UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC

POST-2020 SAP BIO

MALTA
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

United Nations Environment Programme
Mediterranean Action Plan
Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafat
B.P.337 - 1080 Tunis Cedex - TUNISIA
car-asp@spa-rac.org

The present publication has been prepared as Malta national contribution to support the Post-2020 SAPBIO elaboration. It has been prepared by the Environment and Resources Authority as National consultant, guided by Mr Darrin T. Stevens National SAPBIO Correspondent and Focal Point for SPAs.

For bibliographic purposes, this document may be cited as
UNEP/MAP-SPA/RAC, 2021. Malta Conservation of Mediterranean marine and coastal biodiversity by 2030 and beyond. Ed. SPA/RAC, Tunis: 103 pp + Annex.

Cover photo
© Ruben Holthuijsen

This publication has been prepared with the financial support of the MAVA foundation

For more information
www-spa-rac.org

MALTA
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

Ecological Status, Pressures, Impacts, their Drivers and Priority Response Fields

POST-2020
SAPBIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

Executive Summary

Malta has been actively working towards achieving its national biodiversity targets as provided in the National Biodiversity Strategy and Action Plan 2012 – 2020. As Malta's main instrument to implement the Convention at a national level, the NBSAP its national targets are aligned with the Global Biodiversity Strategic Plan 2011-2020[1], the Aichi Biodiversity Targets and the EU Biodiversity Strategy to 2020 and its targets. This ensured an effective and over-arching coverage of the various biodiversity targets. In fact, an overall review of the progress and implementation of the targets and measures in its NBSAP 2012 – 2020, show that Malta has contributed to the achievement of the UN Aichi Targets and CBD objectives and advanced on the implementation of the NBSAP 2012-2020, with some of the Targets have been exceeded and several Targets have been achieved. Additionally, various challenges have been identified and evaluation on how these can be integrated in the development of the upcoming NBSAP to 2030, was carried out. This notes Malta's ongoing commitment and determination towards focussing further concerted efforts were needed at the national level.

Malta acknowledges the need for sound and concrete knowledge of the marine environment to inform effective management processes that would work towards the sustainable use of the marine resources in the longer-term. Knowledge has significantly improved through the implementation of EU funded projects and through the implementation of a comprehensive marine monitoring programme. Knowledge gaps still need to be addressed to enable a holistic assessment of environmental status and work towards the achievement of environmental objectives in the marine environment. There is the need to attain more knowledge on the ecology of specific habitat types, such as caves and reefs, through the identification of suitable monitoring processes and the definition of Indicators on the structure and function. Levels of pressures or thresholds still need to be determined, also in quantitative terms, to inform management processes. Such knowledge gaps will be addressed through the implementation of sustained monitoring processes.

Malta designated up to 4,138km^2 of marine waters, more than the 35%, for the conservation of important marine habitats and species listed in Annex I and II to the Habitats Directive and Annex I to the Birds Directive. In total, eighteen (18) MPAs have been established and four (4) natural habitat types occurring in Maltese waters have been identified, namely Posidonia beds (1120), Sandbanks which are slightly covered by sea water all the time (1110), Reefs (1170), and Submerged or partially submerged sea caves (8330). Five (5)

1. Strategic Plan for Biodiversity 2011-2020: https://www.cbd.int/sp/

SACs in inshore/coastal waters and five (5) SACs in offshore waters are designated for the protection of these four marine habitat types. Malta designated one (1) inshore/coastal area and three (3) offshore areas for the protection of the loggerhead turtle and three (3) offshore areas for the protection of the bottlenose dolphin. Eight (8) Special Protection Areas (SPAs) are designated for the protection of breeding seabirds in Malta, namely the Yelkouan shearwater, the Scopoli's shearwater and the European Storm-petrel.

The critical impacts on coastal and marine waters are those associated with the introduction and establishment of non-indigenous species, physical disturbance from anchoring activity in inshore waters, marine litter and extraction of fisheries resources. Although hydrographical changes can have an impact on the coastal habitats, including coastal wetlands, impacts resulting from such changes are considered localised and not significant when considering the marine waters under jurisdictional rights. On the other hand, some coastal wetlands are known to have been impacted by changes in hydrology and coastal erosion processes. Considering that all sensitive coastal and marine habitats are covered by the designation of both terrestrial and marine Natura 2000 sites pursuant to the EU Habitats and Birds Directive, such impacts are being addressed accordingly through Natura 2000 management regimes.

Malta adopts an integrated approach towards the management of the marine environment based on the ecosystem-based approach principle as stipulated through the EU MSFD and the Barcelona Convention. Priority needs for the marine environment are addressed by PoMs identified as part of the EU MSFD and EU WFD. Management measures for MPAs complement the overarching management regime through more targeted measures that ensure the protection of sensitive habitats and species and enhance the contribution of the protected areas to the conservation status of key habitats and species. Such management regime needs to be accompanied by continuous knowledge improvement on the marine environment, both through monitoring processes and research activities. Based on the outcome of the assessment of environmental status of the marine environment and associated elements, urgent actions are required in relation to the most relevant pressures. These are captured by the environmental targets as described in Section 5.1 and covered by the necessary management regimes as described in Section 6.1.

Public funding is the major source of finance for the implementation of conservation measures on the marine and coastal environment. Further resources are needed to coherently implement the EU acquis and international treaties, as well as to assist in the identification of the applicable funding and ensure an increased success rate of funding applications, thus accessing various funding programmes. Biodiversity mainstreaming is also an important component of resource mobilisation: instruments to align existing financial flows with biodiversity and marine objectives are to be explored, as well as to identify harmful subsidies and incentives. As such, EU funds and programmes have been the most widely used solution for resource mobilisation and reinforcement of the national funds allocated for biodiversity. Thus, it is envisaged that future applications for funded projects under EU funds and programmes will be considered. The possibility of increasing investments from the private sector, other than banks, in biodiversity-positive projects is also to be further explored.

© SPA/RAC, Yassine Ramzi Sghaier.

List of Acronyms

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area
ACD	Acoustic Diversity Index
ALDFG	Abandoned, Lost or Discarded Fishing Gear
ARU	Automated Sound Recorder
CARLIT	Cartography of littoral rocky-shore communities
CBD	Convention on Biological Diversity
CMR	Capture-mark-recapture
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CSD	Continental Shelf Department
DFA	Department of Fisheries and Aquaculture
EcAp	Ecosystem Approach
EMFF	European Maritime and Fisheries Fund
ERA	Environment and Resources Authority
EU	European Union
EUNIS	European Nature Information System
FAD	Fish Aggregating Device
FMZ	Fisheries Management Zone
GFCM	General Fisheries Commission for the Mediterranean
GSA	Geographic Sub-Area
IAS	Invasive Alien Species
ICCAT	International Commission or the Conservation of Atlantic Tunas
IUCN	International Union for Conservation of Nature
LUPE	Landings Per Unit Effort
MEDITS	International bottom trawl survey in the Mediterranean
MPA	Marine Protected Area
MSFD	EU Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
NIS	Non-Indigenous Species
PA	Planning Authority
PoMs	Programmes of Measures
PREI	Posidonia oceanica Rapid Easy Index
RAS	Rapid Assessment Survey
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SCI	Site of Community Importance
SPA/BD	Protocol concerning Specially Protected Areas and Biological Diversity
Protocol	In the Mediterranean
SPAs	Special Protection Areas
SSB	Spawning Stock Biomass
SST	Sea surface temperature
TM	Transport Malta
UNEP/MAP	United Nations Environment Programme – Mediterranean Action Plan
UNFCCC	United Nations Framework Convention on Climate Change
uPBTs	Ubiquitous Persistent, Bioaccumulative and Toxic substances
WCMP	Water Catchment Management Plan
WFD	EU Water Framework Directive

1.

Reference documents and information consulted

© SPA/RAC, Mathieu FOULQUIE

1.1. Documents provided by SPA/RAC and its international consultants

This national report has been compiled on the basis of information and documents compiled and/or provided by the Environment and Resources Authority.

1.2. National documents and publications identified and available

- Update to Malta's Initial Assessment under the EU Marine Strategy Framework Directive (ERA, 2020)
- General report outlining the adequacy of the current monitoring programmes under the EU Marine Strategy Framework Directive (MEPA, 2015)
- Report on the progress and implementation of measures under Article 17 of the EU Habitats Directive (ERA, 2019)
- Prioritised Action Framework (PAF)
- LIFE BaĦAR for N2K project. (2014). LIFE BaĦAR for N2K (LIFE12 NAT/MT/000845) - Life+ Benthic Habitat Research for marine Natura 2000 site designation. Retrieved from https://lifebahar.org.mt/
- LIFE+ MIGRATE project. (2013). LIFE MIGRATE (LIFE11 NAT/MT/1070) -Conservation Status and potential Sites of Community Interest for Tursiops truncatus and Caretta caretta in Malta. Retrieved from http://lifeprojectmigrate. com/
- LIFE-IP RBMP-Malta project. (2019). LIFE-IP RBMP-Malta (LIFE16 IPE/MT/000008) - Optimising the implementation of the 2nd RBMP in the Maltese River Basin District. Retrieved from https://www.rbmplife.org.mt/projects

1.3. Quality and comprehensiveness of available information documents

The documents, publications and information used for the compilation of this overview have been considered to be of good quality and deemed to be the most comprehensive available sources of input to carry out this overview. Moreover, these documents are the most recent references available during the compilation of this overview. Knowledge and data gaps/limitations, and ways forward to tackle them, have been highlighted in the relevant sections of this overview

2.

Marine and coastal ecosystem status

© SPA/RAC, University of Sevilla

2.1. Biological characteristics

2.1.1. Description of water column biological communities

Plankton communities (phytoplankton and zooplankton) constitute an important component of water column biological communities, forming the base of marine food webs. The composition of these communities can provide a good indication of the status of water column ecosystems, also because plankton responds to anthropogenic pressures, in particular nutrient enrichment.

For the purpose of the description of water column biological characteristics, the following classification is used following definitions by the European Environmental Agency (Evans, Condé, & Royo Gelabert, 2014):

- Coastal Waters: *shallow-depth marine systems that experience significant land-based influences. These systems undergo diurnal fluctuations in temperature, salinity and turbidity, and are subject to wave disturbance. Depth is down to approximately 50-70 meters, depending on local factors determining the zone boundary. Pelagic habitats in this type include the photic zone.*
- Shelf Waters: *Marine systems away from coastal influence, down to the shelf break. They experience more stable temperature and salinity regimes than coastal systems, and their seabed is below wave disturbance. Depth is up to 200 meters. Pelagic habitats in this type include the photic zone.*

'Coastal waters' are considered to extend up to 1 nautical mile from the baseline[1] based on the definition of the EU Water Framework Directive 2000/60/EC[2]. Waters beyond the 1 nautical mile boundary are considered to be 'shelf waters'. This however should be considered an interim definition of water column habitats in Malta's waters, pending further knowledge on these habitat types.

Data on phytoplankton and zooplankton composition and abundance, as well as data on chlorophyll-a levels, was generated through the implementation of the monitoring programme pursuant to the EU Marine Strategy Framework Directive 2008/56/EC as part of the EU funded project EMFF 8.3.1[3] over the period 2017-2019. Datasets collected for phytoplankton and zooplankton are listed in Table 1. The sampling design for zooplankton communities as implemented during the first monitoring year was not very effective since the sampling volume was insufficient for representative counts of zooplankton. Such methodology was improved in the second monitoring year, however this shortcoming has limited the extent of data on zooplankton communities.

1. Baseline from which the breadth of territorial waters is measured
2. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy
3. EMFF 8.3.1 – Marine environmental monitoring: towards effective management of Malta's marine waters.

Table 1

Datasets collected through EMFF 8.3.1 for phytoplankton and zooplankton

Species group	Datasets
Phytoplankton	• Full species composition and abundance • Total abundance of major groups (dinoflagellate/diatoms) • Percentage abundance of known opportunistic/blooming/non-indigenous species
Zooplankton	• Species composition and abundance • Percentage abundance of non-indigenous invasive species • Biomass

Phytoplankton

The majority of phytoplankton species recorded are diatoms (Bacillariophyceae) represented by an overall 48% of all species recorded in Maltese waters and dinoflagellates (Dinophyceaea) represented by 40% of the species. A minor proportion of the recorded species belong to the following groups: Cryptophyceae, Cyanophyceae, Prymnesiophyceae, Dictyophyceae, Chrysophyceae, Euglenophyceae and Prasinophyceae.

A total of 145 species (identified to species level) have been recorded from 41 inshore sampling stations (including stations along transects) representing the coastal waters. The shelf waters were sampled at 30 monitoring stations across which 90 species (identified to species level) were recorded. The most frequent phytoplankton taxa (based on the number of samples with presence of the specific taxa) were the diatoms *Cylindrotheca spp., Pseudo-nitzschia spp., Navicula spp., Dactyliosolen fragilissimus* and *Amphora*; and the dinoflagellates *Alexandrium spp.* and *Lingulodinium polyedrum*.

There is a marked difference in the abundance of phytoplankton in inshore and offshore stations, with total abundance (number of cells for all species/genera averaged per sample) in inshore stations being five times higher that recorded in offshore stations. Phytoplankton composition based on the most abundant species in coastal and shelf waters is indicated in Table 2. Most of the species are common to both habitat types. However, it is noted that the diatom *Skeletonema costatum* which was a specific taxon showing highest abundance[4] in overall samples (close to 5.5 x 10^3 cells per L in one sample) was not very abundant in shelf waters.

On the basis of the data available so far, Maltese pelagic habitats are dominated by diatoms. The highest abundances of any specific taxa were close to 5.5 x 10^3 cell l^{-1} of the diatoms *Skeletonema costatum* and *Dactyliosolen fragilissimus* in February and May 2018. Most of the counts of any single taxa higher than 3 x 10^3 cell l^{-1} were of diatoms. Very few counts of any dinoflagellate taxa above 1 x 10^3 cell l^{-1} were registered.

4. together with Dactylioselen fragilissimus

The predominance of diatoms in terms of abundance is evident also when considering coastal and shelf monitoring stations separately. Both Maltese pelagic coastal and shelf waters are characterised by a high diatom/dinoflagellate ratio. Such ratio however is more pronounced (i.e. higher diatom: dinoflagellate ratio) in coastal waters rather than in shelf waters. Further elaboration or assessment of the composition of phytoplankton species in pelagic coastal and shelf waters however requires long time-series data, as well as the definition of typical species composition at Mediterranean level.

Table 2

Species composition (at species level only) in pelagic coastal and shelf waters based on the top 15 most abundant species (based on number of cells per sample) across all monitoring stations sampled in the period 2017-2019. Common species are in bold.

Pelagic Coastal Waters	Pelagic Shelf Waters
Dactyliosolen fragilissimus	*Cylindrotheca fusiformis*
Cylindrotheca fusiformis	*Leptocylindrus danicus*
Leptocylindrus danicus	*Leptocylindrus minimus*
Lingulodinium polyedrum	*Cylindrotheca closterium*
Skeletonema costatum	*Rhizosolenia clevei var. communis*
Dactyliosolen blavyanus	*Lingulodinium polyedrum*
Leptocylindrus minimus	*Prorocentrum compressum*
Cerataulina pelagica	*Nitzschia longissima*
Cylindrotheca closterium	*Dactyliosolen fragilissimus*
Pseudo-nitzschia delicatissima	*Proboscia alata*
Chaetoceros compressus	*Haslea wawrikae*
Nitzschia longissima	*Rhizosolenia imbricata*
Licmophora gracilis	*Gonyaulax fragilis*
Gonyaulax fragilis	*Dactyliosolen blavyanus*
Asterionellopsis glacialis	*Leptocylindrus mediterraneus*

Zooplankton

In general, zooplankton presented very low numbers of taxa, abundances and biomass. The most frequent taxa were copepods (*Calanus sp., Euterpina sp.* and *Acartia sp.*) followed by Cirripedia larvae.

The available data and the lack of knowledge on typical zooplankton communities at Mediterranean level does not enable further elaboration on the basis of this element.

Chlorophyll-a levels

Chlorophyll-a concentrations were very low in both coastal and beyond coastal monitoring stations. This parameter is used as an indicator of status of coastal water bodies under the processes of the EU Water Framework Directive 2000/60/EC. Within this context, it should be noted that the measured chlorophyll-a levels are almost always below the 'Good'/'Moderate' status boundary for this parameter set for Type IIIE waters by Cyprus and Greece (Table 3). Levels of chlorophyll-a are thus indicative of good water quality.

Table 3
Chlorophyll-a status assessed at coastal, beyond coastal and overall.

Monitoring Stations	'Good'/'Moderate' status boundary set by Cyprus and Greece	% monitoring stations > threshold	% mon. stations < threshold
Overall	0.53 µg l^{-1}	3.04	96.96
Coastal	0.53 µg l^{-1}	3.15	96.85
Beyond Coastal	0.53 µg l^{-1}	0	100

2.1.2. Information on invertebrate bottom fauna, macro-algae and angiosperms including species composition, biomass and annual/seasonal variability

Invertebrate bottom fauna

The waters around the Maltese Islands host a whole plethora of benthic invertebrate species within the variety of seabed and bottom habitats present. Particular reference is made to *Stermophala nivosa, Centrostephanus longispinus*, *Paracentrotus lividus* and *Lithophaga lithophaga,* all species within the Annexes of the SPA/BD Protocol and protected at national level.

The Maltese top-shell, *Stermophala nivosa*, is an endemic gastropod to the Maltese Islands (Ghisotti 1976; Giannuzzi-Savelli *et al.* 1997). Moreover, this species is considered to be a Lazarus species, which is critically endangered (Schembri *et al.* 2007; Evans *et al.* 2011). Recent studies have corroborated the earlier consideration that cobble and pebble beds particularly those consisting of pebbles covered by turf and/or coralline algae at depths of 5-12 m, are the main habitat for *S. nivosa*. It is noted that, whilst the habitat of the species is being considered as stable, it is quite rare, and the species is not always found in every locality where the habitat occurs, and even where found it is irregularly distributed in individual cobble/pebble patches. On the other hand, the majority of the sites from where this species has been recorded fall within the boundaries of various Natura 2000 sites. The species range and population have been reported[5] as stable in both size and trend, the elusive nature of the species and the limited knowledge on the ecology and life history must be taken into context. However, populations fluctuate widely, and while the reasons for such fluctuations are unknown, experts noted that this could be related to the shallow depths at which these beds occur making them subject to natural disturbances such as storms, particularly those beds that are located in exposed situations and of limited spatial extent. The shallow nature of its habitat makes it prone to anthropogenic pressures such as pollution, eutrophication and coastal development, which if not properly assessed could lead to the alteration and possible destruction of the habitat and any specimens within.

5. ERA. (2019). Habitats Directive: Report on implementation measures. Retrieved November 24, 2020, from Eionet: http://cdr.eionet.europa.eu/mt/eu/art17/envxngv_g/

Various species of echinoderms are recorded from Maltese waters. *Paracentrotus lividus* (the edible sea urchin) and *Centrostephanus longispinus* (the long-spined sea urchin) are two echinoderm species listed in Annexes of the SPA/BD Protocol.

C. longispinus is known to have varied habitat preferences ranging from hard substrata in the semi-dark, outer parts of caves just beyond the cave mouth where dim light is present to deep sea waters with muddy, detritic bottoms. Data on this species was generated through Scuba and ROV surveys, carried out through the EU funded project Life BaHAR for N2K in 2015 and 2016. These were carried out along coastal geogenic reefs, within accessible coastal submerged caves and offshore habitats like detritic bottoms, rhodolith accumulations and coralligenous concretions/rocks. Encounters of this species on coastal reefs and cave habitats were rare. In Maltese waters, this species seems to prefer muddy, detritic bottoms. This study recorded specimens up to depths of 116m with a high abundance recorded within depths from 80 - 95m. These observations are in line with González-Irusta *et al.* (2015). Moreover, noting that the mentioned habitats are relatively frequent in the Maltese waters, it can be inferred that the area and quality of occupied habitat is sufficient for the long-term survival of the species, and has a stable trend. This is further supported by K. Terribile *et al.* (2015) who, based on the assessment of MEDITS trawl data, noted that this species is common within the waters surrounding Malta falling within the Northern Sicilian Channel.

Paracentrotus lividus (the edible sea urchin) is listed as a commonly found echinoid in Maltese waters. It inhabits complex rocky bottoms along the coast, with a preferred depth range up to 20m. However, over the past years its numbers have been noted to have regressed, from those recorded in a baseline study carried out in 2006. There are various presumptions surrounding these observations the major being the increased harvesting of the species for the consumption of its roe, as a culinary delicacy, coastal pollution and the possible incidence of a disease affecting the species. This concern and the species' importance, serving as a regulator and a bioindicator in the marine environment, has necessitated dedicated research on this species to assess the decline and propose management recommendations for the conservation of the species and restoration of its habitat. A study on the investigation into the conservation status of this species has been commissioned and its outcomes are being expected. On the other hand, the preferred habitat of the species, supporting rocky reefs, platforms and ledges, are very common in Maltese waters indicating that the area and quality of the occupied habitat is sufficient for long-term survival of the species.

The Date mussel, *Lithophaga lithophaga*, is another species which is known for its culinary uses. The bivalve lives embedded in burrows in the littoral marine ecosystem in limestone rocks. Due to its sessile nature, its range was set as equivalent to its distribution. The species has suffered habitat loss through the years, mostly related to loss associated with illegal operations in connection with date mussel collection, where rocks are broken up so as to facilitate extraction of specimens; and to an extent due to development along the coast. Despite the possibility that this is still being practiced illegally, this activity has declined through the years, especially in view of strict protection of the species, also through national law. Recent studies and updates in knowledge have led to the range

and population of the species to be reported[6] as stable in both size and trend. Moreover, observations and assessments emanating from the LIFE BaĦAR for N2K project, which reported favourably on the conservation status of cave and reef habitats in Maltese coastal waters, the area and quality of the occupied habitat is considered as sufficient for the long term survival of the species and has a stable trend.

Macroalgae

The Maltese littoral zone is majorly comprised of a rocky shoreline - amounting to circa 90% of the coastline (Gauci *et al.* 2005) – with gently sloping shores prevailing along the north-eastern coastline of the islands, and sheer vertical cliffs characterising the south-western coast. The gently sloping shores support macroalgal communities occupying the lower mediolittoral zone, with characteristic species varying depending on conditions present. Well-lit areas are majorly characterised by belts of *Cystoseira* species (Fucales; brown algae) forming 3 dimensional canopies hosting a range of associated flora and fauna, whereas shaded rocks are inhabited by calcareous red algae (Corallinales) such as *Corallina elongata.* Green algae (e.g. *Ulva* sp.) are known to thrive along water bodies with reduced water quality, particularly due to the presence of nitrate and phosphate pollution and are hence recognized indicators of such disturbed conditions (Malta Environment and Planning Authority, 2013 a). Table 4 lists the macroalgal habitats present along the Maltese coastline.

Macroalgal communities were first mapped out at a national scale in 2008 (Thibaut, 2011). Surveys held as part of Malta's monitoring programme (EMFF 8.3.1) in 2018 provide an update on the distribution of such littoral communities as shown in Figure 1.

Table 4

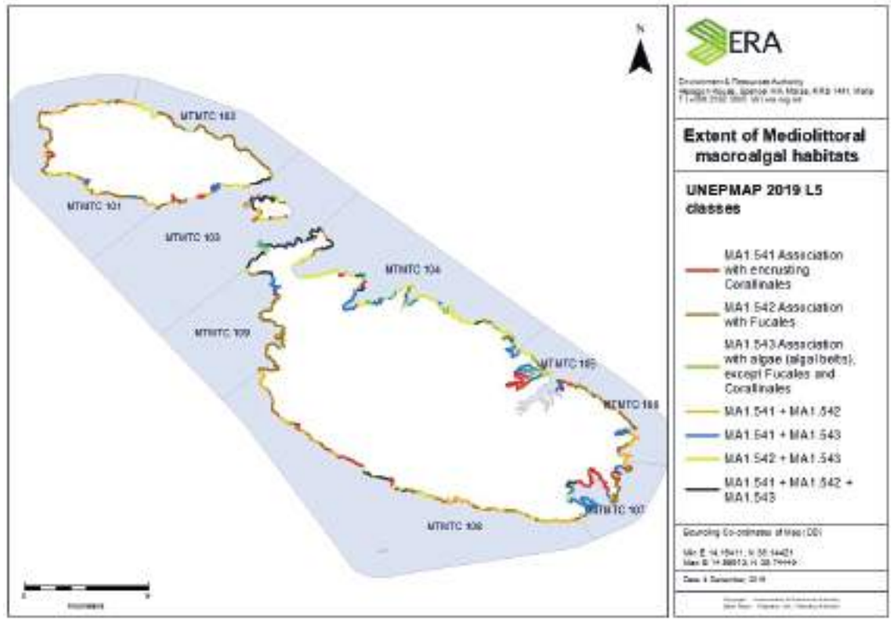
Summary of habitats discussed and/or assessed under the MA1 broad habitat type

UNEP/MAP 2019 class (Corresponding to EUNIS Level 4)	UNEP/MAP 2019 class (Corresponding to EUNIS Level 5)
MA1.53 Upper mediolittoral rock	**MA1.531** Association with encrusting Corallinales (e.g. belts of Lithophyllum byssoides, Neogoniolithon spp.)
MA1.54 Lower mediolittoral rock	**MA1.541** Association with encrusting Corallinales
	MA1.542 Association with Fucales
	MA1.543 Association with algae (algal belts), except Fucales and Corallinales

6. ERA. (2019). Habitats Directive: Report on implementation measures. Retrieved November 24, 2020, from Eionet: http://cdr.eionet.europa.eu/mt/eu/art17/envxngv_g/

Figure 1

Macroalgal communities along the littoral zone as mapped under Malta's monitoring programme in 2018 (EMFF 8.3.1)



The ecological status for macroalgae was undertaken though the application of the CARLIT index, which reflects the status of coastal waters based on the cartography of littoral and upper-sublittoral rocky-shore communities as per Ballesteros *et al.* (2006). This methodology is applied through the Water Framework Directive (WFD, 2000/60/EC) for assessing status in relation to macroalgae as a WFD biological quality element (BQE). The results of the CARLIT index re-assessed in 2018 show that the majority of the Littoral Rock along the Maltese coastline is in good/high status with fewer stretches in moderate status, and a localised stretch of coast in poor status in the Marsaxlokk harbour area.

Sheer vertical cliffs along the southwestern coast of Malta represent a favourable substratum for biogenic concretions such as those of the red alga *Lithophyllum byssoides*, forming concretions in the form of platforms, also referred to as algal rims or 'trottoirs' (**MA2.511** Association with encrusting Corallinales creating platforms). This habitat was surveyed in a number of stations along the north and south-western coast of Malta, assessing the percent cover of living and dead surface as an indication of the habitat's condition. In most stations the percent cover of living surface is between 70% - 100%, with only a few stations falling below 70%. While no thresholds have been set to determine the status of this habitat type on the basis of % live coverage, the current data points towards undisturbed conditions in most of the survey areas.

Data with respect to macroalgal communities in infralittoral waters is limited. However, 'reefs' as defined by the Habitats Directive (92/43/EEC), as mapped and reported through LIFE BaĦAR for N2K (LIFE12 NAT/MT/000845), are found along extensive parts of the

shoreline of the Maltese Islands, including the north-western, western, and south-western coast of Gozo and the southwestern coast of Malta. This habitat type has not been surveyed in detail with information on species assemblages restricted to localised areas.

Angiosperms

Posidonia oceanica meadows constitute the most important seagrass meadows zone in the infralittoral zone in Maltese marine waters, exploiting shallow sandy substrata, and to a lesser extent, hard bottoms. The extent of *Posidonia oceanica* meadows reported in Malta Environment and Planning Authority (2013a) mainly referenced findings of a 2002 side-scan sonar survey. However, noting acknowledged inaccuracies within this dataset (particularly due to the limited recognition by the side-scan sonar of *P. oceanica* meadows growing on rock), the final extent was further supplemented by published data or data generated through localised surveys.

The latest update of the distribution and extent of these meadows was undertaken as part of Malta's EMFF funded monitoring programme (EMFF 8.3.1) using a combination of remote seabed mapping techniques. Further, expert advice (Borg J. 2019, pers. comm) served to confirm the representativeness of the resulting map, and apply minor corrections where necessary, as a result of which the overall extent is depicted in Figure 2.

Currently *P. oceanica* meadows are expected to cover a total area of 64.4 km^2, with one third of this area comprising of dense and continuous meadows and two thirds of the area having more of a patchy distribution.

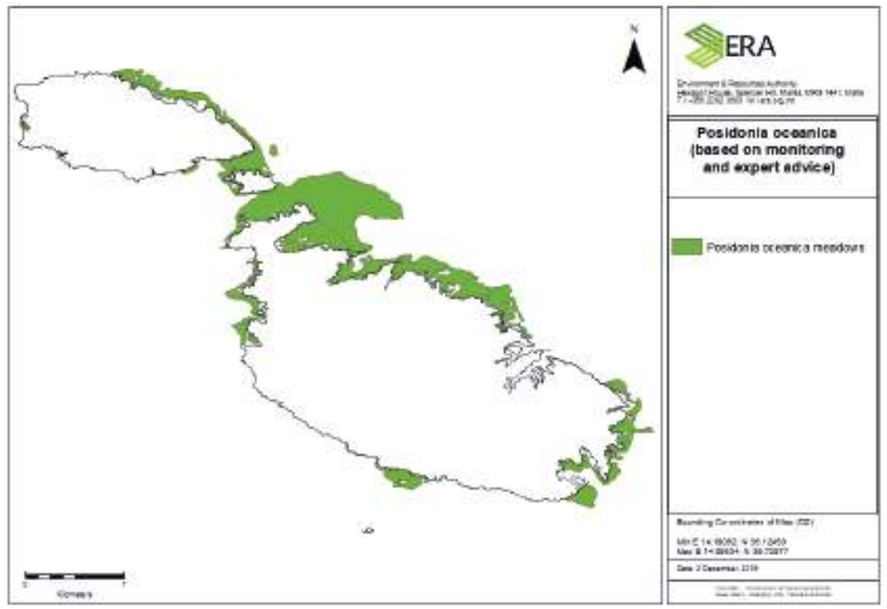


Figure 2
Posidonia oceanica meadows based on monitoring data and expert advice

For the assessment of the overall condition of *P. oceanica* meadows, the PREI (*Posidonia oceanica* Rapid Easy Index) method as described by Gobert *et al.* (2009) was applied at specific monitoring stations. The status boundaries as intercalibrated for Malta and published in Commission Decision (EU) 2018/229 were applied to classify the status of *Posidonia* at the respective monitoring sites. Overall, *Posidonia* meadows are in high/good status on the basis of 2017-2018 data.

2.1.3. Information on vertebrates other than fish

Marine Mammals

Marine mammals recorded in waters surrounding the Maltese Islands are listed in Table 5. Some of these species are occasional or stragglers, while others are regularly present in Maltese waters. This report focuses on regularly occurring species in Maltese waters in view of the larger datasets available for such species. These are the three delphinid species (*Tursiops truncatus*, *Delphinus delphis, Stenella coeruleoalba*). Records of other occasional species are not substantial enough.

Table 5
Cetacean species recorded in Malta. All cetacean species are listed in Annex I of ACCOBAMS, Annex IV of the EU Habitats Directive 92/43/EEC and Annex II to the SPA/BD protocol.

Scientific name	English name
Balaenoptera physalus	Fin whale
Delphinus delphis	Short-beaked common dolphin
Grampus griseus	Risso's dolphin
Stenella coeruleoalba	Striped dolphin
Tursiops truncatus	Common bottlenose dolphin
Physeter macrocephalus	Sperm whale
Globicephala melas	Long-finned pilot whale
Ziphius cavirostris	Cuvier's beaked whale

The data used for the purpose of this report has been primarily collected through the following:

- Systematic surveys undertaken in the period 2013-2015 through the LIFE+MIGRATE (LIFE+MIGRATE, 2013)
- Occasional sightings of LIFE BaĦAR for N2K (LIFE BaĦAR for N2K, 2014) for the period 2015-2016.

The following provides a brief description of the population dynamics and distribution of the three delphinid species in Maltese waters:

(i) Tursiops truncatus

Observations throughout 2013-2016 indicate that *Tursiops truncatus* is widely distributed in Maltese waters with sightings being more common off the Southern and Western coasts of the islands (Figure 3). This data confirms that this species occurs regularly throughout the majority of Maltese waters within Malta's Fisheries Management Zone (25 nm boundary). The population data available from systematic surveys is listed in Table 6.

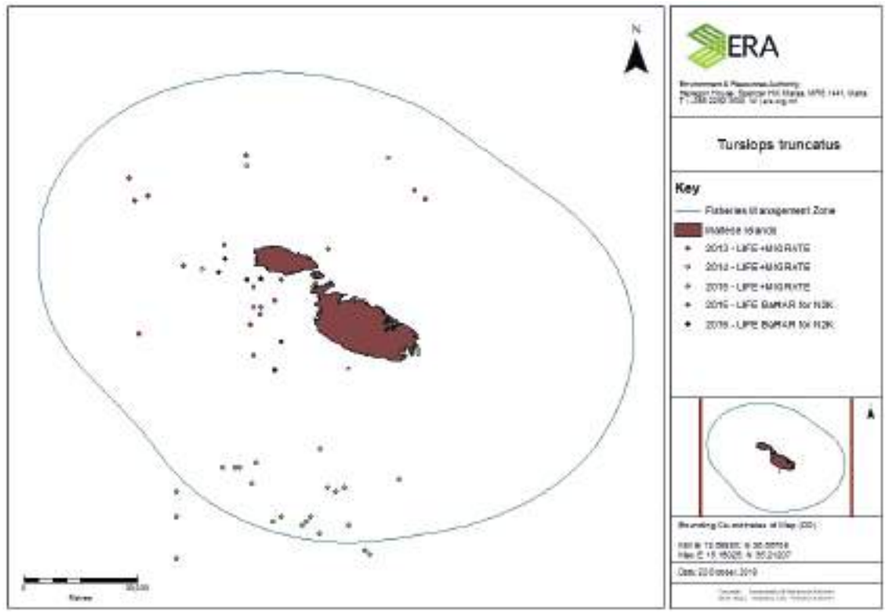


Figure 3
Distributional range of *Tursiops truncatus* as sighted during the systematic surveys and occasional sightings during the project LIFE+MIGRATE in 2013-2015, and the occasional sightings recorded during the project LIFE BaĦAR for N2K in 2015-2016.

Table 6
Total number of sightings of *Tursiops truncatus* from systematic surveys

Year	Data Source	Time Period	Total Number of individuals sighted in one year of systematic surveys	
			Min	Max
2013	LIFE+ Migrate	23rd August - 15th October	55	60
2014	LIFE+ Migrate	3rd July - 14th September	115	173

When compared to previous data reported by Malta in 2013 pursuant to the EU MSFD, trends in population size are considered stable. In 2013 Malta reported a total of 126 individuals of ***T. truncatus*** sighted within a period of one year (surveys covering spring – autumn 2012) in pods of maximum 8 individuals[7]. The present data indicates that the number of sightings of this species in one year over a specific area has not decreased throughout the period 2012-2014. Number of sightings in 2013 are however lower, highlighting the need for longer-term data for appropriate analysis of trends.

The maximum number of individuals observed in pods throughout the 2013-2016 period ranged between 10 and 40, with a median of 12 individuals. This data indicates that the size of the observed pods has also not decreased over a period of five years.

(ii) Delphinus delphis

The distribution of *Delphinus delphis* as sighted during the period 2013-2016 shows that this dolphin occurs over a relatively wide area within Malta's Fisheries Management Zone (FMZ) and is mostly observed in the South-Western part of Malta (Figure 4). The population data available for *D. delphis* from systematic surveys is listed in Table 7.

The data reported by Malta in 2013 pursuant to the EU MSFD reported a total of 100 individuals of *D. delphis* sighted within a period of one year (surveys covering spring – autumn 2012) in pods of maximum 30 individuals[8]. The available data in 2014 is indicative of the fact that the number of sightings of this species in one year over a specific area has not decreased between 2012-2014. The drop in number of individuals sighted in 2013 however shows the need for long-term data for a robust analysis of trends. Such variation in number of sightings would need to be assessed in the longer-term and in the light of the fact that the majority of records for the species in Maltese waters are considered to be of migratory nature.

The maximum number of individuals observed in pods throughout the 2013-2016 period ranged between 6 and 45 with a median of 30 individuals. The current data thus indicates that the size of the observed pods has also not decreased over a period of five years.

7. Such data was collected through systematic surveys by BirdLife Malta as part of the EU LIFE+ Malta Seabird Project. Although the location of the visual transects was different from that used by the LIFE Migrate Project, the same area was covered.
8. Such data was collected through systematic surveys by BirdLife Malta as part of the EU LIFE+ Malta Seabird Project. Although the location of the visual transects was different from that used by the LIFE Migrate Project, the same area was covered.

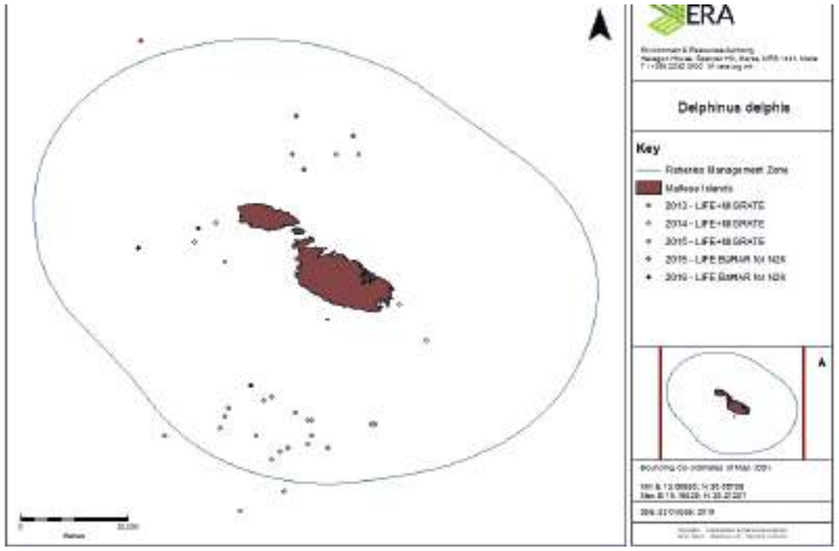


Figure 4

Distributional range of *Delphinus delphis* as sighted during the systematic surveys and occasional sightings during the project LIFE+MIGRATE in 2013-2015, and the occasional sightings recorded during the project LIFE BaĦAR for N2K in 2015 and 2016.

Table 7

Total number of sightings of Delphinus delphis from systematic surveys.

Year	Data Source	Time Period	Total Number of individuals sighted in one year of systematic surveys	
			Min	Max
2013	LIFE+ Migrate	23rd August - 15th October	44	55
2014	LIFE+ Migrate	3rd July - 14th September	110	150

(iii) Stenella coeruleoalba

Stenella coeruleoalba migrates through Maltese waters and is most common off the Northern and the South-western coasts of Malta (Figure 5). Such distribution was also observed through 2012 sightings data. The population data available for *S. coeruleoalba* from systematic surveys is listed in Table 8.

In 2013, Malta reported a total of 171 individuals of *S. coeruleoalba* sighted within a period of one year (surveys covering spring – autumn 2012) in pods of maximum 50 individuals[9]. This number is comparable to the 2013 LIFE Migrate data, however the 2014 data indicates a lower number of sightings. While this may indicate a decrease in the number of *S. coeruleoalba* over the period 2012-2014, such fluctuations can also be attributed to the fact that this species only migrates through Maltese waters and further long-term data is required to adequately assess trends in number of individuals. In fact, more than 100 occasional sightings of this species were reported in 2015 through LIFE BaĦAR for N2K, of which surveys covered only part of the 25 nm boundary.

The maximum number of individuals observed in pods throughout the period 2013-2016 ranged between 30 and 70, with a median of 48 individuals. This implies that the size of the observed pods has not decreased over a period of five years.

Due to the significant fluctuations in number of individuals sighted, trends in abundance for this species are difficult to establish on the basis of the limited time-series data available. However the maximum number of individuals in pods seems to have remained stable throughout the five year period, potentially implying a stable trend in the number of S. coeruleoalba migrating through Maltese waters.

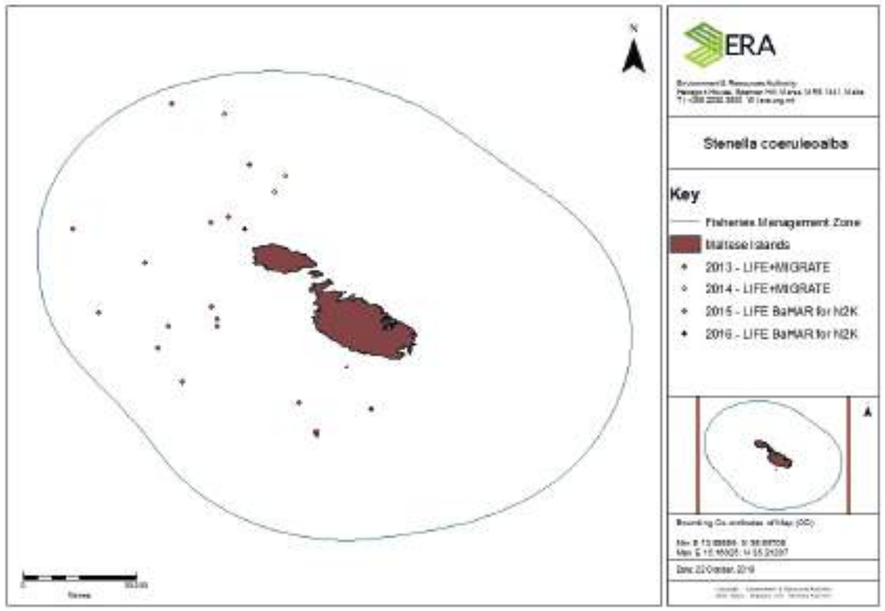


Figure 5

Distributional range of Stenella coeruleoalba as sighted during the systematic surveys and occasional sightings during the project LIFE+MIGRATE in 2013-2015, and the occasional sightings recorded during the project LIFE BaĦAR for N2K in 2015 and 2016.

9. Such data was collected through systematic surveys by BirdLife Malta as part of the EU LIFE+ Malta Seabird Project. Although the location of the visual transects was different from that used by the LIFE Migrate Project, the same area was covered.

Table 8

Total number of sightings of Stenella coeruleoalba over one year from systematic surveys.

Year	Data Source	Time Period	Total Number of individuals sighted in one year of systematic surveys	
			Min	Max
2013	LIFE+ Migrate	23rd August - 15th October	125	207
2014	LIFE+ Migrate	3rd July - 14th September	69	94

Marine Reptiles

The loggerhead turtle Caretta caretta is considered to be the only marine turtle that is a true member of the Maltese fauna. Records of other turtle species are occasional (Malta Environment and Planning Authority, 2013 b).

The data used for the purpose of this report has been collected through the following:

- Systematic surveys undertaken in the period 2013-2015 through the LIFE+MIGRATE (LIFE+MIGRATE, 2013)
- Occasional sightings of LIFE BaĦAR for N2K (LIFE BaĦAR for N2K, 2014)

As yet, there are no estimates of the population abundance of loggerhead turtles in Maltese waters. Data based on sightings cannot be used to derive accurate information on population abundance. However, sightings and visual observations provide an indication of the total number of animals in a specific area in a specific time period that can be analysed on the basis of trends. During the 2013 – 2014 systematic surveys, 102 and 188 turtles were recorded respectively. The majority of the turtles were observed alone, although occasional sightings with two to four turtles together were also recorded in the South-West area in 2015.

Loggerhead turtle observations during the LIFE+ MIGRATE and LIFE BaĦAR for N2K surveys confirmed the wide distribution of this species in Maltese waters (Figure 6). This also indicates that the distributional range of the species is stable over time. Figure 6 also shows that while individuals of *C. caretta* were sighted throughout the Maltese waters, there is a predominance of sightings in the North-West and South-West areas. This potentially irregular distribution might be due to preference to deep waters present in the West area, which is in accordance with the findings of other areas of the Mediterranean (Cardona, 2005; Revelles *et al.*, 2007; Eckert *et al.*, 2008). However, it could also be attributed to the fact that the LIFE BaĦAR for N2K surveys were undertaken primarily in North-West and South-West of Malta. During such surveys a total of 62 sightings in 2015 and 81 sightings in 2016 were recorded. On the basis of this data and expert judgement, *Caretta caretta* can be considered to be in good status in Maltese waters.

During the period 2016 and 2018, two nesting events of *C. caretta* were recorded in Malta within two different sandy beaches located in close proximity to one another on Malta's Western coastline. In September 2016, 66 turtles hatched from a nest in Ramla tal-Mixquqa, and in August 2018, 98 turtles hatched from another nest in Ġnejna Bay.

Nesting events were more frequent in the past years with seven nests recorded in the summer of 2020. In all, such nests yielded a total of 320 loggerhead turtle hatchlings, making summer 2020 the most successful turtle nesting season in local recorded history.

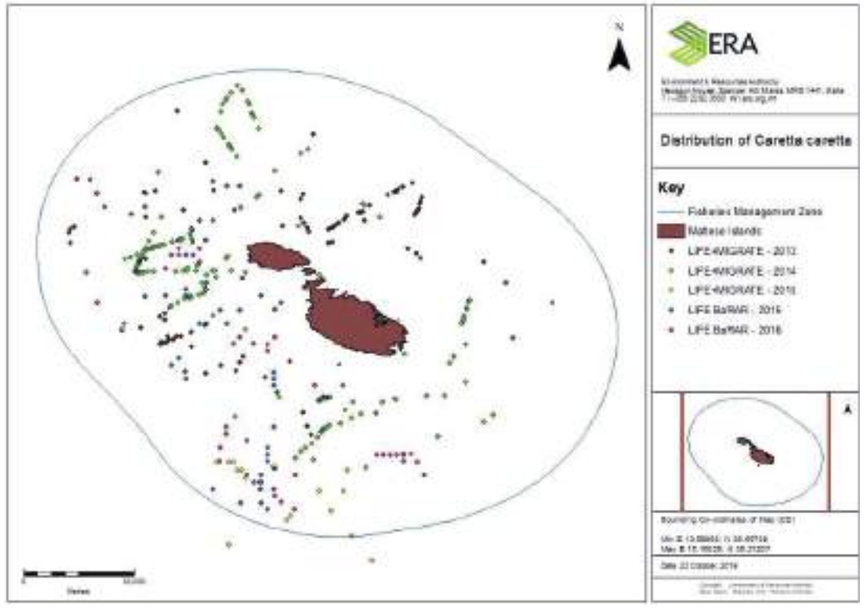


Figure 6

Overall distribution of *Caretta caretta* as sighted during the systematic surveys and occasional sightings for the project LIFE+ MIGRATE in 2013-2015, and the occasional sightings recorded during the project LIFE BaĦAR for N2K in 2015 and 2016.

Seabirds

Seabirds recorded in waters surrounding the Maltese Islands and breeding on the islands are listed below:

- ***Puffinus yelkouan*** (Yelkouan shearwater)
- ***Calonectris diomedea*** (Scopoli's Shearwater)
- ***Hydrobates pelagicus*** (European Storm-petrel)

These are the three main offshore feeding birds occurring in Malta, forming aggregations that are regularly observed on coastal waters during migrations, and that breed on a regular basis. Indeed, coastal cliffs and screes, which predominate along the southwestern coast of the Maltese Islands, provide shelter and a breeding habitat to these seabirds. Malta is in fact an internationally important breeding location for these three species.

The data used for the purpose of this report has been primarily collected through the following:

- Independent studies by researcher John Borg, of which findings are partly covered in (Borg J. , 2017)

- The implementation of the LIFE+ Malta Seabird Project (LIFE10 NAT/MT/090 -2011-2016) and the LIFE Archipelagu Garnija Project (LIFE14 NAT/MT/000991 - 2015-2020) led by BirdLife Malta
- Additional surveys also led by Birdlife Malta in 2019, aimed at substantiating previously collected data.

The mapping of breeding ranges for the three seabird species involved the combination of data from several methodologies including long-term ringing and nest monitoring data (Metzger *et al.* 2015; BirdLife Malta unpublished data), as well as more recent land-based and boat-based surveys, call-counts and thermal imaging. Based on such data, it was necessary to use two levels of certainty when determining breeding range;

- "1" – Potential range based on calling of adult birds in flight and presence of suitable habitat;
- "2" – Higher confidence range based on detected nests, adults seen entering with thermal imaging camera or calling activity from inside nests.

(i) Puffinus yelkouan (Yelkouan Shearwater)

The breeding range of Yelkouan Shearwaters spans the western cliffs of Malta and Gozo (Figure 7). A majority of colonies span small sections of cliffs and are focused in the north of Malta, south of Gozo, Comino and Cominotto.

The Yelkouan Shearwater population size was estimated using a variety of methods, as no one singular method could be applied across all colony sites. Data was gathered over a period from November 2015 to July 2018 and involved methods as explained in Austad *et al.* (2019), including:

- General Colony Assessment through land-based and boat-based surveys;
- Thermal imaging counts;
- Camera traps;
- Acoustic monitoring through Automated Sound Recorders (ARUs)10; and
- Capture-mark-recapture (CMR) of adult Yelkouan shearwaters to obtain adult survival estimates and population abundance for specific sub-sites.

Site specific lower and upper estimates of the number of breeding pairs, derived from the different methodologies, were summed to give the total lower and upper estimates for each study colony. The total population of Yelkouan Shearwater for 2016 to 2018 was estimated at 1795 to 2635 breeding pairs for the Maltese Islands, in contrast to the 1660 to 1980 breeding pairs reported in the 2013 initial assessment (Malta Environment and Planning Authority, 2013 c).

10. Acoustic data was analysed using the sound ecology R package (Villanueva-Rivera, Pijanowski, Doucette, & Pekin, 2011) (Villaneuva-Rivera & Pijanowski, 2016) as well as through the application of the Bioacoustics Index (BIX) (Boelman, Asner, Hart, & Martin, 2007) and the Acoustic Diversity Index (ACD) (Villanueva-Rivera *et al.*, 2011)

CMR data was further used to investigate trends in abundance at sub-sites within four colonies between 2013-2019. Results show that the abundance of adult Yelkouan Shearwaters fluctuates between the years 2013 and 2017, with increases in abundance in 2018, corresponding with the start of this conservation action and increased CMR effort.

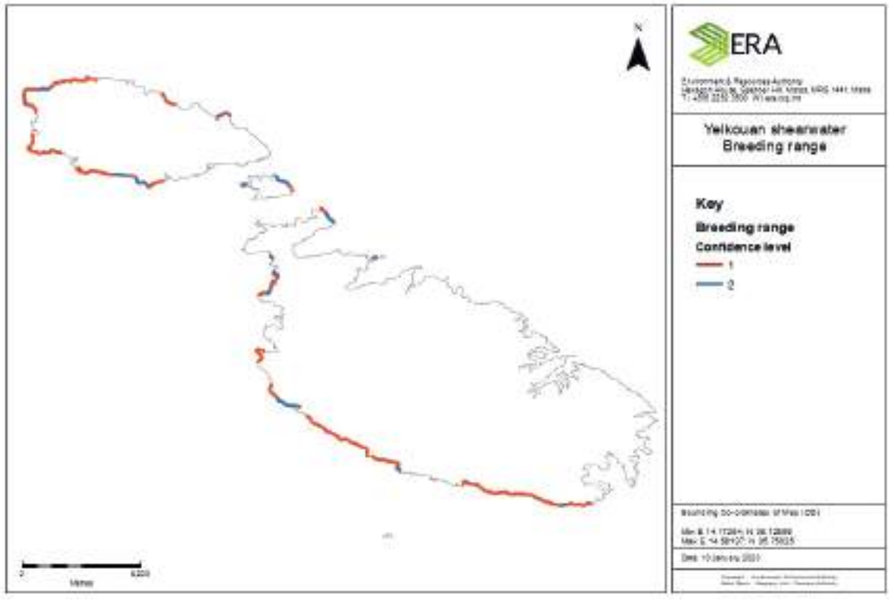


Figure 7

Breeding range for Yelkouan Shearwater showing potential range (level "1") in red and the high confidence range (level "2") in blue, for the period 2016 to 2019

Overall, the data suggests possible increases in the population of Yelkouan shearwater. However, it is noted that such increases in breeding numbers may also reflect the increase in the knowledge and monitoring effort, as well as the new technologies used in this assessment and conservation measures (e.g. rodent control) in relatively accessible locations. Therefore, whilst acknowledging such additional monitoring and surveillance effort as well as possible increases, the population of this species is deemed to be considered as currently stable.

(ii) Calonectris diomedea (Scopoli's Shearwater)

Scopoli's Shearwater breeding range extends along the western cliffs of Malta and Gozo with several other less extensive colonies on Filfla, the east cliffs of Comino and Rdum tal-Madonna (Figure 8).

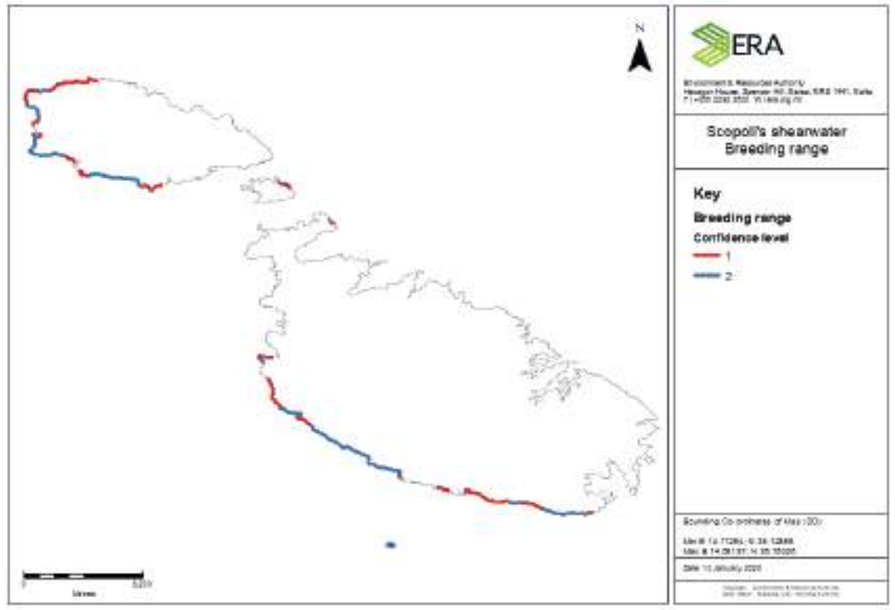


Figure 8
Breeding range for Scopoli's Shearwater showing potential range (confidence level "1") in red and the high confidence range (confidence level "2") in blue, for the period 2018 to 2019

Colony-based population sizes for this species were available from 2013 to 2018 mainly sourced from data collected by John Borg, through methods as described in Borg (2017) including:

- Counting of flying and rafting birds in front of the breeding colonies in the pre-laying and again in the post-laying period;
- Direct counts of birds arriving at the colonies (visual and audio)
- Use of play-back
- Ringing and recapture of breeding and non-breeding adults and chicks at the colonies

In order to cross-check such estimates, further sound data was collected using ARUs during the independent surveys led by Birdlife Malta in 2019. Following the filtering of the collected sound data (to counteract effects of wind condition, breeding season phase and moon phase), recordings were analysed using the 'soundecology' R package (Villanueva-Rivera & Pijanowski, 2011) and through application of the Bioacoustic Index (BIX) and Acoustic Diversity Index (ACD).

2018 colony size range estimates were cross-checked with 2019 predictions based on ARU data. For some colonies the predicted colony size was larger possibly indicating that the colonies may be larger than previously estimated and merit further assessment with different methods in the next years to obtain new colony estimates. With only one year of ARU data and the use of different methodologies, the discrepancy should not be interpreted as a trend of population increase between 2018 and 2019. Borg (2017) has also shown that Scopoli's Shearwater colonies demonstrate natural variability in size between years. Furthermore, ARU data and analysis using acoustic indices is subject to several sources of variation such as the unknown proportion of calling activity arising from non-breeders. Therefore, a trend should only be identified when comparing estimates or predictions produced with the same methodology. When comparing colony size estimates gathered by John J. Borg using the same methodology from 2013 to 2018, a general trend of decline is observed. Out of the 14 monitored colonies, 9 colonies experienced a decline, 2 colonies experienced an increase, and 3 colonies were stable; where a change was defined as at least a difference 10 pairs in either the upper or lower estimates. As for total estimates of breeding pairs this varied from 3046 to 3962 in 2013, and from 2670 to 3605 in 2018.

(iii) Hydrobates pelagicus (European Storm-petrel)

The European Storm-petrel is a highly localised breeder in Malta (Figure 9). The island of Filfla remains the stronghold of this species in the Maltese Islands. Several smaller colonies exist in sea-caves at Għarb, Ta' Ċenċ and Rdum tal-Madonna. It is possible that the breeding range of Mediterranean Storm-petrel is wider than that reported here; however, difficulties in observing this species likely means that small colonies remain undetected.

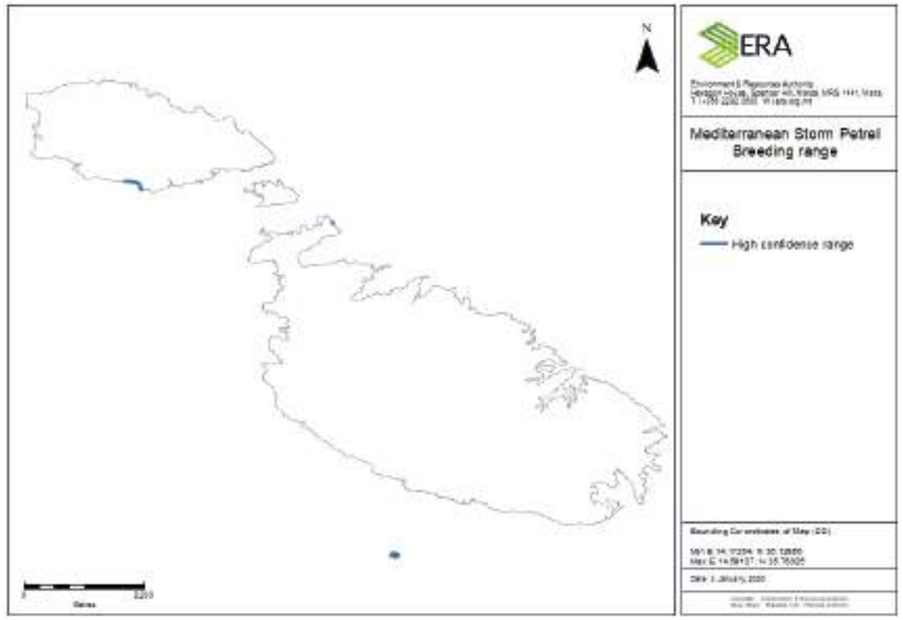


Figure 9
Breeding range for the European Storm-petrel showing confirmed nesting sites (confidence level "2") in blue, for the period from 2016 to 2019

The population estimate and abundance of the European Storm-Petrels for the islet of Filfla was based on CMR studies using mist-nets, carried out in 2013 and 2019. Each captured bird was fitted with a uniquely numbered ring for individual identification, essential for CMR analysis. If a captured bird was already bearing a ring, it was regarded as recapture and the present ring number was recorded. Only adult birds (at least in their 2nd calendar year) were considered in the analysis. The Jolly-Seber model for a closed population and the Robust Design model were tested for the estimation of population abundance and adult survival estimates.

The population estimates generated by the Robust Design Model were considered more plausible than the ones from the 2019 Jolly-Seber Model, being closer to previous estimates for the Storm-petrel Filfla population. Various studies confirm that the non-breeding proportion of long-lived seabird populations may comprise of up to half of the total population (Davis, 1957, Rodrigues *et al.* 2012, Sanz-Aguilar *et al.* 2010). Therefore, with a 50% non-breeding proportion assumed for Filfla, a breeding population of 16,920 individuals is estimated from robust design results of 2013 and 2019, this being very close to the upper limit estimated by Sultana (2011) of 8,000 breeding pairs (16,000 individuals). The difference in the 2013 and 2019 estimates from the robust design model is small and should not be interpreted as a population increase over the period. Long-term monitoring is required for inference of population trends (Insley *et al.*, 2014), especially since Storm-petrels are long lived as confirmed by 2019 results (Sultana *et al.*; 2011 and Fransson *et al.*; 2017).

Such assessment points to a stable breeding population of Storm Petrels on Filfla. Finally, even though Filfla is by far the largest colony of Storm-Petrels, not only locally but also regionally, there are three other small colonies on the Maltese Islands. These are found in sea caves in Gozo, at Għarb (50 – 70 pairs) and Ta' Ċenċ (40 – 60 pairs), and at Rdum tal-Madonna (1 – 10 pairs). Any increase in the population size of these colonies over the recording period and compared to previous estimates, is due to increase monitoring effort and use of technology such as a thermal imaging.

2.1.4. Inventory of the temporal occurrence, abundance and spatial distribution of non-indigenous, including invasive, species

Non-indigenous species (NIS) are defined as species, subspecies or lower taxa introduced outside of their natural range and outside of their natural dispersal potential. They constitute a biological pressure that is particularly relevant for the Mediterranean marine region, where there has been an increasing trend of new introductions reaching an unparalleled rate of one new record per 10 – 14 days (Zenetos, 2010). This could be due to sea temperature rise, which accommodates Indo-Pacific species from the Suez Canal as well as Atlantic species from the Gibraltar Strait (Evans, Barbara, & Schembri, 2015).

The presence of NIS is due to intentional or unintentional introduction of such species as a result of human activities. Natural shifts in distribution ranges (e.g. due to climate change or dispersal by ocean currents) do not qualify species as NIS. As indicated by Evans *et al.* (2015), Malta is also subject to range-expanding species due to warming temperatures, which enable Eastern Atlantic species to extend into Mediterranean and these are not directly human-assisted. These range-expanding species are not considered alien, however still need to be managed as they can change the recipient ecosystem (Evans, Barbara, & Schembri, 2015).

The information in this report is based on the data collected through the implementation of the EU MSFD monitoring programme as part of the EU funded project EMFF 8.3.1. The targeted monitoring programme for non-indigenous species was implemented in 2017–2018 through transect surveys within selected Marine Protected Areas (MPAs) and Rapid Assessment Surveys (RAS)[11] in the main port areas in Malta. Visual underwater surveys in MPAs were undertaken to monitor the occurrence and distribution of invasive species in selected localities in line with the methodologies outlined in Otero *et al.* (2013).

Assessment of pathways of identified NIS was also undertaken as part of EMFF 8.3.1 on the basis of published literature with reference to the IUCN (2017) Invasive Species Specialist Group on pathway terminology, classification and analysis of pathway data.

In 2013, Malta reported a total of 56 non-indigenous species in Malta's marine waters as part of the EU MSFD Initial Assessment of status. Tsiamis *et al.* (2019) acknowledged that although some of the NIS initially reported are now considered as native in Europe, and thus excluded from the refined baseline inventories, there is a large number of NIS that were missing from the original reporting lists. The refined baseline thus indicates a total of 63 non-indigenous species for Malta in the first reporting cycle (Tsiamis *et al.* 2019).

The results of the targeted NIS monitoring programme in 2017-2018 are included in Table 9. A total of 17 'newly introduced species' were recorded from both Marine Protected Areas (3 newly introduced species) and hotspots (14 newly introduced species).

Table 9
Newly Introduced Species as recorded through the monitoring of NIS in 2017-2018. Possible Pathway: C-Corridor (interconnected waterways/basins/sea); E- Escape from confinement (aquaria, aquaculture); O-Other (includes secondary, unaided, spread); R-Release in nature; T-Transport (as a stowaway - fouling, ballast); Tr-Transport (as a contaminant - food contaminant).

Species	Taxonomic Group	Pathway	MPA	MPA	Hotspots	Hotspots
			2017	2018	2017	2018
Acrothamnion preissii	Macrophyte	C	x	x		
Botryllus schlosseri	Tunicata	C			x	
Branchiomma bairdi	Annelida	T				x
Bugula neritina	Bryozoa	C			x	
Caprella scaura	Arthropoda	T				x
Caulerpa taxifolia var. distichophylla	Macrophyte	C	x	x		

11. UNEP/MAP 2014. Draft Monitoring and Assessment Methodological Guidance, 4th meeting of the EcAp Coordination Group UNEP(DEPI)/MED WG.401/3

Species	Taxonomic Group	Pathway	MPA 2017	MPA 2018	Hotspots 2017	Hotspots 2018
Celleporaria brunnea	Bryozoa	T				x
Celleporaria vermiformis	Bryozoa	T				x
Chrysiptera hemicyanea	Fish	R			x	
Codium fragile	Macrophyte	E, T		x		
Dendostrea folium	Mollusca	T				x
Didemnum sp.	Tunicata	C			x	
Hippopodina sp.	Bryozoa	T				x
Mesanthura cf. romulea	Arthropoda	T				x
Oculina patagonica	Cnidaria	C, O			x	
Paranthura japonica	Arthropoda	T, Tr				x
Stenothoe georgiana	Arthropoda	T				x

In addition to targeted *in situ* surveys, NIS recorded through assessment of benthic invertebrates and phytoplankton, as well as species recorded in published literature contributed to this report as follows:

(i) Benthic Invertebrates:

Macroinvertebrates in shallow sublittoral sediment were sampled as part of the EU MSFD monitoring programme for the purpose of assessing habitat condition. Throughout this process, the identification of any non-indigenous species was recorded. A total of five macrobenthic NIS (Annelida) were identified, all of which are considered to be newly introduced (Table 10). The potential introduction pathway for these species has not been identified.

Table 10

Newly introduced non-indigenous macroinvertebrates

Newly Introduced Annelids
Dispio uncinata
Lumbrinerides neogesae
Notomastus aberans
Kirkegaardia dorsobranchialis
Prionospio (Prionospio) depauperata

(i) Phytoplankton:

Species composition of phytoplankton was assessed for the purpose of monitoring water column habitat types. 203 taxa of phytoplankton were identified among which 16 are considered to be NIS[12] (Table 11). However, noting the limited data availability with respect to phytoplankton NIS, these species cannot be verified as 'newly introduced' or otherwise. In this regard, they are being listed as baseline data for future assessment processes.

Table 11

Non-indigenous phytoplankton species recorded in coastal and territorial waters

Phytoplankton NIS	Location of monitoring stations
Alexandrium minutum	Coastal and Territorial Waters
Alexandrium pseudogonyaulax	Coastal Waters
Alexandrium taylori	Coastal Waters
Asterionellopsis glacialis	Coastal Waters
Chaetoceros diversus	Coastal and Territorial Waters
Chaetoceros peruvianus	Coastal and Territorial Waters
Detonula pumila	Coastal and Territorial Waters
Gyrodinium corallinum	Coastal Waters
Octactis octonaria var. pulchra	Coastal and Territorial Waters
Ostreopsis ovata	Coastal and Territorial Waters
Prorocentrum triestinum	Coastal Waters
Pseudo-nitzschia multistriata	Territorial Waters
Pseudosolenia calcar-avis	Coastal and Territorial Waters
Rhizosolenia setigera	Coastal and Territorial Waters
Scrippsiella trochoidea	Coastal and Territorial Waters
Spatulodinium pseudonoctiluca	Coastal Waters

(i) Published Literature:

New NIS have also been recorded in published literature as per Table 12. These species are also considered to be 'newly introduced species'.

12. http://easin.jrc.ec.europa.eu

Table 12

Newly Introduced Non-Indigenous Species as per published literature. Pathway: C-Corridor (interconnected waterways/basins/sea); E- Escape from confinement (aquaria, aquaculture); O-Other (includes secondary, unaided, spread); R-Release in nature; T-Transport (as a stowaway - fouling, ballast); Tr-Transport (as a contaminant - food contaminant); U- Unknown

Newly Introduced NIS	Taxonomic Group	Pathway	Literature Source
Abudefduf hoefleri	Fish	T	(Vella, Vella, & Agius Darmanin, 2016)
Abudefduf saxatilis	Fish	U	(Evans, Barbara, & Schembri, 2015)
Acanthurus coeruleus	Fish	U	(Evans and Schembri, 2016)
Acanthurus monroviae	Fish	U	(Evans and Schembri, 2016)
Acanthurus chirurgus	Fish	U	(Evans, Tonna & Schembri, 2017)
Achelia sawayai s.l.	Arthropoda	U	(Ulman, *et al.*, 2017)
Caulerpa taxifolia var. distichophylla	Macrophyte	T	(Evans, Barbara, & Schembri, 2015)
Cephalopholis nigri	Fish	T	(Vella, Vella, & Agius Darmanin, 2016)
Heniochus intermedius	Fish	U	(Evans and Schembri, 2016)
Herdmania momus	Tunicata	T	(Evans, Barbara, & Schembri, 2015)
Hydroides dirampha	Annelida	T	(Ulman, *et al.*, 2017)
Lagocephalus sceleratus	Fish	C	(Deidun, *et al.*, 2015)
Littorina saxatilis1	Mollusca	Tr	(Evans, Barbara, & Schembri, 2015)
Lutjanus fulviflamma	Fish	U	(Evans, Barbara, & Schembri, 2015)
Maritigrella fuscopunctata	Platyhelminthes	T	(Evans and Schembri, 2016)
Paracerceis sculpta	Arthropoda	U	(Ulman, *et al.*, 2017)
Pomacanthus maculosus	Fish	T	(Evans and Schembri, 2016)
Sargocentron sp.	Fish	U	(Evans and Schembri, 2016)
Stegastes variabilis	Fish	U	(Evans and Schembri, 2016)
Watersipora arcuata	Bryozoa	T?	(Ulman, *et al.*, 2017)

A total of 40 'newly introduced non-indigenous species' have been reported through the 2017-2018 monitoring processes. These species belong to the following taxonomic groups: 13 fish, 7 Annelida (polychaeta), 6 Arthropoda (crustacea), 5 Bryozoa, 3 Macrophytes, 3 Tunicata, 1 Mollusca, 1 Cnidaria and 1 Platyhelminthes.

Such substantial number of newly introduced NIS points towards an increase in such pressures throughout the past years. On the other hand, the relatively large number of newly introduced NIS does not necessarily imply an increasing trend, but is more likely to be a result of the more systematic and intensive data collection processes undertaken as part of the EU MSFD monitoring programme in 2017-2018. As also acknowledged in literature, most "first country records" may have been introduced much earlier than the year of discovery since they might have not been noticed due to limited taxonomic expertise and limited focused studies (Ulman, *et al.*, 2017). When comparing the 2017 and 2018 surveys it is noted that there is a large difference in number of NIS, especially in hotspot areas, between July 2017 and July 2018, which is further evidence that Malta has still not reached a plateau with respect to knowledge on established NIS.

Furthermore, it should be noted that while Malta can take measures to prevent the introduction of NIS in Maltese waters through anthropogenic activity, secondary dispersal of species entering the Mediterranean region from the Suez Canal cannot be controlled.

2.1.5. Information on species of commercial interest for fishing (fish, mollusc and shellfish)

Extraction of species from the marine environment can affect the environmental status of our waters and associated marine ecosystems. While acknowledging that Malta's contribution to the exploitation of shared commercial stock at a regional level may not be significant, selected species of commercial and non-commercial fish were assessed on the basis of relevant pressure and state indicators.

The data used in this report was collected by the Department of Fisheries and Aquaculture (DFA) on the basis of Commission Decision 2010/93/EU[13], Commission Implementing Decision (EU) 2016/1251[14], and as required by (EU) Regulation 2017/1004[15] and (EC) Commission Regulation 665/2008[16]. This included data on discards, landings and MEDITS surveys for the years 2015-2017. The analysis of this data for both commercial and non-commercial species was undertaken by Dr Giuseppe Scarcella.

(i) Commercially-exploited fish and shellfish:

Selection of species assessed in terms of their commercial exploitation was based on the following criteria:

- ***Stocks that are managed under Regulation (EU) No 1380/2013***: Total landing weights for each species were averaged for the years 2015-2017 to ensure the selection was based on the most recent data available. The species responsible for 75% of landings in Geographic Sub-Area (GSA) 15 were selected.
- ***Species for which fishing opportunities (total allowable catches and quotas) are set by Council under Article 43(3) of the Treaty on the Functioning of the European Union***: Only two species fall under this criterion: the bluefin tuna (Thunnus thynnus) and the swordfish (Xiphias gladius). Both species were selected.

13. Commission Decision of 18 December 2009 adopting a multiannual Community programme for the collection, management and use of data in the fisheries sector for the period 2011-2013
14. Commission implementing decision (EU) 2016/1251 of 12 July 2016 adopting a multiannual Union programme for the collection, management and use of data in the fisheries and aquaculture sectors for the period 2017-2019
15. Regulation (EU) 2017/1004 of the European Parliament and of the Council of 17 May 2017
16. Commission Regulation (EC) NO 665/2008 of 14 July 2008 laying down detailed rules for the application of Council Regulation (EC) No 199/2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy

- ***Species for which minimum conservation reference sizes are set under Regulation (EC) No 1967/2006***: Species managed by minimum conservation reference sizes (MCRS) are listed in Annex III of Regulation (EC) No 1967/2006[17]. The list includes species of fish, crustaceans and molluscs. All species listed in EC 1967/2006 landed by Maltese fishers in 2015-2017 were selected.
- *The species under multiannual plans according to Article 9 of Regulation (EU) No 1380/2013:* The only relevant multiannual plan currently in place is Recommendation GFCM/40/2016/4, establishing a multiannual management plan for the fisheries exploiting European hake and deep-water rose shrimp in the Strait of Sicily (geographical subareas 12 to 16). Both hake (*Merluccius merluccius*) and deep-water rose shrimp (*Parapenaeus longirostris*) were thus selected.
- *Species under national management plans according to Article 19 of Regulation (EC) No 1967/2006.*
- ***Any important species on a regional or national scale for small-scale/local coastal fisheries:*** In order to ensure that all species of importance to Maltese small-scale fishers were included in the selection, total landing weights for each species fished by vessels measuring 6-12 m in length overall were averaged for the years 2015-2017. The top 75% of species landed by small-scale fishing vessels were then selected
- ***Commercially exploited species of conservation concern:*** A decline of elasmobranchs has been documented in the Mediterranean Sea and several species of sharks are caught as by-catch. For certain species, there is evidence that landings are declining, raising conservation concerns since sharks have k-selected life-history characteristics including slow growth rates, late maturity, and prolonged periods of gestation (Koehler, Smith, & Nowell, 2018). Consequently, selachian[18] species which contributed ≥0.04% to the average landings in GSA 15 in 2015-2017 were selected. Most of these species are listed in Annex III to the SPA/BD Protocol, which provides a list of species of which exploitation is regulated.

The selected species, with the exception of *Hommarus gammarus*[19] (which is also listed in Annex III to the SPA/BD protocol) were assessed in terms of the following:

- *Fishing Mortality/Fishing Mortality*$_{MSY}$: the fishing mortality rate of populations of commercially exploited species should be at or below levels that can produce the maximum sustainable yield (MSY). Where the ratio of F/FMSY was larger than 1, the species was considered to be in a status of overfishing and therefore not indicative of good status; Where relevant the MSY proxy $F_{0.1}$ was considered. This refers to the fishing mortality rate at which the marginal yield-per-recruit (i.e. the increase in yield-per-recruit in weight for an increase in one unit of fishing mortality) is only 10 percent of the marginal yield-per-recruit on the unexploited stock. When fishing mortality could not be applied, the ratio between the catch (or landings in the absence of discard data) and biomass index was used. This 'harvest rate' was calculated for all the years for which both commercial landings and biomass index data from MEDITS were available. In order to assess whether the species was indicative of good status the harvest rate in the last three years was compared to the long-term historical average. If two or more years were above the long-term average the species was not considered to be in good status. Conversely, if two or more of the recent years were below the long-term historical average the species was considered to be indicative of good status.

- *Spawning Stock Biomass (SSB)*: the SSB of populations of commercially exploited species should above biomass levels capable of producing Maximum Sustainable Yield (MSY). Where assessments of population biomass were available from stock assessments, the ratio of B/B_{MSY} was calculated. A ratio of B/BMSY < 0.5 was considered a stock size outside safe biological limits, since in such cases the biomass is < 50% of that needed for MSY. Where no quantitative assessments of population biomass were available, biomass-related indices such as catch (or landings) per unit effort or survey abundance indices were used as alternative methods. In the case of species landed by several gear types, the Landings Per Unit Effort (LPUE) indicator was calculated for the gear which had the highest landings in the last three years. Both MEDITS survey biomass indices (BI) and LPUE were calculated for the longest time period possible, and the status in the most recent three years was compared to the long-term historical average. If two or more years were above the long-term average, the species was considered to be in good status. Conversely, if two or more of the recent years were below the long-term historical average the species was not considered to be indicative of good status.

- *Age and Size Distribution:* the age and size distribution of individuals in the populations of commercially exploited species is indicative of a healthy population. Assessment is based on the size distribution of individuals in the population expressed as either the proportion of fish larger than the mean size of first sexual maturation, or the 95th percentile (P(95%)) of the fish-length distribution of each population. Since information on mean size of first sexual maturation in the Central Mediterranean Sea was only available for a very limited number of species, the P (95%) indicator was calculated for the available time series and compared to the long-term historical average. If two or more years were above the long-term average the species was considered to be in good status. Conversely, if two or more of the recent years were below the long-term historical average the species was not considered to be indicative of good status.

The outcome of such assessment on the basis of data collected for Malta's FMZ is summarised in Table 13.

17. Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94
18. Sharks, skates and rays
19. This species was selected on the basis of the fact that 3.9 tonnes were landed in 2017. However, landings of Hommarus gammarus are equal to zero in the rest of the time series, therefore assessment could not be undertaken.

Table 13

Outcome of the assessment of status for selected species. The highlighted 'good' and 'not good' status refers to assessments at the scale of the FMZ. The status followed by an (*) refers to assessments at a regional scale or a scale beyond Malta's FMZ. Greyed cells indicate species listed in Annex III to the SPA/BD protocol

Species Name	Fishing Mortality	Spawning Stock Biomass	Demographic Characteristics
Aristaeomorpha foliacea	Not good*	Good	Not Good
Auxis rochei	N/A	Not good*	N/A
Boops boops	Good*	Not good	Not good
Centrophorus granulosus	N/A	Good*	N/A
Chelidonichthys cuculus	N/A	Good*	N/A
Coryphaena hippurus	Not good*	Not good*	N/A
Dicentrarchus labrax	Not good*	Not good*	N/A
Diplodus annularis	N/A	Not good*	N/A
Diplodus sargus	N/A	Good*	N/A
Epinephelus aeneus	N/A	Good*	N/A
Epinephelus caninus	N/A	Good*	N/A
Epinephelus marginatus	Not good*	Not good*	N/A
Hexanchus griseus	N/A	Not good*	N/A
Illex coindetii	Good*	Not good	Not good
Lepidopus caudatus	Good*	Good*	N/A
Lithognathus mormyrus	N/A	Not good*	N/A
Loligo vulgaris	N/A	Good*	N/A
Lophius piscatorius	N/A	Good*	N/A
Merluccius merluccius	Not good*	Not good	Good
Mullus barbatus	Not good*	Not good	Good
Mullus surmuletus	Not good*	Not good	Not good
Mustelus mustelus	Not good*	Not good	Not good
Nephrops norvegicus	Not good*	Not good	Not good
Octopus vulgaris	Not good*	Not good*	N/A
Pagellus acarne	N/A	Good*	N/A
Pagellus bogaraveo	N/A	Good*	N/A
Pagellus erythrinus	Good*	Good	Good
Pagrus pagrus	Not good*	Good*	N/A
Palinurus elephas	Not good*	Not good*	N/A
Parapenaeus longirostris	Not good*	Not good	Not Good
Polyprion americanus	N/A	Good*	N/A
Prionace glauca	N/A	Good*	N/A
Raja clavata	Good*	Good	Not Good
Raja montagui	Good*	Good	Good
Sardina pilchardus	Not good*	Not good*	N/A
Sardinella aurita	N/A	Not good*	N/A
Scomber japonicus	Not good*	Not good*	N/A
Scomber scombrus	Not good*	Not good*	N/A
Scorpaena scrofa	Good*	Good*	N/A
Scyliorhinus canicula	Good*	Good	Not good
Sepia officinalis	Not good*	Good*	N/A
Sparus aurata	N/A	Not good*	N/A
Squalus acanthias	N/A	Good*	N/A
Squalus blainville	Good*	Not good	Not good
Thunnus thynnus	Good*	N/A	N/A
Trachurus mediterraneus	Not good*	Not good*	N/A
Trachurus trachurus	Good*	Not good	Good
Xiphias gladius	Not good*	Not good*	N/A

(ii) Fish species assessed on the basis of populations, spatial distribution and age/size:

In addition to the assessment of commercially exploited fish and shellfish, a selection of fish and cephalopod species, including species that are not commercially exploited, were assessed on the basis of population indicators. The selection of such species was such to ensure representation of the fish and cephalopod fauna in the Maltese Islands, whether commercialised or not. These species were selected on the basis of the MEDITS data 2015-2017, with fish species contributing at least to 0.1% in terms of abundance or biomass for either the GFCM Geographical Sub-area 15 or the Fisheries Management Zone being selected. In addition to these, species which were reported in the landings data and are found in the relevant section of Table 1D of the Commission Implementing Decision (EU) 2016/1251[20] were also selected. Noting that *Alosa alosa* and *Alosa fallax* are listed in Annex II and V of the Habitats Directive 92/43/EEC and in Annex III to the SPA/BD protocol, and have been reported in the landings data, these were also taken into consideration. However, on the basis of expert judgement, it is highly likely that these species are misidentified when landed, hence these two species were not assessed. Distinction between commercial and non-commercial fish and cephalopods was based on landings information. When a species appears rarely in the landing statistics, it was not considered a target species but rather incidental catch.

The selected species were assessed on the basis of the following parameters:

- Population Abundance: a stable or increasing pattern in abundance throughout the sampling period (if data was available), was considered to be indicative of good status. For commercially exploited species, all the relevant indicators have also been used:
  - B/BMSY < 0.5 was considered to be a stock size outside safe biological limits;
  - Survey Biomass Index (BI) compared to long-term historical average. If in last 3 years BI values for 2 or more years were above the average stock, this was considered to be indicative of good status; whilst if 2 or more years were below the average stock, this was considered to be indicative of not good status;

20. Species to be monitored under protection programmes in the European Union or under international obligations

- Landings per Unit Effort was calculated by considering the most important gear in the last three years and using the effort of that gear.

- *Population Demographic Characteristics:* Non-commercially exploited fish and cephalopods could not be assessed in this regard unless temporal data-series was available. For commercially exploited fish, the associated indicators were considered as per below:

  - 95th percentile (P(95%)) of the fish-length distribution of each population was compared to the long-term historical average. If in the last 3 years, values for 2 or more years were above the average stock, this was considered to be indicative of good status; whilst if 2 or more years were below the average stock, this was considered not indicative of good status.

- *Distribution*: maps of the distribution of the species based on biomass data, across the years were assessed. If the maps showed a species distribution biomass, which is constant throughout the analysed period, or the species increased its distributional range and biomass within the last three years, this was considered indicative of good status.

Table 14

lists the outcome of the assessment of the selected species, where possible, at the level of Malta's Fisheries Management Zone. These results should be interpreted with caution noting that they are based on trends for a relatively short time period (2015-2017).

Exploitation	Species Name	Pop. Abund.	Pop. Demo.	Distribu-tion
Commercially exploited	*Illex coindetii*	Not good	Not good	Good
	Loligo vulgaris	Good*	N/A	Not Good
	Octopus vulgaris	Not good*	N/A	Not Good
	Sepia officinalis	Good*	N/A	Not Good
Non-commercially exploited	*Eledone cirrhosa*	Not Good	N/A	Not Good
	Eledone moschata	Not Good	Not Good	Not Good
	Scaeurgus unicirrhus	Not Good	N/A	Good
	Sepia orbignyana	Not Good	N/A	Not Good
	Todarodes sagittatus	Not Good	N/A	Not Good
Commercially exploited	*Diplodus annularis*	Not good*	N/A	N/A
	Diplodus sargus	Good*	N/A	N/A
	Diplodus vulgaris	Not Good*	N/A	N/A
	Epinephelus aeneus	Good*	N/A	N/A
	Epinephelus caninus	Good*	N/A	N/A
	Epinephelus marginatus	Not good*	N/A	N/A
	Lepidopus caudatus	Good*	N/A	Good
	Lithognathus mormyrus	Not good*	N/A	N/A
	Mustelus asterias	Not good	Not good	Not good
	Mustelus mustelus	Not good	Not good	Not good
	Mustelus punctulatus	Not good	N/A	N/A
	Pagellus acarne	Good*	N/A	Good
	Pagellus bogaraveo	Good*	N/A	Good
	Pagrus pagrus	Good*	N/A	N/A
	Polyprion americanus	Good*	N/A	N/A
	Raja clavata	Good	Not Good	Good
	Squalus acanthias	Good*	N/A	N/A
	Squalus blainvillei	Not good	Not good	Not Good
	Centrophorus granulosus	Good*	N/A	Good
	Chimaera monstruosa	Good	Good	Good
	Coelorinchus caelorinchus	Not Good*	N/A	Good
	Dasyatis pastinaca	Not good	?	Not good
	Etmopterus spinax	Not good	Not good *	Not good
	Galeus melastomus	Good	Good	Not good
	Helicolenus dactylopterus	Good	Not good	Not good
	Heptranchias perlo	Not good *	N/A	N/A
	Hexanchus griseus	Not good*	N/A	N/A
	Hymenocephalus italicus	Not good	N/A	Not good
	Myliobatis aquila	Good	Not Good	?
	Nezumia sclerorhyncus	Good	N/A	Good

Table 14: Outcome of assessment of status. The highlighted 'good' and 'not good' status refer to assessments at the scale of the Fisheries Management Zone. '?' refers to those species whose status cannot be determined at this stage. The status followed by an (*) refers to assessment of status at a regional scale or a scale beyond the FMZ. Greyed cells indicate species listed in Annexes to the SPA/BD protocol

The assessment results presented above for both commercially exploited and non-commercial species should be interpreted bearing in mind the limitations listed hereunder:

- For all the indicators calculated with MEDITS survey data, the current status was compared to the average value in 2005-2017 since the MEDITS survey in Malta has been carried out since 2005. The exploitation of species however began long before 2005, and therefore the long-term historical average is inherently indicative of exploited populations, not of a species in good status.

- The MEDITS survey in Malta was not always held during the period May-June. As a result, the data on biomass indices and size frequency distributions is not directly comparable across years. For example, hake (*Merluccius merluccius*) juveniles are known to settle on the seabed during spring in GSA 15 (Druon *et al.*, 2015), so a higher proportion of juveniles will be present in MEDITS hauls taken in late spring/early summer compared to hauls taken later in late summer/autumn/winter.

- Many of the species exploited by the Maltese fishing fleet are stocks which are shared at a regional level, and GFCM/STECF stock assessments are therefore available for the Central Mediterranean (GSA 12-16 combined) or the Ionian Sea (Froese *et al.*, 2018). In some cases, stock distribution spans over larger areas, for instance bluefin tuna (*Thunnus thynnus*) in the Eastern Atlantic and Mediterranean Sea is considered as a single stock and assessed at this level by ICCAT. The results of indicators calculated for the FMZ irrespective of the stock boundaries of individual species thus need to be interpreted with caution since they would not necessarily cover the ecologically relevant scale. For instance, considering only the population size distribution within the FMZ may give the impression that a species is not in good status if most adults are found in deeper waters beyond the FMZ boundary, whilst when considering the entire stock distribution may show this same species in good status.

2.2. Main Habitat types

Benthic habitat types in Maltese waters were defined in terms of the EUNIS classification (European Nature Information System) and the "Classification of Benthic Marine Habitat Types for the Mediterranean Region and Reference List of Marine and Coastal Habitat Types in the Mediterranean". Under this classification Level 4 classes are the habitat types defined according to either the environmental features, such as exposure to hydrodynamism, irradiance, sedimentological/ morphological characteristics, amongst others. A list of the identified representative habitats for Maltese waters, including references to the habitat codes under the EU Habitats Directive 92/43/EEC as well as references to the predominant habitat types identified under EU MSFD processes, is provided in Appendix I.

The assessment of predominant habitats is based on the following data:

- A European Maritime and Fisheries Fund (EMFF) project aimed at implementing and updating Malta's monitoring programme (EMFF 8.3.1) running from 2017 to 2019.
- the LIFE BaHAR for N2K (LIFE12 NAT/MT/000845) project[21] aimed at gathering existing and new data on the location, range and conservation status of Annex I marine habitats as listed in the Habitats Directive, for the extension of existing marine Sites of Community Importance (SCIs) and the identification of new SCIs for inclusion within the Natura 2000 network.
- the broad-scale predictive habitat map as retrieved from EUSeaMap[22].

A description of *Posidonia oceanica* meadows (MB2.54; Habitats Directive code 1120), Upper/Lower Mediolittoral rock (MA1.53; MA1.54), as extrapolated to Algal-dominated infralittoral rock (MB1.51; Habitats Directive code 1170) and Lower mediolittoral biogenic habitat (MA2.51) is given in Section 2.1.2. of this report and will not be repeated here. This section will thus be focusing on the following benthic habitat types:

(i) Infralittoral Sediments (MB3 – MB6)
(ii) Coastal detritic bottoms with rhodoliths (MC3.52), including associations with maerl[23] (MC3.521)
(iii) Upper Bathyal Rock & Biogenic Reef (ME1, ME2)

(i) Infralittoral Sediments:

Infralittoral zone (0 – 50 m depth) sediments in Maltese waters comprise of varying extents of the different sediment types including muds, sand, coarse and mixed sediments. The extent of these habitat types is presented on the basis of the 2019 EUSeaMap broad scale predictive model (EUSeaMap, 2019) (Figure 10). Noting the top-down modelling approach on which such mapping is based, the presence and sediment types depicted would require corroboration through sediment sampling, allowing evidence-based confirmation of the specific extents and classification of infralittoral sediments. Granulometric analyses in coastal areas was undertaken as part of EMFF 8.3.1, adopting the Folk classification of substrate in view of its compatibility with the EUNIS classification of habitats. Most of the sediment samples are mainly sandy with less than 25% of gravel. Further surveys are however deemed necessary to enable further classification of infralittoral sediments.

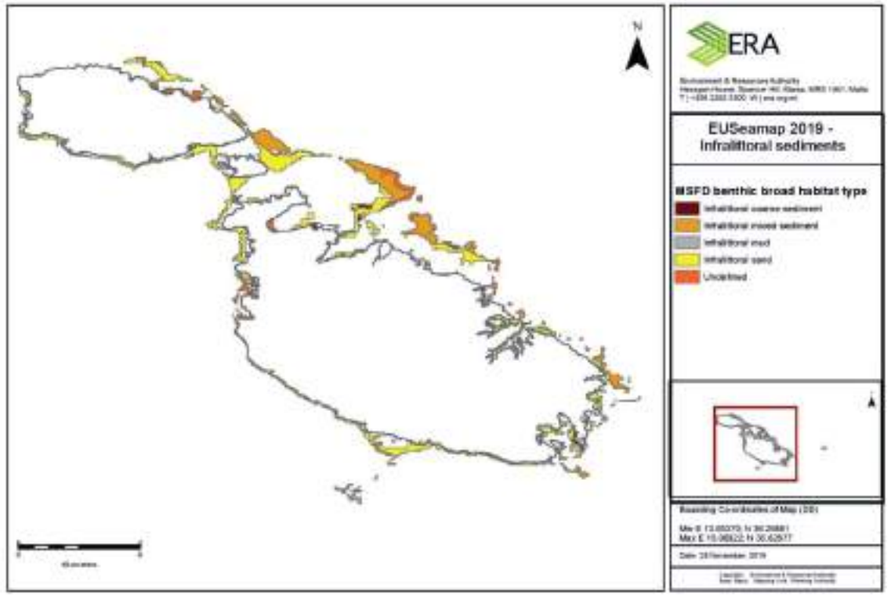


Figure 10
Infralittoral sediments in Maltese waters based on the EUSeamap, 2019

Representation of status in terms of the structure and functions of infralittoral sediments, was undertaken through the use of a biotic index for macroinvertebrates: BENTIX. Macroinvertebrate communities, being responsive to environmental stress by means of different adaptive strategies, are recognized as suitable environmental indicators of infralittoral sediments.

The assessment of these communities in Maltese waters was first carried out as part of the monitoring programme of the EU WFD in 2012 (CIBM and Ambiente SC, 2013), using the AMBI index, as developed by Borja *et al.* (2000). The intercalibration exercise of Biological Quality Elements for Maltese coastal waters (Ecoserv, 2015), led to the revision of the sampling methodology, as well as the recommendation for these communities to be assessed using the BENTIX index as proposed in Simboura and Zenetos (2002). The study of macroinvertebrate communities through the application of the BENTIX index, was first applied in 2018, following sampling of infralittoral sediments at 22 stations in Maltese coastal water bodies at depths ranging from 15 to 20 m. The ecological quality ratios of the BENTIX index for Greece and Cyprus, as identified in Commission Decision

21.https://lifebahar.org.mt/

22.(EUSeaMap, 2019)

23.According to the latest summary by Basso *et al.* (2015), maerl is considered as a specific type of rhodolith bed composed of living and dead branched twig-like thalli that are sometimes interlocking, mostly composed of Phymatolithon calcareum and Lithothamnion corallioides.

(EU) 2018/229[24] (European Commission, 2017), were adopted for the definition of the high-good and good-moderate boundaries.

On the basis of such assessment, the benthic communities in infralittoral sediments reflect an overall high or good status: 13 stations in high status, 8 stations in good status and 1 station in moderate status. Whilst a maximum allowable extent of adverse effects as a proportion of the total natural extent of this habitat in Maltese waters, is yet to be determined, the predominance of stations classifying in high and good status indicates the overall good status for infralittoral sediments.

(ii) Coastal detritic bottoms with rhodoliths including associations with maerl:

In the Mediterranean Sea, rhodoliths generally occur in the transition zone between the lower infralittoral and upper circalittoral. The depth limit depends mostly on the degree of light penetration, and the high degree of light penetration in the Mediterranean Sea explains the occurrence of unattached nodules of live coralline algae (rhodoliths) at a water depth ranging between 51-90m; therefore, this habitat would correspond to the depth zone 'circalittoral zone'. A few records of rhodoliths at shallower (31m) and deeper (103m) depths were also recorded in the Maltese Islands (Sciberras *et al.*, 2009).

(i) North-eastern area surveyed as part of EMFF 8.3.1

As part of EMFF 8.3.1, the rhodolith bed off the Northeastern coast of Malta was surveyed using an ROV along 20km transects oriented approximately parallel to the shoreline at 1km intervals. In order to confirm the absence or otherwise of rhodoliths in waters deeper than 100m, three additional stations were surveyed through one-drop camera surveys. Frames were extracted from the ROV raw video files every 10 seconds, corresponding to a spatial distance of approximately 12m between the frames. The percentage rhodoliths in each frame was determined through generation of different classification models. Using the tool 'Kriging' a map was produced to display the spatial distribution of the rhodoliths on the basis of the % cover recorded from the mentioned algorithm. It must be noted that, for those areas which were not surveyed, rhodolith density obtained via interpolation is only indicative (Figure 11). Rhodolith accumulations in the area of study were recorded in different densities ranging from very sparse rhodoliths (<10% cover) up to 100% cover in certain areas, with patches of no records of rhodoliths in between. No rhodoliths were recorded at depths greater than 100m.

On the basis of superimposition of anthropogenic activity on the extent of this rhodolith bed, Malta can deduct that the extent of pressures on this habitat is not significant, however no conclusion on status is being drawn at this stage in view of the uncertainties associated with the current data.

24.Commission Decision (EU) 2018/229 of 12 February 2018 establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Commission Decision 2013/480/EU

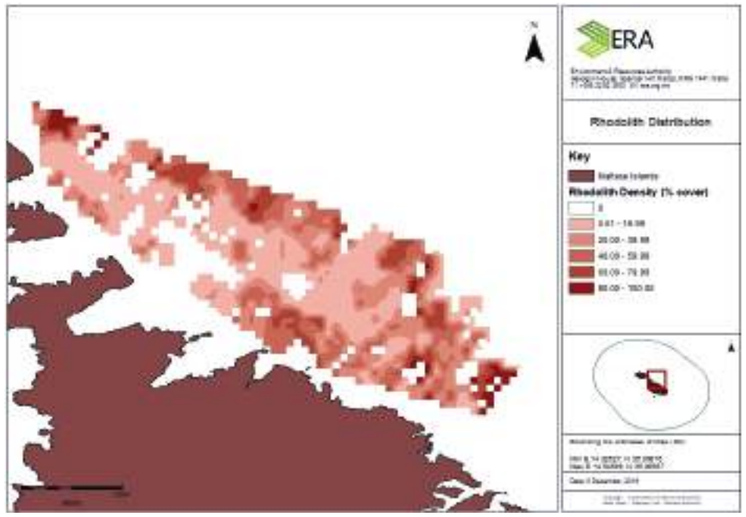


Figure 11
Interpolated map showing the spatial distribution of the rhodolith accumulations located in the NE coast of Malta.

(ii) South-eastern Area surveyed as part of LIFE BaĦAR for N2K

As part of the project LIFE BaĦAR for N2K (LIFE BaĦAR for N2K, 2014), an area in the southeast of Malta known to host rhodolith accumulations (Dimech, Borg, & Schembri, 2004) was surveyed using an ROV in the summers of 2015 and 2016. The presence of rhodoliths was confirmed as per Figure 12.

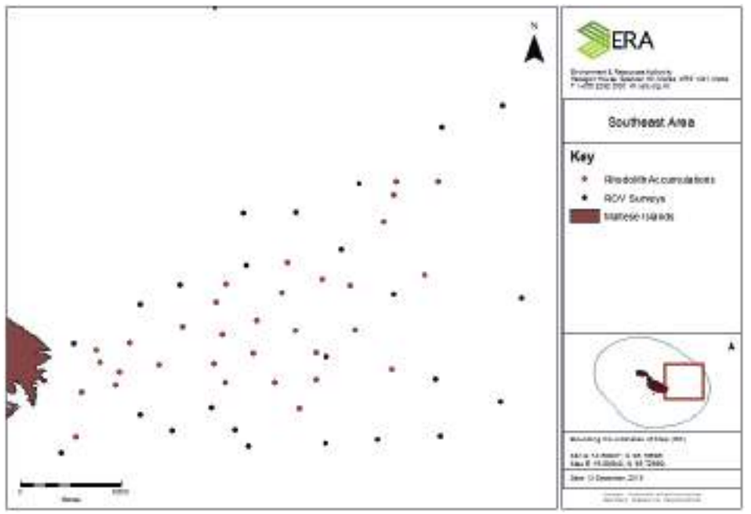


Figure 12
Rhodolith accumulations (red dots) located in the SE of Malta (Source: LIFE BaĦAR for N2K).

(iii) Upper Bathyal Rock & Biogenic Reef (ME1, ME2)

The bathyal zone encompasses a large proportion of Maltese waters, however information on benthic habitats is limited in view of the difficulties linked to surveying at these depths. Information on the seabed types present in the bathyal zone is available from the 2019 EUSeaMap broad scale predictive model (EUSeaMap, 2019). The seabed types for Malta's assessment area are shown in Figure 13 as EUNIS habitat types. Noting the top-down modelling approach on which such mapping is based, the presence and seabed types depicted would require corroboration through sediment sampling.

Higher resolution data is available on specific areas within the upper bathyal zone, as a result of field studies in 2015 and 2016 using ROV and Multibeam echosounder technology through the LIFE BaĦAR for N2K (LIFE12 NAT/MT/000845) project. The aim of the project was to identify areas for the designation of marine protected areas for reefs, cave and sandbanks, and research focused on areas where there was the likelihood of occurrence of at least one of the three relevant habitat types, based on characteristics such as substrate, human pressures, topography, and absence of knowledge. Based on representative biota identified under this project, mainly for areas in the upper bathyal zone, a summary of the relevant L5 EUNIS habitats under ME1 – ME6 broad habitat types are shown in Figure 14. The facies associated with such habitat types are already listed in Table 15.

Figure 13
Bathyal habitats in Maltese waters, with EUNIS classification, extracted from EUSeamap, 2019

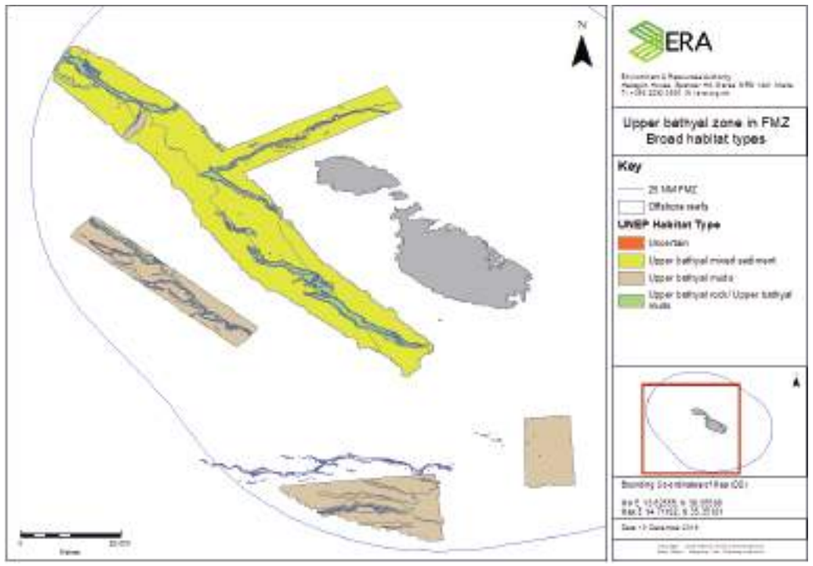


Figure 14
Upper bathyal habitats and geogenic reefs in Maltese waters (Source: LIFE BaĦAR for N2K project)[25]

Areas located in the north of the FMZ that were surveyed through the project (by ROV) were characterised by muddy bottoms with only occasional small rocky outcrops, while to the south of Malta (at the boundary of the bathyal zone/circalittoral), the marine area was found (through the multibeam survey) to consist of gently sloping seabed characterised by a soft sedimentary bottom.

On the other hand, steep escarpments were found on both sides of the Malta Graben and some 20 km southwest of the island of Malta. These escarpments occurred from depths of 300–500 m down to depths of 700 m to 1000 m, although the exact depth range varied depending on location. The multibeam backscatter analysis and ROV surveys indicated that these escarpments were composed of hard substrata with overhangs and crevices in places, although relatively flat areas where the rocky bed was covered by a muddy/silty layer were present between successive tiers of escarpments (Borg, Evans, Knittweis, & Schembri, 2017). Key species associated with these habitats as observed through the LIFE BaĦAR for N2K project, are presented in Table 16.

25.Seabed type has been reinterpreted according to the UNEP/MAP (2019) L3 classification

While some trends were observed in relation to the association of different species groups with either sediment or rock broad habitat types, in general the different species groups were found on both broad habitat types. This is because at the broad scale of assessment, high variability of habitats in the field is not well reflected. In fact, large areas mapped as sediment through the bathymetric surveys revealed mosaics of diverse bottoms during the ROV surveys, such as rocky bottom covered by sediments, detritic bottom, muddy bottom with rocky outcrops, rocky outcrops, etc. Further, areas mapped as upper bathyal rock and biogenic reef included areas where the seabed was characterised by rocky bottom covered by sediments, detritic or muddy, muddy detritic bottom with rocky outcrops.

The main activity linked to physical disturbance, that is carried out in the upper bathyal zone is extraction of living resources, specifically otter board trawling. Fishing activities can also lead to disturbance to the seabed, primarily as a result of lost or discarded fishing gear. In general, the reefs appeared to be in good status, however no conclusion on the status of these habitats is being drawn at this stage. More data with respect to the structure and function of the habitat type is required to enable adequate assessment of the status of this habitat type.

Table 16

Benthic habitat types recorded in upper bathyal zone in Maltese waters, and associated key species

MSFD BBHT	UNEP/MAP 2019 - Corresponding to EUNIS Level 5	Key species observed in Maltese waters
Upper bathyal rock and biogenic reef	Facies with Antipatharia (black corals forest, Antipathes spp., Leiopathes glaberrima, Parantipathes larix)	*Antipathella subpinnata* *Antipathes dichotoma* *Antipathes fragilis* *Leiopathes glaberrima* *Parantipathes larix*
	Facies with Alcyonacea (e.g. Acanthogorgia spp., Callogorgia verticillata, Placogorgia spp., Swiftia pallida, Corallium rubrum)	*Callogorgia verticillata* *Corallium rubrum* *Eunicella verrucosa* *Isidella elongata* *Viminella flagellum*
	Facies with Scleractinia (yellow corals forest, e.g. Dendrophyllia spp.; white corals forest, e.g. Madrepora oculata, Desmophyllum cristagalli, Lophelia pertusa, Madracis pharensis)	*Dendrophyllia cornigera* *Dendrophyllia ramea* *Desmophyllum dianthus* *Lophelia pertusa* *Madrepora oculata*
	Facies with small sponges (sponge ground; e.g. Farrea bowerbanki, Halicona spp., Podospongia loveni, Tretodictyum sp.)	*Hexadella detritifera* *Stylocordyla pellita* *Sympagella delauzei* *Thenea muricata* *Tretodictyum tubulosum*
	Facies with large and erect sponges (e.g. Spongia lamella, Axinella spp.)	*Pachastrella monilifera* *Note*[28]
Upper bathyal sediment	Facies with Alcyonacea Upper bathyal coarse sediment (e.g. Alcyonium spp., Chironephthya mediterranea, Paralcyonium spinulosum, Paramuricea spp., Villogorgia bebrycoides) Upper bathyal muds (e.g. Isidella elongata)	*Callogorgia verticillata* *Corallium rubrum* *Eunicella verrucosa* *Isidella elongata* *Viminella flagellum*
	Facies with Scleractinia Upper bathyal detritic sand (e.g. Caryophyllia cyathus) Upper bathyal muds (yellow corals forest, e.g. Dendrophyllia spp.; white corals forest, e.g. Madrepora oculata, Desmophyllum cristagalli)	*Dendrophyllia cornigera* *Dendrophyllia ramea* *Desmophyllum dianthus* *Lophelia pertusa* *Madrepora oculata*
	Facies with Pennatulacea Upper bathyal detritic sand (e.g. Pennatula spp., Pteroeides griseum) Upper bathyal muds (e.g. Pennatula spp., Funiculina quadrangularis)	*Funiculina quadrangularis* *Pennatula phosphorea* *Pennatula rubra* *Pteroeides spinosum*
	Facies with Crinoidea Upper bathyal detritic sand; Upper bathyal muds (e.g. Leptometra spp.)	*Leptometra phalangium* *Antedon mediterranea*
	Facies with Echinoidea Upper bathyal detritic sand; Upper bathyal muds (e.g. BrisLIsopsis spp. For upper bathyal muds)	*Cidaris cidaris* *Stylocidaris affinis* *Gracilechinus acutus*

28.20% of observations were of large demosponges, but species was not identified. Another 40% of all Porifera observations were not classified under either facies due to lack of detailed information.

2.3. Singular habitats in the country

No additional information is deemed necessary under this section. Reference should be made to previous section on seabed habitats.

2.4. Transboundary issues

Transboundary issues in Malta are generally associated with contaminantion of the marine environment. Monitoring data collected throughout the period 2017-2018 as part of EU funded project EMFF 8.3.1 however indicates that only a few ubiquitous persistent, bioaccumulative and toxic substances (uPBTs) as listed in Directive 2013/39/EU are present in levels that exceed current thresholds. These include mercury levels analysed in biota and benzo(a)pyrene in sediment. The only non-uPBT contaminant that has exceeded thresholds is fluoranthene in sediments.

Contamination of the marine environmental matrices with mercury is considered to be a widespread issue in the Mediterranean. Therefore the occurrence of relatively high levels of mercury in biota collected in Maltese waters can be attributed to transboundary sources of such contaminant. On the other hand, sources of mercury in Maltese waters still need to be assessed at a National scale in line with Malta's second Water Catchment Management Plan (WCMP) pursuant to the EU WFD.

The WCMP is also seeking futher understanding of the transportation mechanisms brought about by sea currents, winds and waves that may bring contaminants and marine litter into Maltese waters. In this regard and as part of the EU funded project LIFE 16 IPE MT 008, Malta is working towards the setting up and running basic elements of the modelling and observation systems required to develop the baseline hydrographic knowledge for Malta's nearshore and offshore waters. This would enable better understanding of potential transboundary sources of contaminants reported in Maltese marine waters also through international networking.

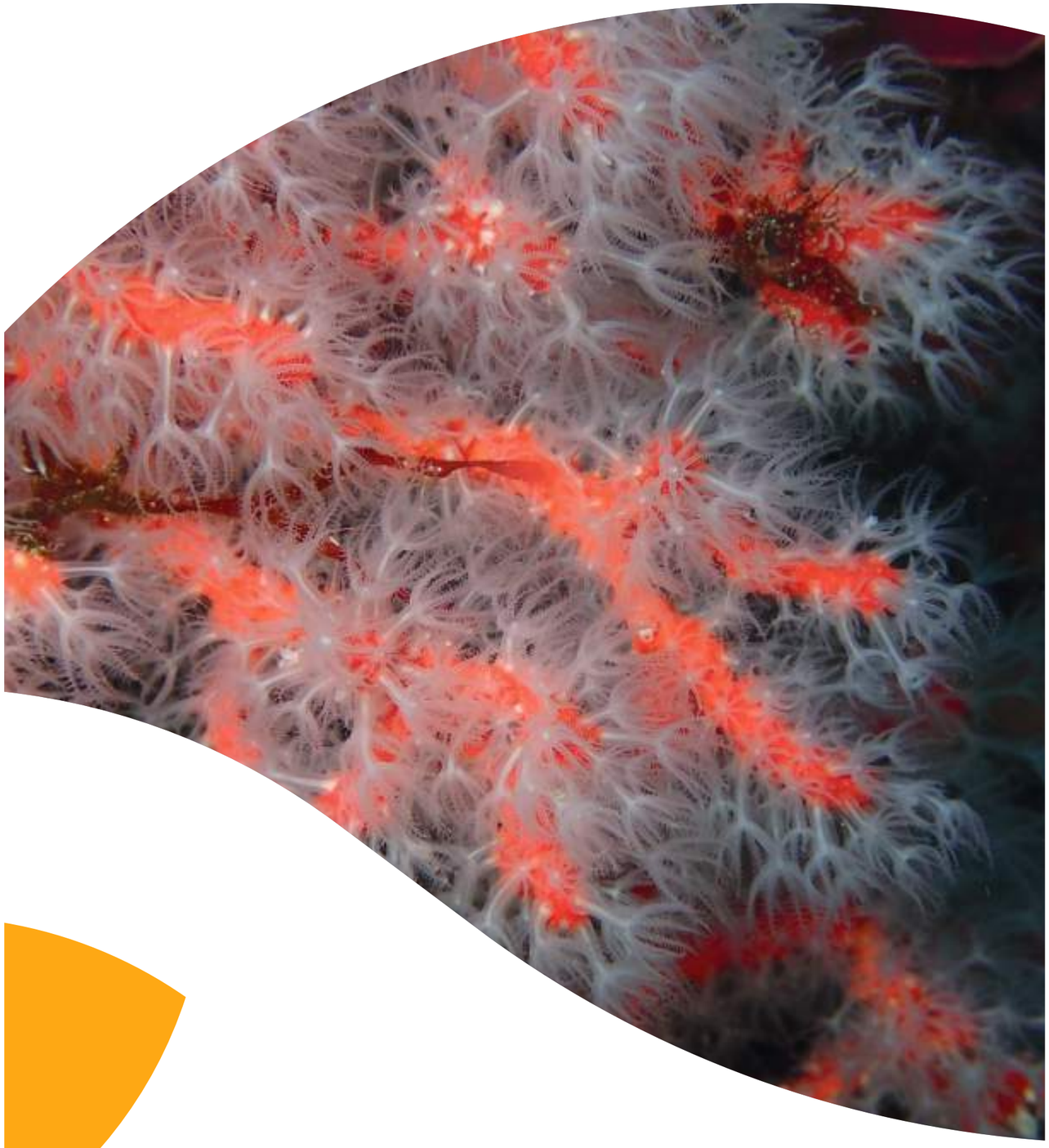
Another issue of a transboundary nature is related to the fish stocks within the Maltese waters and the assessment of their status. Fish stocks, in particular those which are commercially exploited within the Maltese Waters, form part of shared stocks. Thus, even though the assessments carried out at a National scale are relevant for management purposes, they should be taken in consideration, along with other national assessments, as part of broader regional assessments, in order to obtain a clearer indication of status of shared stocks. This would ensure optimal management and sustainabile use of such stocks.

2.5. Identification of the country's marine and coastal biodiversity gaps needed for scientifically sound based conservation

Malta acknowledges the need for sound and concrete knowledge of the marine environment to inform effective management processes that would work towards the sustainable use of the marine resources in the longer-term. Knowledge has significantly improved through the implementation of EU funded projects as referenced in this report and through the implementation of a comprehensive marine monitoring programme.
However, knowledge gaps still need to be addressed to enable a holistic assessment of environmental status and work towards achievement of environmental objectives in the marine environment. The following provides a list of priority gaps that Malta intends to address in the upcoming years:

- To date monitoring in the marine environment has taken place in separate episodes, making assessment of trends and long-term data a challenging task, especially if different methodologies are used. Malta will be ensuring the implementation of sustained monitoring implemented on a continuous basis, whilst focusing on synergies and streamlining across related legal obligations and optimisation of existing data collection processes under other sectoral policy.
- While knowledge on the presence and distribution of seabed habitats has significantly improved through LIFE BaĦAR for N2K (LIFE12 NAT/MT/000845), there is still the need to attain more knowledge on the ecology of specific habitat types, such as caves and reefs. This gap will be addressed through the identification of suitable monitoring processes for such habitat types. Indicators regarding the structure and function of such habitat types will be defined to enable assessment of status.
- There is the need for a better understanding, also in quantitative terms of the interactions between habitats/species and pressures. Levels of pressures or thresholds still need to be determined to inform management processes. Furthermore, indicators used for status assessment need to better reflect the different pressures to inform targeted management practices. Such knowledge gaps will be addressed through implementation of sustained monitoring processes.

Pressures and impacts



© SPA/RAC, University of Sevilla

3.1. Biological disturbance

Invasive Alien Species

Monitoring processes implemented to date were not geared to assess selected or particularly invasive NIS and their impacts on ecosystems. However the below information may provide an indication of expected impacts from NIS, particularly from established Invasive Alien Species (IAS).

In 2013 Malta reported 9 non-indigenous species that were well established in Maltese waters. The majority of these species have once again been recorded through the monitoring processes in both MPAs and hotspots as indicated in Table 17. This table lists the ubiquitous species recorded through the monitoring processes. Most of these species are on the list of the 100 'Worst Invasives' in the Mediterranean by Streftaris and Zenetos (2006).

Table 17

Established NIS that are considered to be relatively widespread in Maltese waters (11 sites studied including ports and MPAs)

Species	Number of sites in which species was recorded (out of 11)	Taxonomic Group
Caulerpa racemosa	8	Macroalga
Caulerpa taxifolia var. disticophylla	7	Macroalga
Percnon gibbesi	7	Arthropoda (Crustacea)
Asparagopsis taxiformis	6	Macroalga
Lophocladia lallemandii	6	Macroalga
Womersleyella setacea	6	Macroalga
Pinctada imbricata radiata	5	Mollusca (Bivalvia)
Amaranthia verticillata	5	Bryozoa

Monitoring data confirms the predominance of NIS (both established and newly introduced) in port or harbour areas. This implies that ports/harbours represent the main entry points of NIS into Maltese waters through shipping activity. Such data can also imply that sensitive habitats within MPAs may be less vulnerable to the establishment of NIS. Nevertheless, an increase in the number of NIS was still recorded in MPAs, albeit to a lesser extent than in hotspots (Table 18). Such increase in the number of NIS throughout the coastal waters can be attributed to the more systematic and higher monitoring efforts undertaken in 2017-2018 as part of the EU MSFD implementation process. Therefore such trends in distribution would need to be confirmed through longer-term monitoring.

In terms of species groups which may be adversely affected by non-indigenous species, 2017-2018 data indicates that most of the NIS recorded belong to the fish taxonomic group, followed by annelids (polychaetes), arthropoda (crustacea) and macrophytes. The number of NIS has increased for most of the taxonomic groups, with the exception of mollusc and macrophyte NIS for which the 2017-2018 data indicates a lower number of species than that reported by Malta's Initial Assessment. Although the number of fish NIS

has remained stable, this group shows the highest number of newly introduced species and may thus constitute one of the most adversely affected species groups.

Table 18

Number of NIS recorded in hotspots and MPAs in the first and second EU MSFD cycles.

Site	Number of NIS as reported by Malta in 2013	Number of NIS found in targeted surveys (2017 – 2018)
Hotspots		
Birżebbuġa	9	18
Grand Harbour	9	17
Marsaxlokk	9	10
Marsamxett	5	9
Msida Yacht Marina	1	9
Marine Protected Areas		
Pembroke (CNIS04-02)	6	9
Għar Lapsi (CNIS08-01)	5	8
Ġnejna (CNIS09-01)	2	7
Salini (CNIS04-01)	5	7
Mġarr ix-Xini (CNIS03-01)	3	6
L-Aħrax tal-Mellieħa (CNIS03-03)	6	5
Ċirkewwa (CNIS03-02)	5	3

Impact of Fisheries on target and non-target species

As part of the requirements of the Common Fisheries Policy (Regulation 1380/2013), Malta collects data on incidental by-catch of seabirds, marine mammals and marine turtles as listed in Table 1D of Commission Implementing Decision (EU) 2016/1251. Such data on by-catch is collected during scientific observer trips and through logbook completion by fishers in order to estimate the level of fishing and the impact of fishing activities on these species groups.

On the basis of the data collection processes in place, no by-catch of all three species groups has been recorded for the period 2013 – 2018. The absence of incidental by-catch corroborates the results of some of the studies presented by Malta in 2013 for seabirds and marine mammals, which indicated that fishing methods adopted in Malta may not pose a significant threat to these two species groups as far as by-catch is concerned.

However, in 2013 Malta has reported a low level of turtle by-catch by surface long liners on the basis of fishers' reports and on board observations carried out by Fisheries officers. The fact that no by-catch of turtles has been recorded for the period 2013 – 2018, does not exclude the vulnerability of turtles to by-catch. The analysis of stranded specimens of turtles provides information on the pressures on this species group and the cause of death, where relevant. Figure 15 refers to the number of stranded turtle specimens with signs of interaction with fishing gear in general for the same period 2013 - 2018. The presence of hooks on some of these specimens may be indicative of by-catch of turtles from long lining.

Malta is seeking continuous improvement of the data collection processes in order to ensure that the current data reflects the real scenario with respect to incidental by-catch of seabirds. To this end, Malta's latest version of the Work Plan for Data Collection (Department of Fisheries and Aquaculture, 2018) continues to implement pilot studies through on-board observations and logbooks with a view to collect accurate information on these species in terms of quantities, gears, temporal and spatial areas. With the implementation of the planned pilot studies, it is expected that accurate information will be collected on the species incidentally caught, as well as their quantities, locations and the timing of such catches.

With respect to non-target species of fish and shellfish, the current limitations in data did not enable an assessment of the mortality rate per species from incidental by-catch.

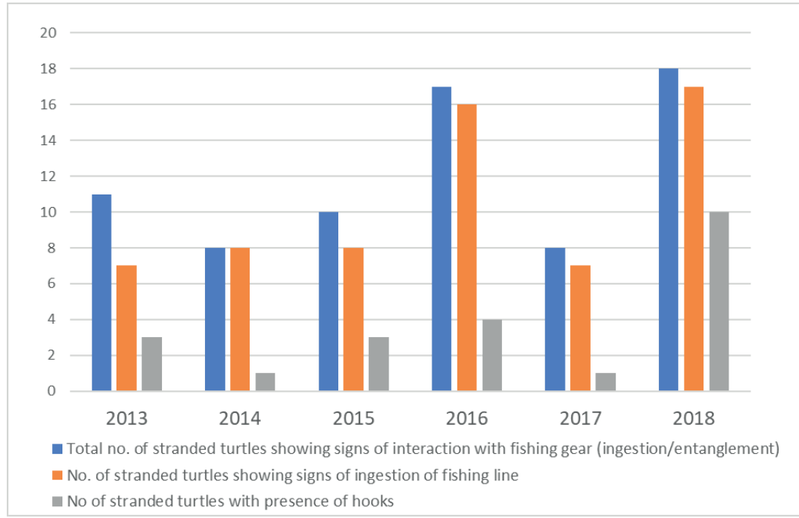


Figure 15

Number of stranded turtle specimens which appear to have interacted with fishing gear (2013-2018).

Impact of Fisheries on habitats:

Fisheries activities in which fish gears come in contact with the seabed can give rise to physical disturbance as a result of abrasion. Surface abrasion is defined as the damage to seabed surface features (top 2 cm), and subsurface abrasion is the penetration and/or disturbance of the substrate below the surface of the seabed (below 2 cm) (ICES, 2019a).

Otter trawlers, demersal seiners, beam trawlers, and dredgers have been identified as the most significant types of mobile bottom contacting gears in the European and Black Sea (Eigaard, *et al.*, 2016), of which only otter trawling is carried out in Malta's FMZ. Other types of fishing activity that take place in Malta's waters, and which can give rise to physical disturbance in view of contact with the seabed are static gears such as pots, gill nets and fishing aggregation devices. Regarding pots and gillnets, spatial data on the use of these gears is not available; however they are only used close to the coast, and impacts on

the seabed are minor and localised. Fishing aggregating devices (FADs) are used for the dolphin fish ('Lampuka') fishery. The FADs (Maltese: kannizzati) are small rafts made of floating materials, such as palm tree fronds, which are anchored to the seabed using stone sinker blocks. These blocks are deployed once a year at the start of the season along set transects, which is when they can cause damage to the seabed through smothering. While the impact from this fishing method is considered to be spatially widespread throughout the FMZ, it is considered to be of limited impact in terms of the area disturbed, in view of the small footprint of the stone blocks.

Within this context, the most significant impacts from fisheries on seabed habitats is expected to be associated with otter board trawling. Noting that trawling activities are limited to designated areas within the Maltese FMZ, the impact of such activity on sensitive habitats is not considered to be significant on the basis of the available data.

Additional infromation on fisheries is provided in Section 2.1.5. (i).

3.2. Vulnerable marine ecosystems

Detail on the vulnerable marine ecosystems within Maltese waters is provided Section 2.1. above.

3.3. Emerging issues such as climatic change effects and open sea including deep-sea ecosystem concerns

Climate Change:

Climate change can affect the marine environment through physical changes, such as increased sea temperature, ocean acidification and sea level rise, that in turn can impact marine ecosystems and processes. The potential impacts of climatic changes on the marine ecosystems include changes in faunal and floral diversity and distribution, spread of alien species, epidemiological outbreaks, changes in coastal hydrodynamics and deep water circulation, coastal erosion and loss of habitat, and ocean acidification.

Malta's recent Communications to the UNFCCC have focused on changes in air temperature and precipitation as the key climate elements that would affect the priority sectors such as water resources, health, and tourism; marine elements such as sea level rise and sea temperature are discussed in detail in an earlier report – namely Malta's Second National Communication under the UNFCCC (Micallef & Sammut, 2010):

(i) Precipitation:

Malta's Second National Communication to the UNFCCC (Micallef & Sammut, 2010) states that over the last 85 years there has been no significant change in rainfall during winter and summer, whereas there has been a decrease of 0.14 mm/year during spring, and an increase of 0.8 mm/year during autumn. However, during the rainy season, the increasing number of days with thunderstorm (with an upward trend of +7 days over 55 years) implies that convective type rainfall – which is of short duration and often quite heavy - is on the increase.

Changes in precipitation or rainfall regime – particularly an increase in the frequency of extreme weather events – can affect seagrass species in shallow water or in relatively enclosed environments such as lagoons or bays, according to the ecological characteristics of the species involved. Potential impacts include sediment erosion or burial from severe run-off during extreme rainfall events (Pergent, *et al.*, 2014), as well as changes in coastal hydrodynamics which can have consequences for the upper and lower limits of *P. oceanica* meadows (Vacchi, Montefalcone, Bianchi, Morri, & Ferrari, 2012) in (Pergent, *et al.*, 2014).

(i) Sea temperature

Local observations of sea surface temperature (SST) based on *in situ* measurements for 1977 – 2006 showed that the average SST in Malta's coastal waters had increased steadily at an average rate of close to +0.05 °C per year. These observations were registered by the Malta Meteorological Office, through measurements taken at a constant single point (in the open sea outside Delimara point) and at the same level of about 1 m below the sea surface.

Shifts in the temperature of an area can result in conditions that are no longer optimal for a given species, while extreme events such as temperature anomalies that can cause mass mortalities (Borg, Evans, Knittweis, & Schembri, 2017). Changes in water flow – which can result from changes in sea water temperature - can impact cave and reef species by altering the availability of food supply, which is particularly relevant for sessile suspension feeders, or cause silting up, which is particularly detrimental to reef organisms that are not occurring on near-vertical surfaces of reefs (Borg, Evans, Knittweis, & Schembri, 2017). Changes in sea temperature can also facilitate the spread and establishment of NIS. The number of NIS that have been recorded in the Mediterranean, and in particular during the last 30 years decades has increased significantly.

Overall, the status of the marine ecosystems does not provide evidence of impacts related to climate change or exacerbation of pressures, with the exception of non-indigenous species, with a total of 40 newly introduced NIS reported during the period 2017-2018.

Effects of Marine Litter:

In the period 2012 - 2018, a total of 161 specimens of stranded turtles were recorded, out of which 17 could not be identified and the rest (144) belonging to the species ***Caretta caretta***. In most cases, the cause of death was not known, however a large fraction of the stranded turtles (both dead and live specimens) showed signs of interaction with fishing gear either in terms of ingestion or entanglement (Figure 16).

The data available with respect to ingested litter is qualitative. On a qualitative basis, ingestion in marine reptiles was mainly that of fishing line and nylon, although a few cases of ingestion of other plastic material (such as bags) were also recorded. Entanglement, almost always involved fishing lines, although entanglement with other debris or material was also reported. In terms of number of individuals which are adversely affected due to litter by entanglement, reference is made to Table 19, implying that 43% of the stranded specimens affected by entanglement with marine litter were dead. Additional data is however required to enable a quantitative assessment of status on the basis of this criterion.

With a few exceptions, most interactions (ingestion or entanglement) occurred with 'artificial polymer material' (or plastic), primarily originating from fishing activity. When hooks are present in the mouth of the specimen, the impact could be more related to by-catch rather than marine litter. However, for the purpose of this assessment and due to the nature of the available data based on stranded specimens, no attempt is made to distinguish between impacts from by-catch and Abandoned, Lost or Discarded Fishing Gear (ALDFG).

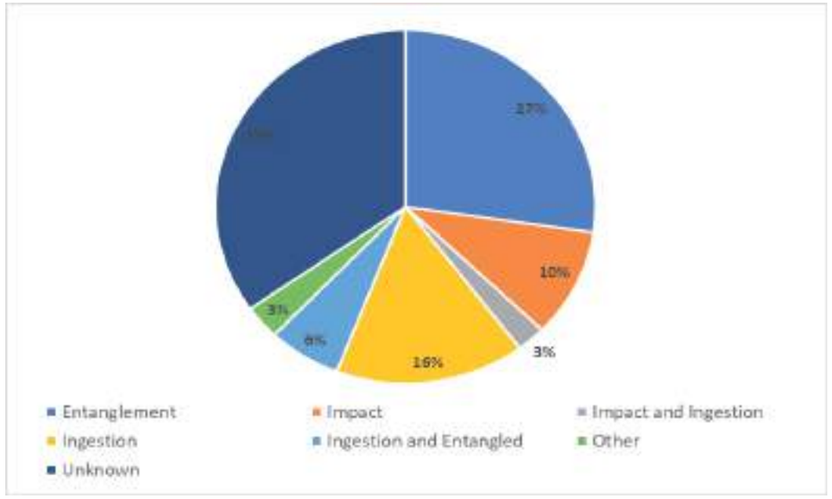


Figure 16
Causes of death/injury in specimens of stranded turtles recorded during the period 2012-2018

Table 19
Number of turtle specimens affected by entanglement with marine litter

Year	Number of Stranded turtle specimens affected by entanglement				
	Total	Dead	Released	Rehabilitated	Unknown outcome
2012	0	0	0	0	0
2013	4	4	0	0	0
2014	3	1	0	0	2
2015	6	4	1	0	1
2016	5	1	1	2	1
2017	5	1	2	0	2
2018	7	2	3	1	1
Total	30	13	7	3	7

4.

Current response measures

© Artescienza

4.1. Marine protected areas and other area based conservation measures

Malta designated up to 4,138km^2 of marine waters for the conservation of important marine habitats and species listed in Annex I and II to the Habitats Directive and Annex I to the Birds Directive. This area is equivalent to more than 35% of Malta's coastal and marine waters within the 25 nautical mile boundary of the FMZ designated under the Territorial Waters and Contiguous Zone Act (Cap. 226).

In total, eighteen (18) MPAs have been established in accordance with the Flora, Fauna and Natural Habitats Protection Regulations (S.L. 549.44), contributing to the achievement of Favourable Conservation Status of marine habitats and species, and to the protection of seabirds as listed hereunder:

Marine habitats

Out of the nine (9) marine habitat types listed in Annex I to the Habitats Directive as "natural habitat types of community interest of which conservation requires the designation of Special Areas of Conservation (SACs)", Malta identified four (4) natural habitat types occurring in Maltese waters:

- *Posidonia* beds (1120);
- Sandbanks which are slightly covered by sea water all the time (1110);
- Reefs (1170); and
- Submerged or partially submerged sea caves (8330).

Five (5) SACs in inshore/coastal waters (Figure 17) and five (5) SACs in offshore waters (Figure 18) are designated for the protection of these four marine habitat types. Three of these sites (MT0000113; MT0000115 and MT0000116) overlap with SACs for marine mammals, whilst four sites (MT0000105; MT0000113; MT0000115 and MT0000116) overlap with SACs identified for marine reptiles.

The inshore or coastal SACs incorporate all four habitat types listed in Annex I to the Habitats Directive; while offshore SACs are mainly designated for the purpose of protecting reefs (1170) and sea caves (8330). Designation of protected areas for reefs and sea caves followed the results of the LIFE BaĦAR for N2K project (LIFE12 NAT/MT/000845).

Marine Species

The loggerhead turtle *Caretta caretta* and the bottlenose dolphin *Tursiops truncatus* are listed in Annex II to the Habitats Directive that lists "animal and plants species of community interest of which conservation requires the designation of SACs". Malta designated one inshore/coastal area and three offshore areas for the protection of the loggerhead turtle (MT0000105; MT0000113; MT0000115 and MT0000116) and three offshore areas (MT0000113; MT0000115 and MT0000116) for the protection of the bottlenose dolphin (Figure 17 & Figure 18). Designation of protected areas for the loggerhead turtle and bottlenose dolphin was based on the results of the Project LIFE+ MIGRATE (LIFE11NAT/

MT/1070). Such protected areas would also contribute to the protection of other dolphin species occurring in Maltese waters, including the common dolphin (*Delphinus delphis*) and the striped dolphin (*Stenella coeruleoalba*).

In addition, some of the inshore/coastal SACs also contribute to the protection of the Maltese top-shell (*Steromphala nivosa*) which is listed in Annex II to the Habitats Directive (MT0000101; MT0000105).

Seabirds

On the basis of the outcome of the LIFE+ Malta Seabird Project (LIFE10 NAT/MT/090 -2011-2016) Malta designated eight Special Protection Areas (SPAs) for the protection of breeding seabirds in Malta (Figure 19), namely the i) Yelkouan shearwater (*Puffinus yelkouan*), ii) the Scopoli's shearwater (*Calonectris diomedea*) and iii) the European Storm-petrel (*Hydrobates pelagicus*). Overlap between SACs and SPAs can be noted in Figure 17 - Figure 19.

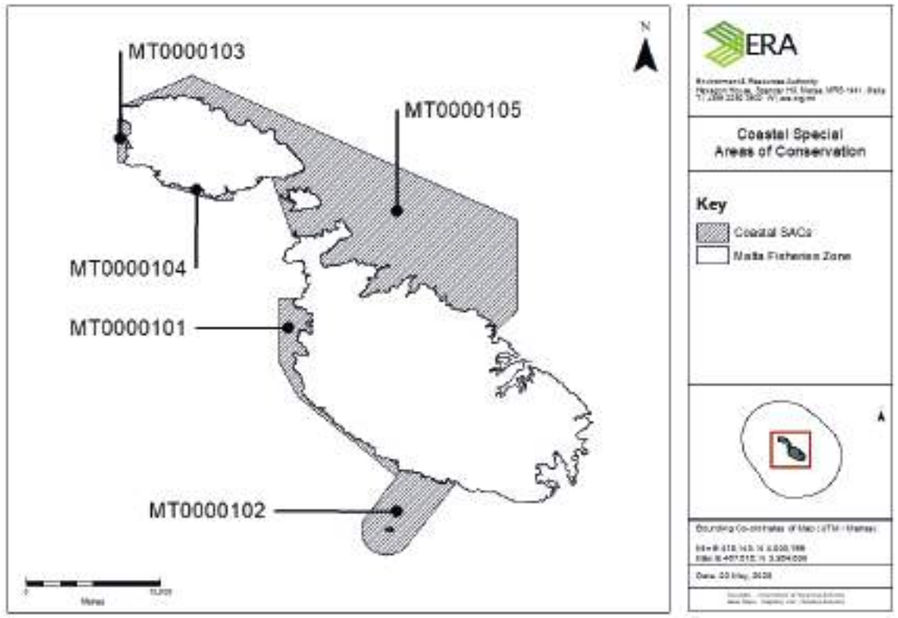


Figure 17
Map of coastal Special Areas of Conservation

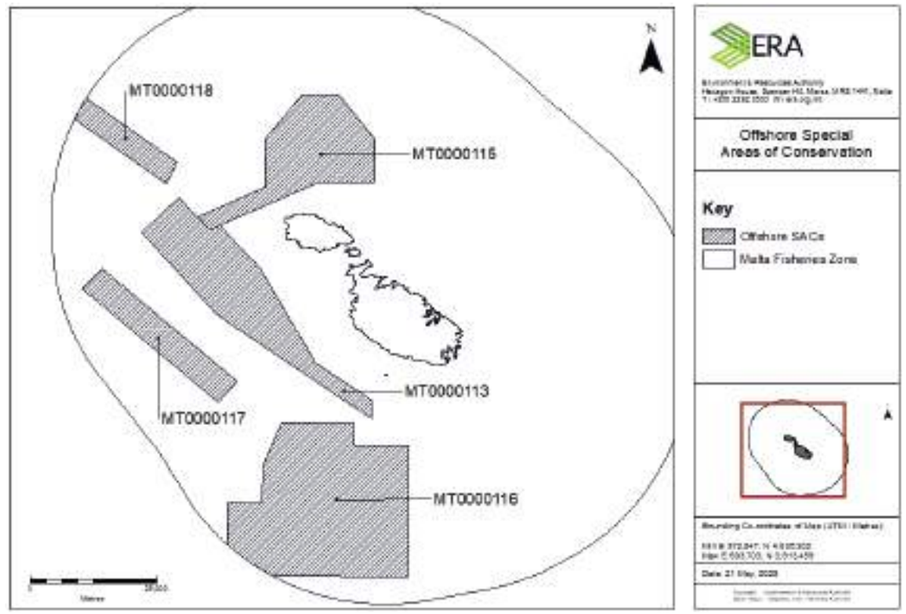


Figure 18
Map of offshore Special Areas of Conservation

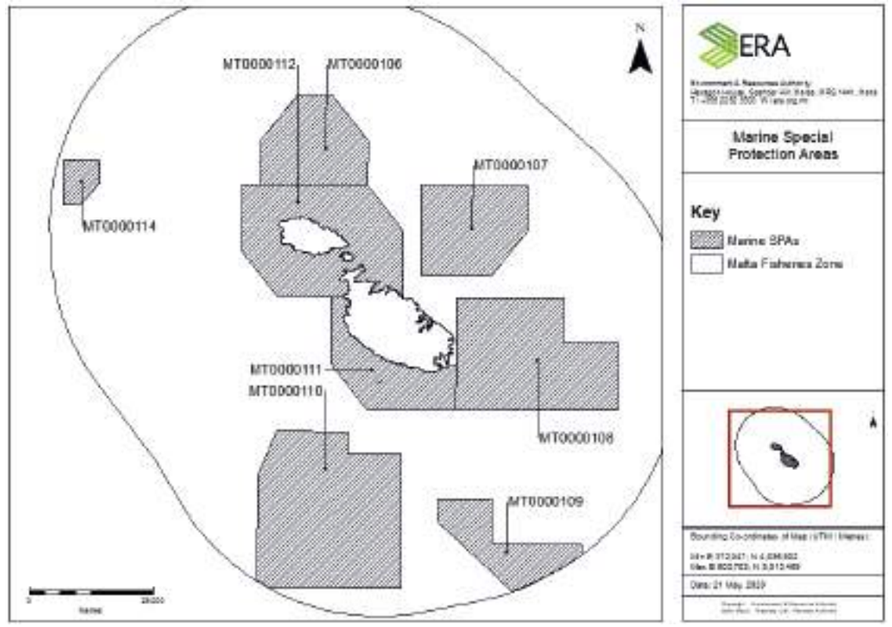


Figure 19
Map of Marine Special Protection Areas

4.2. Legal and institutional frameworks governing the conservation and sustainable use of marine and coastal biodiversity

Institutional actors in relation to marine and coastal biodiversity

The Environment and Resources Authority (ERA) is the national regulator on the environment, with the aim to safeguard the environment to achieve a sustainable quality of life. It does this by i) mainstreaming environmental targets and objectives across Government and society, ii) advising Government on environmental policy-making at the national level, as well as in the context of international environmental negotiations, iii) developing evidence-based policy, and iv) drawing up plans, provide a licensing regime and monitor activities having an environmental impact and to integrate environmental considerations within the development control process, as well as regulating the dumping of waste or discharge into the marine environment, as well as the prevention and control of pollution. ERA is the national focal point, representing Malta, in various multilateral environmental agreements including the CBD, UNCCD, Barcelona Convention, RAC/SPA, Bern Convention, CMS and ACCOBAMS, amongst others.

The Continental Shelf Department (CSD) regulates the exploration and exploitation of hydrocarbons and other activities (including marine scientific research) on the continental shelf. In addition to this regulatory role the CSD is also responsible for regulating other activities on Malta's continental shelf such as the laying of submarine cables and pipelines, marine scientific research and the construction, operation and use of artificial islands, structures and devices. CSD also provides technical support to Government and other entities in connection with Malta's sovereign rights and maritime boundaries.

Transport Malta (TM) is the competent authority for transport in Malta, set up as a government authority to assume the functions previously exercised by three other entities, i) the Malta Maritime Authority, ii) the Malta Transport Authority, and iii) the Department of Civil Aviation. TM regulates and manages the port and marine activities, maintenance of good order in Maltese waters, safety of navigation, and prevention and control of pollution, thus promoting and developing the transport sector in Malta by means of proper regulation and by promotion and development of related services, businesses and other interests both locally and internationally. TM is the focal point for Malta for REMPEC, and other maritime related conventions and agreements.

The Department of Fisheries and Aquaculture (DFA) is the national regulator of the commercial fisheries and aquaculture sectors in Malta. DFA ensures the sustainability of fish species in the seas and to address the requirements in the fisheries sector, by focussing on the regulation of activities concerning fisheries and aquaculture, responsible for monitoring and control, in line with legal obligations, promote the development of the aquaculture sector to supply products to the local and foreign market while reducing the pressure on wild fish and gather, analyse and keep biological and economic information to serve as an objective basis for decisions underpinning the sustainability of fish in our waters

The Planning Authority (PA) is the government entity responsible for land use and planning in Malta. With regards the marine environment, the PA is responsible for the The Strategic Plan for Environment and Development, constitutes the national Maritime Spatial Plan and formulates the strategic spatial policy framework for environment and development, on land and sea, in and integraetd manner

Legal text of relevance to marine and coastal biodiversity (conservation, management of uses (fisheries, tourism, etc)

The following texts are available on the following weblink: *https://legislation.mt/*

Environment Protection, Biodiversity, Water and Marine

- Environment Protection Act (Cap. 549)
- Flora, Fauna and Natural Habitats Protection Regulations (S.L. 549.44)
- Water Policy Framework Regulations (S.L. 549.100)
- Marine Policy Framework Regulations (S.L. 549.62)
- Conservation of Wild Birds Regulations (SL 549.42)
- Reptiles (Protection) Regulations (S.L. 549.02)
- Marine Mammals Protection Regulations (S.L. 549.35)
- Trade in Species of Fauna and Flora Regulations (S.L. 549.38)
- Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilisation Regulations (S.L. 549.111)
- Prevention and Remedying of Environmental Damage Regulations (S.L. 549.97)
- Environment Protection (Preventive and Remedial Measures) Regulations (S.L. 549.04)
- Environmental Impact Assessment Regulations (S.L. 549.46)
- Strategic Environmental Assessment Regulations (S.L. 549.61)
- Control of Invasive Alien Species of European Union Concern Regulations (S.L. 549.119)
- Species Protection (Designation of National Species) Regulations (S.L. 549.120)
- Fungus Rock (il-Ġebla tal-Ġeneral) Nature Reserve Regulation (SL 549.01)
- Selmunett Islands (St.Paul Islands) Nature Reserve Regulations (SL 549.03)
- Environment and Planning Review Tribunal Act (Cap. 551)
- Sustainable Development Act (Cap. 521)
- Crimes Against the Environment Act (Cap. 522)

Development Planning

- Development Planning Act (Cap. 552)
- Maritime Spatial Planning Regulations (S.L. 552.27)

Fisheries

- Fisheries Conservation and Management Act (Cap. 425)
- Fishery Regulations (S.L. 425.01)
- Marine Vegetation Licence Regulations (S.L. 425.06)
- Fishing Vessel Regulations (S.L. 425.07)
- Enforcement of Sea Fishing Conventions Order (S.L. 425.08)
- Implementation and Enforcement of Certain Fisheries Management Plans Order (S.L. 425.09)

Jurisdiction

- Territorial Waters and Contiguous Zone Act (Cap. 226)
- Ship Source Pollution Regulations (S.L. 226.01)
- Territorial Waters Regulations (S.L. 226.02)

Transport

- Authority for Transport in Malta Act (Cap. 499)

Other regulations or plans, such as national plan for species

The objectives, priorities and expected outcomes for the draft NAPs, along with the requirements of the SAPBIO are integrated strategically in the National Biodiversity Strategy and Action Plan (NBSAP), through Malta's national targets and measures, so as to streamline further legal obligations, being national, regional or global, and maximising resources. The ultimate aim is shaped at fulfilling the said obligations and requirements in an integrated fashion, with most cases actions being undertaken in parallel with the implementation of the Flora, Fauna and Natural Habitats Protection Regulations (SL 549.44) and the Marine Policy Framework Regulations (SL 549.62). These two legal instruments are the main national Maltese law transposing into the Laws of Malta the provisions of various EU and multilateral environmental agreements, including the United Nations Convention on Biological Diversity and the SPA/BD Protocol of the Barcelona Convention, and their requirements, obligations and implementation.

List the relevant international Agreement to which the country is a Party

- The Convention on Biological Diversity (CBD)
- The Cartagena Protocol on Biosafety to the Convention on Biological Diversity
- The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity
- The Council of Europe's Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS)
- The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)
- International Union for Conservation of Nature (IUCN)

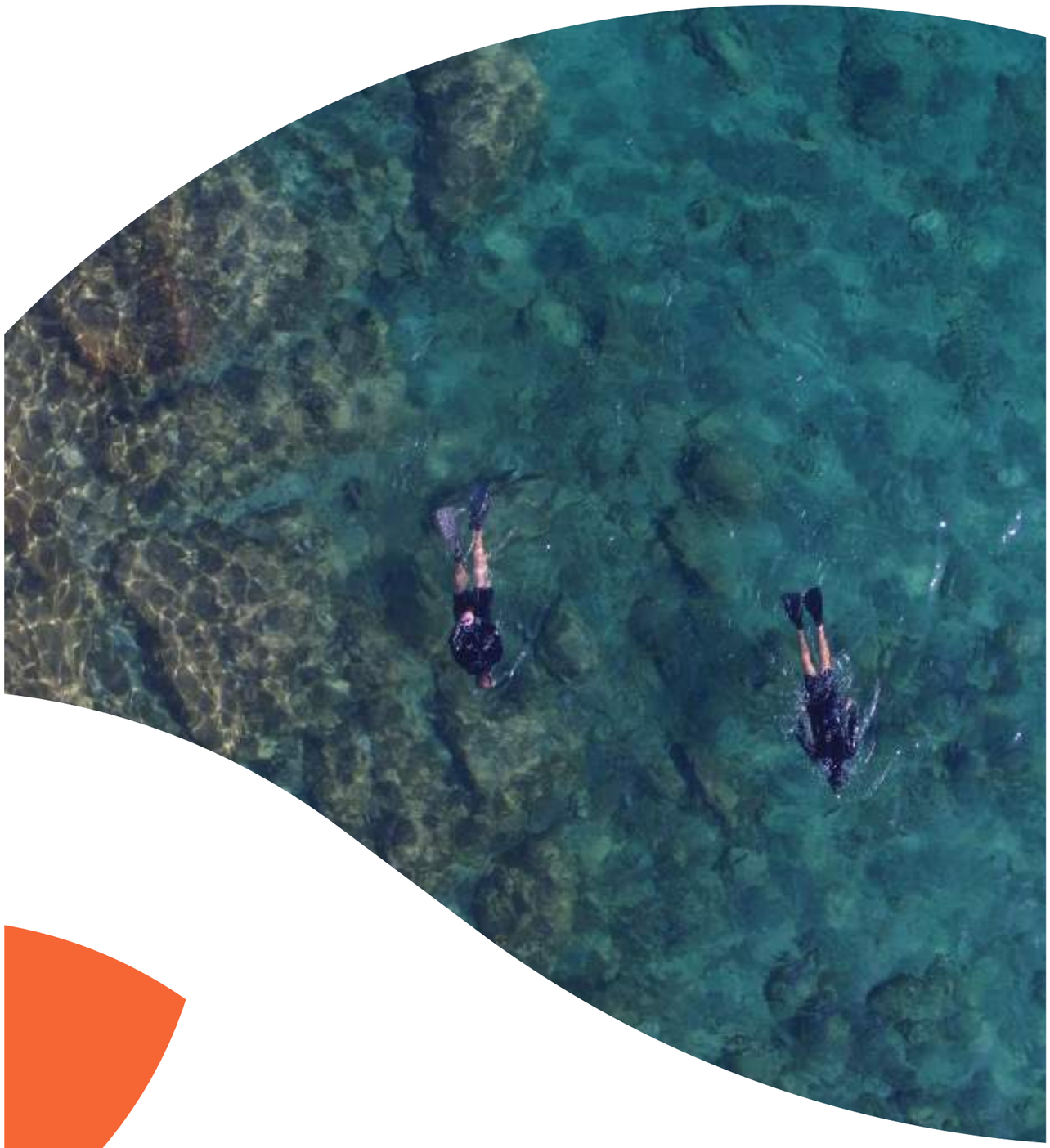
4.3. Transboundary issues and existing, planned or needed coordination / harmonisation at sub-regional or regional level

The marine environment has no boundaries and only concerted efforts at regional or sub-regional scales can contribute to effective management of our marine waters. The need for regional cooperation in assessing, monitoring and managing the marine environment has also been acknowleged by the overarching EU marine policy, the Marine Strategy Framework Directive.

It is within this context that Malta strives to develop and implement marine stratetgies within the framework of the Barcelona Convention and associated Ecosystem Approach (EcAp). Use of *inter alia* (i) UNEP/MAP habitat classifications and the EcAp common indicators for assessment purposes; and (ii) implementation of monitoring processes through parameters and methodologies as identified by UNEP/MAP's Integrated Monitoring and Assessment Plan, allows Malta to ensure coherence of the marine management processes with regional efforts, thus enhancing Malta's contribution to the protection of the Mediterranean Sea. Malta also follows the regional efforts for coordination of assessment of marine environmental status at the level of the EU as well as the outcome of regional projects, aimed at ensuring coherence of marine management at a regional scale. In this regard, Malta is currently participating in the MEDREGION stakeholder platform.

5.

Assessment of marine and coastal status and pressures and impacts on the marine and coastal biodiversity



© SPA/RAC, Artescienza

5.1. Marine and coastal status and pressures relevant for national marine and coastal areas

The biological elements assessed in the Maltese coastal and offshore waters to date were generally identified to be in good status or showed stable trends when assessed on the basis of biological indicators. This, with the exception of commercial fish and shellfish and non-commercial fish species, where only a few species were considered to be in good status within Malta's FMZ:

- For commercial species, out of a total of 15 species assessed at FMZ level, only two (2) species, the common pandora (*Pagellus erythrinus*) and the spotted ray (*Raja montagui*), were assessed to be in good status when integrating the outcome of the indicators used;

- For non-commercial fish species, out of a total of 16 species assessed at the FMZ level, only 2 species, the rabbit fish (*Chimaera monstruosa*) and the roughtip grenadier (*Nezumia sclerorhynchus*), were assessed to be in good status when integrating the outcome of the indicators used.

The status of commercial fish and shellfish and non-commercial fish however should be interpreted with caution in view of the short-term trend data that is currently available and the fact that such assessment was not carried out at the most ecologically relevant scale.

The need to interpret the identified status with caution applies to a certain extent to most of the biological elements, since knowledge improvement with respect to the indicators used and the interactions with pressures is considered necessry to increase Malta's confidence in such results.

Nevertheless, the status assessment points towards two major pressures on the marine environment: that arising from the introduction of non-indigenous speceis and from extraction of species, the latter also due to the assessment of a shared stock. Other pressures which are considered relevant to Maltese waters include marine litter and physical disturbance, particularly from anchoring. Although the results of the biological indicators employed for assessment of *P. oceanica* are not currently providing evidence of significant impacts from such activity, anchoring is considered to be an activity which is on the increase in Maltese coastal waters and which may cause deterioration of coastal seabed habitats.

Within this context, environmental targets have been identified through the EU MSFD processes to address pressures which are considered to cause failure in achievement of good status as per outcome of the assessment of status; or are still considered to pose a risk, even if assessment of status does not provide evidence in this regard. These environmental targets address the following:

(i) Incidental by-catch of seabirds, marine reptiles and marine mammals
(ii) Discards of non-commercially exploited fish and cephalopods
(iii) Anthropogenic activity resulting in disturbance to seabirds
(iv) Anchoring

(v) Non-indigenous species
(vi) Input of nutrients and chemical contaminants
(vii) Marine Litter

Achievement of the environmental targets will be sought through integrated management regimes in the marine environment, including the PoMs as part of the EU MSFD and Malta's 3rd WCMP pursuant to the EU WFD, as well as localised management measures associated with the management of MPAs.

5.2. Critical impacts and effects on marine and coastal biodiversity

As indicated in Section 5.1 of this report, the critical impacts on coastal and marine waters are considered to be those associated with the introduction and establishment of non-indigenous species, physical disturbance from anchoring activity in inshore waters, marine litter and extraction of fisheries resources.

Although hydrographical changes can have an impact on the coastal habitats, including coastal wetlands, impacts resulting from such changes are considered localised and not significant when considering the marine waters under jurisdictional rights. On the other hand, some coastal wetlands are known to have been impacted by changes in hydrology and coastal erosion processes. Such impacts are being addressed accordingly through Natura 2000 management regimes.

Overall, all sensitive coastal and marine habitats are covered by the designation of both terrestrial and marine Natura 2000 sites pursuant to the EU Habitats and Birds Directive. Management plans for terrestrial Natura 2000 sites address relevant pressures and impacts on terrestrial coastal habitats[1]. Management measures for MPAs are being developed at the time of drafting this report. Such measures will be addressing the most relevant impacts on the most sensitive seabed habitats and species, including pressures which are considered critical as mentioned above.

1.Natura 2000 Management Planning for Terrestrial Sites in Malta & Gozo - https://era.org.mt/topic/natura-2000-management-planning-for-terrestrial-sites-in-malta-gozo/

6.

Assessment of national priority needs and response actions

© SPA/RAC, Simone Modugno

6.1. Needs

In order to address the pressures on the coastal and marine environment in a holistic manner, Malta adopts an integrated approach towards the management of the marine environment on the basis of the ecosystem-based approach principle as stipulated through the EU MSFD and the Barcelona Convention. In this regard, marine strategies are developed through collaboration with all relevant economic sectors and stakeholders in order to work towards the sustainable use of the coastal and marine environment through both environmental and sectoral policy.

Priority needs for the marine environment are addressed by PoMs identified as part of the MSFD and WFD. These overarching measures:

(i) address all relevant pressures on the marine environment in an integrated manner;

(ii) seek achievement of environmental targets to achieve good status in the marine environment;

(iii) facilitate the implementation of site-specific measures within MPAs;

(iv) are based on the information and data collected through mointoring and research processes to ensure information-based decisions.

Management measures for MPAs complement the overarching management regime through more targeted measures that ensure the protection of sensitive habitats and species, and enhance the contribution of the protected areas to the conservation status of key habitats and species. The whole framework provides for a robust and comprehensive management regime that covers the marine environment as a whole as well as specific habitats and species.

Such management regime needs to be accompanied by continuous knowledge improvement on the marine environment, both through monitoring processes and research activities. In this regard, implementation of monitoring processes will be sought on a continuous basis and in parallel to the implementation of the management processes. This will ensure adaptive management processes to address the most relevant pressures as well as emerging issues that may be captured through mointoring and research activity.

6.2. Urgent actions proposed

On the basis of the outcome of the assessment of environmental status of the marine environment and associated elements, urgent actions are considered to be required in relation to the most relevant pressures. These are captured by the evironmental targets as described in Section 5.1 and covered by the necessary management regimes as described in Section 6.1.

7.

Funding problems and opportunities

© The Tunisian Dolphin Project

7.1. Regular national sources, potential co-financing for international funding

Public funding is the major source of finance for the implementation of conservation measures on the marine and coastal environment. A total of €39,293,016 was allocated from national budgets in the period 2016 – 2018 to the management of terrestrial and marine Natura 2000 sites, green infrastructure and species protection as follows:

- Administration costs: €18,190,100
- Monitoring: €8,980,719
- Information and education activities: €165,714
- Species & Habitat research: €962,483
- Management of Natura 2000 sites, Green Infrastructures and species protection: €10,994,000

Further resources are needed to coherently implement the EU acquis and international treaties, as well as to assist in the identification of the applicable funding and ensure an increased success rate of funding applications, thus accessing various funding programmes.

Biodiversity mainstreaming is also an important component of resource mobilisation because it encourages a more efficient use of existing resources. Instruments to align existing financial flows with biodiversity and marine objectives are to be explored, as well as to identify harmful subsidies and incentives.

7.2. Other sources (private, public, partnership)

Malta is currently developing management measures for its MPAs. In this regard, a bottom up approach has been implemented and input has been considered from the general public, organisations and stakeholders regarding their views on the management of Malta's MPAs. Various funding opportunities are being explored, these include Public-Private Partnerships and public interest-centred mechanisms, such as green taxes and fiscal instruments.

An Environment Fund is being discussed, to be set up and run by ERA to gather the different revenues from various mechanisms and sources. The purpose of the Environment Fund would be to sustain various environmental initiatives such as those linked to conservation and management. The Planning Authority has set up the Development Planning Fund based on a similar approach. Although it is not directly meant for marine conservation purposes, it can support works which may be needed for the purpose to remedy any harm caused to the environment in connection with any contingency or emergency plan. Possible synergies between the two authorities could be explored to assess the possibility of channelling of funds towards specific marine conservation activities.

Throughout the years, banks have been important sources of financing for direct and indirect conservation efforts in the country. Support is not limited to providing financial sources. Banks have acted as co-financiers of biodiversity projects, e.g. Bank of Valletta is a co-financier of the LIFE+ Migrate project, while HSBC Malta Foundation has sponsored the LIFE Yelkouan Shearwater project. Banks hosted and financed conferences and their proceedings and supported environmental educational programmes. Some banks also dedicated staff time in supporting NGOs activities, such as in conservation projects (e.g. Killifish Conservation project) and clean-ups events. Various environment and nature related publications, as well as scientific journals, have also been sponsored.

The possibility of increasing investments from the private sector, other than banks, in biodiversity-positive projects is to be further explored.

7.3. International funds, projects, programmes, national eligibility for international programmes/funds (e.g. green funds) identified.

The 2014 - 2020 European Multiannual Financial Framework (MFF) aimed to address knowledge gaps and research needs relating to the marine and coastal areas. Four major LIFE projects and one EMFF project, have been co-funded to fill major knowledge gaps. These are:

- LIFE Malta Seabird Project. The project addressed monitoring surveys for Yelkouan shearwater (*Puffinus yelkouan*), Scopoli's shearwater (*Calonectris diomedea*) and the Mediterranean subspecies of the European storm petrel (*Hydrobates pelagicus*) breeding in Malta.
- LIFE Project MIGRATE. The project implemented both data-collecting activities and marine surveys to understand the conservation status of, and to identify the best areas in Maltese waters to establish Natura 2000 network sites for, loggerhead turtle (*Caretta caretta*) and common bottlenose dolphin (*Tursiops truncates*).
- LIFE BaħAR for N2K. The project addressed the dearth of marine habitat data – specifically location, range, conservation status – by collecting existing information, surveying marine areas and analysing the data collected.
- LIFE Arċipelagu Garnija. The project sought to complement the findings of the LIFE Yelkouan Shearwater Project and the LIFE Malta Seabird Project by identifying and fully understanding the distribution of Yelkouan shearwater (*Puffinus yelkouan*).
- EMFF 8.3.1 - Marine environmental monitoring: towards effective management of Malta's marine waters. The aim of the project is to initiate the implementation of such monitoring processes in the marine environment, test the methodologies and develop a monitoring programme of which implementation can be sustained in the long-term. Monitoring which would contribute to management of MPAs, particularly inshore sites.

During the period 2014 – 2020 a total of €6,759,739 was allocated on European Maritime and Fisheries Fund (EMFF) projects, with a national contribution of €1,475,630. Other relevant projects carried out were: A scientific study to improve trawl gear selectivity, Data Collection Multi-Annual Programme 2017-2019, Data Collection Framework Multi-Annual Programme 2014-2016, Publicity Campaign, Training for Fishers, Mantis, and MARE.

Other EU Structural and Investment Funds (ESIF), i.e. EAFRD, ERDF, ESF and CF, and the Horizon 2020 funding programme, presented opportunities for funding activities and research related to the marine and coastal biodiversity preservation. It is expected that the funds and programmes that will succeed the above in the next MFF 2021 – 2027 will continue to contribute to the national and EU objectives of conserving and improving the marine and coastal environment.

Other international funding is available through ACCOBAMS, MAVA foundation, IUCN and SPA/RAC. Malta is one of the beneficiary countries of the MedKeyHabitats II Project, financially supported by the MAVA Foundation. The project aims to establish a mapping inventory of marine key habitats on six pilot sites in Mediterranean countries and to assess their sensitivity to fishing activities.

As such, EU funds and programmes have been the most widely used solution for resource mobilisation and reinforcement of the national funds allocated for biodiversity. Thus, it is envisaged that future applications for funded projects under EU funds and programmes will be considered.

8.

Conclusions and recommendations

© Artescienza

As indicated throughout the report Malta has, over the years, cemented its vision towards the conservation and sustainable use of the marine environment and its resources. This is supported by, amongst others, the:

i) Good water quality in the coastal waters around Malta;

ii) Overall good status of marine species and habitats found nationally;

iii) Designation of more than 35% of Malta's waters, amounting to 4,138km^2, as Marine Protected Areas;

iv) The implementation of EU funded projects to improve knowledge;

v) Enhanced data availability and quality; and

vi) Adequate regulation of the exploitation of species listed in Annex III to the SPA/BD Protocol.

However, it is also noted that further efforts are required to maintain the ongoing work and to ensure the strategic implementation of the SPA/BD Protocol towards the conservation of marine biodiversity. This has also been reported in the sections above. In this regard, the following considerations are noted:

- Further assistance on the use of modern technology in research, surveillance and monitoring should be considered, possibly by setting up standards to be employed and/or adapted by Contracting Parties, sharing the result through existing platforms under the Barcelona Convention.
- On the conservation of sensitive habitats, species and sites, building on the site designation efforts, Malta is to focus towards implementation of conservation measures and management plans for existing MPAs, a process which is ongoing
- A more coordinated approach is required between Mediterranean Contracting Parties in relation to the research, surveillance and monitoring of selected species, particularly migratory fauna (e.g. sharks, rays, other migratory fish, seabirds, turtles, pinnipeds, cetaceans and selected invertebrates); strict marine endemics or species with a very restricted distribution in the Mediterranean; and species showing dramatic decline throughout the region (e.g. the noble pen shell). This should be the case for the assessment and management of fish stocks, particularly stocks shared at a regional level.
- Whilst noting that various pressures and threats do affect local biodiversity, some actions are merely consequential to current globalisation, particularly issues linked with movement of non-indigenous species, and should be addressed better by assessing socio-economic needs and related pathways for introduction, keeping in mind that the Mediterranean Sea has no borders, and as such joint support is required.

- Although one understands the need for assessments, at this point one should also consider moving from the assessment phase to the implementation, mitigation and adaptation phases, at least where sufficient knowledge is available, or the situation is considered as critical.
- EU funds and programmes have been the most widely used solution for resource mobilisation and reinforcement of the national funds allocated for biodiversity. Thus, it is envisaged that future applications for funded projects under EU funds and programmes will be considered.
- Funding may be required to have a Mediterranean-wide campaign within relevant Contracting Parties, although this should also be accompanied by a tangible project showcasing how such collaboration can lead to achievement of results, and potentially focus on key issues of environmental concerns common to all countries (e.g. marine litter and plastics and their impact on biodiversity and the quality of life).

The outcomes of this report, the lessons learnt, the achievements, the gaps and the considerations for the future will all be taken into consideration, along with the national specificities of Malta, as the basis for the development of Malta's forthcoming processes in the field of biodiversity and the environment, raising the ambition, at national, regional and global level, towards achieving the long-term goals in this regard. As such, Malta will be focussing on the development of its NBSAP to 2030, maintaining and enhancing the implementation of effective measures in the marine environment, address data and knowledge gaps, collaborate at regional and sub-regional level and mainstreaming biodiversity into relevant sectors and policy fields. This will ensure that Malta is aligned with the goals and targets set in following governance frameworks:

- *the UN Sustainable Development Goals (SDGs),*
- *the CBD Post-2020 Global Biodiversity Framework,*
- *the processes relating to the Barcelona Convention's EcAp and the EU MSFD,*
- *the EU Biodiversity Strategy to 2030;*
- *the regional Multilateral Agreements*

References List

Austad, M., Crymble, J., Sahin, D., Greetham, H., Cabello, J. S., & Varnham, K. (2019). *Site assessment report for Yelkouan shearwater populations in the Maltese Islands. LIFE Arċipelagu Garnija (LIFE14 NAT/MT/991) Report for Action A1 and A3.*

Borg, J. (2017). Interpreting pelagic seabird population numbers in the Maltese Islands. *Avocetta, 41*, 1-4.

Borg, J. A., Evans, J., Knittweis, L., & Schembri, P. J. (2017). *LIFE BaHAR for N2K (LIFE12 NAT/MT/000845). Action A2: Data Analysis and Interpretation. Report on the third analysis following the second surveying phase carried out through Action A3.*

Borja, A. *et al.* (2000). A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. . *Marine pollution bulletin 40(12)*, 1100-1114.

Cardona, L. (2005). Western Mediterranean immature loggerhead turtles: habitat use in spring and summer assessed through satellite tracking and aerial surveys. *Marine Biology: 147*, 583-591.

CIBM and Ambiente SC. (2013). *Development of Environmental Monitoring Strategy and Environmental Monitoring Baseline Surveys - Water Lot 3- Surveys of Coastal Waters - August 2012. ERDF156.* Retrieved from http://era.org.

Davis, P. (1957). The breeding of the Storm Petrel. *British Birds*(50), 85-101.

Department of Fisheries and Aquaculture. (2018). *Malta's Work Plan for data collection in the fisheries and aquaculture sectors.*

Dimech, M., Borg, J. A., & Schembri, P. J. (2004). *Report on a video survey of an offshore area off Zonqor Point (south-eastern coast of Malta), made in April 2004 as aprt of baseline ecological surveys in connection with the establishment of an 'aquaculture zone'.* Msida.

Druon, J. N., Fiorentino, F., Murenu, M., Knittweis, L., Colloca, F., Osio, F., & Sbrana, M. (2015). Modelling of European hake nurseries in the Mediterranean Sea: an ecological niche appraoch. *Progress in Oceanography 130*, 188-204.

Eckert, S. A., Moore, J. E., Dunn, D. C., Van Buiten, R. S., & Eckert, K. L. (2008). Modeling loggerhead turtle movement in the mediterranean: importance of body size and oceanography. 290–308

Ecoserv. (2015). *Service Tender for the Provision of Scientific Expert/s Assistance in the Intercalibration Exercise of Biological Elements of Maltese Coastal Waters – Final Report. MEPA tender reference: T03/2014; Ecoserv Ltd. and UCV-IMEDMAR Consortium: 91.* Retrieved from https://era.org.mt/en/Documents/Report_Intercalibration%20v%2018%2002%202015%20FINAL.PDF

Eigaard, O. R., Bastardie, F., Breen, M., Dinesen, G. E., Hintzen, N. T., Laffargue, P., . . .

Rijnsdorp, A. D. (2016). Estimating seabed pressure from demersal trawls, seines,and dredges based on gear design and dimensions. *ICES Journal of Marine Science*, 27-43.

ERA. (2019). *Habitats Directive: Report on implementation measures.* Retrieved November 24, 2020, from Eionet: http://cdr.eionet.europa.eu/mt/eu/art17/envxngv_g/

ERA. (2020). *Update to Malta's Initial Assessment under the EU Marine Strategy Framework Directive.* Retreived November 23, 2020 from Eionet: http://cdr.eionet.europa.eu/mt/eu/msfd_art17/2018reporting/

European Commission. (2017). Commission Decision (EU) 2017/848 of 17 May 2017 aying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU . Official Journal of the European Union.

EUSeaMap. (2019). *Broad-Scale Predictive Habitat Map - EUNIS classification.* Retrieved from www.emodnet-seabedhabitats.eu

Evans, J., Barbara, J., & Schembri, P. J. (2015). Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). *Mediterranean Marine Science, 16*(1), 225-244. doi:10.12681/mms.1064

Evans J, Borg JA, Schembri PJ, 2011. *Distribution, habitat preferences and behaviour of the critically endangered Maltese top-shell Gibbula nivosa (Gastropoda: Trochidae*). *Mar. Biol.*, 158: 603 – 611.

Evans, D., Condé, S., & Royo Gelabert, E. (2014). *Crosswalks between European marine habitat typologies - A contribution to the MAES marine pilot. ETC/BD report for the EEA.*

Froese, R., Winker, H., Coro, G., Demirel, N., Tsikliras, A. C., Dimarchopoulou, D., & Matz-luck, N. (2018). Status and rebuidling of European fisheries. *Marine Policy 93*, 159-170.

Fransson, T., Jansson, L., Kolehmainen, T., Kroon, C., & Wenninger, T. (2017). *EURING list of longevity records for European birds.*

Giannuzzi-Savelli R, Pusateri F, Palmeri A, Ebreo C, 1997. *Atlante delle conchiglie marine del Mediterraneo, volume 1: Archaeogastropoda.* La Conchiglia, Rome, Italy.

Gauci, M.; Deidun, A. & Schembri, P.J. (2005). Faunistic diversity of Maltese pocket sandy and shingle beaches:. *Oceanologia 47 (2)* , 219 – 241.

Ghisotti, F. (1976). *Considerazioni su Gibbula nivosa A. Adams, 1851*. Conchiglie, Milano 12(3-4): 79-88.

Gobert S., Sartoretto S., Rico-Raimondino V., Andra, B., Chery A., Lejeune P., Boissery P. (2009). Assessment of the ecological status of Mediterranean French coastal waters as required by the Water Framework Directive using the Posidonia oceanica Rapid Easy Index: PREI. . *Marine Pollution Bulletin 58(11)*, 1727-1733.

González-Irusta, J.M., González-Porto, R.S., Sarralde, R., Arrese, B., Almon, B., & Martin Sosa, P. (2014). *Comparing species distribution models: a case study of four deep sea urchin species.* Springer: Hydrobiologia. Retrieved from DOI http://10.1007/s10750-014-2090-3

ICES. (2019a). *Workshop to evaluate and test operational assessment of human activities causing physical disturbance and loss to seabed habitats (MSFD D6 C1, C2 and C4) (WKBEDPRES2). ICES Scientific Reports. 1:69.* Retrieved from http://doi.org/10.17895/ices.pub.5611

Insley, H., Hounsome, M., Mayhew, P., & Elliott, S. (2014). Mark–recapture and playback surveys reveal a steep decline of European Storm Petrels Hydrobates pelagicus at the largest colony in western Scotland. *Ringing & Migration, 29(1), 29-36.*

IUCN. (2017). Guidance for interpretation of CBD categories on introduction pathways. Technical note prepared by IUCN for the European Commission. *European Commission*.

LIFE BaĦAR for N2K project. (2014). *LIFE BaĦAR for N2K (LIFE12 NAT/MT/000845) - Life+ Benthic Habitat Research for marine Natura 2000 site designation.* Retrieved from https://lifebahar.org.mt/

LIFE+ MIGRATE project. (2013). *LIFE MIGRATE (LIFE11 NAT/MT/1070) - Conservation Status and potential Sites of Community Interest for Tursiops truncatus and Caretta caretta in Malta*. Retrieved from *http://lifeprojectmigrate.com/*

LIFE-IP RBMP-Malta project. (2019). *LIFE-IP RBMP-Malta (LIFE16 IPE/MT/000008) - Optimising the the implementation of the 2nd RBMP in the Maltese River Basin District*. Retrieved from https://www.rbmplife.org.mt/projects

Malta Environment and Planning Authority. (2013 a). *MSFD Initial Assessment - Benthic Habitats*. Retrieved from https://era.org.mt/en/Documents/MSFD-InitialAssessment-BenthicHabitats.pdf

Malta Environment and Planning Authority. (2013 b). *MSFD Initial Assessment - Reptiles*. Retrieved from https://era.org.mt/en/Documents/MSFD-InitialAssessment-MarineTurtles.pdf

Malta Environment and Planning Authority. (2013 c). *MSFD Initial Assessment - Seabirds*. Retrieved from https://era.org.mt/en/Documents/MSFD-InitialAssessment-Seabirds.pdf

Malta Environment and Planning Authority. (2015). *General report outlining the adequacy of the current monitoring programmes under the EU Marine Strategy Framework Directive*. Retreived November 23, 2020 from Eionet: https://era.org.mt/wp-content/uploads/2019/05/MSFD-Article11-Malta-General-Report.pdf

Metzger, B. O. (2015). *Malta Marine IBA Inventory Report.* Retrieved from https://birdlifemalta.org/wpcontent/uploads/2018/03/LIFE10NATMT090-MSP-A8_mIBA_Report_final.pdf

Micallef, A., & Sammut, C. V. (2010). *The Second Communication of Malta to the United Nations Framework Convention on Climate Change.* Ministry for Resources and Rural Affairs. Retrieved from https://unfccc.int/resource/docs/natc/mlt_nc02.pdf

Otero, M., Cebrian, E., Francour, P., Galil, B., & Savini, D. (2013). Monitoring Marine Invasive Species in Mediterranean Marine Protected Areas (MPAs): A strategy and practical guide for managers. *IUCN*, 136.

Pergent, G., Bazairi, H., Bianchi, C. N., Boudouresque, C. F., Buia, M. C., Calvo, S., . . .

Serrano, O. (2014). Climate change and Mediterranean seagrass meadows: a synopsis or environmental managers. *Mediterranean Marine Science, 15*(2), 462-473. Retreieved from http://dx.doi.org/10.12681/mms.621

Revelles, M., Cardona, L., Aguilar, A., San Félix, M., & M. & Fernández, G. (2007). Habitat use by immature loggerhead sea turtles in the Algerian Basin (western Mediterranean): swimming behaviour, seasonality and dispersal pattern. *Marine Biology: 151*, 1501–1515.

Rodrigues, P., Aubrecht, C., Gil, A., Longcore, T., & Elvidge, C. (2012). Remote sensing to map influence of light pollution on Cory's shearwater in São Miguel Island, Azores Archipelago. *European journal of wildlife research, 58(1), 147-155.*

Sanz-Aguilar, A., Tavecchia, G., Minguez, E., Massa, B., Lo Valvo, F., Ballesteros, G., . . . Oro, D. (2010). Recapture processes and biological inference in monitoring burrow-nesting seabirds. *Journal of Ornithology, 151(1), 133-146.*

Schembri PJ, Borg JA, Deidun A, Knittweis L and Mellado Lopez T, 2007. *Is the endemic Maltese Topshell Gibbula nivosa extinct? Rapp. Comm. int. Mer Medit.,* 38: 592.

Simboura, N., & Zenetos, A. . (2002). Benthic indicators to use in Ecological Quality classification of Mediterranean soft bottom marine ecosystems, including a new Biotic Index. *Mediterranean Marine Science, 3(2)*, 77-111.

Streftaris, N., & Zenetos, A. (2006). Alien Marine Species in the Mediterranean - the 100 'Worst Invasives' and their Impact. *Mediterranean Marine Science*, 87-118.

Sultana, J. B. (2011). *The Breeding Birds of Malta.* . Malta: BirdLife Malta.

Terribile, K., Evans, J., Knittweiss, L., & Schembri, P.J. (2015). *Maximising MEDITS: Using data collected from trawl surveys to characterise the benthic and demersal assemblages of the circalittoral and deeper waters around the Maltese Islands (Central Mediterranean).* Regional Studies in Marine Science 98. Retrieved from http://dx.doi.org/10.1016/j.rsma.2015.07.006

Thibaut, T. (2011). Ecological status of the rocky coast of Malta. Note Naturaliste, Mission PIM.

Tsiamis, K., Palialexis, A., Stefanova, K., Gladan, Z., Skejić, S., Despalatović, M., . . . Cardoso, A. (2019). Non-indigenous species refined national baseline inventories: a synthesis in the context of the European Union's Marine Strategy Framework Directive. *Marine pollution bulletin*, 145: 429-435.

Ulman, A., Ferrario, J., Occhpinti-Ambrogi, A., Arvanitidis, C., Bandi, A., Bertolino, M., . . . Ramos-Esplá, A. (2017). A massive update of non-indigenous species records in Mediterranean marinas. *PeerJ*, 5, e3954.

Vacchi, M., Montefalcone, M., Bianchi, C. N., Morri, C., & Ferrari, M. (2012). Hydrodynamic constraints to the seaward development of Posidonia oceanica meadows. *Estuarine, Coastal and Shelf Science, 97*, 58-65. Retreived from https://doi.org/10.1016/j.ecss.2011.11.024

Villanueva-Rivera, L., Pijanowski, B., Doucette, J., & Pekin, B. (2011). A primer of acoustic analysis for landscape ecologists. *Landscape Ecology, 26(9), 1233–1246.* Retrieved from https://doi.org/10.1007/s10980-011-9636-9

Annex

Classification of seabed habitats in accordance with MSFD Broad Habitat Types, EUNIS habitat codes (Level 2) and the latest classification by UNEP/MAP at EUNIS Levels 3-4.

EUNIS habitat codes (Evans *et al.* 2016)	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 3	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 4	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 5	Habitats Directive habitats	MSFD Broad habitat types as per Commission Decision 2017/848/EU
MA1	**MA1.5** Littoral Rock	**MA1.52** Mediolittoral caves	**MA1.521** Association with encrusting Corallinales or other Rodophyta	8330 - Submerged or partially submerged sea caves	Littoral rock and biogenic reef
		MA1.53 Upper mediolittoral rock	**MA1.531** Association with encrusting Corallinales (e.g. belts of *Lithophyllum byssoides*, *Neogoniolithon* spp.)		
		MA1.54 Lower mediolittoral rock	**MA1.541** Association with encrusting Corallinales (e.g. belts of *Lithophyllum byssoides*, *Neogoniolithon* spp.)		
			MA1.542 Association with Fucales		
			MA1.543 Association with algae (algal belts), except Fucales and Corallinales		
MA2	**MA2.5** Littoral biogenic habitat (plants or animals)	**MA2.51** Lower mediolittoral biogenic habitat	**MA2.511** Association with encrusting Corallinales creating platforms		
			MA2.513 Facies with Vermetidae (*Dendropoma* spp.) (vermetid reefs)		

EUNIS habitat codes (Evans *et al.* 2016)	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 3	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 4	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 5	Habitats Directive habitats	MSFD Broad habitat types as per Commission Decision 2017/848/EU
MA3	**MA3.5** Littoral Coarse sediment				Littoral sediment
MA4	**MA4.5** Littoral Mixed sediment				
MA5	**MA5.5** Littoral Sand				
MA6	**MA6.5** Littoral Sand				
MB1	**MB1.5** Infralittoral Rock	**MB1.51** Algal-dominated infralittoral rock	Associations as for **MA1.54**	1170 - Reefs	
		MB1.56 Semi-dark caves and overhangs		8330 - Submerged or partially submerged seacaves	
MB2	**MB2.5** Infralittoral biogenic habitat (plants or animals)	**MB2.51** Reefs in algal-dominated habitat	**MB2.511** Facies with Vermetidae (*Dendropoma* spp.) (vermetid reefs)		Infralittoral rock and biogenic reef
		MB2.54 *Posidonia oceanica* meadows	**MB2.541** *Posidonia oceanica* meadow on rock	1120 - *Posidonia* beds	
			MB2.542 *Posidonia oceanica* meadow on matte		
			MB2.543 *Posidonia oceanica* meadow on sand, coarse or mixed sediment		
			MB2.544 Dead matte of *Posidonia oceanica*		
			MB2.545 Natural monuments/ Ecomorphoses of *Posidonia oceanica* (fringing reef, barrier reef, atolls)		
			MB2.546 Association of *Posidonia oceanica* with *Cymodocea nodosa* or *Caulerpa* spp.		
			MB2.547 Association of *Cymodocea nodosa* or *Caulerpa* spp. with dead matte of *Posidonia oceanica*		
MB3	**MB3.5** Infralittoral coarse sediment				Infralittoral coarse sediment

EUNIS habitat codes (Evans *et al.* 2016)	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 3	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 4	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 5	Habitats Directive habitats	MSFD Broad habitat types as per Commission Decision 2017/848/EU
MB4	**MB4.5** Infralittoral mixed sediment				Infralittoral mixed sediment
MB5	**MB5.5** Infralittoral sand			1110 - Sandbanks	Infralittoral sand
MB6	**MB6.5** Infralittoral mud				Infralittoral mud
MC1	**MC1.5** Circalittoral rock	**MC1.53** Semi-dark caves and overhangs		8330 - Submerged or partially submerged seacaves	Circalittoral rock and biogenic reef
MC2	**MC2.5** Circalittoral biogenic habitat				
MC3	**MC3.5** Circalittoral coarse sediment	**MC3.52** Coastal detritic bottoms with rhodoliths	**MC3.521** Association with maërl (e.g. *Lithothamnion* spp., *Neogoniolithon* spp., *Lithophyllum* spp.)		Circalittoral coarse sediment
MC4	**MC4.5** Circalittoral mixed sediment				Circalittoral mixed sediment
MC5	**MC5.5** Circalittoral sand				Circalittoral sand
MC6	**MC6.5** Circalittoral mud				Circalittoral mud
MD1	**MD1.5** Offshore circalittoral rock				Offshore circalittoral rock and biogenic reef
MD2	**MD2.5** Offshore circalittoral biogenic reef				
MD3	**MD3.5** Offshore circalittoral coarse sediment				Offshore circalittoral coarse sediment
MD4	**MD4.5** Offshore circalittoral mixed sediment				Offshore circalittoral mixed sediment
MD5	**MD5.5** Offshore circalittoral sand				Offshore circalittoral sand

EUNIS habitat codes (Evans *et al.* 2016)	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 3	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 4	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 5	Habitats Directive habitats	MSFD Broad habitat types as per Commission Decision 2017/848/EU
MD6	**MD6.5** Offshore circalittoral mud				Offshore circalittoral mud
ME1	**ME1.5** Upper bathyal rock	**ME1.51** Upper bathyal rock invertebrate-dominated	**ME1.511** Facies with small sponges (sponge ground; e.g. *Farrea bowerbanki*, *Halicona* spp., *Podospongia loveni*, *Tretodictyum* spp.)		Upper bathyal rock and biogenic reef
			ME1.512 Facies with large and erect sponges (e.g. *Spongia lamella*, *Axinella* spp.)		
			ME1.513 Facies with Antipatharia (black corals forest, *Antipathes* spp., *Leiopathes glaberrima*, *Parantipathes larix*)		
			ME1.514 Facies with Alcyonacea (e.g. *Acanthogorgia* spp., *Callogorgia verticillata*, *Placogorgia* spp., *Swiftia pallida*, *Corallium rubrum*)		
			ME1.515 Facies with Scleractinia (yellow corals forest, e.g. *Dendrophyllia* spp.; white corals forest, e.g. *Madrepora oculata*, *Desmophyllum cristagalli*, *Lophelia pertusa*, *Madracis pharensis*)		
		ME1.52 Caves and ducts in total darkness			

EUNIS habitat codes (Evans *et al.* 2016)	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 3	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 4	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 5	Habitats Directive habitats	MSFD Broad habitat types as per Commission Decision 2017/848/EU
ME2	**ME2.5** Upper bathyal biogenic habitat	**ME2.51** Upper bathyal reefs	**ME2.511** Facies with small sponges (sponge ground; e.g. *Farrea bowerbanki*, *Halicona* spp., *Podospongia loveni*, *Tretodictyum* spp.)		
			ME2.512 Facies with large and erect sponges (e.g. *Spongia lamella*, *Axinella* spp.)		
			ME2.513 Facies with Scleractinia (yellow corals forest, e.g. *Dendrophyllia* spp.; white corals forest, e.g. *Madrepora oculata*, *Desmophyllum cristagalli*, *Lophelia pertusa*, *Madracis pharensis*)		
		ME2.52 Thanatocoenosis of corals, or Brachiopoda, or Bivalvia, or sponges	**Same as ME1.511** Facies with small sponges (sponge ground; e.g. *Farrea bowerbanki*, *Halicona* spp., *Podospongia loveni*, *Tretodictyum* spp.)		
			Same as ME1.514 Facies with Alcyonacea (e.g. *Acanthogorgia* spp., *Callogorgia verticillata*, *Placogorgia* spp., *Swiftia pallida*, *Corallium rubrum*)		
ME3	**ME3.5** Upper bathyal Coarse sediment	**ME3.51** Upper bathyal coarse sediment	**ME3.511** Facies with Alcyonacea (e.g. *Alcyonium* spp., *Chironephthya mediterranea*, Paralcyonium spinulosum, Paramuricea spp., *Villogorgia bebrycoides*)		Upper bathyal sediment
ME4	**ME4.5** Upper bathyal Mixed sediment				

EUNIS habitat codes (Evans *et al.* 2016)	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 3	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 4	UNEP/MAP (2019) classes - Corresponding to EUNIS Level 5	Habitats Directive habitats	MSFD Broad habitat types as per Commission Decision 2017/848/EU
ME5	**ME5.5** Upper bathyal Sand	**ME5.51** Upper bathyal detritic sand	**ME5.511** Facies with small sponges (sponge ground, e.g. Rhizaxinella spp.)		
			ME5.512 Facies with Pennatulacea (e.g. Pennatula spp., Pteroeides griseum)		
			ME5.513 Facies with Crinoidea (e.g. Leptometra spp.)		
			ME5.514 Facies with Echinoidea		
			ME5.516 Facies with Brachiopoda		
			ME5.518 Facies with Scleractinia (e.g. Caryophyllia cyathus)		
ME6	**ME6.5** Upper bathyal Muds	**ME6.51** Upper bathyal muds	**ME6.511** Facies with small sponges (sponge ground, e.g. *Pheronema* spp., *Thenea* spp.)		
			ME6.512 Facies with Pennatulacea (e.g. *Pennatula* spp., *Funiculina quadrangularis*)		
			ME6.513 Facies with Alcyonacea (e.g. *Isidella elongata*)		
			ME6.514 Facies with Scleractinia (yellow corals forest, e.g. *Dendrophyllia* spp.; white corals forest, e.g. *Madrepora oculata*, *Desmophyllum cristagalli*)		
			ME6.516 Facies with Crinoidea (e.g. *Leptometra* spp.)		
			ME6.517 Facies with Echinoidea (e.g. *Brissopsis* spp.)		
			ME6.519 Facies with Brachiopoda		
MF1	**MF1.5** Lower bathyal rock				Lower bathyal rock and biogenic reef
MF2	**MF2.5** Lower bathyal biogenic reef				
MF5	**MF6.5** Lower bathyal Mud				
MG1	**MG1.5** Abyssal Rock				Abyssal
MG6	**MG6.5** Abyssal Mud				

SPA/RAC WORKING AREAS

*SPA/ RAC, the UNEP/ MAP **Specially Protected Areas Regional Activity Centre**, was created in 1985 to assist the Contracting Parties to the Barcelona Convention (21 Mediterranean contries and the European Union) in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).*

POST-2020 SAPBIO

Strategic Action Programme for the **Conservation** of **Biodiversity** and **Sustainable Management** of **Natural Resources** in the **Mediterranean Region**

Marine turtles

Cetaceans

Mediterranean Monk Seal

Cartilaginous fishes
(Chondrichtyans)

Marine and coastal bird species

Listed in Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean

SPAMI

Specially Protected Areas of **Mediterranean Importance**

Specially Protected Areas

Monitoring

Coralligenous and other calcareous bio-concretions

Marine vegetation

Dark Habitats

Habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena

Species introduction and invasive species

POST-2020

SAP BIO

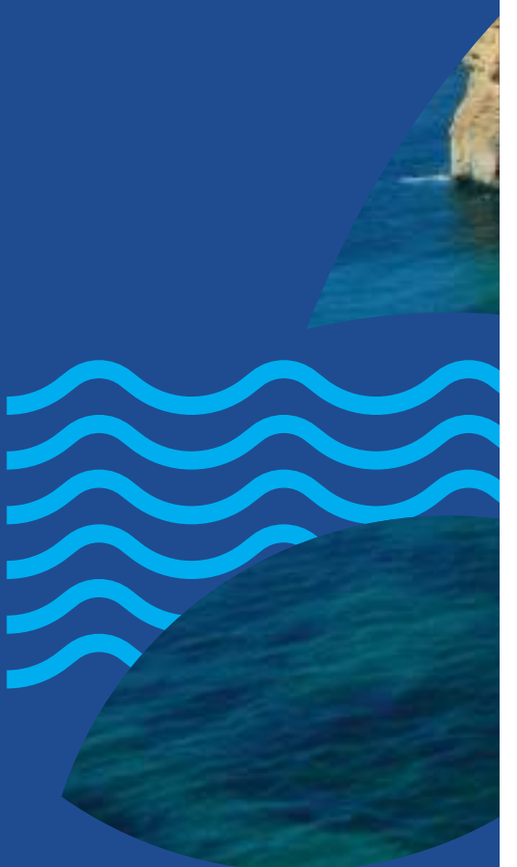
Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC
The Mediterranean Biodiversity Centre

Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafet
B.P. 337 - 1080 - Tunis Cedex - Tunisia
+216 71 206 649 / +216 71 206 485
car-asp@spa-rac.org
www.spa-rac.org



MAVA FONDATION POUR LA NATURE

This publication has been prepared
with the financial support of the MAVA foundation