STUDY SUMMARY

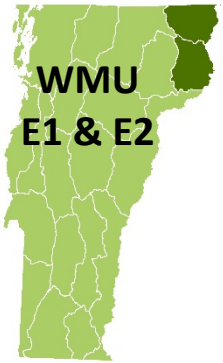
"Effects of Winter Ticks & Internal Parasites on Moose Survival & Fecundity in Vermont, USA" by Jake DeBow, University of Vermont

Are winter ticks causing low moose survival and birth rates?

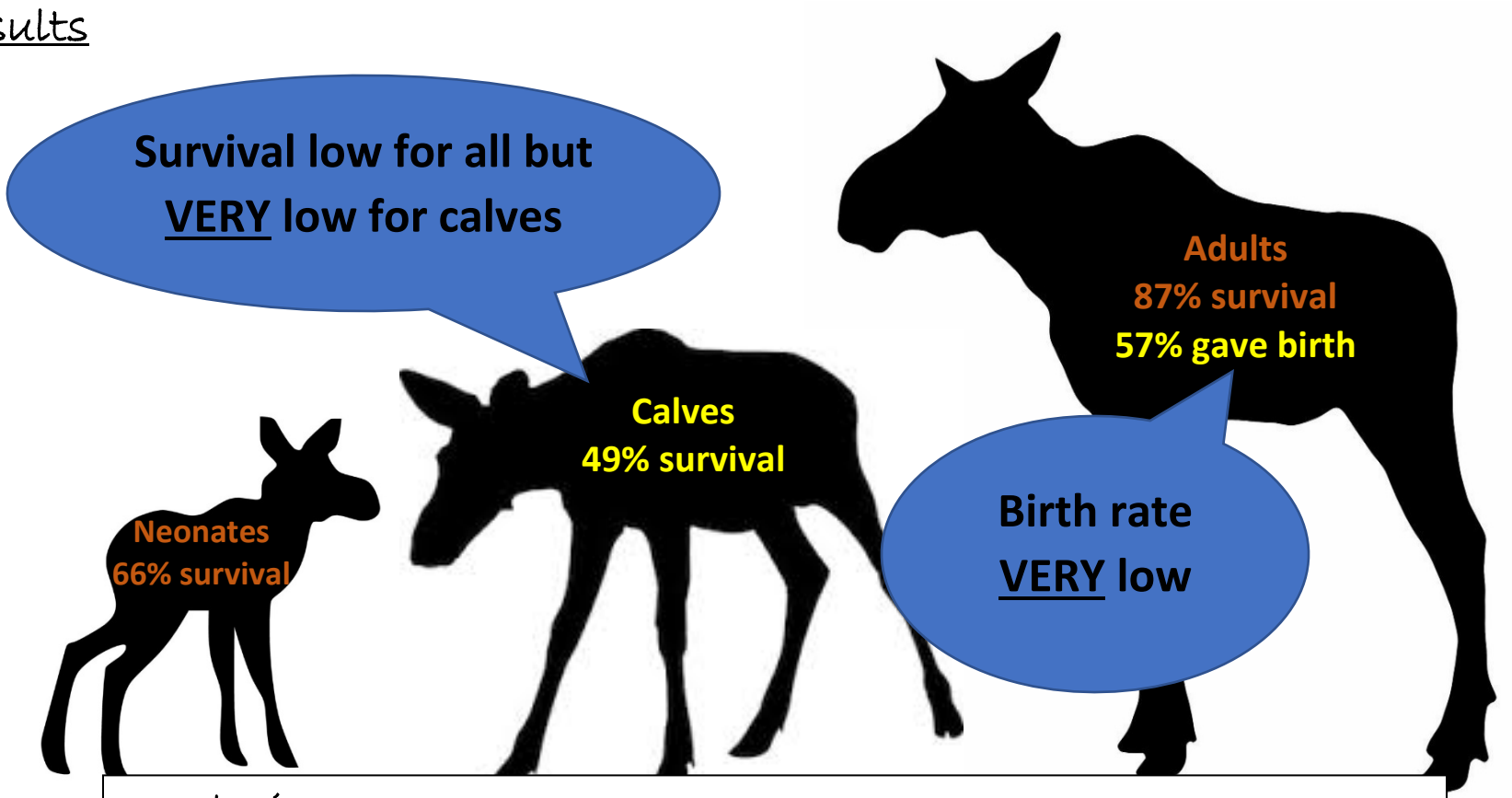
Field work

NATIVE RANGE CAPTURE SERVICES

- Conducted 2017-2019
- 37 cows, 90 calves fitted with GPS collars
- tick count, weight/size, feces, hair, blood samples taken



Results



Conclusions

- Winter ticks linked to 74% of mortalities (91% of calf mortality)
- Winter ticks were main cause of low survival
- Lungworm and roundworm made low survival even lower

2018-2019 UVM VERMONT MOOSE MORTALITY AND RECRUITMENT STUDY

VERMONT MOOSE MORTALITY AND RECRUITMENT

Principal Investigators: Therese M. Donovan and James Murdoch.

Graduate Students: Jacob DeBow (M.S.), Joshua Blouin (M.S), and Elias Rosenblatt (Ph.D.—Rubenstein Fellow).

Project Officers: Cedric Alexander and Scott Darling, VFWD

Project Funding: Vermont Fish and Wildlife Department, U.S. Geological Survey, Rubenstein School of Environment and Natural Resources, UVM.

Project Period: 1 September 2017 - 31 December 2021

Synopsis: Concern has risen in Vermont and neighboring states over the past decade regarding higher mortality and lower recruitment rates of resident moose (*Alces alces*) populations. High winter tick (*Dermacentor albipictus*) infestations are considered to be a major cause of these trends. In response, the State of Vermont initiated a 3-year study similar to those in New Hampshire and Maine to investigate rates of moose mortality, productivity, and recruitment of moose populations over a three-year period in Wildlife Management Units E1 and E2 (632 square miles of prime moose habitat).

Since January of 2017, 126 moose have been radio-marked (90 calves and 36 adult cows) and tracked on a daily basis with GPS technology. Cause of mortality was determined through field necropsy and pathology analysis of tissue. Adult annual survival was observed at 90% (n = 27 of 30) in 2017, 84% (n = 38 of 45) in 2018, and 86% (n = 38 of 44) in 2019. Observed winter survival (March-April) of calves fluctuated between 60% (n = 18 of 30) in 2017, 50% (n = 15 of 30) in 2018, and 37% (n = 11 of 30) in 2019. Field necropsy and pathology attributed 74% of all mortalities (91% of calves and 25% of adults) to winter ticks (*Dermacentor albipictus*). Meningeal worm (*Parelaphostrongylus tenuis)* and lung worm (*Dictyocaulus viviparous)* were recorded in 32% (n = 20 of 62) and 63% (n = 39 of 62) of all mortalities respectively.

These low survival rates would not be alarming if births can offset mortalities. However, this is unlikely. Of the 36 adult females captured, 67% (n = 24) were pregnant. Given pregnancy, observed birth rates ranged between 0.53 and 0.67. Analysis of calf survival rate (survival from birth to day 60) are ongoing.

Analysis of fecal glucocorticoid metabolites (fGCM, or stress hormones) over the study period confirmed that winter tick load had a strong positive effect on fGCM levels. Other variables including snow depth, road density, and conifer forest coverage also positively influenced fGMC levels. Investigations between fGMC levels and key fitness parameters (survival and reproduction) are in progress.

Population viability analyses are planned to estimate the probability of extirpation of moose from the study region within 50 years. The GPS data, in conjunction with contemporary maps of land cover types (from the newly available 2016 National Land Cover Database) and fine-scale landscape conditions from 2016 LIDAR (*light detection and ranging*) imagery, are being used to create habitat suitability models throughout Vermont in hopes of identifying habitat features associated with high survival and reproduction.

Our research provides the Vermont Fish and Wildlife Department basic information and a suite of tools to help aid in reversing the decline of this iconic species.

Project Status: Ongoing.

Photo: Moose captured in 2017 and outfitted with a GPS collar. Credit: Josh Blouin

Photo: Necropsy photo of moose with high density of feeding winter ticks. Credit: Jake DeBow.