Gesner, A. 1847. New Brunswick: With notes for immigrants. Simmonds and Ward. London. 388 pages.
Hansen, K. 1992. Cougar - The American lion. Northland Pubublishing Co. Flagstaff, Arizona. 144 pages.
Murie, O.J. 1974. A field guide to animal tracks. Peterson's field guide series. Second Edition. Houghton Mifflin Co. Boston, Massachusetts. 375 pages.
Tischendorf, J.W. 1990. The Eastern Panther on film? Results of an investigation. Cryptozoology 9: 74–78.
Wright, B. S. 1948. Survival of the northeastern panther (*Felis concolor*) in New Brunswick. Journal of Mammalogy 29(3): 235–246.
Wright, B. S. 1953. Further notes on the panther in the northeast. Canadian Field-Naturalist 67(1): 12–28.
Wright, B. S. 1959. The Ghost of North America. Vantage Press, New York. 140 pages.
Wright, B. S. 1961. The latest specimen of the eastern puma. Journal of Mammalogy 42(2): 278–279.
Wright, B. S. 1965. The cougar in eastern Canada. Canadian Audubon 27(5): 144–148.
Wright, B. S. 1972. The eastern panther: A question of survival. Clark, Irwin and Co., Toronto, Ontario. 180 pages.

Received 18 August 1993
Accepted 15 March 1994

Range Extension and First Holocene Record of the Arctic Shrew, *Sorex arcticus*, from the Driftless Area, Southeastern Minnesota

FREDERICK J. JANNETT, JR., and RONALD L. HUBER[1]

Science Museum of Minnesota, 30 E. 10th Street, St. Paul, Minnesota 55101
[1]Present address: 4637 W. 69th Terrace, Prairie Village, Kansas 66208

Jannett, Frederick J., Jr., and Ronald L. Huber. 1994. Range extension and first Holocene record of the Arctic Shrew, *Sorex arcticus*, from the Driftless Area, southeastern Minnesota. Canadian Field-Naturalist 108(2): 226–228.

A specimen of the Arctic Shrew, *Sorex arcticus*, was secured in extreme southeastern Minnesota, at a locality within the late Pleistocene Driftless Area. This new record extends the known range approximately 198 km and is discussed in the context of the Pleistocene distribution of the Arctic Shrew.

Key Words: Arctic Shrew, *Sorex arcticus*, Driftless Area.

Sorex arcticus is a boreal species with large geographic and broad ecological ranges across Canada (van Zyll de Jong 1983). In the United States, the species reaches the southern limit of its distribution in Wisconsin and Minnesota (Hall 1981). Heaney and Birney (1975) reported it to be common in a grass-sedge meadow and at the edges of a marsh near what was thought to be that limit, Anoka County, Minnesota. Hazard (1982) depicted the known localities in Minnesota as extending south only as far as the Minnesota River and the Mississippi River east of its confluence with the Minnesota River.

We report finding a *S. arcticus* dead on a road in Beaver Creek Valley State Park, Houston Co., the most southeastern county in Minnesota, on 3 May 1980. The specimen was a parous female with seven embryos. The standard measurements (total, tail, hindfoot, and ear(n) lengths, in mm; weight, in g) were, respectively, about 105 (the rostrum was broken off cleanly), 39, 13.5, 7, and 8.8. Identification was made on the basis of cranial and mandibular characters, and the tricoloration typical of this species (Junge and Hoffmann 1981).

Beaver Creek Valley is narrow (about 650 m wide at the top) and deep cut (about 90 m maximum depth). The forest canopy was originally Boxelder (*Acer negundo*), Cottonwood (*Populus deltoides*), American Elm (*Ulmus americana*), maple (*Acer* spp.), Basswood (*Tilia americana*), and oaks (*Quercus* spp.), much of which persists today with an assemblage of at least eight plant species officially recognized by the state of Minnesota as endangered, threatened, or of special concern (K. Bolin, personal communication). Surrounding land is intensively and extensively cultivated. Attempts to secure additional specimens here and elsewhere in the area failed in 1990 and 1991, although the effort was hampered by flash floods and, presumably, Raccoons (*Procyon lotor*). Nor was *S. arcticus* secured on algific (cold air producing) talus slides elsewhere in southeastern Minnesota in 1984.

The historic and geographic patterns of this species in Minnesota are uncertain. First, it is possible that the species distribution is currently and historically continuous between the more northern localities (Hazard 1982) and the one in Houston Co., and that it is simply not documented in the hiatus of approximately 198 km. This is not likely considering extensive collecting in this region of the state. Secondly, the species may be expanding its range. Frey (1992) correlated the southward expansion of the range limits of four species of boreal small mammals with recent cool, mesic climatic

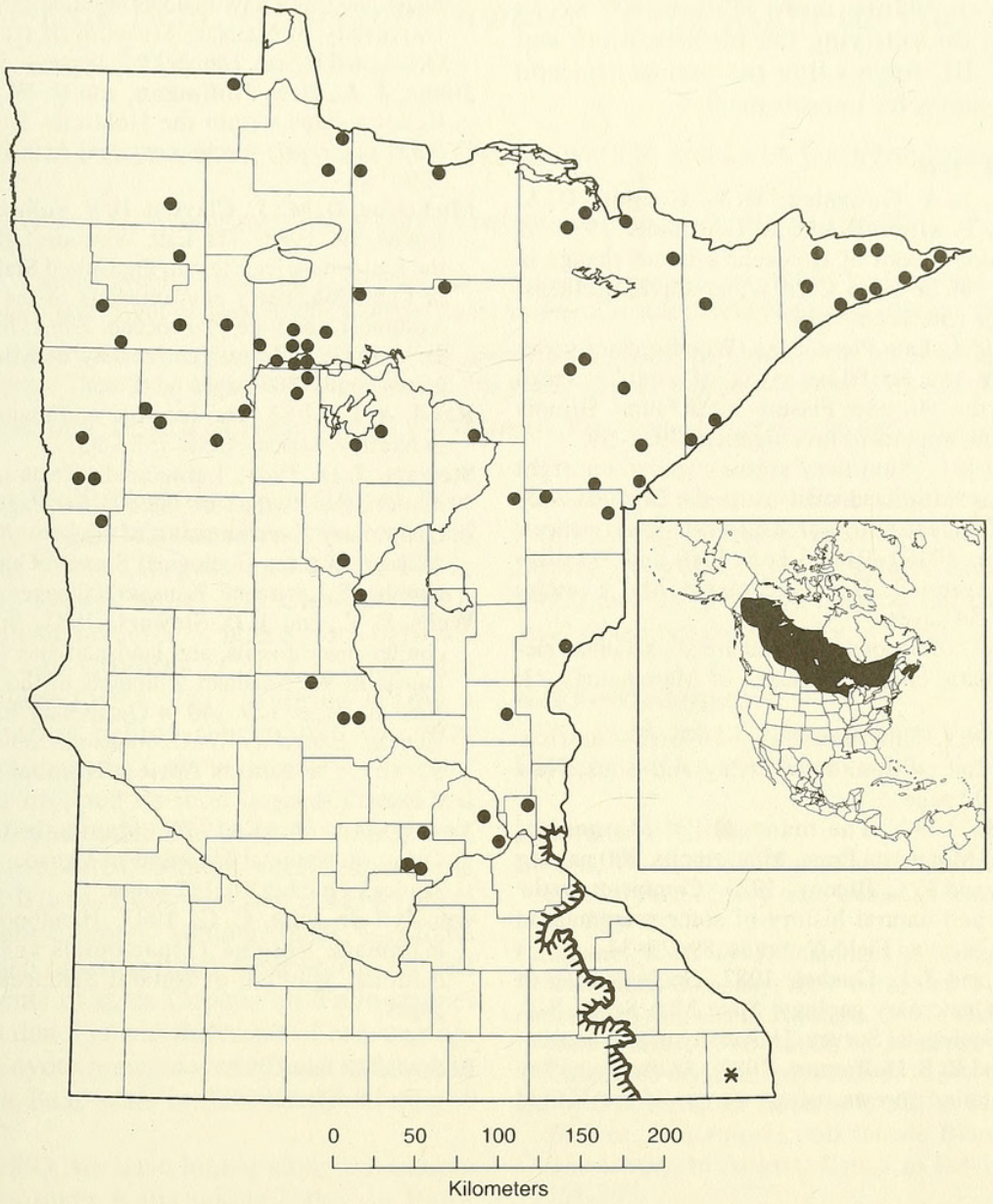

FIGURE 1. Range of *Sorex arcticus* [after Hall (1981)], extent of the Driftless Area in Minnesota [hachured line after Hobbs and Goebel (1982)], previous specimen localities in Minnesota [after Hazard (1982)], and new locality (*).

patterns. The southward range extension of *S. arcticus* reported here may be another example of this phenomenon. Lastly, the range of *S. arcticus* in Minnesota may be disjunct and the population in Houston Co. may be relictual. *Sorex arcticus* occurred on the Great Plains during the Pleistocene (Stewart 1987; Wells and Stewart 1987). Extreme southeastern Minnesota was part of the Driftless Area, which included contiguous parts of Wisconsin, Iowa, and Illinois and which is generally recognized as having been free of the late Wisconsin ice sheet (e.g., Mickelson et al. 1983). *Sorex arcticus* is documented from the late Pleistocene Driftless Area of Wisconsin (Foley 1984). This region is known for other relict species, including, for example, an assemblage of land snails (Frest 1991). It has been suggested (Rand 1954; Youngman 1975; Junge et al. 1983) that *S. arcticus* has expanded its range northward into Canada since glacial retreat. If so, one explanation of the relict population in southeastern Minnesota is that the range there may have been continuous with that of more northerly populations until the species disappeared from what is now the intervening hiatus during a Holocene warming period (Dorale et al. 1992).

This specimen is Science Museum of Minnesota (SMM) number Z82:1:10.

Acknowledgments

We thank the Minnesota Department of Parks and Recreation for a permit to trap in Beaver Creek Valley State Park, R. J. Oehlenschlager for help in

the attempt to secure more specimens, G. L. Kirkland, Jr., for verifying the identification, and O. Ç. Shane, III, for reading the manuscript and making suggestions for improvement.

Literature Cited

Dorale, J. A., L. A. Gonzalez, M. K. Reagan, D. A. Pickett, M. T. Murrell, and **R. G. Baker.** 1992. A high-resolution record of Holocene climate change in speleothem calcite from Cold Water Cave, northeast Iowa. Science 258: 1626–1630.

Foley, R. L. 1984. Late Pleistocene (Woodfordian) vertebrates from the Driftless Area of southwestern Wisconsin, the Moscow Fissure local fauna. Illinois State Museum, Reports of Investigations 39: 1–50.

Frest, T. J. 1991. Summary status reports on eight species of candidate land snails from the Driftless Area (Paleozoic Plateau), Upper Midwest. Final report, Contract No. 30181–01366 U.S. Fish and Wildlife Service, Region 3. Deixis Consultants, Seattle, Washington. 54 pages.

Frey, J. K. 1992. Response of a mammalian faunal element to climatic changes. Journal of Mammalogy 73: 43–50.

Hall, E. R. 1981. The mammals of North America. Volume 1. 2nd edition. John Wiley and Sons, New York. 600 + 90 pages.

Hazard, E. B. 1982. The mammals of Minnesota. University of Minnesota Press, Minneapolis. 280 pages.

Heaney, L. R., and **E. C. Birney.** 1975. Comments on the distribution and natural history of some mammals in Minnesota. Canadian Field-Naturalist 89: 29–34.

Hobbs, H. C., and **J. E. Goebel.** 1982. Geologic map of Minnesota, Quaternary geology. State Map Series S–1. Minnesota Geological Survey, University of Minnesota.

Junge, J. A., and **R. S. Hoffmann.** 1981. An annotated key to the long-tailed shrews (genus *Sorex)* of the United States and Canada, with notes on Middle American *Sorex.* University of Kansas, Museum of Natural History, Occasional Papers, Number 94. 48 pages.

Junge, J. A., R. S. Hoffmann, and **R. W. Debry.** 1983. Relationships within the Holarctic *Sorex arcticus – Sorex tundrensis* species complex. Acta Theriologica 28: 339–350.

Mickelson, D. M., L. Clayton, D. S. Fullerton, and **H. W. Borns, Jr.** 1983. The Late Wisconsin glacial record of the Laurentide ice sheet in the United States. Pages 3–37 *in* Late-Quaternary environments of the United States, Volume 1, the Late Pleistocene. *Edited by* H. E. Wright, Jr., and S.C. Porter. University of Minnesota Press, Minneapolis. 407 pages.

Rand, A. L. 1954. The Ice Age and mammal speciation in North America. Arctic 7: 31–35.

Stewart, J. D. 1987. Latitudinal effects in Wisconsinan mammalian faunas of the Plains. Pages 153–158 *in* Quaternary Environments of Kansas. *Edited by* W. C Johnson. Kansas Geological Survey, Guidebook Series, Number 5. Lawrence, Kansas. 208 pages.

Wells, P. V., and **J. D. Stewart.** 1987. Spruce charcoal, conifer macrofossils, and landsnail and small-vertebrate faunas in Wisconsinan sediments of the High Plains of Kansas. Pages 129–140 *in* Quaternary Environments of Kansas. *Edited by* W. C. Johnson. Kansas Geological Survey, Guidebook Series, Number 5. Lawrence, Kansas. 208 pages.

Youngman, P. M. 1975. Mammals of the Yukon Territory. National Museums of Canada, Publications in Zoology Number 10. 192 pages.

van Zyll de Jong, C. G. 1983. Handbook of Canadian mammals. Volume 1, marsupials and insectivores. National Museum of Natural Sciences, Ottawa. 210 pages.

Received 12 July 1993
Accepted 8 April 1994