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Current Status of the Plains Pocket Mouse, Perognathus flavescens, in Iowa

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The plains pocket mouse (Perognathus flavescens Osgood), which reaches the eastern limits of its range in Iowa, is the only rodent of the southwestern family Heteromyidae that occurs in the state (Lampe and Bowles 1985, Schmidly et al. 1993). Although published accounts indicate a general preference for grassland (Lampe and Bowles 1985, Schmidly et al. 1993), the overall natural history about its biology. This paper reviews published data and reports new information pertaining to the distribution and biology of Perognathus flavescens in Iowa, where it is listed as endangered (Endangered and threatened species included the western two-thirds of Iowa. Fichter (1939), however, gave no reproductive details for the Fremont County specimen, and none were recorded on the specimen tag (University of Nebraska State Museum # 0001).

Polderboer (1937) reported a specimen taken in Black Hawk County, and deposited in the National Museum of Natural History in Washington, D.C. (Bowles 1975). Unfortunately, the specimen tag (USNM # 210538) provides neither habitat nor reproductive details for this individual. In his account of mammals of North Dakota, Bailey (1926) alluded to the presence of Perognathus flavescens in the prairie country of Iowa and adjacent states, but he did not call attention to the Greene County specimen, nor did Stoner (1918) in his summary of Iowan rodents. Fichter (1939) reported a female Perognathus flavescens “taken in a potato patch on Tama silt-loam soil” in Fremont County in 1935. His map for the eastward and southward extension of the known range of the species included the western two-thirds of Iowa. Fichter (1939), however, gave no reproductive details for the Fremont County specimen, and none were recorded on the specimen tag (University of Nebraska State Museum # 0001).

Polderboer (1937) reported a specimen taken in Black Hawk County in 1936. Although only one was described in detail, he noted that “All captured specimens... were fully mature (none examined for embryos).” In addition, Polderboer (1937) commented that a “study of contents of the cheek pouches of 15 specimens revealed the following seeds: grass (Panicum), sandbur (Cenchrus), foxtail (Setaria). The sedge seeds composed the major portion of the contents of the cheek pouches.” Polderboer went on to discuss “specimens” taken in Union Township, Black Hawk County, and commented that “the higher ridges in the township are mostly sandy prairies... [primarily] covered with Carrington sand and Carrington sand loam soils... [and that] a few sparse plants such as bur clover, panicum, sandburs, roses, sedge and mullein grow here.” This probably was where Polderboer trapped the 15 pocket mice. In 1938, he collected a male and female in Backbone State Park, Delaware County (Fichter 1939). The specimen tag of the female indicates it was taken on a sandy prairie, but no habitat information is available for the male specimen. No additional reproductive comments were noted for either specimen. Although reportedly deposited in the mammal collection at Iowa State University (ISU) (Polder 1935), both specimens are currently housed in the National Museum of Natural History in Washington, D.C.

In his survey of mammals of Iowa, Scott (1937) reported two specimens of Perognathus flavescens in the ISU collection — one from Guthrie Center, Guthrie County, and the other from Oakland, Pottawattamie County. The former was a female collected in 1930, and the latter, sex unrecorded, was collected in 1928. An additional ISU specimen, sex unrecorded, was taken in 1940 in Boone County (Bowles 1975). No habitat or additional reproductive information is available for any of the ISU specimens. From 1955-1957, four plains pocket mouse were collected near Center Point, Linn County, and deposited in the Coe College collection (Bowles, 1975). Although neither reproductive nor habitat information were recorded, all individuals were collected on sandy substrate (Goellner, pers. comm.). Despite further searches for Perognathus flavescens near Center Point during the 1960s (Goellner, pers. comm.) and in 1983 (N. P. Bernstein, pers. comm.), no additional specimens were collected.

Published and unpublished accounts of the plains pocket mouse (Perognathus flavescens) were utilized to document the existence of extant populations and to summarize and report additional data about the biology of this state endangered Iowa species. Populations of Perognathus flavescens exist in western (Harrison, Monona, and Plymouth counties) and extreme eastern (adjacent portions of Louisa and Muscatine counties) Iowa, the latter of which represents the eastern-most record for the species in North America. In addition, we document a new locality for Perognathus flavescens from the interior of the state (Benton County). All known populations of Perognathus flavescens in Iowa occur in grassland habitats on well-drained substrates (i.e., loess, sandy loam, and sandy soils). Reproductive data suggested that Perognathus flavescens occur in grassland habitats on well-drained substrates (i.e., loess, sandy loam, and sandy soils). Reproductive data suggested that Perognathus flavescens have at least two litters (early spring and late summer) of three to eight young. We hope this paper will stimulate additional research that will lead to a better understanding of the general distribution and biology of Perognathus flavescens in Iowa.
Plains Pocket Mouse

RECENT RECORDS SUBSEQUENT TO BOWLES (1975)

In 1978, Christiansen and Sanz (1978) reported the capture of six
P. flavescens in pitfall and Sherman live traps on sparsely vegetated
sand dunes at Big Sand Mound (now Louisa Generating Preserve) in
northeastern Louisa County, near the Mississippi River (not
Muscátine County, as reported). Plains pocket mice have continued to
be captured in pitfall traps at the edge of scrub vegetation and
contiguous sandy habitat at the Louisa Generating Preserve in
southeastern Muscátine County, as well as along the west side of
Beattys Pond in extreme northeastern Louisa County (Fig. 1; J. L.
Christiansen, pers. comm.).

From 1978-1982, 19 adult P. flavescens were captured by Lampe
and Bowles (pers. comm.) at five sandy, grass-dominated sites in
Harrison, Monona, and Plymouth counties in western Iowa (Fig. 1).
These sites were typical of the gently to steeply rolling Loess Hills
that lie along much of the Missouri River Valley (Murel 1989, Prior
1991). Remnant stands of mixed-grass prairie occurred on the ridges
and steep bluffs of the western-most hills, which were connected to
the main body of mixed prairie along the Missouri River bluffs in
South Dakota and Nebraska (Novacek et al. 1985). The vegetation
that occurred on the upper slopes and summits was dominated by
caespitose grasses, consisting mostly of sideoats grama (Bouteloua
curtipendula [Michx.] Torr.) and little bluestem (Andropogon scoparius
Michx.). Woodland and cropland dominated the moist valleys, with
the woodland habitats forming an ecotone with the ridge-top
prairies, especially along north facing slopes (Murel 1989, Roosa and
Koenig 1990). Although most western Iowa records of P. flavescens
are from prairie hillsides of the Loess Hills and Bowles (1985), a male was collect in 1979 in a patch of marijuana (Cannabis
sativa L.) at Gleason-Hubel Wildlife Area, Harrison County (J. B.
Bowles, unpubl. data), and another male was live-trapped in 1982 in
a field of smooth brome (Bromus inermis Leys.) at Little Sioux Boy
Scout Ranch, Monona County (J. B. Bowles, unpubl. data; Fig. 1).

We suspect these two males may have simply been dispersing
through these habitats that could be considered atypical for P.
flavescens, or they may have been foraging. Unfortunately, the fur-
lined cheek pouches of these individuals were not inspected.

During our trapping efforts on 25 sandy prairie patches in the
eastern one-third of Iowa during the summers of 1990 and 1991, we
found only one extant population of P. flavescens (Bowles 1991). In
August 1990, we captured a nonpregnant adult female (with
placental scars) at the Cumberland Target Range, Benton County, in
east-central Iowa (Fig. 1), an area managed by the Benton County
Conservation Board. The mouse was captured in a Museum Special
snap trap baited with rolled oats in a small stand of native prairie
with dry, loose sandy soil. The predominant plant species at the trap-
site were big bluestem (Andropogon gerardi Vitman), switchgrass
(Panicum virgatum L.), and smooth brome, along with several woody
invaders that included honey locust (Gleditsia triacanthos), red
cedar (Juniperus virginiana L.), and mulberry (Morus L. spp.). The
small stand of native prairie was bordered by a tilled agricultural
field and a freshly cut alfalfa (Medicago sativa L.) field.

Despite the increased trapping and capture of the plains pocket
mouse in Iowa since the mid-1970s, reproductive data for this
species are limited (Table 1). Only two of the five females collected
after October 1970 showed signs of reproduction (i.e., pregnant,
lactating, or enlarged mammae) — one in May and another in early
August. Likewise, only two of the six males for which we have data
were reproductively active (i.e., enlarged seminal vesicles) — one
collected in late July and the other in early August. The other four
males, two of which were captive individuals with testes
measurements (length x width in mm) of 4 x 2 and 3 x 2 when they
died on 15 December and 9 March, respectively, were not fully
developed reproductively at the time of necropsy (i.e., minute to
moderately enlarged seminal vesicles and epididymides not clearly
visible with a hand lens), or lacked critical data.

Table 1. — Month, day, sex, and reproductive condition of plains pocket mice, P. flavescens, collected in
Iowa since October 1970a.

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Sex</th>
<th>Reproductive condition/comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>6 f</td>
<td>no embryos</td>
<td>3 x 6 mm</td>
</tr>
<tr>
<td></td>
<td>15 f,f</td>
<td>3 x 6 mm</td>
<td>no embryos</td>
</tr>
<tr>
<td>June</td>
<td>24 f</td>
<td>no embryos</td>
<td>27 m</td>
</tr>
<tr>
<td>July</td>
<td>20 m</td>
<td>testes 5 x 3 mm</td>
<td>epididymides</td>
</tr>
<tr>
<td></td>
<td>26 m</td>
<td>enlarged seminal vesicles</td>
<td>with hand lens, small seminal vesicles</td>
</tr>
<tr>
<td>August</td>
<td>3 f</td>
<td>not pregnant, 8 placental scars, mammae</td>
<td>6 m</td>
</tr>
</tbody>
</table>

a Measurement of testes is length x width; measurement of embryos is crown-rump length.

b Testes and epididymides were eaten when the animal was still in the trap.

COMMENTS

We were encouraged to find and report records of extant
populations of P. flavescens in at least three of the Iowa landform
regions identified by Prior (1991) despite the loss of most tall- and
mixed-grass prairie following European settlement (Bowles 1981,
Smith 1981). Plains pocket mice occur in at least five sites in the
Loess Hills Region (one each in Harrison and Plymouth counties
and three sites in Monona County) and one each in the Iowan Surface
Region (Benton County) and Mississippi Alluvial Plain Region.
(adjacent portions of northeast Louisa and southeast Muscatine counties; Fig. 1). Although most of these sites have at least some measure of protection and management (i.e., prescribed burns) by state and county conservation agencies, most prairie remnants in Iowa do not. In many cases, such as in the Loess Hills, sites where *P. flavescens* have been collected are being invaded by woody plants, such as red cedar, rough-leaved dogwood (*Cornus drummondii* Meyer), and smooth sumac (*Rhus glabra* L.) because of the suppression of naturally occurring prairie fires (Mulet 1989). As a result, the existence of the state endangered plains pocket mouse is threatened at many of these sites due to the loss of species specific habitat.

All populations of *P. flavescens* in Iowa are known to occur only in grass-dominated habitats on well-drained strata such as loess, sandy loam, and sandy soil. Consequently, the distribution of the plains pocket mouse may be discontinuous throughout the state, as suggested by Bowles (1981). Based on the soil association map for Iowa (Iowa Agriculture and Home Economics Experiment Station, et al. 1978), we suspect other localized populations exist, especially in extreme western (Missouri Alluvial Plain Landform Region) and eastern counties (Mississippi Alluvial Plain Landform Region) of Iowa, and in the extreme northwestern corner of the state (Northwest Iowa Plains Region). Additional populations likely will be found in the remainder of Iowa in sparsely vegetated sand prairies and roadside ditches, as well as in margins of grain fields with well-drained substrates, as shown elsewhere in its range (Hibbard and Beer 1960, Jones et al. 1985, Jones and Birney 1988, Reed and Choate 1986). However, we suspect that *P. flavescens* is not nearly as abundant in the Des Moines Lobe Landform Region in north-central Iowa as it is in the other landform regions. The substrate of the Des Moines Lobe is characterized as mostly prairie-derived soils that developed from Wisconsin till following the Pleistocene glaciation. The soil types in this landform region, which include Webster, Okoboji, Canisteo, and Nicoller, among others (Iowa Agriculture and Home Economics Experiment Station, et al. 1978), are generally characterized as being poorly-drained. If extant populations of plains pocket mice do occur in the Des Moines Lobe Landform Region, we suspect they would be found, as were individuals collected prior to 1970, in the southern portion (Bemis Moraine) of the landform region and near the Des Moines, Boone, Raccoon, and Skunk river systems (Fig 1).

Despite the meager reproductive data, we suspect that *P. flavescens* in Iowa has at least two litters of three to eight young (late spring and late summer) as shown elsewhere in its range (Table 1; Asdell 1964, Jones et al. 1983, Jones and Birney 1988). Similarly, food habits of *P. flavescens* in Iowa are probably similar to those found elsewhere (i.e., wide range of grass, sedge, and forb seeds; Jones and Birney 1988, Reed and Choate 1986), but the paucity of information precludes any comment on seeds consumed in Iowa. Likewise, data are needed to define the late fall, winter, and early spring biology of *P. flavescens*. In Iowa, the latest fall and the earliest spring records to our knowledge are 7 September and 23 March, respectively.

The survival of at least a few populations of the state endangered plains pocket mouse affords an excellent opportunity to learn more about its biology. Efforts should be made to search for new records of locality and monitor known populations of *P. flavescens* by using Sherman live traps, pit fall traps, or mesh live traps. Such methods of trapping will maximize capture (Christiansen and Sanz 1978, O'Farrell et al. 1994, Reed and Choate 1986) and minimize mortality. Once specimens are captured, fluorescent pigments could be used to obtain information on habitat requirements and movement patterns of this nocturnal rodent (Lemen and Freeman 1986). Cheek pouch contents and reproductive condition of individuals should be carefully examined and recorded. If mortality occurs, we strongly urge that the skin, complete skeleton, stomach contents, and tissues such as heart, liver, spleen, and kidney be saved and incorporated into an accredited systematic collection that is equipped for long-term storage of such material. The use of molecular assays, such as restriction fragment length polymorphism (RFLP) analysis of mitochondrial DNA (mtDNA), gene sequences of mtDNA, and allozymic data (Patton et al. 1981, Riddle 1995) would help to better understand both gene flow and the effects of isolation within and among populations of *P. flavescens* in Iowa.

**ACKNOWLEDGMENTS**

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**LITERATURE CITED**


PLAINS POCKET MOUSE

APPENDIX

Post-October 1970 capture records
This list includes 27 specimens of *P. flavescens* collected in Iowa subsequent to October 1970, 25 of which are deposited in the following institutions (acronyms in parentheses): Buena Vista College, Storm Lake (BV); Central College, Pella (CUI); Drake University, Des Moines (DU); Ecology Consultants, Inc. Collection, Ft. Collins, CO (ECIC); University of Iowa Museum of Natural History, Iowa City (IOWA). Localities listed correspond to locations plotted in Fig. 1. See Bowles (1975) for distributional details for specimens collected prior to November 1970.
