



LIFE Project Number
< LIFE18 NAT/SE/000959 >

Progress Report¹
Covering the project activities from 01/01/2021² to 27/09/2024

Reporting Date³
<30/09/2024>

LIFE PROJECT NAME or Acronym
<LIFE LOPHELIA>

Data Project

Project location:	SE0520170 Kosterfjorden-Väderöfjorden, Sweden
Project start date:	01/09/2019
Project end date:	31/12/2025
Total budget:	€ 3,126,528
EU contribution:	€ 1,842,941
(%) of eligible costs:	58,95%

Data Beneficiary

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¹ Progress Report without any payment request (for Progress Reports with payment request, use the Mid-term Report template)

² Project start date in the case of the first Progress Report, otherwise date since the last reporting period

³ Include the reporting date as foreseen in Form C2 of Annex II of the Grant Agreement or as modified in agreement with the Agency

Section 1 - Overall assessment of the achievements and as to whether the project objectives and work plan are still viable (2 pages max)

The project is going largely according to plan, which means that the project's objectives are still achievable. Here we briefly report what has been done in the different actions since the last Progress report in February 2021.

Action A1 - Development of restoration method

A series of laboratory experiments have been performed and settlement panels analyzed to decide on the material, surface structure and overall design of the artificial reef objects as well as the optimal distance between them at deployment. During the coral spawning season in spring 2023 a series of larval behaviour experiments were performed. Attachment preferences depending on concrete mixture, surface topography and presence of metallurgical slag was assessed. Furthermore, was the role of specific topographical features on chances for larvae to attach and explore a substrate in flow assessed. During 2023 and 2024, 3 rounds of settlement panels have been retrieved and analyzed looking at the role of concrete mixtures, surface structures and metallurgical slag on recruitment and biodiversity. Results of these studies have been used to decide on the design of the artificial reef objects. Scaled models of these were during spring 2024 tested in a laboratory flume to decide on spacing between them at deployment. Results from lab and field experiments will be summarized in 3-4 scientific publications.

Action A.2 – Expanded fishery restrictions

The purpose was to ban all type of fishing gear in the restoration sites before the deployment of the artificial reefs. New fishing regulations entered into force in 15/10/2021.

Action C.1 – Environmental mapping of reef sites to be restored

This action aims to thoroughly map the sea floor, the biodiversity and the environmental conditions at each reef site before deployments of the artificial reefs (AR).

Action C1.1. The report from the mapping of the sea floor with sonar and multibeam of the six sites was completed on 03/05/2022. We also conducted a survey in 2021 of the biological biodiversity surrounding the remaining coral reefs in the restoration sites. The report was delivered on 15/12/2022.

Action C.1.2 Environmental conditions on the sites have been measured during various seasons between February 2020 and October 2023. A total of 24 deployments of ADCPs measuring currents and temperature, and 16 deployments of sediment traps have been done. Results show a variation of current speeds and amount of sedimentation among the sites. The sediment in the traps were also analyzed for content of heavy metals. The results have been utilized for using relevant velocities in flume studies of artificial reef design and the optimal distance between them at deployment. They have also been used to decide which sites are more suitable for successful restoration, concentrating more restoration effort to these sites. In addition, these measurements will be crucial in the follow-up studies where restoration success will be coupled to environmental parameters. A manuscript summarizing these findings has been prepared and will soon be ready for submission to a scientific journal. Here we have also used data collected in both C1.1 and C1.2 to perform habitat suitability modelling predicting subareas within the restoration sites most suitable for coral growth. These results have been used concentrating restoration efforts to the most promising spots within the sites.

Action C.2 Manufacturing and deployment of artificial reef objects

In this action, we implement the method developed in A1 and results from C1 with the attempt to restore *Lophelia pertusa* reef habitats in the project area.

After the procurement process for manufacturing the ARs we decided to engage one company to cast most of the ARs (132 pieces) in a mold, but also to engage a company that 3D prints to deliver a few 3D printed ARs (28 pieces). Contract was signed in August 2023, and in dialogue with respective company, we have during autumn 2023 developed the blueprints to adapt them for the different methods used. The ARs was then produced in spring 2024 and have been deployed in June and September 2024 with a hired company.

Action D. Monitoring of the impact of the project actions

Monitoring of the AR:s started in September 2024, though not every reef was in place.

Unfortunately, it was not possible to postpone this. However, it is still too early to see if any coral larvae have settled on the reefs, but associated fauna we hope to see. The County Board will ensure that there is a follow-up of the AR every third year.

For the public outreach we gather statistics regarding the number of individuals reached through our channels of communication, visitors to the visitor centres, web sites, lectures, etc. We will also be able to report on the indicators in the KPI.

Action E.1. Public awareness and dissemination of results

In June 2023 the project leaflet was printed, and the public video was ready. The video is available at the website www.lifelophelia.se and the leaflets is spread at the National Park Visitor Centre and at the Marine laboratory at Tjärnö and in other occasions.

We also had a public seminar in June 2023 in Strömstad with 25 participants.

In September 2023 we visited another project on coral restoration, LIFE ECOREST in Barcelona for the exchange of experiences.

In various contexts we have presentations for students and the public. Our project has received a lot of attention in different media; newspapers, radio and television, and 2024 we also had a visiting film team from BBC Blue Planet III.

Action E2. Dissemination of scientific results

E2.1: Participation in international scientific workshops and conferences

During 2022-2024 we have been able to participate in several events: iAtlantic general assembly Florianopolis Brazil, oral presentation, 8th International Symposium on Deep Sea Corals Edinburgh, 2 oral presentations, 3 posters, Workshop on Cold-Water corals in Aquaria–Maintenance and Experimentation. Edinburgh, invited speaker, iAtlantic final meeting Edinburgh, SAMSKAG meeting in Strömstad, oral presentation, Ocean Decade in Barcelona, oral presentation and at SERE conference in Tartu, 2 oral presentations.

E2.3: Arrangement of a workshop targeting scientists involved in deep-sea coral restoration and management. The workshop took place in Strömstad, Sweden on October 2-5, 2023, and was arranged as the 2nd International Meeting on the Restoration of Deep-Sea Coral Populations. The meeting had 28 on site participants and 3 online presenters.

Action F. Project management

The Steering committee meet twice a year and we have monthly meetings with partners.

Meetings with the CINEA project monitor 2021 and 2022. We have participated in the Nordic Baltic LIFE platform meetings online in 2021 and in place in Klaipeda 2022 and in Riga 2024.

Section 2 - Identified deviations, problems and corrective actions taken in the period (max 2 pages)

A1: Retrieval of settlement panels from all reef sites is delayed. Retrieval and analysis will start autumn 2024. Results from other settlement panels have been used for decisions on artificial reef design. The results from all reef sites are though important for assessment of differences in fauna community and biodiversity among the sites and will be used as background information in future comparison of restoration success. Therefore, we ask to postpone Deliverable *Preliminary results from field settling studies*, with the end date of 30/06/2023 to 30/06/2025.

The hydrodynamic assessment of reef design has been delayed due to malfunctioning equipment in the lab. The Particle Image Velocimetry system needed first reparation of the laser and later other components of the system needed replacement. The system is now working again and before deployment of reef structures started, the system was used to assess the optimal distance between reef structures.

During spawning seasons 2021 and 2022 there were problems with parasites in the larval cultures that ended in 100% mortality in the long-term experiments, and no results were achieved. We tried different measures to minimize the damage and to be able to take more efficient measures to protect the health of the larvae for the next spawning season in 2023, which was more successful. Because of the problems with laboratory reared larvae, we expanded our field trials with both different materials and surface structures. The preliminary blueprint was ready in spring 2023.

C2: Manufacturing of the first artificial reefs (AR) was from the beginning planned to take place in Aug-Sept 2022 and deployment was planned to take place in the autumn of 2022 with a few artificial reefs and most reefs in autumn of 2023. We decided (in June 2022) to postpone the manufacturing and deployment of the reefs to 2023. The reason for postponing was that we needed more results from our studies (action A1 and C1) to be able to specify material and form for the artificial reefs. Though contract was signed with manufacturing company in Aug 2023, it took the autumn to develop the blueprint in dialogue with the companies and the production started in spring 2024.

In the project plan we planned for approximately 500 AR, this is now reduced to 160 AR, since the manufacturing and deployment costs were significantly higher than calculated in the budget. Now 140 AR have been deployed in June and September 2024. Still, we have 20 AR to deploy. The vessel used for deployments is small with a custom-built ponton for deployment in clusters but are sensitive to weather. They cannot operate if wind strength exceeds 6 m/s, this sets a limitation to the number of days they can use for deployments and the summer has been very windy. The last AR will be deployed as soon as the weather is good enough.