Field surveillance of host-seeking ticks on beef cattle pastures in Missouri

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Introduction

Ticks and tick-borne diseases pose a major health risk to humans and animals. Two important tick-borne diseases affecting cattle in the US are bovine anaplasmosis (caused by *Anaplasma marginale*) and bovine theileriosis (caused by *Theileria orientalis*).

Bovine anaplasmosis causes clinical signs such as weight loss, spontaneous abortion, and death. This disease is costly to US cattle producers. While there are multiple mechanisms of transmission for bovine anaplasmosis, the most effective is through infected ticks. In the Midwest, this is specifically the adult male American dog tick (*Dermacentor variabilis*).

Bovine theileriosis causes clinical signs similar to bovine anaplasmosis and is also costly to cattle producers. A significant vector of this disease is the longhorned tick (*Haemaphysalis longicornis*), which has become established as an invasive species in the US since it was first recognized in New Jersey in 2017.

This study utilizes field surveillance to characterize tick populations and *A. marginale* prevalence on Missouri cattle pastures.

Figure 1. Research student using a flannel drag to capture questing ticks in the grass.

Methods

Ticks are collected from pastures on four different beef grazing operations (Figure 5). Pastures are actively grazed by cattle and consist primarily of open grassland, with areas of grassland-woodland edge habitat.

Tick are collected with flannel drags over 750-meter transects according to CDC's published guidelines. Ticks are transported to the lab, identified under a dissecting microscope using morphologic keys, and subsequently stored at -80°C for later analysis.

Molecular analysis of *D. variabilis* ticks is in progress. *A. marginale* will be detected by PCR for one of the organism's major surface proteins, MSP1b.

5mm

Figure 2. Longhorned tick (*Haemaphysalis longicornis*) nymph (left) and adult female (right)

Results

In 2022, a total of 237 ticks were collected from 79 transects between May and August. In 2023, 1905 ticks have been collected from 103 transects between May and July with more collection attempts planned through August. The species, life stage, and sex breakdown are illustrated in Figures 6 and 7.
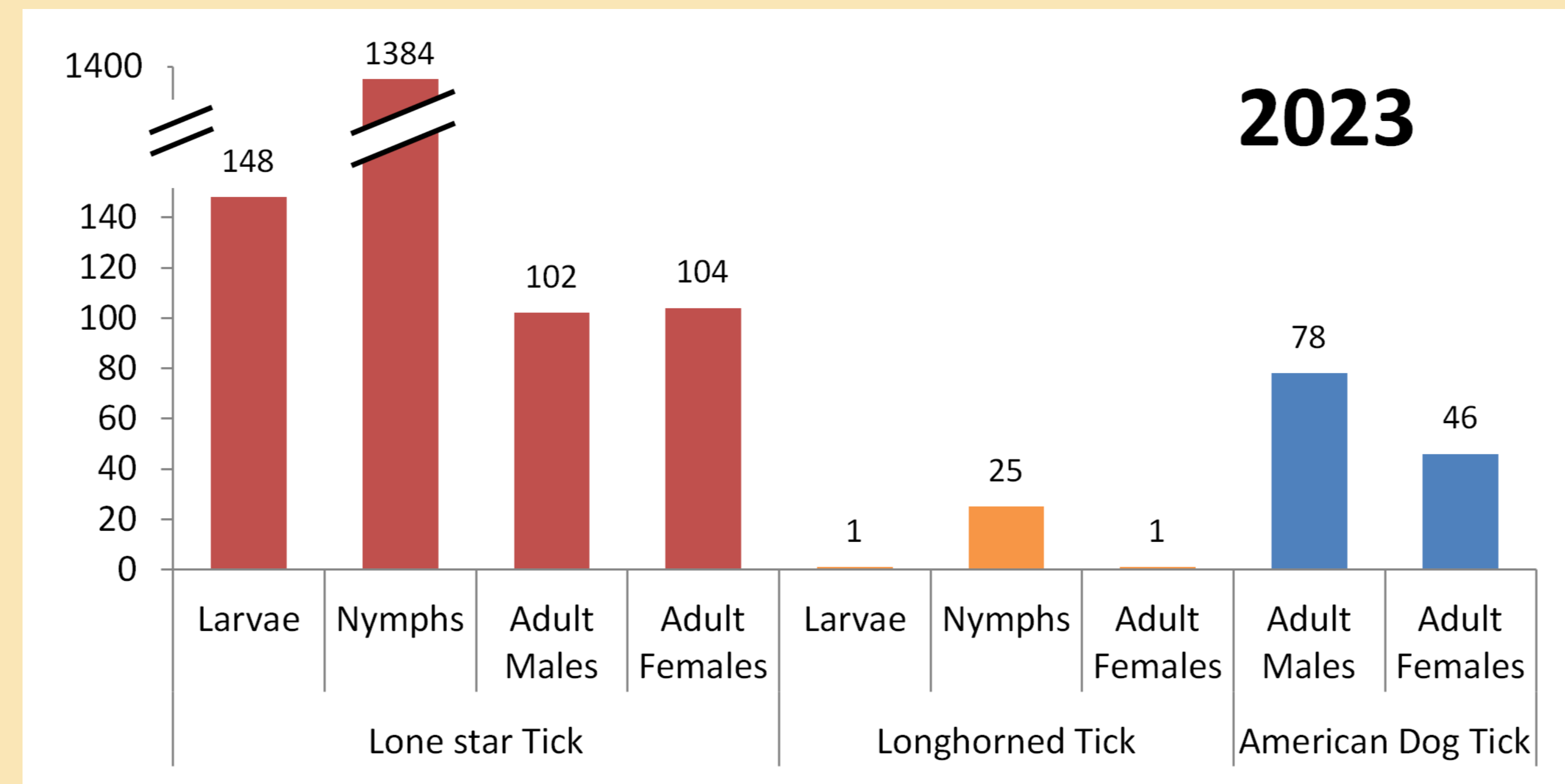

Figure 6. Species, life stage, and sex of 237 ticks collected in 2022. The longhorned ticks found during these samplings represent the first confirmed findings in Linn County.
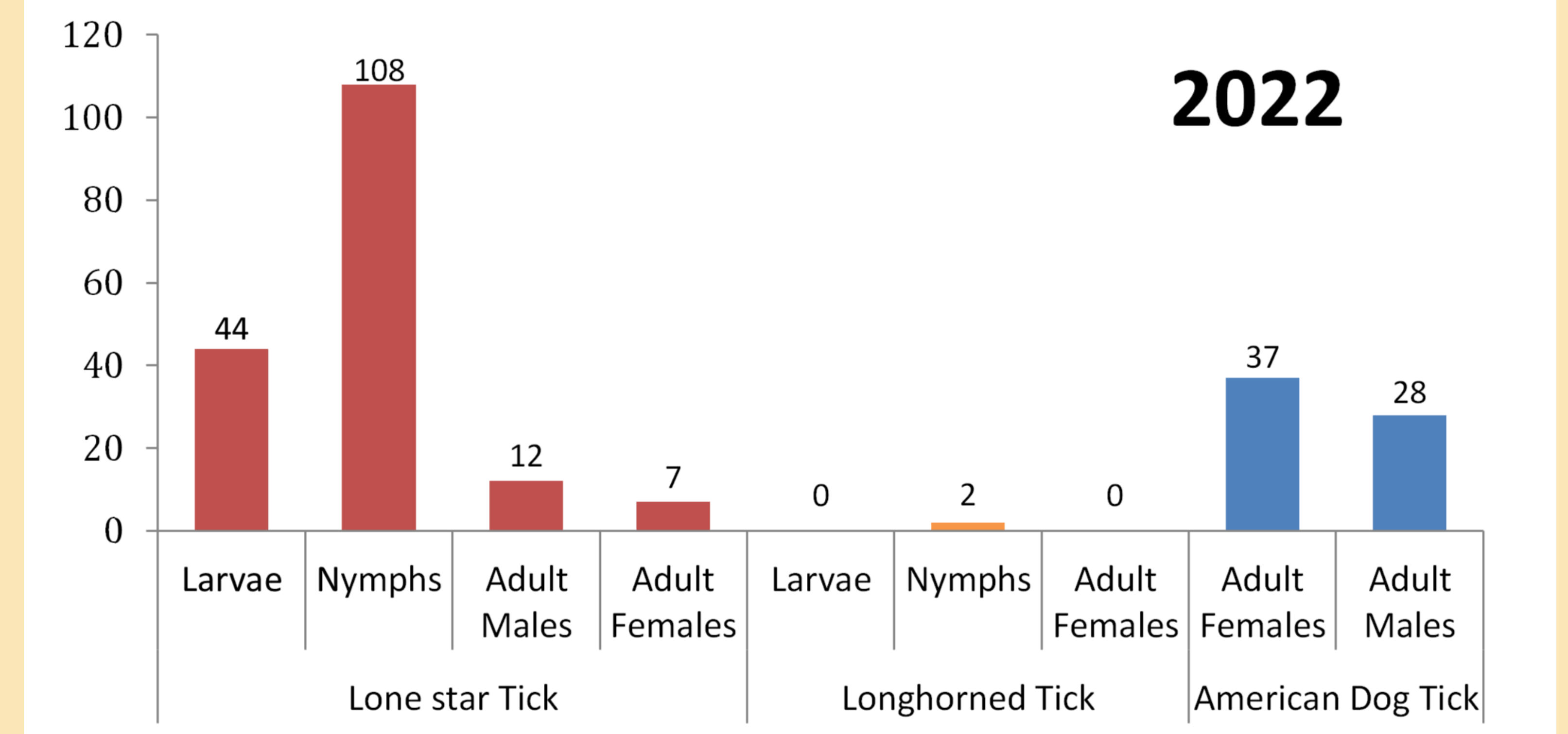

Figure 7. Species, life stage, and sex of 1905 ticks collected in 2023. The longhorned ticks found during these samplings represent the first confirmed findings in Boone County.
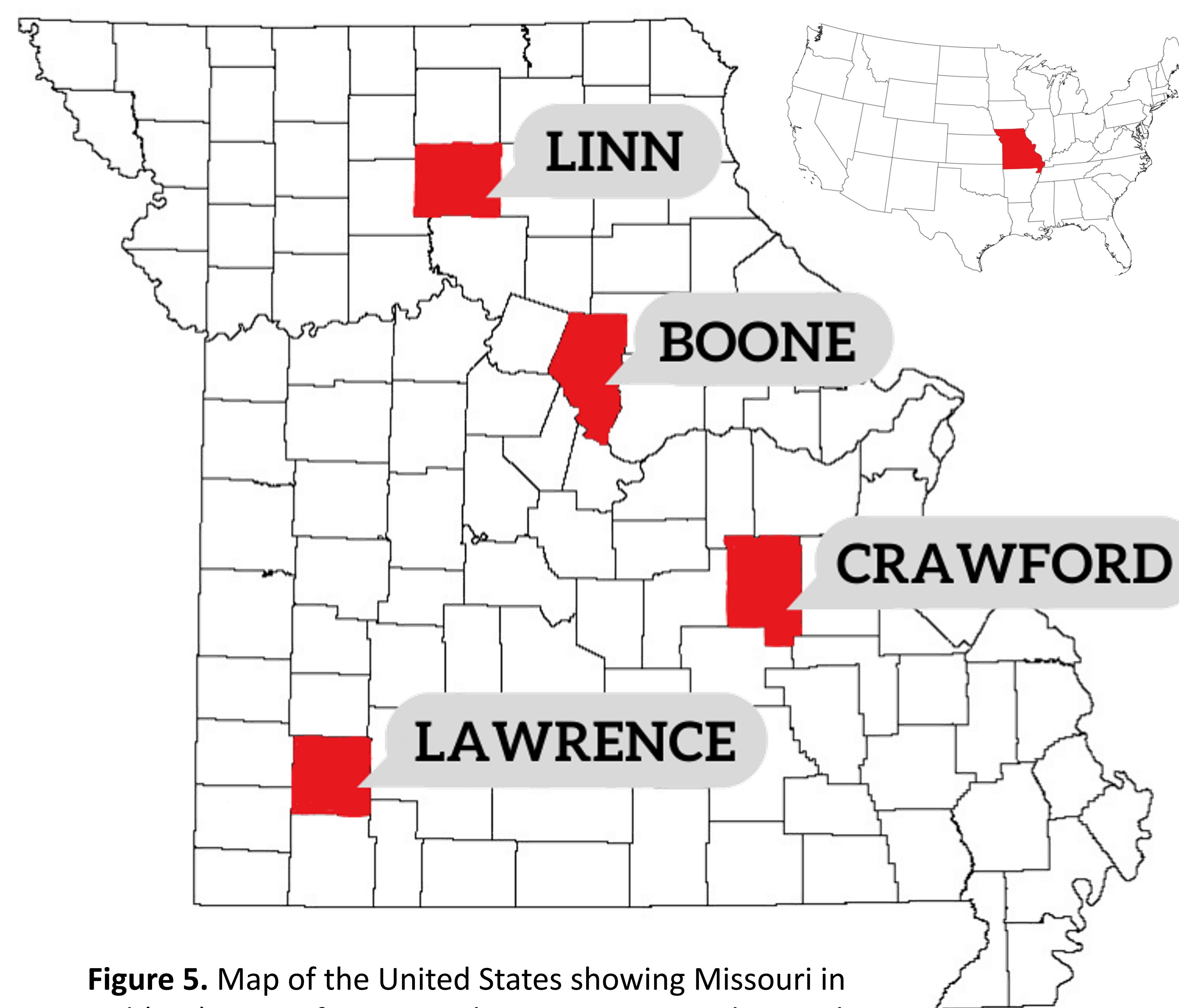

Figure 5. Map of the United States showing Missouri in red (top). Map of Missouri showing counties where tick collection sites are located (bottom).

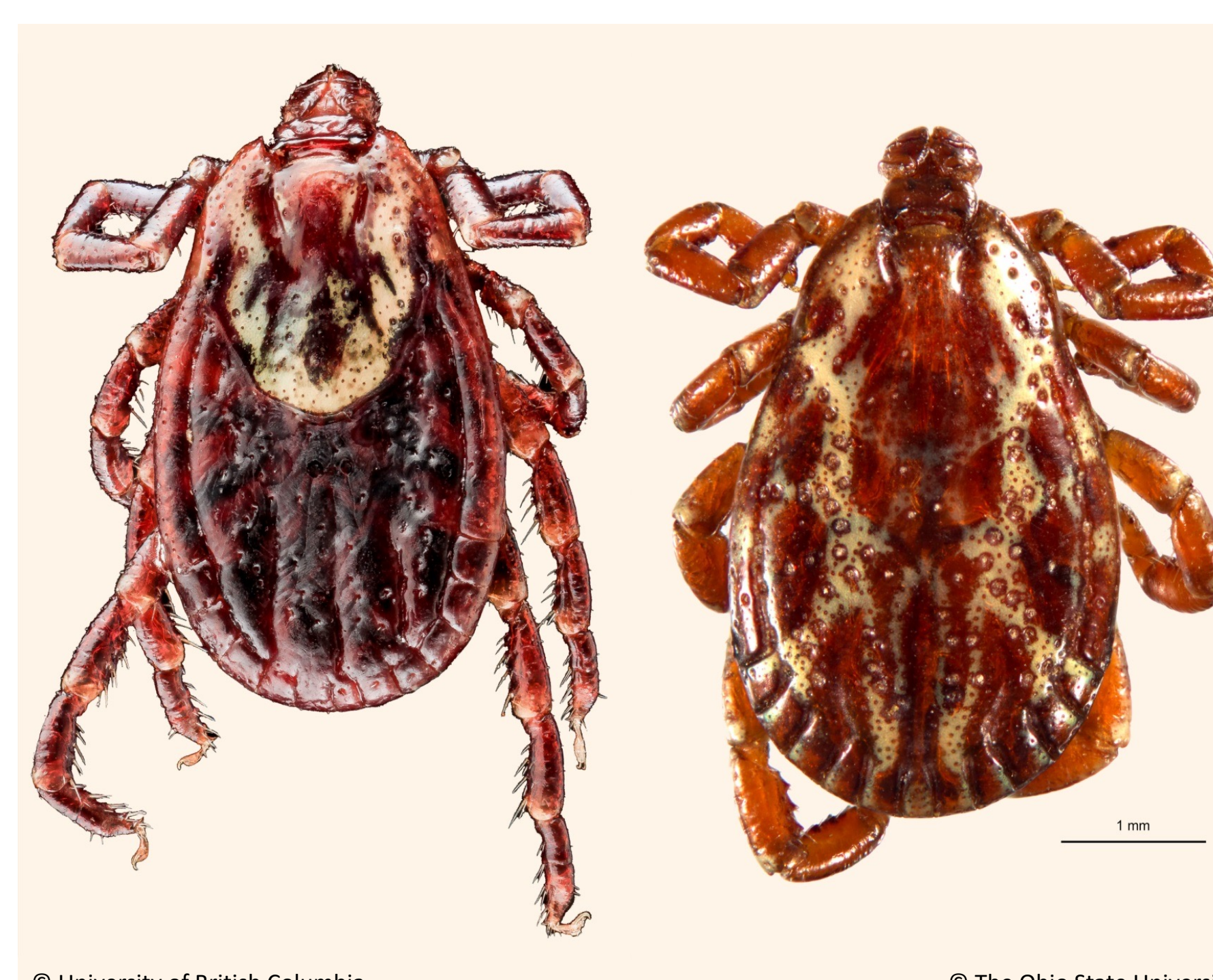**Figure 3.** Adult female lone star tick (*Amblyomma americanum*)

Figure 4. American dog tick (*Dermacentor variabilis*) adult female (left) and adult male (right)

Discussion

The most prevalent tick encountered was the lone star tick, *Amblyomma americanum*, which is known to be the most common tick species in this area (Brown 2011).

The drastic increase in ticks collected from 2022 to 2023 can be attributed to multiple factors. First, an increased number of lab employees and more favorable tick collecting weather in 2023 allowed for a larger number of transects. As a result of this increased sampling effort, more ticks were able to be recovered. Additionally, the mild winter conditions before the 2023 collection season likely contributed to a higher abundance of ticks, as reflected by the increase in average ticks collected per transect from 3.0 to 18.5 ticks.

Also, field collection began one month earlier in 2023 than in 2022. Since species and life stage distribution changes throughout the season, collecting ticks at different times can alter the findings (Spare 2021).

Dragging did not procure any *D. variabilis* larvae or nymphs, which aligns with our understanding of this tick's behavior. Immature stages preferentially feed on small ground-dwelling mammals, so they are unlikely to climb tall grass to quest (Sonneshine 1993).

Finally, this is the first confirmed longhorned tick discovery in Linn and Boone counties of Missouri. While it is known that these ticks can transmit diseases to both humans and cattle, more investigation is required to determine the risk of exposure for the animals in this area. Potential next steps include physical examination of cattle for ticks and species identification of any ticks present.

References

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