributed in temperate and western Mediterranean Europe, occurring in Belgium, France, Italy, Hungary, Portugal, Spain and southern England (Durio *et al.* 1982, Marquez *et al.* 1987, Martyn 1988, Gilot *et al.* 1992, Manilla, 1998, Caeiro 1999, Barandika *et al.* 2007, Földvári *et al.* 2011, Jameson & Medlock 2011, Santos-Silva *et al.* 2011, Tomassone *et al.* 2013).

The current records for Germany come from Baden-Württemberg (Littwin *et al.* unpublished data).

**Hosts:** *Ixodes acuminatus* has predominantly been found on small mammals, such as insectivores (Soricidae, Talpidae) and rodents (Arvicolidae, Cricetidae, Gliridae and Muridae), including the house mouse (*Mus musculus*) and the common rat (*Rattus norvegicus*). It also occurs on medium-sized mammals including hedgehogs (*Erinaceus europaeus* and *Erinaceus roumanicus*) (Gilot *et al.* 1992, Manilla 1998, Boyard *et al.* 2008, Gyurancz *et al.* 2010, Földvári *et al.* 2011). Carnivores (Canidae, Felidae, Mustelidae and Viverridae) including martens, badger, red fox, gray wolf (*Canis lupus*) and domestic dogs and cats are occasionally infested (Manilla 1998, Földvári *et al.* 2007, Lorusso *et al.* 2011, Santos-Silva *et al.* 2011, Tomassone *et al.* 2013). Manilla (1998) also reports a nymph from a common buzzard (*Buteo buteo*), as well as from a human, while Tomassone *et al.* (2013) found one adult tick on a red partridge (*Alectoris rufa*) and Norte *et al.* (2012) recorded a single specimen (stage not indicated) from a common blackbird (*Turdus merula*). Both adults and immature stages occur on most of the host families listed.

In Baden-Württemberg both larvae and nymphs have been found on the bank vole (*Myodes glareolus*) and the yellow-necked mouse (*Apodemus flavicollis*), and rarely by flagging (Littwin *et al.* unpublished data).

**Ecology:** This is chiefly a nest-dwelling species, although we have collected a few immatures by flagging. *Ixodes acuminatus* is widespread in France, though it is rare or even missing in regions where the average temperature in January is below 0°C (eastern France, the northern Alps, high altitudes of the central Pyrenees) (Gilot *et al.* 1992). Ticks occur throughout the year on small mammals, although adult activity seems to peak from the end of February to the end of April. Nymphs seem to have a spring peak and larvae a summer peak (Gilot *et al.* 1992).

**Medical and veterinary significance:** Although *Borrelia burgdorferi* sensu lato has been isolated from *I. acuminatus* feeding on small mammals in eastern France (Doby *et al.* 1990), this tick is not currently considered a competent vector. Tomassone *et al.* (2013) collected four *I. acuminatus* from wild and domestic cats (3) and red partridge (1); these carried *Borrelia spielmanii* (cats and partridge), *B. valaisiana* (cats) and *Rickettsia helvetica* (both host species). Obsomer *et al.* (2013) list Bhanja virus, *Francisella tularensis*, the causative agent of tularemia, and *Coxiella burnetii*, the causative agent of Q-fever, as being associated with *I. acuminatus*.

Hillyard (1996) also lists Uukuniemi viruses. Unfortunately, we were unable to locate the primary literature describing these associations.

#### ***Ixodes (Ixodes) inopinatus* Estrada-Peña, Nava and Petney, 2014**

This species was recently described (Estrada-Peña *et al.* 2014). Whether it is a permanent resident in Germany is currently unknown. Two females attached to sheep and one male crawling on a sheep were found south of the village of Kapsweyer at the margin of the Bienwald forest in southern Rhineland-Palatinate. Neither farm nor companion animals from outside Germany had been introduced to the farm for at least 12 months prior to tick collection. To date, no sampling has been carried out on either foxes, which are common hosts in Spain (Estrada-Peña *et al.* 2014), or cattle, which may be potential hosts in Algeria (Noureddine *et al.* 2011).

**Identification:** Estrada-Peña *et al.* (2014) indicate that females of *I. inopinatus* can be separated from those of *Ixodes ricinus* (Linnaeus, 1758) by the relative dimensions and punctations on the scutum, the length of the idiosomal setae, the size of the auriculae, the aspect of the porose areas, and a 2/2+3/3 hypostomal formula. Separation of *I. inopinatus* and *I. ricinus* nymphs is possible by comparing scutal dimensions, the relative size of the scutal and idiosomal setae, and the relative size of the spurs on coxa I. In larvae of the new species, the scutum is broader than long and idiosomal setae Md1 to Md3 are unusually long.

**Distribution:** *Ixodes inopinatus* is largely confined to the western Mediterranean: Spain, Portugal, Morocco, Algeria and Tunisia. In Spain, its northern limit is the province of Guadalajara. In Spain and Portugal, close monitoring of *I. inopinatus* populations shows that there is no overlap of this species with *I. ricinus*. This is not the case with specimens from Rhineland-Palatinate, where both species occurred on the same individual host.

**Hosts:** Immatures of *I. inopinatus* have been found on *Psammotromus algirus*, a lizard belonging to the family Lacertidae, and adults parasitize red fox (*Vulpes vulpes*) (Estrada-Peña *et al.* 2014). Noureddine *et al.* (2011) found genetically identical specimens, then classified as *I. ricinus*, on cattle in Algeria.

**Ecology:** *Ixodes inopinatus* occurs in Mediterranean habitats in which cork oak (*Quercus suber*) predominates with limited areas characterized by pine (*Pinus* spp.). The climate is dry and warm with minimum temperatures above 6-7 °C and a total rainfall of 700-800 mm/year. In North Africa, *I. inopinatus* (previously identified as *I. ricinus*) is active during the winter months (Yousfi-Monod & Aeschlimann, 1986), with adults occurring on cattle from November to March. This is in contrast to *I. ricinus* from most of continental Europe, where this species usually has two activity peaks, one in spring and another in autumn (Kurtenbach *et al.* 2006).

**Medical and veterinary significance:** The medical significance of *I. inopinatus* is currently unknown, but “*I. ricinus*” from North Africa has been recorded as carrying *Borrelia burgdorferi* sensu lato (Dsouli *et al.* 2006), *Borrelia lusitaniae* (Younsi *et al.* 2001, 2005), *Rickettsia helvetica* and *R. monacensis* (Sfar *et al.* 2008, Kernif *et al.* 2012), *Anaplasma* spp. and *Ehrlichia* sp. (Sarih *et al.* 2005). Clearly, this calls for urgent clarification of the status of *I. inopinatus* and *I. ricinus* in North Africa.

#### **Acknowledgements**

We thank the Ministry of the Environment, Climate Protection and the Energy Sector, Baden-Württemberg (BWPLUS+ program: BWZ11001) and the Ministry of the Environment, Agriculture, Nutrition, Viticulture and Forestry, Rhineland-Palatinate (Research Establishment for Forest Ecology and Silviculture No. 6.4/09/11).

## References

- Barandika, J.F., Hurtado, A., García-Estaban, C., Gil, H., Escudero, R., Barral, M., Jado, I., Juste, R.A., Anda, P. & Garcá-Pérez, A.L. (2007) Tick-borne zoonotic bacteria in wild and domestic small mammals in northern Spain. *Applied and Environmental Microbiology*, 73, 6166–6171.  
<http://dx.doi.org/10.1128/AEM.00590-07>
- Boyard, C., Vourc'h, G. & Barnouin, J. (2008) The relationships between *Ixodes ricinus* and small mammal species at the woodland-pasture interface. *Experimental and Applied Acarology*, 44, 61–76.  
<http://dx.doi.org/10.1007/s10493-008-9132-3>
- Cairo, V. (1999) General review of tick species present in Portugal. *Parassitologia*, 41 [Suppl. 1], 11–15.
- Doby, J., Bigaignon, G., Launay, H., Costil, C. & Lorvellec, O. (1990) Présence de *Borrelia burgdorferi*, agent de spirochétoses à tiques, chez *Ixodes (Exopalpiger) trianguliceps* Birula, 1985 et *Ixodes acuminatus* Neumann 1901 (Acarina: Ixodidae) et chez *Ctenophthalmus baeticus arvensis* Jordan, 1931 et *Megabothris turbidus* (Rothschild 1909) (Insectes: Siphonaptera), ectoparasites de micromammifères de forêts dans l'ouest de la France. *Bulletin de la Société Française de Parasitologie*, 8, 311–322.
- Dsouli, N., Younsi-Kabachii, H., Postic, D., Nouira, S., Gern, L. & Bouattour, A. (2006) Reservoir role of lizard *Psammotromus algirus* in transmission cycle of *Borrelia burgdorferi* sensu lato (Spirochaetaceae) in Tunisia. *Journal of Medical Entomology*, 43, 737–742.  
<http://dx.doi.org/10.1093/jmedent/43.4.737>
- Durio, P., Durante, G. & Sobrero, L. (1982) Contributo alla conoscenza della fauna ixodologica Italiana—indagine sulla distribuzione delle zecche del Piemonte e della Liguria. *Rivista di Parassitologia*, 433, 345–352.
- Estrada-Peña, A., Nava, S. & Petney, T.N. (2014) Description of all the stages of the tick *Ixodes inopinatus* n. sp. (Acari: Ixodidae). *Ticks and Tick-Borne Diseases*, 5, 734–743.  
<http://dx.doi.org/10.1016/j.ttbdis.2014.05.003>
- Földvári, G., Márialigeti, M., Solymosi, N., Lucács, Z., Majoros, G., Kósa, J.P. & Farkas, R. (2007) Hard ticks infesting dogs in Hungary and their infection with *Babesia* and *Borrelia* species. *Parasitology Research*, 101, S25–S34.  
<http://dx.doi.org/10.1007/s00436-007-0608-6>
- Földvári, G., Rigó, K., Jablonszky, M., Biró, N., Majoros, G., Molnár, V. & Tóth, M. (2011) Ticks and the city: ectoparasites of the northern white-breasted hedgehog (*Erinaceus roumanicus*) in an urban park. *Ticks and Tick-borne Diseases*, 2, 231–234.  
<http://dx.doi.org/10.1016/j.ttbdis.2011.09.001>
- Gilot, B., Couatarmanac'h, A., Guiguen, C. & Beaucournu, J.C. (1992) Bio-écologie d'*Ixodes acuminatus* Neumann, 1901. Hôtes et répartition spatio-temporale de l'espèce en France. *Annales de Parasitologie Humaine et Comparée (Paris)*, 67, 19–25.
- Guglielmone, A.A., Robbins, R.G., Apanaskevich, D.A., Petney, T.N., Estrada-Peña, A. & Horak, I.G. (2014) *The Hard Ticks of the World*. Heidelberg, Springer. 738 pp.  
<http://dx.doi.org/10.1007/978-94-007-7497-1>
- Gyuranecz, M., Dénes, B., Dán, A., Rigó, K., Földvári, G., Szeredi, L., Fodor, L., Alexandra, S., Jánosi, K., Erdélyi, K., Krisztalovics, K. & Makrai, L. (2010) Susceptibility of the common hamster (*Cricetus cricetus*) to *Francisella tularensis* and its effect on the epizootiology of tularemia in the area where both are endemic. *Journal of Wildlife Diseases*, 46, 1316–1320.  
<http://dx.doi.org/10.7589/0090-3558-46.4.1316>
- Hillyard, P.D. (1996) *Ticks of North-west Europe*. London, Linnaean Society. 178 pp.
- Jameson L.J. & Medlock, J.M. (2011) Tick surveillance in Great Britain. *Vector-borne and Zoonotic Diseases*, 11, 403–412.  
<http://dx.doi.org/10.1089/vbz.2010.0079>
- Kernif, T., Messaoudene, D., Ouahioune, S., Parola, P., Raoult, D. & Bitam, I. (2012) Spotted fever group rickettsiae identified in *Dermacentor marginatus* and *Ixodes ricinus* ticks in Algeria. *Ticks and Tick-borne Diseases*, 3, 379–380.  
<http://dx.doi.org/10.1016/j.ttbdis.2012.10.012>
- Kurtenbach, K., Hanincova, K., Tsao, J.I., Margos, G., Fish, D. & Ogden, N.H. (2006) Fundamental processes in the evolutionary ecology of Lyme borreliosis. *Nature Reviews*, 4, 660–669.
- Lorusso, V., Lia, R.P., Dantas-Torres, F., Mallia, E., Ravagnan, S., Capelli, G. & Otranto, D. (2011) Ixodid ticks of road-killed wildlife species in southern Italy: new tick-host associations and locality records. *Experimental and Applied Acarology*, 55, 293–300.  
<http://dx.doi.org/10.1007/s10493-011-9470-4>

- Manilla, G. (1998) *Fauna d'Italia 36: Acari-Ixodida*. Bologna, Edizione Calderini. vii + 280 pp.
- Marquez, F.J., Huiete, L.E. & Soriguer, R.C. (1987) *Ixodes acuminatus* Neumann, 1902 (Ixodoidea, Ixodidae). Primeras citas para Andalucía. *Revista Iberica de Parasitologia*, 47, 311–312.
- Martyn, K.P. (1988) *Provisional Atlas of the Ticks (Ixodoidea) of the British Isles*. Abbots Ripton, Biological Records Centre, Natural Environment Research Council. 62 pp.
- Norte, A.C., Lopes de Carvalho, I., Ramos, J.A., Goncalves, M., Gern, L. & Nuncio, M.S. (2012) Diversity and seasonal patterns of ticks parasitizing wild birds in western Portugal. *Experimental and Applied Acarology*, 58, 327–339.  
<http://dx.doi.org/10.1007/s10493-012-9583-4>
- Noureddine, R., Chauvin, A. and Plantard, O. (2011) Lack of genetic structure among Eurasian populations of the tick *Ixodes ricinus* contrasts with marked divergence from north-African populations. *International Journal for Parasitology*, 41, 183–192.  
<http://dx.doi.org/10.1016/j.ijpara.2010.08.010>
- Obsomer, V., Wirtgen, M., Linden, A., Claerebout E., Heyman, P., Heylen, D., Madder, M., Maris, J., Lebrun M., Tack, W., Lempereur, L., Hance, T. & Van Impe, G. (2013) Spatial disaggregation of tick occurrence and ecology at a local scale as a preliminary step for spatial surveillance of tick-borne diseases: general framework and health implications in Belgium. *Parasites and Vectors*, 6:190 <http://www.parasitesandvectors.com/content/6/1/190>
- Petney, T.N., Pfäffle, M. & Skuballa, J. (2012) An annotated checklist of the ticks of Germany. *Systematic and Applied Acarology*, 17, 115–170.  
<http://dx.doi.org/10.11158/saa.17.2.2>
- Santos-Silva, M.M., Beati, L., Santos, A.S., De Sousa, R., Nuncio, M.S., Melo, P., Santos-Reis, M., Fonesca, C., Formosinho, P., Vilela, C. & Bacellar, F. (2011) The hard-tick fauna of mainland Portugal (Acari: Ixodidae): an update on geographical distribution and known associations with hosts and pathogens. *Experimental and Applied Acarology*, 55, 85–121.  
<http://dx.doi.org/10.1007/s10493-011-9440-x>
- Sarih, M., M'Ghirbi, Y., Bouattour, A., Gern, L., Baranton, G. & Postic, D. (2005) Detection and identification of *Ehrlichia* spp. in ticks collected in Tunisia and Morocco. *Journal of Clinical Microbiology*, 43, 1127–1132.  
<http://dx.doi.org/10.1128/JCM.43.3.1127-1132.2005>
- Sfar, N., M'Ghirbi, Y., Letaief, A., Parola, P., Bouattour, A. & Raoult, D. (2008) First report of *Rickettsia monacensis* and *Rickettsia helvetica* from Tunisia. *Annals of Tropical Medicine and Parasitology*, 102, 561–564.  
<http://dx.doi.org/10.1179/136485908X311795>
- Tomassone, L., Grego, E., Auricchio, D., Iori, A., Giannini, F. & Rambozzi, L. (2013) Lyme borreliosis spirochetes and spotted fever group rickettsiae in ixodid ticks from Pianosa Island, Tuscany Archipelago, Italy. *Vector-borne and Zoonotic Diseases*, 13, 84–91.  
<http://dx.doi.org/10.1089/vbz.2012.1046>
- Younsi, H., Postic, D., Baranton, G. & Bouattour, A. (2001) High prevalence of *Borrelia lusitaniae* in *Ixodes ricinus* ticks in Tunisia. *European Journal of Epidemiology*, 17, 53–56.  
<http://dx.doi.org/10.1023/A:1010928731281>
- Younsi, H., Sarih, M., Jouda, F., Godfrod, E., Gern, L., Bouattour, A., Baranton, G. & Postic, D. (2005) Characterization of *Borrelia lusitaniae* collected in Tunisia and Morocco. *Journal of Clinical Microbiology*, 43, 1587–1593.  
<http://dx.doi.org/10.1128/JCM.43.4.1587-1593.2005>
- Yousfi-Monod, R. & Aeschlimann, A. (1986) Studies on ticks (Acarina, Ixodidae), parasites of cattle in west Algeria. I. Systematic survey and seasonal activity. *Annales de Parasitologie Humaine et Comparée*, 61, 341–358.

Submitted: 24 Oct. 2014; accepted by Z.-Q. Zhang 24 Feb. 2015; published: 27 Feb. 2015