THE EXPANDING DISTRIBUTION OF THE LEAST SHREW, CRYPTOTIS PARVA, IN SOUTH DAKOTA

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ABSTRACT

Westward range expansions of least shrew, Cryptotis parva, have been reported for New Mexico, Texas, Kansas, Nebraska, and Colorado. A westward range expansion is now reported for South Dakota with the first documentation of a northward range expansion. Prior to 1992, only two specimen records of C. parva were reported from South Dakota. One specimen was collected in 1932 near Okreek in Todd County by T. J. Turner (USNM #250199). The second specimen was collected near Cottonwood in Jackson County in 1954 by J. S. Findley. Since 1992, small mammal trapping in western South Dakota has extended the known range of the least shrew considerably north and west, into Dewey and Ziebach counties to the north and into Fall River County, near the Wyoming border, to the west. Other specimens have been taken from near Pierre in Hughes County and from Wind Cave National Park in Custer County. A lack of historical specimen records from elsewhere in South Dakota, particularly the lack of records from the Black Hills region, suggests that the species is colonizing habitat in a northward and westward direction.

INTRODUCTION

In the Northern Great Plains, C. parva, a short-tailed shrew, is easily identified, unlike the species of long-tailed shrews in the genus Sorex. Blarina brevicauda is the only other species of short-tailed shrew known to occur in South Dakota. C. parva is much smaller than B. brevicauda. B. brevicauda has lead-gray pelage while C. parva is brownish-gray with lighter underparts. In addition, Cryptotis has only 30 teeth (large incisors 1/1, unicuspids 4/2, large premolars 1/1, molars 3/3), whereas Sorex and Blarina have 32 teeth (large incisors 1/1, unicuspids 5/1, large premolars 1/1, molars 3/3). C. parva is the most widespread species in a genus of about twelve extant species (Choate, 1970). Most species of Cryptotis inhabit forests of tropical and subtropical Central and South America, but C. parva, the only species found north of Mexico, usually inhabits grasslands with average annual precipitation approaching or greater than 50 cm (Porter, 1978; Hafner and Shuster, 1996). Until 1992 C. parva was reported from only two locations in South Dakota, both in the south-central area of the state (Fig. 1). Small mammal trapping in grassland and riparian habitats of central and western South Dakota has resulted in specimen
records of *C. parva* north and west of the reported range (Fig. 2). At the same time, extensive trapping in eastern South Dakota has not detected *C. parva*.

**METHODS**

Small mammal trapping in western and central South Dakota has documented new range extensions of *C. parva*. A search of the literature, the South Dakota Natural Heritage Database, and personal communication with mammalists and wildlife biologists are combined in this paper to present the current distribution pattern of *C. parva* in South Dakota. Interpretation of the new distribution records is based on other research results and the fossil record of the late Pleistocene and Holocene. The author has deposited specimens from Hughes County, Ziebach County, Dewey County and Fall River County at University of Kansas Natural History Museum, KU155934, KU155933, KU155932, KU155931, KU155935, KU146018, KU146017, KU146016, KU155936.

**DISCUSSION**

Prior to 1992, only two specimen records of *C. parva* were known from South Dakota. One specimen was collected in 1932 near Okreek in Todd County by T. J. Turner (USNM #250199). The second specimen was collected near Cottonwood in Jackson County in 1954 by J. S. Findley (1956). Based on the lack of records, the species was thought to be rare in South Dakota and was one of the original rare species tracked by the South Dakota Natural Heritage Program (Houtcooper, et al., 1985).

Since 1992, small mammal trapping in western South Dakota has extended the known range of the least shrew considerably northward and westward. The author has collected specimens in Dewey and Ziebach counties to the
north and in Fall River County, near the Wyoming border, to the west. Many specimens have been taken from near Pierre in Hughes County (Backlund, 1995). One specimen was collected at Wind Cave National Park in Custer County in 1999 (Jeremy Duckwitz, personal communication). Eleven specimens of *C. parva* were taken in 2000 on R. E. (Ted) Turner’s Bad River Ranches in Stanley and Jones counties (Kevin Honness, personal communication). These are significant range extensions beyond the known historical distribution. Range expansions have been reported in Texas (Jones, 1993), New Mexico (Hoditschek et al., 1985), Nebraska (Benedict et al., 2000), Kansas, and Colorado (Choate and Reed, 1988). The new South Dakota records could be the result of a natural range expansion or range extensions that reflect increased trapping effort. While other researchers have suggested that irrigation increased available habitat for range expansion (Hafner and Shuster, 1996; Armstrong, 1972), none of the collection sites in South Dakota were affected by irrigation. Habitat at recent South Dakota collection sites ranged from dense riparian vegetation to dry prairie. One specimen in Ziebach County was taken in a dry woody draw. All of the specimens were taken from relatively undisturbed habitats.

Hafner and Shuster (1996) reported that one of three peripheral populations in eastern New Mexico represented a relic population from the late Wisconsinan, based on a unique allozymic complement and cranial morphology, while the other two populations were thought to be recent dispersals. Benedict et al. (2000) speculated that *C. parva* taken from the Pine Ridge area of northwestern Nebraska differed sufficiently from populations in eastern Nebraska to indicate vicariance but did not rule out recent dispersal. Harris (1985) speculated that bones of *Cryptotis* from the Little Boxelder Cave, in the foothills of the Laramie Mountains in southeastern Wyoming were from populations that spread west during the pluvial pre-Alithermal or, alternatively, that the bones could have come from populations of *Cryptotis* forced to higher elevations during the warmer and drier Alithermal.

The Black Hills function as refugia for many species, isolated from the more arid and warmer climate of the surrounding grasslands. Small mammal species such as *Clethrionomys gapperi*, *Microtus longicaudus*, and *Zapus hudsonius* persisted in the Black Hills during climatic extremes of the late Pleistocene and Holocene to the present (Turner, 1974). Jones et al. (1983) placed *Cryptotis parva* in the eastern faunal element. Other flightless, small
mammal species in the eastern faunal element include *Peromyscus leucopus* and *Synaptomys cooperi*. *Peromyscus leucopus* is extant in the Black Hills but *Synaptomys cooperi* appears to be extipated (Turner, 1974). *S. cooperi* remains have been recovered from the Beaver Creek Holocene site in Wind Cave National Park (Rachel Benton, personal communication). *S. cooperi* is a moist grassland species that is now sympatric with *C. parva* across a broad range in the east-central United States. A grassland species such as *C. parva* could have persisted during climatic extremes as a relic population in the Black Hills region, utilizing riparian areas and wet meadows around the periphery of the Black Hills. However, as with *S. cooperi*, there is no evidence that vicariance occurred in the Black Hills (Turner, 1974). The *Cryptotis* remains from Little Boxelder Cave, Converse County, Wyoming indicate a Holocene distribution (Harris, 1985) that would have included the Black Hills region (Figure 3). Both species were probably extirpated from this region during the Holocene, possibly during the Altithermal period.

Turner (1974) does not include *C. parva* as a species of unverified occurrence or as a species of uncertain status in the Black Hills region. Turner considered the least shrew to be completely absent from the area. Cinq-Mars et al. (1979) used approximately 144 pitfall traps in Jackson and Haakon counties during the summer of 1970. Although four specimens of the rare *Sorex nanus* were taken, no *C. parva* were detected. The 1990's collections in western South Dakota, including specimens from Wind Cave National Park, Fall River County, Hughes County, Ziebach County and Dewey County indicate the species is in fact expanding northward and westward.

The efforts of Cinq-Mars et al. (1979) and Turner (1974) indicate that *C. parva* has not been merely overlooked. However, the Jackson County specimen taken by Findley in 1954 is somewhat of an enigma. Findley's record was based on a specimen consisting of the rostrum and one mandible with the covering skin. Findley stated "To my knowledge this species has not been recorded in the Great Plains northwest of a line connecting Yuma County in northeastern Colorado with the area of the type locality in Washington County, Nebraska." Findley was not aware of the Todd County specimen collected by T. J. Turner in 1932.

Recent small mammal trapping in eastern South Dakota has not detected *C. parva*. There are no historical records. Skadsen conducted intensive pitfall trapping in Day and Marshall counties in 1997, catching more than one hundred shrews of the genus *Sorex*, including eighteen *Sorex hoyi*, a species once considered rare in South Dakota (Dennis Skadsen, personal communication). Mullican used pitfall traps in a variety of locations in eastern South Dakota, capturing many shrews, including *S. hoyi* (Mullican, 1993). King et al. (1999) trapped shrews in Union County in 1994 and 1995, also capturing *S. hoyi*. Pitfall traps were used at Ordway Prairie to capture shrews in 1983, including *S. hoyi* and the second state record for *Sorex arcticus* (Gruebele and Steuter, 1988). Rinker trapped small mammals for many years in the Vermillion area of southeastern South Dakota (George Rinker, personal communication). None of these sampling efforts detected *C. parva* in eastern South Dakota. Other small mammal sampling efforts are too numerous to list but are cited in Higgins et
al. (1999). The apparent absence of remnant populations in eastern South Dakota is further evidence that *C. parva* was not historically present. The species is expanding in the western South Dakota but is apparently unable to colonize favorable habitat in eastern South Dakota, possibly due to the barrier created by extensive conversion of upland grassland to agriculture. Loss of grassland habitat in eastern South Dakota may be a barrier to dispersal in that region of the state even though the higher annual precipitation in southeastern South Dakota indicates optimum habitat in remaining grasslands.

The Missouri River may act as a barrier. It is interesting that the only *C. parva* specimens collected from the eastern side of the Missouri River were taken near Pierre, near the Oahe Dam (Backlund, 1995). The dam may provide a dispersal route across the river allowing recent colonization of this area. More small mammal sampling is needed along the Missouri River to determine the actual distribution of *C. parva*.

Competitive exclusion due the presence of other shrew species, such as *Sorex haydeni*, *S. cinereus*, *S. boyi*, *S. arcticus*, and *B. brevicauda* may also be a factor limiting the distribution of *C. parva* in eastern South Dakota and the Black Hills. These five species are found in eastern South Dakota in varying abundance, becoming much less common to completely absent in most of western South Dakota. *B. brevicauda* and *S. baydeni* are widespread and often abundant in eastern South Dakota. In the Black Hills, *S. baydeni* is the dominant Soricid and appears to be the only Soricid present in most of the Black Hills. *Sorex merriami* (Mullican, 1994) and *Sorex nanus* are known from grasslands and scrub habitats of western South Dakota, but are rare and local. The drier western grasslands may be suitable habitat for *C. parva* but not optimal for *S. baydeni* or *B. brevicauda*, species that become more abundant to the east. Porter (1978) also speculated that competition with *Sorex* species may inhibit dispersal and colonization of *C. parva*.

The construction of thousands of small stock dams in western South Dakota could provide new habitat, free of Soricid competitors, for *C. parva*. These stock dams may provide "stepping stone" habitats for *C. parva* to advance westward and northward and refuge for survival in drier years. It is likely that range expansions occur during years of higher precipitation or warmer winters followed by retreats during less optimum years. Small populations become isolated in refugia until favorable conditions return. Such a pattern could result in periods of time when the species is very difficult to detect followed by periods of abundance and expansion.

**CONCLUSIONS**

I suggest that the South Dakota distribution of *Cryptotis parva* is expanding north and west. *C. parva* may be taking advantage of new habitat created by the construction of thousands of stock dams in western South Dakota. Expansion and colonization into eastern South Dakota may be limited on a landscape scale by the Missouri River, loss of grassland habitat, and the presence of Soricid competitors in the remaining suitable habitat. It is likely that a gen-
eral trend of increasing annual precipitation and and temperature is contributing to this expansion. Westward range expansions have been reported along the entire western periphery of the range of *C. parva*. This is the first report of a northward range expansion. I predict new state records for *C. parva* in eastern Wyoming and south-central North Dakota in the near future.

**LITERATURE CITED**


