Update on the AMAre project

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Objectives of AMAre

1. develop shared methodologies and geospatial tools for multiple stressors assessment, coordinated monitoring/management, multicriteria analyses with stakeholders' engagements;

2. Specific pilot actions in selected Marine Protected Areas (MPAs) to solve hot spots of conflicts affecting marine biodiversity and the services it provides.
WPs in AMAre

WP3: Studying

WP4: Testing

WP5: Transferring
Overview of WP4 deliverables

- Mapping Human Activities and Ecosystems
- Quantifying Impacts and Pressures
- Providing Management Measures for MPAs
Achieving deliverables in AMAre

Data Collection
- Mapping, Geospatial data, Shipping databases, Statistical data, Fieldwork, Interviews

Cumulative Impact Assessment
- Conflict hot-spots, Sensitive habitats, Impact chains, impact on ecosystem services

Data Analysis
- Vulnerable habitats
- Environmental variables
- Indicators of change
- Ecosystem services

Management strategies
- Pilot activities, potential synergies between conservation and local uses, sharing of best practices
Data mining and spatial geoportal

GIS layers for the North-East MPA

- Administration
- Habitats and Biotopes
- Monitoring
- Geology
- Hydrography
- Oceanography
- Threats
- Socioeconomics
- Elevation
Socioeconomics layers
Elevation layers – Bathymetry contours
Zoom Feature
Data base for coordinated monitoring and early warning indicators of regime shifts

Comparing monitoring plans and identifying a common set of variables (MSFD – GES)

MONITORING AND ASSESSMENT GUIDELINES FOR MARINE LITTER IN THE MEDITERRAN RAN MPAS

Spatial geoportal

early warning indicators to alert of an approaching regime shift in marine ecosystem
Mapping Human Impacts

Marine Uses
- Malta
- Bunkering
- Aquaculture
- Industrial Trawling
- Spoil Dump
- Sewage Disposal
- No Stopping Zones
- Shipping Routes
- Diving Sites
- Swimming Zones
- Marine Protected Areas
- 3 Nautical Mile Zone

0 2.5 5 10 km
Overlaying Cumulative Human Impact

- fishing
- tourism
- shipping
- anchoring
- littering
- pollution
- ecosystems
- habitats
Climatological data services

**Climatologies:** Monthly; Seasonal and Annual average datasets and maps

**Statistical data:** maxima/minima; STD and variance; range and thresholds;

**User interaction:** data subsetting; online interface; online elaboration

**Other assessments:** trends; return periods; extreme values; derived indices
Climatologies
DECEMBER 2017
Dissolved $O_2$ and Nitrates
01/1999 – 12/2017
OGSTM BFM model

chlorophyll-a
09/1997 – 12/2017
MODIS-Aqua, NPP-VIIRS and Sentinel3-OLCI

SST 01/1982 – 12/2017
AVHRR + other

SST, SSS, currents
01/1987 – 12/2017
MFS model
Positive overall SST trend
Rate of increase: 0.135°C/year
Measuring variability and trends

- The major climate changes are occurring at the northern parts.
The mixing index is derived from the model 3D fields using the formula

\[ K \propto \frac{1}{\left(N^2 + \frac{2\gamma}{g}\right)^{1/2}} \]

where \( K \) is the mixing coefficient, \( N \) is the Brunt-Vaisala frequency, estimated from the temperature and salinity vertical profiles.
Chlorophyll-a metrics from satellite ocean colour is used as a measure to analyse variations of phytoplankton concentration in relation to nutrient availability.

In MSFD implementation it is used to identify the eutrophication status of coastal waters.
Environmental Indices: EUTROPHICATION INDEX

Ecological Quality Status for local environmental assessments using a modified eutrophication scale based on Simboura et al. (2005)

<table>
<thead>
<tr>
<th>Eutrophication Scale</th>
<th>Chlorophyll-a (mg/m³)</th>
<th>Ecological Quality Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oligotrophic</td>
<td>&lt;0.1</td>
<td>High</td>
</tr>
<tr>
<td>Lower mesotrophic</td>
<td>0.1–0.2</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>0.2–0.3</td>
<td>Good to Moderate</td>
</tr>
<tr>
<td></td>
<td>0.3–0.6</td>
<td>Moderate</td>
</tr>
<tr>
<td>Higher mesotrophic</td>
<td>0.6–2.21</td>
<td>Poor</td>
</tr>
<tr>
<td>Eutrophic</td>
<td>&gt;2.21</td>
<td>Bad</td>
</tr>
</tbody>
</table>

![Ecological Quality Status from P90Chi for the year 2016](image1)

![Ecological Quality Status from P90Chi for the year 2017](image2)
Observing and quantifying human impacts

- To measure the stress on the environment
- To identify major activities that make most impact
  - What is local and remote
- Assess the natural environment and its complex interactions and variability
- Bring societal awareness and hence acceptance to change attitudes
- Make effective management plans to avoid/repair/reverse damage
Planned Surveys for 2018

**Temperature Probes**

**Offshore** - attached to an anchoring rope at one of the fish farms

**Near Shore** – attached to the rope/chain of a coastal navigation buoy
Depth vs Average Temperature

- Average Temp from Site 1A
- Average Temp from Site 1B
- Average Temp from Site 2A
- Average Temp from Site 2B
- Average Temp from Site 3A
- Average Temp from Site 4A
- Average Temp from Site 4B

Depth (m) vs Temperature (°C)
Temperature Time Series at various depths from 07May 2018 09:30 to 10May 10:30 GMT
Station: 36.2311 °N; 14.3936 °E
Floating and Beached Marine Litter Surveys

Floating litter
For Gozo and Malta

June and August 2017

Monitoring along separate routes.
Floating and Beached Marine Litter Surveys

Beached litter
October 2017
June and November 2018
For Gozo and Malta
Monitoring along coastline
Planned Surveys for 2018

Cystoseira spp. survey

AMARE

Cystoseira sampling in Malta!

Sampling in the North-East Marine Protected Area in Malta for assessing the status of Cystoseira canopy.

Coastal walks in early August 2018 with phytal taxonomist, along coastal stretches of the NE MPA, as part of a broad-brush survey documenting the occurrence of different Cystoseira species within the surveyed area.
**Cystoseira canopies**: application of a Habitat Suitability Model (HSM) in Malta

**Observed data**
1. **abundant canopies**;
   - high probability of presence
   - suitable conditions for *Cystoseira* growth and good status of canopies also considering the low levels of human pertubations

2. **frequent canopies**;
   - intermediate probability of presence
   - potential unsuitable conditions for *Cystoseira* growth also considering the intermediate levels of human pertubations

**Predicted data**

**HSM as a useful tool:**
- assessment of actual canopies status
- predictive value for not sampled areas
- to be discussed the role of human pertubations in determining *Cystoseira* occurrence
- establishment of future-oriented marine planning policies from both the conservation and the restoration point of view
Planned Surveys for 2018

Mapping of anchoring damage to *Posidonia oceanica* in embayments

Huge pressure from numerous recreational boats and yacht marina footprint is on the increase due to large demand for additional berthing places.
Bunkering and Anchoring damage
Planned Surveys for 2018

Mapping of anchoring damage to *Posidonia oceanica* in embayments – evidence from previous surveys
Supporting MPA Administration by ERA

• Management Plans are actively being developed; the process is currently in the stakeholder consultation phase.

• Relevant national regulations applicable to MPAs are enforced.

• Operations and developments are screened for Appropriate Assessment.

• Other regulations include the EIA process, fisheries and navigation regulations.

Supporting Systematic Monitoring by ERA

- DFA monitoring of fish stocks and professional fishing activities (nationwide, not MPA specific)

- ERA monitoring as per MSFD requirements

- TM monitoring of bunkering activities

- Aquaculture zones and concession areas (through the permitting process)
Key challenges: Integrated ecosystem monitoring and management

Request from EU: Holistic, Integrated, Ecosystem-based, Cross-cutting approaches

Good legislation and good science: where is the gap?

Coastal-High seas, Benthos – Water column, Patterns – Processes

Data: Chronic absence of biological/environmental data that are of critical importance for setting the stage to improve the governance, management and monitoring; Data modelers solicited to find more sources to fill this gap.

Communication among MPAs: Strengthen the interactions and the communications among MPAs to interact more to share data, experiences, vision
AMAre Webpage
https://amare.interreg-med.eu/

NEWS

AMARE
First AMAre Annual Meeting agenda is now...
On 30th and 31st October 2017 in Malta AMAre project is organizing the First Annual Meeting involving all partners to discuss the state of the art and progress of the project. The General Assembly is...
03/10/2017

AMARE
Pictures of PANAceA - Knowledge Sharing Event...
On 23rd and 24th October 2017 in Barcelona PANAceA project organized Knowledge Sharing Event “Bridging the Science-Practice-Policy Interface in Biodiversity Protection”
03/10/2017