D10.4: Minutes of the second Annual Meeting (internal WP meetings SC, GA, AB)

Marine Ecosystem Restoration in Changing European Seas MERCES

Grant agreement n. 689518

COORDINATOR: UNIVPM

LEAD BENEFICIARY: 1. UNIVPM

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DISSEMINATION LEVEL

CO	CO Confidential, only for members of the consortium (including the Commission Services)	X

Content

1. Summary

The MERCES second annual meeting took place in Barcelona, in the beautiful location of the CSIC in front of the Barceloneta beach from the 23rd to the 25th May 2018. Overall 70 participants including members of the Consortium, members of the project Advisory Board and invited speakers attended the meeting. 40 oral contributions and 15 posters were presented during the sessions dedicated to the project's WPs:

WP1: European marine habitats, degradation and restoration;

WP2: Restoration of marine, shallow soft bottoms habitats;

WP3: Restoration of coastal shallow hard bottoms and mesophotic habitats;

WP4: Restoration of deep-sea habitats.

WP5: Effects of restoration on the recovery of ecosystem services;

WP6: Legal governance and policy;

WP7: Socio-economic impacts of restoration;

WP8: Putting Business at the Heart of the Restoration Agenda;

WP9: Dissemination, communication and public engagement.

The meeting has been an excellent occasion to present the progress of the project's activities, to open fruitful discussions and develop new collaborations among the partners of the Consortium, within WPs and between WPs.

After the welcome of the Director of the CSIC, Prof Josep LLuis Pelegri, the MERCES coordinator Roberto Danovaro presented an overview of the progress of the project in the last two years. This introduction was followed by a key note entitled: Transitional habitats as an opportunity to understand drivers of ecosystem functioning presented by Paul Snelgrove (MERCES Advisory Board member).
The second day of the meeting opened with an Open Session with the contribution of invited speakers:

- Jordi Cortina-Segarra (Chair Society for Ecological Restoration Europe): The Society for Ecological Restoration to promote the science and practice of ecological restoration;
- Sr. Sergi Tudela (General Director of the Fisheries and Maritime affairs, Catalan Government): Initiatives on coral conservation and restoration of coralligenous habitats in Catalonia;
- James Aronson (SER International and member of the MERCES advisory board): The SER Standards need input from MERCES.

The Open Session stimulated a general discussion on the importance of the ecological restoration in marine ecosystems and the need of a support from policy, economy and society. Several similarities and problems were identified both in the terrestrial and marine ecological restoration. The meeting has been an excellent occasion to improve the link among the MERCES project and the Society for Ecological Restoration.

During the meeting, the General Assembly met for the 3rd time, as well as the Steering Committee and the Advisory Board. The annual meeting was preceded by a one-day WP2 and WP6 workshops.

2. Conference programme

Wednesday 23rd May 2018

08:45 - 09:00	**Participants registration**
09:00 - 09:05	Prof. **Josep LLuis Pelegri**: CSIC Director Welcome
09:05 - 09:15	**Roberto Danovaro**: Welcome and General Introduction to MERCES annual meeting
09:15 - 09:45	**Keynote talk – Paul Snelgrove** Transitional habitats as an opportunity to understand drivers of ecosystem functioning
09.45 - 10.30	**WP1: *European marine habitats, degradation and restoration***
	Chairs: Nadia Papadopoulou (HCMR), Anthony Grehan (NUIG)
9:45 - 10:00	**Papadopoulou & Grehan**: WP1 overview
10:00 - 10:10	**Papadopoulou et al.** State of the knowledge on marine habitat restoration
10:10 - 10:20	**Papadopoulou et al.** Restoration and MERCES Key Habitats/Species: approaches, timescales, bottlenecks and up-scaling.
10:20 - 10:30	**Sevastou et al.** A literature review on the economic cost and benefits of marine restoration
10:30 - 11:00	**Coffee break**
11:00 - 12:00	**WP2: *Restoration of marine, shallow soft bottoms habitats***
	Chairs: Christoffer Boström (ÅAU) - Johan van de Koppel (NIOZ)
11:00 - 11:15	**Boström & van de Koppel**: WP2 overview
11:15 - 11:25	**van der Heide et al.** Applying biodegradable establishment structures for mussel and seagrass restoration
11:25 - 11:35	**Gagnon et al.** Mytilus -Zostera field experiments in Estonia, Finland, Norway
11:35 - 11:45	**Kipson et al.** Exploring interactions between the bivalve *Pinna nobilis* and seagrasses: implications for the restoration
11:45 - 11:55	**Siteur et al.** Patchiness as indicator for seagrass meadow restoration success and resilience
11:55 - 12:00	General discussion
12:00 - 13:00	**WP3: *Restoration of coastal shallow hard bottoms and mesophotic habitats***
	Chairs: Joaquim Garrabou (CSIC), Simonetta Fraschetti (CoNISMa - UniSALENTO)
12:00 - 12:10	**Garrabou & Fraschetti**: WP3 overview
12:10 - 12:15	**Tamburello et al.** Are we ready for scaling up on Mediterranean macroalgal restoration?
12:15 - 12:20	**Ledoux et al.** Enhancing the effectiveness of restoration actions in a changing ocean: insights from a transregional thermotolerance experiment
12:20 - 12:25	**Cebrian et al.** Regional environmental conditions determine tolerance to future warming of a marine macroalgae forests
12:30 - 12:35	**Cerrano et al** Exploring facilitation processes to enhance the effectiveness of coralligenous restoration actions
12:35 - 12:40	**With Fargeli et al** Restoration of collapsed kelp ecosystems – MERCES WP3 pilot study

12:40 - 12:45	**Medrano et al.** Large-scale sea-urchin eradication drives a rapid recovery of Cystoseira populations
12:45 - 12:50	**Cerrano et al.** Evaluation of the best techniques to restore coralligenous communities through transplants of sponges and gorgonians in different conditions
12:50 - 13:00	General discussion
13:00 - 14.15	**Lunch break**
14:15 - 15:30	**WP4: *Restoration of deep-sea habitats***
	Chairs: Telmo Morato (IMAR-Uaz), Andrew K. Sweetman (HWU)
14:15 - 14:25	**Morato & Sweetman**: WP4 overview
14:25 - 14:35	**Jones & Gates** Insights for restoration from deep-sea communities colonising existing structures
14:35 - 14:45	**Marticorena et al.** Towards a restoration approach in the deep sea: first results of a disturbance experiment in the Lucky Strike hydrothermal vent field
14:45 - 14:55	**Gambi et al.** Restoration of deep-sea ecosystems: the Palinuro Seamount case study
14:55 - 15:05	**Gori et al.** Restoration of cold-water coral gardens on the Mediterranean continental shelf: the Cap de Creus case study
15:05 - 15:15	**Carreiro-Silva et al.** Methodologies and tools for restoration of degraded deep-sea coral gardens in the Azores
15:15 - 15:30	**Morato et al.** Principles and key concepts for ecological restoration in the deep-sea
15:30 - 16:30	**WP5: *Effects of restoration on the recovery of ecosystem services***
	Chairs: Chris McOwen (WCMC) - Trine Bekkby (NIVA)
15:30 - 16:00	**McOwen & Bekkby**: WP5 overview
16:00 - 16:30	Discussion
16:30 - 17:00	**Coffee break**
17:00 - 18:00	**WP6: *Legal governance and policy***
	Chairs & introduction: Jan P.M. van Tatenhove (WU) - Ronan Long (MLOPRS)
17:00 -17:30	**van Tatenhove & Long**: WP6 overview
17:30 - 18:00	Discussion
18:00 - 19:00	**Steering Committee meeting**
19:00 - 19:30	**Advisory Board meeting**
20:30	**Social dinner: Senyor Parellada Fonda**

Thursday 24th May 2018

09:00 - 10:30	**Open Science Session**
09:00 - 09:05	**Roberto Danovaro:** Welcome and Introduction to the Open Science Session
09:05 - 09:25	**Jordi Cortina-Segarra** (SER Europe): The Society for Ecological Restoration to promote the science and practice of ecological restoration
09:25 - 09:45	**Sr. Sergi Tudela** (General Director of the Fisheries and Maritime affairs, Catalan Government): Initiatives on coral conservation and restoration of coralligenous habitats in Catalonia
09:45 - 10:05	**James Aronson** (SER International): The SER Standards need input from MERCES
10:05 - 10:30	Open Discussion on restoration initiatives
10:30 - 11:00	**Coffe break**
11:00 - 12:00	**General Assembly**
12:00 - 13:00	**WP7: *Socio-economic impacts of restoration***
	Chairs: Wenting Chen (NIVA) - Stephen Hynes (NUIG)
12:00 - 12:10	**Chen & Hynes:** WP7 overview
12:10 - 12:20	**Papadopoulou et al.** Stakeholder perceptions on marine restoration: policy targets and supporting actions
12:20 - 12:30	**Groeneveld et al.** The economics of marine ecosystem restoration
12:30 - 12:40	**Heynes et al.** Marine ecosystem restoration benefit values: Some initial findings
12:40 - 13:00	Discussion
13:00 - 14:30	**Lunch break**
14:30 - 15:30	**WP8: *Putting Business at the Heart of the Restoration Agenda***
	Chairs: David Billett (DSES) - Eva Ramirez-Llodra (NIVA)
14:30 - 14:40	**Billett** WP8 overview: Introduction to activities in the MERCES Business Club
14:40 - 14:50	**Ramirez-Llodra:** The first MERCES webinar - lessons learned and topics for future webinars
14:50 - 15:00	**Groeneveld & de Jong:** Private finance of kelp restoration in northern Norway: A MERCES case study
15:00 - 15:10	**Billett:** The second MERCES business-focussed newsletter
15:10 - 15:30	Discussion
15:30 - 16:30	**WP9: *Dissemination, communication and public engagement***
	Chairs: Martina Milanese (GAIA) - Silvia Bianchelli (ECOREACH)
15:30 - 16:00	**Bianchelli & Milanese**: WP9 overview
16:00 -16:30	Discussion
16:30 - 17:00	**Coffee break**
17:00 - 19:30	WPs prepare the wrap-up and plan joint work for the next year

Friday 25th May 2018

09:00-11:45	Wrap-up Session
09:00 - 9:15	**WP1** synthesis of the working group and future work Nadia Papadopoulou (HCMR), Anthony Grehan (NUIG)
09:15 - 9:30	**WP2** synthesis of the working group and future work: Christoffer Boström (ÅAU) - Johan van de Koppel (NIOZ)
09:30 - 9:45	**WP3** synthesis of the working group and future work: Joaquim Garrabou (CSIC), Simonetta Fraschetti (CoNISMa - UniSALENTO)
9:45 - 10:00	**WP4** synthesis of the working group and future work: Telmo Morato (IMAR-Uaz), Andrew K. Sweetman (HWU)
10:00 - 10:15	**WP5** synthesis of the working group and future work: Chris McOwen (WCMC) - Trine Bekkby (NIVA)
10:15 - 10:30	**WP6** synthesis of the working group and future work: Jan P.M. van Tatenhove (WU) - Ronan Long (MLOPRS)
10:30 - 11:00	**Coffee break**
11:00 - 11:15	**WP7** synthesis of the working group and future work: Wenting Chen (NIVA) - Stephen Hynes (NUIG)
11:15 - 11:30	**WP8** synthesis of the working group and future work: David Billett (DSES) - Eva Ramirez-Llodra (NIVA)
11:30 - 11:45	**WP9** synthesis of the working group and future work: Martina Milanese (GAIA) - Silvia Bianchelli (ECOREACH)
11:45 - 12:00	**Conclusions**
13:00 - 14.30	**Lunch**

The abstracts of oral presentation and posters are reported in Annex 1.

3. Minutes

3.1 Annual Meeting

23rd May 2018

After the welcome of the CSIC Director Prof. Josep LLuis Pelegri, Prof Roberto Danovaro, the MERCES coordinator, welcomed all participants to the second Annual meeting. He reported the excellent progress of the project activities in the second year in terms of MERCES products for each WP with field works, publications, workshops, outputs, and international events.

1. WP1 delivered 3 deliverables and 2 catalogues on current marine pressures and mechanisms, European marine habitats and degraded habitat maps.
2. In the WPs 2, 3 and 4 field activities, different marine restoration methods were tested from summer 2016.
3. NIVA, RU, UNIVPM, AAU, UTARTU and MSC conducted WP2 Pilot studies in soft bottom habitats.
4. WP3 Pilot studies in hard bottom and mesophotic habitats were conducted by NIVA, PMF-Zagreb, CoNISMA, MCS, SZN-UNIVPM, UNIGIRONA, UB, CSIC, UNIVPM and UNIVPM-GAIA.
5. Pilot studies in deep-sea habitats were the objectives of WP4 and conducted by NERC in Abyssal plain, HWU in fjord, CSIC in Cap de Creus canyon, UNIVPM in Palinuro Seamount and Dohrn canyon, IMAR-Uaz in coral gardens and IFREMER in Hydrothermal vents.
6. WP5 produced 3 spreadsheets for the pilot study sites (WPs 2, 3 and 4) including information on:
    - habitat feature/characteristic
    - pressure
    - restoration methods
    - the recovery success
    - ecosystem service restoration
7. WP6 products were the D 6.1 Review of existing international governance structures, regarding the conservation, restoration and recovery of marine ecosystems; and D 6.2 Review of current EU and international legal frameworks
8. WP7 realised a questionnaire on Social acceptance of marine restoration: questionnaire for stakeholders
9. WP8 organised the first MERCES business Club webinar “Getting better value from our coasts”, available in the website
10. WP9 activities: Ocean literacy, Training, Networking, Citizen Science.

Overall, 20 deliverables were submitted, 25 milestones achieved and 4 newsletters published (2 general and 2 business).

The coordinator commented also the excellent scientific production developed from the beginning of the project with more than 20 publications in high impact factor journals that have received a large acknowledgment in terms of press release. Two WP1 synthesis papers have been submitted and much more are in preparation for all WPs.

He also highlighted the excellent work done in terms of networking in the single WPs with several physical workshops organized as well as skype meetings.

MERCES has been presented in several International events, some of them here listed:

- Blue Economy Research & Industry Dialogue Workshop, London, March 12, 2018,

- OECD workshop (October 10th and 11th 2017) on INNOVATION FOR A SUSTAINABLE OCEAN ECONOMY
- ATLAS event (12-14 July 2017, Lisbon, Portugal)
- 10th World Sponge Conference, 25-30 June 2017 (Galway, Ireland)
- MARE 2017 People and the Sea IX Conference: Dealing with mobilities (5-7 July 2017)
- Maritime Spatial Planning, Ecosystem Approach and Supporting Information Systems (MaPSIS) - Las Palmas de Gran Canaria (24-28 April 2017)
- 2nd ATLAS General Assembly - Mallorca, Spain (26 April 2017)
- SponGES Annual Meeting - London, UK (4 April 2017)
- Blue Symposium "Sponges, Corals & the World"- Blanes, Spain (30-31 March 2017)
- …. and much more (including national events)

Recently, MERCES, together with ATLAS and SponGES, was presented at the World Conference on Marine Biodiversity 2018 (Montreal, Canada 13-16 May 2018) by some members of the consortium with the following contributions:
•MERCES: Marine Ecosystem Restoration in Changing European Seas, *Cristina Gambi*
•MERCES: State of degradation and recovery potential of the six key European marine habitats, *Anthony Grehan*
•Drastic effects of climate change on Mediterranean forests, *Jana Verdura*
•Regional Environmental history drive the tolerance of marine macroalgae forests to future warning, *Emma Cebrian*
•Restoring Biodiversity in the Mediterranean Coralligenous: the MERCES project, *Martina Milanese*
•Restoration actions in marine ecosystems: a global analysis, *Simonetta Fraschetti*

A joint exhibition MERCES-ATLAS-SPONGES has been set up during the WCMB conference that was visited by hundreds of delegates.

MERCES will be present in several forthcoming events like the SER Europe Conference 2018 next September in Reykjavik, the Deep-sea Biology Symposium in San Diego (September 2018) and the Marine Key Habitats & NIS Symposia in Ankara in January 2019.

The coordinator presented the agenda of the meeting and the keynote talk by Paul Snelgrove on the Transitional habitats as an opportunity to understand drivers of ecosystem functioning.

Following is the presentation of the WPs.
WP1: general overview introduced by Nadia Papadopoulou.
WP1 Overall Objectives: Review the current knowledge base, gather information and set the framework for the project work packages.
Specific tasks included:
State of knowledge of European habitat mapping and degraded habitats;
State of knowledge of habitat pressures and restoration potential;
Critical review of habitat restoration technologies, tools and best practice and literature review of the economics of marine and coastal ecosystem service restoration

- Task 1.1. (M0-12) Habitat and Degraded Habitat Mapping: D1.1. Delivered Month 12, available on the website;
- Task 1.2. (M0-12), Pressures and Mechanisms driving habitat changes, D1.1. Delivered Month 12 available on the website;
- Task 1.3. (M0-18), The Catch-All Review on:
  - ✓ Marine habitat restoration methods

- ✓ Technologies and tools
- ✓ Restoration principles for "passive" and "active restoration"
- ✓ Key issues linked to success or failure
- ✓ Economic costs and benefits of ecosystem service restoration

The Catch-All Review: D1.3. Delivered Month 18 and available on the website
All tasks have been successfully completed by M18 according to the MERCES Grant Agreement.

WP 1 Further Activities
Milestone 3: Draft manuscripts for review papers
3 draft manuscripts on the November 2017 deadline.
Since April 2018 two papers have been submitted:

- Gerovasileiou et al. Habitat and degraded habitat mapping: Ocean & Coastal Management
- Dailianis et al. Activity and pressures mapping: Marine Policy

Close to Submission:

- Fraschetti et al., Restoration review
- Bekkby et al., Key habitats and their restoration potential
- Sevastou et al., Cost and benefits

The WP1 introduction was followed by three oral contributions.

WP2: general overview introduced by Christoffer Boström & Johan van de Koppel.
The summary of the WP's tasks.

- Task 2.1 Conduct a field survey and identify sites for experimental work;
- Task 2.2 Experimentally test addition of ecosystem engineers on seagrass establishment and recovery on experimental and case study sites.
- Task 2.3 Develop numerical models of the interactions between seagrasses and other engineering species.

All WP2's partners are conducting field experiments using different approaches:

- ✓ Applying biodegradable establishment structures for mussel and seagrass restoration;
- ✓ Mytilus-Zostera Experiments;
- ✓ Exploring interactions between the bivalve *Pinna nobilis* and seagrasses: implications for the restoration.

Field works are progressing well in the different study areas. Some experiments affected by strong winter storms will be replaced by new ones this summer.
The aim of the Task 3 is the development of a numerical model using patchiness as indicator for seagrass meadow restoration success and resilience.
WP2 arranged a workshop the day before the beginning of the annual meeting to make the point on the progress of the activities, the structure and contents of the deliverables and the contributions of all partners involved.
The WP2 introduction has been followed by four oral contributions summarising the main field activities based on common approaches/experiments in different areas.

WP3: general overview introduced by Simonetta Fraschetti on the good progress of the WP3
Main goals:
1- increasing the understanding of the role of animal and macroalgal forests, to identify key processes and mechanisms influencing restoration success
2- set and test protocols to support common approaches across Europe
3- test the effectiveness of restoration actions under a changing ocean scenario
4- exploring tools to enhance the effectiveness of restoration actions

WP3 main features:

- ✓ Large geographical representation to develop restoration experiments on the same species or on the same processes
- ✓ Maximize collaborative actions to test generalities of processes
- ✓ Develop a common vision about strategies and approaches to enhance restoration efforts

Outcomes:

- ✓ Drivers of change have to be well identified - A good knowledge of life history traits is needed
- ✓ Biological and ecological processes are fundamental in restoration processes
- ✓ The identification of species able to facilitate such processes is an important step to enhance the effectiveness of restoration approaches.
- ✓ Restoration at large spatial scale is possible but the knowledge about key steps and the methodological issues to be carefully considered to support the scale up in restoration interventions

Restoration for the future:

- ✓ Acquisition of basic information about the thermotolerance at species level in response to heat stress
- ✓ Implications for restoration action of macroalgae / coralligenous community in the context of on-going climate change

The WP2 introduction has been followed by four oral contributions summarising the main field activities based on common approaches/experiments in different areas.

Lunch break

WP4: general overview introduced by Telmo Morato on the progress of the multiple activities carried out in this WP.
The vision: To build upon the groundwork laid by restoration activities in other ecosystems, to develop principles, guidelines and tools for deep-sea restoration, including pilot projects in the deep-sea
Objectives
1. to apply the lessons learned from terrestrial and coastal ecosystems to develop principles of deep-sea restoration
2. to promote the integration of the deep-sea 'restoration agenda' into policy objectives
3. to develop conceptually coherent tools and methodologies for deep-sea restoration
4. to assess the ecological benefits of cost-effective restoration activities in the deep-sea

Task 4.1 Improve principles of deep-sea restoration (M3-M42)

- ✓ Adapt lessons learned from terrestrial and shallow water restoration to deep-sea ecosystems to improve principles of deep-sea restoration (IMAR, HCMR, DSES)
- ✓ Promote the engagement of the wider community in the discussion of deep-sea restoration and promote the integration of deep-sea 'restoration agenda' into policy objectives (all partners)

Task 4.2 Unassisted restoration in the deep-sea (M3-M42)

- ✓ Spontaneous generation of deep-sea soft sediment communities impacted by rock drilling (UNIVPM)
- ✓ Assess the rate and success of spontaneous restoration of active hydrothermal vent communities impacted by mining (IFREMER)

- ✓ Assess if land-based activities help in the spontaneous regeneration of deep-sea benthic communities that have been exposed to altered food-input (HW)
- ✓ Role of oil and gas infrastructure in the spontaneous regeneration of deep-sea benthic communities (NOC)

Task 4.3 Restoration activities in the deep-sea (M3-M42)

- ✓ 1. Assess the feasibility of cold-water corals and temperate gorgonians transplantation techniques and the deployment of artificial substrates for the active restoration of populations impacted by fishing (CSIC-UB, IMAR-UAZ)
- ✓ 2. Assess the feasibility of fish transplantation for active restoration of deep-sea fish stocks impacted by fishing (IMAR-UAZ)

The WP4 introduction has been followed by six oral contributions summarising the main activities carried out in each study area and the main output of the deliverable 4.1.

WP5: general overview introduced by Hazel Thornton
WP5 will analyse the effects of habitat restoration identified in WPs 2-4 on the recovery of ecosystem services.
In case study areas selected from the pilot studies investigated in WPs 2-4, WP5 will:
1. Determine spatial variation in ecosystem service provision following habitat restoration
2. Analyse the efficiency of restoration actions across selected habitats
3. Analyse the thresholds for effective ecosystem service restoration.

Collation of details from 83 sites: WP 2: 32 sites from 7 countries; WP 3: 40 sites from 6 countries, WP 4: 11 sites from 5 countries.

WP5 Objectives for the next 6 months:
WP5 will analyse the effects of habitat restoration identified in WPs 2-4 on the recovery of ecosystem services.

So...
Do we have all your site information about pressures, ecosystem services, restoration efforts?
What are your indicators of success for restoration at your site?
What is the efficiency of your restoration actions?

WP6: general overview introduced by Jan van Tatenhove
Governing marine restoration: discourses and uncertainties
Understanding the enabling and constraining conditions to govern marine ecosystem restoration
Discourses:
Discourses entail the views and narratives of the actors involved, and imply specific definitions of marine restoration problems, approaches to solutions, but also substantive strategic positions of the actors in a restoration arrangement.
Uncertainties:
Marine restoration governance arrangements

Restoration governance arrangements:
Governing of marine restoration activities takes place in marine restoration arrangements.
Starting point of analysis to construct marine restoration arrangements are discourses ("Putting Nature First," "Bringing Nature Back," "Helping Nature support Humans," and "Building with Nature.")

Each of these discourses is defended or opposed by coalitions and gives insight in the availability of resources and the rules guiding restoration activities.
Each marine restoration arrangement faces different forms of uncertainties, which affects the governing of marine restoration activities.

The structure of the (D6.3) Review on restoration, conservation and recovery of marine ecosystems in the four regional EU seas:
Part A overview
An overview of ecological restoration in the Regional Seas Conventions and EU maritime policies

Part B: Cases
Seagrass restoration in the Wadden Sea
De-commissioning (demonstration) project in Faroe-Shetland
Pinna nobilis case in Croatia
Red coral in an Italian MPA

Part C ex ante evaluation
Ex ante evaluation, based on a comparative analysis of the cases and leading to recommendations about governing restoration in EU policies

Followed by the Advisory Board and the Steering Committee meetings (minutes are reported below).

24th May 2018
The second day of the meeting was opened with an Open Science Session with the Prof Roberto Danovaro who welcomed all participants and introduced the MERCES project, followed by the talk of representatives of SER Europe (Jordi Cortina-Segarra), SER International (James Aronson) and the Catalan Government (Sergi Tuleda, General Director of the Fisheries and Maritime Affairs).
Jordi Cortina-Segarra, Chair of SER Europe, presented the activities/initiatives carried out in SERE. The importance of the ecological restoration is evident for all (terrestrial and marine) habitats and this is also of great interest for EU initiatives on biodiversity. SER has realised the first certification programme for practioners. The MERCES project represents an excellent opportunity to include also marine ecosystems that are only marginally discussed in the SERE community. The SERE newsletter can be a tool to reach a large audience of experts on ecological restoration.
Sergi Tuleda stressed the importance of the conservation of key species that are important not only for the ecological point of view but also for the society (their function, role in terms of ecosystem goods and services). Conservation should include the ecological restoration to allow the recovery of good and services important for the human well-being. The stakeholders (from public to private sectors of industry but also municipality and managers) as well as scientists play a key role in supporting initiatives of recovery of marine ecosystems. The EU legislation has in agenda the restoration of key habitats as the coralligenous since these habitats can have a relevant importance in the Blue Growth strategy. Some crucial issues for the conservation/restoration of marine ecosystems are still neglected: the problem of the spatial and temporal scale; the water column features and characteristics, the importance of culture/society.
James Aronson presented a contribution on the exercise conducted in the WP4 to find similarities and differences between the ecological restoration in deep-sea ecosystems and the international standards for the practice of the ecological restoration (including principles and key concepts) provide by the Society for the Ecological restoration on terrestrial ecosystems.

The WP4 exercise included a new topic: the characteristics of ecosystem good and services. The social economic attributes are important and have to be set up prior to setting long-term goals, strategies, milestones.

The Open Science Session stimulated a rich discussion on the ecological restoration in marine ecosystems suggesting that there are several similarities between terrestrial and marine ecosystem in particular on the problems of the spatial and temporal scale and the evaluation of the restoration success.

Followed by the General Assembly (minutes are reported below).

WP7: general overview introduced by Stephen Hynes
WP7 Objectives:

1. Assessment of social acceptance of restoration activities;
2. Assessment of direct and indirect economic and social benefits of changing ecosystem services that arise through selected restoration activities;
3. Assessment of cost effectiveness of restoration measures;
4. Assessment of the net social benefit of restoration activity in the marine environment.

Specific Tasks:

- ✓ Task 7.1 Assessment of social acceptance of the restoration activities.
- ✓ Task 7.2 Framework for the selection of the pilot studies
- ✓ Task 7.3 Assess the ecosystem service benefits from ecosystem restoration.
- ✓ Task 7.4 Assess the costs of restoration measures.
- ✓ Task 7.5 Carry out full Social Cost Benefit Analysis (SCBA).

From ecosystem to welfare benefits, a simple conceptual framework based on Hanley et al. (2016): the ecosystem management influences the ecosystem function that can be divided in intermediate ecosystem service and final ecosystem services that have important cascading implication on benefits, values and human behaviour. This approach will be the base for the analyses that will be conducted during the MERCES project in selected pilot studies.
The WP7 introduction has been followed by three oral contributions on stakeholder perceptions on marine ecosystem: policy targets and supporting actions, the economics of marine ecosystem restoration and the values of the benefits linked to the marine ecosystem restoration.

Lunch break

WP8: general overview introduced by David Billet & Eva Ramirez-Llodra
Major goal of the WP is building bridges to industry for marine ecosystem restoration.
Main tasks:

- Task 8.1 ‘Business Club’
- ✓ MERCES Deliverable D8.1 completed
- ✓ More than 350 contacts from 26 countries – new members joined
- ✓ Case studies - industry Business Club partners on MERCES website
- ✓ Working with other MERCES WPs – Rolf Groeneveld (WP7)

Foster best practice in marine ecosystem restoration and develop greater business opportunities for European companies. Important contacts with other international initiatives: Innovation for a sustainable ocean economy: linking economic potential and ecosystem health, Stazione Zoologica, Naples and OECD (Oct 2017); European Coral Reef Symposium, Oxford, ‘Assisted Evolution’ and ‘Coral Restoration’ special sessions (December 2017); Blue Economy and

Industry Dialogue Workshop, London, Maritime Alliance and BlueTech Cluster (March 2018) and MARINA Project workshop for Responsible Research and Innovation for Deep-Sea Mining, Sustainability and Policy, Lisbon (May 2018). WP8 contributed to the paper Murray et al. Data challenges and opportunities of North Sea oil and gas decommissioning. Submitted to Marine Policy.

- Task 8.2 Business targeted newsletters

✓ Second business-focussed MERCES newsletter published May 2018. The draft was completed but the annual meeting was the excellent occasion to finalise the content.

- Task 8.3 Interactive Webinars

✓ First MERCES webinar held on 15 February 2018 with the first contribution of Dr Scott Cole (EnviroEconomics Sweden) and Dr Per-Olav Moksnes (University of Gothenburg) on the environmental compensation: disappearance of eelgrass in Sweden. Major questions: How can we evaluate the many different benefits of eelgrass beds and what have we lost? The Zorro project has developed an interdisciplinary framework for estimating the monetary value associated with multiple ecosystem services provided by eelgrass meadows. The second contribution was presented by Prof Johan van der Koppel (NIOZ-MERCES partner, WP2) on the new technique for presenting projected outcomes of nature restoration and compensation projects using a combination of ecological models and 3D visualization techniques.

Participants:

✓ 64 participants: 58 on Zoom and 8 on YouTube screening
✓ 18 countries
✓ 21 companies (environmental consultancy, energy and engineering)
✓ 18 government policy makers
✓ 1 EU Commission

Next webinar (next September 2018) will be dedicated to the restoration of coastal hard bottoms and mesophotic habitats (WP3). Following the previous experience, the idea is to have two excellent speakers (1 academic from MERCES and 1 from industry) and currently looking for European experts on:

✓ Coral restoration
✓ Rigs to reefs
✓ Value of ecosystem services of benefit to tourism
✓ Open to other suggestions from the MERCES consortium

WP9: general overview introduced by Silvia Bianchelli
Objectives of WP9:
1) disseminate the MERCES outcomes to the scientific and non-specialized audience;
2) raise awareness on restoration activities, promoting an innovative and sustainable multidisciplinary approach;
3) encourage different stakeholder groups to share knowledge and identify the best practices for restoration;
4) create a network with other EU projects on ecosystem restoration;
5) promote capacity building for key marine policy-makers in Europe,
6) engage policy and decision-makers throughout the duration of the project.

Task 9.1 (M1-48) Dissemination Plan and Quality Control

Dissemination plan, timeline and stakeholder's database revised every year and available on the MERCES website (available by the end of May).

Task 9.2 (M1-48) E-MERCES
e-material available on the MERCES web site: poster, factsheets, brochure, newsletters, photo-video material
link to the main social networks (twitter, Facebook, YouTube)
link to the Business Club
All MERCES documents available in the Partners' Area

Task 9.3 (M13-48) Ocean Literacy: students involvement (starting from the youngest…)

- ✓ The Hellenic Centre for Marine Research (HCMR) presenting MERCES at the major school kids/youth event in Heraklion (Crete, Greece).
- ✓ CONISMA carrying out theoretical-practical activities at primary schools, involving about 100 students (Lecce, Italy).
- ✓ Course on Marine Biology for I level secondary school (Ancona, Italy), April 2018 (PON project, Ecoreach).
- ✓ CONISMA carrying out activities for II level secondary school, involving about 200 students (Lecce, Italy)
- ✓ UNIVPM students during the educational trip at MARE outpost (Lecce, Italy), June 2017 (UNIVPM, CONISMA, ECOREACH)

Task 9.4 (M1-48) Public engagement on pilot restoration actions in coastal habitats via Citizen Science

- ✓ Transplant of 400 gorgonians in the Medes Islands (Spain) with the collaboration of local dive instructors (CSIC)
- ✓ Transplant of ca. 50 sponges and ca. 170 gorgonians in Portofino and Alassio (Italy), with the help of local dive instructors and recreational divers (UNIVPM, GAIA)
- ✓ Questionnaires realized on the perception of the degradation of marine ecosystem destined to the general public, fishermen and divers (CONISMA)
- ✓ Preliminary activities with general public at Gabicce pilot study area (ECOREACH, UNIVPM)
- ✓ First scientific paper using data collected by means of Citizen Science

Task 9.6 (M24-48) Training
Workshop for the students of the Master in Coastal and Marine Biology and Ecology of UniSalento (Apulia, Italy) and the students from UNIVPM have been carried out, jointly with CONISMA.
Brief training course for fishermen (CONISMA) to raise their knowledge on macroalgae importance and to prepare them to the Citizen Science activities (task 9.4).
Master and PhD students involved for their thesis at UNIVPM and CONISMA
Collaboration with WP8 in order to activate the blog session coupled to the first webinar organized and dedicated to the Business Club (ECOREACH).
7 newspaper articles (PMF ZAGREB, HCMR, CONISMA)
4 interviews (UNIVPM, PMF ZAGREB, HCMR) in National Televisions
After the end of the general presentation of the WPs, the members of the consortium were divided in different groups to prepare the WPs wrap-up and plan joint work for the next year.

25th May 2018

The last part of the meeting was dedicated to the activities plan for the next year. The WPs co-leaders presented the outputs of the internal meetings.

WP1: Nadia Papadopoulou & Anthony Grehan
Steps taken towards the next 3 publications
Other publications Under consideration:
Papadopoulou et al, Cases, Pressures & consequences for restoration and mitigation other synthesis paper?
Other Ideas-linking with WP8/WP9:

- ✓ one-page summary factsheets
- ✓ subject summary infographics

Link with WP8-9

WP2: Johan van de Koppel & Christoffer Boström
Facilitation and synergies between WPs 2-3-4 in order to produce a conceptual paper
Inside this WP, one partner PMF-Zagreb is already a link between WPs 2 and 3 (see D3.2)

WP3: Joaquim Garrabou & Simonetta Fraschetti
Will send the report to the PMO and Silvia Bianchelli and Martina Milanese.
Will organize a summer restoration school.

WP4: Telmo Morato & Marina Silva
Asked for one month extension for D4.1 to integrate the results/comments and discussion carried out with all WP 4 partners during Annual Meeting.
Task 4.1 (M3-42) Application of the lessons learned from terrestrial and coastal ecosystems to improve principles of deep-sea restoration.

- ✓ High level of interest in the output
- ✓ To be presented in September
- ✓ SER European Conference – Iceland
- ✓ Discussion panel at SER
- ✓ Deep Sea Biology Symposium, USA
- ✓ Manuscript submission to the SER Journal
- ✓ Implications document/notice to Hi-level journal

Task 4.2 (M3-42) Assessing the ecological benefits of low-cost unassisted restoration in the deep-sea.
D4.2: Effectiveness of passive restoration in fjord ecosystems, hydrothermal vents and CWCs (M42) HWU

- ✓ Spontaneous regeneration soft sediments from rock drilling (UNIVPM)
- ✓ Hydrothermal vent communities impacted by mining (IFREMER)
- ✓ Land-based impacts on benthic communities from altered food input (HWU)
- ✓ Role of O&G infrastructure on regeneration of deep-sea benthic communities (NOC)

Task 4.3. Restoration activities in the deep-sea (M3-42)
D4.3: Development and effectiveness of tools and techniques for active restoration (M42) UB

- ✓ CWC and temperate gorgonian transplantation techniques and deployment of artificial substrates for active restoration of populations impacted by fishing
- ✓ IMAR-UAZ: landers and settlement plates
- ✓ CSIC-UB: landers and Badminton deployments
- ✓ Assess the feasibility of fish transplantation for active restoration of deep-sea fish stocks impacted by fishing (IMAR-UAZ)

WP5: Chris McOwen & Mirco Scharfe

The importance to collect all info from the pilot studies to allow the submission of the deliverables and papers.

Future work:

- ✓ Compilation of GIS maps of marine habitat / restoration areas, linkages to contextual information
- ✓ In-depth analysis of complementary model case studies, decadal perspective
- ✓ Exploring complexity of marine habitat, large-scale variation across habitats, and restoration potential

WP6: Jan P.M. van Tatenhove

Overview work of WP6 in the third year

Task 6.2 (D6.3) Review on restoration, conservation and recovery of marine ecosystems in the four regional EU seas

Part A (July 2018)

Part B and C (Draft September 2018)

Submitting D6.3 November 2018 (M30)

Start Task 6.3 (M30-48) start in December 2018

Will provide input to the development and design of legitimate governance arrangements and effective regimes to restore and recover marine ecosystems (in the selected working areas). This will be based on a literature review, an analysis of best practices within other (marine) policies, and if needed key-informant interviews, with persons involved in the designing and development of new marine governance institutions and regimes.

D6.4 (M48): Policy brief providing input and options for the development of legitimate governance arrangements and effective regimes regulating the conservation, restoration and recovering of marine ecosystems

WP7: Stephen Hynes

Task 7.3 Assess the ecosystem service benefits from ecosystem restoration.

- ✓ Write up DCE paper results
- ✓ Compare public perceptions to restoration to the stakeholders from task 7.1
- ✓ Complete survey work at coastal site in Galway and write up results
- ✓ Start development of public survey instrument for Dohrn Canyon (Tyrrhenian Sea, Central Mediterranean Sea).
- ✓ Wadden Sea survey to be completed this summer

Task 7.4 Assess the costs of restoration measures.

- ✓ Survey instrument for case study costings being finalised. First draft will be sent for comment to sub set, then final version sent round to all.
- ✓ Liaise with David and Business club to see if there is possibility of getting cost data from some members of the BC.
- ✓ Follow up with contact supplied by James for same as well.
- ✓ Paper on variations in costs under certain category headings across different restoration types.

Task 7.5 Carry out full Social Cost Benefit Analysis (SCBA).

- ✓ Yet to start – building on results in other tasks
- ✓ Financing of restoration activities
    - o Examining what has been done across different countries
    - o Examining what could be done across different case studies

- ✓ Complete full Social CBA
- ✓ Examine connections of restoration work with health benefits

WP8: David Billett & Eva Ramirez Llodra
Looking for volunteers' speakers for the next webinar. One academic from MERCES and one from industry.
Focus on business and 'decision takers' interests and bridging between MERCES science and business. Need 2 excellent speakers for each

Currently looking at topics on:
Private finance initiatives for ecosystem restoration
Kelp restoration case study (Norway)
Coral restoration methods (Western Mediterranean and Azores)
Value of ecosystem services of benefit to tourism (Mediterranean)
Other suggestions?

Expand Business Club contacts
European States – Government and Local Authority Policy makers
Developing nations Government officials for the environment
Create e-mail text on newsletter highlights (with web links) for the distribution of newsletter
Publish more case studies on marine ecosystem restoration for the MERCES website
Continue to work with other MERCES WPs – inputs by selected Business Club members for WP7 surveys on costs

Newsletter
- Thanks for MERCES contributions to the newsletter. Some of you are stars. 7 of 16 articles by MERCES members.
- But partner contributions are patchy. We need better support from all members of the MERCES partnership
- Need to strengthen the applications and policy matters in future newsletters
- Invite WP8 members to WP meetings you organise
- Participate in the MERCES webinars

WP9: Martina Milanese
Next steps:
from promoting the Project to disseminating the results
TRAINING: WP2, WP3 and WP4
Recommendations!
Keep us in the loop
(papers, conferences, activities, etc)
Join MERCES community, use social media
Send us visuals

Followed by a general free discussion.
It was asked to participants suggestion for the format of the next annual meeting. One day more would be appreciated in order to facilitate the cross-WPs discussions. No more parallel sessions for the working groups.
Most of the participants want to keep the individual talks in each WPs presentation but please respect the time!
The presence of more students would be appreciated.

Conclusions and end of the day

3.2 Advisory Board

Marine Ecosystem Restoration in Changing European Seas
MERCES

Grant agreement n. 689518

Advisory Board Meeting

24th May 2018 - Barcelona, Spain
Time**:** 18.00 – 18.30

Participants:

Project Coordinator: Roberto Danovaro
Project Management Office: Cristina Gambi & Emmanuelle Girardin
Advisory board members: James Aronson & Paul Snelgrove

Agenda:

- Welcome and apologies for absence
- Update on the progress of the project
- Comments and suggestions from the Advisory Board
- AB contribution to MERCES
- Annual meetings
- A.O.B

Welcome and apologies for absence
Roberto Danovaro started the meeting welcoming all the Advisory Board members. He asked them if they agree with the presence of the Steering Committee members within the AB meeting and it was decided to start with the AB meeting before the SC meeting. Unfortunately, Cindy van Dover was not able to join the meeting since she was engaged in China for a meeting on deep-sea mining. Roberto Cimino apologized for not being able to join due to meetings for the ENI awards.

Update on the progress of the project
Roberto Danovaro reported the progresses of the project presenting the deliverables submitted and the milestones achieved in the period M13 to M24.
The list of the deliverables is reported below:

Deliverable number	Title	WP	Lead beneficiary	Month
D10.3	Minutes of the first Annual Meeting (internal WP meetings, SC, GA, AB)	**10**	UNIVPM	14
D6.1	Review on existing international governance structures, regarding the conservation, restoration and recovery of marine ecosystems	**6**	AAU-IFM	15
D11.2	EPQ-A Requirement n.4	**11**	UNIVPM	16
SCM	Steering Committee Meeting + minutes	**10**	UNIVPM	18
D1.3	State of the knowledge on marine habitat restoration and literature review on the economic cost and benefits of marine and coastal ecosystem service restoration	**1**	HCMR	18
D3.2	Criteria and protocols for the restoration of shallow hard bottoms and mesophotic habitats	**3**	CoNISMa, CSIC	18
D6.2	Review of current EU and international legal frameworks	**6**	MLOPRS	18
D4.1	Review on the principles of deep-sea restoration and on the ecological benefits of passive and active restoration	**4**	HCMR	24
D7.1	Social acceptance of restoration activities	**7**	HCMR	24
D9.4	Second year report on networking, public engagement and communication activities including collation of products and e-MERCES tools	**9**	GAIA	24
D10.4	Minutes of the second Annual Meeting (internal WP meetings, SC, GA, AB)	**10**	UNIVPM	24

All deliverables have been submitted on time or with a short delay always agreed with the Project Officer. The submission of the Deliverables 4.1 and 10.4, related to WP4 and the annual meeting, have been postponed to Month 25 (31 June 2018) to allow the inclusion of all comments and suggestions discussed during the meeting (D4.1) and the minutes of the annual meeting (D10.4) with the agreement of the Project Officer.

The list of the first project year milestones is reported below:

Milestone number	Title	WP	Lead Participant	M	Means of verification
MS40	First Annual Meeting	**10**	UNIVPM	14	Summary available on the webpage for public and media
MS12	Workshop to discuss the principles of deep-sea restoration, technological gaps and integration of the deep-sea restoration agenda into policy	**4**	HCMR	14	Minutes available on MERCES web site

MS16	Technical workshop on ecosystem services restoration efficiency and recovery potential analysis methodology: list of GIS data layers	**5**	NIVA	15	Meeting minutes available on the MERCES website restricted area
MS3	Draft manuscript for review paper/s	**1**	HCMR	18	Manuscript submitted to journal/s
MS5	Workshop on experimental results & planning of case study work	**2**	NIOZ	18	Minutes available on the website
MS11	Implementation of pilot restoration actions in shallow hard bottoms and mesophotic habitats	**3**	CSIC	18	List of implementation actions provided to the stakeholders community (via the website)
MS24	Data and information from interviews and surveys on social acceptance of the restoration activities	**7**	HCMR	18	Data available in the restricted area of the website
MS31	Industry webinar 1. Restoration of soft seafloor and vegetated habitats	**8, 2**	NIVA	20	Archived and available on MERCES website
MS22	Meeting and outline for the D6.3	**6**	WU	21	Meeting minutes available on the website
MS41	Second Annual Meeting	**10**	UNIVPM	24	Summary available on the webpage for public and media

All milestones have been achieved on time.

The coordinator presented also the deliverables and milestones scheduled in the next 6 months:

Deliverable number	Title	WP	Lead Beneficiary	Type	Month
D3.3	Enhanced tools and indicators for restoration of shallow hard bottoms and mesophotic habitats	**3**	CSIC	Report	30
D6.3	Review on restoration, conservation and recovery of marine ecosystems in the four regional EU seas	**6**	WU	Report	30

The deliverables are in progress and all partners are working to complete and submit them on time.

Milestone number	Title	WP	Lead Participant	Month	Means of verification
MS32	Industry webinar 2. Restoration of hard seafloor and mesophotic habitats	**8, 3**	NIVA	26	Archived and available on MERCES website
MS17	GIS layers of habitats before after restoration (shallow soft hard bottom and deep-sea habitats)	**2, 3, 4, 5**	WCMC	30	GIS layers available on MERCES website restricted area

The milestones are in progress and all partners are working to complete and achieve them on time.
WP8 co-leaders suggested to postpone the webinar (MS32) to M27 (September 2018) to avoid the summer holidays break that could limit the audience.
WP5 co-leaders suggested to remove “after” from the title of the milestone M17 since this is a typo. The “after” restoration implies the end of the project and the time of submission cannot be in M30.

The coordinator asked all members of the Advisory Board comments and suggestions on the MERCES project after the second year of the activities.

Paul Snelgrove declared to be very impressed by the work done. The WPs are advancing quite well; the objectives of the WPs are going wonderfully. He commented the presentations of the field work carried out in the shallow waters where experiments can be difficult and the result not clear but this is normal due to the environmental features of the shallow water areas (high spatial and variability of the key characteristics of the habitats and climate-driven events).
He suggested a major links of all WPs, especially from the field works (WPs2,3 and 4) to the WP6 (policy) and WP7 (society). He thanked the consortium for the work undertaken.

James Aronson also expressed his delight with achievement and on-going evolution of the consortium and its products. He said he was very interested by the question Katerina put to the WP2 representative about costs.
He would like to see more interaction between WPs2-3-4 to explore common issues, problems, and perspectives on the restoration actions in the different habitats. He also expressed the wish to see MERCES talking more with the Society for Ecological Restoration as information and discussion on ecological restoration of marine ecosystems are almost completely missing in the SER documents and the mainstream scientific literature on restoration. MERCES has an opportunity to help fill this gap. He stressed the importance of MERCES participation to SER meetings in Europe (Iceland, September 2018) and in South Africa next year.
He opened a discussion about the use of the term "habitat" and made a proposition: could the terms "marine landscape" and "seascape"? with respect to the marine environment. Chris Bostrom mentioned the 2017 book called "Seascape ecology", edited by Simon Pittmann, and published by Wiley-Blackwell. More discussion of nomenclature and basic concepts for marine ecosystem restoration at broad spatial scales seems worthwhile.

James also mentioned jobs, and noted that the idea of a Restoration Economy is gaining momentum, as new business and job opportunities abound. This notion includes all restoration-related administrations, managers and industries as well as practitioners, educators and researchers. Small companies could have a central role. Restoration could be included in the circular economy under development in many industrial sectors. All ecological services should be considered as well as the effects of their recovery for the local economy.

A general discussion with the SC members followed:
David Billett highlighted that a first industrial webinar and a first newsletter dedicated to industry have been done. The cost assessments are certainly a crucial topic for the success of the restoration activities.
Several examples were given to demonstrate show MERCES is catalysing the attention of the marine community. Chris McOwen would like to associate a new project about seagrass restoration in Turkey to MERCES. The project will start in the next months. Roberto Danovaro also mentioned as side effect of MERCES the submission of the AFRIMED project as he was invited to submit a project in this call. The project is also attracting industries, which want to share ship time or need our knowledge to explore solution in case of impact on the environment (SERPENT experience, the transadriatic pipeline…). Big companies have the interest to have an idea of the costs to restore ecosystems or how to restore in case of impacts both in the shallow waters but also in the deep sea. The cost-benefit analysis is crucial to quantify the costs of damages and the costs for the potential recovery of the good and services. The involvement of big companies in MERCES is already a reality with the presence of a STATOIL PhD student working with 2 MERCES beneficiaries, IFREMER and NIVA, on the ecological restoration in deep-sea ecosystems.
Quim Garrabou pointed out the importance of the participation of the general public, the society, stimulating their interest on the quality of the marine ecosystems where people live, work, spend free time. Barcelona is the example of a big city where all coastal areas of the city has been renewed and re-qualified during the preparation of the Olympic games in 1992. The citizens have re-discovered these city beaches.

AB contribution to MERCES

Roberto Danovaro asked the AB members to be guest editors of a MERCES special issue. James and Paul would like to have some time to consider this request. In particular they want to consult the other members of the Advisory board not present at the meeting. Roberto ensured his support during the editorial processes.

James suggested to create a new thematic group in the SER devoted to marine ecosystem restoration, similar to the one that already exists a section about to cover arid lands restoration. This could be an excellent opportunity to spread info to a large audience with special interest in the topic of the ecological restoration. He also invited the MERCES consortium to publish something about the project in the SER newsletter.

Annual meetings

The question of organizing the third MERCES annual meeting and to have a symposium dedicated to the restoration of marine ecosystems during the 8th World Conference on Ecological Restoration organized by the Society for Ecological Restoration (SER) in South Africa between August-September 2019 was discussed. This idea has been explored with the Project Officer and the Financial Officer. They agreed in principle with our request, provided that the project/the participants will cover the difference of costs (as compared to the organization in UK). Paul agrees with the idea at the condition that students can participate. James is very happy with this idea and reported that the inscription to the conference for students is cheap and that scholarships are available. But obviously several critical criteria have to be taken into consideration as the financial aspect, the time of flight, the need for visa…

Some participants do not understand the objective and the advantage of this proposal. Other participants are very enthusiastic for the global audience opportunity but uncertain with the costs.

The idea to have the third annual meeting in Europe in a more economic location than Edinburgh came out, in order to lower the costs of the annual meeting and allow a big MERCES delegation to attend the SER World Conference in Cape Town. The idea is to have a good participation of the MERCES project as in Montreal for the World Conference on Marine Biodiversity. Paris and Amsterdam have been considered. This solution will be examined, and location and potential dates will be proposed to the consortium as soon as possible. It was also requested to have a longer meeting next year, like 3-4 working days. As it will be the third year of the project, some more time to discuss the results would be appreciated.

A.O.B

No input

End of the meeting.

3.3 General Assembly

Marine Ecosystem Restoration in Changing European Seas
MERCES

Grant agreement n. 689518

General Assembly Meeting

24 May 2018 - ICM, Barcelona, Spain
Time: 11.00 – 12.00

Participants:

Project Coordinator: Roberto Danovaro
Project Management Office: Cristina Gambi & Emmanuelle Girardin
All members of the Consortium

Agenda

- Welcome
- Status of the project management
- Milestones and deliverables due in months 24-30
- Third annual meeting
- Technical and financial reports for the second reporting period (M13-M30)
- Update on MERCES special issue: Philosophical transactions of the Royal Society B
- Biological Sciences
- A.O.B

Welcome
Roberto Danovaro welcomed all members of the consortium. The agenda of the meeting was presented and approved by the General Assembly.

Status of the project management
•Collation of the inputs of the WP co-leaders for the 6 months (June 2017-November 2017) progress report released in December 2017;
•Submission of deliverables in ECAS and milestones in the MERCES website according to the deadlines scheduled in DoW;
•Preparation of the Annual meeting in Barcelona;
•Request of the contributions to the 6 months report covering the period December 2017 to May 2018.

Milestones and deliverables due in months 24-30
The coordinator presented the deliverables and milestones scheduled in the next 6 months:

Deliverable number	Title	WP	Lead Beneficiary	Type	Month
D3.3	Enhanced tools and indicators for restoration of shallow hard bottoms and mesophotic habitats	**3**	CSIC	Report	30
D6.3	Review on restoration, conservation and recovery of marine ecosystems in the four regional EU seas	**6**	WU	Report	30

The deliverables are in progress and all partners are working to complete and submit them on time.

Milestone number	Title	WP	Lead Participant	Month	Means of verification
MS32	Industry webinar 2. Restoration of hard seafloor and mesophotic habitats	**8, 3**	NIVA	26	Archived and available on MERCES website
MS17	GIS layers of habitats before after restoration (shallow soft hard bottom and deep-sea habitats)	**2, 3, 4, 5**	WCMC	30	GIS layers available on MERCES website restricted area

Third annual meeting
The coordinator reported the discussion and decision taken during the AB and SC meeting.
The question of organizing the third MERCES annual meeting and to have a symposium dedicated to the restoration of marine ecosystems during the 8th World Conference on Ecological Restoration organized by the Society for Ecological Restoration (SER) in South Africa between August-September 2019 was discussed. This idea has been explored with the Project Officer and the Financial Officer. They agreed in principle with our request, provided that the project/the participants will cover the difference of costs (as compared to the organization in UK). Paul agrees with the idea at the condition that students can participate. James is very happy with this idea and reported that the inscription to the conference for students is cheap and that scholarships are available. But obviously several critical criteria have to be taken into consideration as the financial aspect, the time of flight, the need for visa…Some participants do not understand the objective and the advantage of this proposal. Other participants are very enthusiastic but uncertain with the costs. It was also requested to have a longer meeting next year, like 3-4 working days. As it will be the third year of the project, some more time to discuss the results would be appreciated. The idea to have the third annual meeting in Europe in a more economic location than Edinburgh came out, in order to lower the costs of the annual meeting and allow a big MERCES delegation to attend the SER World Conference in Cape Town. The idea is to have a good participation of the MERCES project as in Montreal for the World Conference on Marine Biodiversity. Paris and Amsterdam have been considered. This solution will be examined, and location and potential dates will

be proposed to the consortium as soon as possible. It was also requested to have a longer meeting next year, like 3-4 working days. As it will be the third year of the project, some more time to discuss the results would be appreciated. The GA approved this decision. May is the best period for all participants. 12-14 MERCES members expressed intention to participate in the SER conference in South Africa.

Technical and financial reports for the second reporting period (M13-M30)
The second reporting period, as reported in the Grant Agreement, covers M13 to M30. A technical and a financial report are due within 60 days after the end of the reporting period.
The periodic report must include the following:
(a) a 'periodic technical report' containing:
(i) an explanation of the work carried out by the beneficiaries;
(ii) an overview of the progress towards the objectives of the action, including milestones and deliverables identified in Annex 1.
This report must include explanations justifying the differences between work expected to
be carried out in accordance with Annex 1 and that actually carried out.
The report must also detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated 'plan for the exploitation and dissemination of the results';
(iii) a summary for publication by the Agency;
(iv) the answers to the 'questionnaire', covering issues related to the action implementation and the economic and societal impact, notably in the context of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;
(b) a 'periodic financial report' containing:
(i) an 'individual financial statement' (see Annex 4) from each beneficiary and from each linked third party, for the reporting period concerned.
The beneficiaries and linked third parties must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2).
(ii) an explanation of the use of resources and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary and from each linked third party, for the reporting period concerned;
(iii) a 'periodic summary financial statement' (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including - except for the last reporting period - the request for interim payment.

The PMO proposed the following calendars:
•Submission of partners scientific progress reports to the WP co-leaders: 15/11/18
•Submission of relative contributions from the WP co-leaders to the PMO: 30/11/18
•Submission of draft financial statements via the Participant Portal: 30/12/18
•Submission of all final report documents to the EC by the Coordinator: 15/01/19

The Agency will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report, but payment is subject to the approval of the periodic report. The interim payment reimburses the eligible costs reported in the Periodic Report. The only limitation is that the amount of the interim payment(s) cannot exceed 90% of the maximum grant amount minus pre-financing (and minus previous interim payments).
A project review (provisional date early February 2019) related to the second reporting period is planned.

Update on MERCES special issue: Philosophical transactions of the Royal Society B Biological sciences
List of contributions:
1. INTRODUCTION PAPER, Lead author: GUEST EDITORS, (? to confirm)
2. Review: Marine vs Terrestrial restoration, Roberto Danovaro & James Aronson
3. The significance of plant-bivalve interactions in aquatic and marine restoration, Lead author: Karine Gagnon, paper type: review paper
4. An expert assessment of habitat features and their influence on the restoration potential of degraded, key marine habitats in Europe, Lead author: Trine Bekkby, paper type: scoping paper/opinion piece

5. Depletion and recovery of marine ecosystems: linking past ecosystem trajectories to recovery potentials, Lead author: Marta Coll & Heike K. Lotze, Paper type: Original research
6. Key eco-evolutionary processes enhancing the effectiveness of restoration action across ecological gradients in marine temperate rocky habitats, Lead author: J. Garrabou, S. Fraschetti, Paper type: Review
7. Success stories in restoration actions across coastal-marine ecosystems, Lead author: S Fraschetti, Paper type: Review
8. Are we ready for scaling up on Mediterranean macroalgal restoration? Lead author: L. Tamburello, paper type: Original research
9. Old underwater photos reconstruct historical changes in Mediterranean seascapes, Lead author: F. Torsani, paper type: hybrid paper (review with a small amount of new data)
10. Predominant activities and pressures acting on marine habitats: regeneration, mitigation, restoration and blue growth opportunities, Lead author: Nadia Papadopoulou, paper type: scoping paper / opinion piece
11. The economics of marine ecosystem restoration, Lead author: Rolf Groeneveld, Paper type: Review
12. Restoration for Sustainable Development, Lead author: Hazel Thornton, paper type: Opinion piece
13. Ecological restoration of deep sea coral populations, Lead author: Maria Montseny, Paper type: Review

Roberto proposed to include in this special issue international experts to enlarge the interest and the visibility of the project outputs to a widest audience.

This is the list of potential international contributors:
Forrester, Graham E.: gforrester@uri.edu
Roberts, Dai R.: d.roberts@qub.ac.uk
Denise L. Breitburg: breitburgd@si.edu
Cebrián Just: jcebrian@disl.org
Silliman, Brian Reed: brian.silliman@duke.edu
Guest, James R.: james.guest1@ncl.ac.uk
Coen, Loren D.: lcoen1@fau.edu
Orth, Robert J.W.: jjorth@vims.edu
Gomez, Edgardo D.: edgomezph@yahoo.com

The list can be implemented. Suggestions of other contributors are welcome. The list will be sent to the AB members to ask for additional names.

NEXT PROPOSAL SUBMISSION:
Submission by 16th July for a decision in September 2018
Submission by 15th October for a decision in December 2018
Submission by 18th January for a decision in March 2019

The coordinator also made the proposal of a new special issue in Restoration Ecology. This possibility will be examined. It was suggested to explore the possibility to create a section about marine in Restoration Ecology.

MERCES website: inputs
The contributions and inputs (events, sampling activities, participation to special initiatives) of all partners are still needed! Please inform ECOREACH and the MERCES PMO for a continuous update of the activities.

Call for photos and videos during the events and field works is always open!

A.O.B
The next SER Europe conference will take place in 2020 in Valencia. When the dates will be known (probably September 2020), an extension of the project can be asked to the EC.

End of the meeting.

3.4 Steering Committee

Marine Ecosystem Restoration in Changing European Seas
MERCES

Grant agreement n. 689518

Steering Committee Meeting

24 May 2018 - ICM, Barcelona, Spain
Time: 18.30 – 19.30

Participants:

Project Coordinator: Roberto Danovaro

Project Management Office: Cristina Gambi & Emmanuelle Girardin

WPs co-leaders:

WP1 Nadia Papadopoulou & Anthony Grehan

WP2 Christoffer Boström & Johan van de Koppel

WP3 Simonetta Fraschetti & Joaquim Garrabou

WP4 Telmo Morato & Andrew K. Sweetman

WP5 Chris McOwen & Trine Bekkby (invited)

WP6 Jan P.M. van Tatenhove & Ronan Long

WP7 Wenting Chen & Stephen Hynes (both invited)

WP8 David Billett & Eva Ramirez-Llodra

WP9 Martina Milanese & Silvia Bianchelli

Agenda:

- Welcome and apologies for absence
- Update of each WP progress activities
- Milestones and deliverables due in months 24-30
- Third annual meeting
- Technical and financial reports for the second reporting period (M13-M30)
- Update on MERCES special issue: Philosophical transactions of the Royal Society B
- Biological Sciences
- Date for the next Steering Committee meeting by skype
- A.O.B

Welcome and apologies for absence
Unfortunately, Andrew Sweetman was not able to join the meeting since he was engaged in a cruise.

Update of each WP progress activities
A quick update was given by the WP leaders during the meeting.

WP
WP1 Nadia Papadopoulou & Anthony Grehan
WP2 Christoffer Boström & Johan van de Koppel
WP3 Simonetta Fraschetti & Joaquim Garrabou
WP4 Telmo Morato
WP5 Chris McOwen
WP6 Jan P.M. van Tatenhove & Ronan Long
WP7 Stephen Hynes & Wenting Chen
WP8 David Billett & Eva Ramirez-Llodra
WP9 Martina Milanese & Silvia Bianchelli

Milestones and deliverables due in months 24-30
Roberto Danovaro reported the progresses of the project presenting the deliverables submitted and the milestones achieved in the period M13 to M24.
The list of the deliverables is reported below:

Deliverable number	Title	WP	Lead Beneficiary	Type	Month
D4.1	Review on the principles of deep-sea restoration and on the ecological benefits of passive and active restoration	**4**	HCMR	Report	24
D7.1	Social acceptance of restoration activities	**7**	HCMR	Report	24
D9.4	Second year report on networking, public engagment and communication activities including collation of products and e-MERCES tools	**9**	GAIA	DEC	24
D10.4	Minutes of the second Annual Meeting (internal WP meetings, SC, GA, AB)	**10**	UNIVPM	Report	24
D3.3	Enhanced tools and indicators for restoration of shallow hard bottoms and mesophotic habitats	**3**	CSIC	Report	30
D6.3	Review on restoration, conservation and recovery of marine ecosystems in the four regional EU seas	**6**	WU	Report	30

The deliverables are in progress and all partners are working to complete and submit them on time.

Milestone number	Title	WP	Lead Participant	M	Means of verification
MS41	Second annual meeting	**10**	UNIVPM	24	Summary available on the webpage for public and media
MS32	Industry webinar 2. Restoration of hard seafloor and mesophotic habitats	**8, 3**	NIVA	26	Archived and available on MERCES website
MS17	GIS layers of habitats before after restoration (shallow soft hard bottom and deep-sea habitats)	**2, 3, 4, 5**	WCMC	30	GIS layers available on MERCES website restricted area

As MS32 is due at M26, which occurs during the summer time, the lead partner requested to postpone it to September (M28). The request will be made to the PO.
The milestones are in progress and all partners are working to complete and achieve them on time.
WP8 co-leaders suggested to postpone the webinar (MS32) to M27 (September 2018) to avoid the summer holidays break that could limit the audience.
WP5 co-leaders suggested to remove "after" from the title of the milestone M17 since this is a typo. The "after" restoration implies the end of the project and the time of submission cannot be in M30.

Third annual meetings
This point was discussed with the AB members during the AB meeting. The question of organizing the third MERCES annual meeting and to have a symposium dedicated to the restoration of marine ecosystems during the 8th World Conference on Ecological Restoration organized by the Society for Ecological Restoration (SER) in South Africa between August-September 2019 was discussed. This idea has been explored with the Project Officer and the Financial Officer. They agreed in principle with our request, provided that the project/the participants will cover the difference of costs (as compared to the organization in UK). Paul agrees with the idea at the condition that students can participate. James is very happy with this idea and reported that the inscription to the conference for students is cheap and that scholarships are available. But obviously several critical criteria have to be taken into consideration as the financial aspect, the time of flight, the need for visa…Some participants do not understand the objective and the advantage of this proposal. Other participants are very enthusiastic for the global audience opportunity but uncertain with the costs. The idea to have the third annual meeting in Europe in a more economic location like Edinburgh came out, in order to lower the costs of the annual meeting and allow a large MERCES delegation to attend the SER World Conference in Cape Town. The idea is to have a good participation of the MERCES project, like in Montreal for the World Conference on Marine Biodiversity. Paris and Amsterdam have been also considered. This solution will be examined, and location and potential dates will be proposed to the consortium as soon as possible. It was also requested to have a longer meeting next year, like 3-4 working days. As it will be the third year of the project, some more time to discuss the results would be appreciated.

Technical and financial reports for the second reporting period (M13-M30)
The second reporting period, as reported in the Grant Agreement, covers M13 to M30. A technical and a financial report are due within 60 days after the end of the reporting period.
The periodic report must include the following:
(a) a 'periodic technical report' containing:
(i) an explanation of the work carried out by the beneficiaries;
(ii) an overview of the progress towards the objectives of the action, including milestones and deliverables identified in Annex 1.
This report must include explanations justifying the differences between work expected to
be carried out in accordance with Annex 1 and that actually carried out.
The report must also detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated 'plan for the exploitation and dissemination of the results';
(iii) a summary for publication by the Agency;
(iv) the answers to the 'questionnaire', covering issues related to the action implementation and the economic and societal impact, notably in the context of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;
(b) a 'periodic financial report' containing:
(i) an 'individual financial statement' (see Annex 4) from each beneficiary and from each linked third party, for the reporting period concerned.
The beneficiaries and linked third parties must declare all eligible costs, even if - for actual costs, unit costs and flat-rate costs - they exceed the amounts indicated in the estimated budget (see Annex 2).
(ii) an explanation of the use of resources and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary and from each linked third party, for the reporting period concerned;
(iii) a 'periodic summary financial statement' (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and

including - except for the last reporting period - the request for interim payment.

The PMO proposed the following calendars:
•Submission of partners scientific progress reports to the WP co-leaders: 15/11/18
•Submission of relative contributions from the WP co-leaders to the PMO: 30/11/18
•Submission of draft financial statements via the Participant Portal: 30/12/18
•Submission of all final report documents to the EC by the Coordinator: 15/01/19

The Agency will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report, but payment is subject to the approval of the periodic report. The interim payment reimburses the eligible costs reported in the Periodic Report. The only limitation is that the amount of the interim payment(s) cannot exceed 90% of the maximum grant amount minus pre-financing (and minus previous interim payments).

A project review (provisional date early February 2019) related to the second reporting period is planned.

Update on MERCES special issue: Philosophical transactions of the Royal Society B Biological sciences
List of contributions:
1. INTRODUCTION PAPER, Lead author: GUEST EDITORS, Roberto Danovaro & James Aronson
2. Review: Marine vs Terrestrial restoration, Roberto Danovaro & James Aronson
3. The significance of plant-bivalve interactions in aquatic and marine restoration, Lead author: Karine Gagnon, paper type: review paper
4. An expert assessment of habitat features and their influence on the restoration potential of degraded, key marine habitats in Europe, Lead author: Trine Bekkby, paper type: scoping paper/opinion piece
5. Depletion and recovery of marine ecosystems: linking past ecosystem trajectories to recovery potentials, Lead author: Marta Coll & Heike K. Lotze, Paper type: Original research
6. Key eco-evolutionary processes enhancing the effectiveness of restoration action across ecological gradients in marine temperate rocky habitats, Lead author: J. Garrabou, S. Fraschetti, Paper type: Review
7. Success stories in restoration actions across coastal-marine ecosystems, Lead author: S Fraschetti, Paper type: Review
8. Are we ready for scaling up on Mediterranean macroalgal restoration? Lead author: L. Tamburello, paper type: Original research
9. Old underwater photos reconstruct historical changes in Mediterranean seascapes, Lead author: F. Torsani, paper type: hybrid paper (review with a small amount of new data)
10. Predominant activities and pressures acting on marine habitats: regeneration, mitigation, restoration and blue growth opportunities, Lead author: Nadia Papadopoulou, paper type: scoping paper / opinion piece
11. The economics of marine ecosystem restoration, Lead author: Rolf Groeneveld, Paper type: Review
12. Restoration for Sustainable Development, Lead author: Hazel Thornton, paper type: Opinion piece
13. Ecological restoration of deep sea coral populations, Lead author: Maria Montseny, Paper type: Review

Roberto proposed to include in this special issue international experts to increase the appeal and the visibility of the project outputs to a wider audience.
This is the list of potential international contributors:
Forrester, Graham E. gforrester@uri.edu
Roberts, Dai R. d.roberts@qub.ac.uk
Denise L. Breitburg, breitburgd@si.edu
Cebrián Just jcebrian@disl.org
Silliman, Brian Reed, brian.silliman@duke.edu
Guest, James R., james.guest1@ncl.ac.uk
Coen, Loren D. , lcoen1@fau.edu
Orth, Robert J.W. jjorth@vims.edu
Gomez, Edgardo D., edgomezph@yahoo.com

All SC members are invited to propose other contributors. The list will also be sent to the AB members to ask for additional names.

NEXT PROPOSAL SUBMISSION:
Submission by 16th July for a decision in September 2018
Submission by 15th October for a decision in December 2018
Submission by 18th January for a decision in March 2019

The coordinator also made the proposal of a new special issue in Restoration Ecology. This possibility will be examined. Some members of the consortium agreed that restoration ecology is the outlet to present the project outputs to experts on the ecological restoration.

Date of the next Steering Committee by skype
The next SC meeting will be held at M30, November 2018. A doodle will be sent next September to the SC members to decide the exact date.

A.O.B
Jan van Tatenhove informed the coordinator last April that he has been appointed as professor of Marine Governance and Director of the IFM – Centre for Blue Governance at Aalborg University in Denmark. He will leave the Wageningen University on the 15th of August. After consulting the PO and Financial Officer it has been agreed that no amendment is needed and that Prof. van Tatenhove can keep the role of WP6 leader. Some budget can be transferred from WU to AAU to cover the coordination task expenses. Amount needs to be agreed and communicated to the FO.

End of the meeting.

Annex 1: Conference Abstracts

Marine Ecosystem Restoration in Changing European Seas

Second Annual meeting

Barcelona, Spain
23rd-25th May 2018

Conference Programme and Abstracts

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689518. This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

Oral Presentations

Wednesday 23rd May 2018

Key Note

Transitional habitats as an opportunity to understand drivers of ecosystem functioning

Paul V.R. Snelgrove

Network Director, Canadian Healthy Oceans Network, Memorial University, St. John's, NL Canada E-mail: psnelgro@mun.ca

Transitional habitats, by definition, encompass ecotones that typically vary in ecosystem functioning, species composition, and diversity. Increasing interest by ecologists in links between ecosystem functioning and living organisms, and biodiversity in particular, has produced a wide range of experimental studies, particularly in terrestrial environments. However, the open nature of ocean ecosystems complicates such experiments, resulting in studies that either greatly simplify natural systems (testing small subsets of species from a given environment in small containers) or focus on naturally simple (low diversity) systems with unknown utility for understanding more complex systems. Using examples from the NSERC Canadian Healthy Oceans Network and beyond that span the last decade, and habitats from sediments to eelgrass to deep-water corals, I consider how experiments along natural gradients such as those in transitional habitats offer an opportunity to test biodiversity-ecosystem functioning relationships under real-world conditions, and thus advance ecological theory and understanding of the potential ramifications of ocean change. Studies of transitional habitats can therefore not only advance understanding of those habitats, but also provide a model system to understand functioning of other habitats.

WP1

State of the knowledge on marine habitat restoration

Papadopoulou N[1*], Sevastou K[1], Smith CJ[1], Gerovasileiou V[1], Dailianis T[1], Fraschetti S[2], Guarnieri G[2], McOwen C[3], Billett D[4], Grehan A[5], Bakran-Petricioli T[6], Bekkby T[7], Bilan M[8], Boström C[9], Carriero-Silva M[8], Carugati L[10], Cebrian E[11], Cerrano C[10], Danovaro R[10], Eronat EGT[12], Gagnon K[9], Gambi C[10], Kipson S[6], Kizilkaya IT[12], Kotta J[13], Linares C[14], Milanese M[15], Morato T[8], Papa L[2], Rinde E[7], Sarà A[15].

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MERCES project participants have completed their major review of marine habitat restoration. This review actually consists of several separate individual reviews, both of restoration related subjects and restoration work.
i. Review of restoration terminology particularly the family of restoration actions from hands-off to hands-fully-on work.
ii. Review of unassisted restoration: from removal of threats through regulatory management or removing/adding barriers in an intervention, to ecosystem protection.
iii. Review of global peer-reviewed studies: assessing and summarizing methodological trends to provide a framework on where and how restoration has been carried out and with what outcomes.
iv. Review of recent European restoration projects carried out in the last decade.
v. Review of 10 key European habitats/species covering the most current restoration methods, approaches, timescales, bottlenecks/deal-breakers and up-scaling possibilities.
vi. Review on economic costs and benefits of restoration.
Besides the specific reviews, several issues are discussed that cross different boundaries or warranted further development:
• The place, or not, of artificial reefs in restoration.
• The target of ecological restoration is an ecosystem, but the interventions are primarily targeted at species.
• One driver of restoration is large-scale disaster: such single events may require large-scale response, covering multiple ecosystems and concerted management efforts.
• Controlling threatening activities by removal of specific threats.
• The mitigation hierarchy is a set of prioritised steps to alleviate environmental harm as far as possible through avoidance, minimisation and rehabilitation/restoration.
• Alternative strategies through 'soft engineering' ('Nature-based Solutions', 'Building with Nature' and 'Ecological Engineering').
• Technology and Innovation: environmental challenges, new technologies, volunteer engagement and the use of social media in enhancing campaigns.
We also look at the key question: whether or not to undertake restoration action in relation to ecological features effecting restoration, timescales, spatial scales and issues in costing/valuing restoration.

WP1

Restoration and MERCES Key Habitats/Species: approaches, timescales, bottlenecks and up-scaling

Papadopoulou N[1]*, Bakran-Petricioli T[2], Bekkby T[3], Bilan M[4], Boström C[5], Carriero-Silva M[4], Carugati L[6], Cebrian E[7], Cerrano C[6], Danovaro R[6], Fraschetti S[8], Eronat EGT[9], Gagnon K[5], Gambi C[6], Gerovasileiou V[1], Kipson S[2], Kizilkaya IT[9], Kotta J[10], Linares C[11], Milanese M[12], Morato T[4], Rinde E[3], Sarà A[12], Sevastou K[1], Smith CJ[1]

[1]HCMR, [2]PMF-ZAGREB, [3]NIVA, [4]IMAR-UAz, [5]ÅAU, [6]UNIVPM, [7]UdG-CSIC, [8]CONISMA, [9]MCS, [10] UTARTU, [11]UB, [12]GAIA
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In previous works, we have looked at key habitat features (dynamics, connectivity, structural complexity and vulnerability) pertaining to restoration; we have also looked at pressure/activity linkages and habitat responses to pressures. In the latest work we review the extent to global restoration efforts for these species/habitats, restoration approaches and response variables. We include notes on current methods and approaches used, on timescales to success and on bottlenecks/deal breakers and means/potential for up-scaling restoration toe the degree of degradation. We present this information for 12 cases; Kelp forests in Norway, Cystoseira forests in Spain, seagrass meadows in Norway, the Baltic and the Mediterranean, *Pinna nobilis* in Croatia, coralligenous habitats in Spain, red corals in Italy, sponges in Italy, deep sea corals in the Azores and deep-sea seamounts in Italy. We discuss commonalities and differences between the case studies in the framework of restoration.

WP1

A literature review on the economic cost and benefits of marine restoration

Sevastou Katerina[1*], Papadopoulou Nadia[1], Smith Chris[1] & MERCES partners

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A literature review has been undertaken on the economic costs and benefits of marine restoration. A catalogue was compiled based mainly on a global review of peer-reviewed studies from the last 25 years. The marine restoration costs and benefits MERCES catalogue consists of 118 entries extracted from 103 individual documents. For costs, 72% of the catalogue entries provide cost data in monetary terms, mainly concerning a part of restoration costs. The rest concern comparative cost estimations (e.g., in relation to other restoration techniques, types or approaches), or simply an opinion on possible costs (e.g. low, inexpensive, etc.). The studies concern primarily restoration actions for degraded marine environments (88%) and mostly biological techniques, such as planting and transplanting. Studies with cost data focused on rocky habitats, followed by soft-bottom habitats and estuaries/wetlands. With regard to restoration benefits, most discussed ecological benefits, while approximately 40% expressed an opinion on potential economic benefits as an outcome of a reduction of restoration costs through a suggested technique. Our study highlighted the lack of comprehensive cost data, the inconsistent way of reporting marine restoration cost and benefit data, and the insufficient information on restoration outcome.

WP2

Applying biodegradable establishment structures for mussel and seagrass restoration

Tjisse van der Heide* [NIOZ/RuG/RU], Marjolijn Christianen [RU/WUR], Ralph Temmink, Greg Fivash [RU], Tjeerd Bouma [NIOZ], Han Olff [RuG], Marieke van Katwijk [RU], Jannes Heusinkveld [FwC], Wouter Lengkeek [BuWa], Karin Didderen [BuWa], Laura Govers [RuG/NIOZ/RU]

NIOZ: Royal Netherlands Institute for Sea Research, RU: Raboud University, RuG:= University of Groningen, WUR: Wageningen University Research, FwC: Fieldwork Company, BuWa: Bureau Waardenburg
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Both mussels and seagrasses are foundation species that facilitate themselves by forming complex reefs and dense meadows, respectively, that e.g. stabilize sediments, attenuate currents and waves, and reduce turbidity. Such self-sustaining feedbacks can seriously hamper restoration, because they typically only work sufficiently beyond a certain minimum organism patch size and/or density. Below these thresholds, unpredictable losses can occur, while establishment is hampered. In multiple experiments started last year, we investigate whether biodegradable establishment structures (BESE-elements) can stabilize sediments for seagrass, and provide attachment substrate and reduce predation for mussel recruits, to successfully 'jump-start' these habitats. Preliminary results suggest that recruitment of mussels, and also other hard substrate species including oysters, barnacles, and anemones is greatly enhanced on BESE. Results thus far for seagrass appear to depend on local conditions, with BESE stimulating expansion rates of transplants in more dynamic conditions, while effects were neutral to slightly negative in more benign environments. Overall, our results to date suggest that BESE is suitable for restoration of mussel beds, while for seagrasses it should only be applied in environments where sediment stabilization is critical for growth and survival.

WP2

Mytilus -Zostera field experiments in Estonia, Finland, Norway

Karine Gagnon[1]*, Christoffer Boström[1], Hartvig Christie[3], Georg Martin[2], Liina Pajusalu[2] and Eli Rinde[3]

1 Åbo Akademi University, Environmental and Marine Biology, Artillerigatan 6, 20520 Åbo, Finland
2 Estonian Marine Institute, University of Tartu, Mäealuse 14, 12618 Tallinn, Estonia
3 Norwegian Institute for Water Research (NIVA), Gaustadalléen 21, NO-0349 Oslo
**Email: karine.gagnon@abo.fi*

The distribution of eelgrass *Zostera marina* meadows are globally in serious decline mainly due to multiple human activities. So far, too little attention has been paid to how plant-bivalve interactions affect the success of marine ecosystem restoration. The present study focuses on the interactions between *Z. marina* and *Mytilus edulis/trossulus* in the context of applied restoration in northern Europe. In Estonia, Finland and Norway the Mytilus-Zostera field experiments are being conducted in two different sites per country: exposed and sheltered. In all sites 30 experimental plots were set up within 6 different treatments. The field experiments were started in May/June 2017 and the first sampling took place in the beginning of September. All experimental sites were left in place over the winter and will be visited in May/June 2018 to get better knowledge of the restoration success. In all studied sites, the mussels have decreased or have been completely lost in experimental plots, especially in exposed sites since the plots were established. After the first sampling period, the preliminary results showed that the success of Z. marina restoration was highly site-specific. In Estonia, the number of eelgrass shoots have increased in the sheltered site while the number of shoots have decreased in the exposed site in the most of plots since they were established. In Finland, the number of eelgrass shoots have decreased in both sites, while in Norway eelgrass shoots increased in the exposed site but decreased in the shelter site. An aquarium experiment in Finland showed that mussel addition could increase growth, but in order to actually put this into practice, we must determine ways to successfully anchor mussels into soft substrates. Complementary experiments in summer 2018 will focus on developing methods for anchoring seagrass and mussels together in restoration plots, using various different biodegradable materials.

WP2

Exploring interactions between the bivalve *Pinna nobilis* and seagrasses: implications for the restoration

Silvija Kipson[1], Barış Akçali[2], Vahit Alan[3], Tatjana Bakran-Petricioli[1], Fethi Bengil[3,4], Laura Carugati[5], Roberto Danovaro[5], Cristina Gambi[5], Marco Lo Martire[5], İnci Tüney Kizilkaya[3,6], Elisabeth Grace Tunka Bengil[3]

1 Department of Biology, Faculty of Science, University of Zagreb, Rooseveltov trg 6, 10000 Zagreb, Croatia
2 Dokuz Eylül Institute of Marine Sciences and Technology, İnciraltı, İzmir, Turkey
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4 Girne American University, Marine School, Yolu, Girne, TRNC via Mersin 10, Turkey
5Università Politecnica Delle Marche, Italy
6 Ege University, Faculty of Science, Department of Biology 35100, Bornova, İzmir, Turkey
**Email: silvija.kipson@biol.pmf.hr*

Relatively low restoration success of endangered seagrass meadows to date and a worldwide evidence of positive feedbacks between bivalves and seagrasses triggered exploration of these interactions within the MERCES project, with the aim to improve future seagrass restoration actions as well as conservation measures for endangered habitat-forming bivalve species. In the Mediterranean Sea, the endemic and strictly protected noble pen shell *Pinna nobilis*, one of the largest bivalves in the world, lives partially buried in the sediment, anchored by byssus threads, whereas the rest of the shell protrude vertically from the sediment bottom. Hence, its way of life can be considered as sedentary and "semi-infaunal" and presents a peculiar case to examine bivalve-seagrass interactions. To date, the majority of studies on interactions between *P. nobilis* and seagrasses have been purely correlative, mainly exploring the relation between bivalve population density and habitat preference. Whilst scarce experimental work does show some positive effects seagrasses can have on pinnids, e.g. by providing shelter from strong hydrodynamism, virtually nothing is known on the effect *P. nobilis* can have on seagrasses. Here, we will present ongoing experimental work carried out at MERCES sites in Italy, Croatia and Turkey, designed to tackle the nature of interactions between these important but highly endangered Mediterranean habitat forming species and to explore their potential in the restoration context.

WP2

Patchiness as indicator for seagrass meadow restoration success and resilience

Koen Siteur[1,2], Quan-Xing Liu[2], Tjisse van der Heide[1] & Johan van de Koppel[1]

1 Royal Netherlands Institute for Sea Research (NIOZ), The Netherlands
2 East China Normal University (ECNU), The Netherlands
**Email: koen.siteur@nioz.nl*

Positive feedbacks between seagrasses and their biotic and abiotic environment are thought to play a key role in seagrass restoration success. Within WP2 we aim to determine the spatial scale of restoration efforts required to overcome these positive feedbacks, and to provide indicators for restoration success and for the resilience of restored meadows. I will present the results of a model study on seagrass meadows, whose dynamics are governed by the interplay of grazing, nutrient limitation and sediment deprivation. The model highlights that competition between seagrass patches controls the spatio-temporal dynamics of establishing and established seagrass meadows. Patch size and proximity of patches determines the outcome of competition. A critical patch size, below which patches will shrink over time, can be estimated from field data. The modelled patch dynamics result in characteristic patch-size distributions which can be used to assess the resilience of restored seagrass meadows using aerial imagery.

WP3

Are we ready for scaling up on Mediterranean macroalgal restoration?

Tamburello L[1*], Falace A[2], Guarnieri G[1], Papa L[1], Basconi L[1], Zampardi S[1], Fraschetti S[1,3]

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Small-scale experiments (cms, meters) have recently provided promising outcomes in terms of restoration of macroalgal forests. No attempt has been made to promote restoration action at larger scales. Here, we experimentally investigated the potential of success of the transplanting of *Cystoseira amentacea* germlings on a scale of 10 - 100's kms. In the mid-littoral fringe of the rocky shore of Apulia (Italy), we selected donor and recipient populations in locations with continuous or patchy distribution of *C. amentacea* canopy. In each location, we tested the effects of adults and the exclusion of macro-grazers (salema fish and sea urchins) on *Cystoseira* juveniles. We assessed the most critical determinants of mortality for germlings, from the culture in the laboratory to transplanting in the field, including the unexpected pressure of micro-grazers (e.g. crustaceans, mollusks). The quantification of the minimum number of settling units for an intervention at large scale was also assessed. Despite the high mortality observed at all locations, survival of *Cystoseira* juveniles was consistently favored by the absence of adults and the exclusion of grazers. Our results identify the key ecological knowledge and the methodological issues to be carefully considered to support large scale restoration interventions.

WP3

Enhancing the effectiveness of restoration actions in a changing ocean: insights from a transregional thermotolerance experiment

Jean-Baptiste Ledoux (CSIC, CIIMAR), Daniel Gomez Gras (CSIC), Tyler S. Allioto (CNAG), Tatjana Bakran-Petriciolo (PMF-ZAGREB), Joana Boavida (CCMAR), Carlo Cerrano (DiSVA-UNIVPM), Eliana Ferreti (GAIA), Marta Gut (CNAG), Silvija Kipson (PMF-ZAGREB), Cristina Linares (UB), Paula López-Sendino (CSIC), Angel López-Sanz (CSIC), Martina Milanese (GAIA), Ignasi Montero-Serra (UB), Diogo Paulo (CCMAR), Ester Serrão (CCMAR), Joaquim Garrabou* (CSIC).
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Understanding the response of organisms facing on-going climate change is critical to buffer the current biodiversity crisis. While the Mediterranean Sea is recognized as a hotspot of marine biodiversity, it should also undergo one of the largest changes in climate worldwide with the increase of hot extreme events throughout the region. Mediterranean coralligenous communities are a text book example illustrating this duality. Indeed, these communities, dominated by long lived sessile invertebrates such as octocorals and sponges, are some of the richest communities of the Mediterranean. In the mean-time, they were deeply affected by recent warming-induced large-scale mortality events, which dramatically impacted shallow waters (0-50 m depth) of the North Western Mediterranean. Considering the slow population dynamics of many impacted species, these events unambiguously question the future coralligenous communities. In this context, the main objective of the present study was to characterize the response to thermal stress of the red gorgonian, *Paramuricea clavata* (Risso, 1826) (Cnidaria, Anthozoa, Octocorallia). *Paramuricea clavata* is a habitat forming octocoral from the coralligenous, which was severely impacted by the mortality events. We carried out a common garden experiment in aquaria using twelve populations from five different regions (Catalunya, Corsica, Northern Italy, Croatia and Southern Portugal) separated by tens of meters to hundreds of kilometers within the North Western Mediterranean and the Atlantic Ocean. These twelves populations inhabit contrasting temperature regimes at the regional and local scales. The aims of this study were: 1) to further the acquisition of basic information about the thermotolerance features of *P. clavata* by monitoring colonies tissue necrosis in response to heat stress; and 2) to evaluate the role of biological processes (with a focus on local adaptation, genetic drift and acclimatization) in the differential responses of individuals/populations to thermal stress by conducing whole genome sequencing analyses. Here, we will present the results of the experiment and the state of progress of the whole genome sequencing analyses. We will discuss the implications of those results for restoration action of the coralligenous community in the context of on-going climate change.

WP3

Regional environmental conditions determine tolerance to future warming of a marine macroalgae forests

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In the Mediterranean Sea, many species of Cystoseira, which are important habitat-forming species on shallow rocky bottoms, have gone missing from many coastal areas, impairing essential ecosystem services. *Cystoseira crinita* forests thrive in very shallow waters from sheltered environments and are currently regressing in several European shores. In the actual scenario of ocean warming it is essential to determine the vulnerability of these populations to thermal stress in order to design future conservation actions. Since the response of this macroalgae to thermal stress may be site-specific, here we compared the thermal tolerance of populations dwelling in the coldest and warmest areas of the Mediterranean Sea. We show that *C. crinita* populations from warmer areas (Eastern Mediterranean) had a temperature tolerance threshold 2ºC higher than Northwestern Mediterranean populations. There is a strong correlation between the observed differential phenotypic responses and the local temperature regimes experienced by each population. This is the first evidence for the role of thermal history in shaping the thermotolerance responses marine habitat-forming macroalgae under contrasting temperature environments.

WP3

Exploring facilitation processes to enhance the effectiveness of coralligenous restoration actions

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The role of competition, predation and abiotic factors in driving ecological and evolutionary processes is well explored in marine ecosystems. Nevertheless, facilitation i.e. positive species interactions, received much less attention. Here we explore how actions involving multispecific settings could enhance the effectiveness of future restoration initiatives. More specifically, we focus on highly valuable and threatened coralligenous assemblages and test if arborescent, habitat-forming species can affect the survival and growth of co-occurring encrusting and massive ones. For that purpose, we designed an experiment using the red gorgonian *Paramuricea clavata* and bryozoans, especially *Pentapora fascialis*, as model organisms. The experiment, replicated in Spain, Italy and Croatia, is based on the comparison between series of 0,25 m2 experimental plots. Four experimental treatments are considered, including addition of bryozoan recruitment enhancers (plastic grids) with and without gorgonian colonies and controls (empty and artefact ones) for a total of 4 replicates per treatment. The hypothesis is that the arborescent layer (15 *P. clavata* fragments up to 20 cm in maximal height per experimental plot) could facilitate the settlement of bryozoan colonies on plastic grids within the experimental plots, and enhance their survival and growth. The experiment was initiated in May-July 2017 and it is still ongoing. Biological and ecological processes in coralligenous habitats are generally slow, and it can take long before structured populations and communities can be restored. The appropriate identification of species able to facilitate such processes is an important step to enhance the effectiveness of restoration approaches.

WP3

Restoration of collapsed kelp ecosystems – MERCES WP3 pilot study

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During the 1970s, luxuriant kelp forests along the northern Norwegian (NE Atlantic) coast were invaded and overgrazed by green sea urchins (*S. droebachiensis*). The catastrophic event left behind a barren state of the ecosystem, maintained for decades by high urchin densities. Recently, urchin populations are collapsing and recovery from barren ground to kelp forest is taking place in southern parts of the overgrazed area. However, the recovery is not uniform and a mosaic of remaining barrens indicates strong feedback mechanisms preventing natural kelp recovery, although the grazing pressure from the urchins has decreased significantly. Low recruitment success of kelps, due to either low supply of kelp propagules or herbivory of seedlings by remaining urchins, may explain lack of kelp recovery. MERCES have provided an opportunity to test the restauration potential of destructed kelp forests. By transplanting kelp to barren areas we aim at restoring key ecosystem functions, facilitate kelp recruitment and kelp recovery. By reintroducing adult kelps and recreating the habitat structure and spore supply that the kelp forest provides, the reinforcing feedbacks maintaining the barren state might be overcome so that natural kelp recovery can occur.

WP3

Large-scale sea-urchin eradication drives a rapid recovery of Cystoseira populations

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During the spring of 2017, we carried out the removal of two species of sea urchins *Paracentrotus lividus* and *Arbacia lixula* from two large (>100m2) barren areas to promote the restoration of *Cystoseira elegans* macroalgal forests in the Parc Natural of Montgrí, Illes Medes i Baix Ter (Spain, NWMediterranean Sea). The two barren areas are located under two management schemes within Parc Natural del Montgrí, Illes Medes i Baix Ter allowing testing for the potential differential success under different fishing pressure. The two barren areas were located between 5-10m depth (with high densities of sea-urchins (20-25 ind/m^2) and null cover of macroalgal species). All sea urchins found within the pilot sites (> 100 m^2) were removed. After removal, in-situ recruitment enhancement techniques of the macroalgae Cystoseira elegans were setup in view to promote restoring macroalgal forest in the barren areas. During the pilot action, we have assessed the recruitment of *C. elegans* and their survival. One year after, macroalgal forests seem to be completely recovered in both barren areas where pilot actions were performed and we are currently installing 6 more identical large-scale actions in order to assess the temporal and spatial variability of the success of these restoration actions.

WP3

Evaluation of the best techniques to restore coralligenous communities through transplants of sponges and gorgonians in different conditions

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Coralligenous assemblages host a huge variety of species, some of them symbiotic with autotrophic organisms. Several pressures are rapidly decreasing its biodiversity compromising mainly the largest erect and/or massive species. To restore coralligenous' integrity we focused on transplanting portions of massive sponges (*Spongia officinalis*, *S. lamella*, *Petrosia ficiformis*) and gorgonians (*Eunicella singularis*, *E. cavolini*, *Corallium rubrum*), testing different techniques and different conditions in two sites. The main parameters considered towards successful transplanting activities refer to the ecological needs of the species, the type of skeletal arrangement and firmness of each species' skeleton, and the inclination of substrates where the species mostly grow under natural conditions. A further, practical aspect to consider relates to the putty's hardening time. This takes a couple of hours, thereby making transplanting on vertical or subhorizontal substrates challenging, in particular if the transplants are large, long or heavy. Genus Spongia has a relatively soft skeleton, therefore fragments need to be adapted, which we did by inserting a plastic dowel through the lower side of the fragment to ensures better grip into the putty *P. ficiformis* has a hard, brittle skeleton and can be directly attached to the substrate with the putty. The same holds for gorgonians with a thick and rough coenenchyme. Regarding C. rubrum , however, colonies need to be attached upside down, with the base attached to the lower side of coralligenous ledges. For *E. singularis*, which has a thin and smooth coenechyme, we tested different anchorage systems but the use of V-shaped branches guarantees the best results. Local currents, diving activities and fishing lines are the main threats we are considering to interpret the different survival rates. Preliminary results show that sponges transplanted in sheltered conditions (e.g. among gorgonian colonies) have better survival. Moreover, transplants of gorgonians are mainly compromised by fishing lines and, where this impact is not present, positive growth rates, similar to those of natural populations, were documented. The putative impact of recreational SCUBA diving on transplants is for the moment still unclear.

WP4

Insights for restoration from deep-sea communities colonising existing structures

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This presentation details a component of the work of the National Oceanography Centre in MERCES. We have used data obtained from working in collaboration with oil and gas companies to understand the role of new structures in driving deep-water community dynamics. Understanding how communities respond to introduced structures has important implications for evaluation of restoration actions in deep-waters as well as informing debate around decommissioning of infrastructure. We provide details of a case study assessing the community response (over 2 yrs) to a structure placed on the seabed at 150m depth, in the Faroe-Shetland Channel, UK. The talk will focus on temporal community dynamics, from imagery data obtained at three time points (before, 1 year and 2 years after installation). The image data are improved with faunal samples from the structure itself, enabling additional insight over imagery material alone by improving taxonomic resolution and allowing determination of changes in biomass. The new results from this work, obtained over the last year, will be presented and the implications for restoration discussed.

WP4

Towards a restoration approach in the deep sea: first results of a disturbance experiment in the Lucky Strike hydrothermal vent field

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Our knowledge of the natural dynamics, including colonisation processes, of hydrothermal vent ecosystems is still scarce and limits our ability to predict their resilience to natural (volcanic eruptions, hydrothermal flow changes, etc.) or anthropogenic disturbances (deep-sea mining of seafloor massive sulfide deposits, for example). This fundamental knowledge is a prerequisite to assess the natural regeneration capacity of vent communities. To better document the environmental and biological processes governing the recolonisation of vent mussel assemblages, we designed an innovative experimental project based on an induced disturbance. These assemblages, located near the Montségur hydrothermal edifice on the Lucky Strike (Mid-Atlantic Ridge), will be monitored in situ during two years following the disturbance. In 2017, a total of 16 quadrats, instrumented with temperature sensors, were deployed. Eight were cleared of all fauna, four were caged to assess the role of predators on recolonization processes and four additional ones were selected as reference sites. In 2018, video cameras will be installed on each quadrats. Different approaches will be carried out. A quantitative description (composition, diversity and biomass) of macrofaunal assemblages associated to the engineer species *Bathymodiolus azoricus* will inform on faunal recovery in relation to environmental conditions. Then, selected functional traits, such as trophic structure using stable isotopes (δ13C and δ15N), reproductive status of the dominant species and population structure, will be analysed along the ecological succession process. The first results of this study give us an overview of the pre-disturbance state of this ecosystem in term of diversity and population structure. Furthermore, in this context of recovery, the assessment of the reproductive strategy and the analyses of spawning periodicity, sexuality, fecundity, and gamete size of the dominant species provide information about their recruitment and dispersal ability.

WP4

Restoration of deep-sea ecosystems: the Palinuro Seamount case study

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In the last decade, the rock-drilling and dredging activities on the top of the Palinuro seamount (Tyrrhenian Sea – Mediterranean Sea), related to the presence of mineral deposits, severely affected the benthic ecosystem functioning and biota due to the substrate removal and re-deposition along with habitat modification. The Palinuro seamount can represent a case study to investigate the effect of unassisted restoration (i.e., natural regeneration) on benthic ecosystem after the end of the disturbance comparing impacted vs. un-impacted sites. We investigated impacted vs un-impacted sites after 7 and 10 years from the end to disturbance to follow the progress of the resilience of the Palinuro seamount. The results obtained in this study can provide the first insights on the potential and progress of the unassisted ecological restoration on benthic ecosystem affected by deep-sea mining.

WP4

Restoration of cold-water coral gardens on the Mediterranean continental shelf: the Cap de Creus case study

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Deep gorgonian species on the Mediterranean continental shelf are among the most frequent taxa in fishing's bycatch. Being usually long-lived and slow-growing species, the impacts caused by destructive fishing activities can have far-reaching and long-lasting effects on gorgonian's populations. Hence, mitigation and restoration actions are crucial to accelerate and ameliorate the recovery of impacted populations. In this study, a pilot action was performed on the continental shelf of the "Cap de Creus" (NW Mediterranean, Spain), where bycatch gorgonians accidentally collected by artisanal fishermen were transplanted on artificial structures deployed at 85 m depth. After one year, a high survival was observed for the transplanted colonies (93%) by means of regular monitoring performed with a remotely operated vehicle (ROV), impling that bycatch gorgonians can be successfully returned to their natural habitat. On the other hand, to explore the viability of a large-scale and low-cost restoration action, gorgonians also obtained from bycatch were transplanted on small cobbles to be easily returned to their habitat, throwing them directly from the sea surface. Most colonies correctly landed in an upright position, and remained in this position during 3 months. The success of these actions highlight the feasibility of large-scale restoration actions targeted at the mitigation of fishing impacts on deep Mediterranean gorgonian populations.

WP4

Methodologies and tools for restoration of degraded deep-sea coral gardens in the Azores

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Cold-water coral (CWC) ecosystems have been increasingly degraded by human activities. Thus, restoration actions are urgently needed to assist the recovery of these ecosystems as part of their sustainable management. Within the MERCES project, we are developing methodologies and tools for restoration of degraded deep-sea coral gardens. The main pilot action consists in testing the use of CWC transplantation techniques as an assisted regeneration tool to aid the recovery of coral gardens potentially impacted by human activities (e.g. seafloor mining, fishing). Fragments of the octocoral Dentomuricea meteor, a common species in coral gardens in the Azores, were collected, maintained in the lab, and transplanted to the summit of Condor seamount using fauna landers in 2016. Landers were deployed in three areas of differing CWC densities (low, medium, high) with the objective of determining the effect of proximity to natural populations on the transplanted CWC survival, growth, physiological condition, and ability to attract associated fauna, thus restoring natural ecosystem functioning. Additionally, the potential of natural regeneration of CWC communities impacted by deep-sea mining, fishing and both is being assessed by deploying landers with D. meteor intoxicated with cooper (the main trace metal present in SMS sediment plumes), injured with superficial scratches (to mimic fisheries impact), and with both impacts. The survival rates and physiological condition of coral fragments were assessed with ROV video and photography 1 week, 8 months and 1 year after coral deployment. Results of these studies will be presented. The use of CWC transplantation as a restoration tool will be discussed in terms of its challenges, benefits and weaknesses for the recovery of deep-sea coral gardens.

WP4

Principles and key concepts for ecological restoration in the deep-sea

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The Society of Ecological Restoration has recently updated the international standards for the practice of ecological restoration, including principles and six key concepts. The aim of this document was to "provide support for the technical application of ecological restoration across geographic and ecological areas (whether terrestrial, freshwater, coastal or marine) to improve biodiversity conservation outcomes for all ecosystems, secure the delivery of ecosystem services, ensure projects are integrated with socio-cultural needs and realities, and contribute to the 2030 Agenda for Sustainable Development". In this talk we will discuss how lessons learned from terrestrial and shallow water restoration along with previous deep-sea restoration work can be used to evaluate principles, concepts and guidelines for ecological restoration of the deep-sea ecosystems. Namely we will discuss the challenges posed to describing local native reference ecosystem and identifying and measuring key attributes in deep-sea using four case studies. We will also discuss aspects related natural recovery processes in the deep-sea and progression towards full recovery.

Thursday 24th May 2018

Open Science Session

The Society for Ecological Restoration to promote the science and practice of ecological restoration

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The Society for Ecological Restoration was founded in 1988. SER advances the science, practice and policy of ecological restoration to sustain biodiversity, improve resilience in a changing climate, and re-establish an ecologically healthy relationship between nature and culture. SER is a knowledge network of restoration experts and enthusiasts (academics, practitioners, decision makers) with +2,700 members. SER Europe (active since 2001) is part of a global network which is organized in 14 chapters. Our global partnerships include CBD, Ramsar, UNCCD, IUCN and others. SER provides an excellent platform to promote exchange, facilitate contacts and contribute to the improvement of the science and practice of ecological restoration in Europe and worldwide. Our Society has recently engaged in three major initiatives: the publication and diffusion of international standards of good practices in ecological restoration, a professional certification program, and an online restoration resource center. SER Europe activities include (i) making sure ecological restoration is present in political agendas, (ii) producing and exchanging knowledge, (iii) organizing a biannual conference, attended by researchers, professors, policy makers, managers, and representatives of the private sector, (iv) organizing and supporting summer schools, courses, workshops, discussion groups, etc., and (v) acting as the European node of SER International, providing an European perspective to this organization, and thus contributing to make ER and the European view present worldwide. SERE members are key persons in the field of restoration ecology. SERE is linked to national and thematic networks in France, Spain, Finland, Italy and The Netherlands, and collaborates with EUROSITE and EHF.

The SER Standards need input from MERCES

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Launched in 2016, SER's *International Standards for the Practice of Ecological Restoration* is a living document now under revision with large public input. Conceived as a way to establish benchmarks for designing, evaluating, and promoting successful restoration projects within a broad conceptual and policy framework, it features three innovative tools: the restorative continuum, recovery wheel, and 5-star scale. However, in the 2016 version, there is a clear bias towards terrestrial ecosystems which is something that needs to be fixed. Ongoing work of various MERCES work package groups can help to refine the SER Standards so that they do effectively apply to marine ecosystem restoration including the deep sea. Managers and policy-makers and researchers in European waters and elsewhere will all benefit as well.

WP7

Stakeholder perceptions on marine restoration: policy targets and supporting actions

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In recognition of the many degraded ecosystems and the need to prevent further habitat degradation and halt biodiversity loss, many International and European policies have put conservation and restoration at the top of their environmental agenda. Reducing pressures, minimizing damages, putting areas aside for conservation and implementing rehabilitation and restoration actions are all part of the toolkit available to Governments and the global society to support achievement of many high-level policy objectives. Benefits of terrestrial ecosystem restoration are being showcased by many successful large-scale projects and the practice is being embraced by hundreds of thousands of people across the world. Coastal ecosystems have been extensively used and impacted by multiple human activities over time but restoration as a concept and practice is lagging behind for many strictly marine ecosystems. Beyond the many scientific, technological, socioeconomic and feasibility gaps and challenges, little is also known about the social acceptance of marine restoration. Within the MERCES project, we investigate stakeholder perceptions about restoration of degraded marine ecosystems (that we don't even usually get to see). We are looking at reasons behind acceptance of conservation and restoration, degrees of agreement for major policy targets, points of difference and modes of support for restorative actions. A Greek national, a European and an International survey were conducted (the latter one linked to SER media resources/audience) by means of an anonymous on-line questionnaire. Stakeholders include local and central government, NGOs and MPA managers, researchers and marine users. Results from the surveys indicate that stakeholders in general agree that marine restoration can reverse negative human impacts but there is some heterogeneity in their degree of agreement and preferences towards specific targets and restorative approaches.

WP7

The economics of marine ecosystem restoration

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With the exception of Bayraktarov et al. (2016, Ecol Appl), the literature on the economic costs and benefits of ecosystem restoration has so far focused on terrestrial systems. Marine ecosystems, however, are fundamentally different in ways that are relevant for the estimation and magnitude of the costs and benefits of restoring them (OECD, 2016). For example, unlike land, seas are best approached as three-dimensional areas, they are mostly common property or state property, and they have a much higher degree of mixing of pollutants. One major implication of these properties is that land acquisition and opportunity cost of restoration locations are likely to be of less importance in marine systems than they are in terrestrial systems; on the other hand, active restoration is likely to be more expensive in marine systems because sites are more difficult to reach. In this presentation we report on progress made in current effort within WP7 to estimate the costs of a selection of MERCES case studies. Based on these efforts and literature review, we reflect on the fundamental biophysical and institutional differences between marine and terrestrial systems, their implications for the costs and benefits of marine ecosystem restoration, and the available options for financing marine ecosystem restoration.

WP7

Marine ecosystem restoration benefit values: Some initial findings

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In this paper we assess the ecosystem service benefits from marine ecosystem restoration. The core of the economic assessment process is to determine how changes in ecosystem services provision following the chosen restoration actions are translated into changes into welfare benefits. In the first such study under the Merces project we concentrate on kelp forest restoration in Norwegian waters. Recent evidence demonstrates that the structure of kelp forests in the NE Atlantic is changing in response to climate and non-climate-related stressors. In the case of Norway sea urchin populations have increased to such a high level that they overgraze the kelp beds with barren grounds as a result. A key question in terms of restoration of such kelp forests is if the costs of restoration is greater than the benefits to society. Much of the benefit values from this type of restoration project will be non-market in nature. To pick up on such values a stated preference valuation technique is used that is referred to as discrete choice analysis where the public are asked to choose amongst a number of management options that have different characteristics and different costs of implementation. Based on the choices made we model the preferences of the public for the restoration attributes and estimate the value to society of a number of different management options. For the purposes of this study, we think about kelp forest restoration in terms of four characteristics: Biodiversity (abundance of macroinvertebrate species) which refers to the composition and abundance of biodiversity, (i.e. diversity of species without a back bone); Nurseries for juvenile fish which refers to the number of juvenile fish present per m2; the area that is to be restored and finally the cost of any restoration effort in terms of an increase in income tax. The results indicate that the Norwegian public are supportive of such projects and display the highest marginal willingness to pay for the biodiversity service function of the kelp forests.

WP8

Private finance of kelp restoration in northern Norway: A MERCES case study

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The yawning gap between the funds needed for conservation and restoration of ecosystems and those made available by governments raises the question what private institutions can contribute. Such institutions need to overcome two major hurdles: the free-rider problem associated with the public-goods nature of the restored ecosystem services; and the time gap between restoration efforts and the benefits. Within WP7 of MERCES we carried out a desk study to explore the possibilities for private finance of kelp restoration in northern Norway. Large areas of kelp forest in northern Norway have disappeared due to grazing by the green sea urchin *Strongylocentrotus droebachiensis*. Restoring Norwegian kelp forests will enhance a host of ecosystem services. If we map these services with different groups of beneficiaries we can assess the challenge of attracting private funding for their restoration. Of some of these services, such as alginate extraction and recreation, the free-rider problem may be easily curbed as users can principally be excluded from the service. Likewise, carbon offsets can be used to operationalise the kelp's ability to store carbon. Services that are less excludable, such as wave attenuation and water quality, will require the establishment of institutions, such as cooperatives, to facilitate collective action by firms active in the tourism industry, local residents, or fishers. Harvesting sea urchins is unlikely to generate sufficient revenue. Bridging the time gap between investments in restoration and the generation of actual benefits may require the use of mechanisms from conservation finance. For example, the aforementioned cooperatives could set up an environmental investment fund or issue green bonds. Three types of investors can be distinguished: (1) donors; (2) wealth-preserving investors; and (3) return-oriented investors. The risks associated with investments in kelp restoration, however, may be substantial, and a considerable part of the investment will be irreversible.

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Poster abstracts

WP2

Marine Habitat restoration: *Posidonia oceanica* (Linnaeus) Delile, 1813 transplantation and cage experiment design

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Turkish coasts are particularly under pressure from the Red Sea invasive marine organisms. The pressures cause significant damage to marine habitats and in some cases, habitat lost. The aim of the experiment is to try a different restoration method, cages, on damaged seagrasses to determine the suitable method both on regional and species basis. Especially, pressure by species migrated from Red Sea and human activities have severely damaged seagrass P. oceanica and bring to the brink of extinction in some areas throughout the coasts of Aegean and Mediterranean Sea of Turkey. In scope of MERCES project WP2, to test prevention abilities against negative factors cage frames made by PVC pipes covered with plastic mesh, were placed in different depths as experimental stations and next to these PVC frames were placed without coverage. Stations were setup 1 in Foca Special Environmental Protection Area and 3 in Gokova No Fishing Zone each with 3 replicates. Data on growth, spreading, grazing ratio etc. is being collected.

Keywords: Restoration, transplantation, Posidonia oceanica, MPAs, MERCES

WP2

Impact of breakwater relocation on benthic biodiversity associated to seagrass meadows of Northern Adriatic Sea

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Breakwaters are man-made constructions utilised for preventing coastal erosion primarily from wave action. At the same time defence structures, modifying currents and circulation, can affect water quality and benthic assemblages. Assessing and minimizing the impact of these structures is a priority in human-modified coastal ecosystems, such as the central northern Adriatic where breakwaters extend for hundreds of km. We investigated the effects of breakwater relocation on benthic features and meiofaunal diversity. To do this we conducted a before - after comparison (2011 - 2017) the relocation, which occurred in 2015. The analysis was conducted comparing a sheltered site, characterized by the presence of seagrass meadows and a wave-exposed site. Sediment features and meiofaunal variables were altered by the relocation, especially in the areas colonised by seagrass meadows. Results presented here pointed out an enrichment in organic matter, the loss of two sensitive taxa (Cumacea and Ostracoda) and a shift in the assemblage structure with the increase of the relevance of Copepoda and Polychaeta. These results indicate that the careful management of breakwater is crucial for planning adequate conservation practises and protecting seagrass habitats and their biodiversity.

WP2

Experiments of *Pinna nobilis* translocation: the case study of Gabicce Mare

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Marine restoration success has been quite low potentially due to the many interspecies interactions and feedbacks that are necessary to maintain functinoing in vegetated habitats. To better understand how these interactions could affect restoration, we undertook an extensive literature review (421 studies) of plant-bivalve interactions, the mechanisms involved, and in which conditions these interactions were positive and negative. 50% studies showed positive interactions while 23% showed negative interactions, 13% were mixed (positive and negative interactions occurred together), and 10% were non-significant. There were large differences in the types of interactions depending on the habitat and bivalves involved. Interactions in subtidal habitats were mostly positive, and included mechanisms such as nutrient enrichment, protection from physical disturbance and predation on bivalves, and sediment stabilisation. However, in intertidal habitats, interactions with infaunal bivalves were mostly negative (due to space competition) and those with epifaunal bivalves were mixed (positive: sediment stabilisation, nutrient enrichment, shelter; negative: sulfide stress and increased predation). In addition, interactions with lucinid (sulfide-metabolising) bivalves were mostly positive, while interactions with non-native species were overwhelmingly negative. To increase restoration success and promote positive interactions and feedbacks, we suggest ensuring that native bivalves are present in subtidal restoration sites (and simultaneous planting of seagrasses and bivalves if necessary). In intertidal restoration, epifaunal bivalves may be helpful, while infaunal bivalves are likely to be a hindrance (which the exception of lucinid bivalves). In addition, invasive species should be managed prior to beginning seagrass restoration projects.

WP2

Plant-Bivalve interactions: implications for restoration projects

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Marine restoration success has been quite low potentially due to the many interspecies interactions and feedbacks that are necessary to maintain functinoing in vegetated habitats. To better understand how these interactions could affect restoration, we undertook an extensive literature review (421 studies) of plant-bivalve interactions, the mechanisms involved, and in which conditions these interactions were positive and negative. 50% studies showed positive interactions while 23% showed negative interactions, 13% were mixed (positive and negative interactions occurred together), and 10% were non-significant. There were large differences in the types of interactions depending on the habitat and bivalves involved. Interactions in subtidal habitats were mostly positive, and included mechanisms such as nutrient enrichment, protection from physical disturbance and predation on bivalves, and sediment stabilisation. However, in intertidal habitats, interactions with infaunal bivalves were mostly negative (due to space competition) and those with epifaunal bivalves were mixed (positive: sediment stabilisation, nutrient enrichment, shelter; negative: sulfide stress and increased predation). In addition, interactions with lucinid (sulfide-metabolising) bivalves were mostly positive, while interactions with non-native species were overwhelmingly negative. To increase restoration success and promote positive interactions and feedbacks, we suggest ensuring that native bivalves are present in subtidal restoration sites (and simultaneous planting of seagrasses and bivalves if necessary). In intertidal restoration, epifaunal bivalves may be helpful, while infaunal bivalves are likely to be a hindrance (which the exception of lucinid bivalves). In addition, invasive species should be managed prior to beginning seagrass restoration projects.

WP2

In search for better life: the rescue mission for an endangered Mediterranean habitat-forming bivalve

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In search for better life: the rescue mission for an endangered Mediterranean habitat-forming bivalve. Coastal development, resulting in habitat loss or degradation, threatens many sessile marine species. Among them is the noble pen shell Pinna nobilis, an endemic long-lived Mediterranean species and one of the largest bivalves in the world, reaching over 1 m in shell length. As a suspension-feeding habitat-former it provides important biogeochemical functions of water clarification and biodeposition and enhances local biodiversity. To avoid smothering of this strictly protected species during construction of a new nautical center in the Pula Harbour (North Adriatic Sea), a total of 184 pen shells were transplanted to the nearby Brijuni MPA, where we could ensure their protection from adverse impacts of anchoring and illegal extraction. Pen shell transplantation was confirmed as an effective restoration method, resulting in high transplant survival. Here, we outline the transplantation protocol applied within the MERCES project. Besides being the first official case in Croatia to implement transplantation of a sessile marine species as a measure prescribed by the environmental impact assessment, this action additionaly offered a compelling case for the citizen-science. In the light of recently reported pen shell mass mortalities due to a rapidly-spreading disease, every effort should be made to minimize more maneagable impact in situ (e.g. of costal construction, anchoring, trawling, illegal extraction) in order to ensure maintenance of its populations relaying on survival of adults.

WP3

Marine Habitat restoration: Cystoseira sp. transplantation and cage experiment design

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Turkish coasts are particularly under pressure from the Red Sea invasive marine organisms. The pressures cause significant damage to marine habitats and in some cases, habitat lost. The aim of the experiment is to try a different restoration method, cages, on damaged seagrasses to determine the suitable method both on regional and species basis. Especially, pressure by species migrated from Red Sea and human activities have severely damaged Cystoseira sp. and now are extinct in some areas throughout the coasts of Aegean and Mediterranean Sea of Turkey. In scope of MERCES project WP3, to test prevention abilities against negative factors cage frames made by PVC pipes covered with plastic mesh, were placed on rocks in different depths as experimental stations and next to these PVC frames were placed without coverage. Stations were setup 1 in Foca Special Environmental Protection Area and 3 in Gokova No Fishing Zone each with 3 replicates. Data on growth, spreading, grazing ratio etc. is being collected.

Keywords: Restoration, transplantation, Posidonia oceanica, MPAs, MERCES

WP3

Transplanting Eunicella singularis (Esper, 1791) for the restoration of coralligenous habitats in the Ligurian Sea (Italy)

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In the frame of the EU-funded project MERCES, innovative methodologies to restore coralligenous habitat-forming species are being tested. Restoration protocols are based on transplants from donor organisms. Considering the study area is southward and the substrate is sub-horizontal, photophilous species were considered the most feasible candidate. The octocoral *Eunicella singularis* (Esper, 1791), a gorgonian with symbiotic with zooxanthellae, is one of the selected target species. Transplants of *E. singularis* were performed at Gallinara Island, (Western Ligurian Sea, Italy) in 2016 and 2017. The transplants were collected from a close source area at 40 m depth and immediately transferred to the transplant area. Three different techniques were used: “single branch with vertical tube”, “single branch with horizontal tube”, “double branch”. In total, around 200 new colonies were transplanted, and survival and growth have been monitored since June 2016 and August 2017, respectively. Results clearly show that the double branch technique is the most effective (90% survival) and that recreational fishing is the main stressor negatively affecting the survival of the transplants. Undisturbed transplants show positive growth rate (around 1,5 cm/year) confirming the suitability of the area selected for the restoration. Collaboration with volunteers (divers and diving operators) in several phases of the field activities (collection, transplant and monitoring) proves crucial both to minimize underwater working time and to increase the sense of stewardship in a major users’ segment.

WP3

Restoration of Corallium rubrum populations at the Portofino Promontory and at Gallinara Island (Ligurian Sea, Italy)

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Several techniques have been developed in the last twenty years for red coral transplantation. Putty, panels, artificial caves, are all approaches that have been tested providing some good short-term results but only in few cases data from long-term monitoring are available. Several well developed subpopulations of red coral are present along the cliffs of the Portofino Promontory from 25 to 70 m depth. The largest colonies down to 50 m depth are around 10 cm in height. In deeper populations, at 70 m depth, the largest colonies are around 13 cm in height with a higher number of thick branches compared to shallower ones. Considering that data from the literature support the hypothesis of a genetic separation between shallow and deep population, we performed transplants "shallow to deep" to compare the pattern of growth between colonies from the two depths ranges. Red coral is a slow-growing organism, hence results are not yet available. However, ongoing monitoring confirms that transplants have successfully been relocated. At Gallinara Island the presence of C. rubrum was documented in the past. Gallinara Island is isolated from surrounding hard bottom habitats and represents the most important area in the western Ligurian Sea for the connectivity of rocky benthic assemblages. Red coral is no longer present in the area and the restoration of the local coralligenous included the reintroduction of this species. So far, 50 colonies have been successfully transplanted at 30 m depth and a new expedition is due before summer.

WP3

Combined sponges-gorgonians transplantation experiment in the Portofino Marine Protected Area (NW Mediterranean Sea)

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Several stressors are affecting the integrity of marine ecosystems and their negative effects are dramatically enhanced by global warming. Mass-mortalities of benthic organisms are a direct consequences of these processes and are rapidly altering the structural and functional complexity of marine habitats. To reduce the consequences of such episodes, the development of techniques for the restoration of degraded marine habitat is gaining momentum. In the frame of the MERCES project, two transplantation experiments were conducted in the Portofino Marine Protected Area (MPA) located in the NW Mediterranean Sea. The study aimed to identify the most suitable techniques and the most resilient species to perform large-scale restoration of the coralligenous habitat. This habitat is a key feature of the Mediterranean seascapes that also attracts recreational SCUBA divers, potentially a negative driver affecting the effectiveness of restoration The transplanted species, collected from indigenous populations, were: *Petrosia ficiformis*, *Spongia lamella*, *S. officinalis*, *Eunicella cavolini* and *E. singularis*. *S. officinalis* and *E. cavolini* were transplanted on a natural vertical wall at about 23 m depth. *P. ficiformis* and *E. singularis* (both harbouring autotrophic symbionts) were transplanted on a natural horizontal substrate at about 28 m depth. To evaluate the effects of the diving tourism on restoration, the transplants were replicated in two different areas of the same diving site, one highly frequented by divers (W) and one rarely frequented (E). Monitoring of survival and growth were performed by bi-monthly photographic surveys. Moreover, samples from transplanted and wild colonies of *E. singularis* have been collected every six months to test for a possible "transplant effect" on the associated microbiome and on the health status of the symbiotic zooxanthellae. Until now, 4 photographic surveys and one sampling of *E. singularis* has been completed. After 10 months from the transplant, the percentages of permanence in the sites were: 12% of *S. officinalis* (W and E); 100% (E) and 75% (W) for *E. cavolini*; 75 % (E) and 62% (W) for *P. ficiformis*; 92% (E) and 83% (W) for *E. singularis*. The abundance of associated zooxanthellae in the transplanted and wild colonies of *E. singularis* was comparable, although in the former a partial decline of the health status of the symbionts was observed. On the basis of these preliminary results, it is possible to appreciate that i) the transplant method on most of the tested species is feasible, ii) a transplant effect is detectable, iii) the possible effect of diving is still unclear.

WP4

Using 3D reconstruction to assess cold-water coral recovery in restoration actions

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Cold-water coral gardens are important biodiversity hotpots which provide habitat and feeding grounds for invertebrates and fish. Thus, coral gardens are often found in traditional fishing grounds and coral colonies are accidentally caught as bycatch during fisheries operations. Frequently, larger, older and more arborescent corals are first to be impacted by fishing, either leaving the corals with severe injuries or by dislocating them. Within the MERCES project, we are testing the use of coral transplantation techniques as an assisted regeneration tool to aid the recovery of coral gardens potentially impacted by fishing. The recovery of corals is assessed by monitoring several parameters including their growth over time. Growth rates data is commonly extracted from traditional 2D photographs taken at different time intervals. However, arborescent coral colonies grow in different planes and the architectural complexity, rugosity, volume, and other structural characteristics that play a significant role in habitat provision and ecosystem processes is not well captured in 2D models. To overcome these limitations, we are developing a data acquisition and processing workflow for in-lab, image-based 3D reconstruction to assess growth rates of transplanted colonies of cold-water corals. Five cold-water coral species commonly found in the Azores (*Dentomuricea meteor, Viminella flagellum, Callogorgia verticillata, Paracalyptrophora josephine* and *Acanthogorgia armata*) were subject to the 3D reconstruction procedure. We will be presenting the proposed methodology, workflow, statistical analysis and some preliminary results. If successful this method will represent a valuable tool for monitoring recovery of cold-water corals and other structurally complex organisms during restoration actions.

WP4

Recovery of the red coral *Corallium rubrum* following simulated sediment resuspension events

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Benthic suspension feeders are sensitive to sediment resuspension induced by natural forcings and anthropogenic activities (e.g. trawling, sediment dredging), but the magnitude of this impact needs to be clarified. In this study, we investigated the recovery of the red coral Corallium rubrum following simulated sediment resuspension events. Nubbins of the red coral (5-7 cm each) were exposed for 2 weeks to natural sediments (with a size < 125 µm and at concentrations 25 mg/L and 100 mg/L) collected in the surrounding environment where corals were obtained and continuously resuspended by means of a mechanical apparatus. During the experiment, polyps' activity, feeding rates and tissue integrity were analysed and compared to responses of un-exposed nubbins. Our findings revealed that continuous sediment resuspension determines a decrease of polyps' activity and feeding rates and a damage of coral tissues. However, the corals, once reported in clean conditions (i.e. seawater without sediment particles), were highly resilient. Overall results from this study provide new information on the impact of sediment resuspension on sessile organisms such as hard branching corals and pave the way for the definition of mitigation measures to minimise as much as possible the effects of anthropogenically-mediated sediment resuspension on benthic biota.

WP4

Cold –water coral husbandry at DeepSeaLab: best practices for deep-sea restoration

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The development of techniques and guidelines for cold-water coral husbandry in aquaria is becoming increasingly important as a way to obtain basic biological information on these organisms and investigate physiological responses under different experimental treatments. Usually the broad technical needs for keeping cold-water corals in aquaria and conducting ex-situ experimental work is not described in detail in published papers, where focus is given to equipment and experimental techniques. This generally gives only a glimpse of the complete care required, rarely disclosing the full details of the husbandry practices. Although more detailed information on laboratory guidelines would be interesting information to be shared among different laboratories, increasing knowledge and abilities on this matter, this is unfortunately not true for most cases, including our own. This poster intends to fill that gap for the aquaria facilities of DeepSeaLab in the Azores, by presenting a detailed description of our experience on cold-water coral husbandry guidelines and best practices, in the context of deep-sea habitat restoration, as presented in other WP4 talks on the Azores case study. Improving awareness of the available know-how will promote the development of common guidelines and protocols between research institutions, optimizing CWC husbandry, reaching for its full potential.

WP5

Quantifying the potential contribution of coastal habitats recovery to fisheries sustainability in the NW Mediterranean Sea: a spatial ecosystem modelling approach

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Coastal areas host habitat-forming species (such as corals, seagrasses and algae beds) that can play essential ecological roles as nursery areas, refuge habitats and foraging grounds. When these habitat-forming species are degraded these roles erode or can even disappear. The conservation and recovery of coastal ecosystems is essential to maintain and bring back key processes that are involved in the functioning of marine ecosystems. We present a spatial ecosystem modelling approach to assess the impact that changes in the distribution, abundance and complexity of emblematic habitat-forming species can have on the secondary production of northwestern Mediterranean coastal food webs. This approach can be used to quantify the potential contribution of these changes to fisheries production in the study area.

WP9

Ocean Literacy in MERCES: an opportunity to arise awareness on marine ecosystems restoration

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Ocean Literacy means understanding the Ocean's influence on human life and how human life influences the Ocean. Based on this principle and following the guidelines provided by the international Ocean Literacy Framework, Ecoreach and GAIA have organized an Ocean Literacy program on the specific issue of protection and restoration of marine environments, in order to disseminate the scientific results of the MERCES project to different target audiences. In particular, a marine biology course for secondary-school students has been carried out with the aim of increasing their knowledge on the marine environment and raising awareness about the delicate theme of conservation of marine biodiversity. Material dedicated to teachers and students was also produced in order to support the teaching and embracing of science, technology and research. Specific field-work activities were organized for university students of the International Master of Marine Biology at the Polytechnic University of Marche. Additionally, families have been involved during city events, like the European Researchers' Night, following the principle of the necessary partnership between schools and families, for the education of young generations. For all activities, the Ocean Literacy program has been structured as follows: (i) introduction to environmental problems through the development of awareness about the importance of biodiversity and anthropogenic impacts; ii) introduction to the MERCES project, including description and objectives of the project, geographical context, specific actions; iii) practical activities. All the activities have been highly participated, demonstrating the interest that students and citizens have towards the marine environment and its protection.

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Can we predict Atlantic cod recruitment?

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The collapse of the Newfoundland Atlantic cod (Gadus morhua) fishery in 1992 motivated studies on the factors influencing population stability and the ability to forecast future cod abundance. Short-duration time series compromised most efforts immediately following the collapse to link different life history stages. This study used seine surveys of juveniles in nearshore habitats to predict offshore adult Atlantic cod recruitment, and the factors influencing recruitment signal strength. Several multi-year (22+ years) datasets on coastal juvenile and offshore adult cod populations now make this approach feasible. Generalized linear models revealed significant relationships between juvenile (age 0 and 1) and pre-adult (age 3) abundance. Additionally, water temperature and chlorophyll-a level during early life stages appeared to influence the strength of the relationships between juvenile and adult abundance. Interestingly, eelgrass, which acts as nursery habitat for juvenile cod, did not influence any of the linear models. Studies evaluating year-class strength often overlook the value of coastal juvenile surveys. However, the potential to forecast adult abundance from juvenile populations could aid in planning for low recruitment years, and improve inferences on the response of cod population abundance to future environmental changes. Moreover, these findings could help in conservation planning.

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WP1: European marine habitats, degradation and restoration

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WP2: Restoration of marine, shallow soft bottoms habitats

Christoffer Boström (Åbo Akademi University) & ***Johan van de Koppel*** (Royal Netherlands Institute for Sea Research)

WP3: Restoration of coastal shallow hard bottoms and mesophotic habitats

Joaquim Garrabou (Agencia Estatal Consejo Superior de Investigaciones Científicas) & ***Simonetta Fraschetti*** (CoNISMa)

WP4: Restoration of deep-sea habitats

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WP5: Effects of restoration on the recovery of ecosystem services

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WP6: Legal governance and policy

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WP7: Socio-economic impacts of restoration

Stephen Hynes (National University of Ireland, Galway) & ***Wenting Chen*** (Norsk Institutt for Vannforskning)

WP8: Putting Business at the Heart of the Restoration Agenda

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WP9: Dissemination, communication and public engagement

Silvia Bianchelli (Ecoreach Srl) & ***Martina Milanese*** (Studio Associato GAIA)

WP10: Project management

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