

## **Supplementary material on the methodology Part I**

Readme spreadsheet for the Work Package 3 database on European eel habitats, with the list of variables and information for compilation

Readme habitat spreadsheet of the Work Package 3 habitat database

MISSING DATA				
Short definition	Code	Definition		
Not reported	NR	Data or activity exist, but numbers are not reported to authorities (for example for commercial confidentiality reasons).		
No data	ND	Activity/habitat exists, but data are not collected by authorities (for example where a fishery exists but the catch data are not collected at the relevant level or at all).		
Not collected	NC	Where there are insufficient data to estimate a derived parameter (for example where there are insufficient data to estimate the stock indicators (biomass and/or mortality)).		
Not pertinent	NP	Where the question asked does not apply to the individual case (for example where catch data are absent as there is no fishery or where a habitat type does not exist in an Eel Management Unit).		
WP3_HABITAT VARIABLES	Code	EXPLANATION	Units	Types of Units
Country	Country_fullname	Full name		Character
Year of evaluation	Year	Four digits (include successive rows for different years if necessary)		Number
Site name	Site_name	Provide the name you give to your station (include successive rows for different sites if necessary)		Character
Scale	Scale	Indicate the geographical scale to which the data refer, e.g. sub-basin, lagoon basin, river segment, point sampling, etc.		Character
Area/River basin	Area_basin	Indicate the geographical area or drainage basin to which the station (Site_name) belongs		Character
EMU code	EMU_name short	See EMU codes in the general <i>Read Me</i> spreadsheet of the WP3 database		Character
Site coordinates:		Should be in decimal degrees with wgs84-epsg4326 or other coordinate system with complete information to allow us to re-project your data. If it is the entire area of a water body, take the centre		

Longitude	Long		Decimal Degrees (DD)	Number
Latitude	Lat		Decimal Degrees (DD)	Number
<b>AREA DESCRIPTION</b>				
Habitat type		For rivers, select only those with seasonal/permanent waters, eliminating temporary ones (wadis/ravines etc.)		
	OMW	Open Marine Water (open sea)		Character
	CMW	Coastal Marine Water: Surface waters on the land side of a line that is located at a distance of one nautical mile from the coast or the mouth of rivers. In the special case of areas where surface waters extend beyond one nautical mile, they should be considered as Coastal Marine Waters (CMW) and not as Open Marine Waters (OMW)		Character
	LGN	Coastal Lagoons (several saline typologies)		Character
	RIE	River Estuary (transitional waters including deltas, marshlands etc.) measured from the mouth of the river until 30 km upstream of the main channel (if there are more accurate measurements use instead, for example, length of the permanent saline wedge, etc)		Character
	RIV	Freshwater area from the end of the estuary zone (measured as above) to the first unsurpassable obstacle		Character
	LAK	Lake (freshwater)		Character
Potential surface	Pot_sur	Refers to wetted surface (ha) above the first unsurpassable barrier (without eel-pass) until a high of 1 000 m above sea level. Count a representative average channel width each 5 km and multiply these by the length of each representative channel (5 km). If there is another more accurate measurement, please use instead	ha	Number
	Lak_sur	The potential surface area for habitats available to eel at a time prior to the land use modification (extraction, drainage, etc.). Consider all the changes that have occurred since about 1850 to the present date	ha	Number
	Lgn_sur	The potential surface area for habitats available to eel at a time prior to the land use modification (agricultural, channelization, etc.). Consider all the changes that have occurred since about 1850 to the present date	ha	Number

	Rie_psur	The potential surface area for habitats available to eel at a time prior to the land use modification (agricultural, channelization, etc.). Consider all the changes that have occurred since about 1850 to the present date	ha	Number
Current surface		Available habitat at the present time		
	Riv_cur	Rivers: For the river basin, available habitat for eel under the first unsurpassable barrier (ha) at the present time. Count a representative average channel width each 5 km and multiply these by the length of each representative channel (5 km). If there is another more accurate measurement, please use instead	ha	Number
	Rie_cur	Estuaries, deltas or marshlands: available habitat for eel (ha) at the present time (Figure 2)	ha	Number
	Lgn_cur	Lagoons: available habitat for eel (ha) at the present time	ha	Number
	Lak_cur	Lakes: For those water bodies with an average depth of more than 20 m, the area considered suitable for eels is calculated as 10% of the total lake surface. For lakes with an average depth of less than 20 m, consider the entire surface	ha	Number
	Coast_cur	Available surface coastal waters on the land side of a line that is located at a distance of one nautical mile from the coast or the mouth of rivers. In the special case of areas where surface waters extend beyond one nautical mile, they should be considered as CMW and not as OMW. The surface must be estimated whether or not the presence of eels has been detected.	ha	Number
Connectivity	Conn	Only in rivers: percentage of basin area inaccessible to eel	%	Number
Lost surface	Lost	For lakes, lagoons, estuaries, deltas and marshlands: area currently not accessible to eels referred to the pre-reclamation surface (to calculate this area, follow the instructions given above; see for instance Rie_cur, Lgn_cur and Lak_cur)	%	Number
Reclutability	Rec and Time_rec	For all types of habitats (LAK, RIV, RIE, LGN) and for each site separately, value the connection with the sea <b>during the migration period (this should be done for each year considered):</b>	0-2/days	Number/Number
		=> 2 when there is a free arrival (without barriers or when these are open) of glass eels/elvers to the area		
		=> 1 when the arrival has been partially obstructed. In this case, show the periods of time (number of days) in which the barriers have been closed (variable Time_rec)		

		=> 0 when this arrival has been completely obstructed by barriers, obstacles, etc.		
Escapement	Esc and Time_esc	For all types of habitats (LAK, RIV, RIE, LGN) and for each site separately, value the connection with the sea <b>during the migration period (this should be done for each year considered):</b>	0-2/days	Number/Number
		=> 2 when there is a free escape (without barriers or when these are open) of silver eels to the sea		
		=> 1 when the escape has been partially obstructed. In this case, show the periods of time (number of days) in which the barriers have been closed (variable Time_esc)		
		=> 0 when the escape has been completely obstructed by barriers, obstacles, etc.		
Water Exchange Index	Wei	$\frac{\sum_{i=n}^n \text{Tidal channel length}_i \text{ (km)} \times \text{width}_i \text{ (km)}}{\text{lagoon surface (km}^2\text{)}} \times 100$ <p>Only for lagoons</p>		Number
River discharge		You can choose from any of the following variables:		
	AA_riv_disch	Accumulated Annual River discharge (km <sup>3</sup> /year): refers to an entire river basin		
	AA_disch	Annual average discharge (m <sup>3</sup> /s): refers to a given area within a river basin or an entire river basin. If the average is not calculated from all the months of the year, indicate below which ones are missing.		
<b>PHYSICOCHEMICAL CHARACTERISTICS</b>				
To fill in this database, indicate the reason why there is a missing value (drop-down list) or fill in the data of the variable that is requested (drop-down lists or manually).				
Annual Average water temperature	Awt	Annual average water temperature (if known, indicate in brackets the number of measurements used to calculate this average). If the average is not calculated from all the months of the year, indicate below which ones are missing.	°C	Number
Trophic status		Consider any (or all) of the following parameters: Chlorophyll a (Chla); Total phosphorus (Pt); Total nitrogen (Nt)		
		Chlorophyll a (Chla):	µg/l	Number

	Ts_Chla and Ts_Chla_conc	Oligotrophic (Chla < 3)		
		Mesotrophic (3 < Chla < 7)		
		Eutrophic (7 < Chla < 40)		
		Hypereutrophic (Chla > 40)		
	Ts_Pt and Ts_Pt_conc	Total phosphorus (Pt):	μg/l	Number
		Oligotrophic (Pt < 15)		
		Mesotrophic (15 < Pt < 25)		
		Eutrophic (25 < Pt < 100)		
		Hypereutrophic (Pt > 100)		
	Ts_Nt and Ts_Nt_conc	Total nitrogen (Nt):	μg/l	Number
		Oligotrophic (Nt < 400)		
		Mesotrophic (400 < Nt < 600)		
		Eutrophic (600 < Nt < 1500)		
Hypereutrophic (Nt > 1500)				
Dystrophic crisis	Dtc	Subject of dystrophic crisis (algal blooms, anoxic crises, etc.) during summer	Y/N	Character
Annual Average salinity	Av_sal	Annual average salinity. If the average is not calculated from all the months of the year, indicate below which ones are missing.	g/l	Number
Saline typology	Sal_tip	Based on Average Salinity, indicate typology according to:		Characters
		Freshwater (Sal < 0,5 g/l)		
		Oligohaline (0,5g/l < Sal < 5 g/l)		
		Mesohaline (5 g/l < Sal < c 18 g/l)		
		Polihaline (18 g/l < Sal < 30 g/l)		
		Euhaline (30 g/l < Sal < 40 g/l)		
		Hyperhaline (Sal > 40 g/l)		
ENVIRONMENTAL QUALITY PARAMETERS				

Persistent Organic Pollutants (POPs)	POP_type; POP_type_conc and POP_sample_type	Indicate which one of the following pollutants has been estimated in the area considered, its concentration and if it has been obtained from:	µg/kg; µg/l	Character/Number
		Sediment		
		Water		
		Eels		
		Other live organisms		
		PCB (Polychlorine biphenyls)		
		Pesticides: (α-HCH, β-HCH, γ-HCH [Lindane], Dieldrin, Aldrin, Endrin, Hexachlorobenzene [HCB], p, p'-DDD [TDE], p, p'-DDT, p, p'-DDE, trans-nonachlor, Malathion [organophosphorous])		
		Brominated flame retardants: (BDE 28, BDE 49, BDE 47, BDE 66, BDE 100, BDE 99, BDE 85, BDE 154, BDE 154 + BB153, BDE 153, BDE 183, sum PBDEs, HBCD)		
		Dioxins: (sum PCDD/Fs, sum DLPCBs, sum PCDD/Fs and DLPCBs, TetraCDD, PentaCDD, HexaCDD, HeptaCDD, OctaCDD [OCDD], TetraCDF, PentaCDF, PentaCDF, HexaCDF, HeptaCDF, OctaCDF [OCDF])		
		PAH (polycyclic aromatic hydrocarbons)		
PFAS (perfluoroalkyl substances): (PFOS, PFH <sub>x</sub> S, PFOSA, PFOA, PFNA, PFDA, PFUnA)				
<b>Others:</b> e.g. emerging pollutants (EPs)				
Heavy metals	Heav_type; Heav_type_conc	Indicate which one of the following heavy metals has been estimated in the area considered and if the concentration has been obtained from sediment, water, eels or other live organisms	µg/kg; µg/l	Character/Number

	and Heavy_sample_type	Cd Hg Pb Cr Ni Cu Zn As Se Mn Co V Ba Sr		
Land uses	Land_type and Land_type_%	Indicate % of type of land use in the drainage area of the site considered (Figure 3) Agr: Agricultural (including silviculture) Nf: Natural forestry Urb: Urban Ind: Industrial	%	Character/Number
Riparian vegetation	Rip_veg_level	Conservation status of the river basin riparian vegetation (high; medium; low): low if less than 30% of the riparian vegetation is conserved; medium if between 30% and 60%; and high if more than 60% High Medium Low		Character
Number of invasive species	Inv_type and Inv_n_type	Indicate number of species belonging to each of the following categories:  Ot: others (macroalgae; cyanobacteria, fungi, macrophytes, etc.)  Mac: Macroinvertebrates		Character/Number



		Fis: Fishes		
		Ov: Other vertebrates related to the aquatic environment (coypu, American mink, Florida turtle, etc.)		
Protected surface	Prot_sur and Prot_type	Percentage of protected area in the natural element considered (river basin, lake basin, lagoon basin, etc.). Please also indicate the type of specific network protection, e.g. NATURA 2000, Ramsar, regional level, etc.	%/Conservation Type	Number/Character
<b>NATURAL MORTALITY</b>				
Piscivorous birds	Pred_brd_type and Pred_brd_n	Co: Presence of cormorants; if known, indicate number of individuals	Y-N/number	Character
		Ob: Presence of other piscivorous birds; if known, indicate species and number of individuals	Y-N/species-number	Character
Otter	Pred_ot	Presence	Y	Character
		Presence of piscivorous fishes, including invasive ones. If known, indicate species	N	
Piscivorous Fishes	Pred_fish and Pred_fish_sp	<i>Anguillicola crassus</i> : Prevalence (Number of infected eels/Total number of eels)	Y-N/species	Character
Parasites	Ac_prev	<i>Anguillicola crassus</i> : Prevalence (Number of infected eels/Total number of eels)		Number
	Par	Other parasites		
		<i>Trypanosoma</i> sp		
		<i>Myxidium</i> sp		
		<i>Paraquimperia</i> sp		
		<i>Pseudactylogyrus</i> sp		
		<i>Pomphorhynchuslaevis</i>		
	Others (indicate species)			
	Par_prev	Prevalence (Number of infected eels/Total number of eels)		Number
Bacteria	Bac	<i>Edwardsiella</i> sp		Number
		<i>Vibrio</i> sp		
		<i>Aeromonas septicaemia</i>		

		Others (indicate species)		
	Bac_prev	Prevalence (Number of infected eels/Total number of eels)		
Viruses	Virus	<i>Herpesvirus</i> : IPN, EVE, EVEX		Number
		<i>Herpesvirus anguillidae</i>		
	Virus_prev	Prevalence (Number of infected eels/Total number of eels)		
<b>ANTHROPOGENIC MORTALITY</b>				
Legal Fishery	Leg_Fish_type and Leg_Fish_presence	G: Glass eel	Type and Y/N	Character
		Y: Yellow eel		
		S: Silver eel		
		YS: Yellow eel and silver eel		
		GY: Glass eel and yellow eel		
		AL: Aggregation of the above life stages		
Illegal Fishery	ILleg_fish_type and ILleg_Fish_presence	G: Glass eel; Y: Yellow eel; S: Silver eel; YS: Yellow eel and silver eel; GY: Glass eel and yellow eel; AL: Aggregation of the above life stages	Type and Y/N	Character
Fishing lagoon barriers	Flb	Presence of fishing lagoons barriers (e.g. pantena, lavoriero, capéchade, etc.)	Y/N	Character
Turbines	Ntb	Number of dams with turbines downstream between the site considered and the estuary		Number
Turbines with eel pass	Per_Ntb	Percentage of those turbines having a <b>silver eel</b> pass	%	Number
Pumping stations	Nps	Number of dams with pumping stations downstream between the site considered and the estuary		Number
Pumping stations with eel pass	Per_Nps	Percentage of those pumping stations having a <b>silver eel</b> pass	%	Number