New Records for the Arctic Shrew, *Sorex arcticus* and the Newly Recognized Maritime Shrew, *Sorex maritimensis*

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We report the first record for the Arctic Shrew (*Sorex arcticus*) in the state of Montana, USA. We also report range extensions for the closely related Maritime Shrew (*Sorex maritimensis*) in New Brunswick and Nova Scotia, Canada. These collections augment our limited knowledge of the ranges and habitat associations of these rarely collected shrews, and highlight the need for a careful assessment of the status of *S. maritimensis* in Canada.

Key Words: Arctic Shrew, *Sorex arcticus*, Maritime Shrew, *Sorex maritimensis*, range, state record, Montana, New Brunswick, Nova Scotia, Quebec.

Approximately 38 species of shrews (genus *Sorex*) are currently recognized in North America (Hall 1981; Jones et al. 1986; George 1988; Wolsan and Hutterer 1998; Fumagalli et al. 1999). Most North American shrews belong to the subgenus *Otisorex*, which is primarily restricted to this continent. Until recently, the only two recognized members of the subgenus *Sorex* found in North America were the Tundra Shrew (*Sorex tundrensis*) and the Arctic Shrew (*Sorex arcticus)* (van Zyll de Jong 1983a), the latter species documented throughout much of the boreal forest region of North America. Recent molecular work, however, has supported the recognition of the Maritime Shrew (*Sorex maritimensis*, previously *S. arcticus maritimensis*) as a distinct species (Stewart et al. 2002). The range of the Maritime Shrew is limited to the eastern portion of New Brunswick and Nova Scotia.

Sorex arcticus and *S. maritimensis* are infrequently observed or collected. Both species exhibit a preference for grass-sedge meadows and wetland edges (Wrigley et al. 1979; van Zyll de Jong 1983b; Kirkland and Schmidt 1996). Although there are limited studies which include estimates of density (Buckner 1966), both species appear to exist at lower population densities than other common mammal species of the boreal region (e.g., Masked Shrew [*Sorex cinereus*] and Meadow Vole [*Microtus pennsylvanicus*]), although they may be locally common in appropriate habitat (Wrigley et al. 1979). *Sorex maritimensis*, because of its limited range and restriction to areas of grass-sedges, is considered rare (van Zyll de Jong 1983b). This may be a result of competitive exclusion by similar sized Smoky Shrews (*Sorex fumeus*) which exhibit a preference for less mesic, wooded habitats (van Zyll de Jong 1983a).

Herein we report the first record of *S. arcticus* in Montana and range extensions of *S. maritimensis* in New Brunswick and Nova Scotia, and provide additional data on habitat associations in these locations. We also report a collection of *S. arcticus* in Sept Iles, Quebec, one of only six records within the province (Peterson 1966; van Zyll de Jong 1983b). In the following sections, we detail trapping methods and results for each collection.

Methods

Montana, USA. Between 22 and 27 July 2001 we conducted small mammal baseline surveys on wet meadow habitats at Medicine Lake National Wildlife Refuge, Sheridan County, northeast Montana (48°30'N, 104°20'W; Figure 1). The refuge is located in the glacially influenced prairie pothole region, noted for its gentle rolling plains with occasional shallow depressions—host to vast wetlands and seasonally flooded meadows.

We set two 150 m transects, each with 10 trap stations set 15 m apart for five consecutive nights. Each station included three different Victor® snap-traps: one mouse trap, one museum special trap, and one rat trap (300 trap nights). Nearby pitfall traps consisted of two 5-m fences (aluminum flashing) with 5-L paint buckets (dry, not baited) at either end (40 trap nights; each night a bucket was open was considered a trap night). The transects were located in the Lake Creek flood plain, an area seasonally inundated with water during spring run-off and early summer rains (Stuart and Kantrud 1971). The plant community was herbaceous, dominated by sedges (*Carex* spp.), grasses (*Agropyron* spp. and *Spartina* spp.), and rushes (*Juncus*

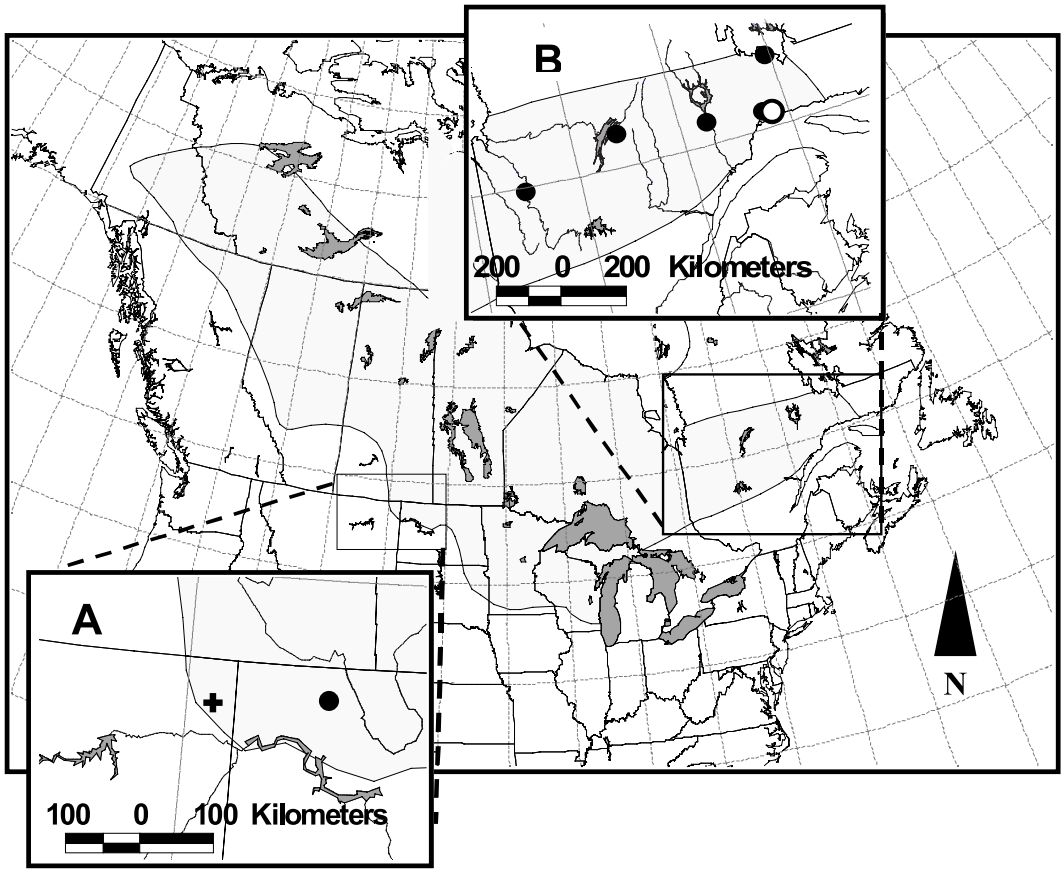

FIGURE 1. Suggested range for *Sorex arcticus.* Includes extensions presented herein and ranges suggested by Peterson (1966) and van Zyll de Jong (1983b). **Insets: A +** Indicates location of Montana *S. arcticus* collections, Medicine Lake National Wildlife Refuge. ● Indicates location of nearest known record, Lostwood National Wildlife Refuge, North Dakota. **B**. ○ Indicates the location of the Quebec *S. arcticus* collection, other points (●) indicate location of historical collections in Quebec.

spp.), with a variety of wetland forbs interspersed. Identical survey efforts were conducted in two additional habitat types on the refuge: native prairie and planted perennial grasslands. Total combined effort for all three habitat types was 900 snap trap nights and 120 pitfall nights.

Quebec, Canada. One hundred pitfall traps (800 trap nights) were set at each of two sites, 17-21 July 1990 (Figure 1). Sites were 8 km north and 8 km east of Sêpt Iles, Quebec (50°12'N, 66°23'W) in coniferous woodland near the edge of a marsh and in an old grassy field next to a road, respectively. The coniferous woodland/marsh was characterized by White Spruce (*Picea glauca*), Balsam Fir (*Abies balsamea*) and sedges (*Carex* spp.).

New Brunswick, Canada. A total of 175 non-baited pitfall traps (525 trap nights) were set 3 km southeast of St. George, near L'Etete, New Brunswick (45°8'N, 66°50'W), 3-7 August 1990 (Figure 2). Traps were set in thickets of predominantly alder (*Alnus* sp.) with some mixed conifer growth and some grasses. A small brook (0.5 m wide) transected the site, maintaining relatively moist soils.

Nova Scotia, Canada. [Method information is not available]

Results

Montana, USA. Six *S. arcticus,* the first confirmation of this species in Montana (Foresman 2001), were collected in wet meadows at Medicine Lake National Wildlife Refuge (Figure 1). The nearest known previous collection was at Lostwood National Wildlife Refuge, Burke and Mountrail counties, North Dakota, approximately 190 km to the east (R. Murphy, personal communication).

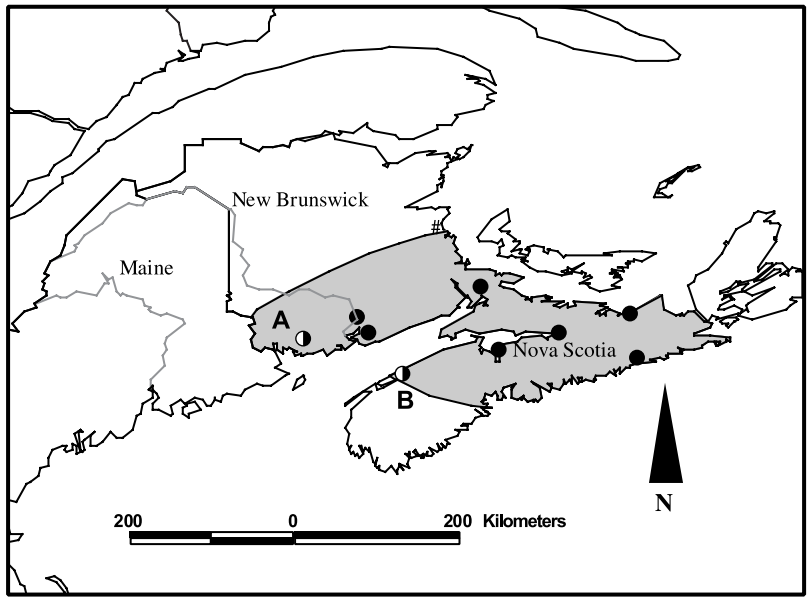

FIGURE 2. Suggested range of *Sorex maritimensis*, including collections described herein. **A** indicates the location of the St. George collection, New Brunswick. **B** indicates location of the Belle Isle collection, Nova Scotia. Historic locations, indicated by solid dots, were taken from van Zyll de Jong (1983b). We found no extralimital collections since that publication.

These specimens were captured using Victor® Museum Specials (n = 5) and Victor® rat traps (n = 1) baited with a mixture of peanut butter, oatmeal, flour, and black sunflower seeds. No *S. arcticus* were collected in either pitfall traps or smaller Victor® mousetraps. Although identical survey efforts were conducted in native prairie and planted perennial grasslands, *S. arcticus* were collected only in wet meadow habitats. Other species collected from wet meadow sites included: Meadow Vole (n = 19), Deer Mouse (*Peromyscus maniculatus*, n = 1), and Masked Shrew (n = 8).

All specimens were confirmed as *S. arcticus*; however, they were collected on the periphery of the *S. a. arcticus* and *S. a. laricorum* ranges, and identification to subspecies is difficult. These specimens are catalogued at the Philip L. Wright Zoological Museum at the University of Montana, Missoula (catalog numbers UMZM 18554 – 18559).

Quebec, Canada. Two Arctic Shrews (*S. a. arcticus*; Royal Ontario Museum [ROM] catalogue numbers 110254 and 110255) were collected by D.T.S. near Sept Iles, Quebec (50°12'N, 66°23'W), 17-21 July 1990 (Figure 1). This is the sixth reported collection of *S. arcticus* in this province (Peterson 1966; van Zyll de Jong 1983b). Both specimens were collected from the grassy site east of Sept Iles. Other species collected during this effort were Masked Shrew (n = 7), Pygmy Shrew (*Sorex hoyi*; n = 1), and Meadow Vole (n = 1).

This record is as far north along the immediate coast of the St. Lawrence River as *S. arcticus* have previously been reported. The last specimen in this general area, near Moisie River, just north of Sept Iles, was trapped in 1937 (van Zyll de Jong 1983b). Though little trapping has been conducted in this region, van Zyll de Jong (1983b) speculates that the species is distributed further north in Quebec and Labrador throughout the boreal forest, which includes extensive marshy habitats.

New Brunswick, Canada. Three Maritime Shrews (originally identified as *S. a. maritimensis*; ROM catalogue numbers 110314, 110315, 110331) were collected 3 km southeast of St. George, near L'Etete, New Brunswick (45°8'N, 66°50'W), 3-7 August 1990 (Figure 2). This collection extends the known range of *S. maritimensis* ca. 100 km south. Other species collected from this effort were Masked Shrew (n = 21) and Northern Short-tailed Shrew (*Blarina brevicauda*; n = 1).

Nova Scotia, Canada. On 4 October 1992, a single specimen of *Sorex maritimensis* (originally identified as *S. a. maritimensis*) was collected at Belle Isle, Nova Scotia (Tom Herman, personal communication). The specimen, collected in a marshy area dominated by the sedge *Scirpus cyperinus*, represents a provincial range extension of this species by ca.100 km (Figure 2).

Discussion

Sorex arcticus. The range of the Arctic Shrew is strongly associated with the boreal forest region of North America. Southward range expansions of four other boreal species, Masked Shrew, Meadow Vole, Meadow Jumping Mouse (*Zapus hudsonius*), and the Least Weasel (*Mustela nivalis*), have been correlated with contemporary cool, mesic climate patterns in the Great Plains region (Frey 1992). Jannett and Huber (1994) speculate that a recent southward extension of *S. arcticus* in Minnesota is associated with these cooling climate patterns. Indeed, this southwestward extension of *S. arcticus* into Montana could be correlated with this phenomenon.

Nevertheless, few small mammal surveys have been conducted in northeastern Montana (D. Flath, personal communication); it is possible this has prevented earlier detection in the state. Similar wet meadow habitat exists approximately 40 km to the south as the Big Muddy Creek feeds into the Missouri River. Thus, it is plausible that the range of *S. arcticus* extends further into Montana.

All Montana *S. arcticus* specimens were sexually inactive young-of-year. Clough (1963) observed that over-wintering *S. arcticus* captured between February and July were reproductively active. Also, the characteristic tri-colored pelage for adults of this species was indistinct in these specimens, further supporting our designation of these shrews as young-of-year, products of early season breeding by the previous year's cohort (Clough 1963; Baird et al. 1983). These specimens were collected in two groups of three, each group approximately 3 km apart and separated by a small perennial stream. Given their inactive reproductive status and that individuals from each group were collected no greater than 15 m apart, group members might have been litter-mates. As such, a viable population of *S. arcticus* likely exists at Medicine Lake National Wildlife Refuge.

Sorex maritimensis. The Maritime Shrew was previously considered restricted to the north and east of the St. John River system, with the nearest previous collection for this species near Saint John, New Brunswick (Peterson 1966; van Zyll de Jong 1983b). The collection of *S. maritimensis* near L'Etete, New Brunswick, brings this species within 30 km of the Maine border. Maine and New Brunswick are separated in this area by the St. Croix River which could be a barrier to shrew dispersal. There is suitable habitat for *S. maritimensis* on the U.S. side of the border and it is possible they will be found there; however, to date there is no record of *S. maritimensis* in Maine (J. Albright, R. Boone, and L. Master, personal communications). *S. maritimensis* is currently recognized as one of only four mammals endemic to Canada (the others are the Varying Lemmings *[Dicrostonyx hudsonius D. richardsoni*], the Gaspé Shrew [*Sorex gaspensis*], and the Vancouver Marmot [*Marmota vancouverensis*]).

The Nova Scotia and New Brunswick collections of the newly recognized *S. maritimensis* imply a greater range, extending inland and likely including the entirety of mainland Nova Scotia. Stewart et al. (2002) speculate that recent glacial encroachment (ca. 20 000 y) may have isolated this species on the coastal flood plain of Nova Scotia. These recent collections may either provide evidence that *S. maritimensis* is recolonizing former range, following the reestablishment of the boreal forest after the last ice age, or may reflect the paucity of efforts to collect *S. maritimensis* within suitable habitats in these provinces. These collections also support a hypothesis that this species is limited to moist grasslands and bogs associated with the boreal forest, competitively excluded from habitats occupied by the Smokey Shrew, a closely related woodland associate. This limited distribution and restriction to fragile wet meadow habitats suggests this species may warrant conservation concern.

These collections offer some data regarding the range and niche characteristics of these shrews. Given that *S. arcticus* and *S. maritimensis* have been the focus of very few research efforts, more research targeting specific life history traits are necessary to better understand the habitat associations and range restrictions of these shrew species.

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