Assessing the welfare challenges posed by climate change to European marine mammals, with a focus on seals

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35th ECS CONFERENCE CATANIA, ITALY 10-12 APRIL 2024

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INTRODUCTION

Climate change is affecting a wide range of marine species in a variety of ways[1,2,3]. Direct impacts include changes in air and sea surface temperatures, a rise in the absolute mean sea level, changes in salinity, ocean acidification, and increased frequency and intensity of extreme events. Shifts in the abundance and distribution of several species and populations, loss of habitat and changes in survival rates and breeding success are now being recorded. Pinniped young may be especially vulnerable because of their use of the seashore or ice floes as nursery sites. Anecdotal reports from rescue centres in the UK and elsewhere in Europe indicate that increasing storms are having escalating negative impacts on seal welfare, for example separating pups from mothers during the nursing period and washing pups out to sea, leading to wounding and increased mortality.

EVIDENCE

More than 10 storms with mean significant wave heights over 6m hit the coasts of northwestern Europe every year[4] and this seems to be increasing.

There are very few studies in the scientific literature that look at potential impacts on pinnipeds. Sepúlveda et al. (2020) considered stranded South American sea lion (*Otaria byronia*) pups in Chile[1]. They reported that "the higher number of stranded pups coincided with coastal storms with normalized wave power values exceeding a threshold of 100 m^2/s".

For Australian fur seals (*Arctocephalus pusillus doriferus*) a predicted rise in sea level was modelled[5]. Results indicated that by 2100, a 1-in-10 year storm will inundate more habitat on average than a present-day 1-in-100 year storm causing an increase in pup mortality rates associated with storm surges, or the dispersal of individuals to higher ground and/or new colonies. Similarly, three sea-level rise scenarios were run for Northern elephant seals (*Mirounga angustirostris*) for Point Reyes Peninsula, California. These indicated that most current and potential haul-out sites would largely be inundated by 2050[6].

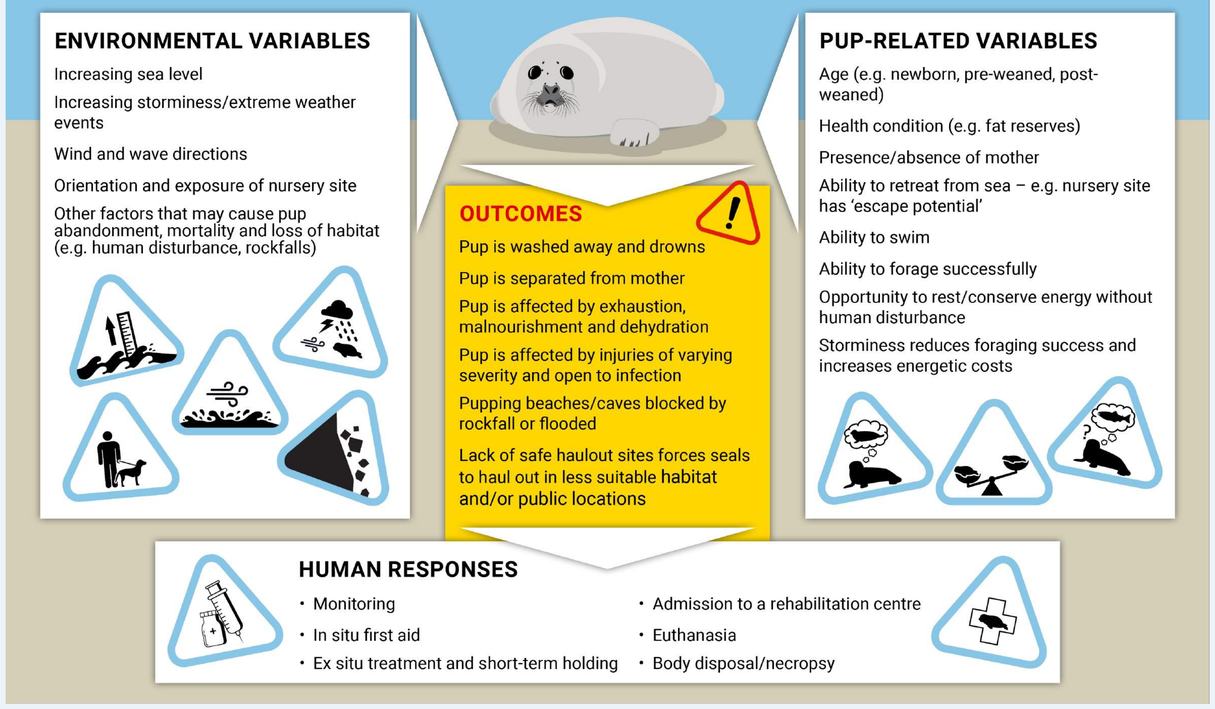
Grey seal pup swimming with its mother.

IMPACTS ON SEAL PUPS

A weaned grey seal pup that stranded after stormy weather with evidence of a blunt force trauma to the head. It is likely this pup hit its head on a rock in the rough seas generated by the storm.

A weaned grey seal pup that had suffered two deep lacerations to its chest wall after a period of stormy weather. Injuries such as this are more likely to be seen when sea conditions are rough.

A weaned grey seal pup with a severe mandibular fracture, and subsequent infection and necrosis of the bone. The injury was likely to be weeks old and yet the pup was discovered alive, and required immediate euthanasia.



Grey seal (*Halichoerus grypus*) and harbour seal *(Phoca vitulina*) pups are maternally dependent for the first few weeks of their lives. Once weaned and their mothers have departed, they typically remain on shore for several days or weeks before they go to sea. During these nursing and post-weaning periods, the pups are not usually able to swim well, making them vulnerable to storm driven incursions from the sea, potentially exacerbated by rising sea levels. (Although some pups, even whilst in the white-coated stage do swim with their mothers. pers. obs. MPS). Unweaned pups separated from their mothers may starve or have insufficient fat stores to survive[7].

From the perspective of a vet working in a rescue centre in the UK (pers. obs. NA), the following impacts are increasingly seen after storms:

- Severe injuries including wounds and fractures (particularly of the skull and mandible); and
- Starvation and/or hypothermia resulting from separation from mothers.

For weaned pups, a period of stormy weather could tip them over the edge metabolically leading to deterioration/further illness, particularly if exacerbated by other factors such as anthropogenic disturbance when they are trying to rest and conserve energy. Additionally, pups which become separated from their mothers may demonstrate an increased stress response[10]. A mother seal losing her pup may also have her welfare impacted.

EUROPE

In Europe there has been no dedicated study on storminess/sea level rise and pup survival. However, the observed increasing frequency of storms in parts of the UK has been noted as potentially causing problems for pups[7]. In 2017, two powerful named storms hit the UK's west coasts at the start of the grey seal breeding season in the autumn. More than two thirds of the 160 grey seal pups on Pembrokeshire's Skomer Island in south Wales were killed along with another 90 from the rookeries on nearby Ramsey Island[8,9]. This was followed by the loss of over 850 pups from a single site in Scotland in 2021, and a comparable number in Norfolk in 2023 during similar extreme weather events.

CONCLUSION

Concerns about the survival of European seal pups on their rookeries in the face of increasing storminess and sea-level rise are being increasingly consolidated by direct observations. Further data collection on this would be helpful to confirm suspicions that the increasing frequency of these extreme events and mortality could represent an emerging population-level threat to seals in Europe and other parts of the world. In the meantime, the implications for the welfare and conservation of seals should be considered, including impacts on rescue networks and centres where facilities may already be overstretched.

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Photos of injured seals by BDMLR. Other seal photos by MPS. Thanks to Roman Richter for help creating the figure.

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