Saimaa Seal
(Phoca hispida saimensis)

5-Year Review:
Summary and Evaluation
January 2018

National Marine Fisheries Service
Office of Protected Resources
Silver Spring, Maryland

5-YEAR REVIEW

Species reviewed: Saimaa seal (*Phoca hispida saimensis*)

5-YEAR REVIEW
Saimaa Seal/*Phoca hispida saimensis*

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional or Headquarters Office:

Therese Conant, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) Office of Protected Resources, Silver Spring, MD (301) 427-8456; Peter Boveng, NMFS Alaska Fisheries Science Center, Seattle WA (206) 526-4244; Tammy Olson, NMFS Alaska Region, Anchorage AK (907) 271-2373.

1.2 Methodology used to complete the review:

A 5-year review is a periodic analysis of a species' status conducted to ensure that the listing classification of a species as threatened or endangered on the List of Endangered and Threatened Wildlife and Plants (List) (50 CFR 17.11 – 17.12) is accurate. The 5-year review is required by section 4(c)(2) of the Endangered Species Act of 1973, as amended (ESA) and was prepared pursuant to the joint National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife 5-year Review Guidance and template (NMFS and USFWS 2010). The NMFS Office of Protected Resources, Alaska Fisheries Science Center, and Alaska Region led the 5-year review. We relied mostly on the status review completed by Kelly et al. (2010) and updated information based on peer-reviewed publications, government and technical reports, conference papers, dissertations, and theses. Information was gathered *through November 2017*. The information on the Saimaa seal (*Phoca hispida saimensis)* biology and habitat, threats, and conservation efforts was summarized and analyzed in light of the ESA section 4(a)(1) factors (see Section 2.3.2.1) to determine whether a reclassification or delisting may be warranted (see Section 3.0).

NMFS initiated a 5-year review of the Saimaa seal and solicited information from the public on June 21, 2017 (82 FR 28304). We received information from the Marine Mammal Commission and Center for Biological Diversity, which we incorporated as appropriate in this review.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review: 82 FR 28304, June 21, 2017

1.3.2 Listing history

Original Listing
FR notice: 58 FR 26920, May 6, 1993
Date listed: June 7, 1993
Entity listed: Subspecies—Saimaa seal, *Phoca hispida saimensis*
Classification: Endangered

Revised Listing: In 2014, the scientific name of the Saimaa seal was updated in the list of endangered species to reflect use of either genus name (79 FR 20802; April 14, 2014). Herein, we follow Kelly et al. (2010) and use the genus *Phoca*.

1.3.3 Associated rulemakings: NA

1.3.4 Review History:

Kelly et al. 2010. Status review of the ringed seal (*Phoca hispida*). NOAA Technical Memorandum NMFS AFSC-212. 265 pages. Recommendation: retain listing status as Endangered.

1.3.5 Species' Recovery Priority Number at start of 5-year review: NA—Foreign species

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

__X__**Yes,** go to section 2.1.2.
_____**No,** go to section 2.2.

2.1.2 Is the species under review listed as a DPS? [1]

____ ***Yes****, go to section 2.1.3.*
__X__***No****, go to section 2.1.4*

2.1.3 Was the DPS listed prior to 1996?

____ ***Yes****, give date and go to section 2.1.3.1.*
____ ***No****, go to section 2.1.4.*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ ***Yes,*** *provide citation and go to section 2.1.4.*
____ ***No****, go to section 2.1.3.2.*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ ***Yes****, discuss how it meets the DPS policy, and go to section 2.1.4.*
____ ***No****, discuss how it is not consistent with the DPS policy and consider the 5-year review completed. Go to section 2.4., Synthesis.*

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[1] To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include “any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature.” NMFS and USFWS jointly published a policy regarding the recognition of DPSs of vertebrate species under the Endangered Species Act (DPS Policy, 61 FR 4722; February 7, 1996).

“DPS” is not a scientifically defined term; it is a term of art that is used in the context of ESA law and policy. Furthermore, when passing the provisions of the ESA that give us authority to list DPSs, Congress indicated that this provision should be used sparingly. We have discretion with regard to listing DPSs and, in order to be consistent with the directive of the Congressional report that followed the introduction of the DPS language in the ESA to identify DPSs sparingly, we will generally not, on our own accord, evaluate listings below the taxonomic species or subspecies level if the best available information indicates that the species or subspecies is in danger of extinction throughout all or a significant portion of its range. We should only identify DPSs if there is an overriding conservation benefit to the species.

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ ***Yes***

__***X***__ ***No****, go to section 2.2., Recovery Criteria.*

2.2 Recovery Criteria

NA. The Saimaa seal is a foreign species and a recovery plan would not result in a conservation benefit.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

We incorporated by reference the last comprehensive status review (Kelly et al. 2010) and provided updated information that is relevant to a change in status since the last review.

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

The population of Saimaa seals was estimated to have been 160-180 in the 1980s (Sipilä et al. 1990), 300 in 2010 (Kelly et al. 2010), 320 in 2015 (Sipilä 2016), and 360 in 2016 (Metsähallitus 2016). The estimate of adults is 135-190 based on sex ratio data (Sipilä 2003; Krafft et al. 2007 cited in Sipilä 2016). The population is increasing (Metsähallitus 2016; Sipilä 2016). The mean growth rate from 1990 to 2004 was 1.026, but varied from 0.919 to 1.056 depending on the population (Kelly et al. 2010). However, overall population size is likely limited due to the dimensions of Lake Saimaa (about 180 km long and 140 km wide, with approximately 14,000 islands) and its carrying capacity (Valtonen et al. 2012). Population density in known breeding colonies is low with only 0.1 to 0.2 seals per km^2 of ice (Sipilä et al. 2013). One breeding population at Pyhaselka has already nearly failed as breeding females were not observed there during 1998-2010, and only one breeding female has been observed there each year since 2011 (Ranta and Lundberg 2016 cited in Sipilä 2016).

Saimaa seals excavate lairs in snowdrifts over their breathing holes in the ice, typically along the shorelines of islands and islets, generally during the ice-covered period from December through April. Pups are generally born and nursed in these lairs from February to March, when snow cover is at its thickest (Kelly et al. 2010). Annual pup production varies between 44 to 66 pups and around 80% of these births are from females aged from 6 to 16 years (Sipilä et al. 2013). In 2016, the estimated number of seal pups born was well above the annual average–86, which is more than any other count in the last 30 years of monitoring (Metsähallitus 2016). New born pups averaged 68 cm long and weighed 5 kg size (Auttila et al 2016). They attained their first

year of growth during nursing. The nursing period was estimated to last about 9 weeks (Niemi et al. 2013b). Pups appeared to begin foraging during the nursing period, but were unable to maintain their weight post weaning. Although body condition and growth declined after weaning, growth was regained at about six months (Auttila et al. 2015). At four years of age, they achieved their maximum size–on average 59 kg (range 45-124 kg and 132 cm in body length) (see Sipilä 2016).

Survival to adulthood is extremely low due to high bycatch mortality in fisheries and loss of habitat due to climate change. Average pup mortality during normal winters has been reported at 8% (Sipilä 2003) and 13.5% (range 5.0%-17.9%) (Auttila et al. 2014). Mortality can vary greatly and has reached almost 30% in some years depending on snow cover and water levels within Lake Saimaa (Sipilä and Kokkonen 2011). In the Auttila et al. (2014) study, the causes of the mortality were not known. Of 24 pup carcasses, three were stillborn, 13 had survived for less than a month, and eight were too decomposed to perform an autopsy. Predation was likely not a factor in the mortalities and there was no evidence of *Brucella sp.* albeit infections have been reported in ringed seals in other studies (see Auttila et al. 2014).

Sexual maturity is reported at 4-5 years for females and 4+ years for males. The proportion of mature females in the population that are either pregnant of have a corpus luteum ovulation in any given year ranges from ca. 0.70 to 0.83 (see Kelly et al. 2010). Sex ratios do not differ significantly from 1:1 (162 males and 182 females; $x^2$1.163, df = 1, two-tailed P = 0.281) (Auttila et al. 2016). The average age at death (discounting pup mortality) was 10.4 $\pm$ 8.8 years with a maximum age of 35 years (Auttila et al 2016).

Saimaa seals exhibit a high degree of fidelity to their breeding areas (see Kelly et al. 2010). Kunnasranta et al. (2011) tracked 11 adults during the wintertime from 1998-2011. The average number of lairs used by seals was 3.27 ± 1.01 SD (ranged from 2 to 6) and the average home range size was less than 8 km^2 (ranged from 4 km^2 to 14 km^2; n=5). Koivuniemi et al. (2016) used camera traps to identify individual seals based on their unique lateral fur patterns. From 2010 to 2014, 164 individual seals were identified, of which 43% were re-sighted in successive years. The average distance between sightings of individual seals was 1.6 km, and individuals stayed within 5 km of their natal site.

Saimaa seals exhibit a high degree of fidelity to their haulout sites. Niemi et al. (2013a) tracked eight individual seals during the open-water season. Seals averaged 13 haulout sites at approximately 2.5 km apart. About half of the sites were located in the core 50% of the seals' home range.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Kelly et al. (2010) reported that the Saimaa seal was highly differentiated from Arctic and Baltic ringed seals and exhibited low nuclear and mitochondrial (mtDNA) genetic diversity. Recent studies confirm these findings (Martinez-Bakker et al. 2013; Valtonen et al. 2012, 2014; Valtonen 2014; Nyman et al. 2014). Based on analysis of microsatellite loci and mitochondrial control-region sequences, Nyman et al. (2014) found that Saimaa ringed seals have lost most of

the genetic diversity present in their Baltic ancestors. Lake Saimaa was colonized by a small number of seals over 9,500 years ago, and the loss of diversity occurred during this prolonged founder event with further diversity loss taking place throughout the post-colonization period. Their analysis showed a weak effect from the 20th century bottleneck when the population suffered severe declines due to directed kill, indicating that the bottleneck was too recent to manifest itself in the species' genetic composition (Nyman et al. 2014). A slow, but statistically significant loss (H_O = 3.762–0.002*birth year; r^2 = 0.030, P = 0.025) of individual heterozygosity was found over the last five decades, reflecting low effective subpopulation sizes (Valtonen et al. 2014). Despite low genetic diversity, no clear signs of inbreeding depression have been detected in the Saimaa seal (Valtonen 2014).

Migration between Saimaa seal populations and Baltic populations was inferred to be zero both historically and contemporarily; whereas, migrants per generation from Lake Saimaa and the Arctic were 2.8 historically and 6.7 currently. However, these unlikely migration estimates may be an artifact of the contrast in diversity between populations and the time since isolation (Martinez-Bakker et al. 2013). The isolation resulted in distinctive morphometric characteristics such as higher auditory bulla and grey pelage in pups (see Kelly et al. 2010). The heightened auditory senses are thought to be an adaptation to navigate the murky waters of Saimaa Lake. Unlike Baltic and Ladoga Lake seals that den on open ice fields, Saimaa seals den in snowdrifts along the shoreline and white pelage is less important to avoid predators under sufficient snow and ice conditions (Hyvärinen and Nieminen 1990). The grey pelage also camouflages pups against the darker background of the rocky shoreline when snow is insufficient for lairs (Autilla et al. 2016).

Populations within five main regions of Lake Saimaa exhibit different mtDNA (haplotype) and nuclear microsatellite DNA frequencies, indicating subpopulation genetic differentiation despite short distances among the main basins in Lake Saimaa (Valtonen et al. 2012, 2014; Figure 1). The population substructure is most likely due to the small subpopulation sizes, fragmented lake habitat, and behavioral patterns. Females are philopatric and males are more prone to disperse but not at a level that would offset the effects of genetic drift, which is causing the already low genetic diversity to be further depleted (Valtonen et al. 2014). Valtonen et al. (2014) found that the most productive breeding site--Pihlajavesi area—serves as a source for Southern Saimaa. Identifying productive breeding sites that can serve as a source for less productive sites is important in maintaining population viability and genetic diversity. Subpopulation independence could significantly increase the risk of stochastic extinction, and managed translocations of individuals, especially females, may be necessary to restore demographic connectivity (Valtonen 2014; Valtonen et al. 2014).

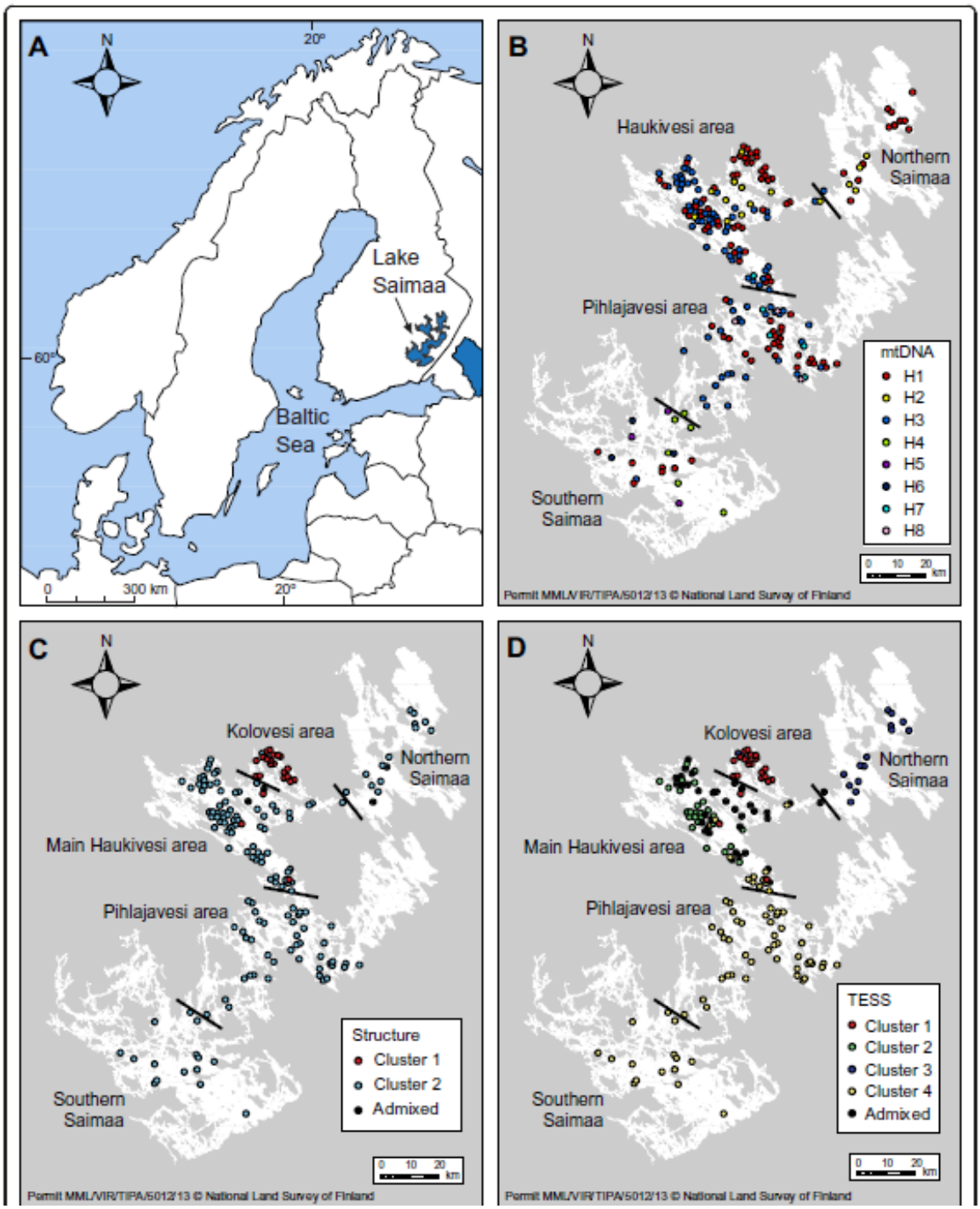

Figure 1. Possible subpopulation structure based on mtDNA haplotypes using two Bayesian genotype-assignment approaches: Initial 4-basin area (B) based on topography of Lake Saimaa; Updated 5-basin area (Bayesian approaches Structure (C) and TESS (D)) subdivides the Haukivesi area into the Main Haukivesi and Kolovesi areas because all individuals assigned to Cluster 1 (red) originated from the Haukivesi area and 86% of them were found to be from the Kolovesi basin in northeastern Haukivesi (*Source:* Figure 1; Valtonen et al. 2014). The recognition of 5-basin areas provides a better explanation of the overall genetic variation at mitochondrial and microsatellite loci (i.e., the genetic data reflect five subpopulations).

2.3.1.4 Taxonomic classification or changes in nomenclature:

Kelly et al. (2010) classified ringed seals as *Phoca hispida* with the recognition that molecular and morphological analyses remain incompletely resolved. The authors cite Árnason et al. (1995, 2006) indicating genetic distances were no greater between than within *Pusa*, *Phoca*, and *Halichoerus* (gray seal), consistent with assigning all three to subgenera within *Phoca*. Kelly et al. (2010) also recognized the Saimaa ringed seal (*Phoca hispida saimensis*) as a subspecies. The Committee on Taxonomy (2016) placed the Saimaa seal in the genus *Pusa* citing Rice (1998). Other recent reviews also use *Pusa* as the classification (Berta and Churchill 2012; Sipilä 2016). In 2014, the scientific name of the Saimaa seal was updated in the list of endangered species to reflect use of either genus name (79 FR 20802; April 14, 2014). Herein, we follow Kelly et al. (2010) and use the genus *Phoca*.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

The Saimaa seal's distribution is limited to the freshwater Lake Saimaa in eastern Finland. The seals occupy about 70% of the lake's surface area (Niemi et al. 2012). The breeding areas within Lake Saimaa have contracted (Metsähallitus Parks and Wildlife; Figure 2) and are currently divided into 14 areas connected by narrow straits (Sipilä 2016).

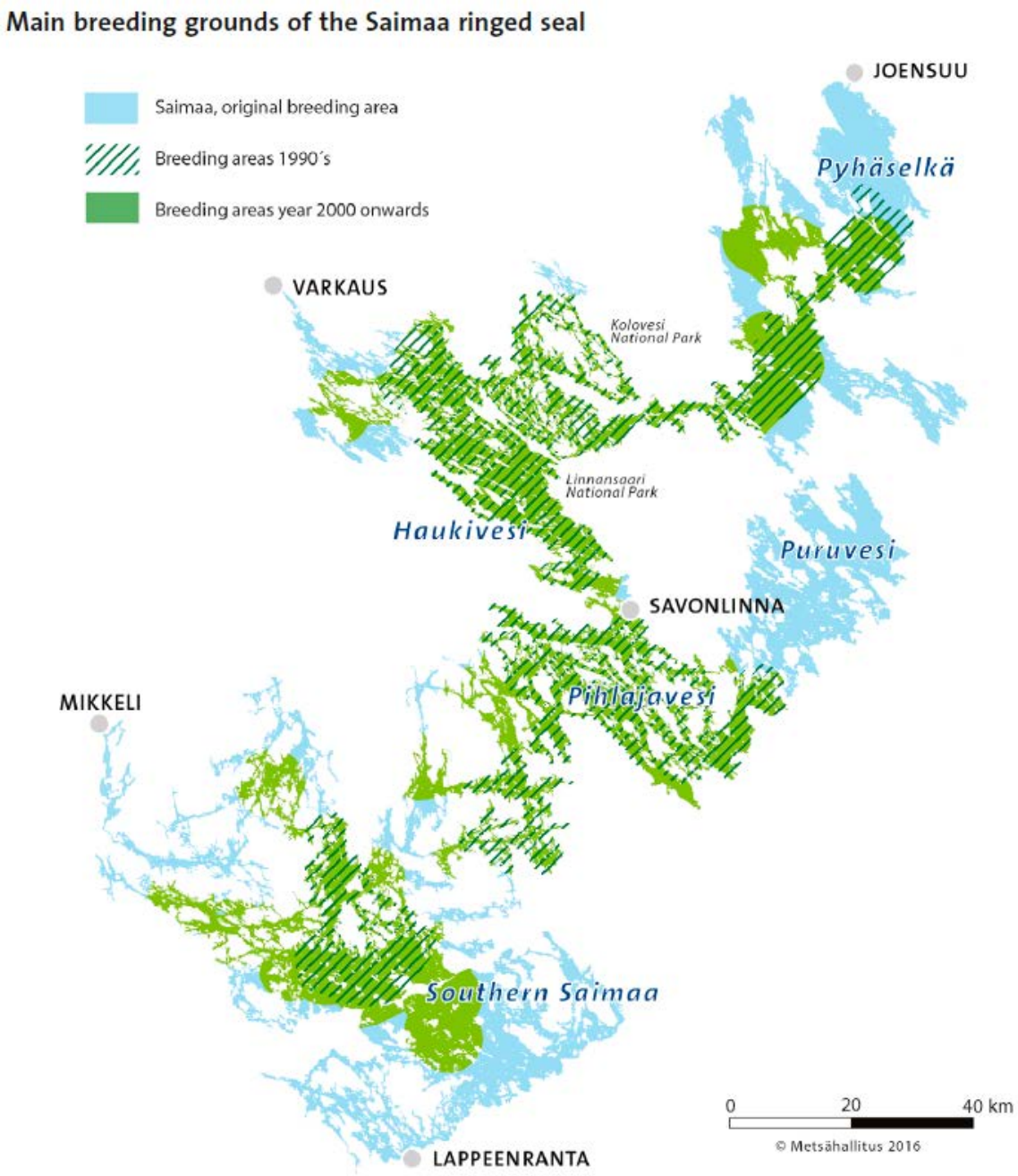

Figure 2. The Saimaa seal breeding range has contracted due to direct harvest. However, since its protection in Finland in 1955, the species is reoccupying some of its breeding sites (*source:* Metsähallitus Parks and Wildlife—Finland).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The habitat of the Saimaa seal is restricted to the Lake Saimaa system with the largest numbers of seals living in lakes Pihlajavesi, Haukivesi, and Kolovesi (Bell et al. 2008). At approximately

4,400 km^2 (1,700 sq mi), it is the largest lake in Finland, and the fourth largest natural freshwater lake in Europe. Saimaa seals occupy about 70% of the surface area of the lake and their breeding area covers about 51% (Niemi et al. 2012). Saimaa seals typically rest on rocks and island shores during the ice-free season. They give birth in late winter-early spring in subnivean lairs protected by snowdrifts where the ice meets the shoreline (see Kelly et al. 2010). Saimaa seal adults and pups require about 90 km^2 for their home range (Niemi et al. 2012). However, pups' home range sizes varied greatly from 3 to 162 km^2 (Niemi et al. 2013b). Shallow water in bays and inshore areas were important habitat within the weaned pup's home range. After weaning at about 3 months, pups dispersed up to 15 km a day to different locations extending up to 25 km away from the birth site (Niemi et al. 2013b).

Saimaa seals rely on abundant schooling fishes such as smelt (*Osmerus eperlanus*), perch (*Perca fluviatilis*), common roach (*Rutilus rutilus*), vendace (*Coregonus albula*), ruff (*Gymnocephalus cernuus*), cyprinids, and to a lesser extent crustaceans due their low densities in the Lake Saimaa (Kelly et al. 2010; Autilla et al. 2015). Stable isotope analysis indicated that diet was similar across age groups, but pups tended to feed on smaller fish (Autilla et al. 2015).

Suitable habitat, including birth, haulout, and foraging sites, exists but has been degraded due to climate warming and human use of the lake area (see Sections 2.3.2.1 and 2.3.2.5).

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Climate Change

Saimaa seals depend on ice and snow for successful reproduction. Warming temperatures have degraded its breeding habitat by decreasing snow cover and causing snow to melt earlier in the season, which destroys subnivean lairs and exposes pups to adverse weather, human disturbance, and predators (see Auttila et al. 2014). In winters with sufficient snow cover, about 8% of pups were found dead in lairs. However, in two consecutive winters with little snow cover, pup mortality rose to 29% (Sipilä and Kokkonen 2011). Model predictions indicate that ice cover, in many winters, will be absent or short-lived in Lake Saimaa by the year 2050 and beyond (see Sipilä 2016). Snow cover in the Nordic peninsula, including Finland, is projected to decrease 10-30% before mid-century and 50-90% by the end of the century (Kelly et al. 2010). Evidence of human influence (i.e., anthropogenic greenhouse gas emissions) on atmosphere and ocean warming, changes in the global water cycle, reductions in snow and ice, and in global mean sea level rise has increased since the IPCC Fourth Assessment Report (IPCC 2014, 2013). The effects of greenhouse gas emissions are projected to continue into the foreseeable future (IPCC 2014, 2013).

Other

Other anthropogenic habitat uses have negative impacts on Saimaa seals, including recreational use such as ice skating, cottage construction, net fishing, and snowmobiling (Sipilä 2016; see Kelly et al. 2010). For example, motion-sensor camera traps at potential lair sites documented a snowmobile running over and collapsing a lair site (Auttila et al. (2014). Construction along the

shoreline of Lake Saimaa has increased over the last several decades, which has increased the risk of perinatal mortality (Liukkonen et al. 2017). When the nearest building was over 4,000 meters away from the lair site, mortality was less than 1%, but increased to 35-72% at distances less than 800 meters. The number of lair sites relative to haulout sites also decreased in areas of high building density. The increase in building construction from 1995 through 2013 resulted in a decrease of available regular breeding sites along the shoreline by 29%. As of 2013, over 8,000 new summer cottages were approved to be built along Lake Saimaa, further increasing the risk of perinatal mortality (Liukkonen et al. 2017).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Saimaa seals were killed in the earlier part of the 1900s for household purposes such as meat, oil, and leather, especially to make gloves. The Finnish government introduced a bounty on the seals in 1894, because the seal was thought to be a competitor for fish in commercial fisheries on the lake. Bounties were paid on seals as late as the 1940s, and the practice was likely responsible for the population decrease from around 700 individuals to fewer than 200 (Bell et al. 2008). Since their protection under Finnish law in 1955, only a few cases of poaching have been reported up through the early 1980s and none have been reported in recent years (Sipilä 2016).

Kelly et al. (2010) reported that use for scientific and educational purposes are low and likely had no impact on ringed seals, including the Saimaa seal.

2.3.2.3 Disease or predation:

Saimaa seals host parasitic worms known as acanthocephalans. *Corynosoma strumosum* is the only acanthocephalan found in Saimaa seals (Kelly et al. 2010). It is likely the parasitic worm was introduced when the seal ate infected fish. However, no data exist indicating whether the parasite has a negative impact on individual seals or populations.

In the winters of 2014 and 2015, two pup carcasses were found in their lairs apparently killed by a predator. Snow conditions during that time were insufficient for protecting the lair sites (Sipilä 2016). Prior to 2014, only one pup was reported killed by a canid—either a dog or a fox (Sipilä 2003). Auttila et al. (2014) monitored lair sites through camera traps from 2010 through 2013 during times of sufficient ice and snow cover. Carnivores (e.g., fox, raccoon dog, and otters) were not recorded to penetrate the lairs; rather the animals bypassed the lairs as they travelled along the shoreline. This study showed that during winter when ice and snow are sufficient, predators are not a considerable threat to the pups. Should climate change decrease the ice and snow cover in breeding areas, predation may increase (Auttila et al. 2014; Sipilä 2016).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

The Saimaa seal has been protected from hunting under Finnish law since 1955 and is designated as an “endangered” species on the Finish Red List. Under the Finnish Nature Conservation Decree, the Saimaa ringed seal is a species under strict protection and under the European Union (EU) Habitats Directive a species in need of strict protection. Finland’s Forest and Park Service, Metsähallitus, is responsible for promoting the protection of the Saimaa ringed seal and

managing the monitoring of the population (http://mmm.fi/en/fisheries/fishing-restrictions-and-management-of-fish-resources/restrictions-at-lake-saimaa).

Since 1982, Finland has implemented seasonal restrictions on fisheries under the Fishing Act (286/1982) in breeding areas to reduce Saimaa seal mortality. Net fishing is prohibited in the main habitat areas for the Saimaa seal from April 15 through June 20 (Finland Decree 294/2011). Since 1999, certain gear types have been prohibited all year (Finland Decree 295/2011). The restrictions include prohibiting the use of fish as bait, limiting the strength and mesh size of multifilament gill nets, restricting the size of the mouth of wire fish traps, and restricting long-line fishing (Bell et al. 2008). See Section 2.3.2.5 for additional information on fisheries bycatch.

According to Niemi et al. (2012, 2013b), the current areas restricting fisheries may neither be large enough nor sufficient in duration to encompass movement and shallow water habitat within a weaned pup's home range. Although the areas covered by fishing restrictions were expanded from 65 km^2 in 1982 to presently >2,000 km^2, five of the 57 known pups born in 2010 were born outside the restricted area. Three of the pups tagged in their study died in fishing gear during the fishing restriction period, two of them outside the restriction areas. In addition, one pup was entangled in a gill net outside the fishing restriction period. Local residents use the inshore waters for subsistence gill net fishing, which may increase pup mortality (Niemi et al. 2013b). Niemi et al. (2012) suggest that the current fishing regulations are inadequate to achieve the short-term goal of 400 living seals by the year 2025 to ensure the minimum viable population size established by the Ministry of the Environment.

New construction is prohibited within several conservation areas encompassing 70% of seal lair sites (birth and resting) to protect such sites. National parks in Finland encompass about 34% of birth lair sites. More generally, new construction has been regulated since 1999 to limit density, but lakeshore development has still increased. Since 1991, the government has prohibited lowering water levels in the lake to protect pups during unstable ice conditions (see Kelly et al. 2010).

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Pollution and Contaminants
Kelly et al. (2010) reviewed the literature finding that contaminants such as nickel, mercury, cadmium, chromium, and lead concentrations adversely affect the Saimaa seal at different life stages. Concentrations of polychlorinated biphenyls and dichlorodiphenyltrichloroethane compounds were highest in the Saimaa seal compared to samples taken from seals in Lake Ladoga and the White Sea (see Kelly et al. 2010). Lyytikäinen et al. (2015) found that the molar ratios of selenium:mercury in the muscles of adult Saimaa seals fall below one, which is considered a threshold for the emergence of detrimental effects to health and reproduction. In addition, mercury contamination was found to be higher than other marine seals, with the highest concentrations found in the liver. Despite a 75% decrease since 1995 in industrial emissions of mercury in waters of Finland, concentrations remain high likely due to clearcutting and other soil treatments, which increase the runoff of mercury from soil that has been deposited over decades (Lyytikäinen et al. 2015).

Fisheries Bycatch and Competition

Bycatch in fisheries is a major threat to Saimaa seals and likely contributed to a population decline in 2006-2007 (Sipilä 2016). Fisheries bycatch was the major cause of death in weaned pups, and although the proportion of bycatch-related mortality declined with age, the proportion remained well over 50% in juveniles (Autilla et al. 2015, 2016). From 2000 to 2010, 65 seals were recorded to be caught in fishing gear (Niemi et al. 2012). However, during that period, 174 carcasses were found of which over 97 were too decomposed to determine the cause of death. The annual mortality from fishing gear is estimated to be between 10 to 20 seals (Sipilä and Kokkonen 2011). Time and areas closures and gear restrictions likely reduce the annual mortality. The survival rate from weaning to 2 years of age was estimated to be 10% higher for pups born inside the fishing restricted areas (Sipilä 2003).

The Saimaa seal was once considered to compete for commercial and recreational fisheries. However, recent studies have found that the seal's diet does not consist of fish targeted in local fisheries (Autilla et al. 2015). Vendace, a freshwater whitefish, is the most commercially valuable fish species in the inland waters of Finland. Vendace was a small proportion of the Saimaa seal diet during years when the prey species was abundant in the lake, indicating the seal does not compete with fisheries catch.

Vessel Traffic

During the moulting season (May and early June), Saimaa seals responded to motor boats that approached within 240 m (Niemi et al. 2013a). Responses were categorized as (1) no response or (2) response (2a: lifting head, i.e. alert, or 2b: entering the water) At a distance of 240 m, over half (approach events n = 219 of which 191 events involved only one seal) of the seals approached were 'alert', and at approximately 150 m, the seals typically entered the water (Niemi et al. 2013a). This study suggests that moulting seals respond to boat traffic at varying distances, but the effects of the response to the Saimaa seal are not fully understood. Harbor seals may incur energetic costs during the moulting season if they enter the water more frequently, which prolongs the season (Paterson et al. 2012 cited in Niemi et al. 2013a).

Conservation Efforts

Saimaa seals were found to accept manmade snowdrifts associated with lair sites. Auttila et al. (2011, 2014) piled up snow around 117 lair sites, including regularly used (44%) and new (56%) sites. From 2010 to 2012, seals increased their use of the artificial snowdrift sites from 32% to 67%. From 2013 to 2014, over 90% of pups were born in the manmade snowdrifts and mortality was lower (17%) than anticipated (30-50%) for lairs without the manmade snowdrifts (Koskela et al. 2014 cited in Sipilä 2016). Poor snow conditions may expose pups to predation and other threats (e.g., direct exposure to low temperatures). The manmade snowdrifts can help offset the impact of less snowfall cover resulting from warmer climate, so long as some snow is available and there is contiguous ice cover.

The European Commission funded € 5.3 million to Finland to help improve the conservation status of the Saimaa ringed seal by reducing risks, in particular, those related to fishing, human-induced disturbance, and climate change. Results of the project will be used to update the seal conservation strategy and related regulations (European Commission 2013; Metsähallitus 2016).

See Kelly et al. (2010) for comprehensive list of existing international agreements and oversight.

2.4 Synthesis

The population of Saimaa seals is increasing, but is still small (~360 seals) with low density (0.1 to 0.2 seals per km^2 of ice). Saimaa seals have lost most of the genetic diversity present in their Baltic ancestors. Over the last five decades, the species has experienced continued loss in genetic heterozygosity. The species exhibits subpopulation genetic differentiation (possibly 5 distinct subpopulations). Pup mortality is high (8%) and increases when lair sites are near high-density construction (35-72%) and (29%) in mild winters with insufficient snow cover. The Saimaa seal's small population size, low density, low genetic diversity, subpopulation structure, and high pup mortality are characteristics that render the population less resilient to demographic and environmental stochasticity (see Section 2.3.1).

Major threats are mortality in fishing gear and habitat loss due to climate warming. Fishing restrictions are reducing pup mortality, but may need to be expanded both temporarily and spatially to adequately encompass seal breeding, haulout, and foraging sites. Snow and ice cover are decreasing due to climate warming. Increased pup mortality from these habitat changes will likely occur and continue into the foreseeable future. The seal appears to use manmade snowdrifts, but to what degree this conservation strategy can abate the loss of natural breeding habitat is unknown (see Section 2.3.2).

The Saimaa seal's demography places it at high risk of extinction, and major threats have not been fully addressed. For these reasons, we conclude the Saimaa seal is currently in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change is needed

3.2 New Recovery Priority Number

NA

3.3 Listing and Reclassification Priority Number

NA

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

NMFS should coordinate with the State Department to continue to seek opportunities to support and encourage Finland's conservation strategies for the Saimaa ringed seal.

5.0 REFERENCES

Amano, M., A. Hayano, and N. Miyazaki. 2002. Geographic variation in the skull of the ringed seal, *Pusa hispida*. Journal of Mammalogy 83(2):370-380.

Auttila, M., M. Niemi, M. Viljanen, and M. Kunnasranta. 2011. Manmade snowdrifts—improving breeding conditions of the endangered Saimaa ringed seal. Page 21 *In* 19th Biennial Conference on the Biology of Marine Mammals. Tampa, FL, 27 November -02 December 2011.

Auttila, M., M. Niemi, T. Skrzypczak, M. Viljanen, and M. Kunnasranta. 2014. Estimating and mitigating perinatal mortality in the endangered Saimaa ringed seal (*Phoca hispida saimensis*) in a changing climate. Annales Zoologici Fennici 51: 526–534.

Auttila, M., T. Sinisalo, M. Valtonen, M. Niemi, M. Viljanen, M. Kurkilahti, and M. Kunnasranta. 2015. Diet composition and seasonal feeding patterns of a freshwater ringed seal (*Pusa hispida saimensis*). Marine Mammal Science 31 (1):45-65.

Autilla, M., M. Kurkilahti, M. Niemi, R. Levänen, T. Sipilä, M. Isomursu, J. Koskela, and M. Kunnasranta. 2016. Morphometrics, body condition, and growth of the ringed seal (*Pusa hipida saimensis*) in Lake Saimaa: Implications for conservation. Marine Mammal Science 32(1):252-267.

Bell, S., K. Hampshire, and M. Tonder. 2008. Person, place, and knowledge in the conservation of the Saimaa ringed seal. Society and Natural Resources 21(4):277-293.

Berta A. and M. Churchill 2012. Pinniped taxonomy: review of currently recognized species and subspecies, and evidence used for their description. Marine Mammal Review 42(3):207–234.

Committee on Taxonomy. 2016. List of marine mammal species and subspecies. Society for Marine Mammalogy, www.marinemammalscience.org.

European Commission. 2013. The 2012 LIFE+ projects. Press Release: http://europa.eu/rapid/press-release_MEMO-13-638_en.htm

Hyvärinen, H. and M. Nieminen. 1990. Differentiation of the ringed seal in the Baltic Sea, Lake Ladoga and Lake Saimaa. Finnish Game Research 47:21-27.

IPCC. 2013. Climate change 2013 the physical science basis. Summary for policy makers. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland. 33 pages.

IPCC. 2014. Climate change 2014. Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland. 151 pages.

Kelly, B. P., J. L. Bengtson, P. L. Boveng, M. F. Cameron, S. P. Dahle, J. K. Jansen, E. A. Logerwell, J. E. Overland, C. L. Sabine, G. T. Waring, and J. M. Wilder. 2010. Status review of the ringed seal (*Phoca hispida*). NOAA Technical Memorandum NMFS-AFSC-212. 265 pages.

Koivuniemi, M., M. Auttila, M. Niemi, R. Levänen, and M. Kunnasranta. 2016. Photo-ID as a tool for studying and monitoring the endangered Saimaa ringed seal. Endangered Species Research 30:29-36.

Kunnasranta, M., M. Niemi, M. Auttila, and M. Viljanen. 2011. Lair distribution and home range size of Saimaa ringed seals during the ice-covered season. Pages 165-66 *In* 19th Biennial Conference on the Biology of Marine Mammals. Tampa, FL, 27 November -02 December 2011.

Liukkonen, L., A. Rautio, T. Sipilä, M. Niemi, M. Auttila, J. Koskela, and M. Kunnasranta. 2017. Long-term effects of land use on perinatal mortality in the endangered Saimaa ringed seal population. Endangered Species Research 34:283-291.

Lyytikäinen, M., J. Pätynen, H. Hyvärinen, T. Sipilä, and M. Kunnasranta. 2015. Mercury and selenium balance in endangered Saimaa ringed seal depend on age and sex. Environmental Science & Technology 49:11808-11816.

Martinez-Bakker, M.E., S.K Sell, B.J. Swanson, B.P. Kelly, and D.A. Tallmon DA. 2013. Combined genetic and telemetry data reveal high rates of gene flow, migration, and long-distance dispersal potential in Arctic ringed seals (*Pusa hispida*). PLoS ONE 8(10): e77125. doi:10.1371/journal.pone.0077125.

Metsähallitus. 2016. Year and Corporate Social Responsibility in 2016. 151 pages. http://www.metsa.fi/web/en.

Niemi, M., M. Auttila, M. Viljanen, and M. Kunnasranta. 2012. Movement data and their application for assessing the current distribution and conservation needs of the endangered Saimaa ringed seal. Endangered Species Research 19:99-108.

Niemi, M., M. Auttila, A. Valtonen, M. Viljanen, and M. Kunnasranta. 2013a. Haulout patterns of Saimaa ringed seals and their response to boat traffic during the moulting season. Endangered Species Research 22:115-124.

Niemi, M., M. Auttila, A. Valtonen, M. Viljanen, and M. Kunnasranta. 2013b. Home range, survival, and dispersal of endangered Saimaa ringed seal pups: implications for conservation. Marine Mammal Science 29(1):1-13.

Nyman, T., M. Valtonen, J. Aspi, M. Ruokonen, M. Kunnasranta, and J.U. Palo. 2014. Demographic histories and genetic diversities of Fennoscandian marine and landlocked ringed seal subspecies. Ecology and Evolution 4(17):3420-3434.

Sipilä, T. 2003. Conservation biology of Saimaa ringed seal (*Phoca hispida saimensis*) with reference to other European seal populations. — Ph.D. thesis, University of Helsinki. 40 pages.

Sipilä, T. 2016. *Pusa hispida ssp. saimensis.* The IUCN Red List of Threatened Species 2016: e.T41675A66991678.

Sipilä, T . and T. Kokkonen. 2011. A new protection strategy for the Saimaa ringed seal, due to climate change. Metsähallitus, Natural Heritage Fact Sheet. www.metsa.fi/naturalheritage.

Sipilä, T., E. Helle, and H. Hyvärinen. 1990. Distribution, population size, and reproductivity of the Saimaa ringed seal (*Phoca hispida saimensis* Nordq.) in Finland, 1980-1984. Finnish Game and Research 47:3-10.

Sipilä, T, T. Kokkonen, and J. Koskela. 2013. The growth of the Saimaa ringed seal population is unstable. Page 193 *in*: 20th Biennial Conference on the Biology of Marine Mammals. Dunedin, New Zealand, December 2012.

Valtonen, M. 2014. Conservation genetics of the Saimaa ringed seal—insights into the history of a critically endangered population. Dissertations in Forestry and Natural Sciences No. 159. University of Eastern Finland. 123 pages.

Valtonen, M., J.U. Palo, M. Ruokonen, M. Kunnasranta, and T. Nyman. 2012. Spatial and temporal variation in genetic diversity of an endangered freshwater seal Conservation Genetics 13:1231–1245.

Valtonen, M., J.U. Palo, J. Aspi, M. Ruokonen, M. Kunnasranta, and T. Nyman. 2014. Causes and consequences of fine-scale population structure in a critically endangered freshwater seal. BioMed Central Ecology 14:22. 14 pages.

NATIONAL MARINE FISHERIES SERVICE
5-YEAR REVIEW
Saimaa Seal
Phoca hispida saimensis

Current Classification:

Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
___**X**_ No change is needed

Review Conducted By:

OFFICE PROTECTED RESOURCES APPROVAL:

Donna S. Wieting, Director, Office of Protected Resources, NOAA Fisheries

Approve: Donna S Wieting Date: _____

HEADQUARTERS APPROVAL:

Chris Oliver, Assistant Administrator, NOAA Fisheries

✓ Concur _____ Do Not Concur

Signature _____ Date 4/11/18