

Introducing CatchmentCARE: Cross-Border Action to Improve River Water Quality (Ireland and Northern Ireland)

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Resumen

CatchmentCARE (Community Actions for Resilient Eco-systems) es un proyecto financiado por la Unión Europea dentro del programa INTERREG VA que tiene como objetivo mejorar la calidad del agua dulce en tres cuencas transfronterizas (Arney, Blackwater y Finn) en la República de Irlanda e Irlanda del Norte. La primera fase, el paquete de trabajo de determinación de objetivos y acción, está liderada por Inland Fisheries Ireland (IFI) y planea proporcionar un análisis más detallado de los factores que afectan la calidad del agua con el fin de aumentar la rentabilidad de los trabajos de intervención que se propongan. Las investigaciones se centran en el estado de las poblaciones de peces y, en términos de hidromorfología, en la situación del cauce y las riberas, así como en la conexión longitudinal mediante la identificación de barreras a la migración de peces y el transporte de sedimentos. Se han desarrollado nuevas herramientas específicamente para los muestreos de este proyecto, como la aplicación para identificación de barreras que usa Survey 123 para ArcGIS. La subcuenca del río Ballygawley (Irlanda del Norte) se muestra como ejemplo de aplicación de los métodos de muestreo, evaluación de problemas identificados y propuesta de medidas potenciales. Las soluciones con miras a recuperar los procesos naturales permitirán que el sistema fluvial aumente su resiliencia, por lo que podrá adaptarse a las perturbaciones actuales y futuras, como el cambio climático.

Palabras clave: Hidromorfología; Restauración fluvial basada en procesos; Resiliencia

Abstract

CatchmentCARE (Community Actions for Resilient Eco-systems) is an INTERREG VA EU-funded project which aims to improve freshwater quality in three cross-border river basins (Arney, Blackwater and Finn) in the Republic of Ireland and in Northern Ireland. The first phase, the Scoping and Action Targeting Workpackage, is being led by Inland Fisheries Ireland (IFI) and plans to provide a more detailed analysis of factors affecting water quality while increasing the cost-effectiveness of any intervention works proposed. Investigations focus on the status of fish populations and, in terms of hydromorphology, the in-channel and riparian situation, as well as the longitudinal connection by identifying barriers to fish migration and sediment transport. New tools have been developed specifically for surveys in this project, like the barrier app using Survey 123 for ArcGIS. An example is provided here for the Ballygawley sub-catchment (Northern Ireland) on the application of surveying methods, assessment of identified problems and proposal of potential measures. Solutions aiming to regain natural processes will allow for the riverine system to increase its resilience, thus being able to adapt to current and future perturbations, such as climate change.

Keywords: Hydromorphology; Process-based river restoration; Resilience

1. Introduction

The Water Framework Directive (WFD) views water quality in an all-round sense of ecological quality and uses a number of elements to assess water quality in a given water body (WFD CIS, 2003). These elements include the fish and invertebrate community and how these communities may differ from natural conditions. Another important quality element in the WFD is that of hydromorphology. This term incorporates the quantity of water (hydrology) and the quality of the physical habitat (morphology and ecology). A component of hydromorphology is that of continuity, i.e. the flow of water and sediment (fluvial-geomorphology) is undisturbed by obstructions or barriers and fish and other wildlife can pass both upstream and downstream.

The EU-funded INTERREG VA cross-border CatchmentCARE (Catchment Actions for Resilient Ecosystems) project to improve water quality is gaining momentum. The Finn, Blackwater and Arney catchments were selected for this cross-border pilot project in the Republic of Ireland and Northern Ireland (UK).

The general objectives of the CatchmentCARE project include: 1) Deliver measurable impacts on water quality; 2) Ensure the actions and activities are transferable beyond the 3 catchments; 3) Contribute to a project legacy. Within the first phase, Scoping and Targeting, the main aim is to find out the current WFD status and propose solutions that will contribute to bring all water bodies in the study areas to at least good status. This will be achieved through a combination of policy actions, catchment actions and community actions.

In its lead role in the Scoping and Targeting Work Package (WP), Inland Fisheries Ireland (IFI) identified the appropriateness of developing a knowledge base of both the biological and physical elements of the three catchments. Ultimately, there are three main lines of investigation for the Scoping phase: 1) fish surveys to establish the current fish status in a range of locations, 2) hydromorphological surveys to establish the current status of the instream and riparian zones in the locations assessed for fish, and 3) barriers surveys to establish the location, nature and dimensions of barriers.

2. Methodology description

2.1. Study areas

The project is located in three cross-border catchments between the Republic of Ireland and Northern Ireland (Figure 1 and Table 1).



Figure 1. Spatial scope of the CatchmentCARE project. Prepared by the authors

Table 1. General characteristics of the CatchmentCARE cross-border catchments. Rol: Republic of Ireland. NI: Northern Ireland (UK)

Catchment	County Councils	Area (km ²)
Finn	Donegal (Rol), Tyrone (NI)	500
Arney	Cavan (Rol), Leitrim (Rol), Fermanagh (NI)	300
Blackwater	Monaghan (Rol), Armagh (NI), Tyrone (NI)	1,500

2.2. Desk study and field surveys

The desk study includes, among others, the analysis of the historical evolution of the hydromorphology, the current status according to the WFD reporting, and possible national and international designations.

Moreover, three types of field surveys are undertaken with the following objectives and techniques:

- 1- Fish surveys. Electric fishing is undertaken as the standard sampling strategy. A timed, 10-minute fishing protocol is used. Key elements of the data collection are (a) recording all fish species encountered i.e. the fish community composition and (b) the length range of all fish within any species.
- 2- River Hydromorphological Assessment Technique (RHAT) surveys. The RHAT method classifies river hydromorphology based on a departure from naturalness. Key elements include the flow, sediment type, channel and floodplain dimensions, topography and substratum, continuity and connectivity of a river.
- 3- Barrier surveys. IFI has developed a field survey barrier assessment form, in line with EU best practice, to capture information on barrier location, type and dimensions in order to assess the risk to fish species. A digitised version of this form has been developed specifically for this project, using Survey 123 for ArcGIS, and can be loaded onto mobile phones and tablets for easy use in the field (Figure 2).

CatchmentCARE_Barriers_v2_1

Do you need to collect a new location? *
N.B. Do not edit if 'No' is already assigned.
Where a new barrier is being captured, use the 'Collect' feature, NOT the Inbox. Then mark the answer as 'Yes'.

☒ Yes ☐ No

Point *
53°17'N 6°25'W ± 34 m
Location quality warning

Barrier code/name *
64_RR_99

Catchment *
Ballygawley Water

Barrier *
☒ Yes ☐ No

2. Barrier Type

3. Barrier Structure

Roughness of Structure *
Smooth Rough Very Rough

Slope *
Gentle Moderate Steep Vertical
~15° ~30° ~45+°

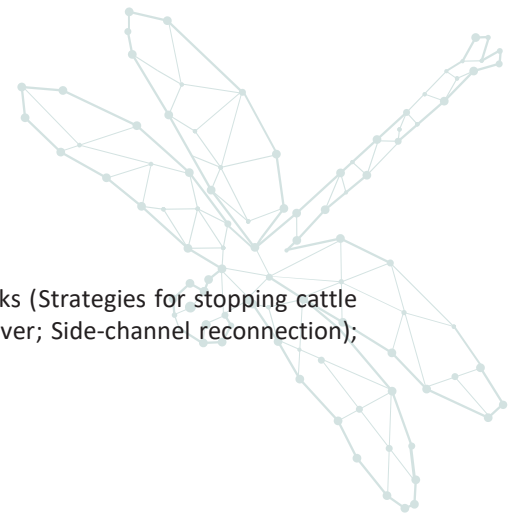
Bridge or Culvert (enter all measurements in metres, to the nearest 0.1m):

Width - C/BW: *
0.8

Length - C/BL: *
11

Figure 2. Example of data captured with the barrier survey app for mobile phones and tablets. *Prepared by the authors*

Assessments on results are reflected both in Equivalent Quality Ratios (EQR's: High, Good, Moderate, Poor and Bad) for fish and RHAT surveys, and in a layer with the actual barriers identified.



2.3. Proposal of measures

Once problems have been identified, solutions will focus on: 1) Riparian works (Strategies for stopping cattle access; Buffer strips for conservation; Management of riparian tree/scrub cover; Side-channel reconnection); 2) In-stream works (Habitat improvement; Fish passage issues).

3. Results

3.1. Desk study and field surveys

The Ballygawley Water is a sub-catchment of the Blackwater catchment. It has endured historical straightening and passed from approximately 19 km in 1832 to 16.2 km in 2018. The upper reach has been drastically affected going from 5 km long in 1832 to 2.5 km today (Figure 3).

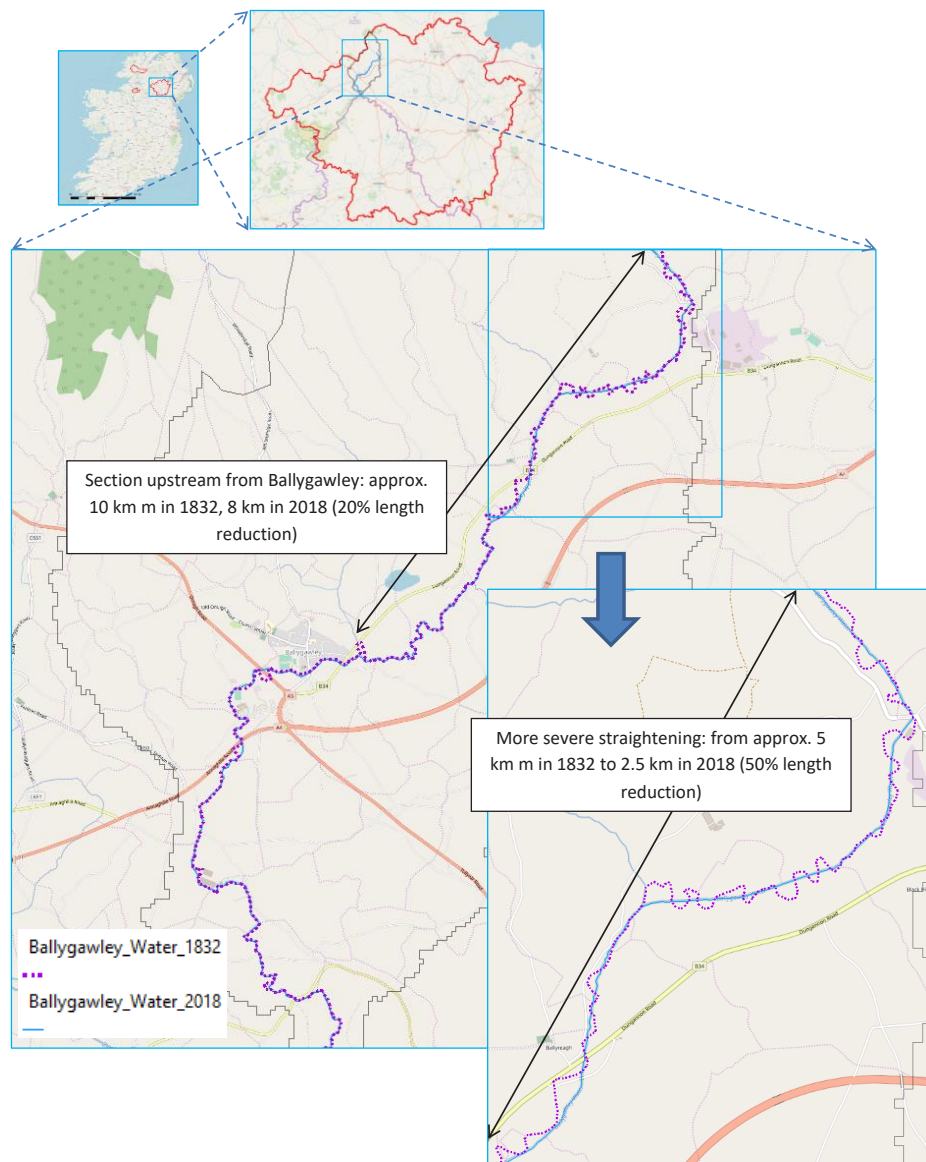


Figure 3. The Ballygawley Water in 1832 and 2018. Prepared by the authors

Results from surveys indicate that fish community is mainly composed by trout. Salmon are also present, although in fewer numbers than expected. Hydromorphological pressures include the already mentioned straightening, resectioning, overdeepening, reinforcements, poaching and lack of riparian vegetation.

Therefore, the final EQR's fall into Moderate status. Moreover, around 15 barriers have been identified in this particular sub-catchment.

3.2. Proposal of measures

The Ballygawley Water has undergone historical hydromorphological alterations that may also be affecting the current status of biological elements, such as fish. However, there is a high potential to regain natural processes with the application of measures that have proved successful (Addy *et al.*, 2016), such as easement of barriers, bank reprofiling to a more stable slope, tree/scrub planting, creation of buffer strips (fencing) and, especially, removal of hard-bank fixations allowing for natural meandering, which is already naturally occurring in some reaches (Figure 4).



Figure 4. Natural remeandering occurring in the Ballygawley water (Northern Ireland). Prepared by the authors

4. Conclusions

The CatchmentCARE project offers a unique opportunity of putting into practice process-based river restoration to improve the resilience of freshwater ecosystems (Beechie *et al.*, 2010), while incorporating the need for balancing cross-border interests. On the one hand, promoting highly dynamic river systems will lead to the riverine ecosystems to recover their self-adjustment capacity, permitting them to adapt to external perturbations, such as climate change (Díaz-Redondo *et al.*, 2018). A critical assessment of the enhancement of freshwater quality within three cross-border complex catchments will allow best practice policies to be transferable to other catchments and will contribute to improved management of this precious resource on a wider scale.

5. References

- Addy S, Cooksley S, Dodd N, Waylen K, Stockan J, Byg A, Holstead K. 2016. River Restoration and Biodiversity: Nature-Based Solutions for Restoring the Rivers of the UK and Republic of Ireland. Scotland's Centre of Expertise for Waters (CREW). International Union for the Conservation of Nature (IUCN).
- Beechie TJ, Sear DA, Olden JD, Pess GR, Buffington JM, Moir H, Roni P, Pollock MM. 2010. Process-based Principles for Restoring River Ecosystems. *BioScience* 60: 209–222.
- Díaz-Redondo M, Marchamalo M, Egger G, Magdaleno F. 2018. Toward floodplain rejuvenation in the middle Ebro River (Spain): From history to action. *Geomorphology* 317: 117–127.
- WFD CIS. 2003. Common implementation strategy for the Water Framework Directive (2000/60/EC). Guidance document No. 13: overall approach to the classification of ecological status and ecological potential. Office for Official Publications of the European Communities, Luxembourg.