

Deer keds: An expanding nuisance parasite in Fennoscandia

For those growing up hiking in the forests of Norway before the 1980'ties, it was always a bit of a relief when the mosquito season ended in late summer. Though it was getting colder, there were at least no more nuisances in the fresh, crisp air during autumn. But "*the times they are a-changin'*". In 1983, the first deer ked (*Lipoptena cervi*) was found on a moose in southeast of Norway, being part of an invasion front coming from south of Sweden. The deer ked is a blood sucking ectoparasite of cervids, but they are incredible poor in separating cervids from humans. During their host-seeking flight activity in autumn, the adult deer keds constitute a considerable nuisance to people and limit human outdoor recreation. The bites of the deer ked are quite rare, but can cause long-lasting dermatitis in humans. We can safely say that forest autumn activities such as hiking, mushroom picking and hunting will never be the same with so many flying deer keds around.



Host seeking deer ked with wings are a considerable nuisance in Scandinavia. They aim for moose, but often land on humans and in large numbers limiting the pleasure of outdoor activities during autumn.

The main host for deer keds in Fennoscandia is moose, and the distribution and densities of moose have increased markedly during the last 50 years. In Norway alone, the number of moose harvested annually have increased from 6-7000 in 1960s to fairly stable around ~35 000 in the last decade. This is likely the main reason deer ked has become so very common in large areas of Norway, Sweden and Finland in recent years. The deer ked distribution is still expanding and will soon have made it half the way up Norway and Sweden. Another wave of keds is coming from Russia into Finland. Deer keds have a peculiar life cycle. The adults seek for hosts during autumn. When they find a host, they shed their wings and live in the fur of the host over winter, producing pupae dropping to the ground. Deer ked infestation intensity can be high with more than 10000

adult keds on a single moose. Each of them produces some 30 pupae during winter. No wonder they increase in numbers! The adults then emerge during autumn. Parasitic arthropods may be strongly affected by prevailing weather during off-host periods. Determining the pattern of flight activity during autumn is hence an important component to understand their life cycle and how it is influenced by climate.

Data on flight phenology was gathered by walking along transects in the forest in two counties of Norway during 2009-2013, counting the number of host-seeking keds landing on our jackets. We analysed how the flight activity of deer keds varied depending on date and prevailing weather during autumn. Host-seeking deer keds were observed from early August to mid-November with a marked peak in late September. Number of host-seeking keds declined with temperatures falling below the mean, but did not increase much at above mean temperatures. The pattern of flight phenology was similar across the two counties and five years.

Our study shows an estimated positive effect of temperature on deer ked flight activity mainly for below mean temperatures in late autumn, while the effect of temperature on flight activity in early autumn was weak. The pattern of host-seeking flight activity during late, rather than early autumn, is hence more likely to change with ongoing climate change, with a predicted increase in duration of the host-seeking period.

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Publication

[Phenology of deer ked \(*Lipoptena cervi*\) host-seeking flight activity and its relationship with prevailing autumn weather.](#)

Mysterud A, Madslien K, Herland A, Viljugrein H, Ytrehus B
Parasit Vectors. 2016 Feb 20