Acronym: AMAre

Project Title:AMARe - Actions for Marine Protected Areas

Priority Axis 3: Protecting and promoting Mediterranean natural and cultural resources

Specific Objective: 3.2
To maintain biodiversity and natural ecosystems through strengthening the management and networking of protected
areas

https://amare.interreg-med.eu/

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Porto Cesareo MPA

The Interreg MED AMAre project, of which CONISMA is Lead Partner, has the specific objective of improving management and protection measures in order to maintain biodiversity and increase the resilience of MPAs networks for current purposes and future challenges, supporting a sustainable use of resources.
According with this purpose and in order to support management and conservation initiatives the AMAre WebGIS is web-based portal for interactive visualization of the spatial data collected in the Project and organized in a common spatial infrastructure. The portal combines Geographic Information Science (GIS) principles and tools to harmonize a relatively large and multi-dimensional datasets, including several themes: administration, biodiversity, elevation, geology, habitats and biotopes, hydrography, monitoring, oceanography, socioeconomic, threats. The tool make accessible and re-usable the data relevant for the management of the MPAs in a coordinated manner.
Here, starting from information collect and stored in webGIS we produce several spatial information useful to address conservation and management initiative for two marine protected areas (MPAs) partner of the project Porto Cesareo and Torre Guaceto

The establishment Marine Protected Areas as a tool for local management of marine resources and biodiversity is considered effective. In the area managed by the MPA of Porto Cesareo (Fig.1) the submarine landscape is a hot spot of biodiversity, with large extension of crucial habitats such as Posidonia oceanica, coralligenous formations and marine caves.

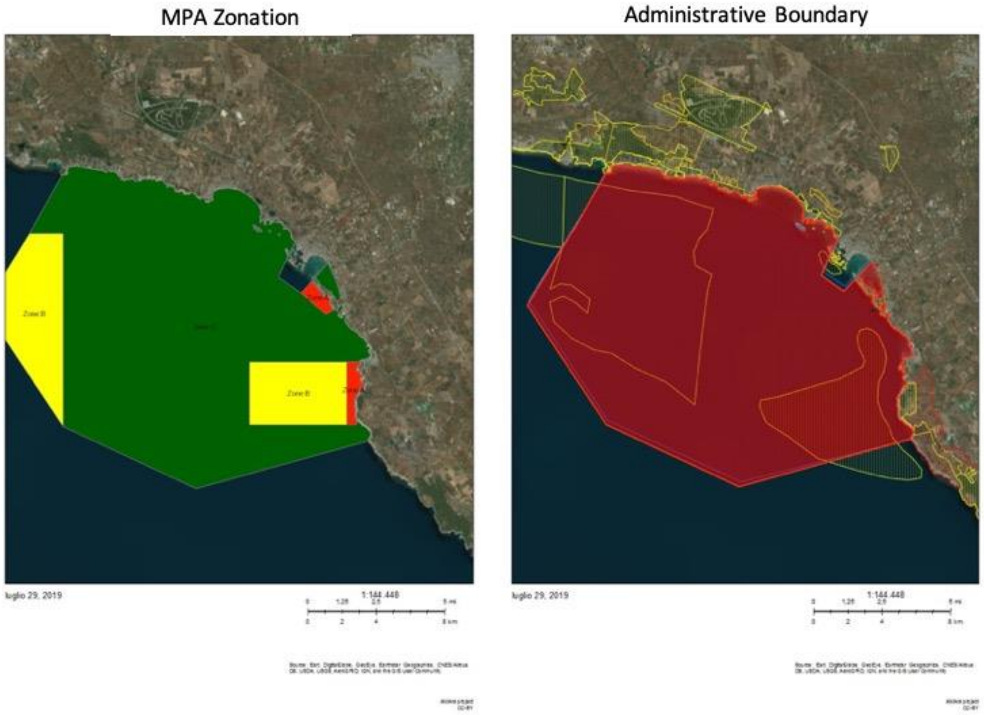


Figure 1. On the right Administrative boundary of MPAs Porto Cesareo and overleaps with Natura 2000 network. On left current MPA zonation. Source AMAre WebGIS (http://gismarblack.bo.ismar.cnr.it:8080/mokaApp/apps/AMAV3pc/index.html)

Here, professional fishermen represent an important category with over 250 artisanal fishermen and about 110 boats (Fig. 2 right). Sport fishing is also very active together with hundreds of divers and tourists, especially during summer months. These anthropogenic pressures increasingly affect the marine coastal system, its health and resources.

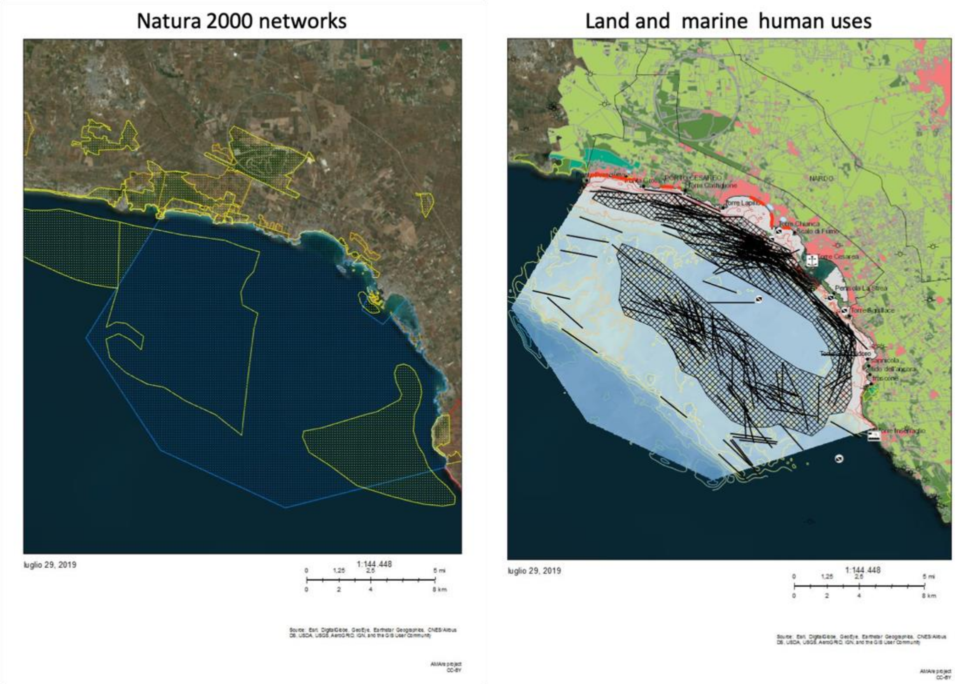


Figure 2. Left pannel, marine and terrestrial distribution of Natura 2000 sites. Right pannel land use and distribution of fishing effort (black lines) Source AMAre WebGIS (http://gismarblack.bo.ismar.cnr.it:8080/mokaApp/apps/AMAV3pc/index.html)

Starting from the information available for the project platform, regarding the distribution of the main habitats and the most important pressures, we have created a cumulative impact map (Fig.3)
The cumulative impact score was calculated based on Halpern et al 2018 the intensity of the activity at location is derived from a linear decay function from all locations of that activity.

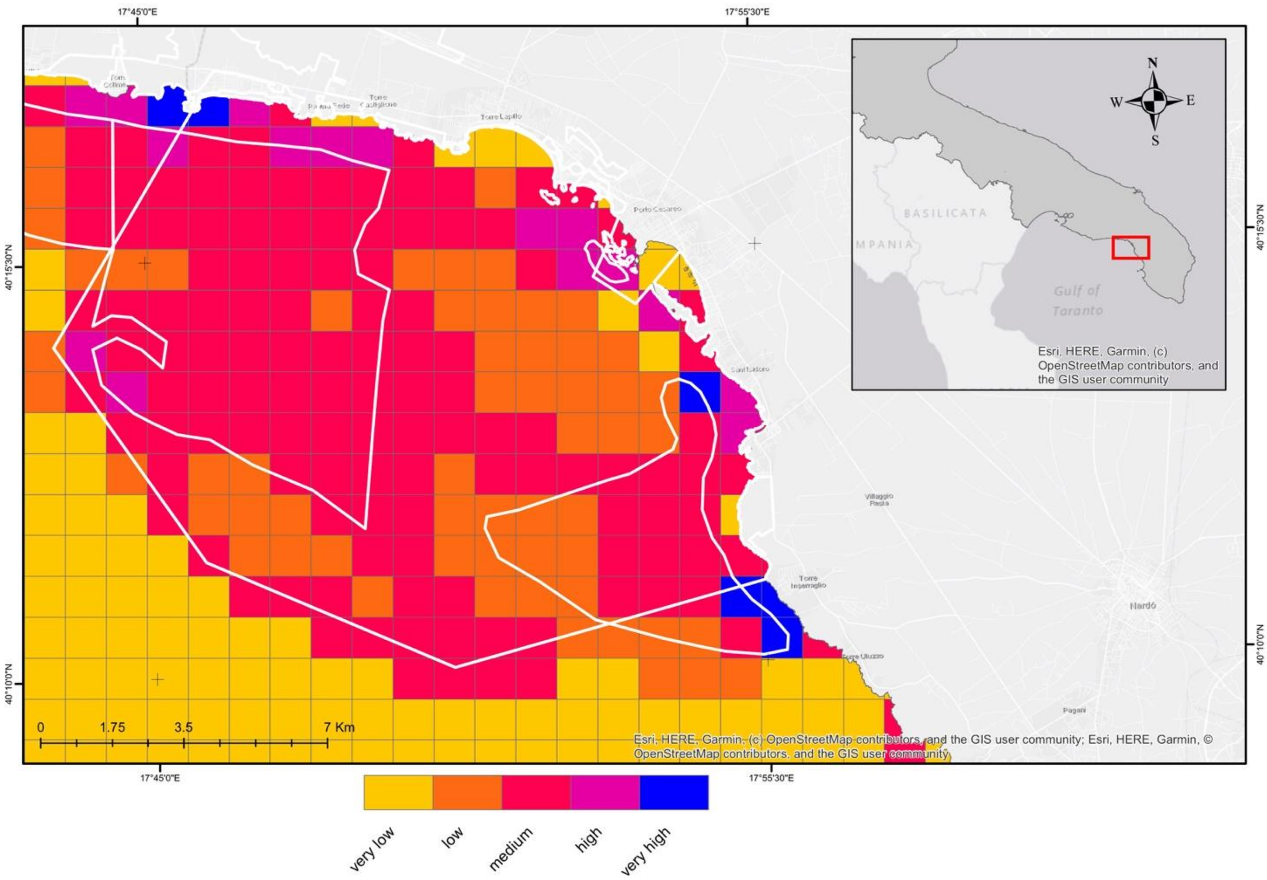


Figure 3 Cumulative impact score for Porto Cesareo MPA

Torre Guaceto MPA

The product scenario is a valuable tool. It can be used by the managing body as a spatial baseline for planning conservation and management activities in areas of high risk threatened by human activities. The MPA of Torre Guaceto is widely recognized in scientific literature as a successful story of protection. Recently, Zupa et al. (2018) demonstrated that Torre Guaceto is among the few MPAs able to reduce anthropogenic pressures in comparison to unprotected external areas. Currently the MPA includes a part of the SCI Torre Guaceto and Macchia S. Giovanni. In the MPA, the surface area characterized by the presence of P. oceanica and/or coralligenous is about 20% (respectively 10% Posidonia, 3% coralligenous, 7% a mosaic of the two). The remaining part is characterized by a mosaic of habitats. More precisely, 17% of the seabed of the WAP is characterized by a mosaic of coral and coastal / muddy debris, while about 13% is characterized by a mosaic of Posidonia and dead matte (Fig. 4)

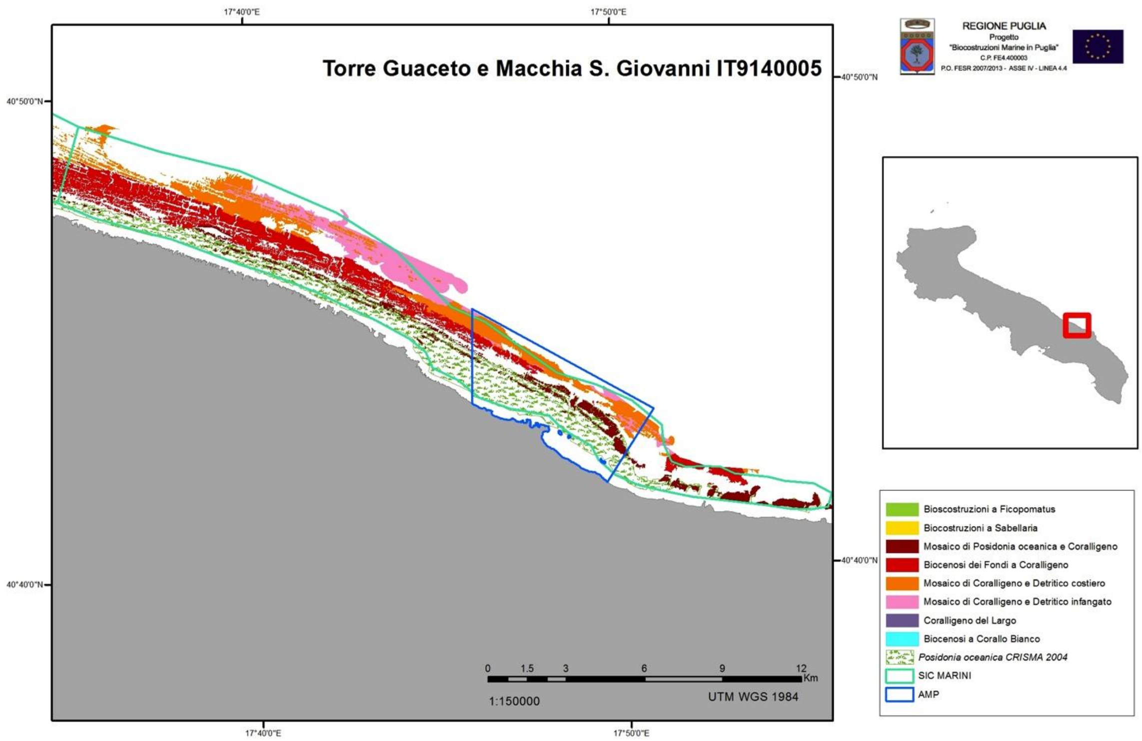


Figure 4. Torre Guaceto national MPAs boundary and habitat distribution

Our data show how the Torre Guaceto MAP shows evidence of protection not only for fish fauna (Guidetti, 2008). Fraschetti et al. (2013) have shown that the unprotected Posidonia meadows outside the MPA are characterized by a more advanced regression state than those inside. The same result was observed for the coralligenous formations by Bevilaqua et al. (2018).

Concerning MPA Torre Guaceto, it has recently been awarded the management of the Special Area of Conservation (SAC) partially falling within the current boundaries of the area. The initiative proposes an interesting model of integrated governance between a National Protected Area and a Natura 2000 site, that are regulated from different legislation instruments.

Here, starting from the spatial data collected on the project platform, analyses have been carried out to identify a new zoning according with a possible extension to include the SAC within the boundaries of the National Marine Protected area. The prioritization analyses were carried out using the Marxan software. The simulating annealing algorithm implemented by the software computes optimal scenarios aiming to minimize costs and maximize conservation targets and is used to support designing new reserve systems, reporting on the performance of existing ones and developing multiple-use zoning plans.

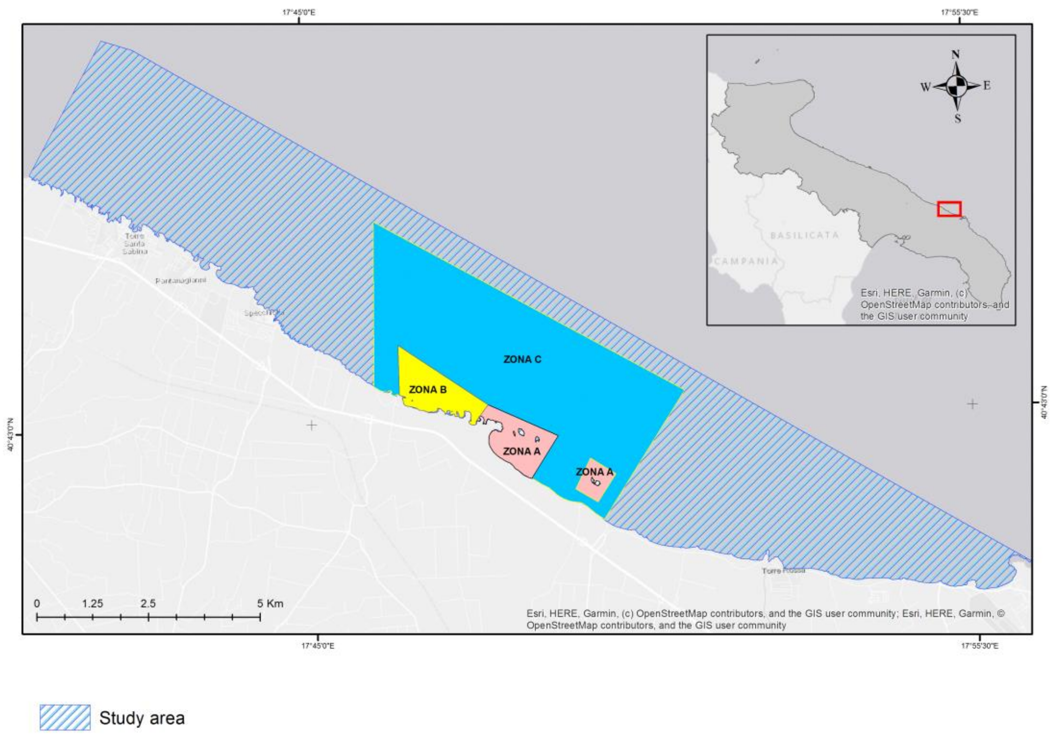


Figure 5. Current zoning of the MPA Torre Guaceto and its assumed expansion area (study area)

Fig. 5 shows the current zoning of the MPA Torre Guaceto and its assumed expansion area (study area). That is, from Punta Penne to the entire territory of the municipality of Carovigno.
The study area was divided into square-shaped planning units (PUs) with 100 m sides.
Starting from the distribution of the habitats in Fig.4, as indicated for the priority habitats by the European Union, we have assigned conservation targets for these of 60%. We have also used the surface area of the planning units as a surrogate for the management/conservation cost.
In Fig.6 we can observe one of the two main results of the Marxan analysis: the "BEST solution".

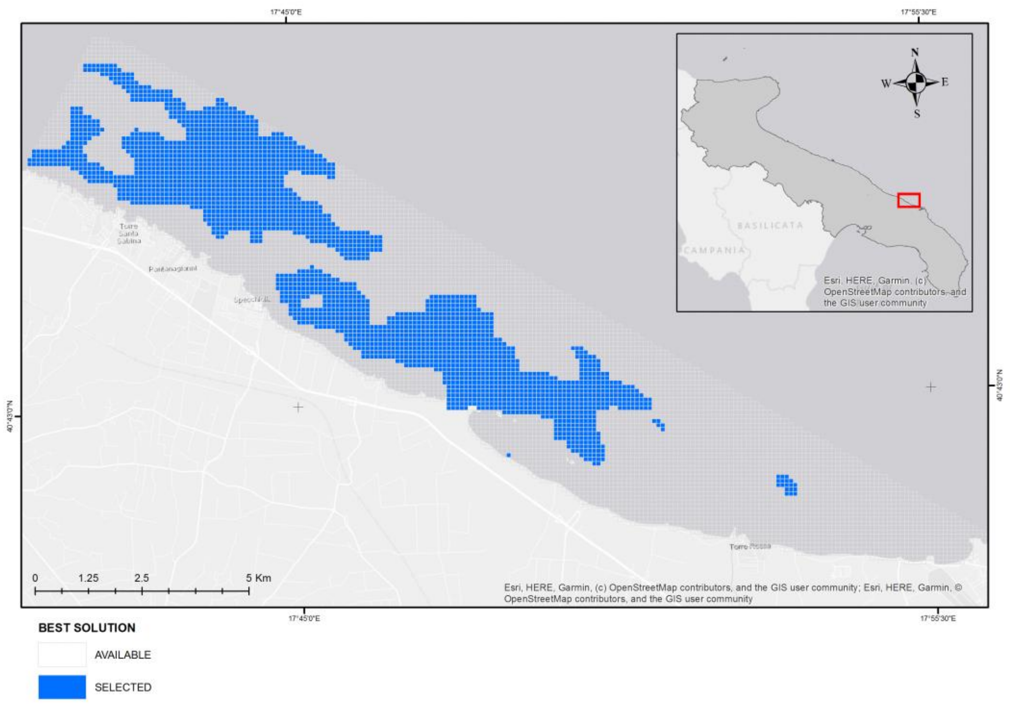


Figure 6. Marxan BEST solution outputs (the reserve configuration that best reduces management/conservation cost and meets biodiversity targets from 1000 Marxan runs) for each planning scenario.

This solution is not entirely useful to identify the new zoning, but it gives us a clear indication that the central portion (current MPA Torre Guaceto) and north (extension area towards the town of Carovigno) have a higher priority in conservation than the south area (extension area towards the city of Brindisi).
Another important output of the Marxan analysis is the IRR score, Selection frequency (Fig. 7). This result provides an assessment of the relative importance of each PUs in achieving the conservation targets. From Yellow to Blue the areas most frequently selected in the 1000 conservation scenarios produced.

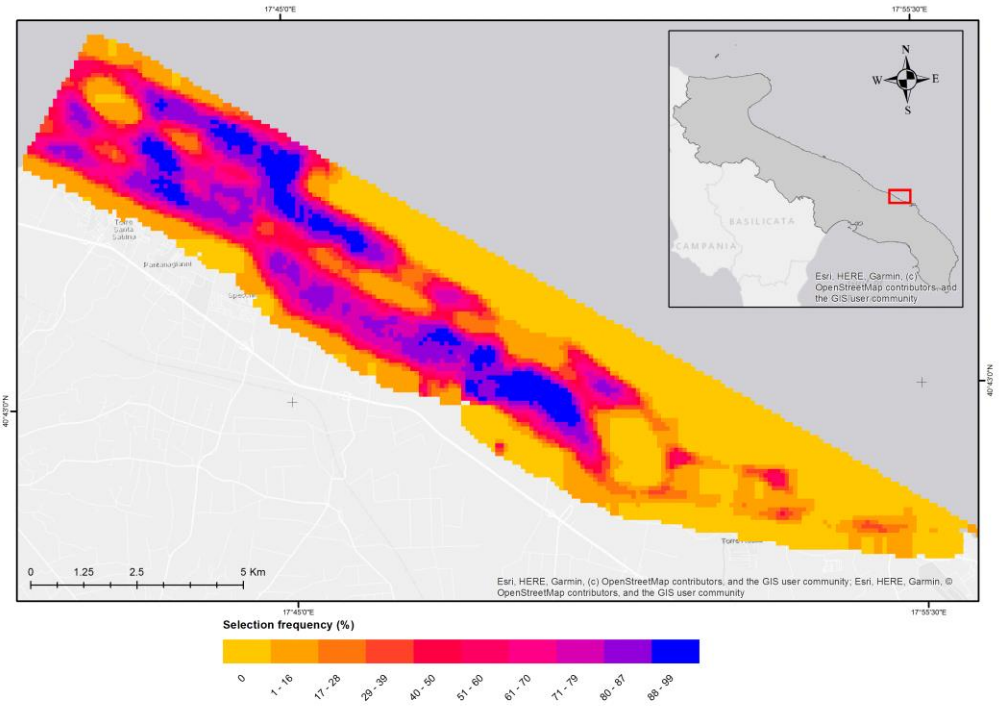


Figure 7. Selection frequency of Marxan results from 1000 runs using conservation target recommended by EU. Yellow indicate areas selected less frequently in Marxan runs, red colours those with intermediate selection, and blue colours those selected most frequently

Using both outputs of the Marxan analysis it is possible to outline areas that need different management/conservation regimes and priorities in order to identify a proposal for a new zoning.
Fig.8 shows the zoning resulting from the spatial overlapping of the two outputs. It is a geometrical simplification, however necessary to transform the out of the analysis, into areas easily represented on paper for management purposes.

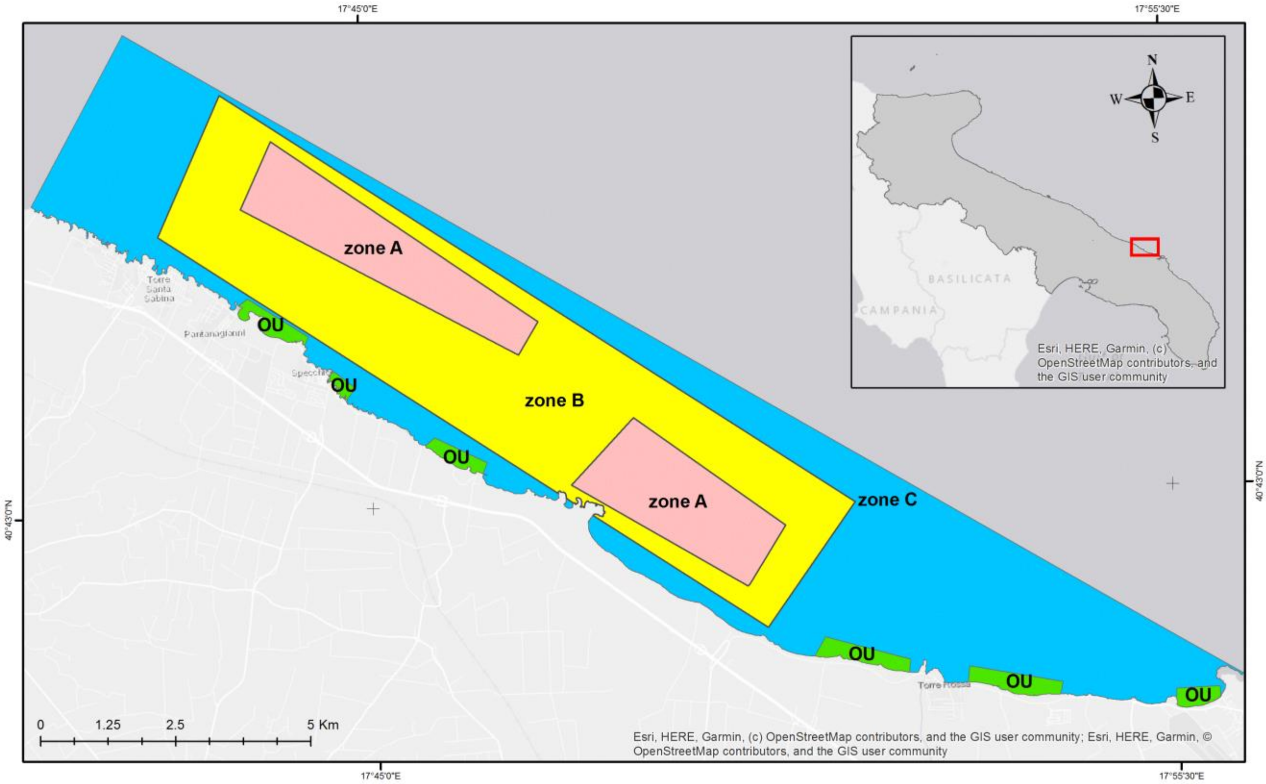


Figure 8 New proposed zonation for MPA of Torre Guaceto

The selection criterion used is the following:
Zone A: Consists mainly of PU selected in the BEST solution and with a selection frequency between 80% and 100%.
Zone B: Constituted mainly PU selected in the best with selection percentage between 50% and 79%
Zone C Consists mainly of PU with a selection percentage < 50%.
In addition, there are planning units that are never included in the 1000 scenarios produced (selection frequency = 0), We have indicated these coastal areas, in green on the map, and indicated by the acronym OU (other uses). These are areas that have little interest from a conservation point of view and could therefore be used for the planning of human activities compatible with the sustainable management of the MPA such as mooring fields for other similar facilities.

Maltese Islands MPA

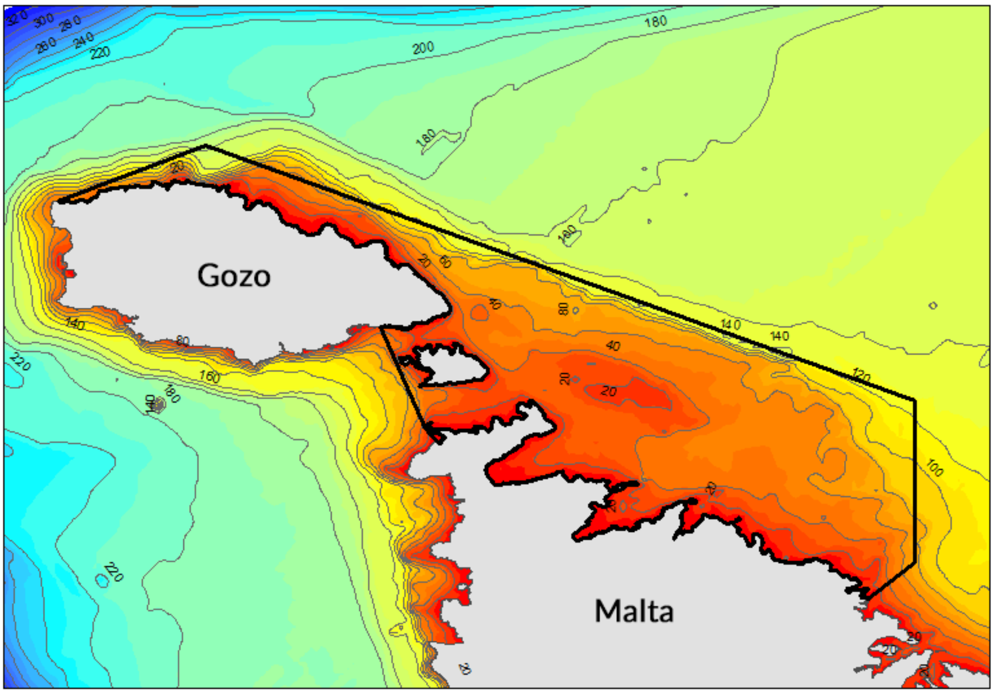
Strategies for improving the conservation and the management of the area

The implementation of solutions enhancing the spatial planning of the MPAs and improving the effectiveness of the biodiversity protection strategy is one of the main aims of AMAre. Within this ambit, on the back of the outcomes emanating from previous comprehensive marine surveys conducted within the MT 105 Site of Community Interest (SCI)/Natura 2000 site within Maltese waters, a number of alternative future scenarios are being presented here in relation to ongoing vessel bunkering activities within the same MPA. Given that vessel bunkering is considered to be the most insidious and nefarious of ongoing anthropogenic activities within the same MPA (reference) and given the lack of equivalent (i.e. acquired at the same spatial resolution and with the same temporal frequency) data for other anthropogenic activities, the Marxan-based approach adopted within the AMAre Project for other participating MPAs (e.g. Torre Guaceto) could not be adopted. A customised mapping approach was adopted within the MT 105 MPA, by utilising the following array of data:

(i) Vessel AIS data for the 2017-2019 period in order to characterise the shipping disturbance;
(ii) Aquaculture facility perimeter;
(iii) ROV survey data of vessel anchoring damage to Posidonia oceanica meadows and to geogenic reefs (survey conducted in May 2019)

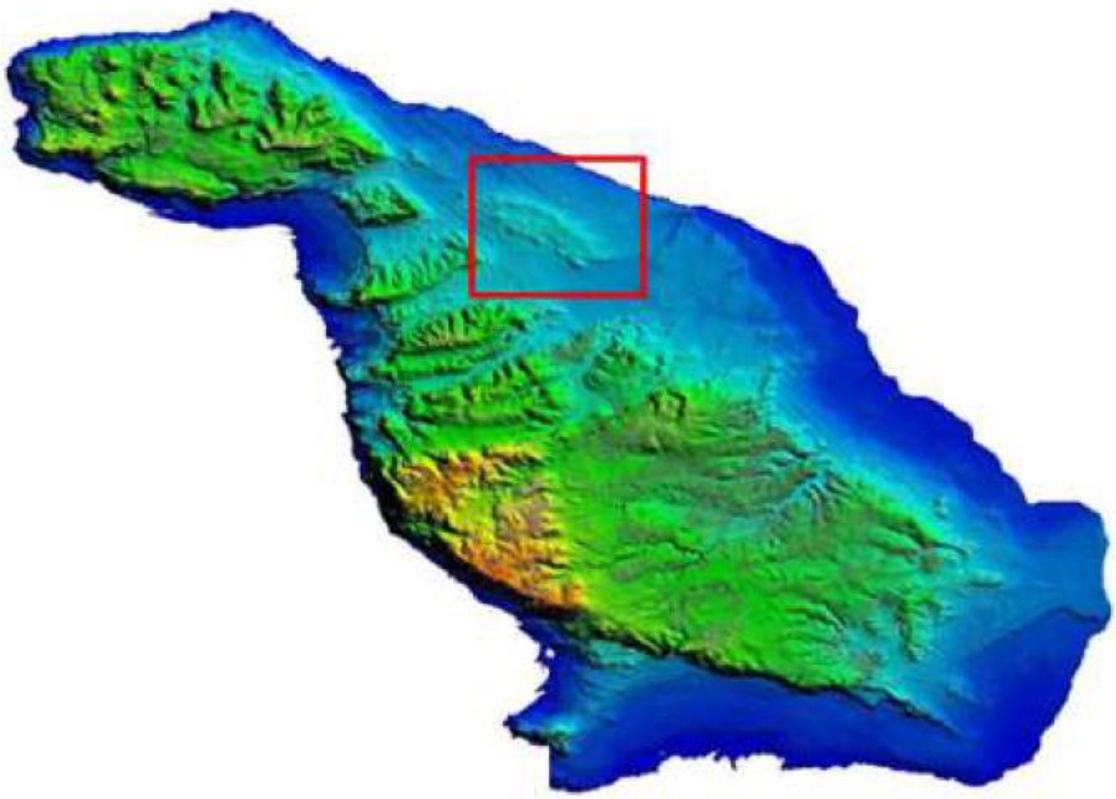
Background/context

The MT 105 SCI/NATURA 2000 site is known by its local/Maltese name as the 'Żona fil-Baħar bejn Il-Ponta ta' San Dimitri (Għawdex) u Il-Qaliet', extending from the eastern coast of the island of Malta to the northern coast of Gozo. This coastal site is relatively large when considering Malta, spanning for almost 160 square kilometres, of which 50km2 are represented by Posidonia oceanica meadows. Justification for this is based on the SLOSS (Single Large Or Several Small sites) debate on site design. Contrary to several small sites, a single large site has low edge effect, affords better protection to organisms with large area requirements and is easier to manage. Moreover, this approach is also in line with the suggested ecological coherence necessary for better conserving Natura 2000 sites. The seabed geomorphology in the site is considerably heterogeneous giving rise to a number of varied seascapes, bottom types and a number of different habitat types.



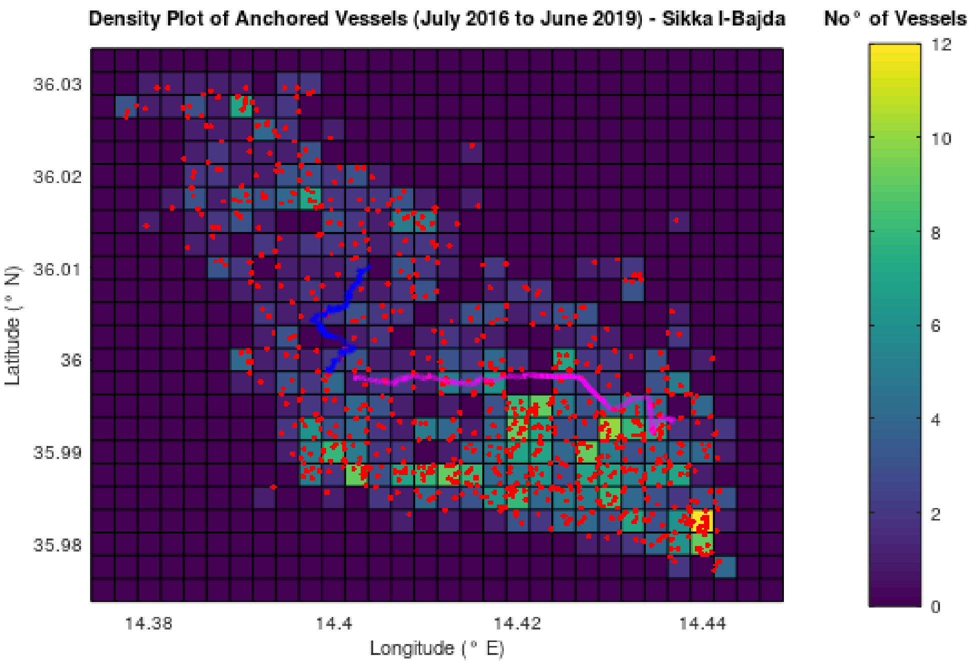
This area hosts the largest variety of Posidonia sub-types when considering the marine sites selected to form part of the Natura 2000 Network, with the representativity of each being considered superior. The subtypes present in this site are the following: Posidonia settled on matte, whose meadows are normally continuous and having a high density; Posidonia settled on rock, showing a reticulate distribution of dense strands; Posidonia settled on sand, with continuous beds generally showing low densities and variable percentage cover; Mosaic morphology, intermixed between Posidonia oceanica, Cymodocea nodosa and coarse sand, showing a reticulate structure; Ecomorphosis of 'barrier reef' Posidonia meadows. The Posidonia meadows within this site are also known for a high degree of connectivity, as well as percentage coverage. It is evident that the Posidonia meadows in various parts of this site are very abundant and healthy. They are dense and show a high degree of shoot density, particularly in White Tower Bay, which appears to host probably the highest shoot density in the Mediterranean. Sandbanks, formed by associations of Cymodocea nodosa are also present within this site. The following subtypes are present: Sandbanks with associations of Cymodocea nodosa on well-sorted fine sands; Sandbanks with associations of Cymodocea nodosa on

superfically muddy sands in sheltered waters; Facies with Cymodocea nodosa occurring within coarse sands and gravels with more or less mud. Reefs have also been identified within this site, occurring on hard beds and rocks. The following subtypes occur within this site: Reefs with associations of Dictyopteris polypodioides; Reefs with associations of Halopteris scoparis and Padina pavonica; Reefs with associations of Flabellia petiolata and Peyssonnellia squamaria; Reefs with associations of Cystoseira spp. Partially submerged caves are also present, mostly located along the coast of Comino. No quantitative data is available for this habitat type. Amongst the important species within this site is Lithothamnion minervae, a species which has been included in national legislation as a plant species of national interest whose conservation requires the designation of Special Areas of Conservation. Note: This site was proposed as an SCI in 2010, confirmed as an SCI in 2012 and was then extended in 2018.
The MT105 MPA also hosts a large vessel bunkering area (Bunkering Area ‘1’), by virtue of the extensive shallow geogenic reef (‘Sikka l-Bajda’) within its confines.



Methodology

A density plot was generated to determine the areas that were frequented the most by anchored vessels within Bunkering Area 1 between July 2016 and June 2019. The table that contained the data for the recorded anchored vessels was amended so as to retain only the latitude and longitude of these vessels and was saved as a text (.txt) file. The two tables containing the GPS coordinates from both surveys were also amended to retain only the latitudes and longitudes and these were also saved as text files. A script code, executable through by both MATLAB and Octave, was written to read and extract the latitude and longitude of these generated text files. A total of 792 points were extracted from the anchored vessels text file; however, once the script code had established a domain matrix, all the points outside the domain matrix were removed, leaving behind a total of 786 points for plotting purposes. The established domain matrix spanned from 35.975 to 36.035 degrees North and from 14.375 to 14.45 degrees East, which resulted in a 25 by 31 grid, with each grid cell having a grid cell resolution of 0.00125 by 0.00125 degrees. The script code computed the total number of vessels found in each grid cell and displayed the results as coloured grid cells through a pseudocolour plot. In addition, the anchored vessels (red) and survey paths (blue and magenta) were plotted on top of the pseudocolour plot. Moreover, the same script code was executed once again but this time using instead the tables containing the information of anchored vessels at six-month intervals (**Errore. L'origine riferimento non è stata trovata.**).



An arbitrary index was created to determine the anchoring pressure within Bunkering Area 1. Anchoring pressure was computed by multiplying he total residence time, the total number of vessels and the total tonnage of the vessels found in a grid cell so as to generate a Shipping Index. To compute this Shipping Index, all the AIS entries of the vessels that had their navigation status set to “At Anchor” were required. The first Microsoft Excel file downloaded from the MySQL AIS database was sorted according to the navigation status of the vessels and any vessels that had their navigation status set to anything other than “At Anchor” were removed. Also, the IMO number and Gross Tonnage corresponding to the MMSI number of these vessels were added to this file. Each MMSI number was checked against the second Microsoft Excel file downloaded from the MySQL AIS database to retrieve the IMO number of the vessels. The MMSI/IMO number was used to retrieve the Gross Tonnage of the vessel from the MarineTraffic webpage. The IMO number was added to keep track of the vessel just in case a vessel had to be referenced; the IMO number never changes, unlike an MMSI number when, for example, the ownership of the vessel changes. To facilitate data processing, this table was split into two separate tables. The first table contained information on the recorded vessels, including their MMSI number, the IMO number, and the Gross Tonnage. The second table contained the AIS entries of the vessels, including their date and time, MMSI number, and the position of the vessel in terms of latitude and longitude.

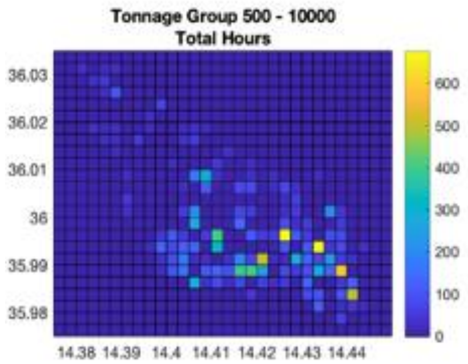
A script code, executable by MATLAB, was written to read and extract the information in the tables. A domain matrix spanning from 35.975 to 36.035 degrees North and 14.375 to 14.45 degrees East was established. This domain matrix is the same size as that established when computing the Density Plots, which resulted in a 25 by 31 grid, with the grid cell resolution being set to 0.0025 by 0.0025 degrees instead of 0.00125 by 0.00125 degrees. The sizes of the vessels (in terms of Gross Tonnage), were grouped into 12 categories, based on the same categories established when producing the GIS maps at six-month intervals.

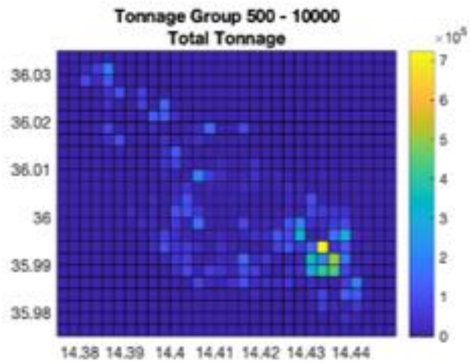
The 12 broad categories groupings vessel sizes in terms of Gross Tonnage (G.T.)

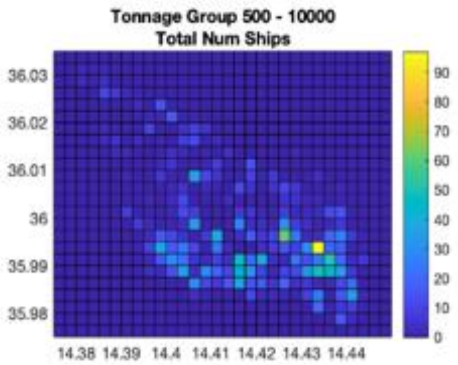
Group	Vessel Size (Gross Tonnage)	Group	Vessel Size (Gross Tonnage)

01	$0 \leq GT < 500$	02	$500 \leq GT < 10{,}000$
03	$10{,}000 \leq GT < 20{,}000$	04	$20{,}000 \leq GT < 30{,}000$
05	$30{,}000 \leq GT < 40{,}000$	06	$40{,}000 \leq GT < 50{,}000$
07	$50{,}000 \leq GT < 60{,}000$	08	$60{,}000 \leq GT < 70{,}000$
09	$70{,}000 \leq GT < 80{,}000$	10	$80{,}000 \leq GT < 90{,}000$
11	$90{,}000 \leq GT < 100{,}000$	12	$100{,}000 \leq GT < 200{,}000$

The script code was written to first create a matrix according to the size groupings in terms of Gross Tonnage, by establishing the minimum and maximum for each group, as shown in **Errore. L'origine riferimento non è stata trovata.**. For each recorded vessel, MMSI number, the corresponding Gross Tonnage, position, date and time were extracted. The script code was written in a way that if the same MMSI number was recorded from the same grid consecutive short intervals, it would not be listed as one single entry. The maximum residence time for the same MMSI was set to 2.5 days to prevent false readings. The results for each vessel size grouping were displayed as pseudocolour plots, depicting the total residence time of the vessels, the total number of vessels, and the total tonnage of the vessels for each grid cell. Additionally, text outputs of the results were generated from which the shipping index could be calculated.

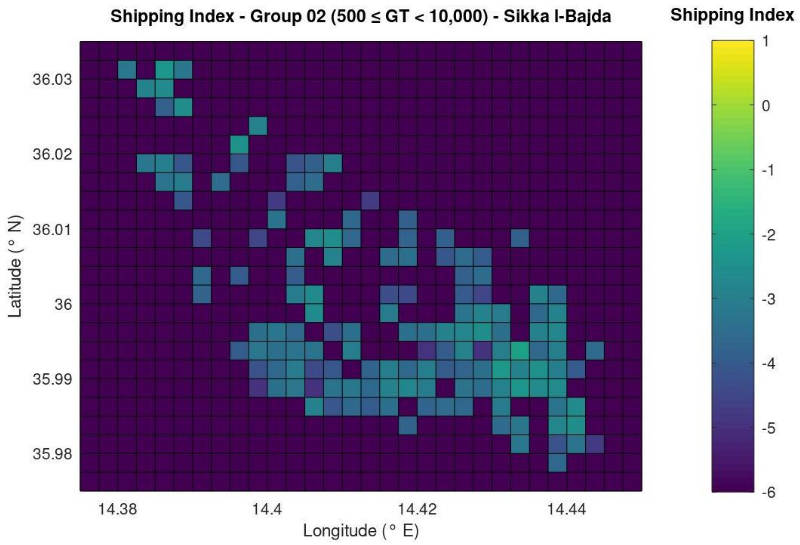




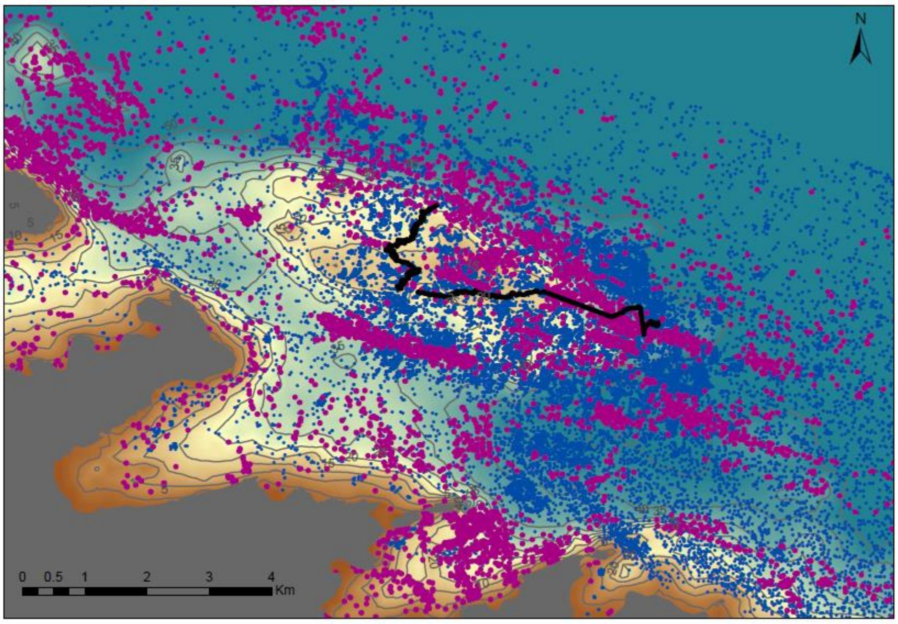


The text file outputs were imported into Microsoft Excel using the “Get External Data” wizard as “Delimited” files separated by commas in order to have one value per grid cell. A separate Microsoft Excel file was created for the 12 vessel size categories, with each file having a spreadsheet for the total number of vessels, total residence time, and total tonnage. The total residence time and total tonnage averages were calculated by dividing the values in these spreadsheets by the corresponding values in the total number of vessels spreadsheet. Then the total number of vessels, the average residence time and the average tonnage spreadsheets were normalised by dividing the values in each spreadsheet by the maximum value of that spreadsheet. Normalising the data would scale the values in each spreadsheet within a narrow 0 to 1 range. The index then was computed by multiplying the corresponding cells for the normalised total number of vessels, averaged residence time and averaged tonnage values. The index was saved as a .csv file. This method was then replicated for the remaining ship gross tonnage categories.

An additional script code, executable through both MATLAB and Octave, was first written to establish a domain matrix. The domain matrix spanned from 35.975 to 36.035 degrees North and 14.375 to 14.45 degrees East, which resulted in a 25 by 31 grid, with each grid cell set to have a resolution of 0.0025 by 0.0025 degrees. Then, once the script code read and extracted the information from the .csv files; a log 10 function was applied to the values so as to accentuate the spatial distribution. The results were shown as a pseudocolour plot, depicting the anchoring pressure over Bunkering Area 1 in terms of the total number of vessels, average time of residence and average tonnage.

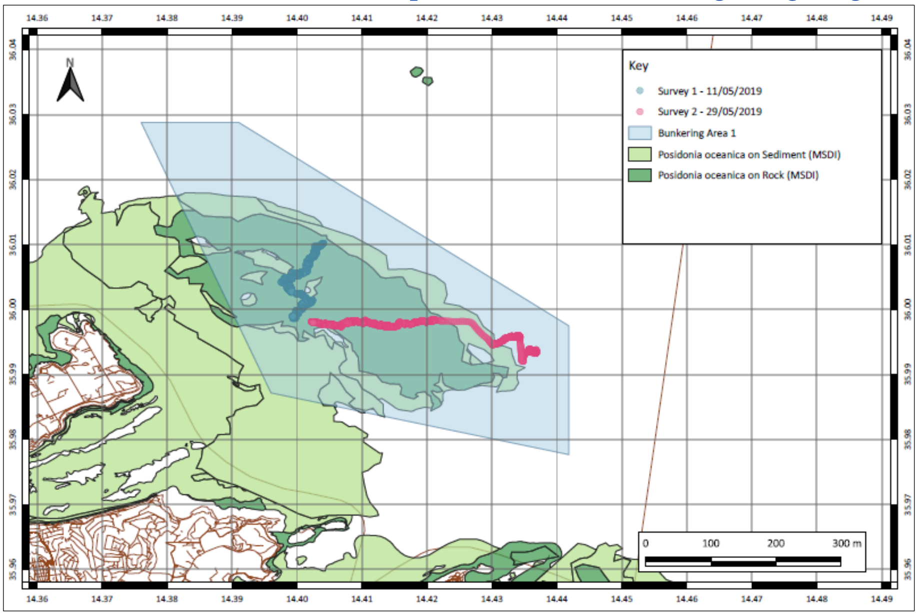


The AMAre Project funds only allowed for two surveys to take place. Before each survey, the Department of Geosciences overlaid both AIS and VMS data form the past year (2018 – 2019) over a bathymetric map of Sikka l-Bajda. This exercise highlighted the areas with the highest concentration of vessels that were known to be stationary (0 knots). This information would determine the path the ROV would take while out in the field. The hypothesis was that the pre-determined paths would extend over area characterised by varying degrees of anchoring pressure to P. oceanica meadows and the seafloor, thus representing a broad spectrum for such a pressure comparative purpose. Each path would cover a varying number of vessels known to be stationary as well as cover a range of depths ranging from 15m to 30m.



AIS data (purple dots) and VMS data (blue dots) overlaid on a bathymetric map of Sikka l-Bajda, including the ROV paths undertaken in the field shown in black.

The first survey was conducted on 11th May 2019, running from North to South, and the second survey was conducted on 29th May 2019, running from East to West. Each survey lasted approximately 6 hours, and the footage collected from each survey was approximately 4.5 hours long. During each survey, the mobile application Locus Map – installed on an Android device – took GPS readings at 10-seconds interval. At the end of each survey, the GPS coordinates recorded by Locus Maps were exported from the Android device as a comma-separated value (.csv) file. One crew member remained at the bow of the vessel once the ROV was in the water, ensuring that the ROV remained ahead of the vessel to prevent the tether from getting tangled in the vessel's propellers.

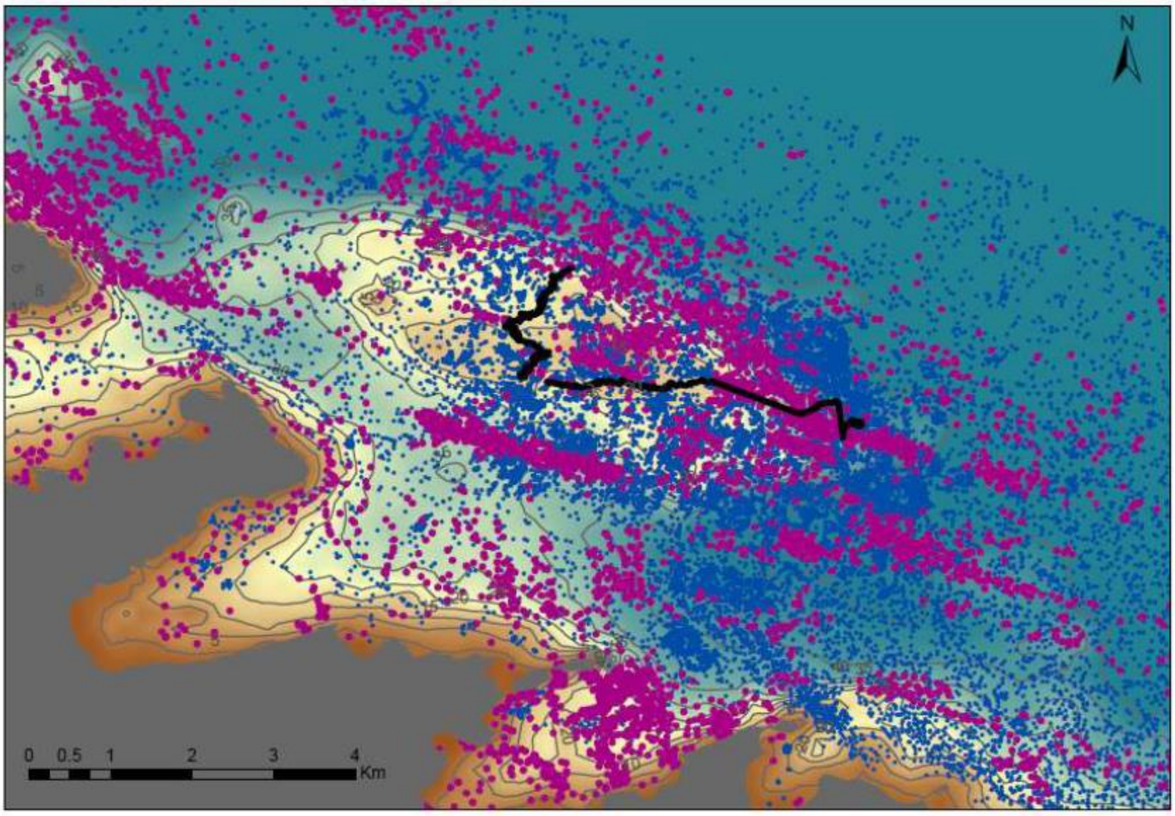


A base map depicting the GPS coordinates of ROV-deploying the vessel as recorded by the mobile application Locus Map.

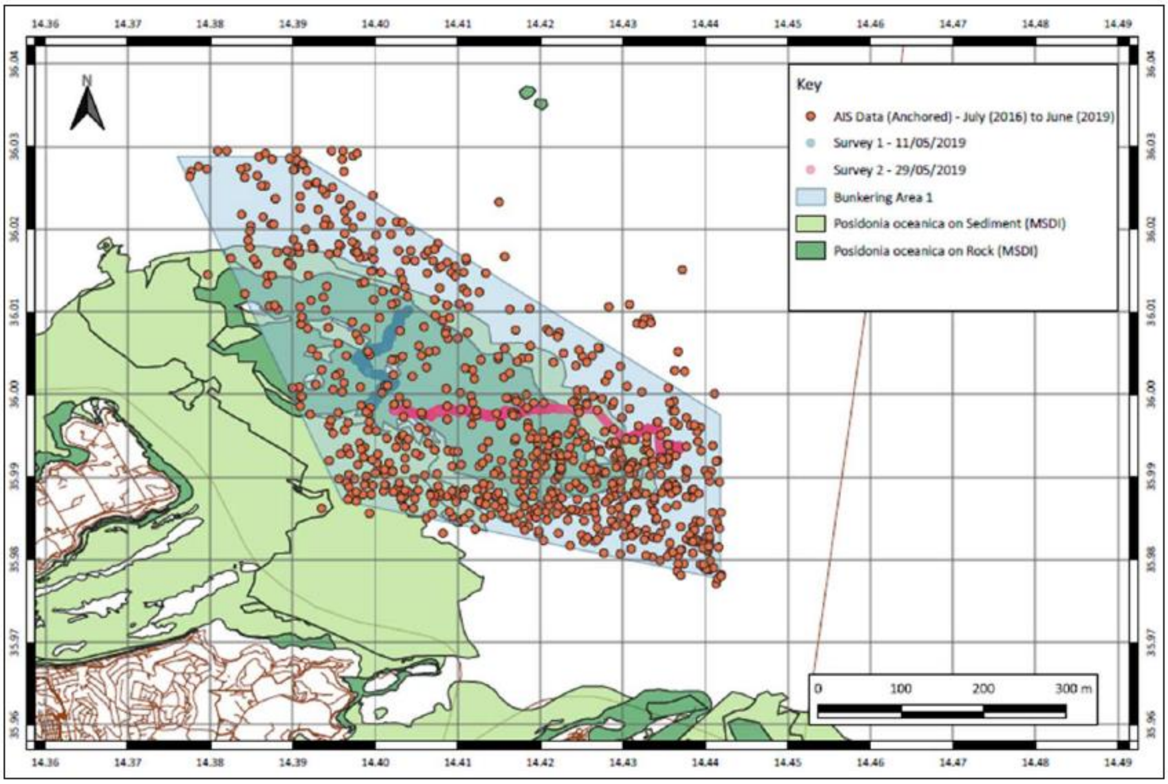
There were instances where the ROV had to be brought back on board during the surveys. In the first survey, the vessel had drifted off-course due to the winds and currents becoming more influential as the day progressed. Therefore, the ROV was brought back on board so that the vessel could to be repositioned. In the second survey, after deploying the ROV in an area displaying a high concentration of vessels, it was found that the substrate was a sandy one. If a vessel had anchored in this area, then any evidence of anchorage would not be picked up in the footage due to the transient surface nature of a sandy substrate. Additionally, fish farms are present in the same area, partly accounting for the anomalously high concentration of vessels recorded through the AIS and VMS data. On such an instance, the ROV was brought back on board, allowing the vessel to be repositioned further west along the pre-determined path.

Main findings and conclusions

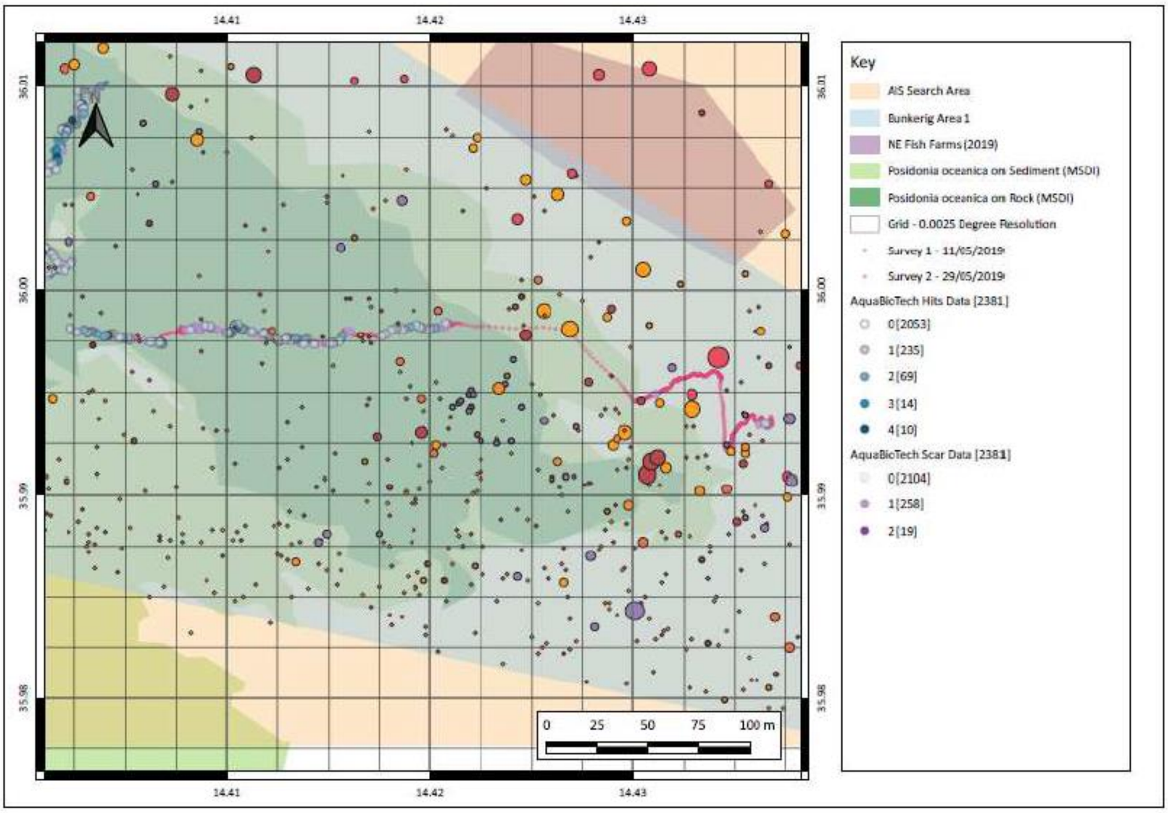
Through the analysis of GIS maps and AIS data, this study determined that vessels mainly anchor along the southern margins of Bunkering Area 1, with smaller vessels being the main contributors to anchoring pressure within this area as indicated by the Shipping Index values. The area along the southern margins of the bunkering area is characterised by deep, coastal water having a medium sand substrate. This implies that vessels can anchor in this area without fear of losing their anchor. Also, this study determined that small clusters of a high concentration of vessels are found along the northern margins of the bunkering area. Moreover, the results of this study indicate that the central part of the bunkering area is not under as much anchoring pressure as this study initially speculated. However, this does not mean that anchoring pressure is completely absent in this area, especially since the GIS maps, AIS data and Shipping Index show that some localised anchoring pressure has occurred in the past. From the AIS data, it resulted that anchoring in Bunkering Area 1 mostly occurs during the winter months, when the winds and currents are much stronger. The main vessel types that visited the bunkering area during the period this study focused on were General Cargo, Oil Products Tankers, Bulk Carriers and Oil/Chemical Products Tankers.



AIS data (purple dots) and VMS data (blue dots) overlaid on a bathymetric map of Sikka l-Bajda, including the ROV paths undertaken in the field shown in black.



A base map depicting all the AIS entries of anchored vessels recorded between July 2016 and June 2019.



A GIS map displaying the AIS data recorded from July 2016 to June 2019 overlaid on the ROV survey anchor and anchor chain damage data recorded during the second ROV survey.

The ROV survey analysis report indicated that there was a significant amount of physical damage to the seafloor. However, when the AIS data was laid over the ROV surveys conducted within the AMAre project, it resulted that there was not much geospatial overlap between the two. Nevertheless, some good examples of seafloor physical damage as a result of anchoring were documented in the recorded ROV footage. It is essential to mention that although some physical damage to the seafloor was not captured in the recorded ROV footage does not mean that seafloor damage as a result of anchoring did not historically occur within the same areas. This is especially true for soft bottoms, where anchor damage often does not leave behind a lasting legacy and where recovery is rapid. This study has also shown that AIS data can be used to semi-quantify anchoring pressure within an area of interest. Even though the protocols and approaches followed need to be refined and optimised, this study can serve as a basis for other future studies. Moreover, the mentioned protocols can be applied to other bunkering areas found within Maltese territorial waters. The results from this study and any future studies can be utilised by managers and policy-makers to mitigate anchoring pressures within the Maltese territorial waters.

Recommendations

Producing in the future a detailed bathymetric map of is-Sikka l-Bajda would aid port operators and vessel masters better in determining which are the best areas for vessels to anchor. If possible, future anchoring would avoid completely is-Sikka l-Bajda and areas where P. oceanica meadows are present. Ideally, vessels should anchor in deeper waters, and if this is not possible, a designated area should be established that is solely used as an anchorage area to minimise further damage to the area. Understandably, this may be difficult to implement since anchored vessels must retain a safe swinging distance between them. Typically, a safe swinging distance is the distance of the length of the anchor chain paid out, the length of the vessel, and the minimum comfortable passing distance from another vessel added together (CHIRP Maritime, 2017). Port operators and vessel masters must also allow for the fact that vessels may not simultaneously change direction when the winds and currents change (CHIRP Maritime, 2017). A collision between anchored vessels may still occur if there is not enough distance between them (CHIRP Maritime, 2017). Better understanding the seafloor beneath those areas that displayed a high concentration of vessels, notably those areas along the northern and southern margins of the bunkering area, would enable managers and policy-makers to mitigate the anchoring pressure to these areas, especially if anchoring is occurring over sensitive benthic environments. Ideally, future visual surveys are conducted using ROVs that are equipped with an acoustic positioning system (e.g. Short baseline or Ultrashort baseline). An acoustic positioning system would allow operators and researchers to determine the position of the ROV while in the water. When this is not possible, the ROV should be released into the water with a pre-determined length of tether with the ROV remaining at the bow or stern of the host vessel. Additionally, both the ROV and host vessel should follow the same heading. During the surveys, the ROV should be kept at a constant height above the seafloor, with the ROV constantly pointing downwards towards the seafloor. This would allow for the recorded ROV footage to be used to assess changes in P. oceanica meadows at least on a semi-quantitative basis.

Gauci et al. (2016) successfully used Machine Learning techniques to classify automatically sand and maerl regions on the seafloor by using recorded ROV footage. The authors state that Machine Learning techniques could be used as an alternative or in conjunction with other mapping techniques. Additionally, Machine Learning techniques can facilitate the laborious and time-consuming analyses of the recorded ROV footage. Using acoustic instruments such as recreational SSSs to produce high-resolution, detailed maps of the area would be beneficial in understanding the distribution of P. oceanica better. Nevertheless, any surveys conducted need to follow pre-determined transects to ensure the full coverage of the area under investigation. The ROV survey transects must be well planned and must overlap with the areas where vessels have anchored in the past, by analysing in some detail historical AIS data, in order to infer shipping-mediated anchor damage to the seafloor. Preferably, the AIS data used corresponds to vessels that have anchored in the recent past so that physical damage to the seafloor and P. oceanica is still visible. One must consider that the estimated growth rate of P. oceanica is approximately 6cm/year (Arnaud-Haond et al., 2012). Moreover, the results from these surveys could be incorporated into maritime charts and may also be used by the competent authorities in Malta tasked with protecting, conserving and preserving the marine environment, such as the Environment and Resources Authority (ERA).