

EFI + Improvement and Spatial Extension of the European Fish Index



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Project overview

The overall objective of **EFI+** is to overcome existing limitations of the EFI by developing a new, **more accurate and pan-European fish index**. The scientific and technological objectives are to (1) evaluate the applicability of the existing EFI and make necessary improvements to the existing index in Central-Eastern Europe and in the Mediterranean ecoregions, (2) extend the scope of the existing EFI to cover very large rivers, (3) analyse relationships between hydromorphological pressures (incl. continuity disruptions) and fish assemblages to increase the accuracy of the EFI, (4) adapt existing software to the requirements of the new EFI to allow calculation of the ecological status for running waters, (5) implement and disseminate the EFI and supporting software by integration of the project results into the CIS activities (Common Implementation Strategy) and national and international monitoring programmes such as the Joint Danube Survey. These results should be presented in end-user workshops and at an international conference.

The following pages provide an overview of the final results of the EFI+ project.

Fish index development

The development of the new assessment method was the main objective of the second project phase. The method development was based on the same principle as applied in the FAME project. In a first step models were developed based on calibration sites. These models describe the fish community – expressed as metrics - of sampling sites as a factor of environmental variables in the absence of major human pressures. They are used to compute theoretical metric values. Afterwards metrics with the best model performance were selected for testing their response to different types of pressures. The metrics showing the best responses were chosen for the final index which is calculated as mean of these metrics. For the final assessment score the thresholds between different status classes were defined. In EFI+ two different indices were developed depending on fish assemblage types, i.e. salmonid dominated fish assemblages and cyprinid dominated fish assemblages. Both indices are composed of two metrics.

Salmonid:

- Ni.O2.Intol = Density (number of individuals per hectare in the 1. run of a sample site) of species **intolerant to oxygen depletion**, always more than 6 mg/l O₂ in water.

- Ni.Hab.Intol.150 = Density (number of individuals per hectare in the 1. run of a sample site) \leq 150 mm (total length) of species **intolerant to habitat degradation**.

Cyprinid:

- Ric.RH.Par = Richness (number of species in the 1. run of a sample site) of species requiring a **rheophilic reproduction habitat**, i.e. preference to spawn in running waters.
- Ni.LITHO = Density (number of individuals per hectare in the 1. run of a sample site) of species requiring **lithophilic** reproduction habitat, species which spawn exclusively on gravel, rocks, stones, cobble or pebbles. Their hatchlings are photophobic.

The main progress of the EFI+ project in comparison to the FAME project was that the pressure variables were much more detailed and enabled a better analysis of metric responses. The finally selected metrics respond much better to hydromorphological pressures than in the previous EFI from the FAME project. Another advantage was the better model performance and a higher level of accuracy of the statistical methods applied for model development. Also, a statically based estimation of uncertainties of the final index was done. All in all the newly developed European Fish Index works in most countries and ecoregions better than the former FAME assessment method. However, some limitations still exist.

Tests of the specific diadromous species metric (proportion of present diadromous species richness compared with historical species richness) showed a clear response to continuum interruptions. Therefore this metric was also included in the final output. However, due to the different structure of this metric (based on presence of species from different sources, i.e. written documents for historical distribution and other fish samples for present occurrence; no estimation of error) it was not integrated in the final index. At this step it provides additional information about the tendency of the index when considering continuity impacts particularly.

Development of the new software and manual

For the implementation of the newly developed European Fish Index, a software tool and a manual were developed. The software works as online tool and offers the possibility for manual data input as well as for input of large datasets using predefined input data spreadsheets (<http://efiplus.boku.ac.at/software>). The software was tested in two end-user meetings at the end of the project and identified bugs have been corrected. In addition, the manual is available online and several help functions are provided for data input.

Outputs of the software are all metric values (i.e. theoretical metrics, observed metrics, final metrics), the river type and the two indices for salmonid and cyprinid dominated fish assemblages. Further, additional comments are provided for the correct interpretation of the results. As mentioned above the diadromous species metric was also integrated in the final output.

Dissemination and meetings

Several dissemination activities were started during the project and in particular in the second project period. The most important were the organisation of two end-user meetings and the final conference where the main EFI+ results were presented in two special conference sessions. The first end-user meeting was held at the end of the conference at the University of Hull. It was attended by some 30 participants of the conference. The second end-users meeting was focusing in particular on water managers and potential end users in Central/Eastern European countries. It was held at the University of Cluj (Romania) and attended by 50 participants.

The final conference was attended by approx. 100 participants. Altogether 36 presentations were given during 9 sessions, focusing on EFI+ project results and related topics.

Outlook

Dissemination of the EFI+ results (index and metric development and testing, species classification, etc.) will be also done via scientific papers prepared by the project members during the next month and upcoming conferences.

Apart from the new European Fish Index the EFI+ central database represents an important output of the project. Key results of the database will be published online on the project webpage. Published data will be limited to the results of the project (metrics, index, scores) as well as to environmental variables necessary to compute the European Fish Index, including some pressure variables.

Finally, work on the New European Fish Index will be continued in two recently started projects. One is WISER, an EC-funded research project focusing on the development of methods for assessing and restoring aquatic ecosystems addressed by the WFD. The second one is FORECASTER, an applied project aiming at the application of output from scientific projects for the implementation of the WFD with special emphasis on ecological response to hydromorphological pressures and rehabilitation. The EFI+ project results will be used to support the intercalibration process.

Thank you for your support and interest in EFI+!

The EFI+ group



EFI+ webpage:

For further information please visit the EFI+ webpage at <http://efi-plus.boku.ac.at>

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