ROADMAP

FOR FISH MIGRATION IN THE DUTCH DELTA

TOWARDS RESTORATION OF FISH MIGRATION HIGHWAYS AND A ROBUST WATERWAY NETWORK FOR FISH

- The most important routes for fish migration (highways)
- A unique collaboration in the Rhine-West region to help fish migrate freely
- Improved connectivity in our water systems (network of rivers, canals and ditches)

Regionaal Bestuurlijk Overleg
Deelstroomgebied Rijn-West
Europese Kaderrichtlijn Water
Nederland leeft met water

Design Shapeshifter.nl

Photography Pictures have been provided by Sportvisserij Nederland, Herman Wanningen and the various water authorities in the Rhine-West Basin area. The Haringvliet Sluices pictures are taken by Henri Cormont – inZicht

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COLOFON

WHY HELP MIGRATORY FISH?

The Netherlands want clean and environmentally healthy waters. Healthy fish stocks do tell us a lot about just how clean our rivers, canals, ditches and other waters are. All fish must be able to migrate freely between their various habitats and spawning areas. However, if a migratory fish cannot pass a weir or lock, the story ends abruptly. It cannot reproduce. Fish like salmon, eel and stickleback depend on free migratory routes to complete their life cycle. For example, salmon must reach the headwaters of the river Rhine to spawn.

Many obstacles in their migratory routes, or limited access to their habitats and spawning areas, may significantly damage their populations. That is why fish stocks have decreased dramatically for some of these species over the last decades. But help is on the way. Barriers for fish migration are being lifted. Our waterway network becomes more and more interlinked and reconnected.

WORKING TOGETHER TO IMPROVE FISH STOCKS IN THE RIVER RHINE AND NORTH SEA

The Dutch Ministry of Infrastructure and the Environment (Rijkswaterstaat), Water Boards, Provinces, Municipalities and other regional partners are working together to help fish on their journey.

These water authorities do that through the Regional Directorate Rhine-West (RBO Rijn-West), a partnership that derives from the European Water Framework Directive (WFD). The WFD is a European law which obliges all Member States to have good water quality in all their major water systems by the year 2027. Having healthy fish stocks is one of the most important criteria for good water quality. The European Marine Strategy Framework Directive (MSFD) also identifies fish stocks as a key indicator for good environmental status of the marine waters.

Close consultation with the river basin area

In addition to collaborating within the Rhine-West region, consultation with water managers in other parts of the Rhine river basin and the Meuse river basin is needed, both nationally and internationally.

After all, Germany, Belgium, France and Switzerland paid millions for fish passes that make fish migration possible again. The various countries within the Rhine river basin depend on each other when it comes to good water quality and open connections for migratory fish. The goal is to have ecologically healthy rivers and seas, with a great diversity of fish.

MOVING FORWARD, WHAT IS NEXT?

At present some 120 obstacles for fish migration (or so called 'bottlenecks') have been resolved already. Thus the Rhine-West region is well on track, but more successes are anticipated.

Fish passage in the River Rhine is doing reasonably well due to effective fishways in the Neder-Rijn. A few regional waters like the river Linge have been reconnected to the main channel of the Rhine. By linking regional waters with local waters, more habitats become available to migratory fish.

EEL AND SALMON, LONG DISTANCE SWIMMING CHAMPIONS

The eel and salmon swim long distances during their lives, sometimes 4,000 miles at a time. Salmon are born in fast-flowing mountainous streams in Germany and Switzerland. The young salmon use the rivers to swim to the sea, where they mature. The adult salmon then swims back to the headwaters to spawn. This life cycle takes up to 7 years.

Eel are born in the Atlantic Ocean (Sargasso Sea). After a few years they arrive at the Dutch coast as small glass eel. In fresh water these eel live for 4 to 6 years to mature and then swim back to the Sargasso Sea to reproduce. The irony of this story is that sometimes 99% of the glass eel journey has been completed already when, in the final stages, a single barrier may withhold the fish to carry on. It is almost there, but unable to complete its life cycle. Or the other way around. A silver eel has matured in the waters of a polder in the Netherlands. To spawn, it needs to return to the Sargasso Sea. But it then finds itself trapped because the waters of this reclaimed land are enclosed by embankments and there is no way out.

Specially designed 'fish friendly' pumps have been installed in the Rhine-West region at the Kralingseplas pumping station. This machine pumps the water from lower parts of the water system to the higher parts without damaging fish such as the eel.

The water authorities of the Rhine-West region have highlighted a few of these success stories (see green dots on the roadmap) .

RHINE-WEST VISION ON FISH MIGRATION

The WFD management plan, in which measures for the second phase (2016-2021) are included, has been in preparation for some time. Another 220 bottlenecks for fish migration have been identified. They need to be resolved by 2027 requiring a joint approach. A selection of these still-to-go bottlenecks you can find on the roadmap (see red dots).

Not all are equally important. Resolving some bottlenecks may be more important than resolving others. Migratory fish are dynamic by nature and move from one place to the other. Similarly priorities may change in time. For example because of new insights following progressive research and monitoring, or better engineering techniques. In order to assess what bottlenecks have priority at the moment - and what approach is needed - the water authorities have developed a joint Vision. The Rhine-West Vision on Fish Migration consists of the following main points:

- **Key role Rhine-West as gateway**
  Rhine-West is the gateway from the North Sea to the river Rhine, thus playing a crucial role for fish migration to and from the river Rhine.

- **More open connections, more efficiency**
  More open connections to the sea are needed (transition zones between fresh and saltwater) such as; the Haringvliet Sluices, the Helsdeur, pumping station Westland and the joint approach of the Nieuwe Waterweg via Rotterdam (see Priorities). Ecologically these connections will result in a better return on investment with positive effects throughout the river basin as a whole. The ecological status of the waters will improve, both within the Rhin-West region and throughout the river Rhine catchment area.

- **Prioritizing fish migration measures 'From sea to source'**
  To facilitate migratory fish in the most effective way, it is important to prioritize measures in an upstream direction 'from sea to source'. Just imagine, if upstream 9 out of 10 barriers would be removed but one last barrier near the sea would remain. Then all the work would have had little effect sofar. It is crucial to consider measures from an ecological point of view.

- **Robust waterway network for fish**
  Working together to establish a robust waterway network that consists of:

  - **Highways**
    The ecological highways for fish migration are the main routes to the spawning areas. These are national waters managed by Rijkswaterstaat. They need to be interlinked just as a road network is. Similar to highways the big canals play a major role when large distances have to be covered. For some species that spawn abroad, e.g. salmon and sea trout, these highways in de Dutch system are of vital importance.

  - **Regional waterways**
    These are the main regional waters (like rivers and canals) that form a link between the national waters (highways) and the local waters. They also provide access to more habitats. Open connections between regional waters and national waters are vital. Not just for migratory fish, but for ALL fish. Even for fish that like stagnant waters. Via the open connections fish larvae and eggs can spread. This is important for genetic diversity and population dynamics.

    In the Dutch delta oftentimes the water systems are artificial (man-made) and disconnected resulting in fragmentation of fish habitats. These habitats need to be actively reconnected. Thus canals play an essential role. They may function as migratory routes or ecological connections between the otherwise fragmented habitats, and are much needed for example by the eel.

  - **Local waterway**
    These small waterways allow fish to reach the capillaries of the system, which might be a polder or a ditch with natural vegetation. Linking these waters with regional waters and highways is essential to prevent fish from being trapped in the polders.

- **Get down to work together**
  Working together closely as water authorities, consulting with regional partners and authorities in other river basins to create 'mutual benefits' and more efficient working methods.

- **Learning from one another**
  The water authorities want to learn from each other by promoting the exchange of knowledge (research and monitoring), techniques & innovations, public participation and education. Good examples of innovations are the Fish Lift and De Wit-fish passage that are being used throughout the Netherlands.

The water authorities in the Rhine-West region have been working together closely to develop this **Roadmap for fish migration in the Dutch Delta**. The key-issue is the **restoration of fish migration highways and a robust road network for all fish**. All stocks of fish should benefit, in river and sea. On the basis of the Vision above, the water authorities have identified a number of Priorities that will soon be taken to hand (see orange dots on the roadmap).

Atlantic Salmon, Eel, Three-spined stickleback and Ide

OUR SUCCESS STORIES

1 Joint approach Noordzeekanaal

The Noordzeekanaal is a big canal and shipping route for sea vessels sailing from the North Sea to the Port of Amsterdam. It is also a major route for migratory fish in the Netherlands being one of the few open connections to the North Sea. However, up until recently connections to side-channels, tributaries, and small rivers were often blocked off for migratory fish. Water authorities and local partners have joined together to successfully address these issues. Migratory fish species such as stickleback, eel and European smelt have benefited significantly.

2 Fishways at Neder-Rijn sluices

In the Neder-Rijn three fishways for migratory fish have been constructed at the sluices near the cities of Driel, Amerongen and Hagenstein. Fish monitoring indicates a good efficiency. A very large variety of fish species at different life stages pass the fishway. Several salmon, sea trout, sea and river lampreys have been recorded.

3 Connecting local waterways via the Linge to the main river Rhine

The river Linge is connected at several locations to main rivers and canals like the Neder-Rijn, Waal, Lek, Merwedekanaal and Amsterdam-Rijnkanaal (all fish migration highways). Thus migratory fish can enter the river Linge (a regional waterway) nearby Gorinchem and Tiel and reach new habitats (local waterways). Via the river Linge they can swim all the way up to Angeren nearby the German border.

To facilitate this migration pattern a fish friendly pump at the Nieuwe Horn pumping station was installed and a fishway nearby Buren was constructed. The monitoring report (October 2013) shows that the Buren fishway functions well and suits a variety of fish at different lengths. These are good local examples that show how migratory fish may benefit when connections to the main river system are included in the project plan.

4 Fish passage at Halfweg pumping station

The fish passage near the Halfweg pumping station works! Since its construction in 2012 over 375.000 fishes migrated between the Noordzeekanaal and the canals, lakes and ditches of the region. Especially glass eel and three-spined stickleback make extensive use of the fish passage.

5 Fish ladder at Caspargauw pumping station opened by children

The fish pass at pumping station Caspargauw was opened by local primary school children. A special fish pod was emptied highlighting that the fish ladder was successful. Monitoring results showed that 23 species of fish were caught among which many large eel.

6 Innovative fish lift in Delfland

The Fish Lift in Delfland is very innovative. During springtime migratory fish are lifted into the polders through a tube in the dykes. When autumn arrives, outgoing fish are lifted back out of the area. This Fish Lift enables migratory fish to safely pass a pumping station without being damaged.

7 Helsdeur mailbox

The Helsdeur is a potential transition zone between the freshwater of the Schermerboezem and the salty North Sea and Wadden Sea. The lock and the pumping station proved to be a bottleneck for fish migration. But engineers came up with a technical solution that looks like the famous red UK mailbox. Via the openings in the mailbox fish can easily pass. The number of migratory fish - especially eel, stickleback and European smelt - has significantly increased.

8 Fishway at Strype

Along the Strypse Wetering nearby Brielle a bypass fishway was constructed in 2013. It connects the newly constructed water storage Strype with the polders. The performance of the fishway was examined and research indicates that it functions properly, being used by eel and gudgeon.

9 Fish friendly pump at Kralingseplas

A Fish friendly pump has been installed at the Kralingseplas pumping station. This advanced machine pumps the water from lower parts of the water system to the higher parts without damaging fish such as the eel. The pump has resulted in a significant decrease in the number of critically injured fish from 29.4% to 0.06%.

SELECTION OF PRIORITIES

A Haringvliet sluices: Open Sesame

The Haringvliet sluices are to be opened in 2018 following the Dutch 'Kierbesluit' (literally 'Crack Act'). The 'Kier' is a continuous opening in the Haringvliet sluices. It will restore the natural mix of salt and fresh water, and the natural migration of fish. The ecological status of the river Rhine as a whole -and fish in particular- will benefit. Indicator species such as salmon, eel, shad, sea trout and maybe sturgeon will be able to swim freely between the sea and the river Rhine and Meuse.

B Fish friendly lock management at the Nieuwegein sluices

At the intersection of the Amsterdam-Rijnkanaal with the Merwedekanaal the free passage of migratory fish is promoted by fish friendly lock management of the Nieuwegein sluices.

C Enhancement inlet Kromme Rijn and Rhine side-channels

At the river Lek and Neder-Rijn the ecological quality of the side-channels is being improved to create more habitat for migratory fish. The inlet of the Kromme Rijn is being enhanced so that fish can pass more easily.

D Fish pass Westland pumping station with fresh-salt water transition zone

A fish pass at the Westland pumping station will connect the Delfland fresh waters with the salt sea water of the Nieuwe Waterweg, and form a key transition zone for migratory fish.

E Connecting the Voorne Canal with the Haringvliet at Hellevoetsluis

At present, the lock management at Hellevoetsluis has been adapted to promote fish migration already. The passage of migratory fish through the Voorne Canal will be more efficient once the Haringvliet sluices are opened and adjustments are made accordingly.

F Connecting the river Linge with the Amsterdam-Rijnkanaal and Waal at Tiel

The river Linge is being connected to the main national waters at several places. At the city of Tiel a fishway at the Linge pumping station A.H. Van Beuningen is used. The Linge is also linked with the river Waal via a fish passage near the inundation-canal.

G Stevin locks fishway near the Afsluitdijk at Den Oever

This fishway will establish a migratory route between the Wadden Sea, the IJsselmeer and the regional waterways. In addition, the water authorities are investigating the possibility of a so-called 'Fish Migration River'. This is a 6 kilometers long -nature like-fish pass designed to enable migratory fish to gradually make the transition between the salt water of the Wadden Sea and the fresh water of the IJsselmeer.

H Connection with the river Oude IJssel at pumping station Gouda

By constructing a fish pass at the pumping station Gouda regional waterways are being reconnected with the river Oude IJssel (a fish migration highway). Thus new habitats for migratory fish are being made available.

I Joint approach Nieuwe Waterweg as fish migration highway via the City of Rotterdam

The Nieuwe Waterweg is currently the main gateway to the Rhine river basin for migratory fish. The water authorities and their local partners want to develop a joint approach to fish migration in the Rotterdam region. A success story like the joint approach of the Noordzeekanaal is being anticipated.

J Connecting the Rhine with the Noordzeekanaal via the Amsterdam-Rijnkanaal and Merwedekanaal

Big canals like the Noordzeekanaal, Amsterdam-Rijnkanaal and Merwedekanaal are important as ecological highways for migratory fish in the Netherlands. Although they may not provide sufficient habitat, they do provide much needed connectivity between habitats. Sufficient habitat along the way will be ensured by connecting the big canals with tributaries, side-channels and small rivers. By doing so a new fish migration highway will be established between the river Rhine and the Noordzeekanaal.

ROADMAP FOR FISH MIGRATION IN THE DUTCH DELTA

L E G E N D

- Fish migration highway
- Regional waterway
- Local waterway
- Successes
- Priorities
- Challenges

NOORDZEEKANAAL
AMSTERDAM RIJNKANAAL
HOLLANDSE IJSSEL
NIEUWE WATERWEG
NEDERRIJN
MERWEDEKANAAL
LEK
NIEUWE MAAS
OUDE MAAS
MERWEDE
LINGE
WAAL
PANNERDENSKANAAL
GREVELINGEN
HARINGVLIET
HOLLANDS DIEP
BERGSCHE MAAS
OOSTERSCHELDE
MEUSE
RHINE