



# *Ixodes ricinus* Surveillance in the Faroe Islands

William Simonsen c, Jolyon M. Medlock a,b,\*, Kayleigh Hansford a, Alexander G.C. Vaux a, William Simonsen c, Jens-Kjeld Jensen d, Christina Joensen e, Veerle Versteirt f, Leivur Janus Hansen e, Shahin Gaini c.

This paper details the findings of both passive and active surveillance on the Faroe Islands. Active field surveillance, using tick dragging, was conducted at 38 sites across the main seven inhabited islands of the Faroes during June-August 2015. Field sampling was conducted at all wooded sites on the islands of Vágar, Streymoy, Eysturoy, Borðoy, Kunoy and Suðuroy as well as in urban parks in the capital Tórshavn, among seabird colonies and at a bird observatory on Nólsoy, at moorland sites on Vágar and Borðoy, and a coastal headland on Suðuroy. In addition, as part of the promotion of a new passive surveillance scheme for the Faroes, new tick records were submitted during summer 2015 and early spring 2016. During tick dragging, only three questing *I. ricinus* ticks (two nymphs, one male) were found at two separate sampling locations in the village of Tvøroyri on the southernmost island of Suðuroy. No questing ticks were found at any other field site. The passive surveillance of ticks identified an additional 33 records of *I. ricinus* collected during the last 10 years on the Faroes, with almost half of these records from 2015. Although this represents the first finding of questing *I. ricinus* and overwintering *I. ricinus* on the Faroe Islands, there appears to be little evidence so far to suggest that *Ixodes ricinus* are established on the Faroe Islands. Additional reports of ticks through the passive surveillance scheme are reported from seven inhabited islands. Reports of ticks on both companion animals and humans suggest that ticks are being acquired locally, and the records of ticks on migratory birds highlight a possible route of importation. This paper details the likely ecological constraints on *I. ricinus* establishment and density on Faroe Islands and makes recommendations for future surveillance and research.

## Introduction

*Ixodes ricinus* (see fig 1) is the principal vector of *Borrelia burgdorferi* sensu lato, see fig 2. (agent of borreliosis) across much of Europe, and one of the main vectors of Tick-borne encephalitis virus as well as a known and potential vector of a number of other pathogens such as Babesia, Anaplasma, Rickettsia, *Borrelia miyamotoi* and louping ill virus. The distribution of *I. ricinus* has increased a lot over the last 25 years. In Scandinavia it has been observed further and further to the north and in central Europe the ticks are reported at higher and higher altitudes. Since *I. ricinus* is a vector of diseases, the spread of *I. ricinus* is a health issue. Therefore, monitoring of *I. ricinus* is considered very crucial. Since *I. ricinus* are commonly found on migrating birds, migrating birds might facilitate the latitudinal spread to northern isolated islands (e.g. Faroes). The present paper investigates possible latitudinal spread of *I. ricinus* in northern Europe/Faroe Islands.



Figure 1. *Ixodes ricinus* - by - wikimedia

The tick *Ixodes ricinus* (Acari, Ixodidae), is a parasite on vertebrates. Its lifecycle has three active stages that each depend on a bloodmeal from a vertebrate host. Hosts are typically small rodents (e.g. mice), lizards, medium sized rodents (e.g. hares), larger animals (e.g. cervids) and many different bird species like thrushes (e.g. blackbirds) and birds belonging to the Muscicapidae family. When ticks are searching for at host "questing" they climb vegetation to reach the hosts by grabbing to them. It is during questing that the ticks may attach to people and bite. This happens during different outside activities when we come in close contact with the vegetation.

In June 2015 Jolyon M. Medlock, Kayleigh Hansford and Alexander G.C. Vaux from Public Health England; together with William Simonsen (National Hospital of the Faroe Islands) and Janus Hansen (National History Museum) conducted a survey covering 38 sites, see figure 2–2c. Sampling was conducted by flagging (dragging) – a 1 m<sup>2</sup> cotton cloth was dragged 5 meters on the vegetation, this was done 45 times at each site, see fig 4. Possible questing ticks might attach to the cloth, which gives an estimate of the presence of ticks – this is active surveillance. Effort was also spent on gathering and registering all recorded *I. ricinus* in the Faroe Islands – this is passive surveillance.



Figure 2a. Location of field sites on Northern Faroe Islands of Vágar, Streymoy, Eysturoy, Borðoy, Kunoy and Nólsoy



Figure 2b. Location of field sites on Southern Faroe Islands of Suðuroy



Figure 2c. Location of Faroe Islands

## Results

Passive surveillance gave 33 ticks and active surveillance gave 3 ticks, see table 1. These are in addition to those described by Jaenson and Jensen, 2007.

No	Date	Location	Host	Stage
1	01/08/1990	Streymoy (Vestmanna)	Dog	Not recorded
2	05/2000	Streymoy (Tórshavn)	Wheatear	nymph
3	01/04/2004	Suðuroy (Tvøroyri)	Cat	female
4	01/08/2004	Nólsoy	Chiffchaff	larva
5	01/07/2005	Eysturoy (Fuglaferdur)	Human	nymph
6	04/07/2005	Suðuroy	Dog	female
7	08/09/2005	Suðuroy	Dog	female
8	18/08/2007	Nólsoy	Human	nymph
9	11/09/2007	Kunoy	Cat	female
10	08/08/2008	Streymoy (Vestmanna)	Dog	female
11	18/06/2010	Streymoy (Tórshavn)	Dog	female
12	01/08/2010	Streymoy (Tórshavn/Hoyvík)	Human	female
13	27/08/2010	Streymoy (Tórshavn)	Dog	female
14	30/08/2010	Streymoy (Tórshavn)	Unknown	nymph
15	02/09/2010	Borðoy (Klaksvík)	Dog	male
16	13/09/2010	Streymoy (Tórshavn)	Dog	female
17	22/08/2011	Vágar (Sandavágur)	Dog	female
18	20/05/2014	Suðuroy (Tvøroyri)	Human	nymph
19	25/08/2015	Suðuroy (Tvøroyri)	Vegetation	nymph
20	25/08/2015	Suðuroy (Tvøroyri)	Vegetation	nymph
21	08/2015	Suðuroy	Dog	female
22	23/07/2015	Borðoy (Klaksvík)	Dog	female
23	31/07/2015	Suðuroy (Vágar)	Cat	3 females
24	05/08/2015	Streymoy (Tórshavn)	Dog	female
25	07/08/2015	Streymoy (Norðasta Horn)	Dog	female
26	10/08/2015	Streymoy (Hoyvík)	Dog	female
27	12/08/2015	Suðuroy (Tvøroyri)	Vegetation	male
28	20/08/2015	Nólsoy	Passerine	2 nymphs
29	24/08/2015	Streymoy (Tórshavn)	Cat	female
30	20/09/2015	Suðuroy (Tvøroyri)	Dog	female
31	20/09/2015	Eysturoy (Sálarferdur)	Dog	female
32	21/09/2015	Streymoy (Tórshavn) [likely from Vágar (Savagur)]	Dog	female
33	Summer 2015	Suðuroy (Tvøroyri)	Cat	female
34	Summer 2015	Suðuroy (Tvøroyri)	Cat	female
35	Unknown	Unknown	Dog	female
36	Unknown	Unknown	Unknown	female
37	Unknown	Unknown	Unknown	female
38	Various	Various	Dogs	female
39	2015	Unknown	Unknown	female
40	27/03/2016	Suðuroy (Fróba)	Cat	female
41	03/05/2016	Suðuroy (Fróba)	Cat	female

Table 2. List of all records (including historical records) of *I. ricinus* on the Faroe Islands. First five records are previously published; records in **vegetation** are active surveillance. All other records were collected by the authors through passive surveillance (including additional unpublished historical records). Those listed as "unknown" represent no information provided with sample. The table also includes some ticks registered after June 2015.

In Tvøroyri in September 2016 two questing males and one questing female were found by active surveillance.

## Discussion

Research from other parts of Northern Europe shows that *I. ricinus* is expanding northwards. In the Faroe Islands, we now have evidence of questing and overwintering *I. ricinus*. It is also likely that ticks are acquired locally in the islands. Since pets (e.g. dogs) are brought abroad for holiday, they can acquire ticks in e.g. Denmark. But we have strict protocols for treating pets when they arrive from abroad, and many of the dogs where ticks have been found on have not been abroad. This suggests that ticks are acquired locally. Since *I. ricinus* has been found on migratory bird this is one route to the Faroes. Despite occasional reports of *I. ricinus* on many of the islands there is insufficient evidence to suggest that there are local populations. Except - in contrast in the southernmost island there is evidence of *I. ricinus* being active around the village of Tvøroyri, because nymphs and adults have been found questing there. This could suggest that *I. ricinus* have established there in low densities; however, no questing or engorged larva have been found. The presence of larva would show that adult ticks were mating. Additional reports of engorged ticks from dogs and cats in the vicinity of Tvøroyri during the same summer that questing ticks were found confirm tick activity. Also the finding of engorged female *I. ricinus* in early spring 2016 in Suðuroy on a cat that has not been abroad confirms overwintering.



Figure 2. *Borrelia burgdorferi*. Mynd: CDC-PHIL

Regarding environmental constraints on *I. ricinus* in the Faroe Islands, the winters are not too cold and the summers are hot enough for the ticks to survive and reproduce. Regarding habitat native woodlands are rare and only consist of *Salix* sp. and *Juniperus communis*, these do not provide a suitable habitat. A number of public woodlands are found throughout the islands. These do provide suitable habitats, but have fewer herbs that are considered important to ticks in nearby countries; also many of the trees are evergreen which causes little litter, an important microhabitat for tick survival between periods of questing.



Figure 4. Flagging with cotton cloth.

The small diversity of vertebrate hosts is another limiting factor. Small mammals, that are important to feeding larva in nearby countries, are absent. The possible role of rat (*Rattus norvegicus*) and mouse (*Mus musculus/domesticus*) is worth considering. However, one of the authors (Jens-Kjeld Jensen) has investigated between 200 and 300 mice and 60 rats, and found no *I. ricinus* on them. Potential hosts like birds known to host larval and nymphal *I. ricinus* – blackbird *Turdus merula* and robin *Erithacus rubecula* – are among the local birds, but there are no records of *I. ricinus* from them. Across Europe deer populations are important in maintaining *I. ricinus* populations. No deer populations exist in the Faroes, but there are numerous sheep. Sheep are important tick hosts in Scotland, but no ticks have been found on sheep in the Faroe Islands. This can be because the outfield areas are heavily grazed giving no habitat to the ticks and also the sheep are treated for sheep keds which might kill *I. ricinus*. Sheep share their habitat with hares *Lepus timidus* which are important hosts in Scotland. No *I. ricinus* have yet been recorded from hares in the Faroes.



Figure 5. Northern wheatear *Oenanthe oenanthe*. This bird is a possible route for *I. ricinus* to the Faroe Islands, because *I. ricinus* larvae have been found on them. Pic: A. Trepte.

Questing populations of *I. ricinus* are most likely to be found around villages, where woodland birds, companion animals (e.g. cats), and possibly house mice and rats sustain a peri-urban population. Humans may then be exposed to these ticks whilst in public woodlands, or other areas around the villages. After drop off from migratory birds (larvae have been found on wheatear, fig 5 and chiffchaff) *I. ricinus* are finding suitable hosts on Faroe Islands as evidenced by engorged female ticks on cats and dogs, and these appear to be important in feeding and dispersing ticks in absence of larger wildlife hosts. It is likely that some of these ticks will then find a suitable habitat to complete their life cycle (including the deposition of eggs and successful hatching of larvae). Further studies to determine the presence of questing larvae would confirm this.

a Medical Entomology Group, Emergency Response Department, Public Health England, Salisbury, Wiltshire, UK  
b NIHR Health Protection Research Unit in Emerging and Zoonotic Infections, PHE Porton Down, UK  
c National Hospital Faroe Islands, J.C. Svabosgøta 41-49, FO-100 Tórshavn, Faroe Islands  
d Í Geilini 37, FO-270, Nólsoy, Faroe Islands  
e Faroese Museum of Natural History, Kúrdalsvegur 15, FO-188, Hoyvík, Faroe Islands  
f Avia-GIS, Zoersel, Belgium

Jolyon M. Medlock, Kayleigh Hansford, Alexander G.C. Vaux, William Simonsen, Jens-Kjeld Jensen, Christina Joensen, Veerle Versteirt, Leivur Janus Hansen. 2017. Surveillance for *Ixodes ricinus* ticks (Acari, Ixodidae) on the Faroe Islands. *Ticks and Tick-borne Diseases*. 8(1):190-195. doi: 10.1016/j.ttbdis.2016.11.001. Epub 2016 Nov 4.

Jaenson, T.G.T. and J-K. Jensen. 2007. Records of ticks (Acari, Ixodidae) from the Faroe Islands. *Norw. J. Entomol.* Vol, 54, 11-15.