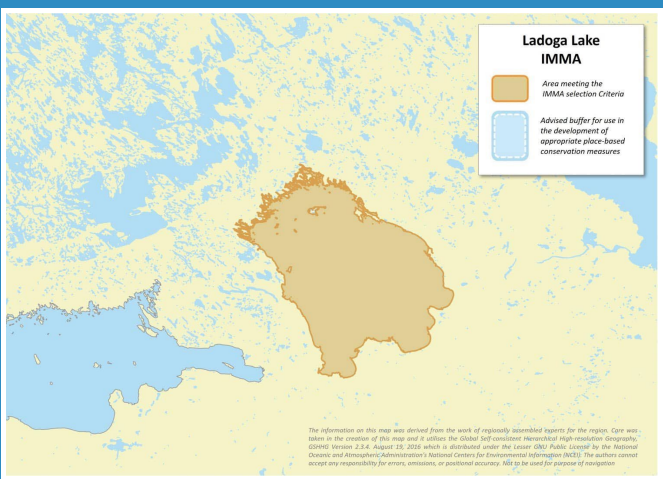

Area Size

17,527 km²

Qualifying Species and Criteria

Ladoga ringed seal – *Pusa hispida ladogensis*

Criterion A; B (1,2); D (1)

Summary

The Lake Ladoga IMMA in Russia encompasses the primary habitat for the Ladoga ringed seal, a freshwater seal subspecies (*Pusa hispida ladogensis*), which is a relic from the glacial era. The subspecies seems to still have some very limited genetic exchange with the Baltic subspecies although the frequency of inter-breeding is unknown. The Ladoga ringed seal population is largely confined to Lake Ladoga and the population is currently considered stable with around 6,000 animals which is 13-49% fewer than in the mid-20th century. The subspecies is affected by climate change, by-catch in fishing gear, recreational use of the region and industrial development.

Ladoga Lake IMMA

Description:

Lake Ladoga, situated in Russia near the Finnish border, ranks among the world's largest freshwater lakes. Its dimensions include a maximum length of 219 km, a width spanning 138 km, and a vast surface area covering 17,700 km². The lake is demarcated from the Baltic Sea by the Karelia Isthmus. With approximately 660 small islands scattered across its expanse, the largest of these is the Valaam Archipelago, serving as a habitat for substantial Ladoga ringed seal (*Pusa hispida ladogensis*) populations. The lake's depth exhibits notable variations, ranging between 70 and 230 m in the northern part and between 20 and 70 m in the southern areas. A well-defined boundary between these two regions is positioned approximately at the lake's center. Particularly noteworthy is the skerries region in the north, standing apart due to its unique environmental conditions. Comprising a collection of granite islands and islets along an intricately indented coastline, these skerries largely remain uninhabited, while several human settlements are along the mainland coast.

Figure 1: Ladoga ringed seals (*Pusa hispida ladogensis*) hauling out on the islands of Valaam Archipelago in Ladoga Lake IMMA. Photo credit: Sergey Petrov / ICPO Biologists for Nature Conservation

Figure 2: Ladoga ringed seal (*Pusa hispida ladogensis*) hauling out on the islands of Valaam Archipelago in Ladoga Lake IMMA. Photo credit: Polina Bakunovich / ICPO Biologists for Nature Conservation

Criterion A: Species or Population Vulnerability

The Ladoga ringed seal (*Pusa hispida ladogensis*) is listed as vulnerable (Criterion A2b) on the International Union for Conservation of Nature (IUCN) Red List (Sipilä, 2016b). It is endemic to Lake Ladoga, Russia. The population is currently roughly 6,000 seals, but earlier estimates were much lower in past decades (Sipilä, 2016). It is unclear why former and current population estimates diverge as much as they do, but more current estimates are consistent independent of the used methodology (Trukhanova et al., 2013; Bizikov et al., 2022). The population faces multiple threats including climate change which is reducing the availability of ice-breeding habitat especially during warmer winters (Trukhanova, 2013; Bizikov et al., 2022), development of coastal areas mainly for recreation (Savelieva & Tolstoguzova, 2008; Nikiforov et al., 2019), and bycatch in fisheries (Trukhanova et al., 2012; 2021).

Criterion B: Distribution and Abundance Sub-criterion B1: Small and Resident Populations

The Ladoga ringed seal subspecies population is estimated at approximately 6,000 individuals. Calculations underscore that over the course of the past three generations, the population has undergone a reduction estimated as from 13% to 49% (Sipilä, 2016b).

The subspecies is resident year-round in the freshwater lake of Ladoga, Russia. The subspecies is pagophilic (ice-breeding) and gives birth in late February and early March. Ladoga ringed seals construct breeding lairs in snowdrifts, primarily within the zone of ice hummocks and ridges of fast ice. Additionally, in the northern region of Lake Ladoga, these seals utilize snowdrifts that accumulate near the coasts of islands or islets (Kunnasranta et al., 2001).

Figure 3: Ladoga ringed seals (*Pusa hispida ladogensis*) mother and lanugal pup observed during an atypically mild winter/spring time, where the pup was born and nursed on land rather than in snow lairs on ice. Photo credit: Anna Loseva

The Ladoga seal primarily utilizes two crucial breeding areas: the open expanse of Lake Ladoga and the skerry region situated in its northern part (Kunnasranta et al., 2001; Agafonova et al., 2007). It is estimated that approximately 80% of the population reproduces in the central part of the lake, while the remaining 20% reproduces in the skerry region (Medvedev & Sipilä, 2010).

The distribution of the seals during the winter and spring is intricately linked to ice conditions. In milder springs, their distribution is more concentrated as they congregate in shallow areas where fast ice forms. These areas include Shlisselburg Bay and Volkhov Bay in the southern sector of the lake, Svir Bay, and the Olonetsky Nature Reserve in the southeast, as well as the straits within the skerry region in the northern part of the lake. The significance of skerries in their habitat seems to be growing due to climate change and the reduction of seasonal ice cover. For instance, an abnormally warm spring in 2020 led to the discovery of approximately 400 individuals in the post-breeding period within the Nizhne-Svirsky State Nature Reserve (Svir Bay) (M.A. Antipin, pers. comm.). In 2020 terrestrial pupping conditions were observed for the first time when a pup was being nursed on an island coast within the skerry region of Lake Ladoga (Loseva et al., 2022).

In colder winters and springs with better ice conditions, the seal distribution becomes more extensive, encompassing the central part of the lake as well (Agafonova et al., 2007; Trukhanova et al., 2013). The presence of commercial and amateur fishermen, however, has disrupted seal behaviour, leading them to use ice located farther from the coast (Trukhanova et al., 2013). Notably, the reduction of ice due to climate change poses a significant

threat to the population, and the distribution of fishermen on the ice further influences the seals' distribution.

Ladoga seals feed mainly on smaller schooling fish and are feeding generalists. They feed locally around the haul outs, but can travel longer distances. The Ladoga ringed seals mainly feed in Lake Ladoga occasionally entering river mouths following fish concentrations. Since few telemetry studies have been carried out there is not much information about feeding areas. The only adult seal (male) tagged in the southern part of the Ladoga Lake in early November remained in coastal areas of Volkhov Bay and river estuaries during the open-water period (with depths up to 40 m). After the beginning of fast ice formation in mid-January, the seal moved to Svir Bay and stayed in deeper waters (with depths up to 60 m) (Glazov et al., 2019).

Sub-criterion B2: Aggregations

The Lake Ladoga region covers an area of approximately 18,000 km^2. The Ladoga seal is distributed throughout the entirety of Lake Ladoga. During the open-water season, their common behaviour involves hauling out on the coasts of islands and near-shore rocks, known as "ludas," where they gather in substantial aggregations. These key sites include various islands in the eastern part of the Valaam Archipelago (Sipilä, 2002; Agafonova et al., 2007, 2010), the Zapadnyi Archipelago, Konevets Island, and several islands in the skerry region located in the northern part of the lake (Agafonova & Sokolovskaya, 2018). These specific areas, which host the majority of the population during the open-water season, hold critical importance for the seal population, especially in light of the increasing prevalence of recreational and other human activities along the coasts.

Figure 4: Lanugal pup of Ladoga ringed seal (*Pusa hispida ladogensis*) was born and nursed on land rather than in snow lairs on ice during an atypically mild winter/spring time.
Photo credit: Anna Loseva

Figure 5: Ladoga ringed seal (*Pusa hispida ladogensis*) yearling.
Photo credit: Anna Loseva

Figure 6: Ladoga ringed seals (*Pusa hispida ladogensis*) hauling out on the islands of Valaam Archipelago in Ladoga Lake IMMA.
Photo credit: Sergey Petrov / ICPO Biologists for Nature Conservation

Figure 7: Ladoga ringed seals (*Pusa hispida ladogensis*) haul-out groups in Ladoga Lake IMMA. Photo credit: Anna Loseva

Throughout the open-water season, the seals utilize permanent haul-out sites situated on rocky shores, treeless islets, or rocks within the water (Agafonova et al., 2007a). The Valaam Archipelago (comprising Sosnovye and Krestovye islands, and Palinsary Island) and the Zapadnyi Archipelago (encompassing Vossinansaari, Myukkerike, and Yalansaari islands) has been identified as the most important haul-out location. In the skerry region, these haul-out sites are primarily used by seals toward the end of the moulting period when fast ice has receded (typically in April and May) (Ulichev & Dudakova, 2016). During the summer months, seals may also occupy some islands in the skerry region (Loseva et al., 2021). The southern part of Lake Ladoga remains relatively underexplored in terms of haul-out sites, with limited scientific data available since the mid-20th century (Sokolov, 1958). Nonetheless, there are reports and videos documenting modern haul-out sites on Sukho Island.

In the autumn months, they forage in the open water areas, exhibiting a preference for regions with high fish biomass. As soon as the ice begins to form, the seals typically follow the ice edge, carefully selecting wintering habitats. To accommodate their breathing and resting needs, they create and maintain a network of water access holes in the ice, and they establish snow lairs either on the fast ice or in nearshore zones. These lairs serve various purposes, including pupping and resting. In the spring, the entire population converges on the remaining ice fields as part of their annual moulting process, which they subsequently complete on the coast once the ice has completely disappeared.

Criterion D: Special Attributes
Sub-criterion D1: Distinctiveness

The Ladoga ringed seal consists of a small, genetically distinct population (Berta & Churchill, 2012), and they are primarily isolated both geographically and genetically from their related subspecies: the Arctic ringed seal (*Pusa hispida hispida*), the Baltic ringed seal (*Pusa hispida botnica*), and the Saimaa seal (*Pusa hispida saimensis*). Furthermore, morphometric studies have highlighted the distinctiveness of Ladoga seals from the Baltic and Saimaa seal populations (Hyvarinen & Nieminen, 1990; Amano et al., 2002). Their unique adaptation to a freshwater environment sets them apart from other pinnipeds, which are predominantly marine species. As highly adapted apex predators in a land-locked ecosystem, which is atypical for marine mammals, Ladoga seals offer a rare example of pinniped adaptability and resilience under extreme conditions. Ladoga Lake, in turn, serves as an isolated model water body, providing scientists with a unique opportunity to study seal adaptations in the face of changing climate conditions and anthropogenic impacts, albeit on a smaller scale compared to the entire polar regions.

Supporting Information

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PDF made available for download at ***https://www.marinemammalhabitat.org/factsheets/ladoga-lake-imma/***