Not all ticks bite you

If you are an eager hiker in forests of Europe, you have likely come across or at least heard of the sheep tick, *Ixodes ricinus*. Ticks are creepy! The sheep tick is well-known to transmit the pathogens causing Lyme disease and several other human and animal diseases. The sheep tick is a generalist - it will bite virtually anything moving with blood inside. But there are also other ticks that are far pickier in terms of host use. In a study in a coastal forest of Norway, we found high numbers of the tick *Ixodes trianguliceps*, which is a specialist on small mammals, alongside the sheep tick. Even though *I. trianguliceps* will not bite you, it can affect your chances of retrieving Lyme disease.

Fig. 1. The fjord landscape of Norway is beautiful, but host ticks

The study of ticks and their ecology is growing now that climate and land use changes have caused increased incidence of tick-borne diseases both in Europe and North America. Both the sheep tick in Europe, and the ecological equivalent the black-legged or deer tick *I. scapularis* in North America, have three active life stages requiring a blood meal to moult into the next stage or to reproduce. Small mammals are considered an especially important host group due to their reservoir competence for pathogens causing Lyme disease. Larval ticks that feed on infected hosts will get the infection for life and can transmit it also to humans. Ticks, vertebrates and associated pathogens form complex ecological networks. Specialized tick species can also play a role in the epidemiology by maintaining high infection levels in the reservoir hosts, even if they do not act as vectors of disease to humans. One such example is the rodent specialist tick, *Ixodes trianguliceps*, that do not act as direct vectors of pathogens as they reside in burrows. We quantified the role of different small mammal species in feeding these two species of ticks.

Fig. 2. An adult female Ixodes ricinus tick.

All life stages of ticks were counted on captured rodents and shrews. We found the highest tick infestation intensity on the wood mouse *Apodemus sylvaticus* (13.4 tick/host), which is the species typically regarded as the most important tick host. However, due to high abundance, the common shrew *Sorex araneus* fed most of the larvae of both tick species (*I. ricinus* 61.9%, *I. trianguliceps* 64.9%) with the wood mouse (*I. ricinus* 20.4%, *I. trianguliceps* 10.0%) and the bank vole *Myodes glareolus* (*I. ricinus* 10.9%, *I. trianguliceps* 9.5%) as the next most important hosts. The load of *I. ricinus* larvae and nymphs was related to body mass of the host mainly up to ~10 g, while the load of *I. trianguliceps* was less dependent of host body mass. Our study emphasizes an important quantitative role of the common shrew *S. araneus* as a main host to *I. ricinus* larvae and to both *I. trianguliceps* larvae and nymphs. Shrews often dominate in abundance among small mammals and seem markedly underestimated as hosts to *I. ricinus* ticks.

Lastly, although the two tick species were almost equally abundant (40% *I. trianguliceps*, 60% *I. ricinus*), they had a different seasonality in their attachment pattern. The load of *I. trianguliceps* was higher in spring than in fall, while the seasonal pattern was reversed for *I. ricinus* with higher loads in fall. The partly seasonal distinct attachment pattern of *I. ricinus* and *I. trianguliceps* is evidence for niche separation. Such a seasonal disparate pattern of attachment between the two tick species, possibly to avoid competition by one or both of the species, may also lead to even more infection levels of pathogens over the season.

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