Creation of man-made snowdrifts for improving the breeding success of the Saimaa ringed seal [1]

Image from Climate Adapt about this case study [2]

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The Saimaa ringed seal (*Phoca hispida saimensis*) is an endemic sub-species, a relict of last ice age that lives only in Finland in the fragmented Saimaa freshwater lake complex. Nowadays the population has only about 360 individuals, which poses a threat to its survival. This land-locked population is threatened by varied anthropogenic factors, such as incidental by-catch mortality, habitat loss and climate change. The breeding success of the Saimaa seal is dependent on sufficient ice and snow cover, because the seal digs its dens in snowdrifts where it gives birth and nurses a pup. Therefore, global warming poses an increasingly serious long term threat to this arctic seal. A Finnish national conservation strategy and action plan for the Saimaa ringed seal was adopted in 2011 in order to improve the conservation status of the sub-species.

The LIFE Saimaa Seal project, running from 2013 to 2018, promotes the safeguarding of the Saimaa seal and the efforts to reach a favourable conservation status of the sub-species. The project implements the Saimaa seal protection action plan, drawn up under the leadership of the Ministry of the Environment and in broad-based cooperation with key stakeholders. One of the most important measures related to climate change was the creation of man-made snowdrifts in winters 2014-2016 to improve the seals breeding habitat in poor snow conditions.

Case Study Description

Challenges:

Climate change poses a long-term threat to the Saimaa seal population, because the successful breeding of the sub-species depends on ice and snow cover. Seals give birth typically to a single pup in a subnivean lair that is situated at snowdrift formed on the shoreline of the lake. The lair provides shelter against predators and harsh climate, and mother-pup pair uses it over the nursing period.

In winters with good snow conditions about 8% of the pups are found dead in lair sites. However, a mild winter and a lack of snow can cause high perinatal mortality (as in 2006 and 2007, ca. 30%). The snow cover of Lake Saimaa has been exceptionally thin during some of the recent years. For example, during the winter of 2014 there was total lack of wind drifted snow mounds needed for the seal lairs. This situation can be further exacerbated by global warming and related changes in climatic conditions. Moreover, due to the land-locked lake habitat the Saimaa seals are no able to move to more favourable areas in response to climate change.

Objectives:

The Saimaa seal project aims to reduce the main threats to the Saimaa ringed seal, which were identified in the Saimaa seal conservation strategy and action plan. In particular, it seeks to reduce risks related to climate change, fishing, and human induced disturbance. The results of the project will be used in the updating of the conservation strategy and related regulations.

One of the main goals of the project is to facilitate adaptation to climate change by piling up man-made snow drifts to improve the Saimaa seal´s breeding success during mild winters. Other goals include reducing by-catch mortality by developing seal-friendly fishing methods, reducing human-induced disturbances, involving local people in conservation actions and increase their awareness, and updating knowledge on essential ecological issues and on potential threats to the seals, as the basis for effective conservation and monitoring.

Solutions:
The man-made snowdrift method was developed at the University of Eastern Finland. Its full scale implementation as a new conservation method has been done during the LIFE Saimaa Seal project, to improve the seal's pup survival in mild winters when the snow cover is not sufficient for lairs.

During the winters with poor snow conditions in 2014-2016, altogether 519 man-made snowdrifts were piled up at the breeding habitat of the seal. The drifts were annually piled in January and early February. The shape and size of the man-made drifts mimic the natural wind drifted snow mounds. Saimaa ringed seal lairs are located on ice in snowdrifts on shoreline. Man-made snowdrifts were piled using natural snow collected nearby the drift site using snow shovels and pushers and the drifts were located in the vicinity of the potential lair sites. Minimum snow cover on ice for making a snowdrift is around 5 centimetres. The exact dimensions of the snowdrift depend on location and amount of snow available. However, snowdrifts should be large enough for large birth lairs, i.e., approximately 1 m high, 3-6 m wide and 8-15 m long.

Over 200 people were involved in making the snowdrifts, and most of them were volunteers. Based on lair census conducted annually (in 2014-2016) during March-April the man-made snowdrift method appears to be an effective conservation action; briefed local voluntary workers are well suited to its implementation. During these three winters the majority (>75%) of man-made snowdrifts were used by seals as lair sites, and in exceptionally mild winter of 2014, over 90% of the observed pups were born in those drifts. Due to this conservation action, the perinatal mortality remained significantly lower compared to earlier winters with poor snow conditions.

The LIFE Saimaa seal project is also implementing other measures that do not address directly the effects of climate change but reduce seals' mortality, and therefore increase their resilience also to climate change. Seal-safe fyke nets (a type of fish trap used by professional fishermen, for perch and pike-perch) have been developed in collaboration with local professional fishermen. Also nearly 300 gill nets of recreational fishermen have been replaced by seal-safe fish traps (a different fishing gear type, smaller than the fyke net mostly used by professional fishermen). The goal is that altogether 500 gill nets will be replaced by the seal-safe fish traps during the project (thus by 2018). Moreover, nearly 1,500 stoppers, which make the traditional fish traps seal-safe (by preventing the maximum width of the opening being wider than 15 cm and thus blocking the seals way into the trap), have been given out for free. In addition to these concrete actions, recreational fisherman may sign a voluntary commitment to use seal-safe fishing methods also outside the fishing restriction period. Until now over 400 fishermen have signed the commitment.

Management plans for Natura 2000 areas vital for the Saimaa ringed seal have been prepared or are under preparation and 34 ha land (islands) and 670 ha of water have been acquired for nature conservation. Finally, a number of initiatives for awareness and educational purposes are also being undertaken.

Importance and relevance of the adaptation:
PARTFUND_AS_CCA;

Additional Details
Stakeholder engagement:
Metsähallitus, Parks & Wildlife Finland is responsible for most of the conservation and monitoring measures of the Saimaa seal. The research conducted by the University of Eastern Finland has played a crucial role in developing the man-made snowdrift method and participating in annual lair censuses.

The role of the volunteers is also extremely important both for making the snowdrifts and for monitoring and evaluating the population dynamics. During the years, experienced local volunteers have participated in the

annual lair censuses of the Saimaa ringed seal. These volunteers know the demanding field work conditions on the ice and the traditional breeding sites of the ringed seals. The LIFE Saimaa seal project aimed at building a larger scale network of volunteers based on this initial group of key volunteers to cover the whole distribution area of the seal in order to be prepared for the possible challenges of warming winter climate. In addition to the conservationists, the volunteers included recreational fishermen, politicians (local and national), policymakers, local inhabitants, summer residents and members of several NGOs. Thus, it is a good example of how a concrete conservation act can induce openness and involvement of local people to conservation and bring people together.

During the winters of 2014-2016 an enormous effort was needed to pile up the man-made snowdrifts because of the poor snow conditions on Lake Saimaa. Altogether over 200 volunteers made this work possible. During around two weeks' annual operation in 2014 and 2016, when the implementation of the man-made snowdrifts covered most parts of the seal's distribution area, the volunteers worked totalling 169 (i.e. eight months) and 247 (almost 12 months) full-time equivalent days, respectively. In addition to volunteers and Metsähallitus also some cooperation partners, like University of Eastern Finland, WWF Finland and local Centres for Economic Development, Transport and the Environment, participated to the realisation of the man-made snowdrifts in a notable effort. The total number of man-made snowdrifts piled up was 240 in 2014 and 211 in 2016. During winter 2015 altogether 68 man-made snowdrifts were piled up in the central part of the lake where the snow conditions were weakest, and volunteers played a crucial role then as well.

Success and limiting factors:
The man-made snowdrifts have shown to be an effective method to decrease the pup mortality in winters with poor snow conditions. The perinatal mortality fluctuated from 8% to 16% during these three winters (2014-2016) when man-made snowdrifts were piled as a conservation act, whereas the perinatal mortality in earlier mild winters, before the method was developed, has been near 30% (e.g. 2006 and 2007). The seals have accepted around 75% of man-made snowdrifts as a lair site and during last three winters altogether 59% of observed pups were born in man-made snowdrifts.

This project has received the Biodiversity Award 2013-2014 awarded by the National Committee of Finland for IUCN, the International Union for Conservation of Nature. The preliminary results have also raised interest outside Finland as a new, simple and innovative solution to mitigate the adverse effects of climate change on a highly endangered population has been tested.

However, the man-made snowdrift method is effective only as long as there is some snow available and the lake has contiguous ice cover. Already now, the amount of snow and/or ice has been a limiting factor at some areas also for the man-made snowdrifts. Therefore, development and testing of long lasting artificial lair structures has also started in this project to insure cover for the new born Saimaa seal pups in the future.

Budget, funding and additional benefits:
The total LIFE Saimaa Seal project budget is 5,261,612 €. From the total budget 75% is funded by European Union's LIFE+ Nature and Biodiversity Fund. The action "Improving breeding conditions of the Saimaa ringed seal with man-made snowdrifts" is one of the 63 actions in the project, and the costs for this specific action is about 4% of the total project budget.

Most (59%) of the pups born during 2014-2016 were born in lairs made in man-made snowdrifts and the perinatal mortality was significantly lower compared to earlier winters with poor snow conditions when the method was not in use, which highlights the usefulness and success of the technique (for further details refer to the "Success and limiting factors" section).

Legal aspects:
The Saimaa ringed seal has an IUCN status of endangered (EN) sub-species and in the Habitat Directive the status is a species needing strict protection (Council Directive 92/43/EEC, Annex IV). According to this latter, the deterioration and destruction of a habitat, breeding site, and resting place important for the survival of a species

(or sub-species) under strict protection is prohibited. Therefore, the LIFE project has obtained the permits from for the local Centre for Economic Development, Transport and the Environment for piling up the man-made snowdrifts at the seal's lair sites. In addition, the following legal elements are relevant for the Saimaa seal conservation project.

Conservation policy

The Saimaa ringed seal was protected in 1955 by a statutory decree based on the Hunting Act. In 1993 legal protection was transferred to the Nature Conservation Act, and the responsibility for management was given to the Ministry of Environment and in practice to the Parks & Wildlife Finland that is a public agency that forms part of the state-run enterprise Metsähallitus. A conservation strategy and action plan for the Saimaa ringed seal was adopted in 2011 and is currently being updated.

Conservation areas and programmes

In Saimaa lake district the establishment of the Linnansaari National Park in 1956 was a significant factor for protection of Saimaa seal (9,600 hectares, winter stock of 65-86 seals). Kolovesi National Park was established in 1990 and the protection of the Saimaa ringed seal was the main contributing factor for conservation of the area (2,300 ha, winter stock app. 9-12 seals). There are also some privately owned conservation areas established for the protection of Saimaa seal.

The Finnish National Shoreline Conservation Programme was adopted in 1990. It also gives the means to protect the breeding habitats of the Saimaa ringed seal. In the lake Saimaa the programme covers 92,000 ha (mostly water areas). Most of the distribution area of the seal is included in the Natura 2000 Network; Natura 2000 areas cover a total of 157,426 ha (33,022 ha land, 124,404 ha water). Respectively, the Shoreline Conservation Programme and the Natura 2000 network cover approximately 70% and 95% of the shorelines where the seals' lair sites are located. To implement the conservation programme and conservation goals of Natura 2000 network, nature conservation areas have been established and areas acquired for the state for conservational purposes. Implementation of the Natura 2000 network is carried out also by means of land use plans in line with the Land Use and Building Act, fishing restrictions according the Fishing Act and establishment of restriction areas under the legislation regulating motor vehicle use in terrain.

Fishing restrictions

At Lake Saimaa, fishing has been restricted since the 1980s to protect the Saimaa ringed seal. Fishing closures and restrictions are main conservation measures for the ringed seal population and the restriction areas have increased from 1.5% to ca. 60% of the lake's surface area. At present, the fishing restriction decree (259/2016) has one spatial (covering ca. 60% of the lake), and two temporal (spring-time and year round) fishing restrictions. During spring (from 15 April to 30 June) which is the most critical period for pup survival, the use of gill nets is banned. Whereas, the use of most lethal fishing gear types for seals (e.g. fish traps with an opening wider than 15 cm, strong-mesh gill nets, hooks baited with fish and multifilament nets) are banned year-round. Despite of the spatial enlargement in 2016, the areal coverage of the decree is still smaller than the breeding or distribution area of the Saimaa ringed seal especially in the northern and southern parts of the lake. In addition to the decree, also voluntary based fishing restriction contracts are implemented in water areas near the decree area (covering 81 km^2 at September in 2016). Financial compensation is paid to water owners (the owners of the fishing right) for signing the voluntary fishing restriction contract in the or nearby decree area.

Implementation time:
Man-made snowdrifts were built annually (in 2014-2016) during a short period (couple of weeks per winter and before reproductive season). The drifts will be piled up also in the future, if they are needed due to poor snow conditions.

Reference Information
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Websites:
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http://www.metsa.fi/web/en/saimaaseallife [5]

http://www.nationalparks.fi/saimaa-ringed-seal [6]

Sources:
Life Environment Programme

Links
[1] https://www.adaptecca.es/en/creation-man-made-snowdrifts-improving-breeding-success-saimaa-ringed-seal
[2] https://www.adaptecca.es/sites/default/files/fig1_saimaa_finland_map_v2.jpg
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