Detect2Protect

Deliverable 1.1.

Progress Report

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June 25, 2025

Contents

Foreword

The current document is a brief summary of the activities carried out in the Biodiversa+ project Biodiversa+ “Detect2Protect” as per the end of May 2025. The report was initially planned to be available at the half-way point of the project period but was delayed due to various reasons, including the delay in the overall Biodiversa+ Call 2021 projects mid-term reporting. Along with many other projects of the call, Detect2Protect has since then been granted an extension of six months and will thus be continued until the end of June 2026. Evaluation of the project mid-term report by external reviewers has been considered in the present report and the suggested changes and re-scheduling of project activities have been made where necessary.

1. Background

The Detect2Protect **(D2P)** project *"New approaches in determining the impacts of chemical pollution to protect the biodiversity of the Baltic Sea"*, funded in the Biodiversa+ 2021 Call for Proposals under the theme *"Supporting the protection of biodiversity and ecosystems across land and sea"* kicked off in January 2023. Originally, the project period was set until the end of 2025 but due to various kinds of delays the Biodiversa+ secretariat offered all projects of the call the chance to apply for extension, provided that the national co-funding organisations did not find any problems with the arrangement. Accordingly, D2P was extended until the end of June 2026.

D2P examines the relationships between chemical contamination and biodiversity loss in the Baltic Sea marine environment. Another key objective of the project is to facilitate the implementation of novel monitoring and assessment methodologies in integrated chemical-biological monitoring and assessment frameworks. Field study regions in the coastal areas of Finland, Estonia, Latvia, Lithuania, Poland and Sweden were selected with polluted and reference sites characterized by similar habitats with contrasting pollution status. The newly collected field data include chemical concentrations from different environmental matrices and a wide array of biological effect measurements (biomarkers) in ecologically representative species. Existing data on planktonic and benthic biodiversity at the sites supplemented by new environmental samples applying the eDNA metabarcoding methodology are used to examine the linkages of local biodiversity with the chemical and biological effects data, and for further modelling purposes.

The D2P consortium consists of the following partners: Finnish Environment Institute (Syke), Finland (coordination); Stockholm University (SU), Sweden; University of Gothenburg (UGOT), Sweden; Latvian Institute of Aquatic Ecology, Agency of Daugavpils University (LIAE), Latvia; Tallinn University of Technology (TalTech); Institute of Oceanology, Polish Academy of Sciences (IO PAN), Poland; Nature Research Centre (NRC), Lithuania; Marche Polytechnic University (UNIVPM), Italy (subcontractor).

2. The work performed so far

WP1: Project management

WP1 is led by the coordinating institute Syke and consists of all general issues related to the fluent running of the project, including operational management, administration, monitoring loops and finalizing of the project. All processes related to the initiation of the project were finalized in a timely manner at the beginning of the project. Delays occurred in contacting the potential members of the Advisory Board (AB) and confirming its composition; thus, the first meeting with the AB took place only in March 2025. However, further meetings with the AB have now been re-scheduled until the end of the project.

Regular online meetings have been carried out since the kick-off meeting of the project at intervals of 4-5 months. Importantly, the D2P project activities were incorporated in a larger framework called "Baltic Sea Biological Effects Activities Cluster", which in addition to D2P consisted of the Interreg Baltic Sea Region project BEACON, NEFCO funded project H-BEC, and ICES/OSPAR/HELCOM study group SGEFF, all focusing on the implementation of biological effects methods in Baltic Sea monitoring programmes (Fig. 1). This activity cluster consisted mainly of the same partners and joint meetings were arranged in Tallinn (2023) and Riga (2024).

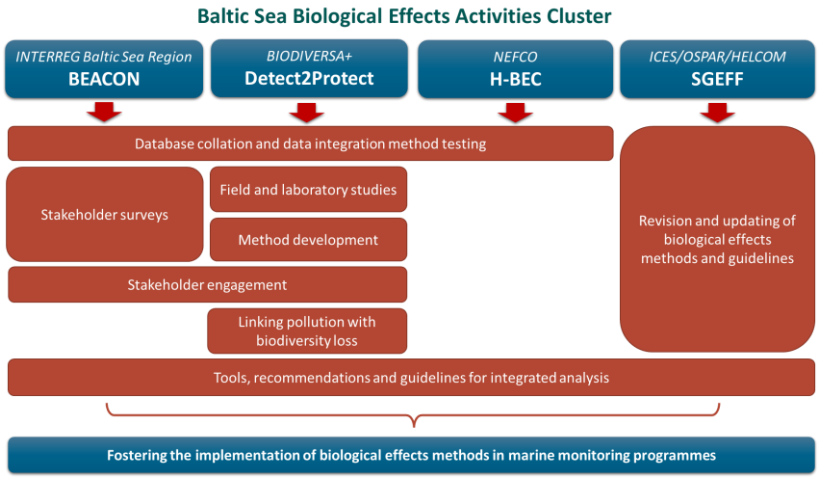

Fig. 1. The "Baltic Sea Biological Effects Activities Cluster": a schematic description of common activities and goals.

However, much due to the simultaneous activities in the cluster the work in the D2P suffered from delays. Also, since especially the biological effects measurements need sampling of the target organisms to take place only at certain times of the year (mainly outside the reproductive season of the species) the delays in samplings caused them to be moved to the next calendar year. Marked catching-up of project activities delayed from the original timetable took place in 2024-25. Now that the project has been granted a six-month extension it is foreseen that most of the listed activities and outputs can be achieved by the end of the project. Finally, due to the mentioned delays, the first Project Report was cancelled.

WP2: Data mining

WP2 is led by TalTech and consists of background data collection and quality check. Open-source databases in the Baltic Sea region have been used to compile data from sampling sites on (i) chemical contaminants and environmental parameters in various matrices (sediment, water, and biota), (ii) biological effect parameters in wildlife, and (iii) species abundance of benthic communities in selected areas. This information has subsequently been aggregated into a structured dataset. Potential pressure and impact areas were identified and visualized in the form of a "pressure map" illustrating contamination by the ubiquitous toxic metal cadmium (Fig. 2). Synthesis of the data on contaminant levels was partly used in the selection of the D2P project study sites (Fig. 3).

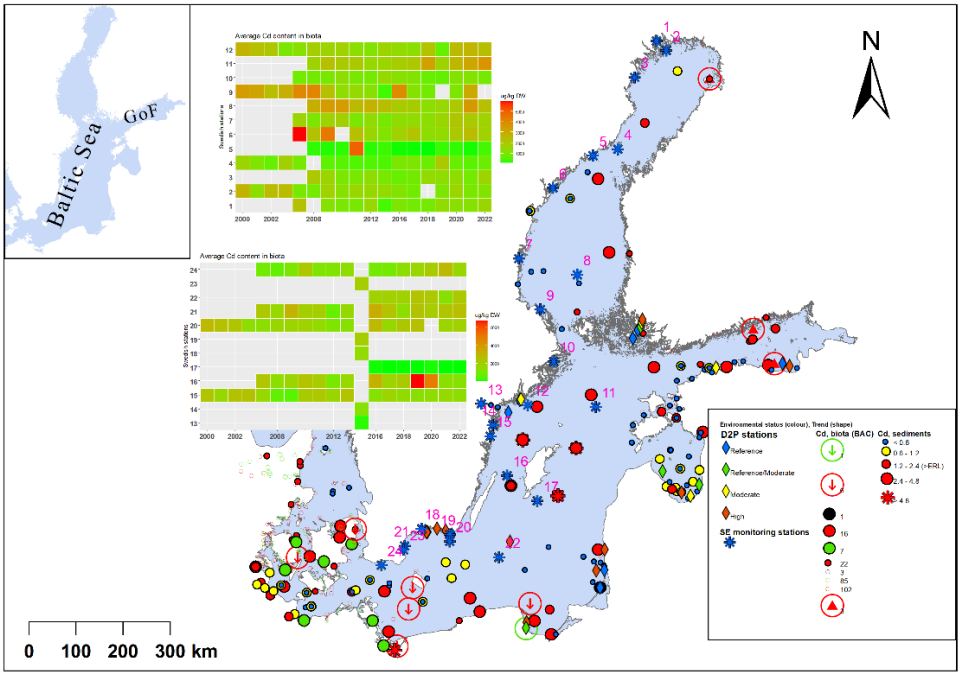

Fig. 2. Data on cadmium (Cd) concentrations in biota (with calculated trends) and in sediments have been compiled for the Baltic Sea region, including a heat map of Swedish cadmium data in biota from monitoring stations, based on HELCOM data (2000–2022). In the map, sampling sites of the D2P project are also indicated.

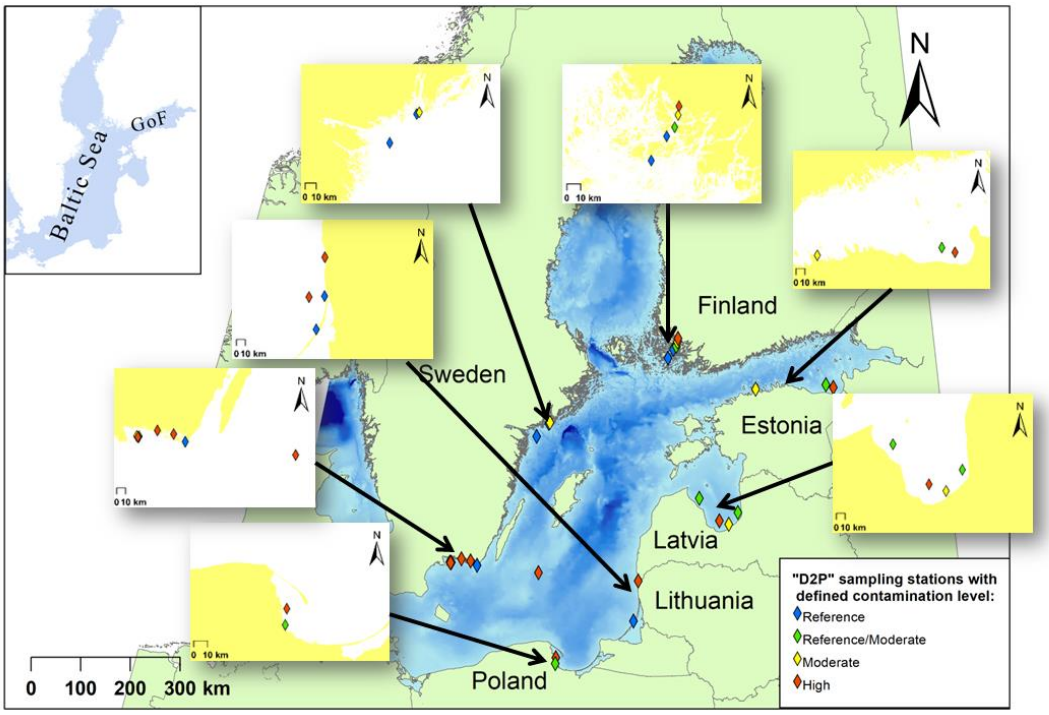

Fig. 3. Final D2P project sampling sites and contamination levels defined considering expert assessments.

WP3: Field studies and laboratory analyses

The work in WP3, co-led by UGOT and SU, was badly hampered by the overall delays in project activities explained above. As a result, only part of the sampling campaigns could be carried out in 2023 as originally planned. However, in 2024 the samplings were successful and samples for various purposes were collected at the study sites in the partner countries, and intensive laboratory analyses by the partners began.

Status of sampling and sample analyses in early June 2025 is presented in Table 1. As expected, variability in the samplings and analyses carried out at the different regions exists. However, since there are marked differences between the regions concerning environmental conditions and biological communities, the overall idea of investigating mainly within-region differences between polluted and less polluted sites is maintained.

An analytical drawback occurred when the original subcontractor SeAnalytics (Sweden) could not perform the eDNA metagenomics on the samples as planned, and the analysis service was needed to be ordered from another provider (Novogene) and using experts of the partner institutions.

Table 1. D2P field samplings, laboratory analysis and data availability as of late May 2025.

RED: SAMPLE TAKEN/BACKGROUND DATA AVAILABLE, GREEN: SAMPLE ANALYSED/BACKGROUND DATA RETRIEVED

Sampling								Biomarkers															Biota_chem					Sediment_chem					Sed		Water		Sed	Biota	Macro	Meio	Background data							
Area no.	Country	Area name	Site no.	Site name	Status	Year/mo	Species	AChE	CAT	GST	SOD	GPx	GR	LPO	TBARS	MT	Genotox	Cytotox	Blood Glu	HCT	Repro	C_index	Metals	7PCB	HCB	PAH	Phenols	Metals	7PCBs	HCB	PAHs	Phenols	eDNA 16S	eDNA COI	eDNA 16S	eDNA COI	Isotopes	Isotopes	Comm	Comm	Chl-a	B_oxygen	B_temp.	B_depth	Salinity	Granulom	C_{org} sed	S_Temp
1	FINLAND	Archipelago Sea	1	Hummelholm	Reference	2024/8	M. balthica	x	x	x	x	x		x			x	x				x	x			x	x	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		
1	FINLAND	Archipelago Sea	2	Seili	Reference/Medium	2024/8	M. balthica	x	x	x	x	x		x			x	x				x	x			x	x	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		
1	FINLAND	Archipelago Sea	3	Airistonmaa	Medium	2024/8	M. balthica	x	x	x	x	x		x			x	x				x	x			x	x	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		
1	FINLAND	Archipelago Sea	4	Kuuvannokka	Polluted	2024/8	M. balthica	x	x	x	x	x		x			x	x				x	x			x	x	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		
1	FINLAND	Archipelago Sea	5	Turku Shipyard	Polluted	2024/8	M. balthica	x	x	x	x	x		x			x	x				x	x			x	x	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		
1	FINLAND	Archipelago Sea	1	Hummelholm	Reference	2024/8	P. fluviatilis	x	x	x				x								x	x															x							x			x
1	FINLAND	Archipelago Sea	4	Kuuvannokka	Polluted	2024/8	P. fluviatilis	x	x	x				x								x	x															x							x			x
2	ESTONIA	Gulf of Finland	1	N	Polluted	2023&24/10	M. balthica	x	x	x			x	x			x	x				x	x			x	x	x	x	x	x	x	x				x	x	x		x	x	x	x	x	x	x	x
2	ESTONIA	Gulf of Finland	2	N12	Reference/Medium	2023&24/10	M. balthica	x	x	x			x	x			x	x				x	x			x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x	x	x	x
2	ESTONIA	Gulf of Finland	3	3	Medium	2023&24/10	M. balthica	x	x	x			x	x			x	x				x	x			x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x	x	x	x
2	ESTONIA	Gulf of Finland	1	N	Polluted	2023/10	S.entomon																x					x	x	x	x	x	x				x	x	x		x	x	x	x	x	x	x	x
2	ESTONIA	Gulf of Finland	2	N12	Reference/Medium	2023/10	S.entomon																x				x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x	x	x	x
2	ESTONIA	Gulf of Finland	3	3	Medium	2023/10	S.entomon																x					x	x	x	x	x	x	x			x	x	x		x	x	x	x	x	x	x	x
2	ESTONIA	Gulf of Finland	3	3	Medium	2023/10	H.spinulosus																x					x	x	x	x	x	x	x			x	x	x		x	x	x	x	x	x	x	x
3	LATVIA	Gulf of Riga	1	101A	Medium/Polluted	2023/11	M. balthica	x	x	x			x		x		x	x				x	x	x		x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	1	101A	Medium/Polluted	2023/11	M.affinis	x	x	x			x		x						x		x				x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	1	101A	Medium/Polluted	2023/11	S.entomon																x				x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	1	101A	Medium/Polluted	2023/11	Marenzelleria sp.																					x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	1	101A	Medium/Polluted	2023/11	H.spinulosus																					x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	2	162B	Reference/Medium	2023/11	M. balthica	x	x	x			x		x		x	x				x	x	x		x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	2	162B	Reference/Medium	2023/11	M.affinis	x	x	x			x		x						x							x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	2	162B	Reference/Medium	2023/11	S.entomon																x					x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	2	162B	Medium/Polluted	2023/11	S.entomon																x				x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	2	162B	Medium/Polluted	2023/11	Marenzelleria sp.																x					x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	3	102A	Medium/Polluted	2024/11	M. balthica	x	x	x			x		x		x	x				x						x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	3	102A	Medium/Polluted	2024/11	M.affinis	x	x	x			x		x						x		x	x	x	x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	3	102A	Medium/Polluted	2024/11	S.entomon																x														x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	4	142	Reference/Medium	2024/11	M. balthica	x	x	x			x		x		x	x				x	x	x	x	x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	4	142	Reference/Medium	2024/11	M.affinis	x	x	x			x		x						x		x	x	x	x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
3	LATVIA	Gulf of Riga	4	142	Reference/Medium	2024/11	S.entomon																x					x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x		x
4	LITHUANIA	E Gotland Basin/Gdansk Basin	1	7 Nida	Reference	2024/4	P. flesus		x	x	x					x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x			
4	LITHUANIA	E Gotland Basin/Gdansk Basin	2	B-1 Būtingė	Polluted	2024/4	P. flesus		x	x	x					x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x			
4	LITHUANIA	E Gotland Basin/Gdansk Basin	1	7 Nida	Reference	2024/8	P. flesus		x	x	x					x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x						x			x	x	x	x	x			
4	LITHUANIA	E Gotland Basin/Gdansk Basin	2	B-1 Būtingė	Polluted	2024/8	P. flesus		x	x	x					x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x						x			x	x	x	x	x			
4	LITHUANIA	E Gotland Basin/Gdansk Basin	1	7 Nida	Reference	2024/4	G. morhua		x	x	x					x	x	x	x	x		x																	x		x	x	x	x	x			
4	LITHUANIA	E Gotland Basin/Gdansk Basin	2	B-1 Būtingė	Polluted	2024/4	G. morhua		x	x	x					x	x	x	x	x		x																	x		x	x	x	x	x			
5	POLAND	Gulf of Gdańsk	1	GG-D2P1	Medium/Polluted	2024/5	M.trossulus	x	x	x				x								x	x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	3	GG-D2P3	Reference	2024/5	M.trossulus	x	x	x				x								x	x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	1	GG-D2P1	Medium/Polluted	2024/9	M.trossulus	x	x	x				x								x	x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	3	GG-D2P3	Reference	2024/9	M.trossulus	x	x	x				x								x	x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	1	GG-D2P1	Medium/Polluted	2024/5	M. balthica	x	x	x	x	x		x									x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	1	GG-D2P1	Medium/Polluted	2024/9	M. balthica	x	x	x	x	x		x									x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	3	GG-D2P3	Reference	2024/9	M.balthica	x	x	x	x	x		x									x			x	x	x			x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
5	POLAND	Gulf of Gdańsk	2	GG-D2P2	Medium/Polluted	2024/5	M. balthica	x	x	x	x	x		x									x			x	x	x			x	x					x	x	x	x	x	x	x	x	x	x	x	x
6	SWEDEN	Blekinge	1	Torhamn	Reference	2023/10	P. fluviatilis	x	x	x	x	x	x	x										x	x	x	x	x	x	x	x	x	x	x	x													
6	SWEDEN	Blekinge	2	Karlskrona	Polluted	2023/11	P. fluviatilis	x	x	x	x	x	x	x										x	x	x	x	x	x	x	x	x	x	x	x													
6	SWEDEN	Blekinge	3	Ronneby	Polluted	2023/12	P. fluviatilis	x	x	x	x	x	x	x										x	x	x	x	x	x	x	x	x	x	x	x													
							Total records	29	35	35	18	12	14	21	8	6	18	18	6	6	4	24	38	12	10	28	32	42	29	29	42	42	39	22	8	5	38	42	40	29	37	42	42	42	44	36	15	33

WP4: Data integration, multivariate analyses, and modelling

This WP is co-led by Syke and UNIVPM, with expertise in data integration methodologies possessed by the latter being in key position. Also multivariate analyses and environmental diagnostics models are applied and developed in this WP to analyse the data gathered during the project.

Unfortunately due to the delays in WP3 sampling campaigns producing the needed data, the progress in this WP has so far been practically zero. However, the work is expected to start quickly in late August when the great majority of the data is expected to be ready for the various analyses. Regarding the environmental diagnostics a special workshop is planned to be arranged, and its results will be reported in September as an extra deliverable.

WP5: Dissemination of results and stakeholder involvement

IO PAN leads this project activity, which consists of the following tasks: (i) identification and engagement of stakeholders related to biodiversity and ecosystem services, (ii) stakeholder dialogue and information campaign and (iii) communication of project results to scientific community and the general public.

The project has been introduced to various stakeholder in different events, including presentations in major scientific conferences (Baltic Sea Science Conferences [BSSC] in Helsinki [2023] and Sopot [2025], Society for Environmental Toxicology and Chemistry [SETAC] Europe Annual Meeting in Dublin [2023] and Seville [2024], networks (Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances [NORMAN] Workshop on chemical pollutants and biodiversity in Frankfurt [2023]), working groups (regular meetings of HELCOM Expert Group for Hazardous Substances [EG Haz], ICES Working Group for Biological Effects of Contaminants [WGBEC]), and the general public (various channels and events).

The publication of the first D2P Newsletter was delayed until November 2024, partly due to the overall delays in the sampling campaigns. The D2P Newsletter was distributed to different stakeholders including the AB and advertised in various fora. The second newsletter is about to be published at the time of the writing of this report (June) while two more will be prepared during the rest of the project.

In addition to the project webpage in the Biodiversa+ portal, a more extensive and informative one was established at the coordinating organization's (Syke) portal in April 2025. Newsletters, project presentation abstracts and other dissemination materials are available via this website.

3. Update of the work plan

According to the request of reviewers of the Biodiversa+ midterm project evaluation event the re-scheduling of the remaining project work was carried out during a consortium meeting in Sopot, arranged back-to-back with the BSSC. Where needed, new realistic deadlines were set for project Deliverables and Milestones to assure the successful accomplishment of the project objectives. After thorough reviewing of the original Deliverables three of them were deleted from the list as being redundant while one additional was included. The new project timeline is presented in Table 2.

Table 2. Timeline of the remaining work in the D2P project as reconsidered by the consortium in late May 2025. Milestones (M) and Deliverables (D) in the different WPs marked with different colours, and the completed ones are marked on green background and target deadlines with red.

WP	M/D	Task	2025 April	May	June	July	Aug	Sept	Oct	Nov	Dec	2026 Jan	Feb	March	April	May	June
5	M	D2P main outcomes are presented at national and international conferences, researcher networks meetings	X	X	X			X								X	
5	M	Public project website is available	X														
5	M	a-d Periodical e-newsletters are delivered			X					X						X	
1	D	Progress report			X												
2	D	Pressure/impact map for sampling site selection			X												
5	D	List of stakeholders with information on possible level of engagement			X												
2	M	Database-derived data available for use in WP4			X												
3	M	All biological effect and chemical data are available for the synthesis and analyses in WP4			X												
3	D	Review paper on methodology of EBM in the Baltic Sea					X		X								
3	M	Synthesis of the methods uploaded to the cloud server					X										
3	D	Report on the biomarker baseline variability						X									
4	M	Results of integrated analyses available; start of the multivariate analyses						X									
4	M	Field collected data available; start of the integrated analyses							X								
4	D-XTRA	Report of ConBio Workshop							X								
3	M	Metabarcoding data are deposited to GenBank							X								
4	M	Results of multivariate analyses available; start of the model development and testing								X							
1	M	AB Feedback Meetings								X					X		
4	D	Report on the data integration procedures and new approaches									X						
3	D	The complete project dataset									X						
4	D	Report on the multivariate analysis on linkages between biodiversity and contamination										X					
3	D	Report on the synthesis of biological effects and biodiversity in contaminated vs. reference sites										X					
4	D	Report on the structure of the “ConBio” model and first results from its application											X				
5	M	Stakeholder Workshop is organised													X		
1	M	Final Project Meeting														X	
5	D	Policy Brief															X
5	M	Several manuscripts to peer-reviewed journals are submitted															X
5	D	Final report on communication activities to general public															X
5	D	Report on communication activities to scientific communities															X
1	D	Final Report															X

Despite the delays that occurred during the first part of the project period, no marked further delays are currently expected. Most of the laboratory analyses have already been accomplished and the new data is soon ready for full analysis. Some effort still remains in the collection of relevant existing background data from different sources. Finally, some minor additional samplings and experiments may need to be carried out in some of the study regions, but these are foreseen not to affect markedly the data analyses.

The Final Report of the project will be delivered on June 30, 2026.