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Occurrence of Twins in Saimaa Ringed Seals

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Pinnipeds typically give birth to a single pup, and twins are extremely rare primarily due to the high energetic costs of lactation that favor single pup rearing (Spotte 1982). The rate of twin pregnancies in pinnipeds has been estimated to be very low, ranging from 0.1% to 0.4%, based on studies conducted across various species (Fay et al. 1991; Gelatt et al. 2001; Schultz et al. 2011; Bonin et al. 2012). These rare twin births are of particular interest because they can provide insights into the species' reproductive biology, energy investment, and survival strategies, which are optimized for single offspring production in the often harsh and resource-limited environments.

The Saimaa ringed seal (*Pusa saimensis*), recently recognized as a distinct species (Society for Marine Mammalogy 2025; Löytynoja et al. 2025), is an endangered seal endemic to Lake Saimaa in Finland, with an estimated population of around 500 individuals (Metsähallitus 2025). The primary threats to this small population are related to high incidental by-catch mortality mostly by gillnets of recreational fishermen, low genetic diversity, and the impacts of climate change (Kunnasranta et al. 2021). The landlocked population is closely monitored through annual pup counts (Sipilä 2003) and photo-identification, which relies on permanent unique hair patterns to track individual seals (Koivuniemi et al. 2016). In addition, placentophagia does not occur in pinnipeds (Kristal et al. 2012), which enables collection of placentas from a seal's birth site for varied research purposes (Auttila et al. 2014; Valtonen et al. 2015; Simola et al. 2024).

Here we report on the occurrence and survival of putative twins (hereafter referred to as twins) in free-ranging Saimaa ringed seals. These observations were recorded as incidental findings during population monitoring. The study was conducted over a period from 2009 to 2025 in Lake Saimaa (61°05′ N, 27°15′ E to 62°36′ N, 30°00′ E), Finland. The lake is about 180 km long and 140 km wide, with a mean depth of 12 m and consists of nine conjunct water basins. Saimaa ringed seals excavate lairs in snowdrifts along shorelines of islands and islets, where they rest, give birth in February to March, and nurse their young for ca. 2.5 months (e.g., Sipilä 1990; Kunnasranta et al. 2021). The seals' lairs were annually surveyed during the late nursing season in April to estimate the number of pups born and total population size. Since 2011, following each lair census, the underwater areas around birth lair sites have been surveyed by divers to collect placentas and dead pups (see details Auttila et al. 2014). Mother-pup pairs were photographed or caught on camera traps whenever possible during nursing. Since 2016 systematic photo-id surveys have been carried out throughout the lake by boat surveys and camera traps during the annual molting season in May. The seals were identified individually from photographs based on individually unique hair patterns, which are visible following the first molt of their lanugo at the age of 2 months (see details in Koivuniemi et al. 2016). Data of this study were collected under permits from the Finnish environmental authorities.

Five cases of twins out of 1216 births were observed during a 16-year study in Lake Saimaa, and since 2014 placentas have been recovered for 56% of the observed pups. The number of observed pups born have grown gradually from 44 in 2009 to 112 pups in 2025. Observations of twins were confirmed either by the presence of two placentas at a birth lair site or by visual observations of the female nursing two pups (Table 1 and Figure 1). During the study period, natal pup mortality rate of twins was 30% (three observed dead out of 10 twin pups), and among all other pups observed it was 13% (159 observed dead out of 1211 pups). From field observations during the nursing season, in two

TABLE 1 | Descriptive data on putative twins of Saimaa ringed seals during 2009–2025.

Year	Location	Female	Observed nursed pups	Number of placentas/ dead pups found	Survival after weaning
2009	Pihlajavesi	Phs076	2	2/0	Phs045: observed 2009–2024, the first pup 2015 Phs068: no observations
2014	Pihlajavesi	Phs147	1	2/1	Unknown
2017	Pihlajavesi	Phs168	2	1/0	Phs300: observed in 2018 Phs301: no observations
2018	Joutenvesi	Unknown	1	2/1	Unknown
2025	Pihlajavesi	Unknown	1	2/1	Unknown

Note: Identified females and pups have individual codes (Phs) in the Photo-ID database.

FIGURE 1 | Female Saimaa ringed seal (Phs168) nursing likely twin pups (Phs300 and Phs301) 18 May 2017.

cases both pups were alive until weaning and in three cases only one was alive.

Based on photo-id records, of the two pairs of twins that were observed alive until weaning, one pup from each pair has been seen alive after weaning. The female pup Phs045 has been photographed since 2009, and it has given birth to at least one pup within 3.6 km from its natal site. The individual Phs300 (sex unknown) from another twin set has been photographed as a yearling, 2.5 km from its birth site in 2018.

This study marks the first documented cases of likely twin births in free-ranging ringed seals, adding to a limited number of observations on twins born in the wild across various pinniped species. Previously, twin occurrences have been sporadically reported in the following phocids: gray seals (*Halichoerus grypus*), Weddell seals (*Leptonychotes weddellii*), elephant seals (*Mirounga* spp.), harbor seals (*Phoca vitulina*), Baikal seals (*Phoca sibirica*), harp seals (*Phoca groenlandicus*), and Hawaiian monk seals (*Neomonachus schauinslandi*) (Pastukhov 1968; Spotte 1982; Spotte and Stake 1982; Gelatt et al. 2001; McMahon and Hindell 2003; Shaughnessy and Erb 2003; Lidgard et al. 2004; Schultz et al. 2011; Alstrup et al. 2025). In addition, twinning has also been observed in walrus (*Odobenus rosmarus*, Fay et al. 1991) and in six otariid species, including both fur seals and sea lions (King 1986; Dowell et al. 2008; Hoffman and Forcada 2009; Maniscalco and Parker 2009; Bonin et al. 2012). In phocids, twins have been reported occasionally in free-ranging populations from observation in utero during necropsies. Live twin births have been reported mostly in captive seals, even triplets in captive gray seals, but published records of a live birth of twins in phocids in the wild are rare (Spotte 1982).

Twinning in Saimaa ringed seals can be considered a rare phenomenon, yet its occurrence is relatively high compared to pinnipeds in general. More precisely, the twinning rate of Saimaa ringed seals (0.41% or twins per 243 observed births) is among the highest observed in pinnipeds (Fay et al. 1991; Gelatt et al. 2001; Schultz et al. 2011; Bonin et al. 2012). The rate is a minimum, as

twins are difficult to observe in the wild regardless of effective birth site monitoring of the Saimaa ringed seal, especially if both pups are stillborn or have died in the early stage of nursing. Most of the twins (4/5) were found in the Pihlajavesi basin, which is the densest seal area in Lake Saimaa.

In pinnipeds, most twins are dizygotic (Spotte 1982), which was also seen in our study, where two placentas were found from 4/5 of twin cases. In the remaining case, only one placenta was recovered; given that placentas were detected for just over half of all pups, it is more likely that the second placenta was simply missed. Monozygotic twinning cannot be entirely excluded, but it could not be confirmed in this study. Fraternal twinning is a heritable trait in mammals and mothers of twins are more likely to produce twins again (e.g., Ely et al. 2006). However, identified females ($n = 3$) in our study have not been observed to give birth to multiple sets of twins, which is in accordance with findings from Hawaiian monk seals (Schultz et al. 2011). In addition to hereditary factors, environmental conditions and nutrition have been suggested to affect twinning rates in mammals (e.g., Franzmann and Schwartz 1985), however, data for the Saimaa ringed seal remain limited.

Previous studies have shown that twins were less likely to survive when they were typically undersized (Spotte 1982) and in general have lower survival probability into adulthood in the wild (McMahon and Hindell 2003; Dowell et al. 2008). In our study, natal pup mortality of twins was over two times higher than those of single pups. However, both pup carcasses that were examined by necropsy were of similar size to typical neonates (circa 5 kg). At least two individuals survived after weaning in our study. Real survival rate could be higher than reported here, while not all twin pups are tracked after weaning, as they could not be identified during nursing due to their lanugo.

Some observations of twins based on nursing may also represent cases of adoption or foster nursing of unrelated pups, a phenomenon common in phocid species (e.g., Stirling 1975; Boness et al. 1998; Schaeff et al. 1999). However, our study provides evidence based on placentas in spatially separated birth lair suggests that fostering behavior is unlikely with Saimaa ringed seals. In addition, pups are born in snow lairs and Saimaa ringed seal females exhibit high breeding site fidelity (Valtonen et al. 2012), and Niemi et al. (2019) noted female territoriality during the breeding season, which all support suggestions on these females nursing their own pups.

This study offers an additional application for field-collected Saimaa ringed seal placentas, enabling identifying twin births, complementing current uses in assessing birth rates (Auttila et al. 2014), genetic sampling (Valtonen et al. 2015), and environmental toxin monitoring (Simola et al. 2024). In addition, photo-id of young seals provides a useful tool to estimate individual survival and behavioral ecology (Koivuniemi et al. 2016, 2019; Biard et al. 2022, 2025). While collection of placentas provides better evidence of twinning than observations of two pups nursing from the same female, future genetic studies of the placentas from putative twins to measure relatedness will provide conclusive evidence.

Author Contributions

Riikka Alakoski: writing – original draft, data curation. **Piia Mutka:** writing – original draft, data curation. **Miina Auttila:** writing – original draft. **Marja Niemi:** writing – original draft. **Mervi Kunnasranta:** writing – original draft, conceptualization.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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