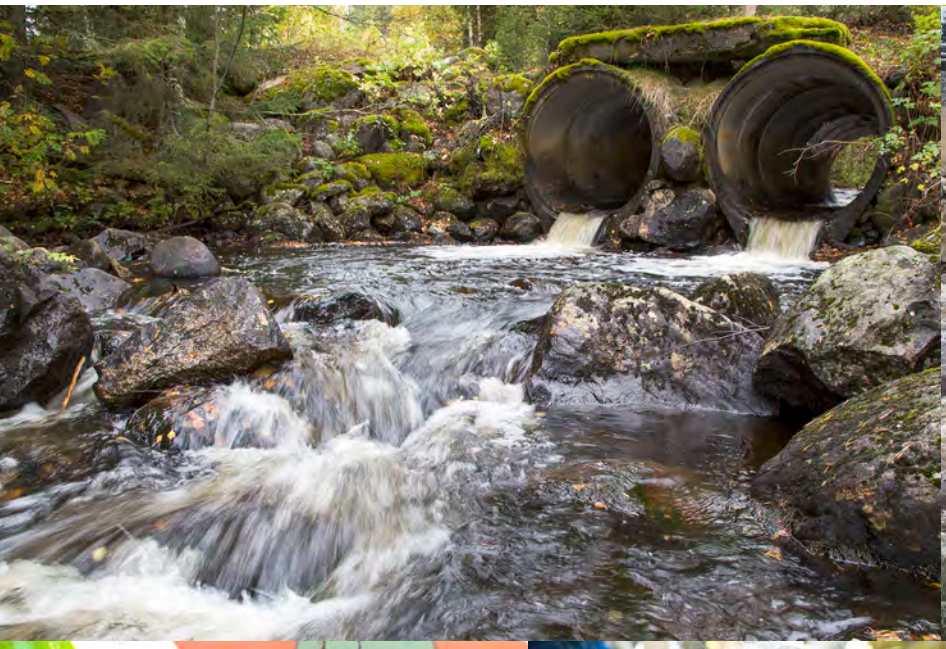
REMIBAR



REMIBAR – *Remediation of migratory barriers in streams*

Layman's Report
EC LIFE+ programme
LIFE10 NAT/SE/045

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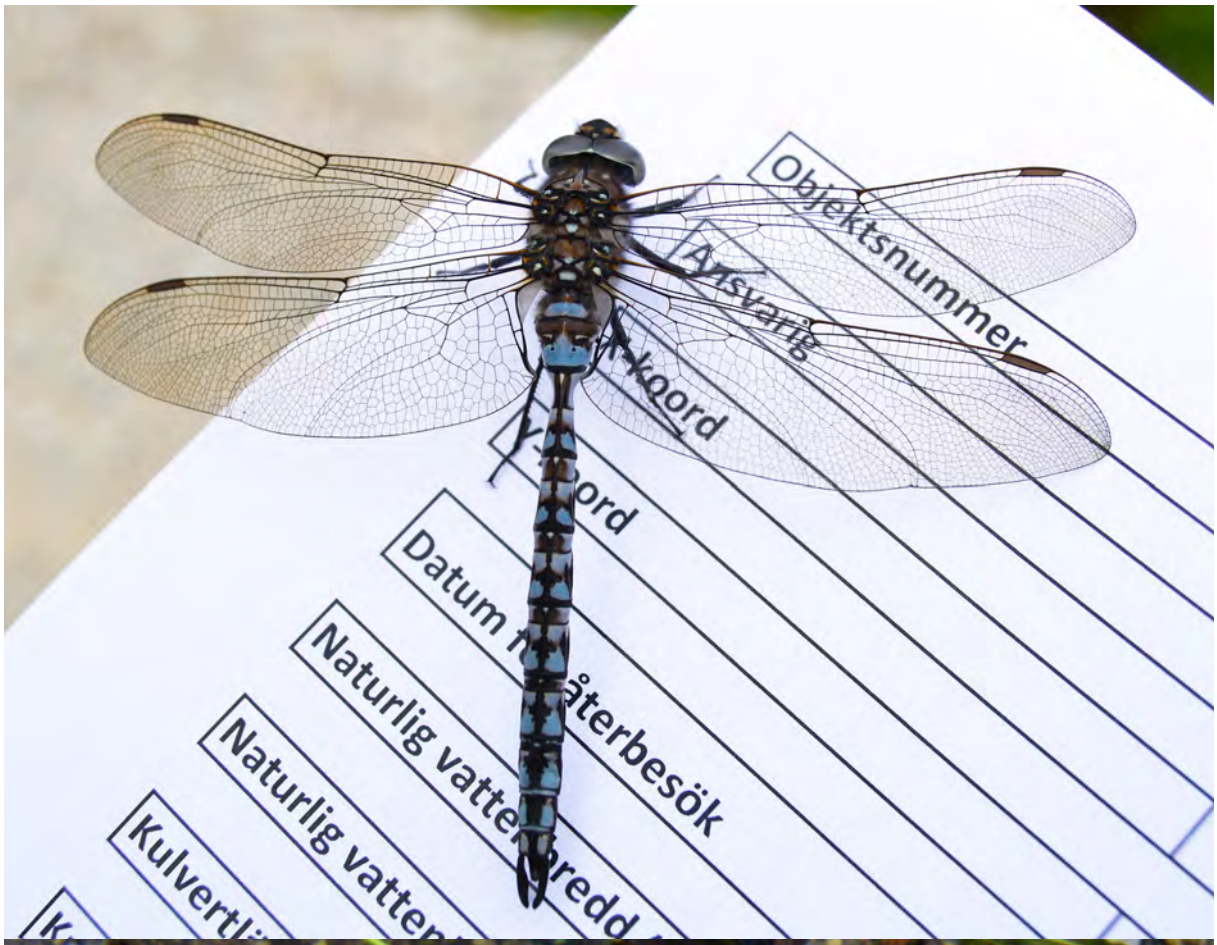
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Summary

Remibar is a project with the objective to remediate culverts and dams in the counties of Norrbotten and Västerbotten that constitute migration barriers in streams.

The goal has been to create open migration routes in five river systems to benefit aquatic animals that must be able to move between reproductive sites, nursery areas, and feeding areas.

Why is it so important with open migration routes in streams?

Streams constitute ecological corridors in the landscape. In addition to the biological life linked to the aquatic environment, the areas surrounding the streams are being used as migration corridors for insects, birds, and terrestrial animals.

Most aquatic animals need open migration routes in order to spread and reproduce. Fish migrate between reproductive sites, nursery areas and feeding areas. Benthic animals, just like the fish, must also be able to move upstream and downstream.

Terrestrial animals moving along the streams, such as otters, foxes and pine martens must be able to pass safely underneath the road, and migration barriers must therefore be eliminated in order not to interfere with their need to migrate.

In Sweden, there is on average one road-river crossing at every two kilometers of a stream. On average, every third road-river crossing constitutes a migration barrier for fish migrating upstream. If other aquatic animals and species that are living on both land and in water are taken into consideration, the situation is even worse.

What constitutes a migration barrier in a stream?

A migration barrier creates a barrier for fish and other animals that live in the stream or along the shore. If they cannot follow the shoreline, animals that move along the shores can be forced to get onto the road and risk getting run over by traffic. A migration barrier can be a dam or a culvert underneath a road or a railroad, or a bridge without banks. The dams are often remnants from the timber floating era and are no longer in use, but are still there as barriers in the streams.

Regarding culverts several factors contribute to turning them into migration barriers:

- High water velocities, due to steep incline and lack of bottom substrate inside the culvert
- Long culverts lacking bottom substrate and therefore lacking resting sites for fish and other animals
- Too shallow water depth make the culverts difficult to swim through
- A perched culvert creates a drop at the outlet.

We have opened up more than 1 700 km of streams

During the course of the project five drainage areas have been opened up and we have remediated 304 migration barriers (picture 1). In total, 1 700 km of streams with a total surface area of 67 km2 has been remediated and reconnected. As a result, fish and other animals in the streams can now reach areas that were previously difficult of impossible to reach. It means that the animals are able to access a larger number of habitats for reproduction, growth, and in their search for food. In the longer term it can lead to increasing and sustainable populations in our rivers and creeks.

Picture 1. Map indicating the project areas included in Remibar.

There are different ways to remediate migration barriers. We have used the following solutions:

- The culvert is replaced with an arch or a bridge
- The original culvert is replaced with a culvert with wider dimensions and the stream bed is recreated.
- The water level inside the culvert has been raised by creating a rocky ridge downstream
- The dam is removed and the stream bed is recreated

In order to make it easier for otters and other medium-sized mammals to move along the shore of the streams we have adjusted a number of bridges by constructing different types of underpasses:

- *Dry banks* – new dry banks are created underneath the bridge. The banks are constructed with large boulders and is a good alternative when the water is not too deep.
- *Ledges* – A ledge can be constructed underneath bridges and inside larger culverts. The ledge should be a natural extension of the bank and be placed so it can be used at most flow regimes.
- *Dry culverts* – if it is difficult to modify the existing culvert or bridge, a dry culvert can be constructed in the vicinity of the bridge. In order to direct the animals towards the dry culvert, structures and sometimes even fences that help guiding the animals towards the culvert may be necessary. It turns out that the dry culverts are working very well and have been used frequently by different species of animals.
- *Fence* – are being put up to direct the animals towards the underpass.

Picture 2. The picture to the left is showing a double culvert with high water velocity and with a drop at the outlet. The picture to the right shows the same site after the culverts have been replaced with a bridge (ID244).

Picture 3. The picture to the right is showing a culvert with high water velocity and with a drop at the outlet. The picture to the right is showing the same site after the culvert has been replaced with a wider culvert and a recreated stream bed (ID 54).

Picture 4. The picture to the left shows a culvert with high and low water depth. The pictures in the middle and to the right show the site following the construction of a rocky ridge downstream the culvert. Due to the rocky ride, the water level has increased and the water velocity is reduced (ID 280).

Picture 5. The picture to the right shows a dam that is an impassable migration barrier. The dam is a remnant from the timber floating era. The picture to the right shows the same site after the dam has been removed and a new stream bed has been recreated (ID 255).

Picture 6. A new dry bank created underneath a bridge. Otter spraints can be seen in the picture (ID 309).

Picture 7. Constructed ledge underneath a bridge (ID 107, Kattån).

Picture 8. Dry culvert next to a wide culvert (ID 97, Långbäcken). The dry culvert has been used very much by different species of animals.

Picture 9. Fence directing the animals towards the underpass (ID 22, Nattajoki)

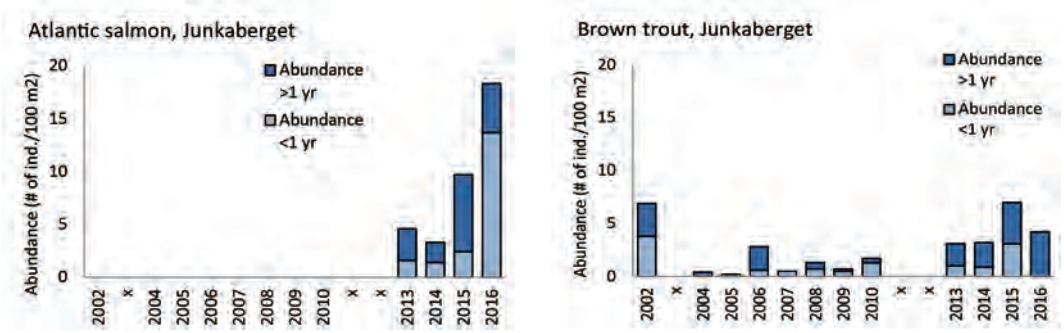
Our remediation efforts are working

In the evaluations we have been using data that has been collected in existing environmental monitoring programs using electrofishing and data from fish counters in the Kalix and Pite Rivers.

We are already seeing positive and apparent trends in the data from some of the electrofishing sites in the Varjisån, Sävarån and Lögdeälven project areas regarding the reproduction of Atlantic salmon and/or brown trout. On the other hand, it was not possible to record any effects of our remediation efforts in the Ängesån and the Råneälven project areas, as the electrofishing sites were not located in the vicinity of the migration barriers that had been removed in those two areas.

Once the remediation efforts have been carried out, it generally takes a long time before it is possible to record any effects on the population. When they reproduce, Atlantic salmon and brown trout return to the area where they were born. If salmon is to colonize new reproduction sites higher upstream, the abundance of reproducing adults and the competition for space must be high enough to force some individuals to continue their migration to new areas. In addition, salmon is a stronger competitor than trout for reproductive areas in the main stem of the river. Therefore, high abundances of salmon will also force trout to migrate higher up in smaller tributaries in order to reproduce. It is therefore important to allow the populations of both salmon and trout downstream the area that has been opened up to grow. In many areas the competition for reproductive areas is already high and in those areas it is very likely that new areas upstream are being colonized. We see this in the results from the electrofishing surveys in Varjisån, Sävarån and Lögdeälven. One example is shown in picture 10 where we see that salmon has returned and the abundance of trout has increased at the Junkaberget site in the Varjisån project area following the removal of migration barriers in 2012 downstream as part of Remibar.

Project area Varjisån



Picture 10. Abundance of trout and salmon recorded during electrofishing at the Junkaberget site in the Varjisån project area.

In the areas where we are seeing positive trends, other restauration efforts have also contributed to the improvements. Evaluations of individual measures would clarify the way in which they contribute. It would be useful to carry out those evaluations before future measures are carried out. Data shows that an increasing number of both salmon and trout are migrating higher up in the river system. Successful management of the stocks of salmon and trout near the mouths of the rivers and in the Gulf of Bothnia have led to an increase in the population sizes of salmon and trout, and consequently an increase in the number of individuals migrating up the rivers to spawn.

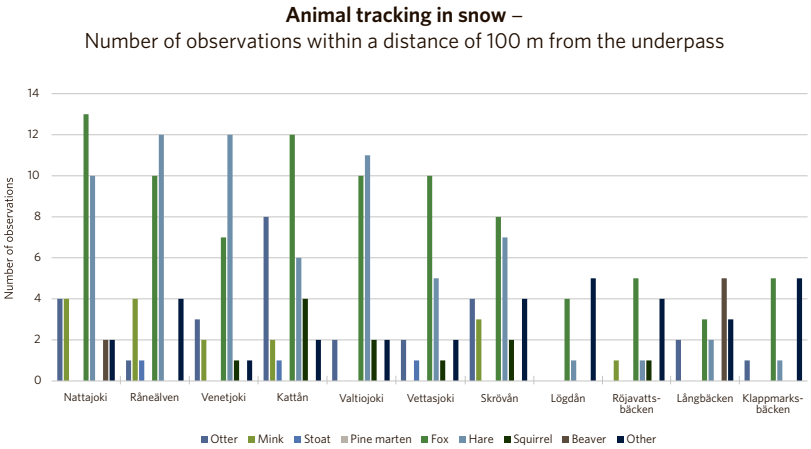
As part of the Remibar project eleven underpasses for otters were constructed: five dry banks, three dry culverts, two ledges and one fence. The function of the underpasses and the movements of animals in the vicinity was assessed through tracking of animals in snow wintertime and monitoring using cameras during part of the bare ground season. The follow-up was carried out during a two-year period.

The follow-up shows that all constructed underpasses have been used by medium-sized mammals

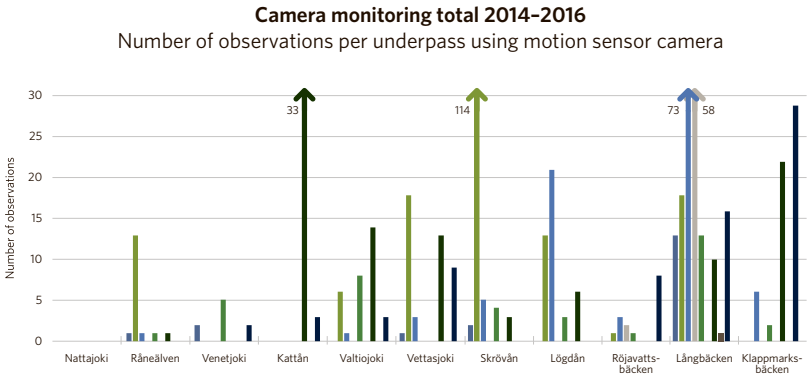
(pictures 11, 12 and 13). Animal tracking in snow shows that otter occurs in the vicinity of all the underpasses. Wintertime the animals can often pass on the ice underneath the bridge without using the constructed underpass. Monitoring using cameras revealed that otter has been using five of the constructed underpasses, namely those in Råneälven, Skrövån, Vettasjoki, Venetjoki, and Långbäcken.

Picture 11. Otter observed at two of our underpasses, one shoreline (ID 24 Råneälven) and one dry culvert (ID 197, Långbäcken).

The studies that have been conducted as part of Remibar do not have a scientific structure and do not, for example, answer the question regarding the proportion of animals in the vicinity that are using the underpasses instead of crossing the road. However, we can draw the conclusion that the constructed underpasses are working and are being used by many species of medium-sized mammals. We have concluded that otters are using all types of underpasses that have been constructed as part of the project, but dry culverts and shorelines have been used slightly more than the other types.



Picture 12. Number of observations of different species of animals near our underpasses.



Picture 13. Number of observations of different species of animals near our underpasses using motion sensor cameras.

Dissemination of information

As part of the project Remibar we have actively been spreading information. We have created a website, spread information via Facebook and Youtube, we have produced distinct profile material, written press releases and actively been spreading news that have been well received locally, regionally and nationally.

We have reached out to different groups of stakeholders, schools and the general public by organizing 18 excursions which were attended by 3 000 participants in total and five seminars which were attended by approximately 130 participants. We have built networks by collaborating and exchanging experiences with other countries including Finland, Estonia, Austria, Scotland, France, France, Poland, the Netherlands, Belgium, and the USA. We have also received groups of visitors from different countries.

Picture 14. Excursion with landowners near the Varjisån.

Our film has been very well received and has been an appreciated part of our presentations. The Swedish version has been watched more than 1 800 times on Youtube and the English version has been watched more than 200 times.

The project's most popular events were the family days that took place in Luleå and Umeå in the summer of 2015 and attracted more than 1 600 visitors. The evening seminar in September 2016, which attracted 300 visitors, was also popular. At the seminar our film was screened and we had also invited the well-known nature photographer Mattias Klum whose talk focused on the impact humans have on the planet in a larger perspective.

Picture 15. The ad for the evening seminar with Mattias Klum.

Picture 16. Family Day in Luleå which attracted approximately 800 visitors.

Picture 17. Family Day in Umeå which attracted approximately 800 visitors.

Facts about the project

The project has been run as a collaboration between the Swedish Transport Administration, The County Administrative Boards of Norrbotten and Västerbotten, the Swedish Forest Agency and the forestry companies Sveaskog, Holmen skog and the SCA. The Swedish Agency for Marine and Water Management was also a partner. The project started in September 2011 and was completed in 2016. The total cost for the project was estimated to 8.1 million €, half of which is being funded by the EU.

The project was financed by the EU Commission through the Life-programme, which is an EU environmental fund. The EU Commission has approved funding for 183 projects within the scope of the Life-programme.

The projects within Life+ Nature and Biodiversity contribute to improving the conservation status for threatened species and habitats.

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