AFTER LIFE PLAN

PROTECTION AND RESTORATION OF PINNA NOBILIS POPULATIONS AS A RESPONSE TO THE CATASTROPHIC PANDEMIC STARTED IN 2016

LIFE PINNARCA 2021-2024
(LIFE20-NAT/ES/001265)

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1. INTRODUCTION

Development of the After LIFE Plan

The implementation of this After LIFE Plan is considered an extension of the LIFE PINNARCA project itself, aiming to ensure the continuity of the actions carried out during its execution. Within the framework of the project, this phase is conceived as an opportunity to consolidate and expand the achievements already attained, ensuring that the actions undertaken not only persist over time but also evolve towards greater accomplishments.

In particular, this type of project—focused on the conservation of species and ecosystems—requires a follow-up of the impacts of the measures implemented. Moreover, the situation of the Pinna nobilis remains critical, and the existing threats continue to pose a serious challenge to the survival of the species and the few populations that still persist.

Therefore, this Plan is defined as a project in itself, whose general objective is to complete the actions undertaken under LIFE PINNARCA, as well as monitoring their outcomes and the establishment of new collaborations. This document outlines the synergistic actions aimed at achieving the stated objectives, as well as the evaluation of the observed results.
Furthermore, we believe that science relies fundamentally on public support. Consequently, some of the proposed measures will focus on raising awareness among the general population, with particular emphasis on younger generations, as a well-informed and engaged society is a cornerstone for the adoption and acceptance of the necessary measures to meet conservation goals.

This After LIFE phase does not represent the end of the LIFE PINNARCA project, but rather the beginning of many other initiatives (such as LIFE PINNACARE) and collaborations that share a common goal: to prevent the extinction of an endemic and essential species in Mediterranean coastal ecosystems—*Pinna nobilis*.

Study areas

Visit the website [LIFE PINNARCA]

2. OBJECTIVES

The main objective of the After-LIFE project remains aligned with the original goal of the LIFE project: **to prevent the extinction of *Pinna nobilis* in the short, medium, and long term**.

It is expected that the combination of threats affecting *Pinna nobilis* will continue to reduce the remaining populations, leaving only a few potentially resistant individuals scattered across the region, along with some non-resistant populations located in refuge areas.

In light of this situation, the **specific objectives** of the After-LIFE phase are:

To continue awareness-raising and outreach actions, in order to reduce the risk of vandalism and illegal collection of the remaining *Pinna nobilis* specimens, as well as to encourage active public collaboration and acceptance of conservation measures.

To maintain the protection measures implemented during the LIFE PINNARCA project, for both resistant individuals and the remaining non-resistant populations, with the objective of increasing the chances of species recovery.

To monitor existing populations, with the aim of keeping track of their status and being able to intervene promptly if any threat arises that could endanger their survival.

To foster new collaborations and networks, thereby enhancing response capacity and improving the infrastructure available for the conservation of *Pinna nobilis*.

3. CONSERVATION ACTIONS

Installation of larvae collectors

Every year, **fan mussel larvae collectors will be placed in different hot-spots** of Spain, France, Italy, Croatia and Greece. Juveniles found will be transferred to areas where the disease hasn't been observed or maintained in tanks. The design of collectors has been used successfully by the consortium and previous projects (e.g. PINNARCA). **Each device will consist of a plastic mesh bag** (ca. 5 mm opening) filled with onion mesh, nylon fishing thread or fishing net attached underneath a subsurface buoy and anchored to a mooring on the seafloor with a rope.

Shallow and deep area census, and translocation of individuals

Extensive underwater visual surveys, mainly targeting juvenile individuals (1-2 years old) will be conducted. At sites where large populations are located, distance sampling surveys will be conducted to estimate the abundance of the species by properly accounting for detectability issues.

In sites where *P. nobilis* are detected to grow **under unfavourable conditions**, individuals will be **transplanted** across deeper parts of the respective *P. nobilis* population's extent or at sites with such environmental conditions that the chances of parasitic infection are substantially reduced. If *P. nobilis* juveniles are caught in the larval collectors, they will be **transferred** to the Aquarium of the University of Murcia, Pula Aquarium and IMEDMAR-UCV before its evaluation for translocation to optimal sites in situ.

Comparative Genomics

We will use microsatellite markers because they bring **insights into population demographics by providing important information on population boundaries and connectivity patterns**. They also provide estimates of **genetic diversity**. It will be necessary to detect by molecular approaches (PCR and/or sequencing) the presence of potential pathogens in healthy and morbid individuals We will continue studying the genes related to the resistance the parasite.

Environmental improvement in sanctuary areas

The objective of this action is increasing the survival and **reducing the threats of fan mussel populations in the remaining reservoirs where *P. nobilis* survive**. These areas are subjected to anthropogenic impacts such as agricultural pollution, fishing, recreational activities, etc. Different actions will be implemented to improve their environmental quality, focused mainly on raising awareness and coordinate the different stakeholders to improve the quality and protection of the reservoirs.

Tank maintenance and treatment assays

Individuals will be maintained in captivity **to maximize the possibilities of captive reproduction**, while ensuring the long-term survival of stabled individuals.

We will use phytotherapy to improve maintenance of juveniles and adults of *P. nobilis, t*he product will be administered through live food. Health parameters (filtration activity, pathogen clearance, behavioural changes) will be measured.

4. ACTUAL KPI VALUES TABLE

Table 1. Actual KPI Values Table

Indicators	Specific Context	Descriptor	Units	Beginning value	Expected value	Beyond 3 years value	End project value
1.5. Project area/length	Monitoring actions	Area of environmental/climate implementation actions (e.g. development, testing, demonstration, application of best practices/innovations).	ha	0	516	950	**923,4**
	Conservation actions	Conservation or improvement of the status of an area or segment	ha	0	301	549,3	**549,3**
1.6. Humans (to be) influenced by the project	Dissemination and awareness actions	Persons who may have been influenced via dissemination or awareness raising project-actions (reaching)	Number of other persons influenced /impacted independently of the project area	0	5.000	55.563	**48.563**
7.3. Natural and semi-natural habitats	Conservation actions	Annex I Habitats Directive - Delta del Ebro	ha	39,43	39,43	39,43	**39,43**
	Conservation actions	Annex I Habitats Directive - Mar Menor/Kalloni Gulf/Brusc Lagoon	ha	645,48	645,48	645,48	**645,48**
7.4. Wildlife species	Monitoring actions	Annex IV Habitats Directive species - Pinna nobilis	number of individuals	5.000	9.000	120.000	**107.487**
			ha	15.000	15.000	15.000	**15.000**
		Annex IV Habitats Directive species - Pinna nobilis (prospected area)	ha	0	400	950	**923,4**
10.2. Involvement of non-governmental organisations (NGOs) and other stakeholders in project activities	Dissemination and awareness actions	NGO	Number of stakeholders involved due to the project	0	4	5	**11**

11.1. Website	Dissemination and awareness actions	No. of unique visits	Number of unique website visits	0	2.500	3.873	**2.873**
11.2. Other tools for reaching/raising awareness of the general public	Dissemination and awareness actions	Number of events/exhibitions organised	Number of outcomes	0	2	5	**5**
		Number of different publications made (Journal/conference)	Number of outcomes	0	8	18	**16**
		Number of different displayed information created (posters, information boards)	Number of outcomes	0	2	6	**5**
		Number of articles in print media (e.g. newspaper and magazine articles)	Number of outcomes	0	10	114	**94**
		Other distinct media products created (e.g. different videos/broadcast/leaflets)	Number of outcomes	0	1	9	**8**
12.1. Networking	Dissemination and awareness actions	Students (in higher education)	No. of individuals	0	100	127	**127**
		Professionals - experts in the field	No. of individuals	0	10	315	**315**
13. Jobs	Conservation actions	Jobs	No. of FTE	0	10	2	**6,16**
14.2. Future funding	Conservation actions	Beneficiary own contribution	€	-	-	138.000,00 €	**16.179,67 €**

5. DISSEMINATION ACTIONS

Continue Awareness-Raising Actions and Events

- **Website**. The project's website serves as a digital platform providing updates on the species' status as well as the scientific and outreach progress achieved. It is planned to remain active for at least three additional years following the conclusion of the project. The estimated cost of maintaining the website amounts to €1,000 in total (Table 2). Over the next three years, a projected increase of 1,000 unique visits is expected, thereby enhancing and facilitating public engagement with the project.

Table 2. Budget allocated to the active maintenance of the LIFE PINNARCA project website.

ACTION	*CONCEPTS*	*BUDGET*
Web update and positioning	*Website maintenance*	*300 €*
	Hosting + Domain	*200 €*

- **Number of events/exhibitions organized**. Scientific events such as conferences allow for dissemination of the current status of the species, as well as of the advances and challenges encountered, which in turn helps expand networks and potential future collaborations. On the other hand, events targeting the general public not only serve to raise awareness, but also provide valuable insights from individuals with direct contact with the marine environment.
- **Number of different publications made (Journal/conference)**. Following the conclusion of the LIFE PINNARCA Project, further experiments focusing on healing and reproduction will be carried out. Time is not on our side, and continued efforts in these experiments are essential to increasing the success rate. At present, one healing and one reproduction experiment are planned beyond the timeframe of the LIFE project, along with several repetitions, which are expected to be included in the upcoming LIFE PINNACARE. These experiments will be published upon completion, thereby increasing the total number of publications from the current 16 to an estimated 18 over the next three years, with the expectation that the final number may be significantly higher.

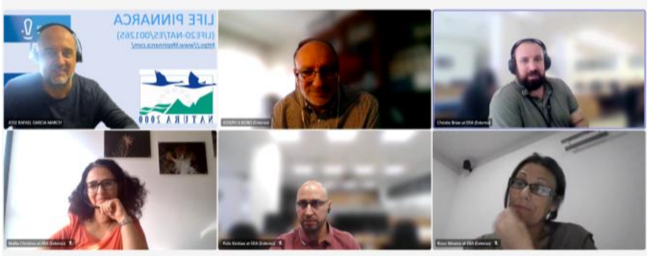
Networking

On one hand, direct collaboration with the project participants after its conclusion is essential to achieve the proposed objectives. In this context, several meetings have already taken place, addressing various issues and discussing how to tackle them effectively.

On the other hand, the creation of new collaborative networks with other countries allows for a more comprehensive understanding of the currently existing populations and their status. Moreover, cooperation with other institutions and research groups enhances research capacity and makes it possible to approach the issue from an increasingly multidisciplinary perspective. Some examples include Cyprus, Germany, Tunisia, Egypt, Morocco, Algeria, Turkey, Japan, or Ireland.

The costs will be covered through own resources.

Networking meetings have been held to prepare studies on the conservation of *P. nobilis.*



Advisement to Environment and Resources Authority: ERA and University of Malta for fan mussel recuperation in Malta.

23/10/24

Talk with Oceanográfic of Valencia and University of Messina to prepare a field visit in Lake Faro in Sicily to plan conservation actions for the surviving fan mussels in this site.

21/01/25

Traslocation talk CSIC-IEO Murcia to coordinate the transport of fan mussels collected in Thau Lagoon for reproduction at the installations of CSIC-IEO Murcia.

23/01/25

Recpopilation of information for preparation of projects related to *P. nobilis* conservation with University of Malta and ERA

21/02/25

Reproduction talk
CSIC-IEO Murcia to coordinate the activities for maturation and reproduction of fan mussels collected in Thau Lagoon.

28/02/25

To monitor existing populations

These populations are essential for the survival of the species, which is why one of the main objectives is to monitor these areas and anticipate potential mass mortality events, allowing for a rapid response in the collection of individuals. Additionally, this will enable us to carry out analyses and investigate the underlying causes.

Furthermore, the availability of individuals from these controlled regions will increase the potential for experimental research involving the species.

One example is the Thau Lagoon (France), which currently hosts the largest population of healthy *P. nobilis* individuals.

The funds required for these actions will come from own resources, derived from other projects of both public and private nature, whether national or international in scope.

6. ESTIMATED BUDGET FOR THE AFTER LIFE PERIOD

The costs of the activities mentioned in this document will be borne by the participants according to the opportunities that may arise in the future.

The actions in the After-LIFE communication plan will be implemented without the necessity of financial support from the European Union.

Table 3. Costs of the activities carried out.

Actions	Where	Who	Source of finance	Needed Finances
Maintenance in tanks and improvement of captive breeding protocols				
Collaboration with aquariums and other institutions for captive maintenance	-	UCV, IRTA, IOPR, UA	Own funds, public and private projects	4,000 €
Participation in periodic meetings of the *Pinna nobilis* reproduction group	Online	UCV, CSIC-IEO, IRTA, UA, IOPR, UNINA, UAEGEAN,	Own funds, public and private projects	1,000 €
Activities to raise awareness about the species' situation among the general and specialized public				
Website maintenance (updates, domain, technical support)	Online	IRTA, UCV	Own funds, public and private projects	500 €
Publication of new scientific works in high-impact journals that highlight the environmental problem and support the project's transferability	Journals and national/international congress	UCV, IRTA, UA, CSIC-IEO, IOPR, UNINA, UAEGEAN	Own funds, public and private projects	3,000 €
Volunteering and citizen science programs	-	UCV, UA, IOPR	Own funds, public and private projects	1,000 €
Collaborations with institutions and NGOs	Spain, Italy, France, Greece, Croatia	UCV, CSIC-IEO, IRTA, IOPR, UNINA, UAEGEAN,	Own funds, public and private projects	1,000 €
Exploring new projects: We will explore opportunities to partner with these organizations on new projects or initiatives that build on the work of	European and national projects	UCV, CSIC-IEO, IRTA, IOPR, UNINA, CIMAR (UA), UAEGEAN	Public and private projects	100.000 €

the current project and align with our shared goals				
Monitoring the species in its natural habitat/sanctuaries				
New censuses	Mallorca (Spain); Mar Menor) (Spain); Stany des Ponts (Spain); Delta del Ebro (Spain); Amvrakikos Gulf, Kalloni and Gera Gulfs (Greece); French Coast, Venice Lagoon and Lake Faro (Italy)	CSIC-IEO, UA, IOPR, UAEGEAN, IRTA, UNINA	Own funds, public and private projects	10,000 €
Search for resistant hybrids	Corsican and Occitan lagoons (France); Venetian lagoons and Sardinian bays (Italy); Balearic Islands (Spain)	CSIC-IEO, IOPR, UNINA, UCV	Own funds, public and private projects	5,000 €
Studies related to the parasite or virus	France, Italy and Croatia	IOPR, UNINA	Own funds, public and private projects	3,500 €
Follow up of adults and juvenile resistant individuals	Corsican and Occitan lagoons (France); Venetian lagoons and Sardinian bays (Italy); Balearic Islands (Spain), Delta del Ebro (Spain)	CSIC-IEO, IOPR, UNINA, IRTA	Own funds	5,000 €

Sustainable management of sanctuary areas through capacity-building for experts and administrative				
Meetings with stakeholders: relevant stakeholders for the survival of *Pinna nobilis* will be scheduled, including professionals or government institutions, to explain the species' issue and establish potential measures	Spain, Italy, France and Greece	UCV, IRTA, UNINA, IOPR, UA	Own funds, public and private projects	1,000 €
Specific measures to prevent fishing/collection of fan mussels in Thau lagoon	Thau (France)	IOPR	Own funds, public and private projects	3,000 €

Table 4. Chronogram.

Action	2025				2026				2027			
Name of the action	I	II	III	IV	I	II	III	IV	I	II	III	IV
Maintenance in tanks and improvement of captive breeding protocols												
Collaboration with aquariums and other institutions for captive maintenance	■	■	■	■	■	■	■	■	■	■	■	■
Participation in periodic meetings of the Pinna nobilis reproduction group		■			■				■			
Activities to raise awareness about the species' situation among the general and specialized public												
Website maintenance (updates, domain, technical support)	■	■	■	■	■	■	■	■	■	■	■	■
Awareness campaigns on social media and communication outlets				■	■	■	■	■	■	■	■	■
Organization of outreach and training events							■	■			■	
Publication of new scientific works in high-impact journals that highlight the environmental problem and support the project's transferability				■			■				■	
Volunteering and citizen science programs						■				■		
Collaborations with institutions and NGOs					■	■				■	■	
Exploring new projects: We will explore opportunities to partner with these organizations on new projects or initiatives that build on the work of the current project and align with our shared goals				■	■	■	■	■	■	■	■	■

Monitoring the species in its natural habitat/sanctuaries												
New censuses				■			■				■	
Search for resistant hybrids						■				■		
Studies related to the parasite or virus		■		■		■	■				■	
Follow up of adults and juvenile resistant individuals		■		■								
Sustainable management of sanctuary areas through capacity-building for experts and administrative												
Meetings with stakeholders: relevant stakeholders for the survival of Pinna nobilis will be scheduled, including professionals or government institutions, to explain the species' issue and establish potential measures		■		■		■			■			■
Establish contact with administration involved in managing the Nature 2000 site				■		■		■		■		
Implement training actions aimed at institutions involved in managing the sanctuary areas									■	■		
Specific measures to prevent fishing/collection of fan mussels in Thau lagoon							■				■	