

Developing the scope for a national fish passage assessment protocol

Prepared for Northland Regional Council

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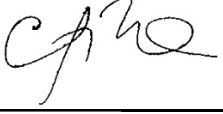
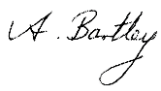
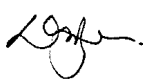
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Executive summary

Connectivity between habitats can be critical to ensuring the long-term persistence and success of fish populations. Instream barriers to migration, such as culverts, weirs, tide gates and dams, can restrict access to critical habitats leading to a reduction in freshwater biodiversity. At present there is no nationally consistent approach to identifying and characterising potential barriers to fish migration (an assessment protocol), nor any facility for storing, interrogating and presenting this information (a database).

This document outlines the need for, and defines a high level scope of, a national fish passage assessment protocol. It also describes a pathway for implementation of a national protocol and associated data management systems, and identifies potential costs associated with implementation.

1 Background

Connectivity between habitats can be critical to ensuring the long-term persistence and success of fish populations. Instream barriers to migration, such as culverts, weirs, tide gates and dams, can restrict access to critical habitats leading to a reduction in freshwater biodiversity. At present there is no nationally consistent approach to identifying and characterising potential barriers to fish migration, nor any facility for storing, interrogating and presenting this information (Franklin et al. 2014). This leads to difficulty in identifying barriers at a regional to national scale and developing robust prioritisation tools for guiding investment in restoring connectivity. This project seeks to scope the development of a nationally consistent fish migration barrier assessment protocol, data collection tool and database system.

1.1 Policy setting

The Department of Conservation (DOC) and regional councils have specific responsibilities to manage fish passage in our waterways under the Freshwater Fisheries Regulations 1983 and Resource Management Act 1991 (RMA) respectively. For structures built after 1 January 1984, culverts and fords may not be built to impede fish passage without a permit from DOC, and any dam or diversion structure may require a fish facility. Under the RMA, regional councils control the environmental effects relating to the construction of structures. Rules implemented in regional plans include requirements to provide for fish passage and the protection of areas of significant habitats for indigenous fauna. However, at present there is no facility for DOC or regional councils to record or monitor the locations of instream structures and therefore to ensure fulfilment of legislative requirements.

2 Project scope

The objective of this project is to define a high level scope for a national fish passage assessment protocol and database, and to outline a possible implementation pathway and summarise likely associated costs. It will include identifying the objectives of a national protocol, establishing the key constituent parts and requirements of a national tool, e.g., assessment protocol, data collection, storage and accessibility, and identifying a potential pathway for delivery.

This project will not involve development of a national assessment protocol or any supporting tools.

3 Analysis of needs

Many of New Zealand's most common and widespread fish species are diadromous, requiring access between the sea and freshwater environments at different stages of their life cycles. Consequently, instream structures and features that delay, impede or prevent upstream and downstream migrations have the potential for significant adverse effects on aquatic biodiversity. For threatened non-migratory fish, instream structures (selective barriers and natural waterfalls) can protect or be used to protect key locations from the impacts of invasive/exotic species.

In the absence of a national inventory of potential barriers and structures, it is not currently possible to effectively evaluate or quantify the effects of stream fragmentation on freshwater fish communities. It also limits our ability to identify and monitor locations where barriers are providing protection to threatened species and therefore should not be fixed or removed. This inability to illustrate the spatial extent of affected waterways limits the potential for highlighting and promoting

the problem, prioritising and optimising restoration efforts, and measuring the results of improved fish passage management.

At the national scale, therefore, the priority is to establish a reconnaissance level inventory of potential instream barriers to fish migration. This should be focused on identifying and recording the location and type (e.g., culvert, tide gate, dam, waterfall) of barriers, and ideally some assessment of their potential impact on fish movements (e.g., not a barrier, partial barrier, total barrier). There should also be the facility to record when fixes have been applied and whether they are confirmed as being effective. To optimise the capture of these data, a nationally consistent fish passage assessment protocol is required, coupled with accessible and practical tools for data capture, storage and delivery. This will support obligations to set freshwater objectives and define limits under the National Policy Statement for Freshwater Management (MfE 2014).

At the regional to local scale, there is some demand for a more comprehensive assessment protocol sufficient for obtaining the information required to design and cost replacement structures. This requires a level of detail beyond that required for national level recording and environmental reporting. However, there are benefits to providing a nationally consistent methodology for collating these more detailed assessments that is fully integrated with any national level reconnaissance inventory.

4 Towards a national fish passage assessment protocol

4.1 Objectives

- Provide a nationally consistent approach to identifying and characterising instream structures and their potential impact on fish passage.
- Allow development of a geographically referenced national inventory of barriers that are impeding fish movement.
- Improve the availability of and access to data on fish migration barriers.
- Support improved national coordination of fish passage management in New Zealand by allowing better characterisation and quantification of the fragmented nature of streams and rivers to support environmental reporting and freshwater limit setting.
- Allow identification of high value catchments with little or no threats of impeded fish passage.
- Document and measure success of efforts and benefits of restoring connectivity.

4.2 Scope

At the national scale, the priority is to establish a national reconnaissance level inventory of potential instream barriers to fish migration. This should be focused on identifying and recording the location and type of structures and assessing the risk that they will restrict or prevent fish movements.

The scope of the national fish passage assessment protocol will be to:

- Record the location and type of different instream structures (including natural barriers) at a national scale.

- Categorise likely constraints (if any) on fish passage at each structure, e.g., fall height, perching or high water velocities.
- Provide an estimate of the risk that a structure may impede the passage of different fish species and life-stages under different conditions, e.g., varying flows.
- Capture a photographic record of the status of barriers at the time of assessment.
- Have the facility to identify if and what solutions have been implemented to restore connectivity at a structure and whether they have been confirmed to be effective.
- Provide the ability to catalogue structure status over time through repeated assessments.
- Have a flexible, hierarchical architecture suitable for future integration of a more detailed assessment methodology to fulfil regional level requirements for characterising instream structures.
- Be delivered in an accessible form with the option of an electronic data capture system suitable for implementation on handheld mobile devices.
- Be linked with a national database and data management system.
- Integrate data quality assurance systems.
- Provide information in a geographically referenced format that is compatible with GIS formats and will be made accessible to end-users through a web-based interface.
- Support prioritisation of barriers for restoration.

The national fish passage assessment protocol will not:

- Provide enough information for the design of fish passage solutions.
- Yield all the information needed to determine which structures should be prioritised for replacement.

4.3 Implementation pathway

The following section outlines some of the critical steps in agreeing and establishing the national assessment protocol and associated data management tools.

1. Agreement of scope

Consultation with key stakeholders including the Department of Conservation and regional councils is required to ensure the scope is fit for purpose. The New Zealand Fish Passage Advisory Group will provide final sign-off of the scope prior to implementation.

2. Funding

Potential funding sources must be identified and funding secured to support development of the assessment protocol and associated data management infrastructure. Options for funding may include, amongst others:

- Direct funding from stakeholders.
- Envirolink.
- Ministry for the Environment.
- The Terrestrial and Freshwater Biodiversity Information System (TFBIS) programme¹.

Detailed costings are not yet available for all stages of the protocol development. However, based on NIWA's previous experience of developing environmental data management systems the following estimates can be used as a guide:

- Initial development of a draft national protocol: consultation with stakeholders and development of fields required for completing reconnaissance level assessment (c. \$20,000 + in-kind support for testing).
- Extension of the draft national protocol architecture to include facility for integrating more detailed assessment protocol for full characterisation of instream structures (c. \$10,000).
- Define specification for national data management system, e.g., mobile application, database, GIS system (c. \$5,000).
- Development and implementation of national data collection tools (e.g., mobile application) and data management system (e.g., georeferenced database, web portal) (\$100,000-\$250,000).

Detailed assessment protocol:

- Initial development of a draft detailed assessment protocol for full characterisation of instream structures (c. \$50,000 + in-kind support for testing).
- Implementation of data collection tools and data management system for detailed assessment protocol (\$50,000-\$100,000).

3. Protocol development and testing

It is proposed that development of the protocol will be led by NIWA and DOC, supported by a small group of technical experts drawn from key stakeholder groups. The process will also be overseen by the New Zealand Fish Passage Advisory Group.

The priority of the development team will be to define and test a national fish passage assessment protocol, and subsequently develop a specification for the data management systems. The support of an information architect is recommended to improve the usability of the protocol and to ensure the framework of the protocol is compatible with any future extension to include a detailed structure characterisation protocol.

Once the protocol is defined, a manual data capture system will be made available to enable stakeholders to begin collecting data in a format that can be uploaded into the database once it is completed.

¹ Note that the TIFBIS fund is currently under review and is not accepting applications

4. Data management infrastructure

It will be the role of the protocol development team, with input from information specialists, to define a specification for the data management infrastructure. This is likely to include requirements for:

- data acquisition and capture, e.g., an electronic data capture system suitable for handheld mobile devices (Android/iOS/Windows)
- data ingestion, storage and quality assurance, e.g., a database system, and
- data retrieval and display, e.g., geographical information system and a web interface.

Once the data management specification has been defined it will be possible to scope and cost the implementation of the data management infrastructure. The costs associated with delivering each component will depend on the level of detail and integration sought by stakeholders. For example, will the data capture system deliver data in a basic .csv format that individual users then upload manually, or will it be fully integrated and compatible with existing data management systems used by multiple stakeholders with fully automated remote upload capabilities? Will the data retrieval and display system be based on a standalone 'fish passage' database, or will it have the capability to interrogate multiple databases (e.g., asset management databases held by multiple organisations) and populate these data centrally? It is expected that alternative options for each element of the data management infrastructure will be scoped and costed and subsequently prioritised for implementation.

5. Legacy data

Kelly (2008) identified a range of potential existing data sources on instream structures that could contribute to developing an understanding of fish passage problems at a national scale. In that review, undertaken on behalf of DOC, it was highlighted that a range of organisations held data on assets that they owned or operated, and that this information could be useful in building a national inventory of potential barriers to fish migration. Where possible, it would be preferential if existing barrier/infrastructure databases held by these organisations could be uploaded and integrated into the new national database and data delivery systems. However, Kelly (2008) indicated that the logistical effort required to achieve this level of integration may not be cost-effective. It would, however, be worthwhile investigating the potential value of collating these data and integrating them into the database.

6. Ongoing maintenance

Ongoing maintenance costs for the system include governance costs (c. \$10,000 pa) and system maintenance and improvements (up to \$40,000 pa). Periodic review and update of the protocols should also be allowed for (c. \$20,000 per review).

5 Acknowledgements

The input and support of a range of stakeholders and members of the New Zealand Fish Passage Advisory Group are gratefully acknowledged. We particularly acknowledge the role of Northland Regional Council as the sponsor of the Envirolink grant application on behalf of councils from around the country. This project was funded by an Envirolink Small Advice Grant.

6 References

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