

Extra-limital Occurrences and Range Revision for *Onychomys leucogaster* (Northern Grasshopper Mouse) in Western Iowa

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Abstract - *Onychomys leucogaster* (Northern Grasshopper Mouse) was previously known to occur in 7 counties in northwestern and southwestern Iowa. Based on 1 recent capture and previously unpublished museum records, we present a revision to this species' range which encompasses 14 different counties across much of western Iowa, including all of the counties bordering Nebraska. Future research should focus on seeking genetic analysis of potential source populations to determine where the populations in Iowa may have originated, as well as continued sampling to probe the eastern edge of the Northern Grasshopper Mouse's current range.

Introduction

Onychomys leucogaster (Wied-Neuwied 1841)(Northern Grasshopper Mouse) is a carnivorous rodent that occurs in a variety of habitats throughout its range, including semiarid shrublands, sagebrush deserts, sandy dunes, grasslands, and grassy pastures (Jones et al. 1983, McCarty 1978). Its distribution stretches from California and the Great Basin in the west, south into Texas and Mexico, north into Alberta, Saskatchewan and Manitoba, and east across the Great Plains into the Dakotas, Minnesota, and Iowa (Hall 1981). The eastern edge of the Northern Grasshopper Mouse's distribution in Iowa has been revised several times in recent decades. Early descriptions suggested the species was confined to the extreme northwestern counties based on captures from 5 localities (Bowles 1975; Fig. 1). Two subsequent captures were reported from Pottawattamie and Mills counties, extending the range along the western edge of the state into southwestern Iowa (Rickert and Geluso 2010). In this paper, we report a capture of a Northern Grasshopper Mouse east of its known range limits in Iowa. We also report a number of unpublished records accessed from the Global Biodiversity Information Facility (GBIF 2023) and present a revision to the range of this species in western Iowa.

Audubon County capture

We captured a Northern Grasshopper Mouse in Audubon County, Iowa while conducting research of small mammal communities in roadsides. On 26 October 2023, an adult female was captured in a roadside dominated by *Bromus inermis* (Leyss) (Smooth Brome) surrounded by corn fields. The individual was subsequently recaptured on the second night of trapping (27 October 2023). Photographs and measurements were taken, and the animal was released alive at the location of capture. The record was reported through iNaturalist and verified as a research-grade observation and can now be accessed through GBIF (iNaturalist 2023). Additional species captured at the site included *Blarina brevicauda* (Say 1823) (Northern Short-tailed Shrew), *Peromyscus leucopus* (Rafinesque 1818)(White-footed

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Mouse), and *Reithrodontomys megalotis* (Baird 1857)(Western Harvest Mouse). Trapping protocols were approved by the Institutional Animal Care and Use Committee (IACUC) of the University of Nebraska at Omaha (protocol #22-010-00).

Unpublished records

In addition to this new Audubon County capture, we also searched GBIF for unpublished occurrences of the Northern Grasshopper Mouse in Iowa. We found 22 such records, corresponding with specimens stored at Brigham Young University, the University of Iowa, and Fort Hays State University. The locations of capture for these occurrences were listed in GBIF, but no details of the surrounding habitat were included. One additional unpublished record of a Northern Grasshopper Mouse from Adair County (ISU 1970) was provided by faculty at Iowa State University (J. Roe, Iowa State University, Ames, IA, 2023 pers. comm.). We obtained photographs of these specimens and verified species identification.

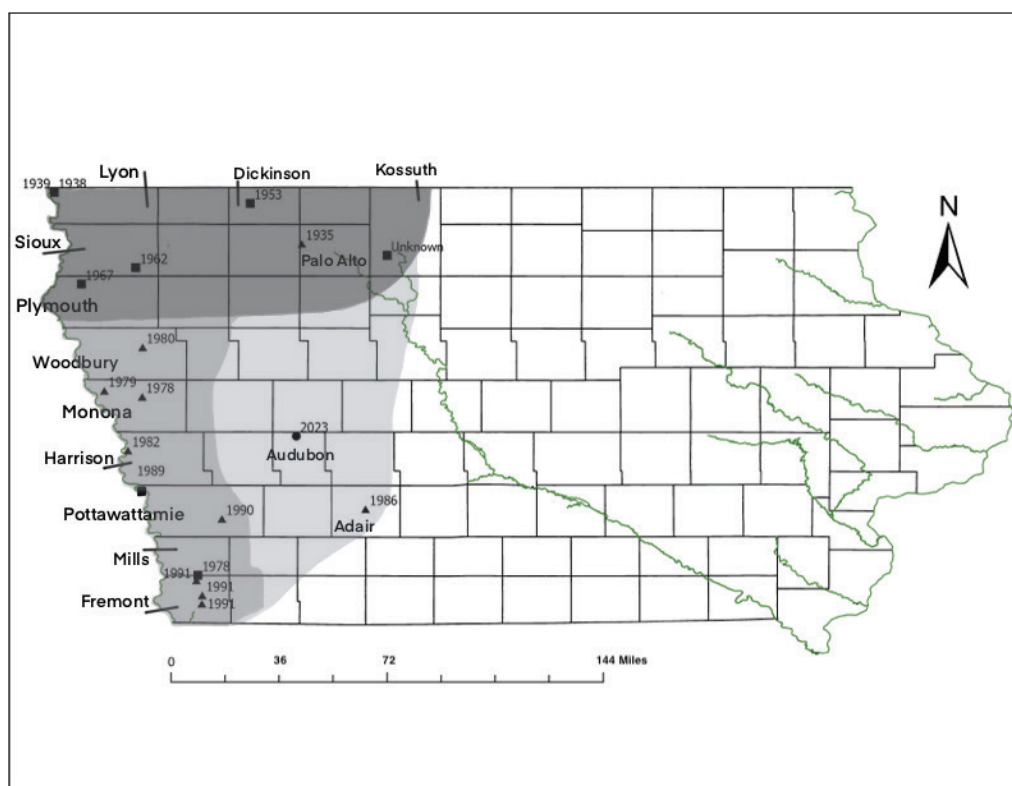


Figure 1. The proposed range for *Onychomys leucogaster* (Northern Grasshopper Mouse) in the state of Iowa. The darkest portion represents the range as originally put forth by Bowles (1975). The medium gray corresponds with the revision by Rickert and Geluso (2010). The lightest portion represents the range proposed as an addition based on a recent capture by the authors, as well as previously unpublished data. Occurrences indicated with squares represent previously published records, while triangles indicate unpublished occurrences found in the Global Biodiversity Information Facility (GBIF). The occurrence provided by the authors is indicated with a circle. Years correspond with dates of capture.

Proposed range revision of the Northern Grasshopper Mouse in Iowa

Including the records reported herein, there have been 42 occurrences of the Northern Grasshopper Mouse across 18 distinct locations in western Iowa. These records occur in 14 counties, including every county along Iowa's western border. Early northwestern records from Bowles (1975) are now connected continuously with those in southwestern Iowa reported by Rickert and Geluso (2010). The occurrences in Audubon and Adair counties also extend the range farther east into Iowa's interior than previously reported. A proposed updated range for the Northern Grasshopper Mouse now covers much of the western half of Iowa (Fig. 1).

This revised range confirms the speculation of Rickert and Geluso (2010) that the Northern Grasshopper Mouse is more widely distributed than previously documented. They also speculated that records in southwestern Iowa likely represented a southward range expansion from the northwestern corner of the state (Rickert and Geluso 2010). In general, the dates of known occurrences move from north to south as time progresses, which could support a proposed range expansion from northwestern Iowa (Fig. 1). To the best of our knowledge, however, trapping effort in the years leading up to these records was limited, so the dates of capture might not accurately represent when populations of the Northern Grasshopper Mouse spread to a certain region. The earliest known record is now in Palo Alto County, nearly 140 km east of Iowa's northwest corner (Fig. 1). This observation along with the additional records in central Iowa suggest that Northern Grasshopper Mice might have spread more generally from north to south in Iowa instead of moving south along the western border of the state.

Determining whether more recent occurrence records reflect a range expansion or extension is beyond the scope of this paper, but further research should focus on comparative use of background species records (Frey 2009), as well as trapping and genetic analysis of current populations and museum specimens from Iowa, Minnesota, South Dakota and Nebraska to determine from where Iowa's animals originate (Ascensão et al., 2016; Mateo-Sanchez et al., 2015). In addition, more sampling is warranted along the eastern edge of the current range of the Northern Grasshopper Mouse in Iowa to gain a better understanding of its range limits in this region.

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