ECRRNEWS - 2/2020

In this newsletter

Swin Burn, River North Tyne (U.K.) Photo DRE

Yecla De Yeltes Dam (Spain) Photo DRE

Editorial

Freshwater ecosystem restoration is an important target in the recently launched EU Biodiversity Strategy for 2030 in order to achieve the objectives of the Water Framework Directive. In this strategy, and also during the EU Green Week held in October this year, it was emphasized that the removing or adjusting the barriers that prevent the passage of migrating fish and improving the flow of water and sediments is an important issue. And to help to make this a reality the removal of primarily obsolete barriers and the restoration of floodplains should in the coming decade restore at least 25,000 km of rivers into free-flowing rivers. Technical guidance and support to the Member States to identify sites and to help mobilize funding will be provided by the commission in 2021, in consultation with all relevant authorities. The guidelines will take a wide range of issues into account, including hydropower generation, flood management, water supply, agriculture, and navigability.

In terms of the EU's Green Deal overall, large scale river and floodplain restoration investments can provide a major economic boost for the restoration sector and for local socioeconomic activities such as tourism and recreation. At the same time, these investments can improve water regulation, nursery habitats for fish and removal of nutrient pollution. River restoration in optima forma after 25 years of WFD implementation. Realising the target of 25.000 km restored free-flowing rivers will be a major achievement, however, looking at what is needed on the European scale it is just a start. Moreover, much is needed on improving knowledge, education, and skills that should be underpinned by sound science. Investing in research, innovation and knowledge exchange will be key to gathering the best data and developing the best nature-based solutions. Research and innovation can test and develop how to prioritise 'green' over 'grey' solutions and help the Commission to support investments in nature-based solutions.

The articles in this issue of the ECRR Technical Newsletter give a very slight impression of some aspects of what knowledge is needed for the foreseen type of integrated river restoration as real ecosystem restoration. An introduction by ECRR's statement on the EC's river restoration target of the Biodiversity Strategy 2030 is followed by an article giving insights from the AMBER project. The latter shows that for meeting these targets several challenges need to be overcome. Followed by an article on the Rhone-Mediterranean river basin restoring the longitudinal ecological continuity on 1009 weirs in the Herbasse River catchment, between 2013 and 2018. Furthermore, the French Agency for Biodiversity - National River Restoration Centre of France), describes the practical guides for technical solutions for barrier removal.

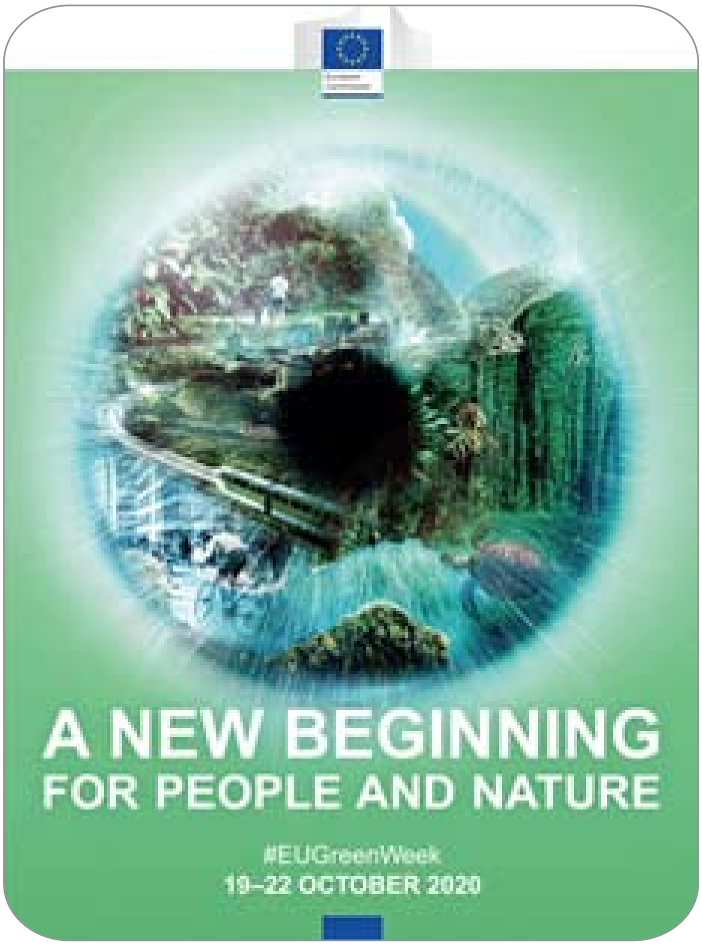
Finding the answer to the question of how successful restoration of riparian vegetation has been a working group forming part of the project "CONVERGES" described how the COST Action puts focus on the need for rehabilitating the vegetation of riparian zones and floodplains of European rivers. And in Spain, approaching the environmental flows from the ecohydrological perspective, the analyses of fish community responses to hydrological antecedent conditions in Mediterranean rivers were performed, resulting in an excellent scientific article. The MICS' project reports how a better understanding of the impact of citizen science activities can help provide evidence to evaluate projects, which can be used to secure funding, but also to develop more meaningful and effective citizen science activities. With the announcement of the 22nd RRC Annual Network Conference and the updated event calendar, the river restoration knowledge exchange is again assured for the coming period. Enjoy your read!

Bart Fokkens, ECRR and Wetlands International
Francisco Martinez Capel, CIREF
Timur Pavlyuk, RosNIIVH

ECRR welcomes European Commission's river restoration target of the Biodiversity Strategy 2030

On 20th of May, the European Commission published the EU Biodiversity Strategy for 2030 'Bringing nature back into our lives'. The Strategy put forward new commitments for nature restoration, including freshwater ecosystems. The European Commission states that in order to achieve the objectives of the Water Framework Directive, the natural functions of rivers must be restored. The Commission aims to do this by restoring at least 25,000 km of rivers into free-flowing rivers through the removal of primarily obsolete barriers and the restoration of floodplains and wetlands.

The ECRR is excited to see that freshwater ecosystems are one of the flagship ecosystems in the EU Biodiversity Strategy for 2030. The adoption of the Strategy will help address previous fragmentation between nature protection and water management. River restoration improves the ecological status and resilience of river systems and provides the framework for the sustainable multifunctional use of estuaries, rivers and streams. River restoration is an integral part of sustainable water management encompassing a large variety of ecological, physical, spatial and management measures and practices. Obsolete structures and those with limited use for society act as a barrier for water, sediment and river biology



The Green Week 2020 highlighted the contribution biodiversity can make to society and the economy, and the role it can play in supporting and stimulating recovery in a post-pandemic world, bringing jobs and sustainable growth.

ECRR Members organising annual national river restoration conferences shifted all to online video conferences, as here the UK River Restoration Centre organising the conference: River Restoration: Scaling up our Ambition.

and their removal is a nature-based solution to restore local river morphology, resulting in a return to natural functioning for sediment dynamics and river wildlife. No other mitigation measures, for example fish passes, can do this. Removal leads to the rapid restoration of fauna and flora that have been suppressed since the structures in question were first built.

The ECRR is the network to promote and build capacity for ecological river restoration across Europe (see annex A), supporting the implementation of the EU Water Framework Directive (WFD), Floods Directive and the Convention on Biodiversity, as well as national policies. According to the ECRR, dam and barrier removal should, as a restoration measure, be integrated into the national River Basin Management Plans. National strategies, policies and planning should therefore include:

- Development of an action plan to prioritise removal of dams that are obsolete or have insignificant benefits to society.
- Redirection of finances to make funds available for barrier removal in the 3rd River Basin Management Plans.
- Deliver status reports on the progress of dam and barrier removal, including presenting the positive benefits of removals.

In 2020, the ECRR will give strategic priority to river continuity restoration, recognizing the importance of free-flowing freshwater ecosystems, based on a considerable body of evidence and realised benefits. The starting point is a Europe-wide survey on the status of national policies and planning and best practices of river continuity and natural process restoration. A summary of the results of this survey will be presented in the next issue of ECRR Technical Newsletter. The ECRR is confident that this body of work will support the European Commission and the European countries not only in achieving the target of 25,000 km restored free-flowing rivers, but also the river continuity by other restoration, mitigation and compensation means.

Meeting the 2030 Biodiversity Strategy River Connectivity Target
Insights from the AMBER project

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The AMBER Mantra

Rivers are most threatened ecosystems, but also the most useful to society
Healthy rivers are flowing rivers
Rivers are more than fish
Fish are more than salmon
Barriers are not just dams
Large dams get most of the attention…small barriers do most of the damage
Water abstraction is not just hydro
Prevention is better than cure
Not everyone is as averse to dams as you are…

Introduction

With only one third of its rivers having 'good ecological status' Europe probably has more heavily modified rivers than anywhere else in the world, as well as a long legacy of dam construction and stream fragmentation that dates back to at least Roman times. Yet, the extent of river connectivity remains unknown for most European rivers, even though inventories of physical barriers are required in the River Basin Management Plans (RBMP). Attempts to quantify river fragmentation have been hampered by incomplete and inconsistent barrier records and this has in turn prevented efficient restoration of river continuity.

The AMBER Atlas of Instream Barriers

The EU Horizon 2020 project Adaptive Management of Barriers in European Rivers (AMBER) launched in June 2020 the first pan-European Atlas of in-stream barriers and provided the first comprehensive assessment of river fragmentation based on empirical and modelled barrier densities.

To this end, we assembled 629,955 unique barrier records (after excluding 106,393 duplicates) into a harmonised database for 36 European countries, and surveyed 2,715 km of 147 rivers to ground truth barrier densities. We also used the random forest regression technique to model the location and number of missing barriers.

As there was no agreed definition of longitudinal barrier, we defined it as "any built structure that interrupts or modifies the flow of water, the transport of sediments, or the movement of organisms, and can cause longitudinal discontinuity". We classified barriers into six functional types that capture most of the variation in barrier types found in Europe (Figure 1). Thus we advocate a shift in the definition of barriers from a simple emphasis on "passability" and movement of fish or other organisms (which is necessarily limited because it is taxon specific) to a consideration of whole river processes and emphasis on quantification of discontinuity.

Key findings from the AMBER Barrier Atlas

We estimated at least 1.2 million instream barriers in Europe (mean density = 0.74 barriers/km), 68 % of which are low-head (< 2 m) structures such as culverts, ramps and fords (Table 1, Figure 1).

Dam

A dam is a barrier that regulates the flow of water and raises the water level, forming a reservoir. Dams come in many shapes and sizes but water does not normally overflow the crest. Dams are often used to generate hydropower or supply water for irrigation or drinking. They cause a significant alteration of river flow and disrupt the transport of sediments.

Dam (Dora Baltea river, Italy). S. Bizzi (2017)

Weir

A weir is a barrier that raises the water level and regulates the water flow, but unlike a dam, water flows freely over its crest. Many weirs are old and many may be abandoned, revealing their former use abstracting water for watermills, sawmills, and foundries. They often have heights less than 5 m.

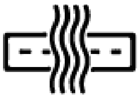
Consolidation weir (Arno river, Italy). S. Bizzi (2017)

Figure 1. The six functional types of longitudinal instream barriers (from Jones et al., 2020).

Sluice

A sluice is a barrier with one or more movable gates that are used to control water levels and flow rates. By opening or closing the sluice gate, water levels and flow rates can be altered. Sluices are used in river locks and canals, to allow boats to navigate over dams or overcome sudden changes in channel slope. They allow canals to be built over uneven landscapes.

Tidal sluice gate (Netherlands). J. Van Deelen (2017)



Ford

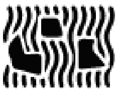
A ford is a low-head structure typically built in shallow streams for wading or crossing. Fords do not raise the water level or regulate the flow of water.

Ford (Orco river, Italy). M. Micotti (2017)

Culvert

A culvert is a structure built to carry the stream flow at road crossings. They are typically built in small streams, under forest tracks or secondary roads. Unlike fords, culverts enclose the stream flow fully (pipe) or partially (half-pipe). They are often embedded in soil and may vary in shape from round and elliptical to box shaped. Culverts do not raise the water level, but they can block the movement of organisms if they are perched, too shallow, or have too high water velocities.

Culvert (Afan river, United Kingdom). J Jones (2019)



Ramp and bed-sill

A ramp or bed-sill is a structure designed to stabilize the channel bed. They are usually built-in high-energy streams to reduce channel erosion caused by channel straightening. They often have a height of less than 1-2 m.

A)

B)

A) Bed sill (Marecchia river, Italy). B. Belletti (2017)
B) Rock ramp (Switzerland). R. Bösiger (2018)

Other

Other types of barriers that can impact on longitudinal connectivity include fish traps and lateral groynes or wing dykes built perpendicular to the river bank to divert the flow of water and reduce flooding or bank erosion, such as the one shown in the picture.

Other (Dora Baltea river, Italy). B. Belletti (2017)

Figure 1. The six functional types of longitudinal instream barriers (from Jones et al., 2020).

Table 1. Number of unique barrier records (excluding duplicates) in the AMBER Barrier Atlas and corrected barrier estimates obtained by applying national correction factors on the level of underreporting derived from field surveys (Belletti et al., 2020). ECRINS: European Catchments and Rivers Network System.

Country	ECRINS river network (km)	Number of each barrier type									Atlas barrier density (No km^{-1})	Corr. barrier density (No km^{-1})	Corr. No. barriers
		dam	weir	sluice	culvert	ford	ramp	other	un-known	total			
Albania (AL)	16,717	210							308	518	0.03	0.51	8,607
Andorra (AD)	273	43	267							310	1.14	1.49	407
Austria (AT)	41,429	19,379	2,208		4		5	5,811		27,407	0.66	1.04	43,189
Belgium (BE)	8,018	1,504	1,388	254	1,993		4	1,394	205	6,742	0.84	1.19	9,580
Bosnia-Herzegovina (BA)	25,295	20	1					11	182	214	0.01	0.20	5,150
Bulgaria (BG)	42,050	187							549	736	0.02	0.42	17,800
Croatia (HR)	21,985	25							88	113	0.01	0.04	889
Cyprus (CY)	2,811	119		1				165		285	0.10	0.46	1,280
Czech Republic (CZ)	26,788	2,210	1,934				7	1,331		5,482	0.20	0.78	20,846
Denmark (DK)	6,723	333	380	19	186		863	305	980	3,066	0.46	0.62	4,176
Estonia (EE)	9,981	187								187	0.02	0.80	7,939
Finland (FI)	87,703	96						733		829	0.01	0.36	31,876
France (FR)	183,373	8,744	36,855	346	5,915	357	4,512	1,579	3,652	61,960	0.34	0.35	63,932
Germany (DE)	104,142	4,250	19,236	530	72,795	337	76,895	4,944	9	178,996	1.72	2.16	224,658
Greece (GR)	61,994	143							75	218	0.00	0.36	22,508
Hungary (HU)	21,483	781	1,048	875				79		2,783	0.13	0.15	3,124
Iceland (IS)	16,367	32								32	0.00	0.36	5,826
Ireland (IE)	19,503	32	389	30	390	34	554	87	16	1,532	0.08	0.43	8,436
Italy (IT)	134,868	1,406	20,428		5	586	7,849	1,760	5	32,039	0.24	0.49	65,756
Latvia (LV)	16,589	601							1	602	0.04	0.39	6,474
Lithuania (LT)	17,218	125							1,132	1,257	0.07	0.45	7,800
Luxembourg (LU)	960	6	7		3		15	5		36	0.04	0.39	376
Montenegro (ME)	7,621	5							33	38	0.00	0.00	38
Netherlands (NL)	3,220	15	55,762	328	11		30	6,440		62,586	19.44	19.44	62,610
North Macedonia (MK)	12,876	7							166	173	0.01	0.37	4,731
Norway (NO)	107,079	3,977	1		1		1			3,980	0.04	0.08	9,045
Poland (PL)	80,401	1,071	10,742	2,707	1,339		44		268	16,171	0.20	0.96	77,530
Portugal (PT)	31,451	725	117				1		354	1,197	0.04	0.51	16,095
Romania (RO)	78,829	305	6	3				302	175	791	0.01	0.23	18,095
Serbia (RS)	25,376	73	3						197	273	0.01	0.59	14,901
Slovakia (SK)	20,412	147	4					1		152	0.01	0.36	7,378
Slovenia (SI)	9,891	23	1						669	693	0.07	0.13	1,321
Spain (ES)	187,809	5,131	17,005	10	135	104	2,725	1,429	3,343	29,882	0.16	0.91	171,203
Sweden (SE)	128,357	7,628	2,483		8,013		1,033		338	19,495	0.15	0.24	31,068
Switzerland (CH)	21,178	415	4,599	93	19,888	722	103,961	670	15,113	145,461	6.87	8.11	171,693
United Kingdom (UK)	68,719	1,566	17,539	2,915	266	61	92	1,280		23,719	0.35	0.70	48,293
Total	**1,649,489**	**61,521**	**192,403**	**8,111**	**110,944**	**2,201**	**198,591**	**28,326**	**27,858**	**629,955**	**0.38**	**0.74**	**1,213,874**
												Sum	**1,194,629**

To a large extent the distribution of barriers reflects the distribution of other anthropogenic pressures in Europe's rivers (Figure 2). The highest barrier densities tend to occur in the heavily modified rivers of Central Europe, and the lowest in the most remote, sparsely populated alpine areas.

Modelling results indicate that barrier density can be predicted by metrics of agricultural pressure, road crossings density, extent of surface water, and elevation.

By comparing existing barrier records with data from river walkovers across Europe we found that existing barrier records underestimate true barrier numbers by ~61% but this varies considerably between countries (range = 3-100%). Some countries like the Netherlands, France and Switzerland have accurate barrier records with little under-reporting, but others like Albania, Greece, Romania and Sweden tend to record only large structures which underestimate the true extent of river fragmentation (Figure 3). Most of the under-reporting occurs for low head structure (<0.5 m) which are typically missing from existing inventories.

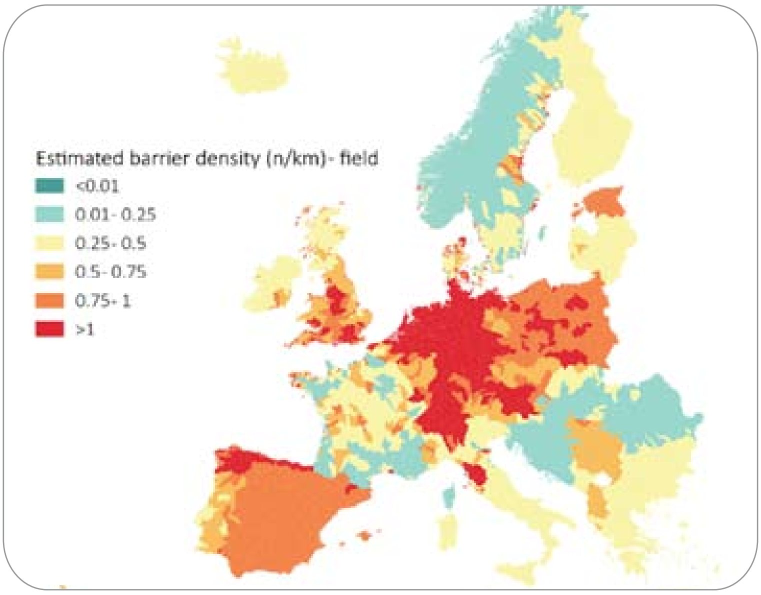


Figure 2. Estimates of barrier density (No./km) across Europe based on ground-truthed barrier numbers (Belletti et al., 2020).

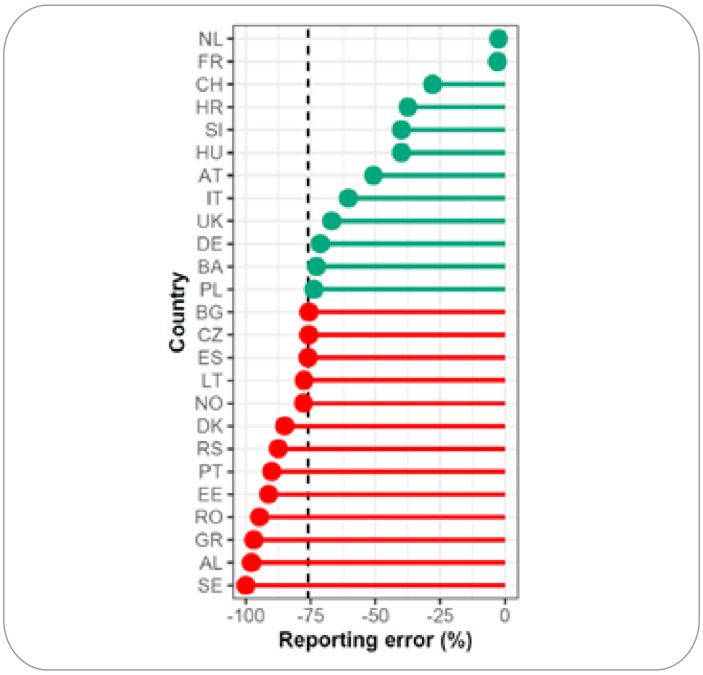


Figure 3. Barrier under-reporting error obtained by comparing barrier records in the existing databases (the AMBER Barrier Atlas) and those derived from field surveys. Values are colour-coded depending on whether they are above (red) or below (green) the median barrier error across countries (dotted line). Country codes are in Table 1. (Belletti et al., 2020).

Risk of further fragmentation of Europe's rivers

No river in Europe can be considered to be completely free of barriers but relatively unfragmented rivers are still found in the Balkans, Scandinavia, and parts of southern Europe. However, many of these rivers are threatened by activities which will result in further fragmentation. Given the critical scarcity of well-connected rivers, a concerted effort is needed to preserve their continuity.

There is an increased risk of further fragmentation due to climate change and ambitions for renewable energy. These may require the building of storage dams to cope with anticipated water shortages in some parts of Europe. Fragmentation threats include those caused by water insecurity (increasing water demand) for agriculture and cities, exacerbated by climate change, but also by energy insecurity that needs to be met by renewable energies, not just hydro-power, but also solar and wind-power, with the service roads that this entails. Forestry and natural resource management require service roads and these often crisscross waterways and result in fragmentation, as do the construction of roads, railways, and motorways, particularly in the Balkans and new Member States. Also there is an increasing threat posed by Aquatic Invasive Species (AIS) that may call for the construction of exclusion barriers, and a cultural heritage associated with old instream structures that must also be taken into account.

Meeting the 25K target of the BS2030

The new EU 2030 Biodiversity Strategy (BS2030) aims to reconnect at least 25,000 km of free-flowing rivers in Europe by 2030. However, to achieve this target several challenges need to be overcome:

Firstly, there is neither agreed metric of river fragmentation, nor clear definition of what is meant by "free flowing" or indeed by "river" in this context. Is one talking about entire catchments (water basins), or individual rivers and tributaries? Or perhaps just river reaches (segments)? What exactly does free-flowing mean? Can a river be considered free flowing if it runs unimpeded for perhaps hundreds of km before hitting a dam close to the estuary? Or how do we categorise a river when the main stem is devoid of barriers, but the tributaries are all heavily fragmented? The "free flowing" term is attractive because it captures people's imagination, but it needs to be defined rigorously. There is tendency to view "free flowing" only from the perspective of migratory fish and just considering the main stem. Perhaps a more useful approach might be to consider degrees of continuity (connectivity) at the basin scale and talk about well-connected and fragmented (disconnected) functional river units. This is also the view of the Water Framework Directive (WFD). Thus, there may be cases where opening specific parts of the basin (i.e. river units) may be very effective for meeting BS2030 objectives. This means that the term free-flowing requires further definition for the WFD and BS2030 implementation.

Secondly, although removal of old unused barriers will often be the preferred management option, it must be emphasized that barriers do not always need to be removed fully to achieve continuity; they can also be adapted in such a way that there is continuity of natural processes while retaining part of their function. In other cases, barriers are obsolete and can be removed although there may be cases (because of safety, invasive species or historical value) that they cannot. There may also be artificial processes which are not physical structures that cause discontinuities (like temperature or pollution barriers) that cannot be addressed by dam removal.

Thirdly, the aim of the BS2030 is best met by a two-pronged approach, namely by (1) halting current rates of stream fragmentation (i.e. STOP fragmenting) and (2) by reconnecting fragmented rivers (i.e. RECONNECT). To halt current rates of fragmentation Member States should be made aware that the activity that most commonly fragment rivers is not the construction of dams. Typically, what fragments rivers most often are culverts and fords at river-road crossings, and ramps and civil engineering works. Every time a road, a path, a forest track, or a railway line crosses a waterway there is a high risk it will fragment it. Particularly if culvers are used. It is ironic that many of these tracks are built to support conservation efforts, for example to manage forested areas (to plant or cut trees), or to create wind-power (wind farms tend to be located in relative pristine and formerly inaccessible headwaters, and tracks are being built to service them). More stringent legislation and specific training are urgently required to tackle this problem. Forestry managers, natural resource managers, and local authorities need to be better aware of this huge problem and the range of simple and effective solutions that are available.

Fourthly, to reconnect rivers effectively at a large EU scale, a prioritisation scheme is required to achieve the best value for money. But for this, metrics of connectivity are needed to predict gains and costs. It is essential that barrier removal follows a clear, rigorous prioritisation process designed to maximise gains and reduce costs. In this sense, some of the prioritisation decision support tools developed in AMBER can help (see our Policy Brief No. 2 at www.amber.international). Opportunities for barrier removal abound, but projects should not be started on a whim. Less than 10% of barrier removal projects are properly monitored (i.e. with controls, and before and after assessments). This is a missed opportunity as lessons cannot be drawn. Consideration of costs is key and efforts should be refocused on removing many small barriers rather than a few high media profile cases. Small barriers are by far the most numerous, and usually also the cheaper ones to fix. The AMBER Atlas can help identify those barriers whose removal would result in the most cost-effective gain in connectivity.

Finally, as part of the BS2030 strategy, one may also need to consider the benefits of 'recycling' and retrofitting old dams. A large part of the cost of new dams is the cost of land purchase and road access. In some cases, it may be less impactive and cost-effective to reuse and retrofit an abandoned dam (that has already caused fragmentation) than to demolish it (at a huge cost) and build a new one somewhere else. It makes little sense to remove old dams only to build new ones somewhere else. Likewise, it may be necessary to perform critical reappraise of the value of micro hydroelectric developments against the alternative of enhancing the efficiency of existing dams. Ultimately, it is the net gains and losses of connectivity that must be taken into account.

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The AMBER Project

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Herbasse River catchment developing an integrated restoration program in France

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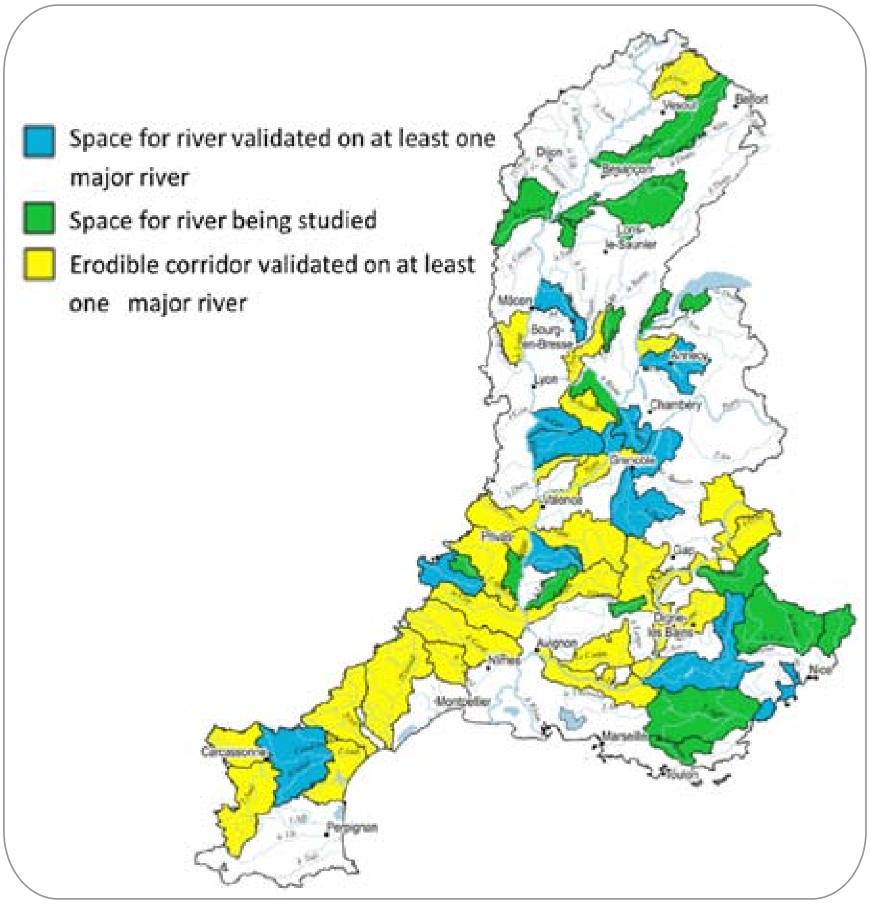
On the Rhone-Mediterranean river basin, restoring river connectivity has been a matter of importance for many years. Priority reaches for the restoration of longitudinal connectivity were defined in 2013, after a technical assessment and a technical consultation led at the river basin scale. Between 2013 and 2018, the Rhone Mediterranean river basin agency has contributed to the restoration of longitudinal ecological continuity on 1009 weirs.

In addition, a policy to preserve and restore space for river with lateral connectivity has been in place since the 1996 river basin management plan. From 2010, this policy has become more integrated and it has gained in momentum with the 2016-2021 river basin management plan. The following map illustrates the catchments where space for river has been defined and validated by the stakeholders, or is being studied at least partially on the catchment. The catchments for which space for river has been defined -based on geomorphological principles- are in yellow, and the catchments with a second generation of space for rivers -more integrated- are in blue. Since 2018, many more sub-catchments have started studies to define this space for river and identify priorities for the preservation and restoration of lateral connectivity.



Agence de l'eau Rhône-Méditerranée Corse, December 2018

The story of the Herbasse catchment in southeastern France (Drôme) illustrates the results that can be achieved through a strategic approach to catchment-scale river restoration and perseverance. The Herbasse River is a right bank tributary of the Isere River. It has a catchment area of around 190 km^2 and the river is 40 km long. Before the 1970s, the ecology of the Herbasse River was rather preserved but the population suffered from regular flood events.

Between the 70s and early 90s, channelization works were carried out. The meandering river was straightened, embankments were built on the river banks, which were regularly stabilized with large boulders. The main objective of such works was to retain the flood peak within the main channel. However, the 1993 and 1999 flood events highlighted the limits of this approach to flood risk management.

In 1996, a first river contract was signed for 5 years, in order to manage flood risk in a more integrated approach and find a better compromise between flood risk and ecological restoration. This first contract proved to be a failure. It seemed that the stakeholders were maybe not ready at the time for such a change of culture in river management.

In the year 2000s, discussions took place between the groups of municipalities on the catchment to prepare for a new river contract, which was eventually signed in 2008. The main objective of this new contract was to manage the river in a more natural and sustainable way, by restoring river connectivity. The key actions were to remove barriers and to restore the space for river so that it can meander, slowing down floods and restoring river habitat. The SIABH (Syndicat Intercommunal d'Aménagement du Bassin versant de l'Herbasse), a local organization set up at catchment scale, led the new project. Land planning was seen as essential so that some land could be bought in the most strategic areas to ensure efficient floodplain restoration. The river banks were to be restored and ecological continuity had to be restored on the whole axis and on the tributaries. A plan to manage sediment also needed to be designed.

To this date, 50 km of river banks have been restored. Land planning and public consultation has been essential to restore space for river and reduce the risk of flooding up to a 100 year return period. Over a 7 year period, 44 ha of land from 52 land owners have been bought and given back to the river in areas where lateral erosion is the most intense. Active morphological restoration was also carried out in 2016 on 2,8 km of river on a tributary (Merdaret River) near the confluence with the Herbasse River. More recently, a remeandering of over 500 m took place on the Herbasse River near Montrigaud town. On the restored reach, 5000 m3 of gravels were injected (see photo below). This project received the French 2020 prize for ecological engineering.

Further work to restore 3 km of space for river of another tributary (the Valéré River) and to remove 5 weirs is now planned in the next few years.

In addition, a sediment management plan was set up and a plan was also carried out to manage Japanese knotweed at the catchment scale for around 15 years. Thanks to this initiative, Japanese knotweed is now almost non-existent in the catchment.

Remeandering of the Herbasse river in 2018 (Photo credit: SIABH)

Last weir before removal in the Herbasse river. (Photo credit: SIABH)

After last weir removed in the Herbasse river. (Photo credit: SIABH)

Photo 1. Remeandering of the Herbasse River, in 2018 (Photo credit: SIABH)

In terms of longitudinal connectivity, an assessment was carried out on all the 31 weirs located on the catchment. The Herbasse River and a tributary, the Limone River, were both designated as priorities to restore longitudinal connectivity in 2013 with high stakes for brown trout and eel populations. Restoration works were carried out on 18 weirs of the Herbasse River. The last weir that was still an issue for the ecological continuity of this river was removed last summer (in 2020) at a cost of 46 k€ (it was 1.8 m high and 20 m wide). Similarly, on the Limone River, the longitudinal continuity was restored on the 9 weirs that were an issue. On the Merdaret River, another tributary, the 2 weirs that were disrupting longitudinal continuity have also been removed. This is a reason to celebrate as the ecological continuity of the whole 40 km of the Herbasse River and of about 15 km of tributaries has now been fully restored.

For more information on this case study, please contact Stéphanie Bardeau from SIABH (s.bardeau@siabh.fr).

Practical guides for removing manmade barriers

Josée Peress, *French agency for biodiversity, OFB*

Gaining 25000 km of free-flowing rivers throughout Europe can be achieved by restoring the river's continuity. This means giving back the possibility for water, sediment, and aquatic fauna to pass freely upstream and downstream along the river (longitudinal continuity), laterally with the floodplain (lateral continuity) and in a vertical direction from riverbed interstitial areas and groundwater. Rivers are dynamic and mobile in space and time, unaltered ones erode, transport and deposit solid material under the influence of flow and gradient.

Transversal manmade structures such as weirs, dams, sluices, culverts, fords, are found in great number- it is estimated in France more than 100 000 structures (on average 1 every 2 km). These disturb the longitudinal river continuity and can have a large impact on river's dynamic and ecology: obstacle to sediment transport and to fish movement, alteration of river morphology and habitats, fragmentation of river corridor. The high density of low head structures can also have a significant cumulative effect on the rivers' natural dynamic.

In order to restore river continuity, one of the most efficient solution is to remove the manmade barrier. If not possible to remove the transverse structure, one alternative solution is to reduce its impact by implementing a fish pass for upstream and downstream movements.

A three-page practical sheet produced by the French Agency for Biodiversity – National River Restoration Centre of France, describing the technical solutions for barrier removal,

Photo 1. Ford after removal, on the Bervezou River; September 2013, France. Copyright SMBRC.

is available on https://professionnels.ofb.fr/sites/default/files/en/doc/documentation/REX_Hydromorphology_2018_Partial%20or%20total%20weir_dam%20removal.pdf

It presents the multiple objectives of such projects, pointers for the design, additional measures that may be required and technical references.

More examples of weir or dam removal carried out in France are available – https://professionnels.ofb.fr/node/654

Photo 2. The ford before removal, on the Bervezou river; September 2012, France. Copyright SMBRC.

How effective have efforts to restore riparian vegetation along rivers been?

River restoration is an activity that has received increasing interest in recent years, both measured in the number of restoration projects and in funding of such activities. The reason for this is of course a will to do something about the widespread degradation of riverine ecosystems across Europe and on other continents. For restoration projects to be successful, it is important that projects are evaluated after implementation, to enable learning what works and what does not. Despite this, the ecological outcome of many restoration schemes is not evaluated at all, and there is a need to synthesize evidence from projects that have been evaluated to guide future work.

In addition, many past reviews of the success of ecological restoration schemes have failed to document significant improvements, potentially calling funding of restoration projects into question. But is this true also for restoration of riparian vegetation along streams and rivers? Finding the answer to this question is the aim of a working group forming part of the COST Action project "CONVERGES" (CA 16208) "Knowledge Conversion for Enhancing Management of European Riparian Ecosystems and Services", described in the ECRR newsletter 1/2019. Since most attention has been on migrating fish and macroinvertebrates, the COST Action puts focus on the need for rehabilitating the vegetation of riparian zones and floodplains of European rivers.

The aim of the project is to evaluate restoration success, but also to help restoration of riparian zones and floodplains more efficient by using more methods in more regions, and aim to reduce the impact of more pressures. Across Europe, many restoration practices are used to counter a range of pressures causing degradation. However, a lack of knowledge exchange among countries and regions, and across disciplines may have hampered the spread of both good examples and lessons that can be learnt from failures. Are there effective restoration practices that could be applied more widely?

Perhaps in contrast to some aspects of river restoration, there are many simple, robust methods to improve riparian and floodplain vegetation centered on efforts to give riparian vegetation space to establish and develop dynamic com-

The rapid in Varjisån after removing the stonewalls as part of the successful efforts to restore riverine ecosystems. (Photo credit: Roland Jansson.)

A rapid in Varjisån, a tributary in the Pite River system in northern Sweden with stone walls blocking the flow in a side channel facilitating timber floating. (Photo credit: Roland Jansson.)

munities along rivers where floodplains had been exploited or separated from the rivers by dikes. To learn more about the effectiveness of such riparian restoration methods and others, we set up a working group with the aim of reviewing scientific publications evaluating the success of riparian restoration. First, participants collected papers reporting the outcome of restoration. Then, a protocol for extracting information from them was developed, covering aspects such as which methods were used, the types of impacts the restoration was intended to remedy, along with information on the, geography and context of restoration. In addition, information about the design of the studies, such as their spatial scale (grain and extent), replication and which variables used were recorded.

The next step was for more than thirty scientists to use the protocol to extract information from scientific papers and reports in the database. Many papers were discarded in the process, not meeting the requirements, but many also contributed valuable data. The data is now being compiled and analyzed to be able to draw conclusions on the magnitude of effect of different methods in different contexts.

Design wise, while all included studies contain comparisons between restored and unrestored sites, having data from pristine, unimpacted sites was found to be rare. Likewise, and perhaps more surprising, is the rarity of studies with data from both before and after restoration. In addition, information on the time since restoration was performed is often lacking, hampering the ability to draw conclusions. In addition, almost no study contained a definition of ecological restoration, few described reference conditions, and descriptions of the target for ecological restoration are usually vague. However, a hypothesis on the expected outcome of restoration was almost always present.

When the data is analysed, we hope to be able to present evidence on which methods that significantly improve riparian vegetation, and the magnitude of the effect on different aspects of riparian vegetation. We will also be able to identify gaps in knowledge, which should stimulate work to fill them.

In the coming years, we anticipate restoration activities targeting riparian vegetation will increase further. A major reason for that is implementation of the European Union Water Framework Directive, mandating restoration, and rehabilitation of freshwater and coastal ecosystems across the union. We hope that the review of riparian restoration methods will expand the toolbox available to practitioners, so they can suggest and implement methods supported by evidence in new areas and perhaps new contexts, and avoid methods lacking evidence in support of their effectiveness. For example, in Sweden, all licenses for hydropower schemes will be re-evaluated with the intention to increase environmental consideration, striking a balance between ecological rehabilitation, and maintaining hydropower production. There is an urgent demand on knowledge of the potential consequences for riparian vegetation and other aspects of riverine ecosystems of implementing environmental flow measures and other ecological rehabilitation techniques. Without knowledge of the effects of such actions, there is a risk such schemes will not be passed in environmental courts, leading to missed opportunities to enhance natural values in streams and rivers across Europe.

An excavator doing restoration work in the Pite river system (Photo credit: Roland Jansson)

Analyses of fish community responses to hydrological antecedent conditions in Mediterranean Rivers

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In recent decades, the river science has incorporated the natural variability of the natural flow regime as the paradigm of the environmental flows for streams and rivers. The critical role of the flow variability, as well as extreme events was demonstrated. However, in the European context of intensive river regulation, the natural free-flowing rivers are scarce and the water managers face the challenge to define sustainable rules for water resources management. For instance, Spain has approximately 1200 large dams, i.e. the fifth worldwide top position of large dams per country. Although dam removal has been indicated as the paramount solution to re-naturalise flow regimes, it is often unfeasible due to socioeconomic constraints; thus, the environmental flow regimes should be widely implemented to emulate some aspects of the natural flow variability.

In Mediterranean rivers, Cyprinids frequently dominate the fish communities, possessing a high specific diversity and morpho-functional and physiological adaptations to fluctuating environments. However, the abundant alien species poses a relevant threat on fish conservation, and environmental flows play a relevant role in the management of alien fish; some experiences have demonstrated that flow regime re-naturalisation can displace alien species in favour of the native ones. In the regulated rivers where native and alien species co-exist, it is very important to focus not only on minimum flows, but on other components of the natural flow regime, such as the timing of low and high flows, duration and rate of change. Today it is amply recognized that focusing on low flows and neglecting high flows during the decision-making, ignores relevant aspects controlling biotic communities, which may lead to uncertain ecosystem management outcomes.

The Spanish environmental flow legislation can be considered progressive because it is not restricted to hydrological methods and requests the application of physical habitat methods that consider specific biotic needs. However, the implementation is largely focused on sustaining the minimum flows. Although the hydrological analyses provide with a necessary framework to understand eco-hydrological relations, one fundamental challenge is to implement more integrative methodologies which couple hydrological and habitat-based methods. Because the morphologic characteristics of the river interact with flow regimes, leading to different responses of species communities, especially for regulated river segments. It is clearly recognized that the distribution and abundance of fishes are strongly influenced by physical factors as flow velocity, substrate and cover, the thermal regime, etc. Thus, not only hydrology but also habitat simulation analyses are fundamental to understand how the habitat availability changes for the aquatic organisms in regulated rivers.

In the study described here, we faced the challenge of developing flow-ecology responses in the form of the so-called Ecological Response curves for fish communities in Mediterranean rivers. The short-term goal is complementing previous studies of environmental flows with a more regional perspective. Specifically, we tested the significance of functions relating antecedent hydrological conditions with fish community metrics. These metrics were analysed by fish groups using two different traits; the life-history strategies (i.e. periodic, opportunistic or equilibrium) and their origin (i.e. native, translocated or alien) in the Júcar River Basin District (JRBD), Spain.

Methods

The biological data consisted of a large database of fish fauna in the JRBD, updated with authors' personal data, and then filtered to consider homogeneous abundance data collected by electrofishing (from 2000 to 2017). With these data we calculated fish community metrics (response variables): richness, proportions and abundance (Catch Per Unit Effort –CPUE) for all the of fish functional groups (origin x life-history strategies). Each of the groups was expected to show different response to antecedent hydrological conditions. By origin, the fish species were classified as native, translocated or alien. By life-history strategies, they are opportunistic, equilibrium and periodic. The hydrological data were collected from 33 gauging sites (i.e. station or dam) with daily discharge records for a period of 20 hydrological years (1997–2017). We selected 32 hydrological indicators concerning the magnitude, frequency, duration and timing of flow events. Each of them were averaged for the last year before each of the biological data (year before sampling date) and for the second year before the fish sampling. Each of the gauging sites provides the river flow data for a group of sampling sites in the same river segment or sector (see figure 1). The hydrological indicators were then standardized (z-score) before being coupled with the biological data. The z-score is the value to be standardized minus the mean of the distribution, and then divided by the standard deviation.

Sampling fish by electrofishing in the Serpis River near the city of Gandia (Valencia).

The final database coupled the hydrological and biological data in 274 sampling events from 2000 to 2017, distributed in 15 river sectors. The rivers represent different river typologies, in five river basins; although ideally, one could perform these analyses with data belonging to a single river type, the amount of data would be considerably lower, hindering the ample representation of data throughout the river basin and the robustness of the regression analyses.

Firstly, for data exploration, the fish community composition – 3 life-history strategies x 3 species origins – and the hydrological indicators were explored with Self and Super-Self Organizing Maps, independently, in order to make groups of relatively similar conditions. When we want to relate the organism distribution and abundance with some environmental variables, it is often very difficult to disentangle the different causes of variation. Due to the cross-effect of several environmental factors, testing hypotheses about the environmental gradients (e.g. gradients of hydrological indicators) as limiting factors or constraints on the density

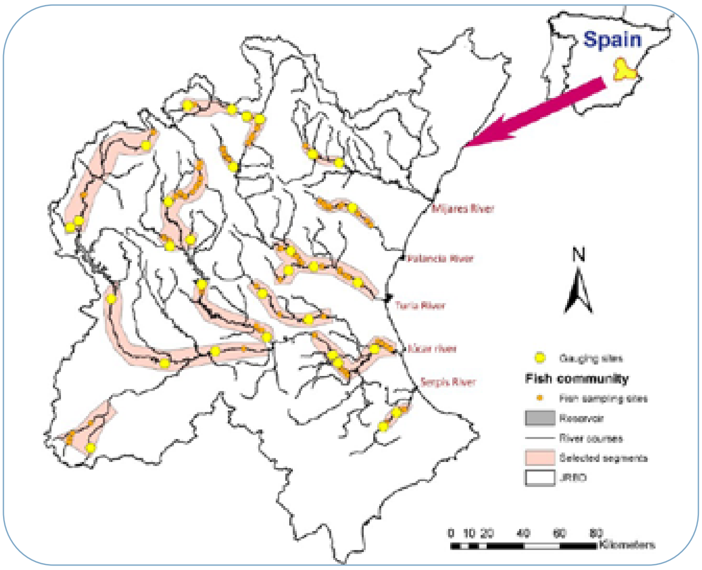


Figure 1. The Jucar River Basin District (JRBD) in the Eastern Spain comprises several rivers (labels near river mouth). Each of the river segments can have one or several gauging sites, used as a categorical factor in the models, and several fish sampling sites. In total, we used 274 sampling events from 2000 to 2017 to model ecological responses to hydrology.

of organisms can be sometimes more significant. We tested mean trends in previous studies, and this study focused on the limiting factors. We used quantile regression to find significant associations between the hydrologic indicators and fish metrics; these associations can be defined either as median or as limiting (upper and lower). The limiting associations where only the upper or lower groups of quantiles are significant correspond to hydrologic indicators acting as "ceilings" and/or "floors", meaning that those hydrological indicators constrain the fish metric.

Results & Discussion

The Self-Organising Map (SOM) identified six clusters in the fish communities based on their species composition, origin and life-history strategy; the groups did not show any temporal pattern. Concerning the flow regime (using the 12 indicators of mean monthly flow) we obtained 3 clusters showing a clear gradient from gauging sites with natural flow regime (with maxima in winter/spring and minima in summer) to sites with inverted flow regime (maxima in summer and minima in winter); the intermediate group included gauging sites without relevant seasonal differences. Their location is shown in figure 2.

The quantile regression analyses identified a large majority of ceiling relationships; that is, among the 102 significant relationships identified, 77% indicated the role of hydrological indicators as limiting factors for different fish community metrics. Nevertheless, 20% of such significant relations corresponded to median relationships, and 3% were floor relationships. Due to the large number of relations, with different variables and model structure, we refer to the original article, and we summarised here some of the main findings.

First, we present some of the significant relations between hydrologic indicators and species richness metrics (figure 3); all of them with regards the immediate antecedent year before sampling. The average flow in June (mean flow in June

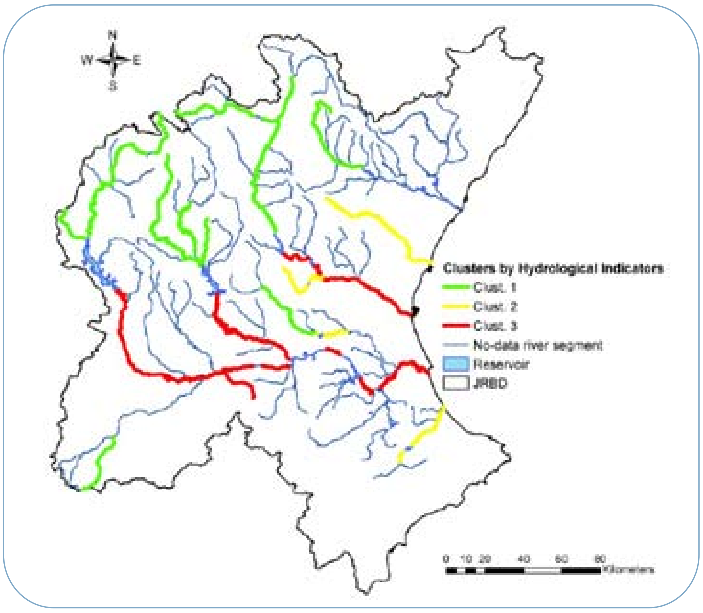


Figure 2. The Jucar River Basin District (JRBD), where the 3 clusters concerning the flow regime (based on 12 mean monthly flows) are displayed. The blue lines indicate river segments where the flow data were not analysed.

in the antecedent year; figure 3, top left) demonstrated a positive relation with the native species richness. The native species were 11 in total, belonging to the families Anguillidae, Bleniidae, Cobitidae, Cyprinidae, Salmonidae and Valenciidae. In addition, the richness of native opportunistic species was positively related with lower minimum flows of 7 days (i.e., the lowest moving average of 7 days in the antecedent year; figure 3, top right). The native opportunistic species belong to the genera Salaria, Cobitis, Achondrostoma, Parachondrostoma, Squalius and Valencia. The first of these results can show that a higher mean flow in June, where the fry of several species are coming out and juveniles are abundant, provides with more habitat and opportunities of survival, thus can produce a higher reproductive success. On the contrary, in these rivers a lower minimum flow (Q7min) can produce better results for some native opportunistic species only.

These two responses were detected in the median values of the richness. It is important to remark that the hydrological indicator is normalized with the z-score. For instance, the mean stream flow in June QJun = 1.4, for which richness is equal to three (figure 3, first plot on the left) corresponds to sampling events where the hydrological indicator (Qjune) minus the average value of Qjune in the nearest gauging site (20-year mean) is 1.4 times the standard deviation of the variable; thus, it is clearly above the average of the variable in the sector or segment where the site/s belong.

In the lower figure 3 we can see two examples of relations concerning the alien species. In these two cases, a wider range of positive response (between 0 and 4 species) was observed in the alien species richness, negatively related with the mean flow of March and similarly with the annual 1-day minima. Specifically, similar responses were found for alien equilibrium species. The alien species recorded in the database were 9 in total, belonging to the families Centrarchidae, Cyprinidae, Esocidae, Percidae, Poeciliidae, and Salmonidae. These two responses had a character of roof or upper limit, indicating a controlling factor on the alien richness. They suggest some possibilities of water management to control the alien species in regulated river segments. Releasing high flows in March over the average values may exert a controlling effect on the alien species; the rationale of this hydrological control may be in the fact that some alien species are used to stable hydrological patterns or prefer lentic aquatic habitats. For instance, the largemouth bass and the pumpkinseed (sunfish) reproduce or start their breeding period in March-April (in these species, with multiple spawning), being the high flows in March a negative factor in such a sensitive period for the reproductive success. This result remarks the importance of the high flow releases in the environmental flow regimes for the improvement of the ecological status, which are still pendent of implementation in Spain as well as in other European countries with legislation on environmental flows. Regarding the effect of very low flows, some of this species may be favoured because they withstand very low oxygen concentrations and high water temperatures (e.g., the sunfish), which favours their survival against other species under severe drought conditions.

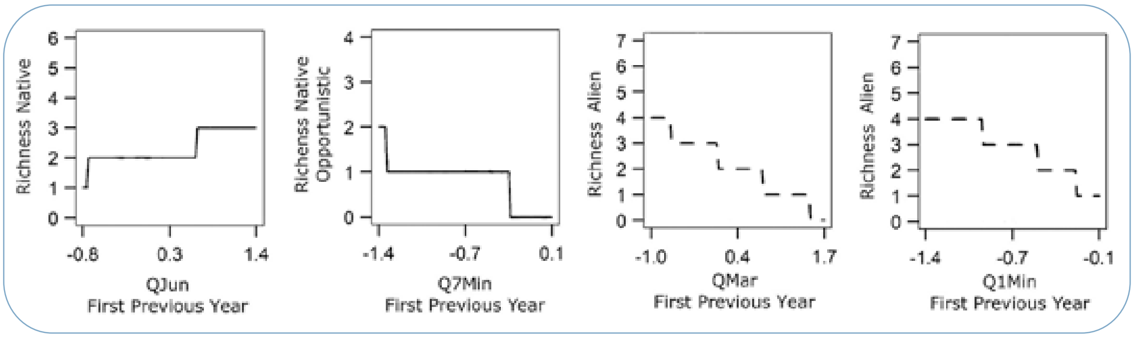


Figure 3. Four examples of quantile regression relationships between some of the hydrologic indicators (x-axis) and species richness metrics (y-axis) with significant regression lines (solid line = median association; dashed line = and ceiling association).

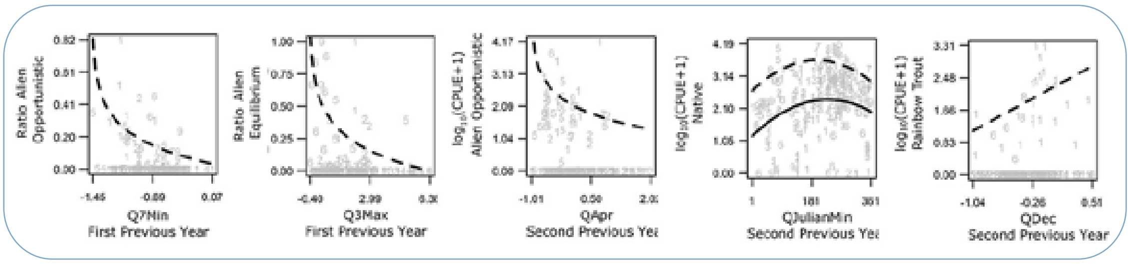


Figure 4. Five examples of quantile regression relationships between some of the hydrologic indicators (x-axis) and fish community metrics (y-axis) with significant regression lines (solid line = median association; dashed line = and ceiling association). These metrics refer to proportions (ratio) and abundance (CPUE).

Moving to the metrics related to the ratio of fish groups (proportion) and abundance (in terms of captures per unit effort -CPUE), the figure 4 shows a few examples of significant relations. The ratio of alien opportunistic is negatively related with the low-flow indicator Q7min (minimum moving average of 7 days); similar results were found for the Q3min, both in the antecedent year and the year before that. This fish group comprises the common bleak and the Eastern mosquitofish. The maximum flows (Q3max, the maximum 3-days moving average) and the flows in April were negatively related with the alien equilibrium and the alien opportunistic groups, respectively. The alien equilibrium species are widespread species in Spanish rivers; largemouth bass, pumpkinseed, goldfish, common carp, Northern pike and zander. Some of these relations were similarly found in terms of proportion and in terms of abundance.

Another relevant relation concerned the native species and it is very relevant for the implementation of minimum flows with the right timing. The optimum timing for the minimum flow was found between July and September, matching the general pattern of the natural flow regime; this relation was found in terms of the median and also as a roof, as a significant limiting factor for the native fish populations as a whole. In the Spanish context, where the water management legislation demands a minimum flow but it is not always implemented in the right season (inverted flow regime), this is a very important issue for the managers in charge of the water and biodiversity. Finally, one of the results concerning the rainbow trout indicated a positive trend with the mean flow in December, i.e. in the time before the start of the spawning in these Mediterranean rivers.

We want to invite the readers of the newsletter to explore more of these relationships, for those interested in either native, invasive, or specifically on salmonids, in the original manuscript and the supplementary material provided with it. Overall, our results highlighted that, in Mediterranean rivers, the management of annual maxima below dams can be a key aspect to benefit the native population disadvantaging the alien ones. Furthermore, the flow-ecology relationships presented in the original manuscript -and exemplified here- represent very relevant information for the application of holistic approaches of environmental flows and can be incorporated, together with a dam operation model into a multi-objective optimization framework that ensure human needs and also benefit populations of native fishes.

Measuring the impact of citizen science activities in environmental projects

MICS
Measuring Impact of Citizen Science

John Wheatland and Hannah Joyce,
UK River Restoration Centre.

The Measuring Impact of Citizen Science (MICS) Project: A Recap

In the January 2020 ECRR Technical Newsletter, we introduced the Measuring Impacts of Citizen Science (MICS) project (www.mics.tools), a three-year project (2019 – 2021) funded by the European Union Horizon 2020. The MICS project aims to develop metrics and tools to evaluate the impact of citizen science activities in the development, implementation and monitoring of nature-based solutions such as river restoration schemes to tackle environmental problems. Understanding the impact of citizen science activities can help provide evidence to evaluate projects, which can be used to secure funding, but also develop more meaningful and effective citizen science activities. In this article we aim to reflect on the progress to date and next steps of the MICS project.

Citizen Science Impact Assessment Development

Citizen science is multi-dimensional and in the MICS project we investigate impact on five distinct and also interlinked impact domains:

- **Society:** individual as well as collective (societal) values, understanding, action and well-being (including relationships).
- **Economy:** production and exchange of goods and services among economic agents; entrepreneurial activity.
- **Environment**: constitution of the bio-physical environment, e.g. quality or quantity of specific natural resource(s) or ecosystems.
- **Science & technology**: the scientific process (method) as well as research more broadly; the scientific system (institutions; science policy; incentive structures), scientific paradigms (Kuhn, 1970) and resulting technological artefacts.
- **Governance:** the processes and institutions through which decisions are made (Lautze et al., 2011), both informal and formal (e.g. public policy), and relationships/partnerships.

At present there is no consistent assessment methodology to capture the impact of citizen science activities across all of the five domains. As part of the MICS project we have conducted a systematic literature review of 77 papers that measure citizen

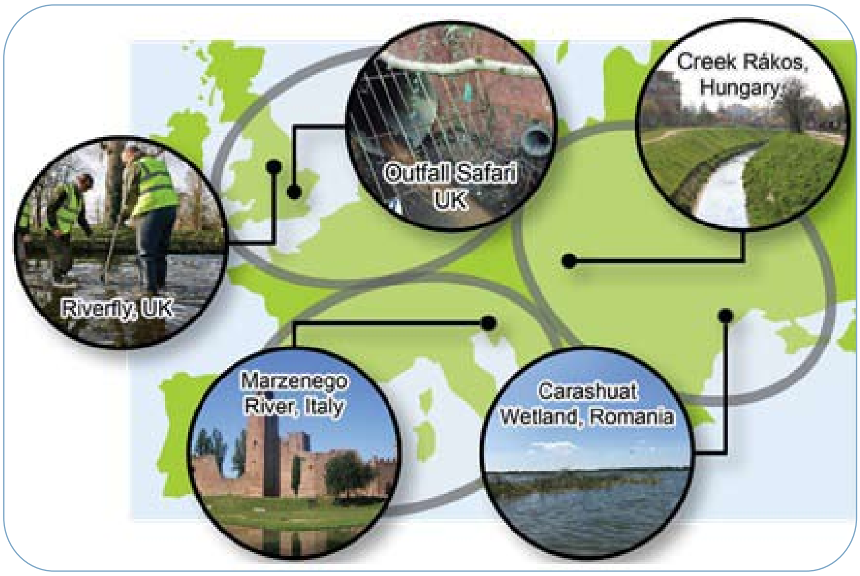
Citizen Science can contribute to several Sustainable Development Goals science impact. Of the papers reviewed, 40% (n = 31) focused on measuring just one impact domain, most commonly the societal domain. Very few papers reviewed measure all five impact domains, and only two of the papers reviewed (3%) captured impact across five domains. In addition, few of the studies provide concrete indicator-level insights but instead just discuss the impact domain theme. Therefore, current citizen science impact assessment approaches provide insights unevenly across the five impact domains.

We have also interviewed 10 different citizen science project coordinators to find out about their motivations for citizen science activities, how and why they measure impact. The main reason why project coordinators measure impact was for accounting / reporting purposes. Both quantitative and qualitative approaches (surveys, interviews, feedback forms) were found to be the most commonly mentioned forms of impact assessment in the publications reviewed and interviews. Using the information gathered from the interviews and review of existing approaches we are developing Citizen Science Impact Assessment Framework and guiding principles for measuring impact as part of the MICS project. We are in the process of writing these up for journal submission later this year (When et al., in prep.). The Citizen Science Impact Assessment Framework will aim to enhance the ease and consistency with which impacts can be captured, as well as the comparability of evolving results across projects and will be used in the MICS project case studies for selecting indicators to measure impact.

MICS case studies: update

The MICS metrics will be validated in case studies across Europe; in the UK, Romania, Italy, and Hungary. The case studies provide the opportunity to evaluate different approaches to tackling water related problems and have different levels of citizen science engagement. In the MICS Italian, Hungarian and Romanian case studies we are implementing the co-design of citizen science activities. Co-designed projects aim to empower citizens, other stakeholders and scientists to develop meaningful citizen science activities together from the beginning of a project. An initial co-design meeting involves citizens working with stakeholders to understand a problem and capture the project requirements. Citizens are given the space to lead discussions and share ideas rather than the process being scientist led.

The MICS case study sites across Europe.



Co-Design of Citizen Science: Reflections from the Italian Case study

An example of the co-design progress is described here for the MICS Italian case study. The Italian case-study aims to examine the benefits of integrating citizen science and river restoration activities in the context of improving the Marzenego River. Several restoration schemes have been carried out along the Marzenego in the past, aimed at combating problems associated with urbanisation, agricultural activities and flooding. The most recent of these occurred in the 1990s, which included the creation of wetlands, the implementation of improved management practices within the riparian zone and efforts to reconnect sections of the river with its floodplain. These activities put a strong emphasis on Nature Based Solutions (NBS) and the long-term involvement of the local communities in managing and monitoring the river. In order to encourage local engagement and a feeling of ownership for the health of the river stewardship contracts, or 'river contracts', were created. However, despite interest from the general public and from the private sector activities gradually stopped and there are currently no ongoing citizen-science activities. Through MICS it is hoped that long lasting citizen-science activities along the Marzenego River will be sustained. New nature based solutions are proposed to improve the flood risk and biodiversity of the river.

Co-design workshop in Italy

In December 2019, 40 citizens – including scientists, teachers, environmental experts and public authorities – were introduced to the new river restoration project; the concepts of citizen science and nature based solutions; and the MICS project as a whole. Through a series of activities (discussions, writing thoughts on large sheets of paper) – intended to facilitate an effective co-design of the project – the volunteers contributed their views on the issues surrounding flooding and poor water quality, and their expectations for what the project might achieve. Expectations were summarised as an infographic, and demonstrate increased well-being, increased biodiversity, environmental risk mitigation and social development as key issues in need of addressing.

Based on these expectations, the second workshop was developed which aimed to produce useful indicators for each citizen science activity, aimed at monitoring the environmental changes before and after the implementation of NBSs. The third workshop will be dedicated to providing the necessary tools (such as practical kits and apps) for volunteers to begin monitoring. While the initiation of citizen science activities planned for Spring and Summer of 2020 were postponed due to the COVID-19 pandemic, regular contact with those involved has been maintained through e-newsletters and social media.

Co-design activities continue in the other case studies and have led to the development of citizen science activities, which will begin later this year and early 2021.

The next step in each case study is to develop impact assessment indicators based on the guiding principles identified from the literature review and project coordinators – watch this space for more information!

MICS Impact Assessment Platform

One of the primary objectives of MICS is the development of an online platform that practitioners and managers of citizen science projects can use to measure the impact of their activities. Over the last year members of the MICS team have been hard at work developing this platform.

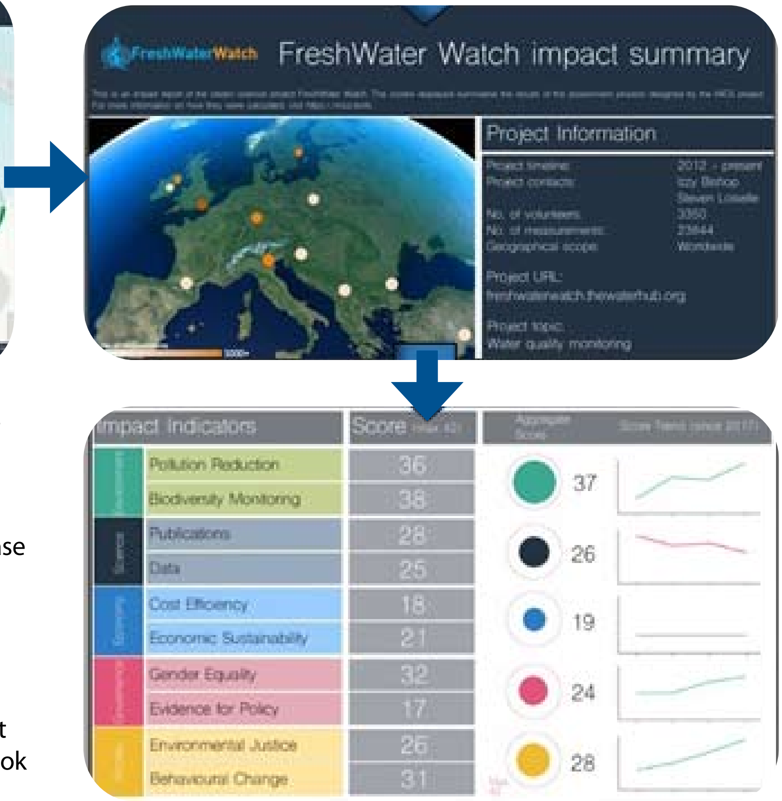
The development of a platform that can successfully capture and assess the impact of citizen science project has presented a significant design challenge. Given the quantity of information required in order to measure impact it was recognised at an early stage that the design of the interface would be critical to user engagement with the toolkit. Three barriers in particular were identified that could limit the 'user friendliness' of the interface and lead to them abandoning the exercise: *User Fatigue*, *Lack of Knowledge* and *Losing Sight of the Purpose*. To mitigate against these barriers the interface has incorporated key features to support users through the exercise.

- ***User Fatigue***: For the platforms 'toolkit' to provide metrics on impact the user must input detailed information regarding their project. To avoid users feeling like they are answering questions with no end in sight, the platform clearly indicates the progress through the form.
- ***Lack of Knowledge:*** In some instances, a user may not have the relevant information to hand to answer a question which can be off putting. Users are therefore given the option to skip questions and priorities those that are easier to answer first.

Marzenego River Info Graphic produced after the first co-design workshop

- ***Losing Sight of Purpose***: To prevent users feeling like there is a lack of purpose to inputting their projects data, questions are punctuated with 'nuggets' of information regarding their projects impact to maintain engagement.

Once a user has input their projects details, they are provided with an assessment of their activities impact. This includes an impact score for each of the individual impact domains (i.e. Environment, Society, Governance, etc.) and the indicators used



The MICS Impact Assessment Platform. Project managers input information and data relating to their project; then they are provided with impact scores for the different impact domains: Environment, Science, Economy, Governance and Society.

to calculate these scores. Recommendations of how to increase the impact of future projects will also be provided, allowing project co-ordinators to prioritise improvement for specific aspects of their project, e.g. co-efficiency or policy impact.

Now that we have a working platform, we are moving to the next stage of the MICS project which will involve pilot testing it with the results from our case-study sites. All this we have to look forward to, and we hope we can bring you more news soon!

If you would like to find out more or get involved with the MICS project and platform testing contact John or Hannah at the River Restoration Centre (rrc@therrc.co.uk) or visit www.mics.tools

22nd RRC Annual Network Conference

the River Restoration Centre
Working to restore and enhance our rivers

27th & 28th April 2021
DoubleTree by Hilton Harrogate Majestic Hotel & Online

We are now accepting abstracts for the 2021 Annual Network Conference! Submit your abstract and be part of our programme next year!

COVID-19 restrictions

Due to the ongoing uncertainty of opening face-to-face venues, the RRC 2021 Conference is being planned as a hybrid event. The booking for the DoubleTree by Hitlon Harrogate Majestic Hotel currently remains, however we are also working with the venue to be flexible on dates and format. With the rise in local restrictions and the current limit of 30 people for venue-based meetings in place until March 2021, we have been in talks with the DoubleTree by Hilton Harrogate Majestic Hotel to move the date of next year's conference to October 21st & 22nd. We will update this webpage as we find out more.

Please continue to submit your abstracts so we can compile another excellent programme of knowledge exchange. We are working with your feedback and comments from this year's event to improve and adapt how we run the event next year. If you have any suggestions and recommendations, please get in touch so we can test them out.

Submit your abstract

DoubleTree by Hitlon Harrogate Majestic Hotel

Bookings will be opening in the new year.

The network for best practices of river restoration in Greater Europe

ECRR
European Centre for River Restoration

THE ECRR ASSOCIATION MEMBER AND PARTNER ORGANISATIONS

I.S. Rivers — 4th INTERNATIONAL CONFERENCE — Integrative sciences and sustainable development of rivers — 21-25 JUNE 2021 Lyon - FRANCE

NORWEGIAN ENVIRONMENT AGENCY

SYKE — Finnish Environment Institute

AGENCE FRANÇAISE POUR LA BIODIVERSITÉ — ÉTABLISSEMENT PUBLIC DE L'ÉTAT

CIREF — centro ibérico de restauración fluvial

CIRF

WORLD FISH MIGRATION FOUNDATION

Global Water Partnership

Warsaw University of Life Sciences — SGGW

Wetlands International

Swedish Agency for Marine and Water Management

stowa — FOUNDATION FOR APPLIED WATER RESEARCH

International Network of Basin Organizations

ІВПіМ

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The River Restoration Centre — Working to restore & enhance our rivers

ECRR Events calendar 2021

Date / period	Title / issue	Location	Links
22 – 27 March 2021	9th World Water Forum	Dakar, Senegal	https://www.worldwatercouncil.org/en/dakar-2021
19 – 21 April 202`1	18th EUROPE - INBO	Malta	https://www.inbo-news.org/en/events/europe-inbo-2020-registration-now-open
6 – 8 May 2021	Dam Removal Europe goes Alps	Bavaria, Germany	https://damremoval.eu/goes-alps/
20 – 21 May 2021	European River Summit	Lisbon, Portugal	https://riverssummit.org/
9 – 11 June 2021	43rd IAD Conference	Eichstätt-Ingolstadt	https://www.ku.de/mgf/geographie/angewandte-physische-geographie/iad-conference-2020
2nd – 6th of August 2021	International Conference on the Status and Future of the World's Large Rivers	Moscow, Russia	http://worldslargerivers.boku.ac.at/wlr/
9 – 10 September 2021	21st RRC Annual Network Conference	Harrington, UK	https://www.therrc.co.uk/rrc-annual-conference-2020
September 27 – October 1, 2021	International Symposium on Ice, Snow and Water in a Warming World (Cryosphere 2021)	Reykjavík, Iceland	https://www.cryosphere2021.is/
11 – 15 October 2021	Alien Species in the Holarctic	Borok, Yaroslavl Province, Russia	http://www.sevin.ru/ASholarctic/registration.html
26 – 28 November, 2021	The 6th Conference on Soil and Water Conservation & Ecological Restoration	Xiamen, China	https://www.novevents.org/conference/CSWCER2020/

Call for articles

The newsletter of the ECRR should also be a way to share with one another what interesting work is being done, information about seminars or literature. One way of doing this is by writing an article of any project, event or literature you may be acquainted with. Send this article ***(maximum of 500 words)*** to the secretariat of the ECRR at info@ecrr.org

We will take a close look to the content and if it is coherent with the philosophy of ECRR (ecological river restoration and sharing knowl-edge) your article will be published with pleasure in the next edition (s) of the ECRR Newsletter.

The secretariat of the ECRR hopes to receive any article on ecological river restoration from any of its members

Free ECRR Network Subscribent

All who are interested in river restoration and sustainable water management are encouraged to join the ECRR. Subscribents receive the ECRR Newsletter about four times a year and are the first to be informed about activities by the ECRR, its members and partner organisations.
To register, go to www.ecrr.org.

If you want to unsubscribe for the newsletter, please send an email to info@ecrr.org.

The network for best practices of river restoration in Greater Europe
ECRR
European Centre for River Restoration

This news letter is a co-production by the Iberian River Restoration Centre (CIREF) and the Russian Research Institute for Integrated Water Management and Protection (RosNIIVHk) as National River Restoration Centres and members of the European Centre for River Restoration (ECRR).