5-Year Review
of the
Ringed Seal, Saimaa Subspecies
(*Pusa hispida saimensis*)

March 2025

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

National Marine Fisheries Service
5-Year Review of the

Endangered Saimaa Subspecies of the Ringed Seal

Recommendation resulting from the 5-Year Review:

- ☐ Downlist to Threatened
- ☐ Uplist to Endangered
- ☐ Delist
- ☒ No change is needed

Review Conducted By (Name and Office):

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HEADQUARTERS APPROVAL:

☒ Concur ☐ Do Not Concur

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Acting Assistant Administrator, NOAA Fisheries

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5-Year Review
of the
Saimaa Subspecies of Ringed Seal
(*Pusa hispida saimensis*)

The National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA) conducted the following review in accordance with the Endangered Species Act of 1973, as amended (ESA).

1 GENERAL INFORMATION

1.1 Reviewer

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1.2 Introduction

Section 4(c)(2) of the ESA requires us to conduct a review of listed species at least once every 5 years. During a 5-year review, we determine whether a species should be removed from the list (*i.e.*, delisted), reclassified from an endangered species to a threatened species (*i.e.*, downlisted), or reclassified from a threatened species to an endangered species (*i.e.*, uplisted; 16 U.S.C. 1533(c)(2)). Section 4(b)(1)(A) of the ESA requires us to make the determination based solely on the best scientific and commercial data available at the time of the review and after taking into account efforts to protect the species (16 U.S.C. 1533(b)(1)(A)). Any recommendation to delist or reclassify the species would require a separate rulemaking process.

1.3 Methodology Used to Complete the Review

As required under 50 CFR 424.21, we announced initiation of the 5-year review in the Federal Register (FR) and solicited relevant information on the subspecies (89 FR 86316; October 30, 2024). We specifically requested electronic submission of data that have become available since the publication of the previous review (Conant *et al.* 2018). We received one comment from Metsähallitus Parks and Wildlife Finland (Metsähallitus 2024), which is the Finnish governmental agency responsible for monitoring Saimaa seals. We incorporated the relevant information into this review.

We gathered available information since publication of the previous review (2018) through February 2025, which included peer-reviewed publications, government reports, and technical data. We reviewed, synthesized, and evaluated this information to make our recommendation.

1.4 Listing and Review

Section 4 of the ESA requires us to promulgate regulations to list threatened and endangered species, which are listed at 50 CFR 17.11. At least once every 5 years, we are required to conduct a review of all species included in this list (16 U.S.C. 1533(c)(2)). For this species, we have completed the following actions under section 4 of the ESA.

1.4.1 Initiation of this 5-Year Review

FR notice: 89 FR 86316
Date published: October 30, 2024

1.4.2 Listing History

Original Listing
FR notice: 58 FR 26920
Date listed: June 7, 1993
Status: Endangered
Entity listed: Subspecies
Common name: Seal, ringed (Saimaa subspecies)
Scientific name: *Phoca hispida saimensis*

Revised Listing
FR notice: 79 FR 20802
Date revised: April 14, 2014
Status: Endangered
Entity listed: Subspecies
Common name: Seal, ringed (Saimaa subspecies)
Scientific name: *Phoca* (=*Pusa*) *hispida saimensis*

1.4.3 Review History

- Conant T, Boveng P, Olsen T (2018). Saimaa seal (*Phoca hispida saimensis*). 5-year review: summary and evaluation.
    - Recommendation: retain endangered classification.

- Kelly BP, Bengtson JL, Boveng PL, Cameron MF, Dahle SP, Jansen JK, Logerwell EA, Overland JE, Sabine CL, Waring GT, Wilder JM (2010). Status review of the ringed seal (*Phoca hispida*). NOAA Technical Memorandum NMFS AFSC-212.
    - Recommendation: retain endangered classification.

2 DESCRIPTION OF LISTED ENTITY

Under the ESA, the term "species" includes 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 (16 U.S.C. 1532(16)). On June 7, 1993, the ringed seal (Saimaa subspecies) was listed as an endangered species (58 FR 26920). For ease of use, we refer to the listed entity as Saimaa seal or "the subspecies" throughout the remainder of this review.

2.1 Species Description

The Saimaa seal has light-colored rings on its dorsal coat. Pups develop this coloration at about 4-6 weeks of age, after molting or shedding their white, lanugo coat.

2.2 Taxonomy and Nomenclature

In the past, there has been debate regarding the genus of ringed seals. When we originally listed the Saimaa seal under the ESA in 1993, *Phoca* was the valid genus. However, when we listed the four other ringed seal subspecies under the ESA in 2014, we changed the genus to "*Phoca* or *Pusa"* to reflect the usage of both names in the scientific literature. Since that listing and the previous 5-year review, the Integrated Taxonomic Information System verified *Pusa* as valid and *Phoca* as invalid (ITIS 2024), citing the Committee on Taxonomy of the Society for Marine Mammalogy (Committee on Taxonomy 2024) and taxonomic experts. Morphological and genetic analyses available since the previous review confirm the monophyly of *Pusa*, which diverged from *Phoca* 2-6 million years ago (Berta *et al.* 2018; Park *et al.* 2024). Acknowledging the validity of this genus, we have used *Pusa* in our regulatory documents for the other ringed seal subspecies, *e.g.*, our 5-year review (Kurland *et al.* 2024) and designation of critical habitat (87 FR 19232; April 1, 2022). To correct confusion caused by synonymy (multiple names for the same species) of the current ESA listing, we recommend changing the scientific name of the listed entity to *Pusa hispida saimensis*.

Despite the name change, there is a high level of confidence in the taxonomic validity of the subspecies, as described in the original and updated listings. Data available since the previous review confirm deep divergence from other ringed seal subspecies, as demonstrated by the best available genomic (Löytynoja *et al.* 2023, 2025) and morphological data (Nihtilä 2019; Valtonen *et al.* 2019; Laakkonen and Jernvall 2020; Laakkonen 2021; Laakkonen and Nihtilä 2021; Laakkonen and Vedrines 2022; Itkonen *et al.* 2024; Laakkonen *et al.* 2024). Independent evolutionary trajectories of the subspecies are further supported by genetic analyses of an obligate ectoparasite (*i.e.*, requiring skin-to-skin transmission). The Saimaa seal lous (*Echinophthirius horridus*) diverged from Baltic and Ladogha seal louse species some 8,360 years ago (range: 7407–10,331 years; Sromek *et al.* 2024).

2.3 DPS Analysis

Since the last review, additional data have become available regarding the application of the 1996 Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the ESA (*i.e.*, the DPS Policy; 61 FR 4722; February 7, 1996). Under the DPS Policy, we consider the following:

1. Discreteness of the population segment in relation to the remainder of the species to which it belongs;
2. The significance of the population segment to the species to which it belongs; and
3. The population segment's conservation status in relation to the ESA standards for listing (*i.e.*, is the population segment, when treated as if it were a species, endangered or threatened?).

At the time of the 2010 Status Review of the Ringed Seal, Kelly *et al.* (2010) described population differentiation within the Saimaa seal, a result of philopatry or fidelity to breeding sites, and recommended further investigation. Based on genome-wide sequencing of 145 Saimaa seals, Löytynoja *et al.* (2023) identified three strongly differentiated populations, with relatively low migration rates among regions of Lake Saimaa. Thus, we find that these populations are discrete. If extirpated from any region, philopatry is likely to prevent the recolonization, leaving a significant gap in the species' range. Thus, we find that the populations are significant to the species. If treated as species, the populations are in danger of extinction throughout their range because of the range-wide impacts of section 4(a)(1) factors, as described in the sections below. In 1993, we listed the Saimaa seal as an endangered species throughout its range because of these 4(a)(1) factors. The identification of endangered DPSs would not provide additional benefit. For this reason and because Congress advises us to use the authority to list DPSs "sparingly" (see Senate Report 151, 96th Congress, 1st Session), we do not recommend further consideration of the DPS Policy for the Saimaa seal.

3 BIOLOGY, LIFE HISTORY, AND RANGE

The Saimaa seal is endemic to Lake Saimaa, Finland (Figure 1). The 4,400 km^2 freshwater lake is highly labyrinthine and further fragmented by 14,000 islands (Löytynoja *et al.* 2023).

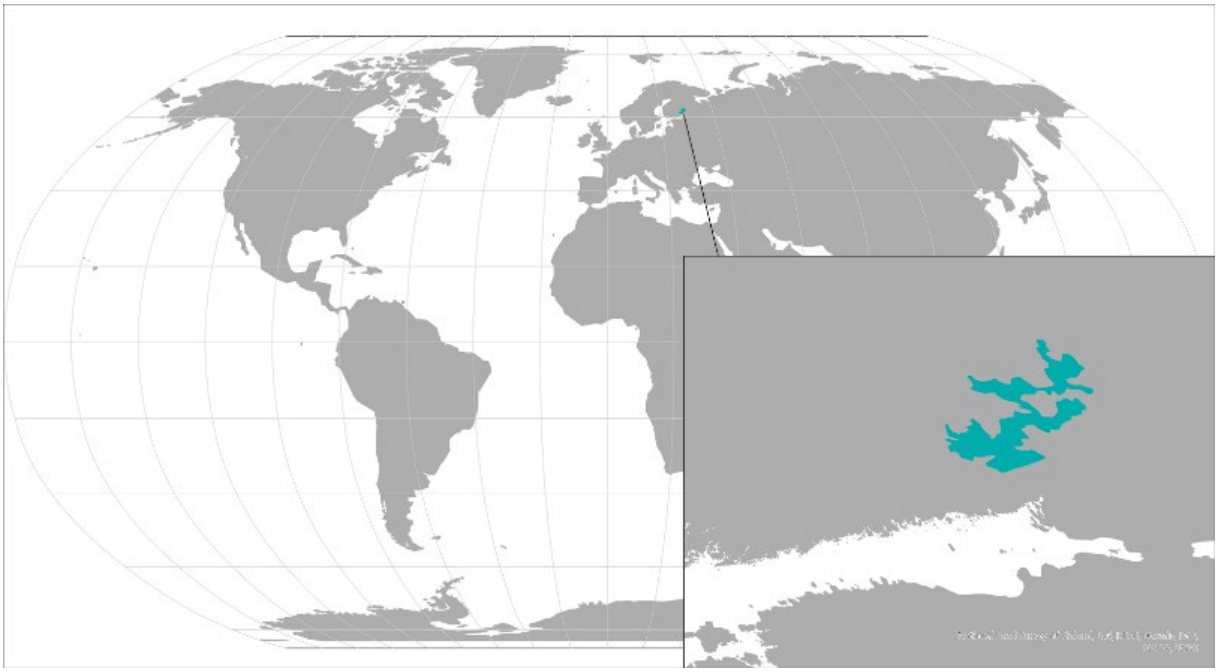

FIGURE 1. RANGE OF THE SUBSPECIES IN LAKE SAIMAA, FINLAND

The subspecies spends its entire life cycle within the waters and shores of the landlocked lake (Figure 2; Metsähallitus 2024). In early winter, when ice forms on the lake, Saimaa seals use their claws to create and maintain breathing holes. When snow accumulates, they dig cave-like lairs into lakeshore snowdrifts for resting (haul-out lair) and giving birth and nursing (birth lair; Kunnasranta *et al.* 2021). These lairs provide thermoregulation and protection from predation and disturbance. Females give birth in February and March and nurse their pups for 7-12 weeks. Prior to the weaning of pups, females temporarily leave their lairs to mate. As the ice thaws, seals abandon these lairs. Starting in May, the lengthening of days, increase of temperatures, and/or loss of ice coverage trigger seals to haul-out and molt (Niemi *et al.* 2021). Molting takes about 16 days and results in the shedding of old fur and surface skin layers. Adults return to the same location to molt annually (Biard *et al.* 2022). The molting process is energetically costly (Thometz *et al.* 2021), and seals are vulnerable to disturbance during this time.

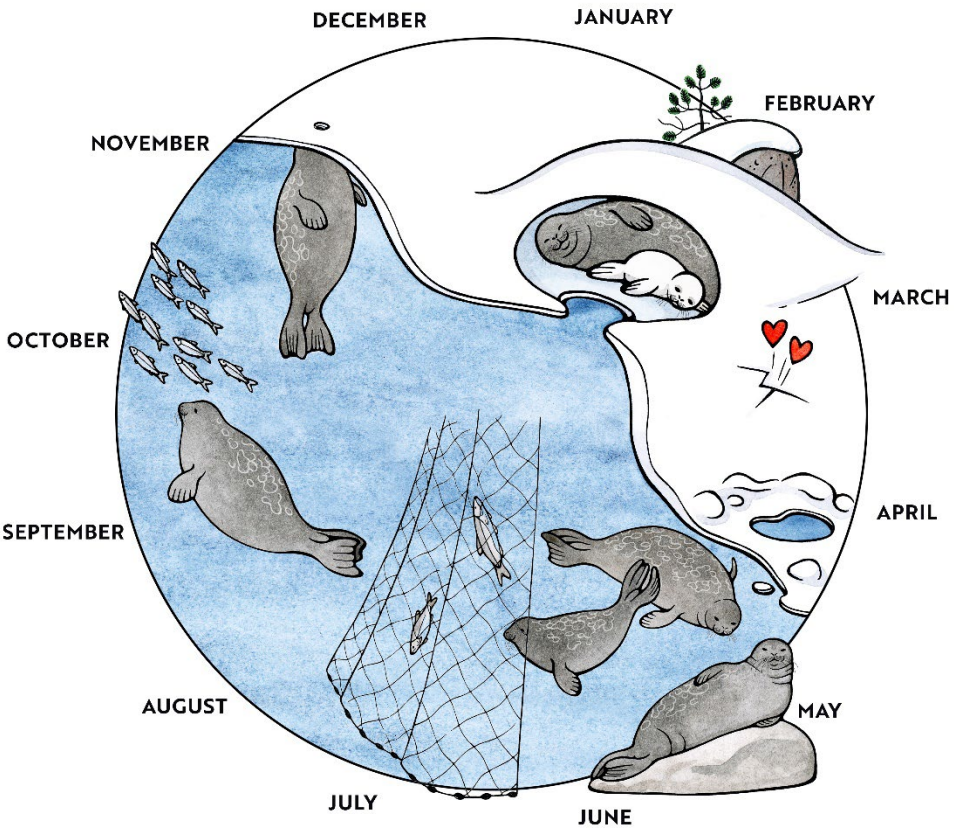

FIGURE 2. ANNUAL CYCLE OF THE SAIMAA SEAL
(Copyright Metsähallitus, Tupu Vuorinen)

Saimaa seals have small home ranges of about 90 km^2 but spend the majority of their time within a 5 km^2 core-use area (Kelly *et al.* 2010; Niemi 2013). They spend 36% of their time foraging in the summer and 21% in the winter (Nykänen *et al.* 2024). As summarized by Kunnasranta *et al.* (2021), Saimaa seals forage almost exclusively on small schooling fish, such as perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), ruff (*Acerina cernua*), smelt (*Osmerus eperlanus*), and vendace (*Coregonus albula*). They may also eat opossum shrimp (*Mysis relicta*). These are the most abundant species in Lake Saimaa, and food availability does not appear to limit population growth. Stable isotope analyses, which reflect the freshwater diet of this subspecies, indicate a similar diet between males and females, and indicate a shift from weaning to independent feeding in juveniles at about 7-12 weeks of age (Pulkkinen *et al.* 2020).

4 DEMOGRAPHIC FACTORS

Abundance, productivity, spatial distribution, and diversity are reliable indicators of a species' persistence and reflect the manifestation of past and current threats.

4.1 Abundance

The Saimaa seal exhibits low abundance. In 2024, Metsähallitus (the agency responsible for monitoring Saimaa seals in Finland) estimated 495 juveniles and adults and 95 pups (Figure 3), based on springtime surveys of lairs and haul-out sites, with input from experts. While there is some uncertainty in these estimates, a mark-recapture study using camera traps and boat surveys during the molting season confirms the increasing abundance (Koivuniemi *et al.* 2019).

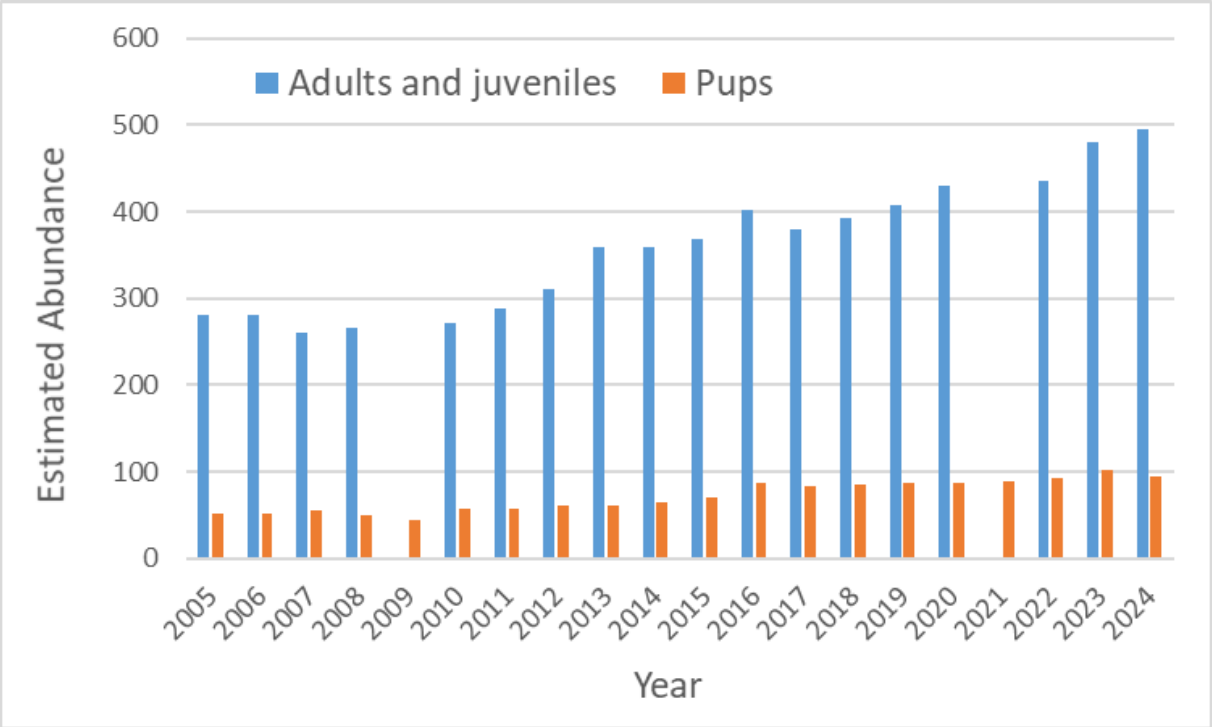

FIGURE 3. ESTIMATED ANNUAL ABUNDANCE
(Metsähallitus 2024)

Historical hunting data indicate that abundance likely exceeded 1,000 individuals in the 1800s (Kunnasranta *et al.* 2021), and habitat modeling studies indicate that Lake Saimaa can accommodate 4,000 seals (Niemi *et al.* 2019). After reaching its nadir in the 1980s, abundance has steadily increased but not to pre-exploitation levels (Table 1). We conclude that current abundance is low but increasing.

TABLE 1. PAST ESTIMATES OF ABUNDANCE

Year	Population	Reference
1800s	>1,000	Summarized by Kunnasranta *et al.* 2021
1966	>250	Simon 1966
1971	250	I. Koivisto and Y. Paasikunnas in Sipilä *et al.* 1990
1984	140	Sipilä *et al.* 1990
2010	300	M. Kunnasranta in Kelly *et al.* 2010
2015	320	Sipilä 2016a

4.2 Productivity and Population Trends

Since 2000, the subspecies' abundance has increased an average of 3% per year (Kunnasranta *et al.* 2021), ranging from -1.3% to 6.6% annually based on data from Metsähallitus (2024). This annual growth rate is less than that of other seal species (Kunnasranta *et al.* 2021), partially due to a relatively high pup mortality rate that ranges from 1.1 to 21.1% annually, with an average of 12.1% (Metsähallitus 2024). Total annual known mortalities (including pups) range from 14 to 38 individuals (Figure 4), with an average annual mortality rate of 7% (Metsähallitus 2024). However, Metsähallitus (2024) notes that the actual seal mortality rate may be three times higher because most deaths are not observed or reported.

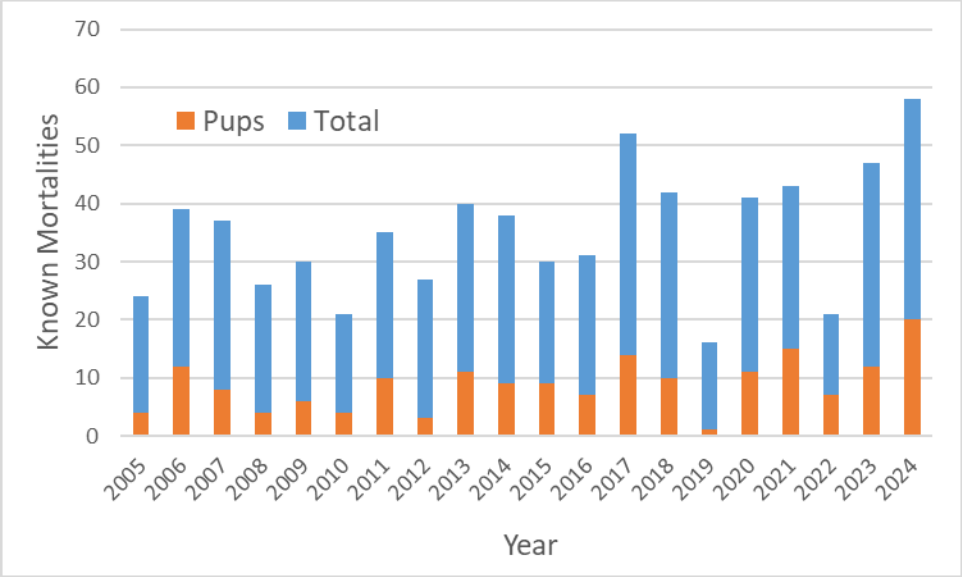

FIGURE 4. KNOWN ANNUAL MORTALITIES
(Metsähallitus 2024)

Productivity trends are not homogenous across the range (Figure 5), and in one region (shown in blue), abundance is decreasing.

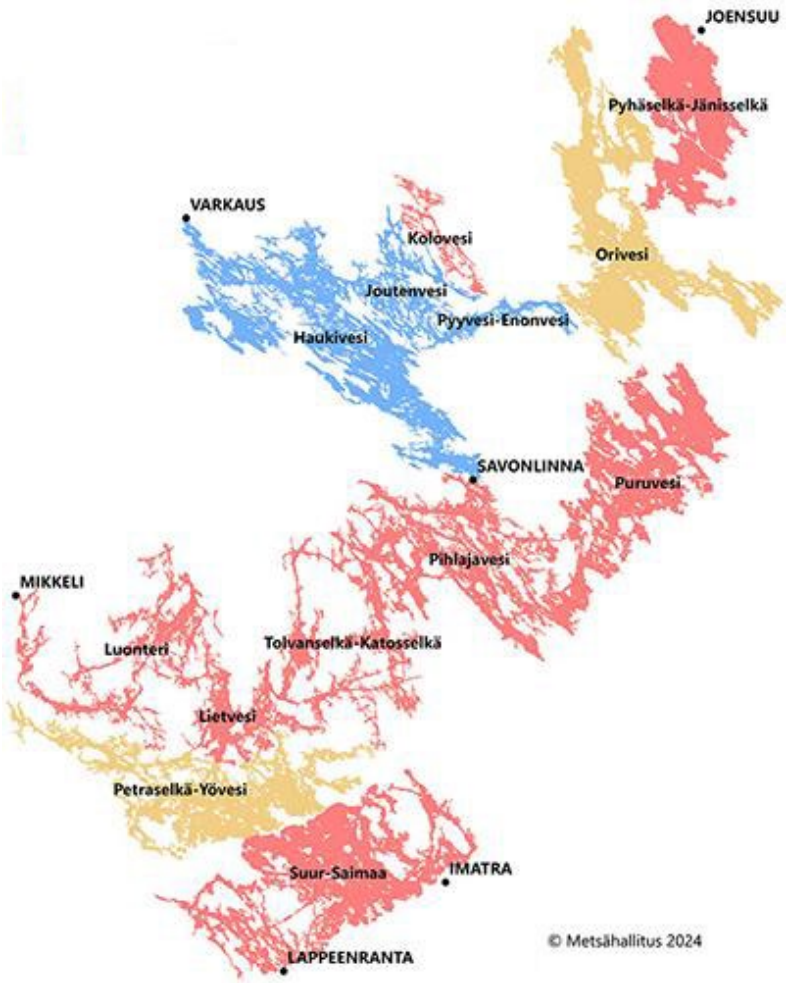

FIGURE 5. REGIONAL POPULATION GROWTH
In relative terms, growth is shown as rapidly increasing (red), increasing (yellow), or decreasing (blue; Metsähallitus 2024).

Kunnasranta *et al.* (2021) summarized other productivity metrics as follows. Saimaa seals typically live 19-23 years, with a generation time of 11 years. Females become sexually mature at 4 years, and males mature 1-2 years later. The gestation period is approximately 11 months, and females generally give birth to one pup annually. Based on this information, we conclude that the Saimaa seal demonstrates positive population

trends that are likely to continue, especially if the high pup and juvenile mortality rates are addressed.

4.3 Spatial Distribution

While the historical range of the subspecies included all of Lake Saimaa, the main distribution is currently limited to 70% of the lake (Kunnasranta *et al.* 2021). Breeding areas have been reduced by 50% (Kunnasranta *et al.* 2021; Figure 6).

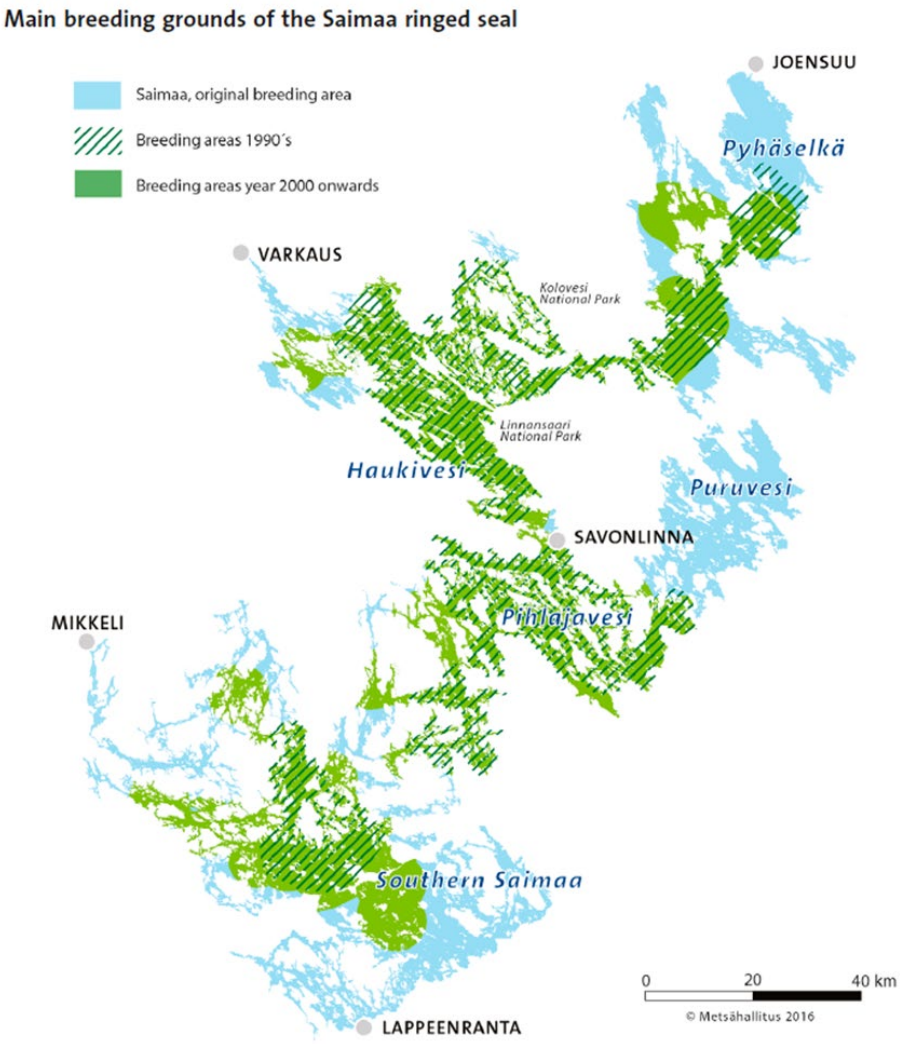

FIGURE 6. HISTORICAL AND CURRENT BREEDING AREAS
Historical breeding areas are shown in blue; current breeding areas are shown in solid green (Metsähallitus 2024).

As described in section 2.3, there is significant population structure within the subspecies because of breeding and haul-out site fidelity. Individuals' ranges generally

do not overlap (Nykänen *et al.* 2024), especially among females in the winter (Niemi *et al.* 2019) when prey availability is reduced. Home ranges are small and further limited by competitive exclusion, avoidance, and/or territoriality. Thus, there is relatively little movement among the regions of the lake.

4.4 Diversity

The Saimaa seal exhibits low genetic diversity, largely due to a hunting-induced population bottleneck in the mid-19th century (Heino *et al.* 2024). While low, genetic diversity and effective population size are higher than would be expected, given the small abundance of the subspecies (Peart *et al.* 2020). As demonstrated by genome sequencing of 145 individuals, the high degree pf population structure likely preserved more genetic diversity than would be expected in a panmictic (*i.e.*, interbreeding) species of a similar size (Löytynoja *et al.* 2023).

Within each region, inbreeding depression is a concern. Between 1991 and 2021, known pup mortalities included 63 stillborn and 97 other pup deaths (Jounela *et al.* 2024). Inbreeding could possibly be reduced by translocation of individuals between regions (Sundell *et al.* 2023). In 1992, a female was translocated from the northwest to the southern region of the lake, and she successfully pupped in 1994. Recent analyses detected genetic intermediaries in the area where she was released (Löytynoja *et al.* 2023), demonstrating reproductive compatibility and the viability of offspring. However, the relative fitness of these offspring is unknown.

5 ESA SECTION 4(A)(1) FACTORS OR THREATS

Section 4(a)(1) of the ESA requires us to determine whether any species is an endangered species or a threatened species because of any of the following factors (16 U.S.C. 1533(a)(1)):

> (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
> (C) disease or predation;
> (D) the inadequacy of existing regulatory mechanisms; or
> (E) other natural or manmade factors affecting its continued existence.

We identified Fisheries Interactions as a manmade factors affecting the species' continued existence. In the sections below, we review the impact of these 4(a)(1) factors or threats on the species. For each threat, we identify the magnitude of the impact on

the subspecies (*e.g.*, high, moderate, low, or unknown) and the trend of the impact (*e.g.*, increasing, decreasing, stable, or unknown). We also identify how the threat impacts the demographic factors described above (*e.g.*, reducing the abundance, productivity distribution, or diversity). Because regulatory mechanisms are intended to reduce the other threats, we address their inadequacy last.

5.1 Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

The Saimaa seal faces present and threated modification and loss of its habitat. The causes of these threats are development, snow loss, and mercury pollution. Development has reduced the available breeding range of the subspecies. Development and snow loss increase pup mortality, which reduces productivity and impacts abundance. Mercury pollution may impair the reproductive and immune potential of individuals. Pollution has decreased in recent years, but development and snow loss have increased. We conclude that habitat loss continues to be a major, increasing threat to the subspecies.

5.1.1 Development and Land/Water Use

Increased construction and development are major threats to the Saimaa seal (Kunnasranta *et al.* 2021). Lake Saimaa is surrounded by six cities and a total human population of nearly 300,000. It has become a major tourism destination, with over 70,000 holiday cottages and plans for 8,000 more as of 2013 (Liukkonen *et al.* 2017). Seals are most vulnerable to disturbance during the breeding season and when hauled-out on land to molt.

Development and increased land use disturb females and pups in their birth lair, resulting in stress and reduced nursing. Liukkonen *et al.* (2017) found that pup mortality is significantly higher (35 to 72%) in areas with numerous buildings and in areas where buildings occur within 800 m of a birth lair. Between 1995 and 2013, the average distance between birth lairs and buildings declined by 167 m, increasing the likelihood of disturbance (Liukkonen *et al.* 2017). The use of snowmobiles also contributes to pup mortality, indirectly from noise disturbance and directly: one of 220 camera-trapped lairs collapsed when run over by a snowmobile (Auttila *et al.* 2014). Due to development, 29% of Lake Saimaa is no longer suitable for rearing pups (Liukkonen *et al.* 2017). However, much of the remaining suitable habitat is protected from development by two national parks, 11 Natura 2000 areas, and other conservation areas (Figure 7; Kunnasranta *et al.* 2021).

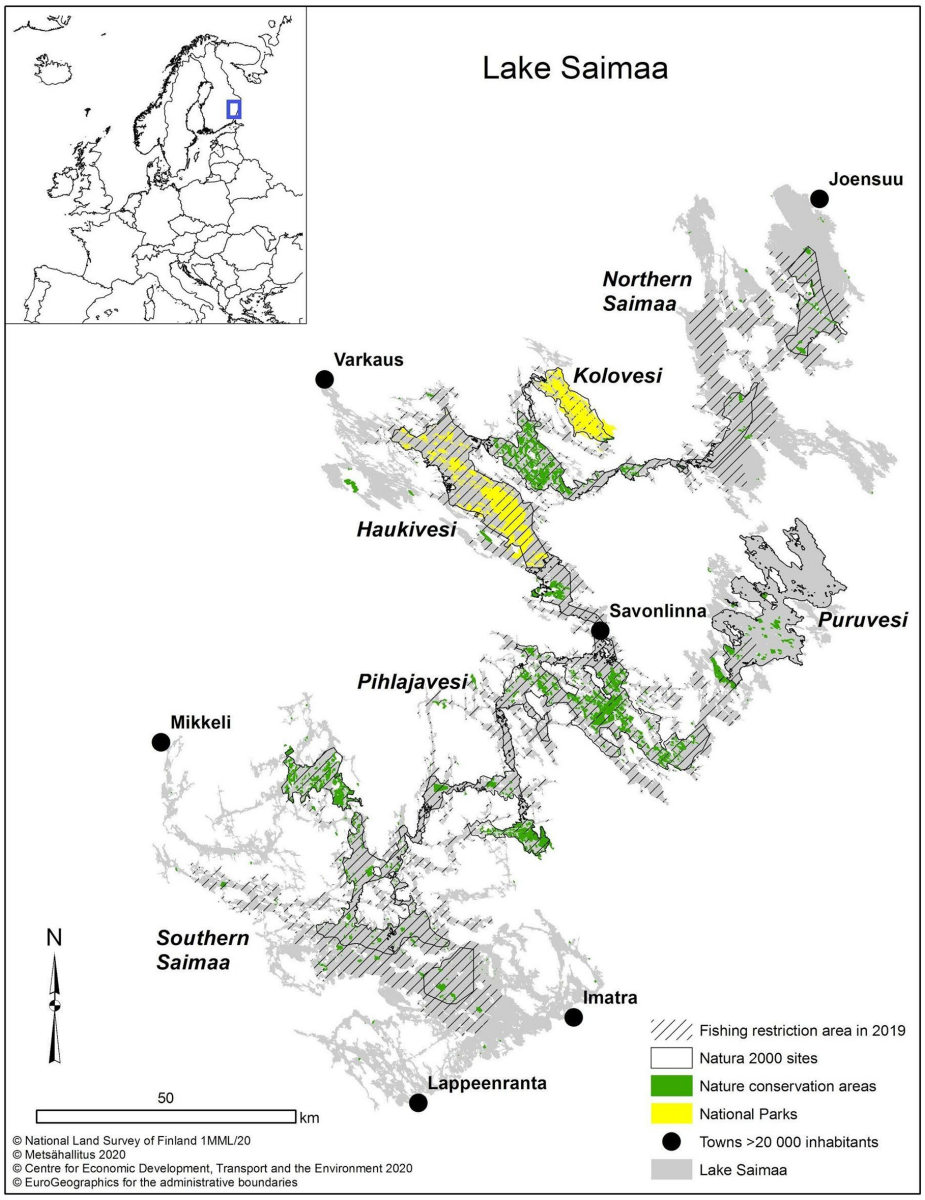

FIGURE 7. PROTECTED AREAS
(Kunnasranta *et al.* 2021)

Vessel traffic also impacts Saimaa seals, directly through strikes and indirectly via disturbance. In a study of 554 carcasses from 1991 to 2021, four seals died due to vessel strike (Jounela *et al.* 2024). Many more seals are impacted by vessel traffic and noise, especially when they haul-out on land during the molting process. Neimi *et al.* (2013a) documented the response of hauled-out seals to approaching vessels. At a

distance of 240 m, half of the seals responded with increased vigilance. At a distance of 150 m, most seals entered the water, interrupting the molting process. With over 1,500 vessels using the lake, such disturbances may increase the length and energetic cost of the molting process (Thometz *et al.* 2021).

In addition to vessel strike and noise, fuel loss poses a threat to the Saimaa seal. Between 1978 and 2014, there were 116 vessel incidents, with 11% resulting in an oil spill (Häkkinen 2016; Halonen *et al.* 2016). Of particular concern are the oiling of breeding areas, especially given the high degree of philopatry, and ingestion of contaminated prey (Sipilä 2016b).

5.1.2 Snow and Ice Loss

The loss of snow and ice cover reduces habitat availability for lairs. Since 1847, temperatures in Finland have increased at almost twice the global rate (Mikkonen *et al.* 2015). Elevated temperatures reduce the duration and thickness of snow and ice cover (Luomaranta *et al.* 2019). During winter 2019–2020, Lake Saimaa lacked sufficient snow cover for birth lairs, and the southern region of the lake did not freeze (Syke 2020). Jakkila *et al.* (2024) predicted that the mean depth of the snowdrifts in 2017-2099 would be half that of those in 1981-2010 and that ice duration would be 1.5 months shorter, melting before pupping season ended. Without the protection of thick snow lairs, pups are exposed to bare ice, resulting in hypothermia, human disturbance, and predation (Kunnasranta *et al.* 2021). After two consecutive winters with reduced snow cover, pup mortality increased to nearly 30% (Auttila 2015).

When snow cover is insufficient for lair construction, volunteers create manmade snowdrifts that mimic natural conditions (Figure 8; Kunnasranta *et al.* 2021). Between 2013 and 2018, more than 300 volunteers built over 1,000 snowdrifts, 75% of which were used by a seal (Meri-Hilkka *et al.* 2018). Over 70% of the pups born during this period were reared in manmade snowdrifts (Meri-Hilkka *et al.* 2018). To prepare for snow and ice-free winters, biologists are experimenting with floating shelters (Auttila *et al.* 2017) and artificial liars made with reeds (Metsähallitus 2018). As of 2021, two pups have been born in such artificial liars (Kunnasranta *et al.* 2021).

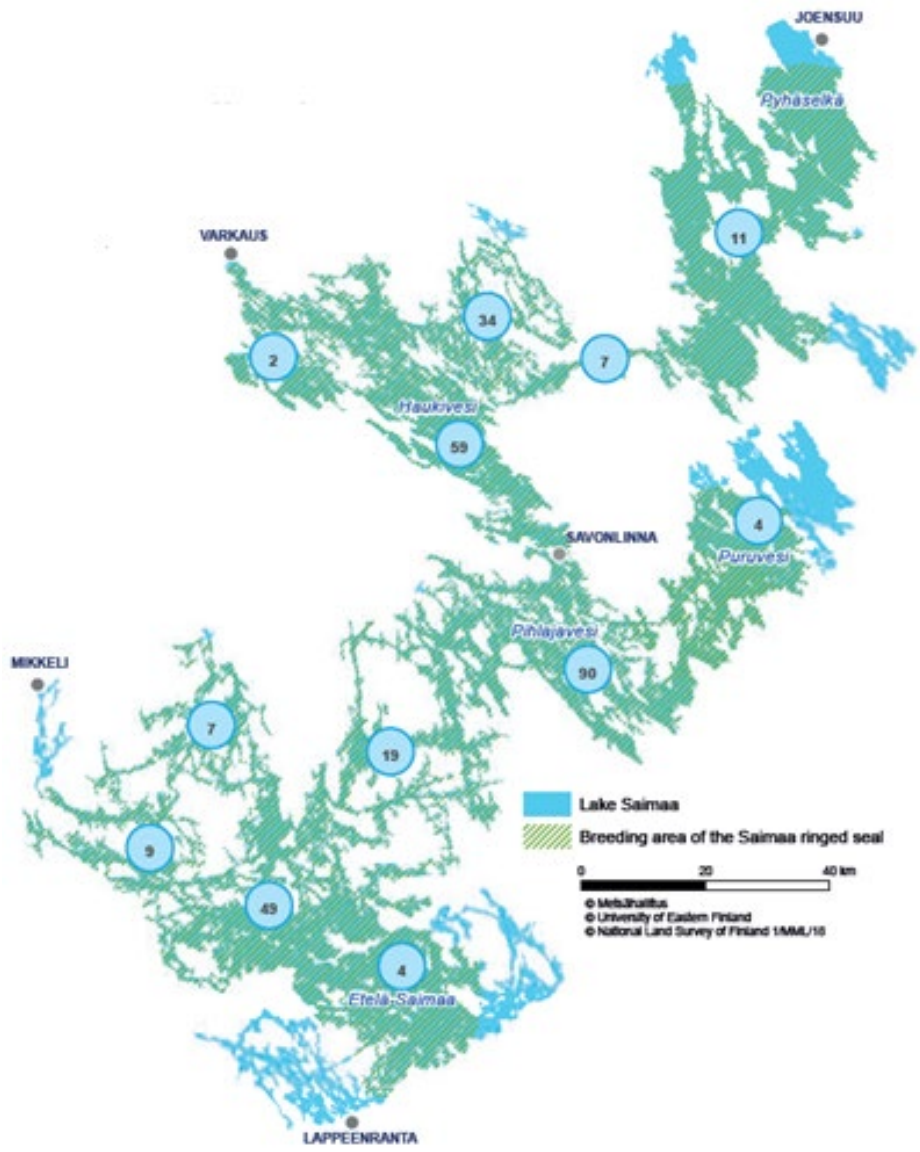

FIGURE 8. MANMADE SNOWDRIFTS IN 2018
Number in circles represents the number of snowdrifts built by volunteers (Metsähallitus 2018).

5.1.3 Mercury Pollution

Mercury is a neurotoxin that is also associated with immune and reproductive system impairments (Levin *et al.* 2020; Peterson *et al.* 2023). Local clearcutting practices may result in mercury-contaminated runoff entering the lake (Lyytikäinen *et al.* 2015). Until it was banned in the 1970s, mercury was commonly used in wood pulping and papermaking industries near Lake Saimaa. In the 1970s, Saimaa seals exhibited the highest concentrations of mercury in pinnipeds, up to 510 µg/g (Kari and Kauranen

1978). Simola *et al.* (2024) detected mercury in all tissues sampled from Saimaa seals between 2014 and 2023. In older pups, levels detected (>0.1 µg/g) are associated with neurobehavioral changes (Simola *et al.* 2024). Simola *et al.* (2024) did not find a correlation between stillbirth and mercury concentration. However, adult levels of mercury (>0.4 µg/g) surpassed the threshold associated with neurochemical changes and impacts to reproduction. The higher levels of mercury in adults likely reflect bioaccumulation and biomagnification of mercury in aquatic food chains. Relatively high levels of mercury were detected in perch, one of the subspecies' main prey (Simola *et al.* 2024).

5.2 Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial purposes in the mid-19th century was the primary cause of the precipitous decline in the subspecies. The Saimaa seal had been hunted for 6,000 years, as demonstrated by seal remains associated with prehistoric settlements (Ukkonen 1993). It was hunted for meat, oil, and leather, especially to make gloves. In 1955, laws were passed to protect the remaining 250 seals. Subsequently, a few cases of illegal hunting were reported, but the last known case was in 1982 (Sipilä 2016a). Hunting is no longer a threat to the species.

Molting seals are the focus of an active seal-watching industry. The presence of humans increases seals' vigilance, alters their behavior, and could alter the length and energetic cost of their molting process (Paterson *et al.* 2012; Niemi *et al.* 2013a). However, seal-watching has also benefited local conservation efforts by changing attitudes toward the seals (Kunnasranta *et al.* 2021). Therefore, we conclude that, on balance, tourism is a minor threat to the species.

5.3 Disease or Predation

Disease and predation are minor but increasing threats to the Saimaa seal. Disease has the potential to reduce abundance through mass mortality events, which have occurred in other landlocked seal species (Kunnasranta *et al.* 2021). Predation increases the already high pup mortality rate.

In a study of 554 carcasses from 1991 to 2021, two Saimaa seals died from cancer (Jounela *et al.* 2024). No additional information is available on these cases.

Saimaa seals are infected by numerous microbes and parasites. Microbial diseases include swine erysipelas, caused by the bacterium *Erysipelothrix rhusiopathiae*, and

joint infections caused by *Streptococcus* and *Staphylococcus* spp. (M. Isomursu in Kunnasranta *et al.* 2021).

Saimaa seals host several internal parasites, including: the spiny-headed worm, Corynosoma magdaleni (Nyman *et al.* 2019, 2021; Sromek *et al.* 2023); a tapeworm, (*Ligula intestinalis*, which normally infects birds); and a lung nematode, likely *Parafilarioides gymnurus* (M. Isomursu in Kunnasranta *et al.* 2021). They also host the Saimaa seal louse, an ectoparasite (Sromek *et al.* 2024). Elevated temperatures allow pathogens to spread quickly to novel areas and species (Kunnasranta *et al.* 2021). This is of concern for Saimaa seals, whose immune potential may be reduced by elevated mercury levels and reduced genetic diversity.

Elevated temperatures also reduce the thickness and duration of snow lairs, exposing pups to novel predators. Predation was the known cause of death for five pre-weaned pups from 1991 to 2021 (Jounela *et al.* 2024). During mild winters with insufficient snow for lair construction, red foxes (*Vulpes vulpes*) and the invasive raccoon dog (*Nyctereutes procyonoides*) prey on pups. On open ice, large birds such as herring gulls (*Larus argentatus*) and ravens (*Corvus corax*) also prey on small pups.

5.4 Fisheries Interactions

Interactions with fisheries are the greatest threat to the Saimaa seal. They include bycatch, entanglement in gear, and conflict with fishers. Bycatch and entanglement often result in death and are the most common causes of mortality, especially for weaned pups and juveniles. Despite spatial and temporal bans on gillnets, this threat remains high. Conflict with fishers may restrict efforts to address this threat.

In a study of 554 carcasses from 1991 to 2021, fishing caused the death of 163 seals via bycatch (n = 142) and entanglement in fishing gear (n = 21). Excluding carcasses with an unknown cause of death (n = 186), fishing accounted for 83% of known-cause deaths during this 30-year period. However, for every carcass recovered, an estimated 1.8 carcasses were not. Based on these data, Jounela *et al.* (2024) estimated an average bycatch mortality of 15 seals/year (range = 10-23). They concluded that such levels of bycatch increase the subspecies' risk of extinction (Jounela *et al.* 2024). For example, in 2021, estimated bycatch mortality (15.88 seals) was six times higher than

the potential biological removal[1] for the subspecies, 2.48 seals (Jounela *et al.* 2024). Fisheries mortalities appear to continue. In 2023, there were nine known non-pup fishing-related mortalities, the highest in the past decade (Figure 9; Metsähallitus 2024).

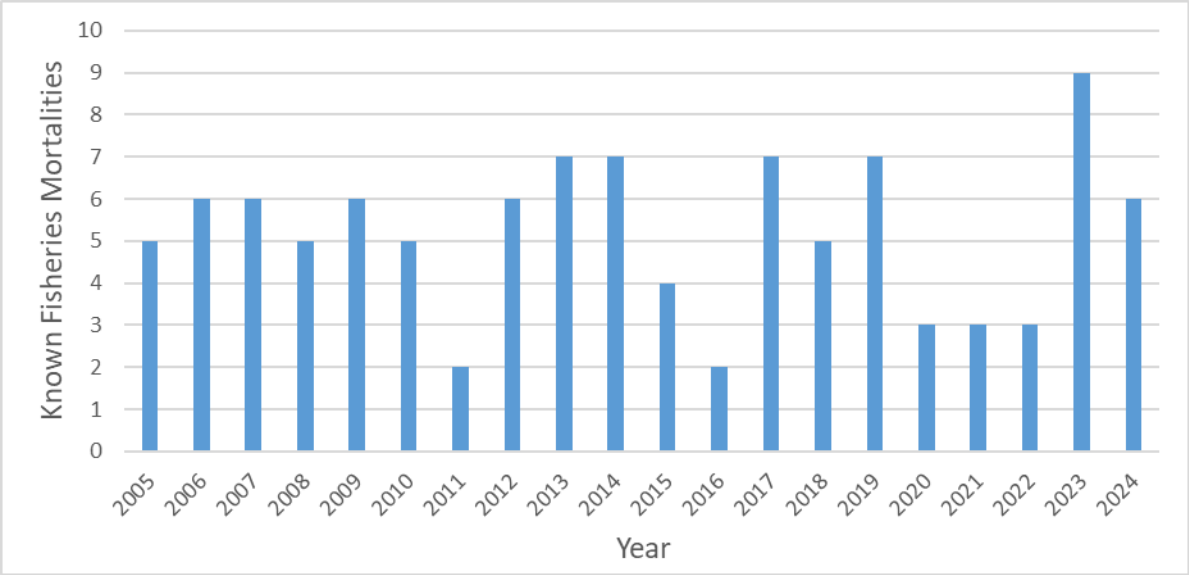

FIGURE 9. KNOWN NON-PUP FISHING-RELATED MORTALITIES (Metsähallitus 2024)

The majority (90%) of bycatch mortality is caused by gillnets, which are left unattended for several days (Jounela *et al.* 2024). Weaned pups and juveniles (up to 15 months of age) are especially susceptible to bycatch mortality (Jounela *et al.* 2024). They become entangled and drown in these nets. Prior to springtime gillnet bans, the highest rates of bycatch mortality occurred between May and July, during the first and second year of life. These peaks reflect the relative inexperience of weaned pups and juveniles, their high energy needs after their molt, and the increased likelihood of encountering nets and/or interactions being reported due to seasonal tourism (Jounela *et al.* 2019).

To address fisheries interactions, Metsähallitus and local organizations introduced gear modifications, provided public education, and enacted temporal and spatial fisheries closures. As of 2010, 95% of birth lair sites were located within areas subject to a springtime gillnet ban from April 15 to June 30 (Jounela *et al.* 2024). Jounela *et al.* (2019) concluded that these restrictions prevented the mortality of 60 juveniles under the age of 15 months, contributing to the 20% increase in abundance between 1991

[1] Potential biological removal refers to the maximum number of individuals that may be removed from a marine mammal population, not including natural deaths, while allowing it to maintain or recover to its optimum sustainable population size.

and 2013. However, gillnet fishing resumes in July, which has since become the peak month for bycatch mortality, with a second peak in February or March (Jounela *et al.* 2019, 2024). Jounela *et al.* (2024) estimated that an additional 13 seals would have survived in 2021 if there had been a year-round gillnet ban.

Gillnets are the most common gear used by 49,000-400,000 recreational and 30-40 commercial fishers in Lake Saimaa (Jounela *et al.* 2024). These fishers target some of the same species as seals (*e.g.*, perch and vendace). However, Autilla *et al.* (2015) found that seals consumed vendace only when abundant, and despite beliefs, there was little competitive overlap between seals and fishers. The major conflict is opposition to fisheries restrictions (Tienhaara *et al.* 2024). Based on a review of local newspaper articles (n = 357) and interviews with local stakeholders (n = 29), this conflict declined between 2011 and 2016 (Jaakkola *et al.* 2019). However, a more recent survey indicated that fishers still oppose key conservation efforts. Based on a survey of 1,487 Finnish adults, extending the ban on gillnet fisheries through July was acceptable to all respondents except fishers (Tienhaara *et al.* 2024). While most respondents supported higher levels of conservation, fishers were opposed to limiting building sites, restrictions on recreational access, and moderate seal population increases (Tienhaara *et al.* 2024).

5.5 Inadequacy of Existing Regulatory Mechanisms

Finland has passed laws and established protected areas to conserve the Saimaa seal and its habitat (Appendix). These efforts have been mostly effective, as described in section 7. However, the regulatory mechanisms intended to address fisheries interactions do not adequately reduce the threat. The current springtime ban on gillnets does not include the months of February, March, and July, when the most bycatch mortalities occur (Jounela *et al.* 2019, 2024). While the ban is required within 5 km^2 of birth lairs, it may not protect juveniles that can travel substantial distances after weaning, with ranges up to 162 km^2 (Niemi *et al.* 2013b). Therefore, the ban is spatially and temporally insufficient.

6 RECOVERY PLAN

Section 4(f)(1) of the ESA requires us to develop and implement recovery plans for listed species, unless such a plan will not promote the conservation of the species (16 U.S.C. 1533(f)(1). We prioritize the development and implementation of plans for species that are most likely to benefit from such plans (16 U.S.C. 1533(f)(1)(A)). In each plan, we describe site-specific management actions; objective, measureable criteria to

delist the species; and time estimates to achieve intermediate steps and the final goal of survival and conservation (16 U.S.C. 1533(f)(1)(B)).

For the Saimaa seal, we did not develop a recovery plan because such a plan is not likely to promote the conservation of the species. It exists solely in foreign waters, and the United States does not contribute to the threat of the species.

7 EFFORTS TO PROTECT THE SPECIES

Section 4(b)(1)(A) of the ESA requires us to make our determinations based solely on the best scientific and commercial data available at the time of the review and after taking into account efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species, whether by predator control, protection of habitat and food supply, or other conservation practices, within any area under its jurisdiction, or on the high seas to protect the species (16 U.S.C. 1533(b)(1)(A). Most protective efforts were established decades ago and evaluated in past reviews. Here we focus on recent efforts to protect the species (Appendix).

In 2023, Finland updated its Nature Conservation Act of 1996. Similar to the ESA, it prohibits the capture, killing, and disturbance of protected species, including the Saimaa seal. Local authorities are responsible for protecting biodiversity in their region. This law requires status reviews of species and their habitat. It allows the development of conservation plans, protective regulations, and the protection of habitat. It is not clear if this update will further reduce threats to the subspecies, but previous protections (such as the law against hunting) have been effective.

The Saimaa Seal LIFE project was implemented from 2013 to 2018 and cost €5.3 million provided by the European Union, Finland Ministry of the Environment, and two foundations. This project initiated and continued numerous projects to protect the subspecies (Metsähallitus 2018), including:

- produced information to guide conservation efforts
- promoted education and outreach to targeted groups
- provided guidance to reduce disturbance by vessels and snowmobiles
- developed seal-friendly fishing gear
- updated the Saimaa seal conservation strategy and action plan
- improved surveillance and monitoring or seals and human activities, including volunteer photo-identification and patrol networks

- organized the construction of artificial dens (Meri-Hilkka *et al.* 2018)

Much of the species' range is protected from future development (Figure 7). Sipilä (2003) estimated that approximately 95% of birthing lairs are located within Natura 2000 areas. Two national parks (Linnasaari and Kolovesi) and other conservation areas also protect habitat from development. Snow loss is being addressed through the creation of artificial lairs and snowdrifts.

These efforts have had a positive on the subspecies, especially in protecting it from hunting since 1955 and improving public opinion since 2011 (Jaakkola *et al.* 2019).

8 SYNTHESIS

In 1993, the Saimaa seal was listed as an endangered species under the ESA. Since then, the name of its genus has changed from *Phoca* to *Pusa*. We recommend changing the listed entity under the ESA to reflect this change; this would require a direct, final rulemaking.

The Saimaa seal has a total estimated abundance of 495 non-pups, which represents a 10% increase since the previous review (Conant *et al.* 2018). The subspecies is endemic to landlocked Lake Saimaa in Finland. While it occurs throughout the entire lake, 29% of its habitat is no longer suitable for breeding habitat, due to overdevelopment. Historically, overutilization for commercial purposes reduced the Saimaa seal's abundance and genetic diversity.

Fisheries interactions (including bycatch and entanglement) pose the greatest threat to the subspecies, resulting in relatively high mortality rates of weaned pups and juveniles. Gillnets cause the majority (90%) of bycatch mortality, and a springtime gillnet ban has been enacted from April to June within 5 km^2 of birth lairs. This ban contributed to the 20% increase in abundance between 1991 and 2013. However, the ban does not include the peak months for bycatch mortality (February, March, and July), and juveniles' ranges far exceed the spatial restrictions. Therefore, such regulatory mechanisms do not adequately reduce the threat of fisheries interaction.

Saimaa seals depend on thick snow cover for haul-out and birth lairs, the latter of which protect pre-weaned pups from hypothermia, predation, and human disturbance. Thus, snow loss is a major threat to the subspecies that reduces pup survival. In recent years, volunteers have created artificial snowdrifts and lairs to mitigate this threat, but it is not

clear how this mitigation will address snow-free and ice-free winters as a result of continually increasing temperatures.

Since the previous review, Finland has updated protections for the subspecies (*e.g.*, continuing to protect it from overutilization and its habitat from development), coordinated efforts to construct the artificial lairs, and promoted conservation messages. These efforts have helped to protect the subspecies, but they have not changed its endangered status. The Saimaa seal remains listed as endangered under the International Union for the Conservation of Nature Red List.

In summary, the best scientific and commercial data available since the previous review demonstrate that the subspecies continues to be in danger of extinction throughout its range. While progress has been made, bycatch mortality remains the greatest threat to the species. Habitat loss is also a high and increasing threat. Low-level but emerging threats include tourism disturbance, disease, and predation. Therefore, we do not recommend reclassification at this time.

9 RESULTS

Based on the best available scientific and commercial data, the Saimaa seal continues to be an endangered species because numerous threats (Table 2).

TABLE 2. SUMMARY OF ESA SECTION 4(A)(1) FACTORS OR THREATS
Magnitude and trend of each threat and how it impacts the species.

Threat	Magnitude	Trend	Impact to Species
Habitat	High	↑ Increasing	Abundance, productivity, spatial distribution
Overutilization	Low	↔ Stable	Productivity
Disease/Predation	Low	↑ Increasing	Productivity
Regulatory Inadequacy	Moderate	↔ Stable	Abundance, productivity
Fisheries Bycatch/Entanglement	High	↔ Stable	Abundance, productivity

9.1 Recommended Classification

_____**Downlist to Threatened**
_____**Uplist to Endangered**
_____**Delist**
_____*Extinction*
_____*Recovery*
_____*Original data for classification in error*
__X__**No change is needed**

10 RECOMMENDED FUTURE ACTIONS

We recommend the following future actions to protect and conserve the species. Completion of these recommendations is not required, and the results of subsequent reviews are not dependent on the completion of these recommendations.

10.1 Highest Priority Future Actions

- Extend the ban on gillnet fishing in Lake Saimaa (Jounela *et al.* 2019, 2024).
- Involve fishers in conservation planning to minimize conflict (Tienhaara *et al.* 2024)
- Develop additional fishing gear modifications including acoustic deterrents, escape panels, or modifications to increase net visibility (Hamilton and Baker 2019)
- Continue building snowdrifts and conducting research into other materials for artificial lairs (Meri-Hilkka *et al.* 2018)

10.2 Other Recommended Future Actions

Although not a high priority to protect or recover the species, we recommend changing the scientific name of the listed entity to *Pusa hispida saimensis* to correct the synonymy of the current ESA listing.

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12 APPENDIX

TABLE 3. REGULATORY MECHANISMS

Regulatory Mechanism, Year	Description
Finland Nature Conservation Act, 2023	Prohibits the capture and killing, as well as the intentional disturbance (especially when resting, breeding or migrating) of protected species. Requires monitoring of the status of threatened species and habitats. Holds local authorities responsible for protecting biodiversity in their region. Allows the development of specific conservation plans or programs that to leverage regulations for species protection. Allows the designation of national parks and nature reserves, within which is it illegal to kill, capture or disturb wildlife. Allows protected areas as required by the E.U. Habitats Directive. Regulates the international trade in threatened species. Requires consideration of threatened species when zoning and planning for development and construction. Recommends adhering to the precautionary principle in nature conservation and decision-making.
Finland Decree 374 on Fishing Restrictions in Lake Saimaa, 2021–2026	Bans springtime gillnet fishing from 15 April to 30 June within 5 km^2 of birth lairs. Requires renewal every 5 years.
Act on Trade in Seal Products, 2020	Controls the trade in seal products.
Finland Fishing Act, 2015	Prohibits fishing gear that could be detrimental to threatened species, restricts the size of nets, traps, longlines and other types of fishing gear.
Environmental Protection Act, 2014	Requires onitoring and control of pollution in Finland.
EU Water Framework Directive, 2000.	Requires member nations to maintain water quality, restrict pollution and restore contaminated water bodies.
European Union Habitats Directive, 1992	Established the Natura 2000 network of protected areas. Prohibits the destruction or deterioration of

Regulatory Mechanism, Year	Description
	any Saimaa seal habitats, breeding sites, or resting places (Figure 7).
Act 44/1976 on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1976	Enacted Finland's obligations under CITES.