Mink
Mustela vison

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DESCRIPTION

Taxonomy and basic description

The American mink, *Mustela vison* was first described by Schreber in 1777. Mink are classified in the order Carnivora, family Mustelidae, and further categorized into the subfamily Mustelinae.

The mink is characteristic of other members of the weasel family with its short legs and long cylindrical body. Body mass ranges from 0.55-1.25 kg (1.2-2.75 lbs.) with an overall length of 470-700 mm (18.5-27.5 in.). Males are approximately 10% larger than females. Pelage is typically dark brown with white markings on the throat, chest, and belly. The tip of the tail is markedly darker than the rest of the body (Jackson 1961).

Mink have two anal glands that produce a strong odor. When stressed, mink can release secretions from these glands, potentially as a defense mechanism (Brinck et al. 1978). Feces are usually deposited in prominent places as territorial markers.

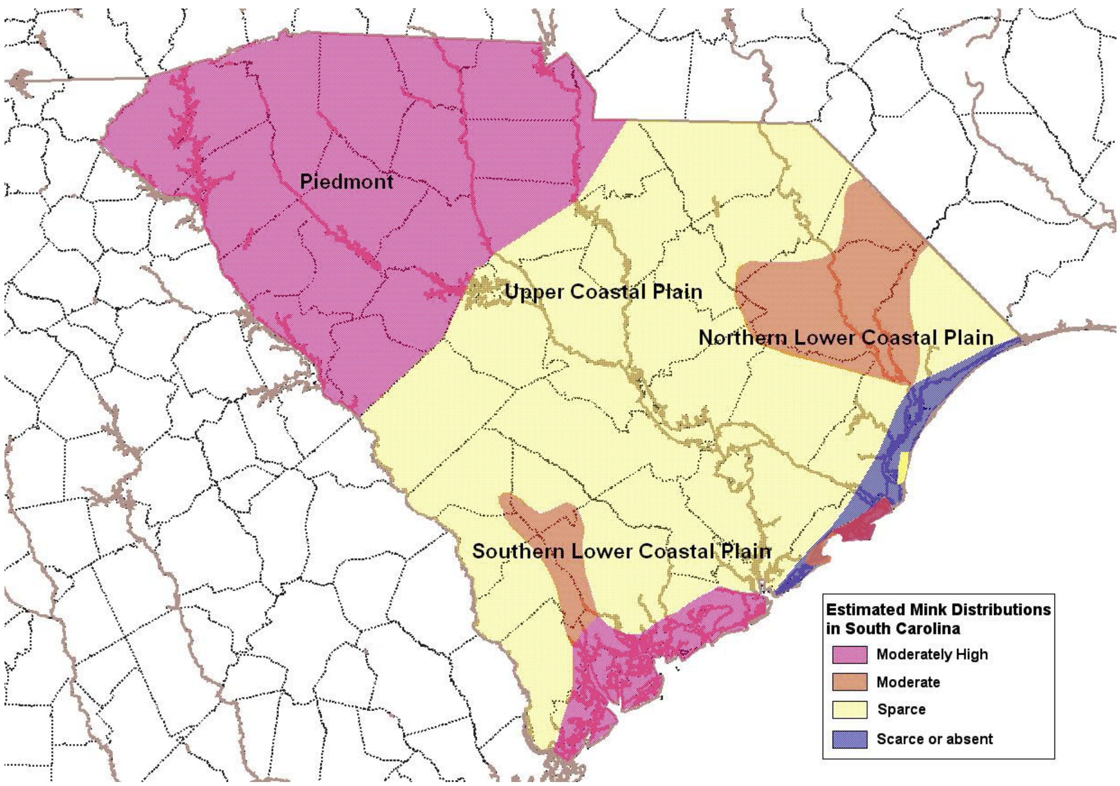
Mink are polygamous, and thus courtship and mating in mink can often be aggressive. Mating usually occurs from January through March, and because of delayed implantation, the gestation period ranges from 40-75 days. Birth of the young occurs 30 days after implantation. Young are typically born from April to June. Weaning occurs at 8-9 weeks, though the young may remain with the female as a family group until fall.

Status

Although no official status has been given to the mink, South Carolina’s population is considered to be in decline statewide. The global status is listed as secure (G5) (NatureServe 2013).

POPULATION SIZE AND DISTRIBUTION

The mink’s range extends throughout Canada and much of the United States except the southwest and a great deal of the northwest. Historically, mink occurred throughout South Carolina. Mink occur in varying densities; the Piedmont region and southern coastal marsh areas have had relatively abundant populations while much of the Upper and Lower Coastal Plain regions have sparse densities, with moderately higher concentrations in the Lynches/Pee Dee and Salkahatchie/Combahee River corridors. Mink are scarce or absent in the northern coastal marshes. Recent survey data, however, indicates mink are essentially absent in the northern coastal marshes where population restoration by SCDNR has not taken place, and possibly declining throughout the remainder of the State (Baker 1999). Annual commercial fur harvest data indicated a 38-year average harvest of 86 animals per year by commercial trappers and hunters. However, this average does not adequately reveal the decline in harvest data over the last few years. From the 1974-75 season to 1988-89, the average mink harvest was 197. Since the 1989-1990 fur harvest season, the average take was only 14 mink (SCDNR 2004 unpublished data).



Map by Jay Butfiloski, SCDNR; modified from Baker 1999.

A considerable amount of anecdotal information has been received from older trappers have reported declining mink numbers. Numerous experienced mink trappers have noted that the species is rare or absent from areas of former abundance, although the habitat is seemingly intact. One trapper from Lancaster County reported that he had not caught a mink in over 20 years from a trap line that once produced as many as 30 mink per year. Furbearer biologists from the Georgia Department of Natural Resources and the North Carolina Wildlife Resources Commission reported similar comments from trappers about declines in mink numbers in their states (Greg Waters, GADNR; Perry Sumner, NCWRC, pers. comm.).

In a mail survey of South Carolina sportsmen who caught mink during the 1987-88 trapping season, over 40% of the respondents perceived the mink population to be declining (SC Wildlife and Marine Resources Department, unpublished data).

HABITAT / NATURAL COMMUNITY REQUIREMENTS

Mink are typically associated with habitats that have some type of water component. These areas include swamps, rivers, streams, ponds, and saltwater marshes. Mink typically live in dens located in rock piles, under tree roots, bridge crossings, and stream bank holes. Mink in saltwater marsh habitat may rarely utilize dens because of tidal fluctuations. Instead, young are often birthed on tide rack rafts.

Mink are carnivorous and their diet often reflects prey availability, opportunity, and location. Statewide, fish may make up 40% of the mink's diet. However, mink will also consume small rodents, rabbits, muskrats, squirrels, crabs, crayfish, insects, snails, frogs, snakes, and waterfowl (Baker 1999).

CHALLENGES

A. Habitat Degradation

Because of the lack of historic data on habitat conditions in South Carolina, it is difficult to evaluate quantitatively how mink habitat has changed over time. While the integrity of some streams has clearly been altered, others appear reasonably pristine. There has been no attempt thus far to correlate mink densities with habitat alteration. Future studies should compare mink densities with existing habitat suitability index models.

While habitat alterations may be a contributing factor in South Carolina mink population declines, it is doubtful that habitat conditions alone are responsible. Elsewhere throughout the mink's range, the species is reported to be adaptable in its use of habitats, tolerating both human activity and habitat changes (Allen 1984). Additionally, some of the areas in South Carolina where mink have declined are in stream drainages, which appear to be intact.

B. Environmental Contaminants

Environmental pollution has long been recognized as a biological hazard to wildlife and to man. Industrial pollutants, pesticides, and heavy metals are known to exhibit biomagnification as they pass up the food chain. The mink occupies a niche at or near the top of the food chain and would therefore be especially vulnerable to these environmental contaminants. Mink population declines in other regions of North America, most notably in the Great Lakes Region, have been associated with environmental contaminants. Numerous studies have demonstrated the mink's high level of sensitivity to pollutants, particularly organic mercury compounds (Aulerich et al. 1974; Woberser et al. 1976) and polychlorinated biphenyl (PCBs) (Platonow and Karastad 1973; O'Shea et al. 1981).

In 1987 the Furbearer Project initiated studies to evaluate contaminant levels in trapper - harvested mink carcasses from South Carolina (Carmichael and Baker 1989). The University of Georgia Riverbend Research Center performed chemical analyses under contract. Mink samples were screened for a total of 21 chlorinated hydrocarbon pesticides plus PCBs. Tests for 10 heavy metals were also conducted.

Residues of DDE, PCBs and mercury were detected in mink tissue samples from South Carolina. Residue levels were generally lower than those reported for other wild mustelid populations and did not approach levels published for mink that suffered mortality in laboratory studies. However, the effect of low levels of these contaminants on reproduction and survivability in wild mink is still questionable. Ringer (1981) stated that reproduction in mink would normally not be impaired by chlorinated hydrocarbon pesticides such as DDT at levels typically encountered in the environment. However, small doses of PCBs and mercury, singly or in combination, are of concern. Fish in most rivers and lakes throughout the country are now contaminated with PCBs (Jacknow et al. 1986), and dietary levels as low as 0.64 ppm have been shown to seriously impair reproduction (Platonow and Karstad 1973). In our studies, 43% of the mink sampled had detectible residues of PCBs with a mean level of 0.56 ppm. Likewise, mercury is widespread in the environment due to man’s activities as well as natural processes, and 1 ppm mercury in the mink diet for as little as 2 months is known to be lethal (Kirk 1971). Smaller doses would likely have sublethal effects on reproduction and behavior.

Health advisories posted by the South Carolina Department of Health and Environmental Control in January of 1995 indicated that mercury contamination of fish in 18 rivers and 9 lakes in South Carolina were high enough to prompt warnings about human consumption of fish. The advisory covered all of the stream drainages of the Coastal Plain and reported mercury levels in many drainages which are above the levels known to be lethal to mink. Mercury levels for some fish species in the Black River and Pee Dee River were nearly 3 times higher than known lethal dietary levels for mink.

While the mean levels of mercury detected in mink from the Piedmont Ecoregion of South Carolina (0.53 ppm) were below levels expected to cause direct mortality, a small sample of Coastal Plain mink (n = 3) exhibited levels considered to be greater than normal background levels (mean = 6.01 ppm).

The current Environmental Protection Agency (EPA) limit for fish deemed safe to consume by humans is 2 ppm for PCBs and 1 ppm for mercury. Wild mink eating fish containing PCBs or mercury at these levels, or even less, are at risk. The situation becomes very complex when synergistic or combined effects of environmental contaminants are considered. Lab studies with mink have shown reduced survival in kits born to mink that received both PCBs and mercury simultaneously (Wren et al. 1987). Over 40% of mink sampled in South Carolina contained residues of both PCBs and mercury. If other conditions such as food shortages, extreme climatic conditions such as cold weather or drought, or parasite burdens are added, tolerance levels for these contaminants may be very low for a species like the mink (Wren et al. 1986; Wren et al. 1987).

In 1990 the Furbearer Project continued its investigations into the impact of environmental toxicants on mink by expanding the sample in the Coastal Plain (Osowski et al. 1995). This study was expanded further to include samples from Georgia and North Carolina because of similar concerns of mink population declines by the wildlife agencies in those states. The Clemson University Institute of Wildlife and Environmental Toxicology conducted chemical analyses for the tri-state study.

Of the organochlorine pesticides tested, only dieldrin was detected at significantly higher levels in South Carolina’s Coastal Plain than in the Piedmont. Liver PCB concentrations were also found to be significantly higher than the Piedmont reference group, and many samples were higher than those known to cause mink reproductive dysfunctions.

This study also revealed mercury concentrations from mink kidney tissue to be elevated in the Georgia, North Carolina, and South Carolina Coastal Plain compared to the Piedmont reference. The concentrations detected were high enough, according to Wren et al. (1986), to cause sub-lethal effects on most physiological functions, including reproduction, growth, and behavior. Of the 3 states, South Carolina had the highest mean level of detectable mercury (3.51 ppm).

CONSERVATION ACCOMPLISHMENTS

The Furbearer Project spent a number of years determining the status of mink populations in South Carolina and the causes of their decline. Our research revealed that one of the areas where mink populations had been lost entirely was the tidal marshes from Charleston Harbor north to the SC/NC line. Beginning in 1999, the Furbearer project initiated restoration efforts with South Carolina's coastal mink population. Fortunately, mink remain abundant in the marshes along our state's southern coast. The marshes in the North Edisto River, the ACE Basin, and in the vicinity of Hilton Head Island have served as mink population sources for our capture efforts. Our first restoration effort in the Cape Romain NWR in 1999 and 2000 was hugely successful, thanks in part to the hard work of then Clemson graduate student Jason Peeples and to Dr. Tim Fendley of Clemson University. Based upon the success of our first effort, we moved up the coast with our mink restoration project.

2002 Restoration

In 2002, our goal was to complete a stocking of mink at North Inlet in Georgetown County. Thanks to many of our cooperators, our trapping efficiency was so good in 2002 that we were able to complete stocking efforts in North Inlet and move on to our next target area which was Murrells Inlet. All totaled, we stocked 17 adults and 35 kits in North Inlet and 25 adults in Murrells Inlet.

Population Indexing

In 2002 we were also able to test a new mink indexing technique for measuring marsh mink populations. The work was conducted by Lisa Vandiver who was working with us on a work study contract with the College of Charleston. The Kiawah Island Natural

Habitat Conservancy provided funding for the studies. We are very grateful to Barbara Winslow of Kiawah Island for getting the project off of the ground and for her willingness to get her hands dirty with marsh mud throughout the project. Lisa's research focused on the testing of a floating track board design. Overall visitation rates by mink were 42%, revealing this technique to have great value as a population monitoring device. Our current technique of monitoring marsh mink involves spotlight flood tide surveys. The shortcoming of the flood tide surveys is that we are limited to employing this technique to several days per season. Additionally, these are the same days (during flood tides) that we need to be trapping mink. The track board technique could allow us greater latitude in population monitoring. No flood tide surveys are currently being done.

Population Health Check
We were fortunate to have the cooperation of the Southeastern Cooperative Wildlife Disease Study in performing a population health check on mink from the ACE Basin. A final report is forthcoming, but preliminary reports reveal some surprising virus antibodies.

Toxicology
Because earlier research suggested that the decline in mink populations from South Carolina's northern coastal region was related to environmental contaminants, we wanted to determine if similar problems exist in mink populations of the southern coastal areas. SCDNR partnered with the Clemson University Department of Environmental Toxicology to answer this question. While this research did reveal concentrations of mercury, organochlorine pesticides, PCBs, dioxins, and furans in tissues of mink at levels that may have some adverse effect on individual animals, the overall levels were not considered to be high enough to have adverse effects on the mink population.

Age Structure
Age structure work on ACE Basin mink suggests good survival rates and good recruitment rates within this population.

Food Habits
The Furbearer Project was able to enlist the assistance of Marine Division scientist David Knott to conduct food habits studies of mink in the ACE Basin. We utilized David's expertise to identify marine organisms in mink scats and stomach contents collected throughout other studies. This data allows us to evaluate prey abundance in prospective restoration sites to test for environmental contaminant uptake in prey without sacrificing mink. It also allows us to better explain mink population fluctuations, which may be tied to changes in food availability. Results of the studies revealed that mink are very opportunistic. Some general observations of the common food items in their diet include; small fish, blue crabs, fiddler crabs, insects, mud minnows, marsh hens, and marsh rice rats.

2002 Restoration Evaluation
During the May flood tides in 2003, we conducted follow-up surveys in North Inlet and in Murrells Inlet to evaluate the success of the 2002 stockings. Our observations in North

Inlet were very encouraging. In the course of a 2-hour flood tide we counted 5 adult mink. Three of these were females with young. For mink to survive the stress of relocation and still be fit enough to reproduce the first year indicates good environmental conditions. Results from the Murrells Inlet surveys were disappointing. We conducted 2 evening surveys without spotting any mink. Conditions were less than ideal, as the survey crew made it into the marsh late on the first night and it rained on the second night. While we failed to document survival of the released mink, two incomplete surveys are not sufficient to demonstrate absence of mink. A mink sighting report from staff from Huntington Beach State Park in the Summer of 2004 does give some encouragement that the released mink may still be present in the area.

2003 Restoration
Pre-release surveys in the vicinity of Dewees and Capers Islands support our belief that mink are absent in that area. This area of marsh was enrolled as our next restoration site. Assisting us with the logistics of that release were Arla Jessen, Environmental Education Coordinator at Dewees Island, and SCDNR Law Enforcement officers from District 9.

2004 Restoration
A total of 12 mink (females with young) were released into the marshes of Dewees Island during the June flood tides. One of the adult females was predated by a marsh hawk which was witnessed by staff. The remaining young were taken to a rehabilitator, and one survived and was released later that year. We also plan to supplement the number of released animals in the future at Murrells Inlet unless surveys indicate that it is not warranted.

2008 - 2009 Survey Work
Clemson Graduate Student Michael Waller worked to implement track board surveys in an effort to reduce survey manpower. However, many of the same issues that plagued track board work previously—such as tidal fluctuations and other environmental factors—again hampered track board implementation. Thus, emphasis was placed on perfecting spotlight survey work in an effort to evaluate which environmental factors were most significant in surveying mink. Waller's work determined that tide heights 6.05' above Mean Lower Low Water (MLLW) level as measured at the Charleston station and adjusted for local areas was the best predictor for when to use spotlight surveys (Waller 2010).

2010-2011 Mink Impacts and Ecology Study
As the reintroduced mink into Cape Romain National Wildlife Refuge (CRNWR) began to thrive, concerns from staff at the refuge centered on the impacts mink may be having on nesting shorebirds. Clemson Graduate Student Caroline Gorga began looking at that potential impact (Gorga 2012). Refuge staff have implemented a mink removal program along Cape Island in conjunction with other predator removal prior to nesting seasons. Diet analysis from mink taken from the CRNWR in an effort to increase shorebird nesting success found that out of 45 mink stomachs collected, 7.4 % contained avian material of unknown species. A bioenergetics model developed from this estimated that an individual mink consumed 8.5 avian prey items per month based on the sampled diet. Unfortunately mink are being blamed for much of the lack of nesting success of several

species of nesting shorebirds for which only anecdotal or isolated data exists. Previous studies in the area have shown that habitat loss from erosion and overwash from tides and boat wakes to be significant factors in loss of coastal nesting birds (Thibault 2008, Brooks 2011). Because the natural loss of habitat and overwash is not controllable, predator control remains one of the management strategies of the refuge. In fact, the CRNWR Comprehensive Conservation Plan states one of the goals is to "remove mink from the refuge" (USFWS 2010).

CONSERVATION RECOMMENDATIONS

- The protection of river corridors, streams, and marsh habitat are necessary for reestablishment of mink populations. Any efforts to improve water quality attributes would benefit mink. Large-scale conservation easements and focus areas such as those in the ACE Basin area, as well as outright purchases of important riparian properties, should benefit mink populations. Such areas would need to be identified and prioritized.

- Continued monitoring through the use of flood tide surveys are needed to assess the success of reintroduction projects in the northern coastal marshes of South Carolina.

- Further research will be needed to fully support the contention that environmental contaminants are associated with the decline in mink populations in South Carolina. From the results of the studies conducted thus far, the list of suspected contaminants can be narrowed to mercury, PCBs, DDE, and dieldrin, with the greatest level of concern assigned to mercury.

- Assess the impacts of predation on nesting shorebirds. Find strategies to limit mink predation where necessary, yet discourage prophylactic trapping and shooting of mink where it isn’t warranted.

- Surveys should be run in the northern coastal marshes to assess the ability of mink to persist in reintroduced areas.

MEASURES OF SUCCESS

A definitive determination of what has caused mink declines in the State would be considered a measure of success with the ultimate goal being to correct the problem(s) and bring mink levels back up to the 1970s or 1980s population count.

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