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# Distribution of the Long-tailed Weasel (*Mustela frenata*) in Illinois

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## ABSTRACT

Knowing the geographic distribution of any species is an important first step toward understanding its ecology. Long-tailed weasels (*Mustela frenata*) are secretive and difficult to detect, so little is known about their distribution in Illinois. To fill this gap in the knowledge, we solicited information from museum curators about the sites where long-tailed weasel specimens were collected in Illinois and surveyed biologists and recreational trappers to document locations of where they had seen or captured long-tailed weasels. We present an updated map of long-tailed weasel distribution, documenting presence in at least 60 of the 102 counties in Illinois. Long-tailed weasels were seen or captured in a variety of habitats, including fields, forests, and forest edges. Most survey respondents considered long-tailed weasels to be relatively scarce. The information we have collected more than doubles the number of counties where long-tailed weasels are known to exist, and indicates that this small carnivore is widely distributed throughout the state.

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## INTRODUCTION

Knowing where a species can be found is one of the most basic steps in understanding its ecology. The geographic distributions of species have been used to better understand the biotic and abiotic factors that limit populations (Case and Taper, 2000), as well as to understand patterns and process of extinction (Lomolino and Channell, 1995). On a more practical level, researchers have overlaid distribution maps of multiple species to provide coarse maps of biological diversity (Scott et al., 1993). Finally, knowing the distribution of a species can simply allow biologists to focus their attempts to study it in areas where it is known to occur. However, information about the distribution of a species must often be gathered from a variety of sources.

Records obtained by museum collections, surveys, and personal interviews can be used to characterize the distribution of a species. Each method has its weaknesses, but when combined they can provide a more complete picture of a species' distribution. In some cases, collection locations are known for museum specimens. However, museum collections may hold few specimens of a given species and therefore do not provide an accurate representation of species distribution. Surveys have also been used by agencies and

researchers to determine the distributions of long-tailed weasels and other species (Proulx and Drescher, 1993; Groves, 1988). Surveys can provide more recent information about a large area without intensive effort, but response is not guaranteed and species identification may be questionable.

Weasel species in general are ecologically important yet difficult to study. In Scandinavia, weasels appear to drive population cycles of voles and lemmings (Hanski et al., 1991; 2001). In New Zealand, the introduced stoat (*Mustela erminea*) threatens native fauna populations, necessitating management to control stoat abundance (Murphy et al., 1998). Weasels in Europe and North America can be important nest predators affecting avian production (Dunn, 1977; Fleskes, 1988). However, little is currently known about the status and ecology of the long-tailed weasel (*M. frenata*) in North America as compared to other furbearer species and to weasels in other geographic areas (Sheffield and Thomas, 1997), probably due to their secretive nature and the lack of standardized methods for their detection and capture.

The distribution of the long-tailed weasel in Illinois was most recently described by Hoffmeister (1989), based on museum specimens and published records. He found records of long-tailed weasel occurrence in 27 Illinois counties, primarily in the northern half of the state with only a few specimens collected in southern counties. However, Hoffmeister (1989) based his assessment of long-tailed weasel distribution on a small sample size of specimen records, so the species may be more widely distributed than his distribution map would suggest. Our objective is to update the known distribution of long-tailed weasels in Illinois based on a larger sample of museum specimens as well as sightings and captures reported by biologists, trappers, and hunters.

## METHODS

We attempted to contact 182 mammal collection curators in the U. S. to compile records of long-tailed weasel specimens from Illinois. We searched the World Wide Web for online collections and requested additional information from collection curators when detailed information was not available online. We also searched for collections held by universities and state agencies. We contacted curators by telephone and email, requesting all available information concerning long-tailed weasels in their collections that originated in Illinois, with particular interest in the collection location. If a response was not received from a curator after 3 weeks, we sent out a second email or telephone call repeating the information request.

To most effectively gather information concerning sightings and captures of long-tailed weasels in Illinois, we developed surveys to be sent to recreational trappers and to biologists throughout the state. On 5 December 2003, we sent surveys to 117 trappers, who had participated in the 2002-2003 Illinois Department of Natural Resources trapper survey and reported having seen or captured a weasel (of any species) in the past 3 years (Miller et al., 2003), plus 3 hunters. On 3 September 2004, we sent surveys to 130 biologists working in Illinois at research universities, state and federal agencies, and non-governmental organizations. The survey asked if the recipient had seen or captured any long-tailed weasels within the past 5 years and, if so, to report the location and other information about the event (e.g., habitat type). Due to differences between observers,

length of observation time, and distance at which a sighting occurred, not all reports of weasel sightings are equally reliable. Therefore, participants were asked to report their confidence in the identity of their sighting. Those who reported having seen or captured a weasel were sent a follow-up letter and a map to more accurately mark the location of these events. Survey methods were approved by the Southern Illinois University Carbondale Human Subjects Committee.

## RESULTS

We contacted 126 curators, only 18 of which indicated that their collections contained long-tailed weasels originating from Illinois, totaling 181 long-tailed weasel specimens. We mapped 179 specimens taken from 44 of the 102 counties in Illinois (Figure 1A); the other 2 records were collected in central Illinois but the specific counties they came from were unknown. Of the 181 specimen records, 142 listed the sex of the specimen with 105 (74%) males and 37 (26%) females. Years in which weasels were collected ranged from 1864 to 2003. Of those specimens for which measurements were reported ( $n = 24$ ), 4 were female, 19 male, and 1 unknown. The average ( $\pm$  SD) total body length was  $363 \pm 45$  mm for males and  $284 \pm 13$  mm for females; average tail length for males was  $115 \pm 19$  mm for males and  $89 \pm 13$  mm for females; and average hind foot length was  $40 \pm 4$  mm for males and  $34 \pm 2$  for females.

Of the 121 surveys sent to trappers and hunters, 11 were returned undeliverable, and we received 37 responses (34% response rate). Respondents reported having trapped recreationally in 34 counties (Fig. 1B). Thirteen reported seeing or capturing  $\geq 1$  long-tailed weasel in the last 5 years, with a total of 32 sighting locations and 30 capture locations (Fig. 1B). Twenty-one of these locations were in counties where there was  $\geq 1$  record of a museum specimen. Of the trappers that reported weasel sightings, 16 were very confident, 3 were confident, and 1 was somewhat confident that what they saw was a long-tailed weasel.

Of the 127 surveys sent to biologists, 3 were returned undelivered and we received 52 responses (42% response rate). Twenty biologists reported either seeing or capturing  $\geq 1$  long-tailed weasel in the last 5 years, with a total of 33 weasel sightings and 7 captures (Figure 1C). Twenty-three of these locations were in counties where there was  $\geq 1$  record of a museum specimen. Of the biologists who reported weasel sightings, 11 were very confident, 4 confident, and 3 somewhat confident that what they saw was a long-tailed weasel. Two reported sightings in east-central Illinois could not be mapped, because the counties in which they were seen were uncertain.

Combining data from all museum specimen locations and capture/sighting locations from the surveys, long-tailed weasels were found in 60 of the 102 counties in Illinois (Figure 1D). These counties are fairly evenly dispersed throughout the state and are not clumped in any one portion of the state, although the number of reports of weasel occurrence in these counties varied from 1 to 49.

Of the trappers and biologists that reported seeing or capturing a long-tailed weasel, we received 69 descriptions of the type of habitat present at sighting or capture locations. Some participants described  $>1$  type of habitat, so our results sum to more than 69

responses. Twenty-four of the participants indicated that they saw or captured weasels near a permanent or intermittent water source such as a lake, stream, ditch or drainage. Thirty participants mentioned fields in their descriptions of habitat: 17 reported weasels in old fields, 1 in an agricultural field, and 12 were not specific as to the type of field. Fifteen participants described weasels using a habitat edge: 4 reported a forest/old field edge, 2 a forest/agricultural field edge, 5 a forest/old field/ agricultural field edge, and 4 were not specific about the type of edge. Ten participants saw or captured long-tailed weasels in forested areas, 6 in brushy or early successional forest areas, and 5 near human dwellings of development and 2 along fence rows.

## DISCUSSION

Species distribution maps for rare or secretive species are likely to be very sensitive to sample size. Our search for long-tailed weasel specimens resulted in 181 records, which exceeds the 48 examined by Hoffmeister (1989) and the 12 additional records he found in the literature. From the museum specimens for which we were able to find records, we documented weasel occurrence in all counties where Hoffmeister found records, plus 17 additional counties. Thus, an updated review of museum specimens alone increased the known number of counties with long-tailed weasels from 27 to 44.

It is difficult to accurately determine long-tailed weasel distribution based on surveys, but surveys indicate areas that should be investigated for weasel presence using other methods. This difficulty is because weasels are not distributed evenly in all habitats, population levels are not static (King, 1989), and survey recipients have varying ability to recall events and identify species. However, reports from trappers and biologists responding to the surveys were often supported by museum specimens collected in the same counties, adding to the credibility of their report. Many biologists and trappers keep very detailed records of trap sites used and capture information, which aids in recalling this information, and they have had more training in identifying these species than the general public.

The use of surveys to determine geographical distribution of a species could be improved by increasing the number of respondents. We surveyed a small sample of the recreational trappers in the state and received completed surveys from only one-third of this group, who trapped recreationally in only about one-third of the counties in Illinois. Within the 34 counties with trapping, there were reports of captures or sightings in 23. Weasel sighting information was obtained from trappers in reference to only 2 counties where trapping was not reported to occur. Therefore, the trappers we surveyed were only able to provide limited information on weasel occurrence in 36 of the 102 Illinois counties. By surveying a greater number of trappers, information could be obtained from recreational trappers in all 102 Illinois counties.

Although reports of long-tailed weasel occurrence are few, it is important to note that few recreational trappers target the long-tailed weasel (Richter, 2005), so low capture success is expected for this species. Also, because weasels have small home ranges compared to many furbearer species (Quick, 1944; 1951; DeVan, 1982; Gerhing and Swihart, 2004) they may not regularly cross roads where they would be more visible. Another reason weasels may rarely be seen is that they often hunt and rest in underground burrows and

dens (King, 1989). For these reasons it is not surprising that there were few reports of weasel sightings.

Previously, the long-tailed weasel was documented to occur primarily in the northern portion of Illinois (Hoffmeister, 1989). However, we compiled records of museum specimens and survey reports of captures and sightings from 60 of the 102 Illinois counties, strongly suggesting that the long-tailed weasel presently occurs statewide. Although weasels could have expanded into these areas in recent years, it is more likely that weasels previously existed in many of these areas without detection. Based on its historic range throughout the U.S., the long-tailed weasel occurs in states immediately surrounding southern Illinois such as Arkansas, Kentucky, Indiana, Missouri, and Tennessee (Hall, 1951; Simms, 1979; King, 1989). More recent studies also have documented weasels or weasel sign in Kentucky (DeVan, 1982), Indiana (Gehring and Swihart, 2003; 2004), east central Illinois (Rosenblatt et al., 1999) and central Illinois (Brawn et al., 2002), revealing long-tailed weasel presence near southern Illinois.

As habitat generalists, it is likely that long-tailed weasels occur in many areas throughout Illinois. Long-tailed weasels are reported to use a variety of habitat types (Fagerstone, 1987; Hoffmeister, 1989) as long as there is a nearby water source (Hall, 1951; King, 1989). Illinois offers a variety of suitable habitats. Much of Illinois is agrarian with fence rows and corridors for movement (Neely and Heister, 1987). There are also large tracts of deciduous forests such as the Shawnee National Forest (Neely and Heister, 1987), open woodlands, old fields such as lands put into the Conservation Reserve Program (Isik and Yang, 2004) and reclaimed coal strip mines, and some urban areas. Illinois also offers a varied prey base with voles (*Microtus* spp.) and mice (*Peromyscus* spp., *Ochrotomys nuttalli*, *Mus musculus*, and *Zapus hudsonius*) found throughout the state, as well as other species of suitable prey for the long-tailed weasel (Hoffmeister, 1989).

With effort, the long-tailed weasel will probably be detected in many of the remaining 43 counties in Illinois. Surveying for weasel presence could best be accomplished with effort concentrated at sites with high prey density near permanent water sources. Track tube surveys (King and Edgar, 1977; Murphy et al., 1998; 1999; Graham, 2002; Richter, 2005) or trapping (Gehring and Swihart, 2004; DeVan, 1982) would be the most useful techniques to determine weasel presence, with trapping providing the most positive form of identification. Information gained from these surveys would enhance existing knowledge of long-tailed weasel distribution. Information about sites where weasels are not present or abundance is relatively low is as important as information about areas where abundance is relatively high. With this knowledge, biologists can investigate habitat characteristics absent in those areas where weasels do not occur or abundance is low and attempt to improve them. This information would help to monitor future changes in this species' range and offer insight into what factors may cause this species to increase or decline.

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Figure 1. Distribution of long-tailed weasel records in Illinois. (A). Number of long-tailed weasels collected as museum specimens from each Illinois county, 1864-2003, with comparison to counties where Hoffmeister (1989) reported long-tailed weasel specimens collected. (B and C) Illinois counties where (B) trapper survey participants and (C) biologists reported sightings and captures of long-tailed weasels, 1999-2003. (D) Illinois counties where  $\geq 1$  long-tailed weasels were collected as museum specimens, or sighted or captured by a trapper or biologist.

