PRIBILOF ISLAND SHREW

Sorex pribilofensis Merriam, 1895
(Soricidae)

Global rank G3 (12Mar1999)
State rank S3 (7May2006)
State rank reasons
Small range is confined to St. Paul Island; abundant and widely distributed, population presumably stable; no immediate threats to the species or to the majority of their habitat.

Taxonomy
Van Zyll de Jong (1982) questioned use of the name *hydrodromus* for this species; the type specimen for *hydrodromus* does not appear to conform morphologically to the samples of shrews from the Pribilofs. Rausch and Rausch (1997) determined that the correct name for the Pribilof Island shrew should be *S. pribilofensis* rather than *S. hydrodromus*. Jones et al. (1997) and Baker et al. (2003) adopted this change. Hutterer (in Wilson and Reeder 2005) used the name *Sorex pribilofensis*.

Demboski and Cook (2003) used DNA sequence data to examine phylogenetic relationships among 8 members of the *Sorex cinereus* group (*S. camtschatica*, *S. cinereus*, *S. haydeni*, *S. jacksoni*, *S. portenkoi*, *S. preblei*, *S. pribilofensis*, and *S. ugyunak*) and *S. longirostris*. Phylogenetic analyses recovered two major clades within the species group: a northern clade that includes the Beringian species (*S. camtschatica*, *S. jacksoni*, *S. portenkoi*, *S. pribilofensis*, and *S. ugyunak*), *S. haydeni*, and *S. preblei* and a southern clade that includes *S. cinereus* and *S. longirostris*. Mitochondrial DNA clades generally corresponded to previously identified morphological groups with two exceptions: inclusion of *S. longirostris* with *S. cinereus* in the southern clade and inclusion of *S. preblei* within the northern clade.

See George (1988) for an electrophoretic study of systematic relationships among *Sorex* species.

General description
Summer pelage has distinct tricolor pattern. A dark brown band extends from top of head down along back. This band sharply contrasts the lighter brown sides which are noticeably distinct from the grayish under parts. The tail is

bicolored: narrowly brown above and broadly white below. The feet are nearly white with a pinkish tinge. During winter the color of the lower parts and sides tend to be similar, giving the appearance of a more bicolor pattern. In both pelages the light color extends well up on the sides and contrasts sharply with the relatively dark dorsal band (Merriam 1895, Hall and Gilmore 1932, van Zyll de Jong 1976). Body length 63 mm (range 56-70); tail length 35 mm (32-37); hind foot 13 mm (12-14) (Hoffmann and Peterson 1967).
Length (mm) 63

Diagnostic characteristics
The only shrew on St. Paul Island. Jackson (1928) noted that compared with any species of the *Sorex cinereus* group, *S. pribilofensis* has a shorter tail, a more pronounced tricolor summer pelage, and a much reduced dark dorsal stripe in winter. Cranially, *S. pribilofensis* has a broader, shorter skull, with a heavier rostrum, broader palate and heavier dentition. Compared with members of the *S. arcticus* group, *S. pribilofensis* is smaller and paler in winter pelage. The skull is shorter and broader interorbitally, with a flatter, less angular cranium, and shorter rostrum. Detailed cranial measurement comparisons were presented by Hoffmann and Peterson (1967) and van Zyll de Jong (1982). See Carraway (1995) for a key to western North American soricids based primarily on dentaries.

Reproduction
The reproductive potential of this shrew is unknown. Other similar sized amphiberingian shrews produce litters of up to 10 young and may have two to three litters per year (van Zyll de Jong 1983).

Ecology
Primary predator in litter fauna; prey species for larger vertebrates. Potential predators include Arctic fox (*Alopex lagopus*), house cats (*Felis silvestris*) and avian species. Voles (*Clethrionomys rutilus albiventer* and *Microtus oeconomus innuitus*), ground squirrels (*Spermophilus parryii lyratus*), and lemmings (*Dicrostonyx groenlandicus exsul*) are likely to compete for food and space. Caribou (*Rangifer tarandus*), if allowed to increase to large numbers, could displace shrews from grazing habitat (West 1991).

Migration
Non-migratory.

Phenology
Circadian. Capture rate not affected by time of day or wind velocity, but more were caught in all habitats on warmer days and on days with no precipitation (Byrd and Norvell 1988).

Food
Invertivore. Eats insects, spiders, and occasionally nesting rodents. Like most shrews, this species is likely to be an opportunistic feeder (West 1991). Beetle remains have been found in the stomach contents of a few specimens (Byrd and Norvell 1988).

Habitat
Maritime tundra. On St. Paul Island, capture rates were highest in dune and grass-umbel habitats, lower in forb and mixed habitats, and none were captured in *Carex* or upland habitats. Most abundant in habitats with greater tall stems per unit area (Byrd and Norvell 1988, Byrd and Mendenhall 1986). Found at high densities within communities dominated by tall plants, particularly beach rye (*Elymus arenarius*), bluegrass (*Poa eminens*), wild celery (*Angelica lucida*), and sage (*Artemesia arctica*) (Byrd and Norvell 1993). Habitats used by *S. pribilofensis* covered over half the island's surface, and formed a coastal band, particularly extensive in the eastern and southern portions of the island (Byrd and Norvell 1993). The tall plant communities on St. Paul Island provide cover, in addition to a thick accumulation of dead plant material on the ground. The litter layer may provide an ideal microenvironment for the shrews, complete with beetles and spiders for foraging (Byrd and Norvell 1993).

Habitat stability: Recent development of the POSS base to support oil and gas exploration activities in the Navarin Basin may expand in the near future. Most of this activity is expected to be concentrated around the airport and development corridor. This area contains approximately 8% of the preferred shrew habitat on the island (Braund 1986, Byrd and Norvell 1988).

Global and state range
The known geographic range is confined to St. Paul Island (90 sq km), Pribilof Islands, Alaska. It is distributed primarily along the periphery of the island. Plant associations supporting shrews in summer occupied nearly 40 sq km in the late 1980s (Byrd and Norvell 1993). Type locality was reported as "Unalaska Islands, Aleutian Islands." However, attempts to collect shrews from the type locality have not been successful. Presumably the shrews, to which the name *Hydrodromus* has been applied, were collected on St. Paul Island of the Pribilof Islands. No shrews have been collected on neighboring St. George and Otter islands, despite numerous surveys (Preble and McAtee 1923, Byrd and Norvell 1988, 1993).

Global and state abundance
Abundance unknown, but total population size is probably more than 10,000 individuals. Jackson (1928) described the Pribilof shrew as "not common" in 1928. Fay and Sease (1985) found them to be abundant in 1965. The highest capture rate was recorded at Zapadni Reef (Byrd and Mendenhall 1986). Byrd and Norvell (1988, 1993) reported capture rates of 0.9 to 4.5 shrews/1000 trap hours over an area of approximately 39 sq km, no estimates of density were provided; they indicated that abundance was highest in the eastern and southern portions of the island. Similar trap efforts for *Sorex cinereus*, a closely related species with similar habitat requirements, resulted in density estimates of 2 to 30 shrews per acre depending on the period of the cycle when captured (Buckner 1966). Using the lower estimate of two shrews per acre and extrapolating over the 39 sq km of suitable habitat gives a very rough minimum total population estimate of 19,266 animals on the island.

Global and state trend
Trend is unknown but suspected to be stable. The population is presumed to be at undisturbed levels, although it may fluctuate substantially

(West 1991, ADFG 2005). The shrews have been known to occur on the island for over 200 years (Fay and Sease 1985). The population is believed to have existed on St. Paul since the area became an island, approximately 16,000 years ago (Hoffmann and Peterson 1967, Hopkins 1967).

Global and state protection

No specific protection measures are in place. Approximately 10% of preferred shrew habitat is on U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) land, where the species is potentially protected by use permit restrictions. Other general protection is provided by land use development restrictions identified in the St. Paul Coastal Management Plan (Kirkwood and Associates1987). Alaska Department of Fish and Game (ADFG) regulations regarding the taking of shrews as "unclassified game" requires a hunting license, but there is no closed season or bag limit.

Global and state threats

The distribution of *S. pribilofensis* is naturally restricted and the population is small; therefore this species is vulnerable to localized perturbations. Habitat is largely intact, but human activities and climatic warming are of potential concern (ADFG 2005). Although the effects of climate change on this species' habitat are unknown, these shrews are a relict, cold-adapted species that could be compromised by a warmer climate. Byrd and Norvell (1993) found the shrews to be distributed widely at relatively high densities, and they identified no immediate threats to the species or to most of their habitat. Little habitat fragmentation has occurred. Of St. Paul Island's 10,093 hectares, only 2 to 3% has been developed. This includes the village of St. Paul, a fish processing plant, the Coast Guard Loran station, an airport, the POSS Helicopter camp (Pribilof Offshore Support Service) and a new seaport (Braund 1986). There are approximately 35 miles of roads which section the island into several large parcels. These facilities do not appear to have caused significant fragmentation of the shrew habitat to date (Byrd and Norvell 1988). There is additional possible threat from habitat loss to new development and overgrazing by caribou, and population declines if rats are accidentally introduced to the island.

Reindeer grazing: In the past, introduced caribou have over-extended their carrying capacity on St. Paul Island and greatly impacted the vegetation and shrew habitat (Fay and Sease 1985). The herd is now maintained at approximately 500 animals.

Rat introductions: With recent completion of the new seaport, increased shipping traffic is expected and the probability of Norway rat introductions will increase. The ecological consequences of this possibility are not well known. Rats introduced to different Aleutian Islands have spread across entire islands, invading most habitats (Brechbill 1977). They are believed to function as significant predators of birds and other wildlife on these islands (Schiller 1952, Kenyon 1961, Amundsen 1974). Byrd and Norvell (1988) predicted that predation on the shrews would increase if rats were introduced to St. Paul Island; rats could also introduce diseases that may be detrimental to the shrews, though this possibility has not been documented. Poisoned bait intended for rats could be deleterious for shrews (ADFG 2005).

Global and state research needs

Present research needs include: continued assessment of habitat preferences and requirements, measurement of reproductive capacity, estimation of feral cat and arctic fox predation levels, investigation of other causes of mortality, and long-term population viability analysis. Additional research needs include an evaluation of interspecific interactions, and collection and archival of material for genetic analyses (ADFG 2005).

Global and state inventory needs

The distribution of shrews on St. Paul is fairly well known and occurrences can be reasonably predicted throughout the range (Byrd and Mendenhall 1986, Byrd and Norvell 1988). Additional surveys are needed on Otter Island where the presence of preferred plant communities suggests the shrew might occur (Byrd and Norvell 1988). Surveys should be conducted on Unalaska Island to determine if *Sorex hydrodromus* actually exists and, if so, to reevaluate its taxonomic relationship to *S. pribilofensis*.

Population densities for many other small mammals are cyclical and/or eruptive; the extent of habitat used is greater when population densities are high, therefore, short-term estimations of density and extent of habitat use are not effective. Long-term monitoring at index

locations is needed to accurately estimate population size and identify trends (ADFG 2005).

Global and state conservation and management needs

Identify and conserve sufficient preferred habitat to insure maintenance of a viable population, minimize feral cat population, manage caribou herds to prevent overgrazing of shrew habitat, and prevent introduction of rats onto the island.

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