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D1.1 – D1.3, Lists and descriptions of sampling methods, type of fish data, environmental variables and pressure variables

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PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Introduction - Summary of WP 1

The objective of workpackage 1 was to define lists and descriptions of data to be collected in WP2 and analysed in WP3. These data are based on both literature reviews and the collective experience of the partners pooled through discussions at the kick-off meeting. The review of necessary and available data leads to lists and descriptions of data to be collected in WP2.

FAME has set standards for fish data and sampling methods. For the new type of data in EFI+, these standards had to be discussed again e.g. with respect to additional sampling methods for large floodplain rivers. During the initiation phase of the EFI+ project the basic principles and the variables for data collection were agreed. As in the FAME project, the focus is set on existing samplings from electro fishing.

The defined set of variables, which must be provided by project-partners for each sampling site and fishing occasion, should enable the consortium to account for different features and fish assemblages of European rivers, and to adequately define existing pressures at a sampling site. The main challenge for the selection of the variables was to find the best compromise between the appropriate descriptors and temporal and financial resources available in the project.

D1.1 List and description of sampling methods and type of fish data to be collected in WP2

Different types of fish data have to be collected:

- Variables describing location, name of site and date of fishing
- Variables describing the sampling methods
- Variables describing catch data
- Variables describing length data
- Data of actual and historical distribution of diadromous species

Data describing the location of the sampling site and sampling methods:

Variable	Description
Site code	Unique reference number per sampling site. International country code XX <i>sitocode</i> (XX, e.g. AT for Austria) plus national code separated by "_".
Date	Sampling date: Day/Month/Year e.g. 23/04/2004.
Latitude	Latitude WGS84 referenced to CCM-rivernetwork
Longitude	Longitude WGS84 referenced to CCM-rivernetwork
X	X-coordinate representing the countries own national grid-value
Y	Y-coordinate representing the countries own national grid-value
River name	The official name used in your country. In case of transboundary river take the river name of the country where the river has it's mouth (either to the sea or to the next river downstream).
Site name	Location name e.g. indicating a nearby town or village.
FIDES	Site was already in FIDES (yes/no)

Variables describing the sampling methods:

Variables	Description
Sampling strategy	Definition of how the section was sampled. Whole river width (<i>whole</i>) or only parts of the river (<i>partial</i>).
Method	Define if electric fishing was carried out by <i>wading, boat or mixed</i> (sites sampled with both - wading and boat).
Fished area	Area of the section that has been definitely sampled (sampled length * sampled width) given in m² .
Floodplain	Sample from main channel, floodplain or mixed.

Variables describing the sampling methods:

Variable	Description
Site_code	See table Site
Latitude	See table Site
Longitude	See table Site
Date	Date of sampling given as MS date format YYYY-MM-DD
Species	Scientific name of species (see table TAXA AND GUILDS)
Native	Is the species native or not (0,1) – on site level
Recruitment	Yes/No
Nr_Runs	Total number of runs
Run1_number_all	All caught individuals of the species in run 1
Run2_number_all	All caught individuals of the species in run 2
Run3_number_all	All caught individuals of the species in run 3
Run4_number_all	All caught individuals of the species in run 4
Total_number_all	All caught individuals of the species in all runs (cumulative total)
Total_biomass	Estimated biomass of the species in kg per hectare (= 10 000m ²)
Biomass_estimate	Define if biomass was estimated by weighing or length-weight-conversion
Total abundance	Estimated abundance (nr. of ind.) of species per hectare (= 10 000m ²)
Abundance_estimate	Method used for the abundance estimation
Estimated_efficiency	State the catch efficiency calculated

Variables describing length data:

Variable	Description
Date	Date of sampling given as MS date format YYYY-MM-DD
Species	Scientific name of species (see table TAXA AND GUILDS)
Run	Run number
Type_of_data	Indicate if the whole catch (species) or a subsample was measured.
Calculation_method	If only a sub-sample was measured, the method how the length of total sample was calculated
Total_length	Total length of individual (mm)

Data of actual and historical distribution of diadromous species

Data on the historical distribution of diadromous fish species are collected and the potential distribution is after modelled as a function of environmental variables to account for lack of historical information. These data are used in WP 3 to create a new metric on migration and to show the impacts of continuity interruptions. Information about historical and actual occurrence of species and environmental data is collected. Environmental data will be used for the prediction of the potential distribution of fish species based on historical occurrence. They will all be generated GIS-based.

List of environmental data for diadromous species

- Mean monthly air temperature 1960-1990; 1901-2000;
- Mean monthly precipitation 1960-1990; 1901-2000;
- (Evapotranspiration)
- Catchment size (lower/upper end)
- Stream order (Strahler)
- Altitude (lower/upper end)
- Distance to sea

Species list – diadromous

- *Acipenser stellatus*
- *Huso huso*
- *Alosa pontica*
- *Acipenser naccari*
- *Acipenser sturio*/*Acipenser oxyrinchus*
- *Anguilla anguilla*
- *Alosa fallax*
- *Alosa alosa*
- *Petromyzon marinus*
- *Lampetra fluviatilis*
- *Salmo salar*
- Sea trout
- (diadromous) *Coregonus* sp.

In addition for some areas data on the occurrence of flounder (*Platichthys flesus*) and Smelt (*Osmerus eperlanus*) are compiled.

Requirements

For each sampling site/fishing occasion, it must be indicated if the species occurs at present; therefore, four categories for each species are foreseen:

- species is absent
- species occurs naturally
- species occurs mainly due to stocking
- no information available

Collection of environmental and pressure data on local and national scale

Using different methods for the collection of environmental and pressure variables

Environmental and pressure data have to be collected by all partners for each sampling site. In many cases, it's possible to provide methods how to calculate these variables, but there are some variables which have to be as consistent as possible and should be computed in the same manner for all countries. Therefore, these variables will be calculated via GIS by one person Europe-wide (see part B of data collection).

All other variables will be calculated by all partners on so called local or national scale.

D1.2 List and description of environmental variables to be collected in WP2

Define natural descriptors

The existing EFI uses environmental variables to predict reference metric values. Therefore, task 1.2 aims to improve the data quality of environmental variables. New environmental variables have been defined to improve the reference models, in particular, to increase coverage of environmental characteristics of Mediterranean, Central/Eastern and Large Floodplain Rivers based on literature review and experience of the partners. Environmental variables will be derived either locally or GIS-based. The environmental variables are needed to model the reference fish fauna on site level.

A prerequisite for environmental variables is that they should not change depending on any existing pressure. For some variables, like river slope and wetted width the actual values will be considered since it will not be possible to gain information about the situation previous to major pressures within the 6-month-phase of data collection.

Different scales for the collection of environmental variables

Scale	Description
Site	The sampled site in the stream
Segment	A river segment is defined as: 1 km for small rivers (catchment < 100 km ²) 5 km for medium-sized rivers (catchment 100 – 1000 km ²) 10 km for large rivers (catchment > 1000 km ²) A segment for a small river will thus be 500m up- and 500m downstream of the sampling site.
Catchment	The whole catchment (watershed) upstream of the site.

Variables on local scale, describing the environment:

Environmental data (for predicting reference conditions)	
Altitude	The altitude of the site in meters above sea level (data source: maps).
Lakes upstream	Are there natural lakes present upstream of the site? Answer <i>Yes</i> or <i>No</i> . Only applicable if the lake affects the fish fauna of the site, e.g. by altering thermal regime, flow regime or providing seston. Use water frame directive definition of lake: more than 50ha . If there are artificial lakes (as e.g. fish ponds upstream) these are pressures and must not be considered in environmental variables.
Distance from source	Distance from source in kilometers to the sampling site measured along the river. In the case of multiple sources, measurement shall be made to the most distant upstream source (data source: maps, preferably preferably 1:25 000).
Natural flow regime	<i>Permanent</i> : never drying out. <i>Summer dry</i> : drying out during summer (data source: gauging station or hydrological reports). <i>Winter dry</i> : <i>drying out during winter</i> (e.g. some alpine or nordic rivers) <i>Intermittent</i> : Can be dry in any period of the year , otherwise it's summer- or winter dry
Wetted width	Wetted width in meters is normally calculated as the average of several transects across the stream. The wetted width is measured during fish sampling (performed manly in autumn during low flow conditions) (data source: field measurement).
Geology	<i>Siliceous</i> , <i>calcareous</i> or <i>organic</i> (based on dominating category) (data source: geological maps).
Water source type	<i>Glacial</i> , <i>nival</i> , <i>pluvial</i> or <i>groundwater</i> (<i>must be dominant</i>), based on hydrograph of the river next to the sampling site.
Actual river slope	Actual river slope . Given as slope of streambed along stream expressed as per mill , m/km (‰). The slope is the drop of altitude divided by stream segment length. The stream segment should be as close as possible to 1 km for small streams, 5 km for intermediate streams and 10 km for large streams.
Valley slope	Length of the valley between two contour lines.
Size of catchment	Size of the catchment (watershed) upstream of the sampling site (km ²).
Catchment name	Indicate main catchment (based on ICES map, see FIDES manual), where river discharges into sea
Floodplain	Presence of a former floodplain : <i>yes</i> , <i>no</i> (e.g. significant area of adjacent landscape flooded at least every 10 years), (data source: old maps, reports, expert judgement)
Valley form	(1): V-shape, (2) gorges, (3) U-shape, (4) plains
Geomorphological river type	information in 4 categories to be selected: naturally <i>constraint</i> without mobility (riverbed is fixed), <i>braided</i> , <i>sinous</i> , and 2 <i>meandering classes</i> (<i>regular and tortous</i> , <i>different in sinosity index</i>). ! Situation before any major human control of river bed!
Naturally dominant sediment	information in five categories: <i>organic</i> , <i>silt</i> , <i>sand</i> , <i>gravel-pebble-cobble</i> , <i>boulder-rock</i> ;! Situation before major changes of sediment conditions, always for the dominating substrate!At large rivers, consicer dominant sediment in the potamic zone with weak to medium water depths.

D1.3 List and description of pressure variables to be collected in WP2

As for environmental data there are “local” variables which must be delivered for each sampling site by EFI+ partners. Human pressure information (through descriptors) allows (1) to identify the reference sites (sites with no or only minor pressure) and (2) to test the sensitivity of metrics and index to pressure.

Collection of pressure data on local scale:

Category	Pressure type	Criterion (unit)	no pressure	pressure intensity			
Connectivity	Migration barriers - river segment scale	Distance to next barrier in the segment - upstream	0 = no barrier	in km			
Connectivity	Migration barriers - catchment scale	Presence of downstream barriers on the catchment scale	no	partial: migration possible for good swimmers (e.g. salmon) or for particular situations/years	yes: definite barriers for most species most of the time		
Connectivity	Migration barriers - river segment scale	Barriers on segment level upstream	no	partial	yes		
Connectivity	Migration barriers - river segment scale	Barriers on segment level downstream	no	partial	yes		
Connectivity	Migration barriers - river segment scale	Number of barriers upstream	no = 0	yes = nr. of barriers			
Connectivity	Migration barriers - river segment scale	Number of barriers downstream	no = 0	yes = nr. of barriers			
Connectivity	Migration barriers - river segment scale	Distance to next barrier in the segment - downstream	0 = no barrier	in km			

Category	Pressure type	Criterion (unit)	no pressure	pressure intensity			
Hydrological alteration	Impoundment	Natural flow velocity reduction on site due to impoundment	no (no impoundment)	weak	strong		
Hydrological alteration	Hydropeaking	Site affected by hydropeaking	no (no hydropeaking)	yes			
Hydrological alteration	Water abstraction	Is the site affected by water flow alteration/minimum flow (water abstraction)	No	weak to medium (less than half of the mean annual flow)	strong (more than half of mean annual flow)		
Hydrological alteration	Water use	Driving force of pressure: hydro power, irrigation, drinking water, snow production, fish ponds, cooling for thermal/nuclear power plants etc.)	no	HP (hydropeaking), I (Irrigation), DW (Drinking Water), SP (Snowproduction), FP (Fishponds), CW (Cooling water); IW (Industrial water), OT (others)			
Hydrological alteration	Hydrograph modification	Seasonal hydrograph modification due to hydrological alteration (e.g. water storage for irrigation, hydropower, ...)	no	yes			
Hydrological alteration	Temperature	Is there an impact on water temperature	no (no temperature modification)	permanent increase (due to cooling water input e.g. for nuclear or thermal power plant, or others)	permanent decrease (e.g. permanent temperature reduction due to coldwater input from impoundment, or others)	summer increase (temperature increase due to epilimnion release)	summer decrease (temperature decrease and/or winter increase due to hypolimnion water release)
Hydrological alteration	Flow velocity increase	Is there an impact on flow conditions (mean velocity) due to channelisation, floodprotection, etc.	no	yes			

Category	Pressure type	Criterion (unit)	no pressure	pressure intensity			
Hydrological alteration	Sedimentation	Input of fine sediment (mainly mineral input; bank erosion, erosion from agricultural land, etc.)	no	weak (slight reduction of sediment porosity)	medium	high (coarse sediment clogged)	
Morphological alteration	Channelisation	Alteration of natural morphological channel plan form; intensity of straightening	no	intermediate	straightened		
Morphological alteration	Channelisation	Alteration of cross section	no	intermediate	technical crossec./U-profil		
Morphological alteration	Channelisation	Alteration of instream habitat conditions	no	intermediate	high		
Morphological alteration	Channelisation	Alteration of riparian vegetation close to shoreline	no	slight	intermediate	high (no riparian vegetation)	
Morphological alteration	Channelisation	Artificial embankment	no (natural shoreline)	slight (local presence of artifical material for embankment)	intermediate (continuous embankment but permeable (e.g. rip rap))	high (continuous, no permeability (e.g. concrete walls))	
Morphological alteration	Floodprotection	presence of dykes for flood protection	no	yes			
Morphological alteration	Floodprotection	If the river has a former floodplain - Proportion of connected floodplain still remaining. Floodplain = area connected during the flood.	no (= no former floodplain)	> 50%	10-50%	less than 10 %	some waterbodies remaining
Water quality	Toxic substances	Toxic priority substances (organic and nutrient appearance)	no or very minor (e.g. atmospheric input far away, no contamination in the segment itself)	weak (important risk, link to particular substance)	high concentration (a clearly known input)		

Category	Pressure type	Criterion (unit)	no pressure	pressure intensity			
Water quality	Water quality index	National water quality index - in 5 classes	indication of classes (1 to 5; 5 = worst)				
Water quality	Water quality index	National water quality index - name	name of index				
Water quality	Eutrophication	Is there an artificial eutrophication?	no	low	intermediate (occurrence of green algae)	extreme (oxygen depletion, increase of primary production)	
Water quality	Organic pollution	Is organic pollution observed?	no	weak	strong		
Water quality	Organic siltation	Is organic siltation observed?	no	yes			
Navigation	Navigation	Navigation intensity	no	low	medium	strong (e.g. large ships)	

GIS-based collection of environmental and pressure data on European scale

As describe before, some environmental and pressure variables are more consistent, if they have the same basis for all countries. Therefore, these variables will be calculated centrally via GIS for all sites.

Relevant environmental data, calculated via GIS on European scale

▪ Distance from source
▪ Distance from mouth
▪ Geology (major groups of dominant parental material)
▪ Soil data (e.g. soil classification, impermeable layers, erodibility)
▪ Mean annual, january, july air temperature
▪ Mean annual precipitation
▪ Size of catchment (individually for each sampling site)

The CCM River and Catchment Database for Europe (JRC) is used to compute natural descriptors for each sampling site such as distance from source, distance from mouth, size of catchment. Other European-wide available GIS information is used to compute environmental variables such as mean annual air temperature, mean annual precipitation for each fish sampling site.

Relevant pressure data, calculated via GIS on European scale

▪ Landuse / Land Cover
▪ Population density
▪ Irrigated land
▪ Road density (major road network)

Also, queries on pressure data will be done: Land use data will be taken out of CORINE land cover (Corine Land Cover, CLC 2000). Also, population density und road density can be calculated via GIS. These data are used to compute pressure variables at different spatial scales such as land use along river buffers (e.g. 50/100/200m buffers), river segments (1/5/10km, upstream river), and catchments (entire upstream catchment, sub-catchments).