



Observations of a free-ranging adult female Saimaa ringed seal carrying a dead pup

P. Mutka¹ · M. Niemi¹ · M. Auttila² · R. Alakoski² · M. Kunasranta^{1,3}

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Abstract

Epimeletic behavior toward dead offspring or conspecifics has seldom been observed in pinnipeds. Here we report a free-ranging adult female Saimaa ringed seal (*Pusa saimensis*) carrying a dead lanugo pup. Behavior data were collected in an artificial nest box by camera traps between mid-September 2024 and the end of April 2025 in Lake Saimaa, Finland. Based on the image data, the nest was used by one adult male and one adult female seal during the study season. The presumed mother seal supported the newborn pup's body for at least seven days over a week during the nursing season in April. Records on Saimaa ringed seal carrying a deceased infant are a novel addition to the knowledge of epimeletic behaviors in pinnipeds, as such behavior in marine mammals has primarily been documented mostly in highly social cetaceans, making this also the first known case in ringed seals (*Pusa hispida*) in general. The use of remote cameras together with Photo-ID offers promising avenues for future research to deepen insights into pinniped behavioral ecology.

Keywords Artificial nest · Post-mortem attentive behavior · Photo-ID · Deceased neonate · Epimeletic behavior · Marine mammals

Introduction

Epimeletic behavior is a form of altruism where typically a healthy adult individual shows care and concern for injured, ill, or deceased conspecifics. This behavior is classified as nurturant if care or attention is directed toward young (Bearzi and Reggente 2018). In a variety of terrestrial and marine mammalian species, individuals care for and carry dead newborns, and sometimes also other conspecifics. Epimeletic behavior toward dead conspecifics has been previously observed especially among long-lived highly social mammals, such as elephants, giraffes, hippos, primates and cetaceans (Bercovitch 2013, 2020; Reggente et al. 2016, 2018; Gonçalves and Biro 2018; Inman and Leggett 2020). Among marine mammals, this behavior has been

documented in at least 21 cetacean species (Smith and Sleno 1986; Fertl and Schiro 1994; Dudzinski et al. 2003; Alves et al. 2015; Reggente et al. 2016, 2018; Bearzi et al. 2018; Frediani et al. 2020; Jog et al. 2020; Bisther and Vongraven 2022).

While there are numerous reports on cetaceans carrying dead offspring or conspecifics, this behavior may have been seen in pinnipeds, but it has very rarely been reported. In the Phocidae family, post-mortem attentive behavior toward infants has been recorded in the harp seal (*Phoca groenlandica*, Kovacs 1995), leopard seal (*Hydrurga leptonyx*, Sperou et al. 2025), grey seal (*Halichoerus grypus*, Twiss et al. 2003), and in harbor seals (*P. vitulina*, Trudeau 1976; Allen 1980; Rosenfeld 1983; Lawson and Renouf 1985).

The Saimaa ringed seal (*Pusa saimensis*), recently recognized as a distinct species (Löytynoja et al. 2025; The Committee on taxonomy 2025), is an endangered freshwater seal living in Lake Saimaa in Finland, with an estimated population of around 500 individuals. This endemic and endangered population faces significant threats from climate change, which impacts ice and snow availability, crucial for their breeding success (Kunnsranta et al. 2021; Jakkila et al. 2024). These seals give birth to a single pup in subnivean lairs in February–March, dens built in snow drifts of the

✉ P. Mutka
piia.mutka@uef.fi

✉ M. Kunnsranta
mervi.kunnsranta@uef.fi

¹ University of Eastern Finland, Joensuu, Finland

² Metsähallitus, Parks & Wildlife Finland, Savonlinna, Finland

³ Natural Resources Institute Finland, Joensuu, Finland

shoreline of islands or islets, providing vital shelter for the pup against harsh weather conditions and predators (Sipilä 1990). The Saimaa ringed seal, like other ringed seals (*P. hispida*) (Ferguson et al. 2019), is considered a more income breeder, relying on ongoing energy intake for reproduction rather than stored energy reserves. Lactation period can last up to 12 weeks and pups are weaned in May (Niemi 2013). The ongoing decline of ice and snow cover due to warming temperatures poses a serious risk to the long-term existence of this small population. Therefore, artificial nest boxes have been implemented as a novel conservation tool during this decade to improve the survival of Saimaa ringed seal pups during mild winters (Kunnasranta et al. 2022).

Here we report the observations on a free-ranging ringed seal's epimeletic behavior toward a dead newborn pup. These observations were recorded by camera traps as incidental side findings of a larger project, monitoring Saimaa ringed seals' behavior in artificial nest boxes during the breeding season.

Material and methods

The study was carried out in the northern part of Pihlajavesi basin (61.8 N, 28.6 E), which is one of the main breeding areas of ringed seals in Lake Saimaa, Southeast Finland. Camera monitoring started during the open-water season (September 17, 2024), when the artificial nest box was set in the vicinity of a known birth lair site on the shoreline of an island. The study area was ice-covered between mid-December 2024 and the end of April 2025. The camera monitoring ended on May 1, 2025, upon removal of the nest box.

Seal behavioral observations were collected by using camera traps inside a floating artificial nest box (Fig. 1), which measured 1.8 × 1.8 m in width with a height of 90 cm. Box walls and roof were constructed from peat moss boards and aluminum. The base of the nest was made from floatable

plastic components, featuring a central hole with a diameter of 53 cm to facilitate seal entry from water into the nest (see details Kunnasranta et al. 2022). Two motion-sensitive game cameras (UoVision Green 30 and UV785-HD) were attached to opposite walls of the nest and set to capture two still images at 10- and 20-min intervals after detecting motion. The artificial nests have been monitored systematically with camera traps since 2021. The seals using the nest were identified individually from photographs based on their permanent and individually unique fur patterns (see Koivuniemi et al. 2016). Data were collected under permits from the Finnish environmental authorities ELY Center (ESAELY/747/2018).

Results

A total of 8905 images were captured by the two cameras during the study period. The first seal images were recorded during November 2–21 (Fig. 2), when the seal was occasionally peeking up from the water entrance of the nest. Due to the lack of visible fur patterns in these images, individual identification was not possible during this period. However, once the seals began hauling out onto the pontoon floor of the nest, fur patterns became visible, allowing for determination of the individual seals and their sex. During the study period, a male and a female seal of adult body size were using the nest. The male had been identified (individual code Phs580) for the first time during the previous molting period in May 2024 in the same area, and the female (code Phs573) had used the same artificial nest for haul out also during the previous winter (Seals Wildbook 2025).

The male Phs580 used the nest to haul out between November 24 and January 11. The female Phs573 arrived on December 30 and used the nest for resting until January 14. After that, an unidentified seal was occasionally observed breathing from the water entrance of the nest until January

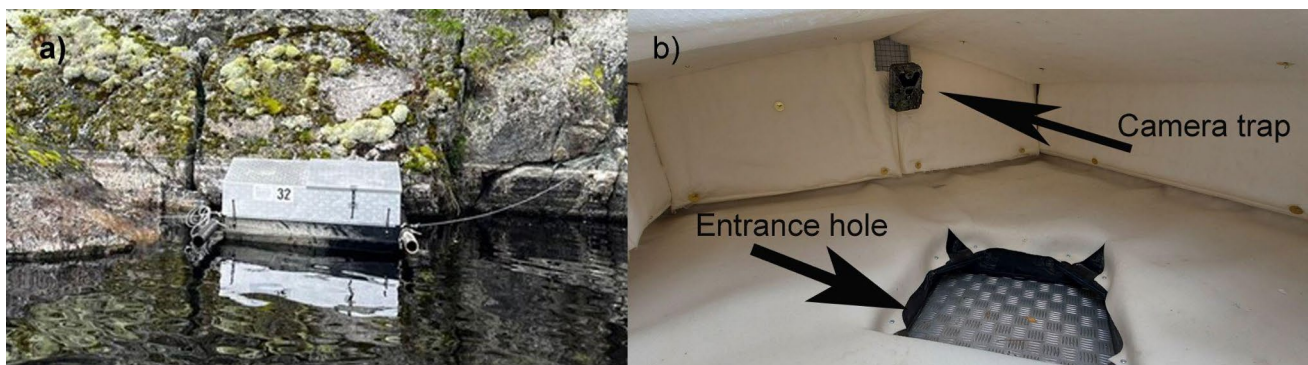
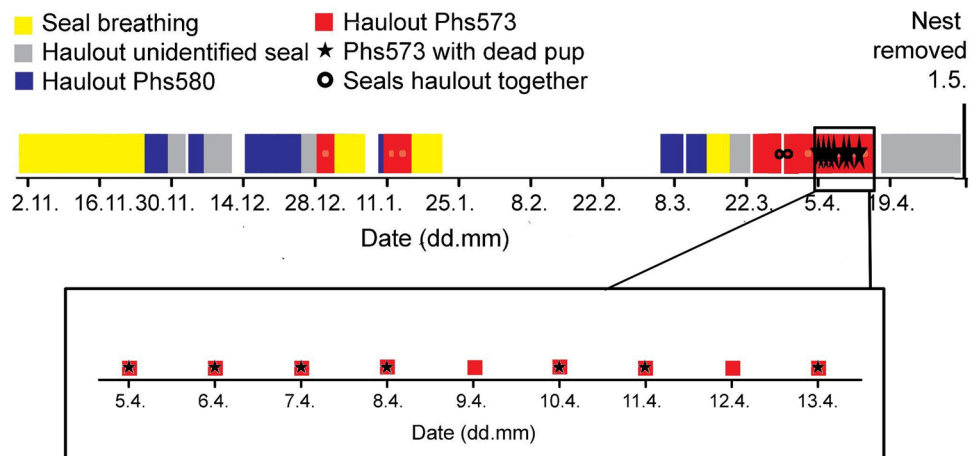


Fig. 1 Artificial nest of the Saimaa ringed seal and locations of the entrance hole and camera trap inside the nest (the other camera is situated on the opposite wall of the nest cavity)

Fig. 2 Timeline of artificial nest usage and behavior of the Saimaa ringed seals using the nest between November 2024 and May 2025



20, after which time no seals were recorded again until March 7, when the same male Phs580 reappeared in the nest and the female returned on March 25 (Fig. 2). They were observed to haul out together in the nest once in late March. Although a further occurrence of two adult seals at the nest was recorded also in late March, the images were blurred due to lens fogging, and the seals could not be identified.

Female Phs573 was next seen in the nest on April 5, together with a dead pup. Based on its lanugo hair and visible umbilical cord, the pup was estimated to have been stillborn or died at less than one-week-old. The female Phs573 was recorded in the nest with the dead infant on seven different days (April 05–08, 10–11 & 13; Fig. 2) entering the box and leaving and coming back, either with the dead pup or alone, showing more restless behavior than previously. The dead pup was shown only with the female, and it was never left on the platform. After that, the female Phs573 was recorded to be alone on April 14. Subsequently, 10 visits were made by adult seal but the individual could not be identified due to blurry images. Last seal visit was May 1, an hour before the nest was removed.

There were a total of ten image sets (two images per occasion) of the female Phs573 and dead pup which showed the female body contacting a pup carcass (Fig. 3a–c). In addition, the female Phs573 was recorded to stare at the water on many occasions (Fig. 3d), as well as going up and down from the platform to the water and tilting its head back. This specific behavior is described because it was only expressed during the period when the female Phs573 was observed to carry the dead pup in the nest box.

Discussion

To our knowledge, this is the first documented observation of a Saimaa ringed seal caring for a dead pup. While it is not known whether the female Phs573 gave birth to the pup, it is

likely the case, as all similar observations in pinnipeds are suggesting the dead pup belongs to the female. Allen (1980) reported female harbor seals lifting and carrying a stillborn pup head to the surface and dragging it to the shoreline. Additional observations of harbor seals have documented similar behaviors (Trudeau 1976; Rosenfeld 1983; Lawson and Renouf 1985). Moreover, there is a documented case of a female harp seal, attempting to induce suckling of a stillborn pup for two days, returning to the dead pup after being in the water at intervals for two days after that (Kovacs 1995).

The pup observed in this study is believed to be either stillborn or newborn. Saimaa ringed seal pups are typically born in February–March (Sipilä 1990). The pup had been born somewhere else because the nest box was not used by the seals at all between January 21 and March 6. The first observation with the dead pup in April may suggest that the female Phs573 could have carried the carcass significantly longer than the observed period of just over a week, potentially even for several weeks. Long-term epimeletic behavior toward dead conspecifics has been observed among several marine mammals. Reported durations range from a few days (Allen 1980; Lawson and Renouf 1985; Kovacs 1995) to up to twenty days in pinnipeds (Sperou et al. 2025), and from some days to even weeks in some cetacean species such as Australian humpback dolphin (*Sousa sahulensis*, Reggente et al. 2016), killer whale (*Ornicus orca*, Shedd et al. 2020), and Risso's dolphin (*Grampus griseus*, Methion et al. 2023).

In marine mammals, epimeletic behaviors typically include supporting or carrying the young at the water surface (Trudeau 1976; Fertl and Schiro 1994; Alves et al. 2015). In our study, the ringed seal female Phs573 was observed trying to maintain physical contact with the dead pup. Carrying the pup around has not been documented as a part of the normal maternal behavior in phocids (Sperou et al. 2025). Our images of this Saimaa ringed seal female showed varied care behaviors such as body contacting, dragging the pup

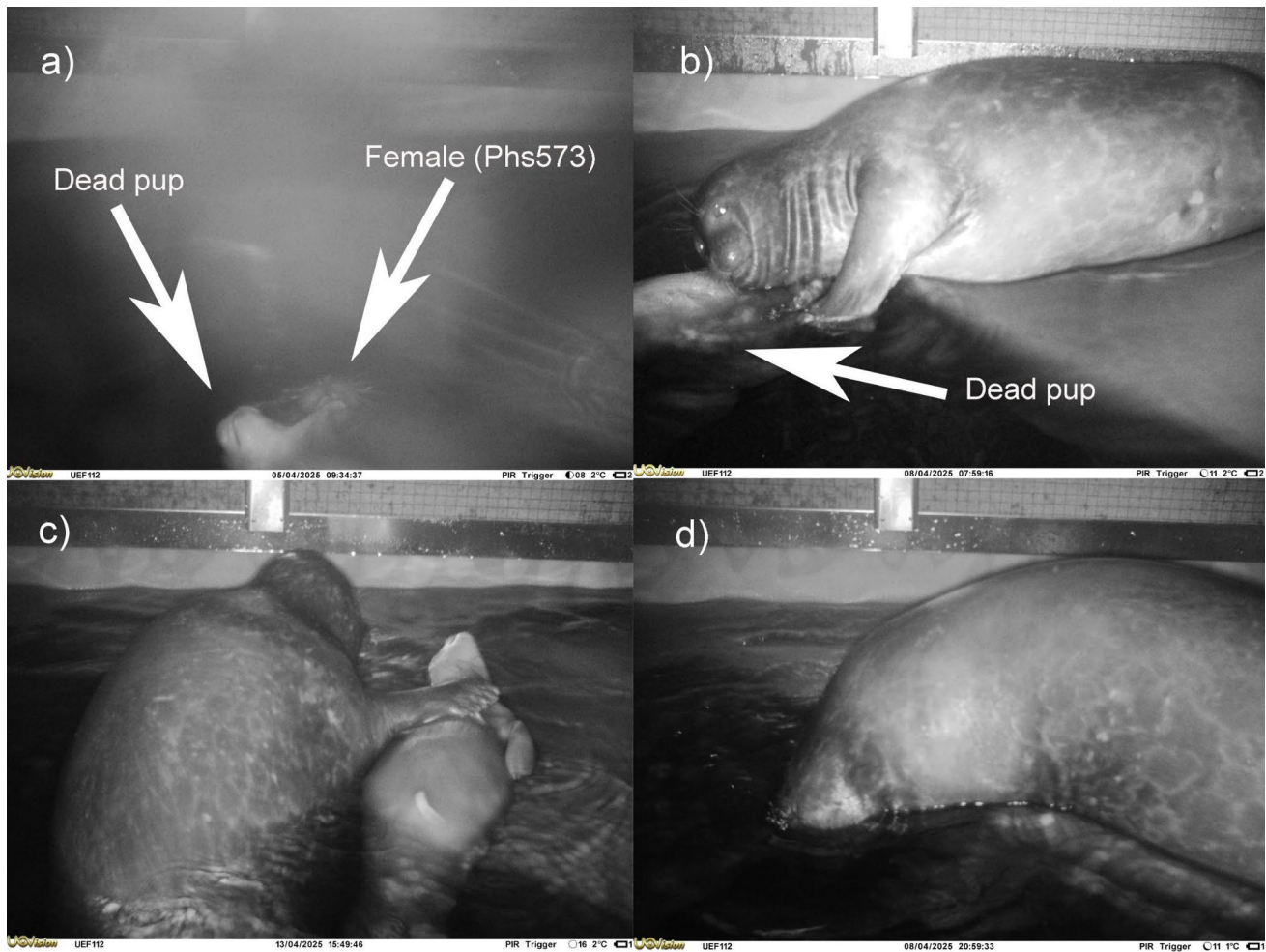


Fig. 3 Saimaa ringed seal female Phs573's interactions with dead lanugo pup showing maternal care behaviors: **a** female dragging a dead pup with her mouth **b** female body contact with the dead pup **c** female escorting the dead pup to the platform **d** female staring at the water

with mouth, and escorting the pup on seven different days during a nine-day period.

Our observations on the female Phs573 caring for a dead lanugo hair pup are in accordance with numerous previous findings, where the typical target age group of epimeletic behavior toward dead conspecifics are newborns or very young juveniles (Kovacs 1995; Reggente et al. 2016; Bisther and Vongraven 2022). However, the causes for caring dead conspecifics are not completely understood, and reasons behind the behavior of this specific female Phs573 remained unknown. It has been suggested that epimeletic behaviors toward dead juveniles is primarily driven by the mother's post-partum hormonal state (Biro et al. 2010), social bonding, kin selection, and emotional attachment, especially in species with prolonged dependency periods that involve learning and strong bonds, such as in primates and cetaceans (Reggente et al. 2016, 2018; Delval et al. 2025). These behaviors may also serve as mourning or facilitate emotional processing (Fertl and Schiro 1994; Delval et al.

2025). Alternatively, it has been suggested that such behaviors could be play-oriented or object-oriented interactions, as seen in behaviors involving other species or objects, which may not necessarily relate to nurturing but rather to social or exploratory play, particularly in juveniles (Reggente et al. 2016; Negrey and Langergraber 2019).

In general, among marine mammals epimeletic behavior is most common in long-lived and highly sociable species (Reggente et al. 2016, 2018). Whereas the Saimaa ringed seal, as ringed seals in general, is considered a relatively solitary species (Hammill 2009). However, recent findings on long-lasting social associations between Saimaa ringed seals (Biard et al. 2025) and active underwater vocalization (Young et al. 2025) together with observations of this report may indicate that ringed seal behavior is more social than earlier suggested. Images of this study confirm previous suggestions on nest sharing by ringed seals (Kunnasranta et al. 2022). Moreover, the female had used the same nest box for resting also during the previous winter, which

is in accordance with observed nest site fidelity of Saimaa ringed seal females (Valtonen et al. 2014; Niemi et al. 2019). However, these kinds of behavioral studies are typically challenging to carry out due to subnivean nursing and the highly aquatic lifestyle of elusive ringed seals in harsh ocean locations. Therefore, remote audiovisual recorders in air and underwater combined with Photo-ID and genetics (see Valtonen et al. 2015) for individual identification and kinship analyses may provide novel opportunities for studying varied behavioral aspects, such as mother–pup interactions, nest sharing with adult individuals, diurnal rhythms, nest site fidelity, and mating behaviors of Saimaa ringed seals in the future.

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Data availability Raw data available on request.

Declarations

Competing interests The authors declare no competing interests.

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