**Minutes of the Workshop fish migration**

A webinar organized by the Green Blue Rhine Alliance ([www.gbra.eu](http://www.gbra.eu))

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**Introduction by Niels Brevé (Sportvisserij Nederland)**

The project Green Blue Rhine Alliance (GBRA) started in 2018. GBRA is a cross-border cooperation between Germany and the Netherlands. The program is financed by Interreg, a European fund, and supported by German and Dutch Ministries, Provinces and nature NGO’s. Together, within this substantial project we work on several themes: flood plain restoration, connectivity for otters and restoration of migratory fish populations of the River Rhine. The latter, which is the theme of today’s workshop.

The river Rhine is home to 18 migratory fish species that need to migrate to fulfill their life cycle. 90% of these migratory fish is listed endangered, either World-Wide, within Europe or within the river basin. The main human threats to migratory fish are habitat degradation (water pollution, channelization, normalization) and losses in the spawning and nursery areas (dams, hydropower and pumping stations). The issues are addressed following European policies such as the Water Framework Directive and remediated by the Rhine member states. Nevertheless, there are still some urgent questions to improve the vulnerable status. This afternoon we will look at studies carried out by the GBRA partners and their work that address issues for migratory fish in the River Rhine.

**Conjoint fish sampling** **Germany – Netherlands by Nicole Scheifhacken (BRG Düsseldorf)**

Several projects of conjoint fish monitoring have been conducted by both German and Dutch authorities. One of the goals was to compare monitoring procedures. We did the study on 4 locations and we used sampling techniques like electrofishing, seine net, eDNA and dredging for lamprey. Until now 5 reports have been made.

The main focus of this conjoint project was: to compare riverine habitats using Dutch and the NRW sampling standards; juvenile rheophilic species; to compare protocols and results of different sampling methods; identification of differences and similarities and to determine general rules and conversion rates for the collected data. Sampling took place in groyne fields and side channels. The overall report with a comparison of German and Dutch data is in progress.

Questions:

* Q: Are the results comparable? A: Not all the data is available yet, we worked with standard protocols, conclusions will follow later. We are learning from each other. Main aim was to get acquainted with each other. Data is now almost complete. Point abundance and stretch sampling was useful to learn about. Both sides learnt from each other. Different procedures, nearly the same river.

**Stow net fisheries Lower Rhine by Roland van Aalderen (Sportvisserij Nederland)**

Professional fishermen know how to successfully fish in difficult circumstances the river Rhine provide. One of the techniques was a fishery with stow nets from an anchored boat (eelschokker). On the Rhine there used to be 75 on the Dutch part and 140 on the German part of the Rhine. The technique seems to be very feasible for monitoring downstream migration of fish and plastic. The goal of the project was to test whether stow net fishing could be a useful technique for monitoring downstream migration, to learn more about this migration (salmon, seatrout, allis shad, lamprey, houting and eel). Sampling took place at two locations in The Netherlands and two locations in Germany. Final results are not available yet, preliminary results show that stow net fisheries are suitable for monitoring diadromous fish, show some differences in species and length composition DE – NL, river dynamics (discharge, temperatures) ask for year-round monitoring (or flexible based on early warnings). A fixed and limited schedule is not suitable.

Questions:

* Q: Are we talking about active migration or passive drift? A: This could be both. Juvenile salmon will migrate actively, juvenile riverine fish will also passively migrate.
* Q: Did you also analyze the fish for pollutants/heavy metals? A: No, that was not included, it’s a good suggestion for a future project.
* Q: The difference in species composition and numbers between NL and Germany strikes me too. Can you say something, how to explain this? Due to difference in methods or different monitoring locations/ habitats? A: Methods and type of locations were comparable. It could be a coincidence, we have to prolong the sampling to learn more about differences.
* Q: You hardly caught any fish in daytime. What causes the difference between day- and night fishing? A: I think it’s a behavioral issue. It’s a passive gear with large dimensions. Even small fish were caught better during night. So I don’t think it is because of the visibility of the net.
* Q: Does the sampling recognize differences in the behavior of fish and plastic? A: Plastic will always drift downstream unless it approaches the bank or river bed, so it can be sampled by a stationary ship. Fish can swim upstream if they want to, but he fish will only catch the downstream swimming individuals, won't it? So I think we have to evaluate the catches differently, right? I meant to say that the ship will catch only the fish swimming downstream. Answer: At the end of the stow net there is a so called “throat” like you will find in fykes. This prevents fish to swim out of the net. But there is always a possibility fish will escape when they enter the net and turn. But if we see the numbers of small fish this will not happen often for smaller fish.

**Plastic sampling by Margriet Schoor (Rijkswaterstaat)**

Rivers transport plastic to the see. Up till now plastic sampling was focused on the shore. Since we started monitoring with an eelschokker in 2018 we are also focusing on plastic in the river. It was horrible to see that we sometimes caught more plastic than fish. We collected thousands of plastic pieces. Most is small, mainly plastic foil. Cords and strings are originated from waterworks, RWS try to use other construction materials. Plastics originated from many countries, most from Germany. Altogether a lot of plastic is transported. It’s a base flow, because sampling took place during low discharges. The fishery with an eelschokker is still needed for sampling because it is the most efficient technique to sample macro plastic. The last years a lot of new initiatives started. Goal is to come to new plastic monitoring strategies. But we also have to make sure that pollution stops.

Questions:

* Q: Are you also monitoring floating tempex at the water surface? There is a difference between shore plastic and plastic in water. Floating tempex will soon drift to the shore as it is easily blown by the wind.
* Q: The majority you found was pieces of plastic foil. If you want to solve you have to start with this group. What is the source? Probably plastic bags and waste which is fragmented by ships. The Rhine is the busiest river of Europe. Are the biggest parts found more upstream? We haven’t studied this yet.
* Q: Plastic polution by geotextiles needs more attention within de waterschappen.
* Q: I would like to advice working together with some organizations that have reducing plastic pollution as their main topic. Combining knowledge and effort. You can contact me if interested. Thomas vd Geest WRIJ
* Q: Maybe, also the yearly International RhineCleanUp (www.rhinecleanup.org) can be involved in river bank plastic garbage monitoring?
* Q: Will bioplastic be a solution?
* Q: Re bioplastic: the challenge is to have something that is stable while you use it but degrades when you don't. What we need, I think, is a way for nature to spot whether or not a piece of plastic is in use. It might be possible to design plastic in such a way, though I admit this is highly abstract. Bioplastics in their present form also are somewhat controversial: <https://en.wikipedia.org/wiki/Biodegradable_plastic#Controversy> Biodegradable plastics are plastics that can be decomposed by the action of living organisms, usually microbes, into water, carbon dioxide, and biomass. Biodegradable plastics are commonly produced with...
* Q: Can you involve other organizations who deal with plastic? We do have contact with several organizations, like the Wageningen University.

**Fish migration between River and Flood Plain by Luc Jans (Rijkswaterstaat)**

Comprehensive research on fish along the river have been conducted. With focus on habitat use of juvenile fish, fish communities of flooded grasslands, monitoring of fish stocks in the main channel and telemetric research on migratory fish. Habitat use varies by species, throughout the life cycle and even during the day. Daily migration of fish, for instance due to daily temperature changes. Fish densities are higher during nights, temperatures, visibility of the net. A very comprehensive fish research was conducted in side waters. We want to analyze what causes the presence.

Finally we want to make an overview of all available fish data in Germany and the Netherlands, for instance active fish monitoring (MWTL), monitoring for the Water Framework Directive and the yearly NEDAP-monitoring.

Questions:

* Q: I remember from Grift's research that yoy barbs have a very specific habitat, at least coarse sand / fine gravel. One year it was there in the Nebenrinne Opijnen, sometimes not. Call me if you want to know where they are (Gerard de Laak).

**Sturgeon habitat River Rhine by Bram Houben (ARK Natuur)**

In 1952 the last sturgeon was caught in the river Rhine. Since 2007 reproduction success in the French river Gironde, which makes it possible to start with a plan in 2009 for the reintroduction of sturgeon in the river Rhine. This led to the Sturgeon action plan in 2020. We just started with the first fase 2020-2030: looking for the feasibility of the Rhine for Sturgeon and make way for reintroduction. At the moment there are six potential spawning sites available. 30% of the lower Rhine is suitable as rearing habitat for juvenile sturgeon. Food is also available, there are very interesting hotspots with macrofauna. So there is a good availability of food for sturgeon. Rhine is a climate proof river for sturgeon.

Questions:

* Q: Is a telemetry study on migrating sturgeon possible? A: There is a Vemco network available. As soon we have juvenile sturgeon we will start a study.
* Q: Could they find the way to the sea?

**Shipping and eel mortality in the Rhine by Max van de Ven (ATKB)**

European Eel stocks are declining. Until now the majority of action was taken on fishing and hydropower and pumping stations. Collision with ship propellors hasn’t been done on this subject. Potential role of shipping as a cause of mortality. We did a study on comparing characteristics of shipping and eel behavior. The main route to and from Germany to sea is via the Waal. Both for shipping and eel this is the main route. Chance of collision: the month with highest shipping activity is also the month of downstream migration. More shipping movements when discharge drops. Ships have a higher speed (2-3 x higher) than eel. The annual ship movements are pretty stable around 100.000 per year and it continues 24/7. A lot of river discharge passes through ship propellors, at low discharges ship propellors “consume” 3 times the river discharge. Fast-moving, heavily loaded and deep-lying vessels with a powerful multiple propulsion system form the greatest risk. In order to limit the risk for silver eels, the number of movements of these ships at critical moments should be kept to a minimum.

Questions:

* Q: Will shipping adept fish friendly propellors? A: I will share the results with the shipping industry, hopefully they adept to it.
* Q: Did you consider acoustic and turbulence as a way eel will migrate away? A: No
* Q: Hundreds of dead eel were found last week, could they be victim of ship propellers? A: More research is needed, you should study the type of wounds/injuries.
* Q: You did not take recreational shipping into account; how do you think this would relate to the large vessels? It would play no role because they are too small? A: No we didn't. The number of recreational ships is many time shigher but on the Waal they are probably of minor importance.

**Stranded and snapped eels by Jeroen Tummers (RAVON)**

Extensive river walkover surveys were conducted in a study to gain insights into factors causing mechanically damaged eels along the Waal. Since many years mechanically damaged eels are found on river beaches. Bound by national and EU legislation for the conservation of the protected eel, this study seeks to identify (severity of) causes of mortality. For this project volunteers undertook standardized walkover surveys, thereby making an inventory of stranded fish incl. eels in predetermined sections / groynes along the Waal. Null observations were also recorded to allow for analyses of time intervals between observations of fish. Study area is the river Waal and some trajectories along the rivers IJssel and Nederrijn. In total we defined 1035 sections of which 718 have been visited by 40 volunteers. The volunteers reported up to 17 eels per week, most in autumn and during low water levels. Further research is strongly advised, with an analyses of the type of injuries, related observations (shipping traffic, water level, temperature, moon cycle).

Questions:

* Q: Are there enough volunteers? We have a growing group of volunteers who are crucial for the project. This year it is our aim to increase survey intensity, both by including more volunteers and by potentially increased survey frequencies, especially in key eel migration periods.
* Q: Were other species also damaged? A: Yes, we also found other species, but eels were most abundant.
* Q: I think there might be a great time lag between the eels being injured and the eels being stranded. How will you deal with this? Q: The problem when you find them, you do not know how long they are dead. When did they strand, difference between summer/winter etc. So direct relations between discharge is difficult. A: Expert judgement on the state of fish. Also taking null observations into account to pinpoint date of stranding in more detail.
* Q: were these other species also mechanically damaged? A: To a lesser degree they were. Eels seemed to be more often mechanically damaged, and also severity of damage was greater in general compared to other species.
* Q: Stranded eels have a big “who did it?” secret. The only way to point out is to do proper research with ships and catching devices just behind ships. This is really the thing that is needed. A: Totally agree. We are currently writing a project plan to study snapped eels in a more holistic approach. Studying ship propellor impact in a standardized, direct working method. We also aim to employ drone surveys to monitor direct impacts of shipping traffic.
* Q: We have an idea of eel damage by hydropower stations and pumping stations, but not by shipping. Before we can ask for regulations on shipping, it is needed that we know the damage by shipping. A: To gain insights in the (probable) correlation of shipping intensity and number and severity of mechanically damaged eels, we will do analyses on shipping intensity and locations of mechanically damaged eels (observed by walkover surveys, by employing professional fishermen and by drone surveys).

**Look ahead to follow-up cooperation GBRA by Bernadette Botman (ARK)**

The end event of the GBRA project will take place on June 1st. We are now looking for a follow up after the current GBRA-project. We want to continue as a network, using a covenant. Besides that we could probably continue with two new projects with funding from Interreg and LIFE.

A new interreg project could start in 2022. Mid-April we would like to have a first impression of new ideas. We will organize a second workshop to discuss ideas. And we will ask which partners want to continue and we are looking for potential new partners. Mentioned ideas: plastic, conjoint sampling, snapped eels, sturgeon, shipping.

Questions:

* Q: A suggestion: there is half a million euro’s left in this Interreg period.
* Q: Are German organizations interested in research for knakaal? Thomas Chrobock, Martin Bruhne and Stefan Staas answer with a potential yes. It’s essential to integrate official organizations like Lanuv and the University of Köln. Also the University of Nijmegen could be a good partner.
* Q: Organizations interested in a Sturgeon project? Rheinischer Fisherei Genossenschaft, also RhFV. Always first contact Lanuv, but not essential. Klaus Markgraf is interested in sturgeon. Biostation Wesel is also interested as they have a potential spawning area in their work region. MUlNV?
* Q: also the NGO’s are important in the Netherlands to get action.