



Life Pinna



Pinna nobilis Marco Colombo

AFTER-LIFE PLAN

LIFE Pinna

*Conservation and re-stocking of the Pinna nobilis
in the western Mediterranean and Adriatic sea*



LIFE20 NAT/IT/001122
Co-funded by the European Union



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DELIVERABLE F1 - AFTER-LIFE PLAN

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TABLE OF CONTENTS

1. PROJECT DATA	4
2. INTRODUCTION	5
3. MAIN RESULTS OF LIFE PINNA PROJECT	6
4. SWOT ANALYSIS	8
5. LEGISLATIVE AND POLICY FRAMEWORK	9
7. SUSTAINABILITY OF THE MODEL	11
8. POST-PROJECT ACTION LINES	12
9. FINANCIAL SUSTAINABILITY	14
10. MONITORING AND EVALUATION	15
AFTER LIFE MATRIX	16
11. CONCLUSIONS	19



NACIONALNI INSTITUT ZA BIOLOGIJO
NATIONAL INSTITUTE OF BIOLOGY





1. PROJECT DATA

PROJECT CODE

LIFE20 NAT/IT/001122

PROJECT TITLE:

Conservation and re-stocking of the Pinna nobilis in the western Mediterranean and Adriatic sea

PROJECT ACRONYM

LIFE PINNA

COUNTRIES

Italy, Slovenia

START DATE:

1/10/2021

END DATES

30/09/2025

COORDINATING BENEFICIARY

ARPAL (Agenzia Regionale per la Protezione dell'Ambiente Ligure)

ASSOCIATED BENEFICIARIES

Asinara National Park

Cooperativa Shoreline

NIB – National Institute of Biology of Slovenia

Triton Research

University of Genoa

University of Sassari

PROJECT BUDGET

Total project budget: 2,965,885 Euro

EU Contribution: 1,753,700 Euro

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PROJECT WEBSITE

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2. INTRODUCTION

The Mediterranean fan mussel, *Pinna nobilis*, is one of the most emblematic bivalves of the Mediterranean Sea and an essential component of shallow marine ecosystems such as seagrass meadows. However, since 2016, the species has suffered an unprecedented mass mortality event that has rapidly spread throughout the basin. This severe decline has been linked to infectious agents, primarily the protozoan *Haplosporidium pinnae*, along with other opportunistic pathogens and environmental stressors. In response to this emergency, the LIFE PINNA project was launched in October 2021 with the overall aim of helping to prevent extinction and laying the foundations for the future recovery of the species.

The project pursued these aims through a combination of in situ and ex situ conservation approaches. In situ actions focused on identifying suitable donor and recipient sites, testing translocation and restocking operations, and establishing monitoring programmes for both *P. nobilis* and potential pathogen reservoirs. Ex situ actions focused on collecting, maintaining and reproducing surviving individuals in controlled facilities, with the aim of preserving genetic diversity and developing captive breeding protocols. These technical components were complemented with strong efforts in stakeholder engagement, networking and communication, aimed at mobilising the scientific community and raising public awareness.

Despite the biological and logistical challenges encountered, especially due to the unexpectedly rapid collapse of wild populations, LIFE PINNA has generated a substantial body of knowledge, protocols and collaborative mechanisms that remain highly valuable. At the time of closure, the project has advanced scientific understanding of the species, refined disease diagnostic tools, enhanced international cooperation, and prepared the ground for further research and conservation actions during the After-LIFE period and beyond.

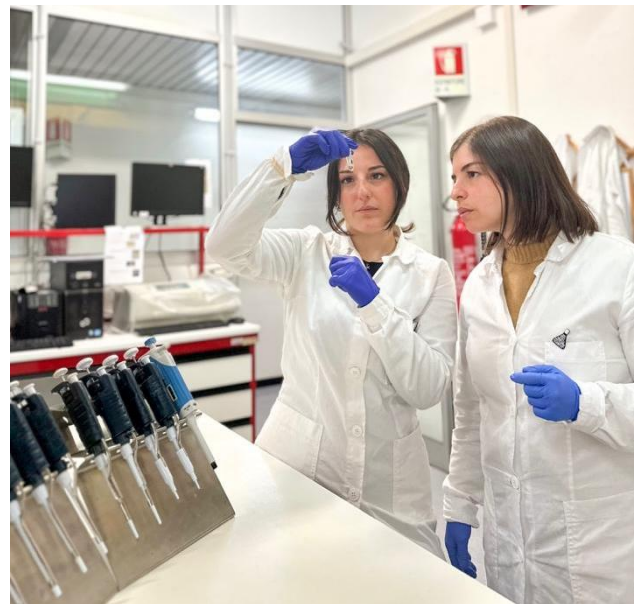


A specimen of *Pinna nobilis* in a *Posidonia oceanica* meadow. Photo Marco Colombo/Triton

3. MAIN RESULTS OF LIFE PINNA PROJECT

Throughout its implementation, LIFE PINNA produced a number of important results at scientific, technical, institutional and social levels. From the scientific point of view, one of the most significant achievements has been the genetic characterisation of the surviving populations of *Pinna nobilis*. Genotyping activities allowed the identification of mitochondrial lineages conserved since the Pleistocene and potentially associated with increased resilience. These data are essential for guiding future conservation choices, especially in relation to the selection of individuals for reproduction, restocking or genetic banking.

Equally relevant has been the standardisation of molecular diagnostic protocols aimed at detecting pathogenic agents. The project developed and validated procedures for DNA extraction from adults, juveniles, empty shells and ancient byssus gland specimens, together with quantitative PCR assays. These techniques support the identification of pathogen-free areas and enable a more precise evaluation of infection levels and disease progression. Importantly, LIFE PINNA confirmed the association of *Haplosporidium pinnae* with the disease development as a possible etiological agent correlated with the mortality event and contributed to the assessment of its genetic variability.



Non-invasive techniques for collecting DNA and genetic analysis in the laboratories of the University of Sassari. Photo UNISS

On the conservation action side, the project collected 34 individuals from the Venice Lagoon and transferred them to controlled facilities. Over the project duration, 20 spawning induction trials were carried out, resulting in 16 spawning events triggered by different stimuli and several successful fertilisations. Although achieving full larval development and recruitment proved difficult, also due to the limited number of healthy breeders available, these results represent an unprecedented advancement in captive reproduction of the species.

Restocking trials were also implemented. Individuals were transferred to the Capo Mortola Marine Protected Area, Miramare MPA and Bergeggi MPA. Unfortunately, despite careful preparation and apparently good health status at release, post-translocation survival was low, confirming the extremely fragile situation of wild populations and the complexity of reintroduction actions under the current disease pressure. This experience was nonetheless crucial in understanding the risks associated with extractive interventions and contributed to ethical decisions taken by the partnership to suspend further wild collection of adults.

The project also strengthened monitoring capacities and data collection. Water quality and pathogen presence were assessed using sentinel species, while distribution surveys were carried out using scuba divers, ROVs and citizen science. LIFE PINNA significantly expanded cooperation among Mediterranean institutions and facilitated the creation of working groups on larval monitoring, genetic diversity and disease research. Finally, communication activities reached a wide audience, building societal support around the conservation of *P. nobilis*.



Captive breeding in Camogli laboratory. (UNIGE)



First specimen transplanted in Slovenia. (NIB)

4. SWOT ANALYSIS

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • High scientific and technical expertise across a multidisciplinary partnership • Standardized protocols for genetics, captive breeding, disease diagnostics, and monitoring • Existing laboratory, aquarium, larval collector, and monitoring infrastructures • Strong international scientific networks and collaboration platforms • Proven experience with citizen science and broad public outreach capacity • Availability of detailed datasets on distribution, genetics, and pathology of <i>Pinna nobilis</i> • Trained personnel and established operational procedures that survive project closure • Recognized role of LIFE PINNA as a reference initiative at Mediterranean level 	<ul style="list-style-type: none"> • Severe decline of <i>Pinna nobilis</i> populations reducing availability of donor individuals • High mortality of translocated specimens despite compliance with best-practice protocols • Limited success in captive breeding due to scarcity of healthy reproductive adults • Dependence on specialized facilities and expert staff, with high operational costs • Delays linked to complex administrative and authorization procedures • Reduced genetic diversity in surviving populations, increasing extinction risk • Ethical constraints limiting collection and experimental manipulation of wild individuals • Strong vulnerability of project outcomes to factors outside direct management control 	<ul style="list-style-type: none"> • Transferability of protocols and methodologies to other MPAs and Mediterranean countries • Contribution to national and EU-level species recovery strategies and biodiversity policy • Expansion of scientific networks, thematic task forces, and collaborative research projects • Growing public awareness and support for marine conservation and endangered species • Access to new funding opportunities under LIFE, Horizon Europe and regional programmes • Technological advances in molecular diagnostics, aquaculture, and automated monitoring • Integration with climate adaptation and habitat restoration initiatives • Potential extension of citizen science to basin-wide monitoring schemes 	<ul style="list-style-type: none"> • Continued spread and persistence of pathogens, especially <i>Haplosporidium pinnae</i> • Climate-change driven environmental events (marine heatwaves, storms, hypoxia) • Limited financial resources for long-term maintenance of facilities and monitoring • Ethical and legal restrictions reducing collection of wild individuals for conservation • Habitat degradation, pollution, and human disturbance in coastal environments • Risk of local extinction of the species before recovery strategies become effective • Loss of key technical personnel or institutional capacity over time • Possible emergence of new diseases or multi-pathogen interactions

5. LEGISLATIVE AND POLICY FRAMEWORK

The LIFE PINNA project is framed within a solid legal context designed to protect endangered species and marine environments. At the European level, *Pinna nobilis* is included in Annex IV of the Habitats Directive (92/43/EEC), which establishes strict protection regimes for species of community interest. This listing implies severe restrictions on capture, killing, disturbance and trade, and requires appropriate authorisation procedures for any handling activity.

In Italy, these provisions are transposed through DPR 357/97. Any action involving manipulation, transport or restocking of *P. nobilis* requires specific authorisation from the Ministry of the Environment and Energy Security, supported by technical evaluations from ISPRA. LIFE PINNA successfully navigated this complex process, obtaining authorisations after rigorous feasibility studies that considered genetic compatibility, disease risks and conservation ethics.

At the regional level, the project operated within Marine Protected Areas and Natura 2000 sites, each of which is governed by management plans and regulatory frameworks. In parallel, other partner countries such as Slovenia and Croatia apply their own national legislation for strictly protected species. The project therefore contributed not only to species conservation but also to the practical implementation of European environmental law.

Even though LIFE PINNA did not directly modify existing legislation, it produced data and experience that are highly relevant for future policy development. The protocols developed for authorisation, handling and disease monitoring can inform administrative procedures and strategic decisions at both national and Mediterranean levels.

The establishment of international networks and coordination with bodies such as SPA/RAC and IUCN provides a foundation for future policy and global conservation guidelines.



Miramare Marine Protected Area, one of the LIFE Pinna's core areas. (Triton)

6. OBJECTIVES AND LONG-TERM VISION

The long-term vision of the project is to ensure that *Pinna nobilis* remains a living component of Mediterranean ecosystems and does not become functionally extinct. Achieving this vision requires a combination of scientific progress, coordinated management and public engagement.

During the After-LIFE phase, the main objectives are to safeguard surviving individuals, preserve genetic diversity, monitor pathogen dynamics and facilitate the possible conditions for the natural or assisted recovery of populations. Surviving individuals will continue to be genetically characterised to identify resilient lineages. Where feasible, whole-genome analyses will deepen understanding of adaptive traits and guide breeding strategies.



A lanternet, nursery suspended in the water column where the juveniles found in the collectors are transferred. (NIB)

Larval collectors will be used to detect and support recruitment events, which currently represent one of the greatest sources of hope for species recovery. Disease diagnostic protocols will be refined to better assess infection levels and predict mortality thresholds. At the same time, cooperation and communication will continue, ensuring that the knowledge generated by LIFE PINNA reaches managers, researchers and citizens throughout the Mediterranean.

The broader vision is that *Pinna nobilis* becomes a flagship species for Mediterranean marine conservation, stimulating improved management of habitats, research capacity and transnational collaboration.

7. SUSTAINABILITY OF THE MODEL

The LIFE PINNA conservation model is based on a combination of scientific rigour, institutional collaboration and social participation. From a scientific perspective, sustainability is ensured through the standardisation and documentation of procedures, which allow activities to be reproduced independently of individual project funding cycles. Genetic, health and environmental data remain available for further analyses, providing a basis for long-term research.

Institutional sustainability derives from the involvement of Marine Protected Areas, universities, research centres and environmental agencies whose mandates extend beyond the project duration. These organisations are committed to continuing monitoring, larval collection and genetic research as part of their ongoing activities. The establishment of international networks further strengthens this institutional backbone.

Social sustainability is promoted through citizen science, communication campaigns and educational activities. These initiatives increase awareness of marine biodiversity and create a supportive environment for conservation investments and legislative action.

Economic sustainability remains challenging but feasible. The project demonstrated that some activities, such as monitoring with sentinel species or ROV surveys, can be conducted with relatively moderate resources, particularly when integrated into existing institutional programmes. More cost-intensive actions, such as captive breeding, can be centralised in specialised facilities to optimise resource use.



Captive breeding in Camogli. (UNIGE)

8. POST-PROJECT ACTION LINES

Expanding International Networks

After LIFE PINNA, networking will remain a priority. The collaboration initiated with researchers from Spain, Croatia, Slovenia and Italy has already resulted in active working groups on larval recruitment, disease monitoring and genetic analyses. The Mediterranean Task Force on *Pinna nobilis* conservation and the Pan-Mediterranean Larval Collectors Network represent platforms through which knowledge and samples can be exchanged. Maintaining and expanding these collaborations will support harmonised monitoring and coordinated conservation strategies.



Researchers networking meeting at IMEDMAR headquarter in Calpe, Spain, in July 2024. (Triton)

Scientific Innovation and Data Infrastructure

The refinement of pathogen diagnostic tools, disease monitoring, and genetic analyses will continue. Quantitative PCR will become a standard for assessing infection levels and disease stages. Whole-genome sequencing of selected individuals will enhance the understanding of resilience mechanisms. Data infrastructure will be strengthened by harmonising databases on genetics, health status and distribution, making them accessible to research institutions and policy makers.

Stakeholder and Policy Engagement

Marine Protected Areas, national authorities, and international organisations will continue to be engaged. LIFE PINNA results will be translated into operational guidance for management plans, including criteria for translocation, quarantine and disease risk assessment. The project partners will also contribute to Mediterranean-wide reflections on species recovery and marine conservation priorities.

Dissemination and Public Engagement

The LIFE PINNA website will remain active for at least five years and will continue to function as a central repository for news, protocols, reports and educational material. Communication will focus on sharing scientific results in accessible language and on promoting citizen participation in monitoring activities. Outreach campaigns will emphasise the ecological role of *P. nobilis* and the importance of protecting seagrass habitats.

Training and Capacity Building

Training activities will be targeted at MPA managers, technicians and early-career researchers. Workshops, manuals and online resources will be developed to facilitate the application of protocols for collection, transport, genetic analysis and health assessment. Building professional capacity is crucial to ensuring that conservation initiatives can be replicated across the Mediterranean.

Replicability and Scaling Up

One of the key outputs of LIFE PINNA has been the identification of which activities are most easily replicable. Monitoring, genetic sampling and disease diagnostics can be implemented in many areas with reasonable investment. Highly specialised activities, such as captive breeding, require concentration in advanced centres but results can be transferred to beneficiary sites. The After-LIFE period will therefore focus on supporting replication while maintaining quality standards.



Transplanting activities in Capo Mortola MTA, Italy. (Shoreline)



9. FINANCIAL SUSTAINABILITY

Ensuring the continuity of activities initiated under the project requires a robust and diversified financial strategy capable of supporting research, monitoring, networking, and capacity-building actions over time. At the end of the project, several structural conditions already exist that facilitate financial sustainability: established partnerships with research institutions, integration within national and European scientific networks, and the recognition of the project's outcomes at Mediterranean scale. These assets constitute the basis for attracting future investments and accessing funding opportunities.

In the short and medium term, sustainability will largely rely on the ability of the partners to mobilize complementary funding sources. European funding programmes, including LIFE, Horizon Europe, INTERREG, PRIMA, and EMFAF, represent the primary avenue for supporting continued scientific and conservation actions. The project results, particularly those related to restoration methodologies and monitoring frameworks, are strong assets in competitive calls addressing marine biodiversity loss, climate resilience, and ecosystem restoration. At national and regional level, additional resources may be accessed through research grants, blue economy programmes, and conservation initiatives led by marine protected areas and coastal authorities.

A further dimension concerns the integration of the project's outcomes into institutional activities that will continue irrespective of dedicated project funding. Universities and research centers involved in the initiative will maintain ongoing research lines on the target species and associated habitats, embedding them into ordinary academic and institutional missions. This integration contributes significantly to long-term financial stability, as core monitoring, data management, and laboratory analyses can be partially supported by existing budgets and institutional infrastructures.

Private-sector collaboration also provides opportunities for complementary resources, especially in relation to aquaculture facilities, environmental consulting, and technological innovation for marine monitoring. While commercial exploitation is not the primary aim, co-funding arrangements, technical sponsorships, and partnerships for equipment development may indirectly support project goals. In addition, citizen science initiatives and public outreach activities may leverage local sponsorships and community programs that require modest but continuous investment.

Overall, financial sustainability is expected to be achieved not through a single large funding stream but through the progressive layering of multiple complementary resources: competitive research grants, institutional budgets, protected-area management plans, and targeted partnership agreements. The recognition of the project's scientific and conservation relevance places it in a favorable position to secure these resources over time.



10. MONITORING AND EVALUATION

Monitoring and evaluation represent central components of the post-project phase, as they ensure that the processes activated during the project translate into measurable and sustained impacts. Monitoring activities will address both ecological outcomes and the effectiveness of management, networking, and communication strategies.

From an ecological perspective, the continuation of surveillance activities in marine environments will focus on the status of surviving populations, ongoing environmental pressures, and the evolution of pathogen presence and prevalence. Periodic field campaigns, ROV-based inspections, larval collector recovery, and environmental parameter measurements will allow a continuous assessment of the condition of priority sites. These observations will provide immediate information on any changes in environmental conditions, with particular reference to the trend of the remaining populations of *P. nobilis* and the possible reappearance of individuals in areas where the species was thought to have disappeared, with the possibility of quickly establishing connections with changes in certain environmental parameters (temperature, salinity, etc.).

At the same time, laboratory-based monitoring will continue to play an essential role. Molecular diagnostics, including the use of quantitative PCR and genetic sequencing, will enable the evaluation of pathogen dynamics and genetic variability in monitored populations and restocking areas. The further refinement of protocols initiated during the project will improve diagnostic precision and provide early-warning indicators of disease progression. These laboratory data will be integrated with field observations to generate comprehensive assessments of species status.

Evaluation will not be limited to biological aspects. The performance of the governance model, collaboration networks, and stakeholder engagement processes will also be assessed. Indicators may include the number of active institutional partnerships, participation in working groups, publication output, data accessibility, and the degree of integration with existing marine conservation strategies. Communication and dissemination activities will similarly be evaluated based on audience reach, online engagement, and involvement in citizen science initiatives.

Long-term evaluation requires the establishment of a system that is both scientifically rigorous and operationally realistic. It is expected that existing institutional monitoring frameworks—particularly those used by marine protected areas, universities, and environmental agencies—will host and support these activities. This reduces the need to create parallel systems and ensures that post-project monitoring remains embedded in already functioning structures.

Ultimately, monitoring and evaluation serve two complementary purposes: verifying the **ecological effectiveness** of the project's legacy and ensuring the **institutional durability** of the collaborative model that has been developed. They also provide the evidence base required for future funding applications and policy integration, closing the loop between research, management, and long-term conservation planning.



AFTER LIFE MATRIX

Quantification of Effort and Sustainability of After LIFE Activities											
Area of Action	After LIFE Activities	Partner/s responsible	KPI beyond end value	Source of finance	Estimated effort (annual average)	Total 1 Year	Internal resources	EU and other funds	Total 5 years	Internal resources	EU and other funds
Scientific Innovation and Data Infrastructure	Periodic molecular characterization of sentinel species to monitor water quality and detect abnormal pathogen levels in restocking and monitoring sites	UNISS	≥1 monitoring campaign/year per site; pathogen presence trends documented	Internal resources; EU funding programmes	40 Wd/year (sampling, lab analysis, reporting); Consumables: reagents for DNA extraction, PCR/qPCR kits, disposables (~€5,000/year); Travel: 4 field missions/year	21.800	13.080	8.720	109.000	65.400	43.600
Scientific Innovation and Data Infrastructure	Genotyping of all surviving <i>Pinna nobilis</i> individuals; whole-genome analyses on selected founders when feasible	UNISS	100% of survivors genotyped; identification of Pleistocene lineages; genomic datasets	Internal resources; EU funding programmes	50 GG/uomo//year X 300€/wd (lab + data analysis); Consumables: sequencing reagents, library prep kits (~€10,000 depending on WGS), Bionformatic tools: hard disks + work station (~€10,000)	36.000	21.600	14.400	180.000	108.000	72.000
Replicability and Scaling Up	Deployment of larval collectors in the Northern Adriatic Sea, collection of recruits, controlled	SHORELINE, NIB	Number of collectors; recruits collected; survival post-transfer	Internal resources; EU funding programmes; Slovenian Research Program P1-0237	20 Wd/year (10 UNIGE+ 10 SHORELINE) (deployment, retrieval, rearing, transfer); Consumables: nets, ropes, floats, cages (~€3,000/year); Travel: 6 boat outings/year	15.700	9.420	6.280	78.500	47.100	31.400



	growth and transfer to sea											
Scientific Innovation and Data Infrastructure	Additional reproduction induction trials under controlled conditions (1 year)	UNIGE, SHORELINE	Induction trials; spawning events; fertilization success	Internal resources; EU funding programmes	70 Wd/year (35 UNIGE+ 35 SHORELINE)(broodstock management, trials, larval rearing); Consumables: microalgae cultures, feeds, filters (~€9,000/year); Travel 2 boat outing/years	30.250	20.000	12.200				
Training, Capacity Building and Replicability	Updating, refinement and consolidation of protocols for collection, handling, transport and restocking	ARPAL	Updated protocol set finalized; protocols shared	Internal resources	10 GG/uomo/year (technical writing, coordination);	2.600 €	2.600		13.000	13.000		
Replicability and Scaling Up	Installation and monitoring of recruited juveniles in pilot areas	SHORELINE, NIB	Individuals installed; survival at 3–6–12 months	Internal resources; EU funding programmes; Slovenian Research Program P1-0237	20 Wd/year (10 UNIGE+ 10 SHORELINE); Consumables: protective cages, anchoring materials (~€2,500/year); Travel: 4 boat missions/year	11.200	6.720	4.480	56.000	33.600	22.400	
Scientific Innovation and Data Infrastructure	Refinement of disease-stage identification protocols using qPCR	UNISS	Validated qPCR thresholds; correlation models	Internal resources; EU funding programmes	30 Wd/year; Consumables: qPCR reagents, standards (~€3,000/year); Travel: none	12.600	7.560	5.040	63.000	37.800	25.200	
Monitoring and Evaluation	Continued monitoring of implanted	UNIGE	Monitoring reports; survival and health indicators	Internal resources; EU funding programmes	15 Wd/year; Consumables: sampling kits (~€1,000/year);	10.250	6.150	4.100	51.250	30.750	20.500	



	juveniles every three months				Travel: 4 field missions/year						
Monitoring and Evaluation	Ongoing ROV-based monitoring along the Ligurian coast	ARPAL	ROV surveys/year; updated distribution maps	Internal resources	20 Wd/year; Consumables: ROV maintenance (~€2,000/year); Travel: 4 boat missions/year	11.200	11.200		56.000	56.000	
Dissemination and Public Engagement	Maintenance and updating of the LIFE PINNA website	TRITON	Website active ≥5 years; visits/downloads	Internal resources	8 Wd/year; Consumables: hosting, minor services (~€500/year); Travel: none	2.340	2.340		11.700	11.700	
Stakeholder and Policy Engagement	Collaboration with replication partners (Berleggi MPA, Arcipelago Toscano)	TRITON	Formal collaborations; joint actions/events	Internal resources	10 Wd/year; Consumables: communication materials (~€500/year); Travel: 2 coordination meetings/year	4.800	4.800		24.000	24.000	
Expanding International Networks	Participation in Mediterranean Task Force and networks	TRITON	Meetings attended; joint initiatives	Internal resources	8 Wd/year; Consumables: negligible; Travel: 1 international meetings/year	2.840	2.840		14.200	14.200	
Coordination and Governance	Coordination and management of the After LIFE Plan	ARPAL – TRITON	Annual coordination updates; plan implemented	Internal resources	12 Wd/year (6Wd/year ARPAL + 6Wd/year TRITON)	2.940 €	2.940		14.700	14.700	
Total Cost						164.520	111.250	55.220	671.350	456.250	215.100

For WD costs are estimated the following average parameter: ARPAL 260 €/day; NIB 270 €/day; SHORELINE 200 €/day; TRITON 230 €/day; UNIGE 350 €/day; UNISS 320 €/day; For travel cost 1000€/travel



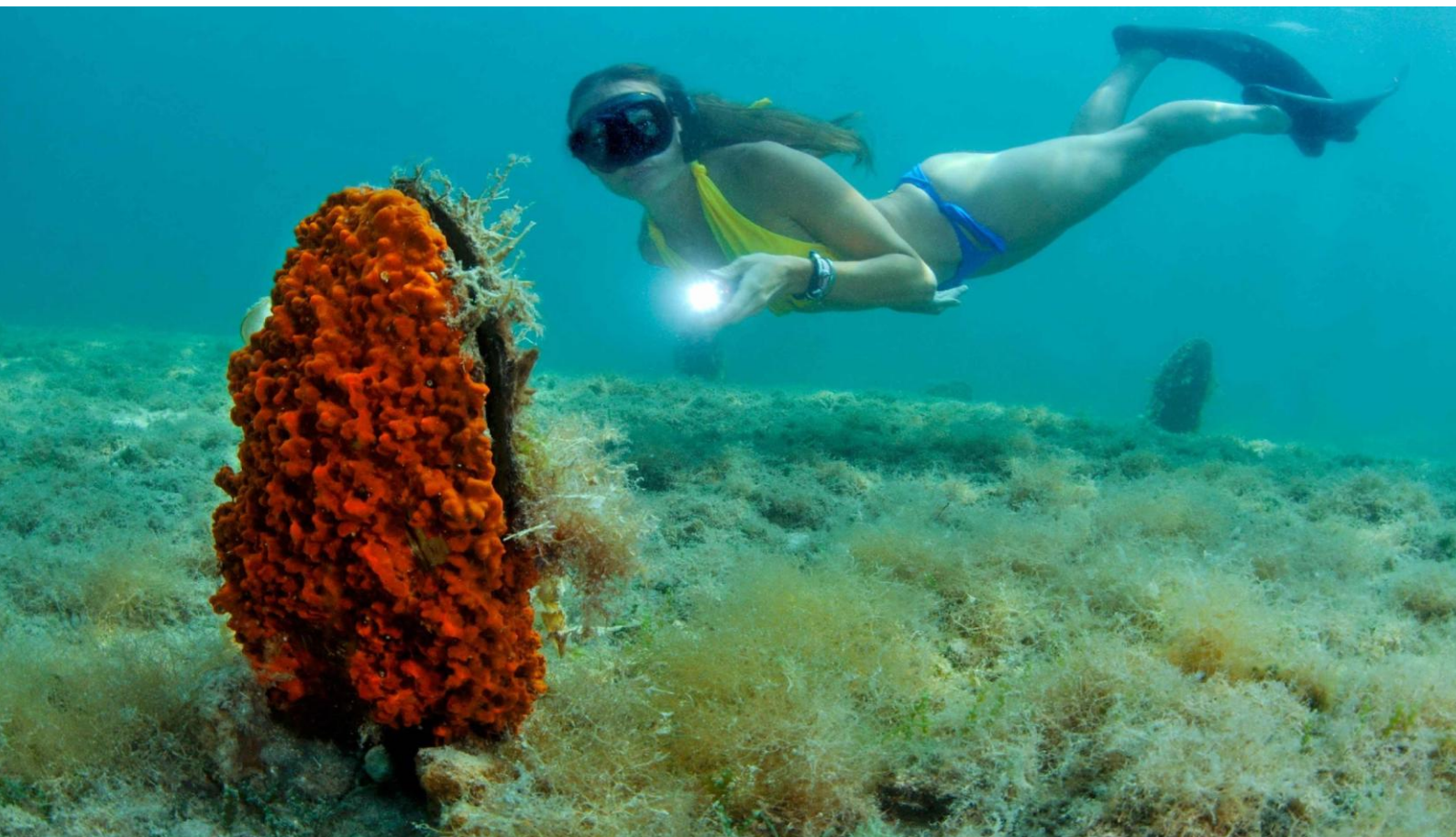
11. CONCLUSIONS

At the conclusion of the project and the design of its After-Life pathway, it is evident that the initiative has generated results that extend far beyond its original temporal boundaries. The project has significantly advanced scientific understanding of the species and its stressors, contributed to the development of innovative methodologies for monitoring, diagnosis, and restoration, and strengthened international cooperation on marine conservation issues. Even where environmental conditions have remained highly challenging, the project has laid the groundwork for future recovery scenarios by establishing protocols, data systems, and trained professional networks.

The After-Life strategy ensures that these achievements will not remain confined to the duration of the project. Instead, they will evolve as living processes through continued research actions, coordinated regional and Mediterranean networks, enhanced data infrastructure, and broad public engagement. The adopted approach recognizes that restoration of endangered marine species is necessarily long-term and must be integrated with climate change adaptation, habitat protection, and disease management strategies.

The future of the species and ecosystems addressed by the project will depend not only on scientific progress but also on political will, stakeholder participation, and societal awareness. The project has demonstrated that cooperation between researchers, institutions, marine protected areas, policymakers, and citizens is both possible and essential. Maintaining and expanding this collaborative framework will be decisive in ensuring that the knowledge produced translates into concrete conservation outcomes.

In this perspective, the project should be regarded not as an endpoint but as a starting platform for a broader and more ambitious phase of Mediterranean marine conservation. The After-Life actions outlined ensure continuity, while the strengthened networks and methodologies open new avenues for innovation and replication. The project therefore contributes not only to the preservation of a threatened species but also to the construction of a resilient model for addressing future marine biodiversity crises.





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