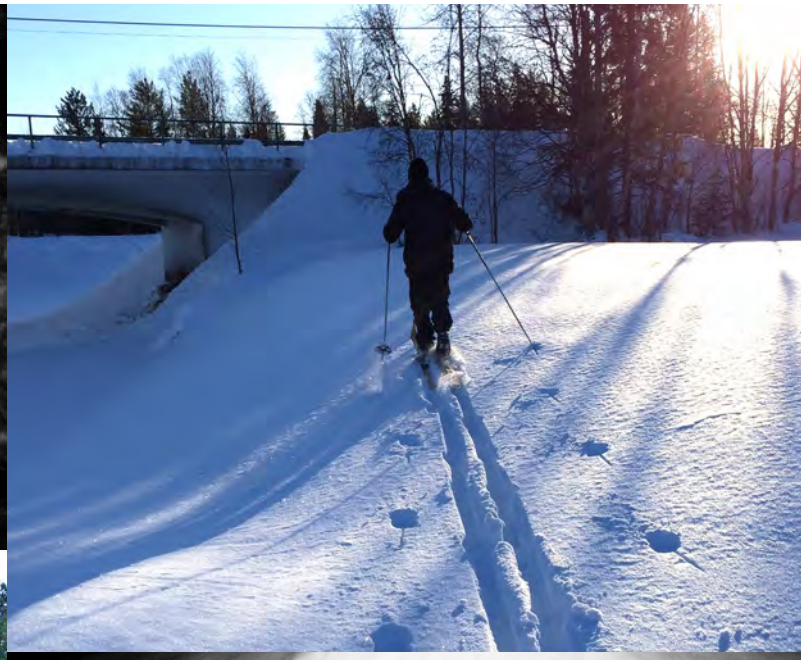
REMIBAR



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Evaluation of mitigation measures for otter in the Remibar project

EC LIFE+ programme
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Otter *(Lutra lutra).*

Summary

As part of the Remibar project, eleven underpasses for medium-sized animals were built under roads: five dry banks, three dry culverts, two ledges, and one fence. To assess whether the underpasses were functional, the underpasses and the movements of animals in the vicinity were monitored through animal tracking in wintertime and camera surveillance during part of the bare ground season. The follow-up was carried out over a two-year period.

The follow-up reveals that all the underpasses that were built have been used by medium-sized mammals. Animal tracking in snow reveals that otters occur in the vicinity of all the underpasses. Wintertime the animals often pass under the bridge on the ice, without using the constructed underpasses. Camera monitoring reveals that otters have used five of the constructed underpasses: the Råne, Skrövån, Vettasjoki, and Venetjoki Rivers and the Långbäcken Creek.

The dry culvert in the Långbäcken Creek has been used frequently by several species including otters while the culvert in the Klappmarksbäcken Creek has been used only by a limited number of species on a few occasions. It is difficult to assess why there is such a big difference between the two dry culverts regarding the presence of animals. Important factors could be their placement in relation to the watercourse and the shore, the presence of animals in the area as well as the proximity to settlements (human activity and the presence of cats).

At three of the five sites with dry banks the presence of otters has been documented by camera (the Råne, Skrövån, and Venetjoki Rivers). The dry banks have generally worked well and have been used by a number of species.

The two ledges have generally been used to a smaller extent and by a lower number of species than the dry banks and the dry culverts. The ledge in the Kattån River has been used only by squirrels and small rodents. One reason could be the placement of the ledge. Its placement higher up makes it difficult to get a good connection with the shoreline. Ledges are placed higher up to avoid the influence from the break-up of ice and to protect them from being covered by water during high flows.

The fence has in some occasions directed animals towards and under the bridge, but on other occasions the animals have walked around the fence and on to the road. Additional studies of a larger number of objects are needed to assess the extent to which fences are preventing animals from getting onto the road.

This study has no scientific structure and does not show, for example, the proportion of animals in the vicinity that use the constructed underpasses instead of crossing the road. On the other hand, we can conclude that the constructed underpasses are functional and are being used by several species of medium-sized mammals. We conclude that otters have been using all the different types of underpasses that were constructed as part of the project, but dry culverts and dry banks have been used slightly more than the other types.

Introduction

Roads and railroads constitute movement barriers for the otter, a threatened species, and other species of medium-sized mammals. If possibilities to cross roads and railroads safely are lacking, the otters risk being killed or injured accidentally by traffic. By constructing dry underpasses and/or sprainting sites it is possible to lure the otter into moving along the watercourse rather than across the road surface. Accurately constructed road underpasses for otters also reduce the risk for other animals to get killed or injured accidentally by traffic, as they also can use them. Efforts to construct safe road underpasses for otters have been ongoing at the Swedish Transport Administration for a large number of years and are nowadays an integrated part of ordinary activities.

The Remibar (Remediation of migratory barriers in streams) project was carried out from 2011 to 2016. The objective of the project was to reduce the number of migration barriers consisting of culverts and dams in five large river systems in the counties of Norr- and Västerbotten in Northern Sweden. The remediation efforts have been carried out in parts of the following catchment areas: the Ånges, Råne, Varjis, Sävar and Lögde Rivers (see figure 1). The objective of the project was to re-open migration routes in the river systems, which will benefit aquatic organisms. In total, 304 mitigation measures were carried out as part of the project. Eleven remediation efforts have been carried out along public roads in order to enable otters to cross safely. The road underpasses are primarily built for otters as the species has been granted the status of a Natura 2000-species and because it is the target species of an ongoing national action programme. The remediation efforts also benefit other medium-sized mammals that migrate along the watercourses and need to cross the road. The project was financed by the EU Commission through EU's Environmental Fund the Life Program.

This report is part of the final account of the Remibar project and reports the follow-up and evaluation of the road underpasses that were built for medium-sized mammals. The follow-up and accompanying report should not be regarded as a scientific study but rather as an evaluation of the different remediation efforts carried out within the framework of the project.

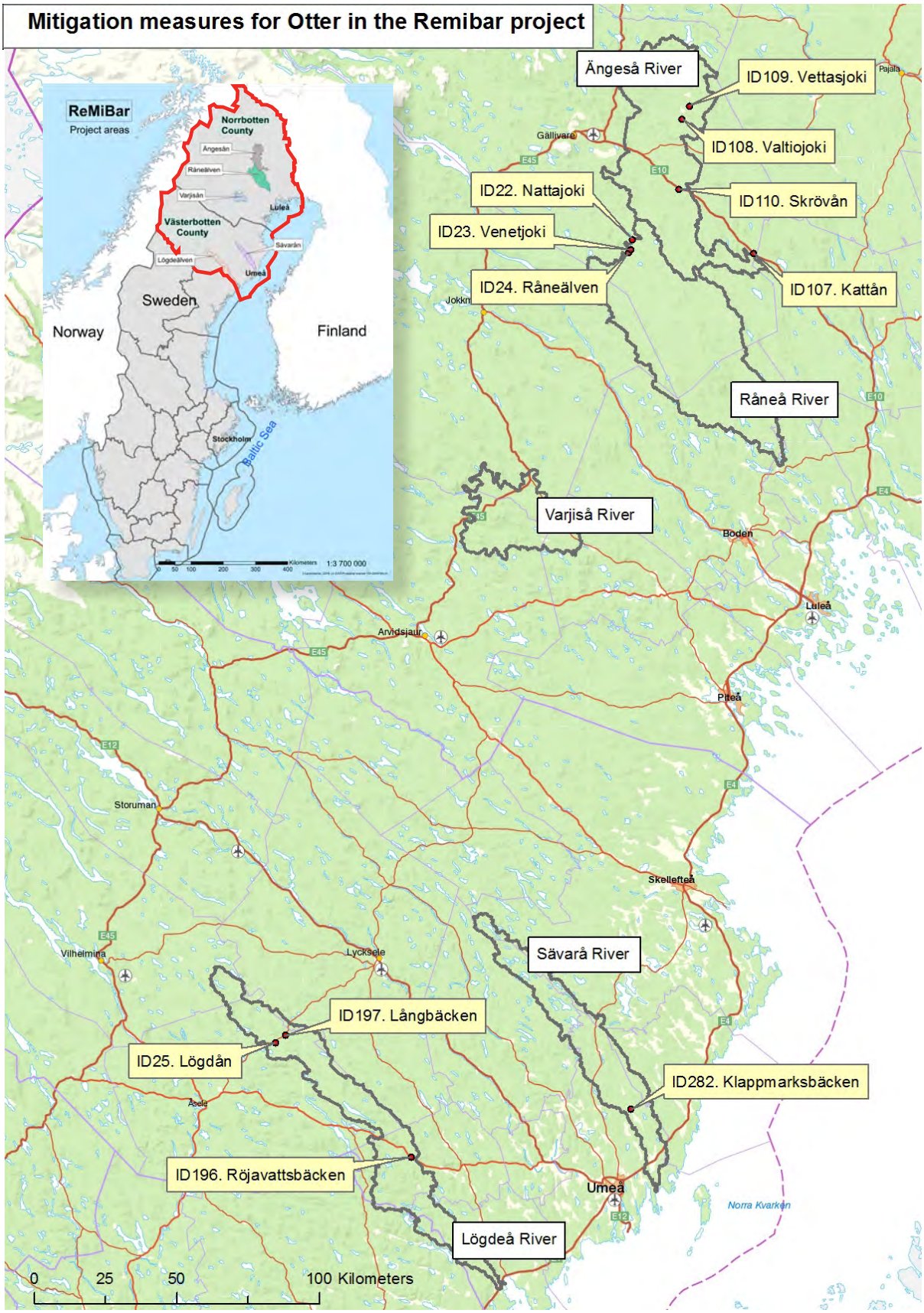

Figure 1. Otter measures carried out in the different catchment areas in the Remibar project.

Remediation types included in the Remibar project

Directed remediation efforts targeting otters and other medium-sized mammals have been carried out on bridges with long remaining longevity but with inadequate possibilities for animals to cross safely. In this chapter the different remediation efforts that have been carried out to reduce the number of accidental deaths of animals on roads are being described. In total, eleven bridges were being remediated in the counties of Norr- and Västerbotten in the years 2013/2014.

Dry banks/shores

A dry bank can be anything from an artificial dry bank made of natural materials to a moulded concrete edge. Ideally, appropriate material should be chosen so that the end result is a dry bank that is as natural as possible but at the same time durable so it does not get swept away at high flows. The underpass must have a minimum width of 50 cm. The dry bank must be high enough to be used at a range of flow regimes. The dry banks built as part of the Remibar project have been constructed using large boulders, see figure 2.

Ledges

Ledges can be constucted under bridges as well as culverts and arches, see figure 3. The ledge should be a natural extension of the shore and be placed so it can be used at most flow regimes. The ledge must have a minimum width of 40 cm.

Sprainting sites made of rocks

Sprainting sites made of rocks have been placed directly on and in the vicinity of the underpasses and can be regarded as complementary to other measures as a way to enhance their attractiveness. An example of a sprainting site can be seen in figure 4.

Dry culverts

Dry culverts are placed in close proximity to the bridge as close to the water as possible in order for the animals to find and use it. However, it must be placed above the high-water mark. A 600-mm wide culvert is preferred as it will also be used by other small and medium-sized animals. Some structures made of stone have been constructed to direct the animals towards the culvert, see figure 5.

Fences

Fences can be used to direct otters and other medium-sized mammals towards an underpass, see figure 6.

Figure 2. Dry bank made of boulders. Location Venetjoki River (ID 23).

Figure 3. A constructed ledge at Kattån river (ID 107).

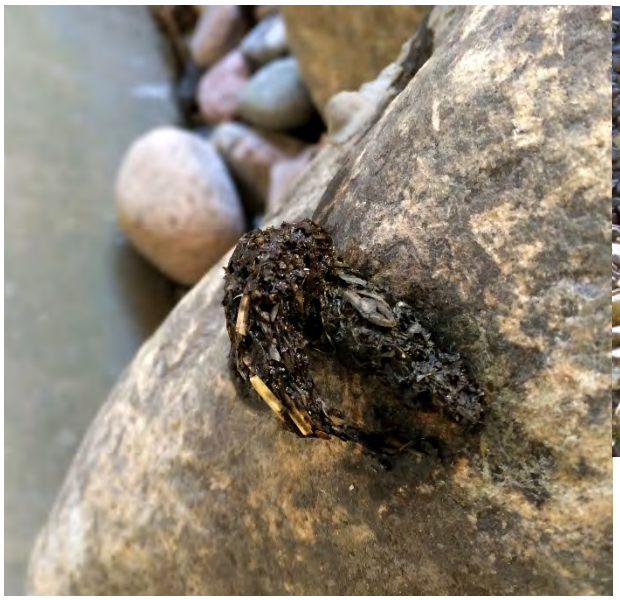

Figure 4. Otter often mark their territory on stones and boulders.

Figure 5. A dry culvert with complementary structures, Röjavattsbäcken Creek (ID 196).

Figure 6. A fence in Nattajoki Creek (ID 22).

Methods

Tracking animals in snow

The tracking of animals in snow was carried out from December to April in the years 2014/2015 and 2015/2016. The inventory was carried out on 14-18 occasions per object depending on the availability of snow and tracking conditions. The tracking conditions were variable and it was difficult to plan the tracking occasions so they coincided with optimal conditions due to long geographic distances to the objects. On some occasions the conditions were sub-optimal due to previous snowfall, the presence of a crust on the surface, conditions with melting snow and ice and even a lack of snow.

Figure 7. Snow tracking in harsh conditions requires the right equipment.

Animal tracking was done in the vicinity of the underpass as well as 100 m upstream and downstream. The animals were identified to species based on the tracks and scats. The results were recorded in a protocol. Some documentation was done using photos. Snow tracking requires the right equipment, including back country skis, see figure 7.

Camera monitoring

The constructed underpasses were monitored with cameras from May to November in 2014-2016 in snow free conditions. The cameras were placed on or adjacent to the underpasses in order to assess the extent to which they were being used. The number of days and the intervals at which the camera monitoring was carried out varies between objects as cameras sometimes broke or were stolen.

Figure 8. The underpasses were monitored with cameras.

The cameras being used are equipped with motion detection. They rapidly and automatically take three pictures when animals (or other objects) are moving. The cameras used at the monitoring were of the model ScoutGuard 880MK-8M (see figure 8).

The pictures of animals were sorted and the animals were identified to species.

Results

Tracking animals in snow

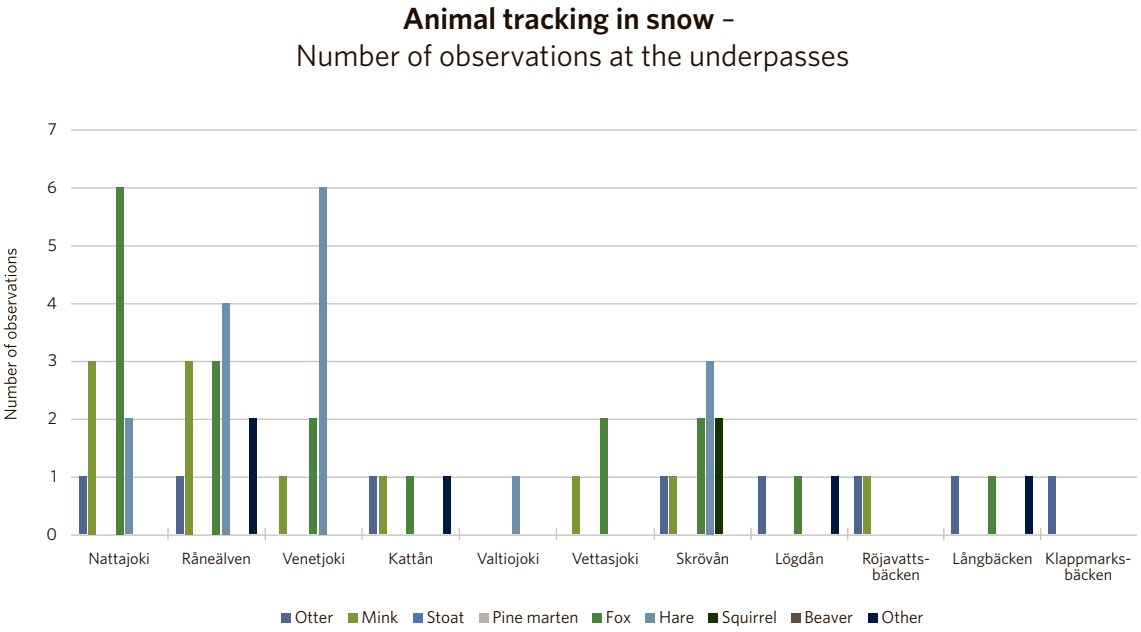

Figure 9. Number of observations of animal tracks at the constructed underpasses per animal species and object. The number of sampling days varies from 14 to 18 per object.

Animal tracking in snow –
Number of observations at the underpasses

	Natta-joki	Råne-älven	Venet-joki	Kattån	Valtio-joki	Vettas-joki	Skrövån	Lögdån	Röja-vatts-bäcken	Lång-bäcken	Klapp-marks-bäcken
Otter	1	1		1			1	1	1	1	1
Mink	3	3	1	1		1	1		1		
Stoat											
Pine marten											
Fox	6	3	2	1		2	2	1		1	
Hare	2	4	6		1		3				
Squirrel							2				
Beaver											
Other		2		1				1		1	

Figure 10. Number of observations of animal tracks at the constructed underpasses per animal species and object. The number of sampling days varies from 14 to 18 per object.

Animal tracking in snow –
Number of observations within a distance of 100 m from the underpass

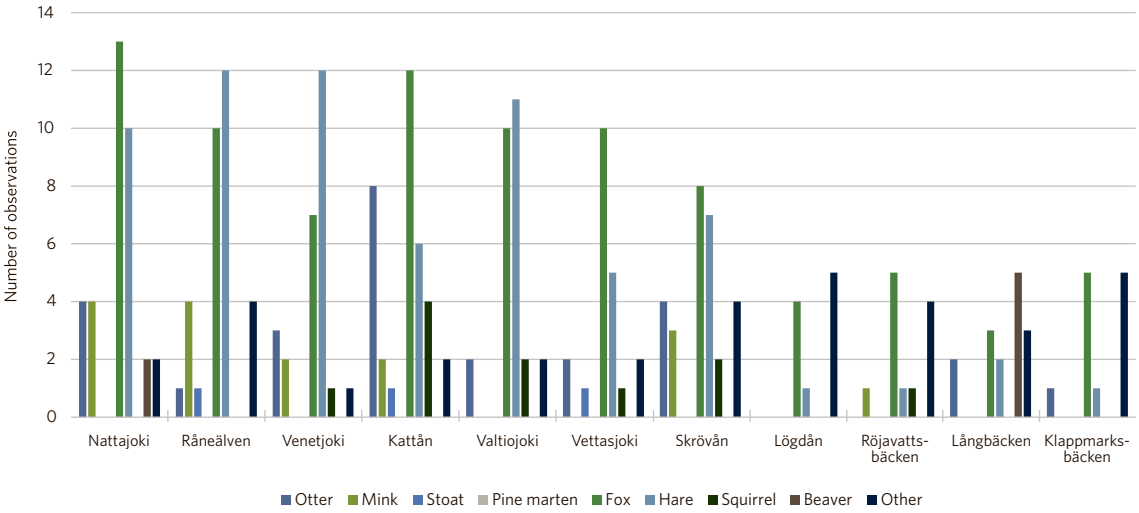

Figure 11. Number of observed tracks within a distance of 100 m from the constructed underpass per animal species and object. The number of sampling days varies from 14 to 18 per object.

Animal tracking in snow –
Number of observations within a distance of 100 m from the underpass

	Natta-joki	Råne-älven	Venet-joki	Kattån	Valtio-joki	Vettas-joki	Skrövån	Lögdån	Röja-vatts-bäcken	Lång-bäcken	Klapp-marks-bäcken
Otter	4	1	3	8	2	2	4			2	1
Mink	4	4	2	2			3		1		
Stoat		1		1		1					
Pine marten											
Fox	13	10	7	12	10	10	8	4	5	3	5
Hare	10	12	12	6	11	5	7	1	1	2	1
Squirrel			1	4	2	1	2		1		
Beaver	2									5	
Other	2	4	1	2	2	2	4	5	4	3	5

Figure 12. Number of observed tracks within a distance of 100 m from the constructed underpass per animal species and object. The number of sampling days varies from 14 to 18 per object.

Camera monitoring

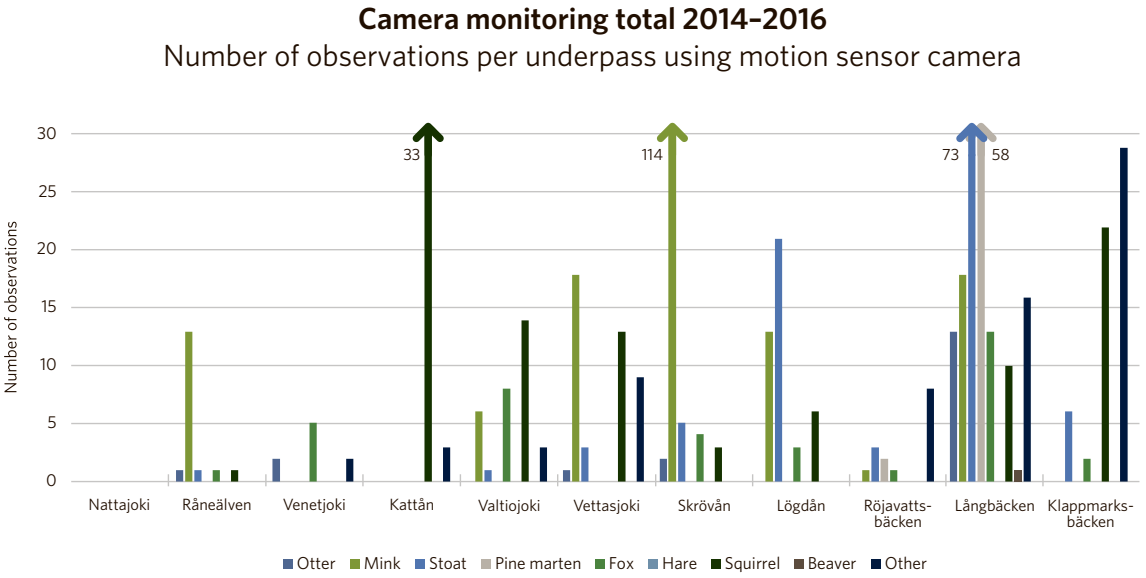

Figure 13. Number of species recorded with motion sensor camera and number of observations per site.

Camera monitoring total 2014–2016

Number of observations per underpass using motion sensor camera

	Natta-joki	Råne-älven	Venet-joki	Kattån	Valtio-joki	Vettas-joki	Skrövån	Lögdån	Röja-vatts-bäcken	Lång-bäcken	Klapp-marks-bäcken
Otter		1	2			1	2			13	
Mink		13			6	18	114	13	1	18	
Stoat		1			1	3	5	21	3	73	6
Pine marten									2	58	
Fox		1	5		8		4	3	1	13	2
Hare											
Squirrel		1		33	14	13	3	6		10	22
Beaver										1	
Other			2	3	3	9			8	16	29

Figure 14. Number of species recorded with motion sensor camera and number of observations per site.

The follow-up reveals that animals are present in the vicinity of the underpasses year-round and consequently there is a need year-round for the animals to cross the road. Wintertime the animals can often cross on the ice under the bridge without using the constructed underpass. Images of otters are available from five sites (the Råne, Skrövån, Vettasjoki, and Venetjoki Rivers and the Långbäcken Creek). Animal tracking in wintertime indicate the presence of otters near all the objects that have been remediated as part of the project, including animals moving within a distance of 100 meters from the underpass.

Discussion

The objective of the follow-up was to examine the extent to which the underpasses were being used and by which species. The follow-up and accompanying report should not be regarded as a scientific study but rather as a verification of the function of the different remediation efforts that have been carried out as part of the Remibar project.

The results from the follow-up reveal that different species of animals frequently use the majority of the constructed underpasses. A higher number of animals have been recorded using camera monitoring during the bare ground season compared to animal tracking in snow, see figures 9-14. It can be due to the fact that camera monitoring was carried out during a higher number of days. In addition, the movement patterns of many animal species differ between the summer/bare ground and winter seasons. For example, the otter depends on open water to catch fish, which limits the area where it resides.

When snow conditions are favourable, animal tracking in winter time can provide a good picture of how different animals move along the watercourse. On some occasions the conditions have been worse due to snowfall, the presence of a crust on the surface and lack of snow, but the long tracking series should provide an accurate picture of the presence of animals in wintertime. The camera monitoring show by which animal species, when and how often the underpasses are being used during parts of the year. The combination of animal tracking in wintertime and camera monitoring provide us with a good overall picture of the presence of different animal species near the underpasses during the course of a year.

The cameras in Nattajoki Creek and Råneå River were stolen, and as a consequence there are fewer animal observations from these sites.

Dry culvert

The results from the camera monitoring reveal that the dry culvert in the Långbäcken Creek is the underpass that has been used on the highest number of occasions by the highest number of species, see figures 13-14. Otter has been photographed at the underpass on eleven occasions. On the contrary, the dry culvert near the Klappmarksbäcken Creek has been used by only a few wild animals. Mostly cats have been photographed at this site. In wintertime, otter tracks have been confirmed on the ice. It is difficult to assess why there is such a big difference between these two dry culverts regarding the presence of animals. However, factors that may be important to consider are their placement relative to the watercourse and the shoreline, the general presence of animals in the area, and the proximity to settlements (presence of cats).

Dry bank

The construction of dry banks using big boulders has proven to be functional. The underpasses are being used by both small and medium-sized animals. The advantage of using larger boulders is that the risk of them being swept away during the spring flood is diminished, which may occur if material of smaller fractions is being used. It can be difficult to construct dry banks on a level that makes them functional at all flow regimes. This is the situation in Northern Sweden, where the water level varies greatly between floods and the mean water level. The constructed dry banks are covered by water for a short period of time during the snow melt and the spring flood. At three of the five sites with dry bank, otter has been documented with camera (the Råne, Skrövån and Venetjoki Rivers).

Ledge

A ledge has been constructed at two sites. However, the results from the follow-up reveal that the ledge in the Kattån River has not been used by species other than squirrel and small rodents. The presence of otter

and other species of animals near the watercourse has been documented during animal tracking wintertime, but neither animal tracking nor camera surveillance indicate that they have been using the ledge. One reason could be the placement of the ledge. Its placement higher up makes it difficult to get a good connection with the shoreline. Ledges are placed higher up to avoid the influence from the break-up of ice and to protect them from being covered by water during high flows. The ledge in Vettasjoki is somewhat better connected to the shoreline and has been used by otter, mink, stoat and small rodents.

Fencing

Fencing as a remediation effort has been carried out in the Nattajoki River. At this site, fences have been put up on both sides of the bridge along a distance of 50 meters. Tracking of animals but no camera surveillance has been carried out at this site. Tracking of animals reveal that an otter on one occasion walked towards the fence. Thereafter, it was directed towards the bridge and crossed on the ice. Foxes have on some occasions walked around the fence and crossed the road. Fences can be effective for some species of animals but it probably depends on the design of the fence and the attractiveness of the underpass under the bridge. Problems associated with fencing include damage during snow removal, caused by the pressure of the snow being pushed to the side, and removal of vegetation around fences.

Choice of remediation type

The remediation efforts as part of the project have been carried out by taking site specific conditions into consideration and with a focus on otters.

The most expensive but also the best remediation alternative is to construct a new bridge with dimensions large enough to enable the construction of a sufficiently wide shoreline under the bridge that will serve as a continuation of the natural shoreline. In many cases existing bridges do not offer a safe alternative for wild animals to pass, but it is not reasonable to replace those bridges due to long remaining longevity. In those situations remediation efforts such as dry culverts, ledges or a completing dry bank can be valid alternatives.

This study does not indicate the proportion of animals in the vicinity that use the constructed underpasses instead of crossing the road. On the other hand, we can conclude that the constructed underpasses are functional and are being used by several species of medium-sized mammals. We conclude that otters have been using all the different types of underpasses that were constructed as part of the project, but dry culverts and dry banks have been used slightly more than the other types.

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