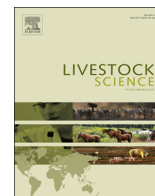




ELSEVIER

Contents lists available at ScienceDirect

## Livestock Science

journal homepage: [www.elsevier.com/locate/livsci](http://www.elsevier.com/locate/livsci)

Short communication

Host-parasite ecology of keds (*Melophagus ovinus* (L.)) relative to sheep breed and age on Wyoming rangelandJohn D. Scasta<sup>a,\*</sup>, K. Koepke<sup>b</sup><sup>a</sup> Department of Ecosystem Science and Management, University of Wyoming, Laramie 82071, United States<sup>b</sup> Sheep Unit, Agricultural Experiment Station, University of Wyoming, Laramie 82071, United States

## ARTICLE INFO

## Article history:

Received 19 January 2016

Received in revised form

3 May 2016

Accepted 4 May 2016

## Keywords:

Animal ecology

Organism-environment interaction

Livestock entomology

Parasitism

Production

Wool

## ABSTRACT

Sheep keds (*Melophagus ovinus* (L.)), an obligate external parasite of economic concern, are a continual problem in high-elevation grazing situations in most temperate sheep production areas of the world. The influence of sheep breed, age, and the interaction of breed\*age on host-parasite ecology, could inform integrated keds management strategies. We measured ked density and presence/absence on Rambouillet, Hampshire, and Suffolk ewes in Wyoming, USA to determine the role of breed, ewe age, and breed\*age interaction on ked parasitism. Eighteen ewes per breed group were examined for ked presence and ked density with sub-groups within each breed of 1, 2, and 3+ years of age. We used a generalized linear mixed model (GLMM) to analyze the effect of breed, age, and the interaction of breed and age, on a stacked response variable 'ked infestation' that is a function of both ked presence and density. Ked infestations differed by ewe age ( $p=0.0153$ ;  $F=4.55$ ) and by ewe breed ( $p=0.0178$ ;  $F=3.30$ ). Ked infestation increased with ewe age, as 29% of yearling ewes had keds and 63% of three-year old ewes had keds. Ked infestation was the greatest on the fine-wool Rambouillet ewes (72% presence; 1.4 keds per ewe), and was lower on the medium-wool breeds (Hampshire ewes had 39% presence and 1.0 keds per ewe and Suffolk ewes had 22% presence and 0.3 keds per ewe). The breed\*age interaction did not significantly influence ked infestation in our joint model of the stacked bivariate ked infestation response outcome ( $p=0.1292$ ;  $F=1.75$ ). The lack of a significant interaction is attributed to the relatively large variance around the mean for such small breed-age sub-groups and warrants additional study. Our results have implications for parasite management as 100% of three-year old Rambouillet ewes had keds present, but none of the yearling Suffolk ewes had any keds and only 29% of three-year old Suffolk ewes had keds present. The results from our study indicate keds do discriminate by breed perhaps due to an ecological adaptation for a wool-environment that is dense and comprised of a long staple – features characteristic of the Rambouillet ewes in our study. Integrated ked management strategies could manipulate this host-parasite ecology by selecting resistant breeds and/or strategically treating the most susceptible ewes. For example, this could be all Rambouillet ewe ages or only Suffolk ewes > 2 years of age.

© 2016 Elsevier B.V. All rights reserved.

## 1. Introduction

Sheep keds (*Melophagus ovinus* (L.)) are a Palearctic external parasite species in the Hippoboscidae family of the order Diptera that are now present in most temperate sheep producing regions of Europe, North America, South Africa, Australia, and high-altitude areas in the tropics (Small, 2005). Sheep grazing in high-elevations tend to have a greater risk of ked infestation as sheep in

Ethiopia had a 13-fold greater risk than sheep in low-elevations (Kassaye and Kebede, 2010; Scasta, 2015). Ked infestations can have a substantial negative economic impact on these high-elevation sheep operations because as ked infestation increases, weight gain and wool production both decrease. Nelson and Slen (1968) reported that ked free lambs gained 3.6 kg more per animal and ked free ewes produced 11% more wool than ewes infested with keds. The mechanisms leading to these reductions include irritation that leads to rubbing and scratching and a loss of blood that may lead to anemia which both reduce growth and production (Small, 2005). Keds also serve as a blue-tongue virus (BTV) vector, a disease of sheep and wildlife (Small, 2005). In Wyoming, sheep keds have been such a concern that the state has had the goal of eradicating the parasite to become "the first ked-free state in

\* Corresponding author.

E-mail address: [jscasta@uwyo.edu](mailto:jscasta@uwyo.edu) (J.D. Scasta).<sup>1</sup> Present/Permanent address: University of Wyoming, Department of Ecosystem Science and Management, Agriculture C 2004, Department 3354, 1000 E University Avenue, Laramie, WY 82071, United States.

the nation" (Nel, 1987). However, this problem has persisted to date because in the Wyoming Wool Grower Association Ram Test guidelines it is required that all sheep be treated for keds within 30 days prior to the sale and "if a ked infestation is found, the ram (s) will be disqualified from the sale and must be removed from the premises" (WWGA, 2016).

The influence of sheep age and breed appear to influence ked migration, infestation, and treatment decisions. Transfer of keds typically occurs from ewe to lamb and usually not between experimental groups (Nelson, 1958; Pfadt, 1976). The migration from ewes to lambs hypothetically decreased infestations in older sheep and new ked generations migrated while older keds remained on ewes (Tetley, 1958; Nelson, 1958). Sheep ked populations increase in the fall and sampling at the time of shearing has been suggested to be an opportune time for detection (Pfadt, 1976; Legg et al., 1991). Moreover, sheep wool type and length can influence the susceptibility of a sheep to ked infestation because these features change the wool environment from the keds perspective (Urquhart et al., 1996). Subsequently, these wool features are variable across sheep breeds that can be generally grouped as either fine-wool or medium-wool categories. For example, the most common sheep breeds in Wyoming, USA are fine-wool sheep (primarily Rambouillet) or medium-wool sheep (Hampshire and Suffolk) (Blackburn et al., 2011). It is also common to have primarily fine-wool ewes with medium-wool sires to produce multiple products – wool from the ewes and maximum meat production from lambs. Thus, in a rural state like Wyoming, USA that currently has an estimated ~354,785 sheep and lambs and is ranked 4th nationally, and is the 2nd highest state in elevation, it is critical to understand the host-parasite ecology of sheep keds (NASS, 2015).

Given the concern from producers about ked infestation of sheep on high-elevation rangeland, and the potential influence of sheep age and breed on ked infestation levels, we sought to quantify the influence of age and breed in a commercial Wyoming, USA sheep production scenario. Our main objective was to determine if sheep keds discriminate between three of the most common sheep breeds in Wyoming, USA (Rambouillet, Hampshire, Suffolk) and explain the role of ewe age as potential integrated pest management considerations based on this host-parasite ecology. Finally, we wanted to determine if and how ewe breed and age interact to explain ked infestation.

## 2. Materials and methods

### 2.1. Flock management and site description

We assessed commercial ewes from the University of Wyoming (UW) Agricultural Experiment Station (AES) Sheep Unit in Laramie, Wyoming, USA for sheep ked infestation. The ewe breed groups assessed in the study stayed together year round with the exception of being separated for 3 weeks in November for breeding. Separation at this time is required for exposure to breed-specific rams. After breeding, ewe breed groups were put back out to pasture together where they remain together through lambing from March through April. In June, ewe breed groups are then put out on pasture together for summer grazing. The study area consists of semi-arid high-elevation native and improved rangeland (41°17'10" N, 105°39'24" W) west of Laramie, WY, USA. Average annual rainfall is ~300 mm, average annual snowfall is ~1270 mm, and the elevation is 2195 m. The soils are loamy, sandy, and shallow clay, and the plant community is dominated by perennial grasses such as blue grama [*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths], crested wheatgrass [*Agropyron cristatum* (L.) Gaertn.], and western wheatgrass [*Pascopyrum smithii* (Rydb.)

**Table 1**

Summary of breed-specific wool characteristics including type, follicle density, grease fleece weight, fiber diameter, and staple length compiled from numerous literature sources<sup>a</sup>.

Breed	Wool type	<sup>b</sup> Wool follicle density	Fleece weight (kg)	Average fiber diameter (microns)	Staple length (cm)
Hampshire	Medium	Low	2.7 to 4.5	25 to 33	5.1 to 8.9
Rambouillet	Fine	High	4.5 to 8.2	19 to 23	7.6 to 10.2
Suffolk	Medium	Low	1.8 to 3.6	26 to 33	6.4 to 7.6

<sup>a</sup> Adapted from Briggs and Briggs, 1980; Ryder and Stephenson, 1968; Lamberson et al., 1982; Leymaster, 1991; Wool Production School Handbook, 1992; Scobie and Young, 2000; and Texas A&M University, 2015.

<sup>b</sup> Indicates primary plus secondary (P+S) follicle density; Low = < 25 per mm<sup>2</sup>, Medium = 25–50 per mm<sup>2</sup>, and High = > 50 per mm<sup>2</sup>. Due to a lack of breed-specific information, Hampshire estimates are based on average of Wiltshire and Southdowns breeds, two of the breeds used to develop the Hampshires, and Rambouillet estimates are based on Merino sheep values, the foundation for the breed.

Å. Löve]; forbs such as scarlet globemallow [*Sphaeralcea coccinea* (Nutt.) Rydb.] and sweetclover (*Melilotus* spp.); and shrubs and cacti such as greasewood [*Sarcobatus vermiculatus* (Hook.) Torr.], plains pricklypear [*Opuntia polyacantha* (Haw.)]; rubber rabbitbrush [*Ericameria nauseosa* (Pall. ex Pursh) G.L. Nesom & Baird], and yellow rabbitbrush [*Chrysothamnus viscidiflorus* (Hook.) Nutt.].

### 2.2. *M. ovinus* sampling

We visually examined Hampshire, Suffolk, and Rambouillet ewes for sheep keds at the time of shearing in October 2015 by three different individuals (sheep shearer, researcher, student technician). These breeds were selected as they are the most common sheep in Wyoming, USA, have variable wool characteristics (Table 1), and the fine-wool and medium-wool breeds are genetically distant and dissimilar (Blackburn et al., 2011). The entire body of each ewe was examined as the wool was being removed and included all parts of the body. This is an advantage to previous evaluation methods that involved parting the wool on only a limited portion of the body (Nelson et al., 1957; Legg et al., 1991). Each fleece was also examined after each ewe was sheared which is important because adult keds can be removed from the fleece at shearing (Evans, 1950). This live count technique has been accepted as a satisfactory estimate of sheep ked populations (Small, 2005). The total number of sheep keds per ewe, breed, and age of each ewe was recorded. Three breeds were examined including Rambouillet, Hampshire, and Suffolk with 18 ewes (*n*) in each breed group. The ages of ewes ranged from 1 year (yearlings) to 3+ years and the average age for each breed group was 1.9 years ± 0.2 for Rambouillet, 1.9 years ± 0.2 for Hampshire, and 2.1 years ± 0.2 for Suffolk. Sample size (*n*) for each age sub-group ranged from 4 to 8 with a mean of 6 ± 0.5 (SE) (Table 2). The elapsed time since the last shearing was 12 months for 2 and 3+ year old ewes and was 9 months for yearlings. The last application of a parasite control product was 10 months prior to sampling with a drenching of Ivomec.

### 2.3. Statistical analyses

The recorded number of keds per ewe was used to calculate the mean for ked presence (i.e., presence/absence) by breed and age and then the mean and standard error (SEM) of sheep keds per ewe (i.e., density) for each of breed group (Rambouillet, Hampshire, Suffolk) and for each age group (yearling, 2 years old, 3+ years old). We jointly conducted modeling and statistical analyses of our presence and density data due to variable inter-dependency

Download English Version:

<https://daneshyari.com/en/article/2446915>

Download Persian Version:

<https://daneshyari.com/article/2446915>

[Daneshyari.com](https://daneshyari.com)