MISTIC SEAS
MACARONESIA

MACARONESIA ISLANDS STANDARD INDICATORS AND CRITERIA: REACHING COMMON GROUNDS ON MONITORING MARINE BIODIVERSITY IN MACARONESIA

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TECHNICAL REPORT 1

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Table of Contents

EXECUTIVE SUMMARY

The European Union (EU) has the world's largest maritime territory and maritime resources are a significant contribution to the economic prosperity and welfare of each Member State. The Marine Strategy Framework Directive (MSFD), together with other existing legislation aims to protect the European marine environment to ensure it is healthy, productive and safeguarded for the use of future generations.

Common approaches are needed to assess the environmental status of the marine environment in the EU in a consistent and meaningful way. Hence, the authorities of the Azores and Madeira (Regional Governments, representing Portugal, in conjunction with the Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos - DGRM) and Spain (Dirección General de Sostenibilidad de la Costa y del Mar, MAGRAMA), for the Canary Islands, with the scientific support of the Instituto Español de Oceanografia (IEO) and the Fundación Biodiversidad (FB) are joining forces to develop a common set of methodologies to be shared across the Macaronesia marine sub-region.

The first MISTIC SEAS workshop (WK1) was held in Horta, Azores, between 29th and 31st of March 2016, at the Observatório do Mar dos Açores (OMA). The workshop was attended by project partners as well as by technical experts and invited observers.

The MISTIC SEAS structure is as follows:

WP1 - Review of initial assessments, including knowledge gaps, GES definition and environmental targets established for the three Macaronesia Archipelagos initial reports.

WP2 - Common MSFD monitoring strategy to marine mammals, sea turtles and seabirds, applied to D1 throughout Macaronesia.

WP3 - Testing common monitoring methodologies.

WP4 - Towards a common infrastructure on Data management and sharing.

WP5 - Design of an Action Plan.

WP6 - Project dissemination and networking.

WP7 - Project coordination and management.

Workpackage 1 intended to analyse the initial MSFD assessment reports for D1 by aligning the GES definitions, the identified pressures and impacts and the targets defined in the initial assessment (IA) and by permitting the revision of the measures to reach or maintain GES. In addition, WP1 aimed at outlining a comprehensive monitoring programme to be applied across the Macaronesia, for the defined functional groups (marine mammals, seabirds and sea turtles), under D1.

This initial report clarifies the general position of the different indicators and GES definitions and assessment values amongst the three archipelagos. The work developed under WP 1 enabled the development of a common understanding of MSFD concepts and criteria within Macaronesia, which is fundamental to achieve a coherent and consistent approach among archipelagos with respect to the selection of Management Units (MU), indicators and targets for marine mammals, seabirds and sea turtles.

This first workshop allowed the experts from all three sub-regions of European Macaronesia to standardize a common approach and to identify the knowledge gaps. The main highlights for each functional group are included in this technical report and were as follows:

Marine mammals

There is still insufficient data to develop robust indicators for the abundance and demographic parameters for most cetacean species and many of the proposed indicators will not be made operational until further work is carried out to set baseline values (especially for abundance indicators in Azores and Canaries) and targets. Further research is also needed to assess if existing monitoring data will enable detecting trends in the proposed indicators.

The only pressure indicator proposed for marine mammals is mortality from ship strikes, applicable only for the sperm whale MU. Still, the sub-lethal effects of whale-watching and underwater noise in Macaronesia should not be overlooked and there is a need to develop robust indicators to monitor impacts from these activities on a wide range of MUs.

Knowledge gaps should be taken into consideration when proposing the Programme of Measures. In addition to including measures to help or maintaining GES, the programme of measures should also list measures needed to make the proposed indicators operational, such as short-term research and pilot studies.

Seabirds

Whenever possible, the MUs are common to the three archipelagos. However, in some cases different MUs were selected in each archipelago given their limited distribution range. For example, the two *Pterodroma* species selected are endemic and only breed in Madeira. The same happens for Monteiro's storm-petrel *Hydrobates monteiroi* (endemic to the Azores) and Roseate Tern *Sterna dougallii*, two species that only breed in the Azores. In total, 10 different MUs were chosen for the three archipelagos.

The GES indicators, GES definition, targets and baseline values were identified following MSFD criteria and adapted to the Macaronesian seabird community features. Some species will not be used as indicators for all the criteria, that is the case with Cory's shearwater that cannot be used for *criterion 1.1 distribution* due to logistical and knowledge constrains (most colonies are not discrete).

Two main land human related threats to seabirds were identified, namely presence and effects of introduced predators and light pollution. Introduced predators are a significant threat in the Azores and Canary Islands archipelagos. In Madeira, the bulk of the seabird community breeds in introduced predators' free sites (Desertas and Selvagens Islands), nevertheless the endemic Zino's Petrel (*Pterodroma madeira)* is affected by this threat. Light pollution has a strong effect on Cory's shearwater populations given the fact that it causes high numbers of fledglings' fallout, ultimately affecting the Macaronesian populations.

The areas and knowledge gaps that need to be tackled were identified. Suggestions for colonies to be assessed for the different archipelagos and indicators were compiled, baseline values identified for all indicators or, in their absence, gaps recognised, providing a solid framework to build upon for the next development phase.

Sea turtles

Based on sighting frequency, only the loggerhead sea turtle (*Caretta caretta*) was proposed as MUs for Azores and Madeira, while the Canaries also considered the inclusion of the green sea turtle (*Chelonia mydas*).

Macaronesian waters hold mixed feeding aggregations from different geographic nesting origins, and their composition varies between archipelagos. The spatial and temporal dynamics are still not well understood. On the other hand, each archipelago varies in the amount, type and quality of collected data and implemented programmes. Thus there are still significant knowledge gaps.

Many of the proposed indicators during WK1 will not be made operational until further work is carried out to set baseline and values. Furthermore, there are three metrics (genetic variability, sex ratio and turtles affected by entanglement) that need further research to determine their applicability. Two state indicators are proposed for sea turtles: population abundance and body condition index (BCI) and three state and pressure indicators are recommended: mortality rate due to by-catch (Macaronesia), entanglement prevalence (Macaronesia) and interaction with recreational activity (Canary Islands).

Knowledge gaps identified in this report should be taken into consideration when proposing the Monitoring Programmes and the Programme of Measures. In addition to including measures to help achieving or maintaining GES, the programme of measures should also list measures needed to make the proposed indicators operational.

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1. BACKGROUND

The European Union (EU) has the world's largest maritime territory and maritime resources are a significant contribution to the economic prosperity and welfare of Member States. Many of the threats to the European marine resources require cooperation and collective action to be tackled effectively. It is within this context that the European integrated maritime policy aims to provide a coherent framework for joint governance of the marine environment.

The European Union, with the Marine Strategy Framework Directive (MSFD, 2008/56/EC of the European Parliament and of the Council), endeavours to protect and clean the seas and oceans as part of an integrated strategy that will allow its sustainable use. This Directive aims to achieve or maintain GES by 2020, protecting the resources on which marine-related economic and social activities depend. Coordination is a key step in creating and strengthening synergies, but also to increase efficiency in the implementation of the MSFD. More specifically, in accordance with Article 5 of the Directive "*Member States sharing a marine region or sub region shall cooperate to ensure that, within each marine region or sub-region, the measures required to achieve the objectives of this Directive (…), are coherent and coordinated across the marine region or sub-region concerned*".

As the first stage of implementation of the MSFD ended in 2013, most Member States (MS) provided information on the of their waters and defined what GES was for their waters using the eleven qualitative descriptors set out in the Directive, and proposed a series of environmental targets and indicators to help measure progress towards the achievement of GES, giving a wide overview of the marine environment in Europe. Nevertheless, the quality of reporting varied greatly between countries and the same goes for the descriptors, within each Member State.

Also, all regional sea conventions (RSC) took important commitments to support the implementation of the MSFD by providing the coherence and coordination needed at regional level. Unfortunately, the use made by the MS of the results or regional cooperation within their respective marine strategies was variable. Sometimes the relevant work in the context of the RSC came too late but when it came in time was not always used in the national reports. This generated a lack of coherence in the EU as well as within the same marine region or sub-region. Therefore, in the EU there isn't a common interpretation of GES, not even at a sub-regional level.

Common approaches are needed to assess the environmental status of the marine environment in the EU in a consistent and meaningful way. Hence, the authorities of the Azores and Madeira (Regional Governments, representing Portugal, in conjunction with the Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos - DGRM) and Spain (Dirección General de Sostenibilidad de la Costa y del Mar, MAGRAMA), for the Canary Islands, with the scientific support of the Instituto Español de Oceanografia (IEO) and the technical support of the Fundación Biodiversidad (FB, are joining forces to develop a common set of methodologies to be shared across the Macaronesia marine sub-region. The two Member States (Portugal and Spain) seek to ensure consistency and to allow comparison of GES within the shared marine Macaronesia region, as recommended by the MSFD, and proceed to the design and implementation of an action plan to help obtain the GES in this bio-geographical region.

The result of this initiative is the project "MISTIC SEAS -Macaronesia Islands Standard Indicators and Criteria: Reaching Common Grounds on Monitoring Marine Biodiversity in Macaronesia" financed under the DG ENV/MSFD Action Plans/2014 call "*Best practices for action plans to* *develop integrated, regional monitoring programmes, coordinated programmes of measures and addressing data and knowledge gaps in coastal and marine waters*".

The main objective of this project is to establish a common road-map for improving an ensuring the coordination for the Marine Strategy Framework Directive (MSFD, 2008/56/EC) implementation by the two Member States (Spain and Portugal, through the Governments of Spain, for Canaries, and the Governments of the Azores and Madeira) in the Macaronesia Northeast Atlantic sub-region. The project benefits from the scientific advice of the Instituto Español de Oceanografia and the technical support Fundación Biodiversidad. This will be achieved by the following operational objectives:

- The detailed analysis of the coherence in the initial phases (Articles 8, 9 and 10 implementation);
- The analysis to address the knowledge gaps identified;
- The proposal and testing of coordinated monitoring programmes for a coherent and consistent assessment of the environmental status of marine waters within a biogeographic region or a sub-region derive from the legally-binding Article 11 of the MSFD;
- The design and establishment of a data infrastructure;
- The dissemination and awareness of the values of the sub-region, and how the MSFD in contributing to its protection;
- The networking and capacity building for experts and policy-makers in the sub-region, including possible dissemination to third countries.

From the project proposal

The MISTIC SEAS project is divided into seven work packages as follows:

- **WP1 -** Review of IAs, including knowledge gaps, GES definition and ETs established for the three Macaronesia Archipelagos initial reports.
- **WP2 -** Common MSFD monitoring strategy to marine mammals, sea turtles and seabirds, applied to D1 throughout Macaronesia.
- **WP3 -** Testing common monitoring methodologies.
- **WP4 -** Towards a common infrastructure on Data management and sharing.
- **WP5 –** Action Plan.
- **WP6 -** Dissemination and Networking.
- **WP7 -** Coordination and management.

The Profile of the project applicants is as follows (Table 1).

Table 1 – Project profile.

Member State	Region	Category	Entity
Portugal	Azores	Public authority	Fundo Regional para a Ciência e Tecnologia (FRCT), Secretaria Regional do Mar, Ciência e Tecnologia, Governo Regional dos Açores
		Public authority	Direção Regional dos Assuntos do Mar, Secretaria Regional do Mar Ciência e Tecnologia, Governo Regional dos Açores (Regional Directorate for the Maritime Affairs)
	Madeira	Public authority	Secretaria Regional do Ambiente e dos Recursos Naturais, Governo Regional da Madeira - [Direção Regional do Ordenamento do Território e Ambiente (DROTA) / Instituto das Florestas e Conservação da Natureza, IP-RAM]
	Portugal - State	Public authority	Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos
Spain	Spain – State/ Canary Islands	Public authority	Fundación Biodiversidad del Ministerio de Agricultura, Alimentación y Medio Ambiente
		Public research institute	Instituto Español de Oceanografía
		Public authority	Dirección General de Sostenibilidad de la Costa y del Mar. Ministerio de Agricultura, Alimentación y Medio Ambiente

The first MISTIC SEAS workshop (WK1) was held in Horta, Azores, between 29th and 31st of March 2016, at the Observatório do Mar dos Açores (OMA). During this workshop, the partners and experts were present. The Steering Committee had the opportunity to meet and three groups of experts (one for each functional group: marine mammals, seabirds and sea turtles) were established and discussions followed these aspects:

- Review ICES WGMME and OSPAR recommendations concerning environmental objectives, indicators and methods to set baseline values and targets for marine mammals, seabirds and marine turtles and discuss their appropriateness for Macaronesia sub-region;
- Define a common approach for selecting species and management units (Sps-MU);
- Review and harmonize methodologies and the data used to establish baselines for indicators in each archipelago;
- Review and harmonize targets for common indicators and MUs;
- Assess monitoring requirements and feasibility of alternative monitoring methodologies.

The results of the WK1 for each functional group are presented on Appendix.

2. THE MSFD PROCESS

The Marine Directive was adopted on 17th of June 2008 and came into force on 15th of June 2008, and transposed into national legislation by 15th of July 2010 in Portugal. In Spain was later on in December 2010, after several years of preparation and extensive consultation of all the relevant actors and the public. By 2010, the Commission also produced a set of detailed criteria and indicators to help Member States (MS) implement the Directive (Table 2).

The Directive is the first EU legislative instrument that specifically refers to the protection of marine biodiversity, as it contains the explicit regulatory objective that biodiversity will be maintained by 2020, and aims to achieve GES of the EU's marine waters. Moreover, it aims to ensure a sustainable exploitation of the resources upon which marine related economic and social activities depend. The Directive incorporates the Ecosystem Approach and the Precautionary Principle into the management of marine waters (Santos and Pierce 2015) to regulate the human activities that have an impact on the marine environment, integrating the concepts of environmental protection and sustainable use.

In order to meet its purpose, the Directive stipulates European marine regions and sub-regions based on geographical and environmental criteria. The Directive lists four European marine regions - the Baltic Sea, the Northeast Atlantic, the Mediterranean Sea and the Black Sea - located within the geographic boundaries of existing regional marine conventions. Cooperation between the MS of a marine region and with neighbouring countries sharing the same marine waters is crucial (as required by Article 5, paragraph 2 of 2008/56/EC, European Commission 2008).

To achieve the goals by 2020, each Member State should develop a Marine Strategy for its waters. In table 2, it's possible to identify what is included in a Marine Strategy.

Table 2 – Steps that are taken in a Marine Strategy.

Stages of implementation of MSFD	Delivery dates
The initial evaluation of the current environmental status of national marine waters and environmental impact and socio-economic analysis of human activities in these waters	15th of July 2012
The meaning of GES for national marine waters	15th of July 2012
The establishment of ETs and associated indicators to achieve GES by 2020	15th of July 2012
The establishment of a monitoring programme for ongoing assessment and regular updating of targets	15th of July 2014
The development of a programme of measures to achieve or maintain GES by 2020	2015
The review and preparation of the second cycle	2018 - 2021

In short and as stated above, MSFD provides for a regional approach to implementation, and establishes European Marine Regions on the basis of geographical and environmental criteria. In these regions, MS should adopt common approaches:

- Work with a common and ambitious schedule to meet GES by 2020;
- To develop marine strategies in cooperation with neighbouring countries and, where practical and appropriate, use existing regional cooperation structures, including in the framework of regional seas conventions;
- The adoption of an adaptive management approach so that strategies are kept up-to-date and reviewed every six years.

The MSFD is complementary and provides the general framework for a number of other key directives and legislation at the European level or international conventions. Examples include EC Habitats Directive, the EC Birds Directive and the EU Water Framework Directive. It will also help to meet the international commitments made at the World Summit on Sustainable Development and under the Convention on Biological Diversity and the OSPAR Convention.

3. THE MSFD APPLICATION IN MACARONESIA

3.1. MSFD process across the archipelagos of Macaronesia

3.1.1 - Azores

The Regional Government of the Azores possesses the authority to implement the environment and marine policies, under the European Integrated Marine Policy, which includes the implementation of MSFD. The elaboration of the two documents was coordinated by DRAM (Regional Directorate for Sea Affairs) which is the entity responsible for the management of the MSFD in Azores, under the Regional Secretariat for the Sea, Science and Technology. Other partners who also collaborate with DRAM in the development of the MSFD implementation in the Azores are:

- Direção Regional das Pescas (DRP – Regional Directorate of Fisheries);
- Regional Inspection of Fisheries (IRP – Regional Inspection of Fisheries);
- Serviço Regional de Estatísticas dos Açores (SREA – Azorean Statistical Board);
- Departamento de Oceanografia e Pescas (DOP - Department of Oceanography and Fisheries – University of the Azores);
- Secretaria Regional do Turismo e Transportes (SRTT - Regional Secretariat of Tourism and Transports);
- Direção Regional do Desporto (Regional Directorate of Sport),
- Portos dos Açores, S.A.;
- Lotaçor, S.A.;
- NGOs.

The marine strategy in the Azores was developed in accordance with an action plan consisting of:

- A preparatory phase - preparation of an initial MSFD report: http://www.azores.gov.pt/Gra/SRMCT-MAR/conteudos/livres/Estrategia_Marinha_para_a_subdivisao_dos_Acores.htm;
- A second phase - definition of the monitoring and measure programmes http://www.azores.gov.pt/Gra/SRMCT-MAR/conteudos/livres/Estrategias_marinhas_para_as_aguas_marinhas_portuguesas.htm.

In 2014, DRAM developed the elements to answer to the preparation phase, creating the initial report for the Azores sub-division specifying:

1. Environmental state of the marine waters;

2. Analysis of the main pressures and impacts;
3. Analysis of the socio-economic features;
4. Evaluation of the environmental status (descriptors).

After defining impacts and the main characteristics of the area, the evaluation of GES for the Azorean archipelago was described. The Figure 1 represents the steps for the evaluation of GES for each descriptor.

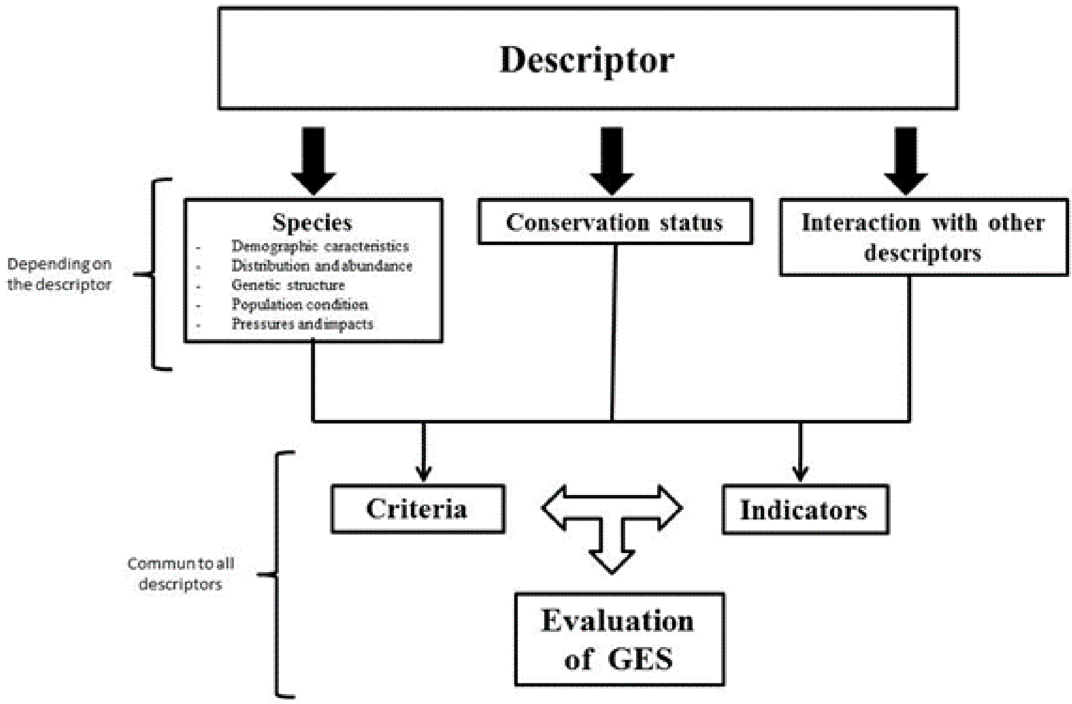

Figure 1 – Protocol followed to define the evaluation of GES in the Azores.

According to the data acquired from the above scheme, the GES was evaluated for each descriptor, as shown in Table 3. This table listed criteria, indicators, characterization of the current status and the evaluation of the environmental state for each descriptor (see the MSFD document for Azores sub-division). Also, the ETs to achieve GES were defined for each descriptor as shown in the table below.

Table 3 – Environmental state evaluation: goals and targets.

Descriptor	ES evaluation	Objectives	Target number	Targets	Affected descriptors	Indicators
D1	Good Environmental state	Maintenance of GES	1	Get information and representative indicator coastal species of the environmental status of the ecosystem (algae and / or coastal fish).	D6	1,1; 1,2; 1,3
			2	Increase the number of couple players and the area occupied by them in relevant protected areas for nesting seabirds, by installing artificial nests and habitat restoration (invasive species) and predator control.		1,1; 1,2; 1,3
			3	Increase knowledge on population dynamics and demographic characteristics of pelagic migratory species such as sea turtles, cetaceans, and nesting seabirds.	-	1,1; 1,2; 1,3
D2	Good Environmental state	Maintenance of GES	4	Prevent the introduction of marine species to mitigate possible marine bio-invasions through the monitoring of the main vectors of introduction.	-	-
			5	Monitor the population dynamics of *Caulerpa webbiana* and other invasive marine species occupying restricted areas in the region.	-	-
D3	Good Environmental state	Maintenance of GES	6	Ensure the sustainability of fishing activities in the region through effective fisheries management measures, framed in the Common Fisheries Policy, based on information obtained by systematic programme monitoring and fisheries resources.	D1; D4	3,1
D4	Good Environmental state	Maintenance of GES	-	-	-	-
D5	Good Environmental state	Maintenance of GES	-	Ensure that the transitional waters in the region remain in good environmental condition.	D1; D6	5.1; 5.2; 5.3

D6	Good Environmental state	Maintenance of GES	8	Mapping the distribution of identified coastal marine habitats and biotopes, the areas occupied by them and their environmental condition, especially those classified and protected under OSPAR and Habitats Directive from Natura 2000 network, and that by their biological and ecological characteristics are considered structuring the benthic and / or vulnerable to human activities communities.	D1	-
			9	Map the distribution of oceanic marine habitats, benthonic, including biogenic, using spatial modelling.	-	-
			10	Ensure that the exploitation of coastal inert does not affect the known communities of MAERL.	-	-
			11	Promote the use of less impacting fishing gear on ocean ecosystems, without affecting the profitability of the fisheries.	D1; D6	-
D7	No evaluation	Fill lack of information	12	Map the artificial coastal areas and collect systematically information on the type of artificial structures distributed over the Azores islands.	D6	-
			13	Create a computer system for compiling information on coastal works of the Azores.	-	-
D8	Good Environmental state/Not evaluated	Fill lack of information	14	Systematically monitor levels of contaminants in species of commercial interest and other indicators considered good environmental status of ecosystems.	-	-
D9	Good Environmental state	Maintenance of GES			-	-
D10	Not evaluated	Fill lack of information	15	Design and implement programmes to collect scientific information and monitoring to address the descriptor.	-	-
			16	Decrease the amount of plastics with terrestrial origin entering the marine systems in the region.	D1; D4; D6	10.1; 10.2; 10.3
D11	Not evaluated	Fill lack of information	17	Design and implement programmes to collect scientific information and monitoring for addressing the descriptor.	-	-
			18	Install infrastructures that allow the monitoring of noise and species susceptible to this pressure such as cetaceans.	D1; D4	-

The second part of the preparation of marine strategies regards the establishment of the Monitoring Programmes (PMO) for continuous assessment of the environmental status of marine waters and periodic updating of targets. The monitoring programmes (Table 4) aim for the systematic monitoring of the environmental status of marine waters, with reference to the ETs set in the initial report, considering relevant biotic and abiotic factors, as well as the most relevant pressures and impacts. The following table presents the monitoring programmes created to answer to the second phase of MSFD for the Azorean sub-division.

Table 4 – Monitoring programmes for the Azores subdivision.

Monitoring Programmes	Coordination	Beginning	End	Target descriptor
CEIC - Contaminantes químicos em espécies de interesse comercial da área marítima portuguesa	IPMA, RAM, RAA	2015	2019	D9
PNAB/DCF - Programa de amostragem biológica	IPMA, RAM, RAA	2015	2020	D3
MONIEXOTICAS/NISPOR - Monitorização da abundância e do impacte de espécies não indígenas na costa portuguesa	IPMA; RAM; RAA	2015	2019	D2 (D1, D4, D6)
DELIXOMAR - Propriedades e distribuição espacial do lixo marinho e impactes na vida marinha	IPMA; RAM; RAA	2015	2020	D10
MONIAVES - Programa de monitorização de populações de aves marinhas na subdivisão dos Açores	RAA	2016	2020	D1
MONIZEC (AMP) - Programa de monitorização da condição ambiental de áreas marinhas protegidas	RAA	2015	2020	D10
MONICET - Programa de monitorização da condição das populações de cetáceos na subdivisão dos Açores	RAA	2016	2020	D10
ARQUEDAÇO - Programa de cruzeiros de investigação dedicados a espécies demersais dos Açores	RAA	2015	2020	D3
POPA - Programa de Observadores para as Pescas dos Açores	RAA	2015	2017	D3
MONIAMT - Monitorização das atividades marítimo-turísticas em zonas costeiras e oceânicas dos Açores	**RAA**	**2015**	**2019**	**D1; D3**
Pesca Lúdica nos Açores - Monitorização de pesca lúdica costeira e embarcada	**RAA**	**2016**	**2020**	**D1; D3**
MONINERTES - Monitorização de dragagens de inertes no Açores	**RAA**	**2015**	**2020**	**D6**

The contribution of the Programme of Measures (Table 5) for the achievement of GES in the marine waters depends significantly on the evolution of monitoring projects in development, and their capacity to assess and detect changes in the indicators selected to measure progress towards achieving GES of the various descriptors. Therefore, the decision to join the timing of both monitoring and measure programmes was taken together by the three National sub-divisions (Portugal - mainland, Azores and Madeira). The following table presents the programmes of measures created to answer to the second phase of MSFD for the Azorean sub-division.

Table 5 – Measures to achieve GES for the Azores subdivision.

Measures	Coordination	Beginning	End
DesignAMP - Designate Marine Protected Areas in the maritime space Portuguese	DGRM, RAM, RAA	2015	2016
GestPlat - Develop sustainable management plans for natural resources on the extended continental shelf	DGRM; RAM; RAA	2016	2017
LiMar - Determine bio-indicators for marine litter	DGRM, RAM, RAA	2015	2016
CAASPER - Characterize the acoustic Portuguese submarine environment and noise effects	DGRM, RAM, RAA	2015	2016
Study of the condition of fish stocks, coastal algae and marine invertebrates and evaluation of environmental condition of priority habitats	RAA	2015	2019
Replacement / conservation of breeding habitats for seabirds	RAA	2016	2019
Assess the distribution and relative abundance, migration patterns, and other demographic parameters of marine mammals in sub-areas of the marine territory of the Azores	RAA	2016	2019
Identify the main introduction vectors for alien species and the environmental conditions that may facilitate the emergence of non-indigenous species	RAA	2015	2017
Evaluate the population demersal fishes subject to the application of quota exploration and develop management plans for Sea Bream	RAA	2015	2019
Mapping of coastal marine habitats and biotopes (OSPAR and the Habitats Directive) on marine protected areas	RAA	2015	2019
Implement and operationalize GIS in the Azores	RAA	2015	2019
To study the impacts of the use of fishing gear on the seabed	RAA	2016	2018
Collect systematic information on the coastline of the archipelago and artificialized coast through mapping	RAA	2015	2018
Select bio-indicators of contamination, establish frequency and sampling parameters	RAA	2015	2017
Implement a waste management programme on board fishing vessels	RAA	2015	2019
Development of management plans for marine protected areas from the island Natural Parks	RAA	2015	2016

In August 2015, a technical report was produced to evaluate the criteria used to define GES in the Azorean waters for all the descriptors. This evaluation focused on the environmental targets (Table 6) to maintain and achieve the GES. In Table 6 it is possible to see the results from the evaluation of the descriptors in relation to the goals and criteria defined in phase 1.

During the process of implementation of the MSFD, a number of information gaps were perceived, which hindered the definition of GES for a number of descriptors. The GES has not been formally defined for the descriptors 1, 2, 3, 4, 6, 7, 9, 10 and 11, and it was not evaluated the status of several groups due to lack of information and well as the lack of baselines, although a set of criteria was applied in each case and the environmental state was defined. With respect to the initial assessment, in included all 11 descriptors, but no evaluation of the state of the marine environment in relation to descriptors 11 and 4 were carried out due to lack of information and the difficulty of the criteria to be applied. Finally, specific ETs were not set initially for D4 and D5.

Table 6 – Summary of the environmental targets defined to maintain or achieve GES.

Descriptor	GES criteria	Initial assessment		Targets Criteria
		Assessment	Criteria	
D1	--	Adequate	Pressures: Cover most types of physical loss and physical damage; comprehensive qualitative and quantitative information; good description of individual pressures and habitats impacted; judgement per reference to GES only in relation to criterion 6.2 of the 2010 Commission Decision. Features: Cover major habitat types and functional groups; mainly qualitative information but several parameters are quantified; judgement on current status per reference to GES; list of the individual species requiring special protection under the Habitats and Birds Directives and relevant international agreements.	Most targets are not targets to help reach GES but rather measures to gather better data; the remaining targets are generic and not measurable.
D2	--	Adequate	Inventory of NIS provided; data on abundance, temporal occurrence, spatial distribution and the ratios between indigenous and non-indigenous species when available; judgement on the level of the pressure but not based on adequate parameters; gaps in knowledge extensively described but detailed plans to fill data and knowledge gaps missing.	targets are generic and not specific and are neither pressure, nor impact-orientated
D3	--	Partially adequate	Comprehensive assessment of fish stocks including those from all functional groups; no assessment of fishing fleets; little assessment of fishing fleets; little assessment of fishery impacts	Target is generic and not measurable; target related to programme of measures and monitoring and will not help achieve GES
D4	--	--	--	--

D5	GES is defined at descriptor level and is very close to the MSFD definition; covers some direct and indirect effects but does not refer to causes of eutrophication and related pressures; lack of assessment values or reference conditions; no clear link to the WFD	Partially adequate	Covers all the relevant nutrients and organic matter, but there is no breakdown into individual sources; qualitative and quantitative information; limited assessment of impacts; based on the OSPAR Common Procedure; judgement on current status per reference to GES.	
D6	--	--	--	Most targets are not targets to help reach GES rather measures to gather better data; the remaining targets are generic and not measurable
D7	--	Partially adequate	Partial assessment, mainly qualitative; covers main pressures but is more limited on impacts; consistence with the OSPAR QSR 2010; not enough information is provided to support the judgement that GES is achieved	Not a pressure-reduction target but monitoring target; relates to data gaps identified in the initial assessment
D8	GES defined ate descriptor level; no aggregation rule or reference to impacts; lacks clarity	Partially adequate	Description of relevant sources of contamination; quantitative assessment of concentrations of a number of substances in the environment against relevant standards (at least EQS), no assessment of impacts; judgement made in relation to GES, following same aggregation rule as included in GES definition.	Not a pressure-reduction target but monitoring target
D9	--	Partially adequate	Detailed and quantitative description of the measurements made to assess level of contamination of fish and seafood; judgement made in relation to GES but unclear whether judgement is made against Regulation 1881/2006 or other standards.	Not a pressure-reduction target but monitoring target; relates to data gaps identified in the initial assessment.
D10	--	Adequate	Assessment of current levels of litter on the beach, on the seabed and micro particles; quantitative trends provided; limited data on impacts on ecosystem components in line with state of knowledge; reference to regional and EU guidance.	One target is a monitoring target; the other target is a pressure-reduction target but is not measurable.
D11	**--**	**--**	**--**	**Not a pressure-reduction target but monitoring target; relates to data gaps identified in the initial assessment.**

3.1.2 - Madeira

Madeira has already developed the "Action Plan for the Marine Strategy and currently complies with all the obligations under the MSFD. The provisions of Articles 8 "Evaluation", 9 "Definition of good environmental status" and 10 "Establishment of ETs" (report submitted to the Commission in June 2014) were fulfilled, and a second document has been complied with the provisions of Article 11 "Monitoring Programme (PMo)" and Article 13 "Programme of measures (PMs) (report submitted to the Commission in November 2014)". The latter document was delivered prior to the deadline set by the MSFD and included three subdivisions: "Continent", "Azores" and "extended continental shelf". It was the first European division to do so. The "reports" are of Member State responsibility, with the information deposited in the European Commission, more specifically the European Environment Information and Observation Network (EIONET) http://www.eionet.europa.eu/ and the General Directorate of Natural resources, Maritime Security and Services (DGRM) http://www.dgrm.mam.gov.pt/.

3.1.3 - Canary Islands

The development of the Spanish marine strategy in the Canary Islands has followed the structured and deadlines established by the MSFD:

Phase 1: Initial assessment of the marine environment (2012) - this work included three types of analysis:

Analysis of essential features and characteristics and the current environmental status of the marine waters.

Analysis of the predominant pressures and impacts which affect the environmental status.

Economic and social analysis of the use of marine waters and the cost of the degradation of the marine environment.

Phase 2: Determination of GES (2012) - following the initial assessment, and for each one of the eleven qualitative descriptors, the GES was determined. The definition of GES proposed by Spain was of a quantitative nature, whenever robust scientific information was available, with quantitative assessment values between GES/non-GES. In those cases where a quantitative definition was not possible, a qualitative definition was established of what the desired status would be with regard to certain descriptors or criteria.

Phase 3: Establishment of ETs and associated indicators (2012): a series of 51 ETs and associated indicators were established for the Canary Islands subdivision in order to guide the process towards the achievement of GES in the previously-defined marine environment. These ETs were approved by Resolution of the Council of Ministers of 2nd of November 2012[1].

Phase 4: Preparation of the monitoring programmes (2014) - a series of 13 monitoring programmes was established, broken down into 58 sub-programmes. They cover monitoring sub programmes of state, pressures, human activities, and operational objectives.

[1] Acuerdo de Consejo de Ministros el 2 de noviembre de 2012. - http://www.boe.es/buscar/doc.php?id=BOE-A-2012-14545

Phase 5: Preparation of the programmes of measures (2015): The programmes of measures were defined by the end of 2015, and their implementation was due in 2016. They are considered as the executive part of the marine strategies, detailing the measures which Spain is going to implement from 2016 over, to achieve or maintain the GES of the marine environment. The design of the programmes of measures was undertaken in such a way that there is a close link with the previous phases of the strategies. Several workshops of experts took place during 2015, in an open participation process. A detailed discussion was made with the relevant competent authorities, including the Regional Government of Canary Islands. Regional coordination on PoMs definition for Macaronesia was facilitated by a bilateral-trilateral meeting with Portugal and France that took place in Madrid, in September 2015.

The public consultation of the draft PoMs has just finished, and Spain is ending the final proposal of the Programmes of Measures. A Strategic Environmental Assessment of the Marine Strategies (including their PoMs) has been made back to back with the public consultation of PoMs, and an official transboundary consultation has been made to Portugal regarding that assessment.

It is mandatory by the Spanish Law of Protection of the Sea (Ley 41/2010, de 29 de diciembre, de protección del medio marino), that the Marine Strategies, including their PoMs, will be approved by a Royal Decree.

3.2. The specificity of Macaronesia and the main pressures and impacts to the marine environmental status

Coastal and marine ecosystems are subject to a number of human-induced pressures and impacts, usually, associated with a variety of anthropogenic activities. As mandated by the MSFD, all MS should assess environmental status of their territorial waters, and develop strategies to achieve GES by 2020. During the preparation phase of the MSFD (end July 2014), all the MS completed an initial assessment of their marine waters, taking account of existing data available and comprising an analysis of the predominant pressures and impacts, including human activities, on the environmental status of those waters. In 2014, Azores developed the elements to answer to the preparation phase, creating the first MSFD report for the Azores sub-division and it was specified an analysis of the main pressures and impacts.

3.2.1 - Azores

The Azores archipelago is composed of nine islands and many islets. This is the northern most archipelago of Macaronesia. The pressures and impacts considered in the marine environment of the Azores (Table 7) include the direct physical damages and loss on the coastal zone, sound pollution resulting from anthropogenic activities, accumulation of solid waste (marine litter), anthropogenic changes in ocean circulation (hydrography and hydrology), contamination by hazardous substances, nutrient enrichment, and the introduction of pathogens and non-indigenous species, as well as selective extraction of species.

For all the pressures and impacts analysed, all the relevant information available was used: public and limited-use databases and scientific documentation, namely: published articles, minutes of conferences, meetings and workshops, specialized technical reports and academic dissertations (bachelor, master and PhD).

Table 7 – Impacts and pressures identified in the Azores.

Impacts and pressures	**ITEMS DESCRIBED**
Physical damages and loss	Seabed profile modification and/or silting Fishing damage to seabed Other physical damages
Subaquatic sound and noise	Sound Influence on marine life Marine noise description in the Azores
Changes in hydrography and hydrology	Origin, accumulation and degradation of marine litter Trends in waste deposition on the coast and marine seabed Marine litter in the Azores (Coastal and marine zones)
Changes in sea circulation patterns (hydrography and hydrology)	Direct influences (physical barriers) indirect influences (temperature and salinity changes)
Contamination by hazardous substances	Main types of hazardous substances Hazardous substances in the Azores
Nutrients enrichment	Coastal waters Transitional waters Characterization procedure Nutrient concentrations
Pathogens microorganisms	Residual waters Microorganisms in bathing water Red tides Ballast waters and aquaculture
Non-indigenous species	Introduction vectors in the Azores Azorean non-indigenous marine species Other cases
Selective extraction of species	History and development of species extraction in the Azores Current exploitation of marine fish Tourist and non-commercial fishing Types of gear and fishing methods Fishery pressures Interrelation with socio-economic factors

3.2.2 - Madeira

The Archipelago of Madeira, of volcanic nature, comprises the islands of Madeira itself and the islands of Selvagens. Therefore, the northern group includes the islands of Madeira, Porto Santo and Desertas, and the southern group includes the islands of Selvagem Pequena and Selvagem Grande located closer to the African continent and to the Archipelago of Canaries. The

Archipelago is situated between the Abyssal Plain of Madeira to the West and the African Continent to the East. The northern group is part of a large submarine ridge, the Madeira – Tore Ridge, which extends for more than 1,000 km in a NNE – SSW direction, located approximately 300 km from the Portuguese mainland coast. The morphology of the oceanic depths indicates some continuity between Madeira and Desertas, whereas the island of Porto Santo, 45 km to the northeast, is separated from the first two by depths exceeding 2,000 m. The islands of Selvagens are separated from the northern group of the archipelago of Madeira by depths higher than 4,000 m.

Several main pressures and impacts in the marine environment were identified in the initial assessment report. The main causes of physical damage and loss, in particular those related to physical damage of the seabed were dredging and deposition of dredged, commercial extraction of sand, marinas and ports, artificial reefs, pools and beach complex, maritime landfills, natural discharge of solids from natural streams. These port facilities showed seal the substrate and promotes the change of hydrography, with an accumulation or elimination of sediment. However, the impacts of such activities or infrastructures appear not to be alarming in the overall assessment.

Marine litter in Madeira archipelago has being assessed in term of its origin (activities that may cause potential inputs of marine litter), location and type (categorization). However, there is the need for more data to characterize the impact on marine life (species and ecosystems), but also to evaluate their evolution over time. Although the levels of litter in the seas of Madeira were considered not too high, there are several records of marine mammals and turtles, and other marine species being severely affected.

Marine noise in Madeira archipelago needs further data and deeper evaluation. However, there were identified three main sources of noise: 1) acoustic sensors, sonar, acoustic modems, the pingers and all other acoustic equipment of data transmission or positioning, research equipment or prospection; 2) Dredging; 3) Transport ships, fishing and other underwater or surface vehicles. One area in particular has gathered some consensus among experts, and it has particular relevance for subdivision of Madeira is the impact of sonar on marine mammals use. Even though, recent historical records show that stranding of whales is a rare event in the archipelago of Madeira.

Interference with hydrological processes. Taking into account the location of activities with some impact, the analysis was restricted to southern coastal areas of Madeira and Porto Santo islands. Generically, in Madeira archipelago, the size of built structures is small, with few exceptions. Therefore, considering the extent of the area under analysis the interference of the overall structures has been considered negligible and, therefore, not to compromise GES, based on available information. However, if Porto Santo is considered by itself, and despite the small concentration of permanent structures, these latter were considered to have a possible medium/high level impact in hydrodynamics. And therefore, due to the configuration of one of the identified structures, and possible implications for sediment dynamics, a long-term monitoring program was recommended. Despite of this, data showed not to occur any significant change in relation to traffic of sediments or no altered habitats are known to exist.

Regarding contaminants in fish and other seafood for human consumption, available data appears to indicate in the overall a GES, though information on some contaminants was scarce and temporally discontinued in contrast with other contaminants were information was obtained over several years through its monitoring in the main species caught in Madeira archipelago.

Non-indigenous species were recorded in Madeira subdivision and their number reaches 39 taxa. Of these, only a few have shown to have impact or negative effects on native fauna and flora or on the ecosystems. About 44% of the taxa are considered installed in the marine environment. The presence of alien taxa has been increasing in numbers as well as in area of distribution in the last two decades. However, at the present time, there is no evidence of negative changes attributable to non-native species, both in terms of native species, communities, habitats or ecosystems. Non-indigenous species introduced by human activities are at levels that do not affect the ecosystems adversely.

Regarding selective extraction of species or fisheries, in the Madeira subdivision the majority of information relates with fish landing made by the fishing fleet based in Madeira. Such populations of commercially exploited fish and shellfish are safe within biological limits, however for a given set of these species, mainly in what concerns the black scabbard fish, GES might be put at risk due to fishing pressure.

The initial assessment report considers that the descriptor on biodiversity, reached the GES in the waters of subdivision of Madeira, thought such assessment was based in much reduced areas (size), localized habitats (reduced spatial coverage), and a limited number of species. All elements of the marine food webs, to the extent they are known, occur at regular abundance. But due to the nature of existing studies point in terms of time, space and groups of organisms examined, it is difficult to identify changing trends throughout the trophic web, as well as their specific distribution. In addition to the high uncertainty associated with this descriptor, there is strong evidence in some areas, the impacts of human activities have caused significant changes at different levels of trophic webs of diverse habitats.

Biological diversity is maintained. The initial assessment report considers that the descriptor on biodiversity, reached the GES in the waters of subdivision of Madeira. However, the report shows that such an assessment was supported especially in very localized habitats (reduced spatial coverage), and a limited number of species.

Regarding Non-indigenous species Introduced by human activities are at levels that do not affect the ecosystems adversely. There is however an increase in the number of alien species in the marine environment of Madeira and the expansion of the area of distribution of certain species, some of them invasiveness, which is an indicator that this descriptor could not achieve GES in the next five years.

Populations of all commercially exploited fish and shellfish are safe within biological limits, however for a given set of these species, with particular concern in the black scabbard fish it is expected that due to fishing pressure GES is in risk.

All elements of the marine food webs, to the extent they are known, occur at regularly. Due to the scope of existing studies in regards to time, space and groups of organisms examined, it is very difficult to identify changing trends throughout the trophic web and throughout their specific distribution. In addition to the high uncertainty associated with this descriptor, there are strong evidences that impacts caused by human activities have caused significant changes at different levels of the trophic webs and habitats.

In the initial report it was not possible to analyse the environmental status of the descriptor 10 on the marine litter. It was thus identified the need for data to not only characterize the waste marine impacts on marine ecosystems, but also to evaluate their evolution over time. Moreover, it is considered that the marine debris, as a descriptor susceptible to suffer cumulative effects over time, is at risk of not achieving GES in the next five years.

3.2.3 - Canary Islands

The Canary Islands Archipelago is located in front of the North West African coast, between the coordinates 27° 37' and 29° 25' N, and 13° 20' and 18° 10' W. The island of Fuerteventura is 95 km far from the African coast, while there are approximately 1.400 km between the archipelago and the European continent. These islands, of volcanic nature, emerge, with sharp slopes from the abyssal lands, at 3.000 m deep.

The distribution of the islands (in line, perpendicular to the African coast), make them to act as an obstacle for the marine and atmospheric currents circulation. The deep of the sea-bottom varies from 1.000 m between Africa and Fuerteventura or Lanzarote, to the 2.500 m in the most western islands (Llinás & Rueda, 2008). The combination of the Canary current, together with the Trade winds, explain the oceanographic characteristics of the archipelago.

The combined effect of these oceanographic situations and the volcanic origin determines that the marine waters surrounding the archipelago have singular characteristics, which determine the distribution of many of the marine species occurring there. The "Banco de Datos de Biodiversidad de Canarias" – still incomplete in what regards the marine biodiversity"- states that, from the almost 18.000 species registered in the islands, 5.232 of them are marine.

Regarding the productivity of their waters, two areas are identified. The first one, mainly oligotrophic, situated in the western islands, and the second, with a higher productivity, located in the eastern islands, due to the upwelling of the Northwest coast.

Several Marine Protected Areas have been declared in that area, to preserve the marine habitats and species that are present in the archipelago (Appendix). Several pressures and impacts are present in the marine environment, such as:

1. The main causes of physical loss identified are ports and land claim defences. The current situation is not alarming in relation to most of these pressures. The main causes of physical damage are also listed and include port infrastructures and defence, anchoring and stream flow retention. Most of these pressures are specific to areas near the shore. Trawling is currently forbidden in the Canary.
2. On the basis of existing literature, 60 non indigenous species were identified in the Canary Islands. All possible vectors and pathways were described in the initial assessment.
3. Regarding fisheries, in the Canarias sub-division the majority of stocks lack any form of reference points, which hampers the adequate assessment of fishing stocks.
4. In what concerns nutrients and eutrophication, remote sensing (satellite) data on chlorophyll show that Spanish waters of the sub-region are unlikely to suffer eutrophication impacts, although this is not a definitive statement since relatively few nutrient data were available.
5. For permanent alteration of hydrographic conditions, the initial assessment addressed those changes at large, local and intermediate scale. The increase in water

temperature is indicated as the main problem, due to climate change. Regarding permanent alterations due to infrastructures, they seem to be local, and not to compromise GES, based on the available information.

6. Regarding pollutants and their effects, as well as contaminants in seafood, very few information was available in the initial assessment, so it was not possible to provide a diagnose about whether or not GES is achieved.
7. The same occurred with marine litter and noise, where the lack of information was predominant. A spatial assessment was done gathering the activities that may cause potential inputs of marine litter and potential inputs of noise.
8. Other pressures affecting fauna were identified, such as collisions with boats (cetaceans and turtles), or nest predation (for birds) by non-indigenous terrestrial mammals in some islands, as well as light disorientation.

4. THE WORKPACKAGE

1 - review of initial assessments, including knowledge gaps, ges definition and environmental targets established for the three macaronesia archipelagos initial reports

The main objective of the meeting was the establishment of the technical works according to the Workpackage 1 (WP1) goal: Review of IA, including Knowledge gaps, GES definition and ETs established for the three Macaronesia Archipelagos initial reports. The initial MSFD assessment reports will be re-evaluated and compared for adequacy coherence and consistency. The European Commission's Article 12 report does not tackle the initial reports of the Azores and Madeira, this WP will fill-up that lack of analysis. This will be performed following the analysis made on the EC report. The partner leading is DRAM (Azores) with the all partners' participation and the expert's teams.

The Workshop expected to discuss:

- General discussion of common approach: Identification of main methodological difficulties in getting a common approach for the MSFD implementation in Macaronesia and abroad;
- Knowledge Gaps: Evaluation of knowledge and data gaps in the Macaronesia IA reports and in the European Commission's Article 12 report for the functional groups in other regions and abroad European waters;
- GES definition and methodologies: Review and harmonized the reference baseline definition and the methodologies to be used for GES definition (Article 9) and assessment (Art 8);
- Environmental Targets (ETs): Common assessment of the whole set of targets previously identified by each of the Macaronesia IA reports; Update GES and the targets to be reached by 2018, if needed.
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A common methodology to address this goal was designed by the WP1 Leader for the taxonomic groups. During this first Technical Workshop (WK1) this methodology was tested and established by the experts, for each region: Canaries, Madeira and Azores and for the 3 taxonomic groups.

This WK1 also integrates officially and in collaborative way the Experts teams on the Mystic Seas project (see table of participants).

During the WK1, the Steering Committee took the opportunity to meet to discuss administrative matters and project progress. It also established a timeline for project milestones and reporting deadlines.

For more information about the workshop, please see the Workshop Reporting (Appendix).

5. Analysis of the application of MSFD for three functional groups of D1 (marine mammals, sea birds and sea turtles)

5.1. Marine Mammals

5.1.1 - Regional initial assessment

5.1.1.1 - Azores: current approach

The IA for the Azores archipelago (SRMCT 2014) did not contain any definition of GES, criteria, indicators, ETs, or baseline levels, for the Marine Mammal component of D1 - Biodiversity.

The IA for the Azores included a review on marine mammal occurrence, movements, distribution and, whenever available, demographic estimates. Marine mammals were divided into three groups: rare species, migratory species and resident species. Rare species were described as not being part of the marine fauna of the Azores, due to the uncertainty of their occurrence in the region. Presence of migratory baleen whales in the region was assumed to reflect natural variability of the marine ecosystem and not good or bad environmental conditions. Thus, the IA considered that baleen whales shouldn't be used to assess GES.

Additionally, the IA listed and described several past and present threats and impacts to marine mammals in the Azores, such as whaling, whale-watching, seismic/scientific surveys using sonars, marine traffic, ship collisions, fisheries by-catch and climate change.

However, the IA did not attempt to assess the environmental status of marine mammal components with the justification that this group has an extensive distribution and the majority of species are migratory. Likewise, there was no attempt to establish MUs for the region, to evaluate pressures and impacts and categorize their risk in the Azorean archipelago.

The only ET proposed in the IA for marine mammals was: "Increase the knowledge on population dynamics and demographic characteristics of the pelagic migratory species, such as sea turtles, cetaceans and nesting seabirds". This ET was later criticised in the "Art12 Technical Assessment" as not really contributing to reach GES, but simply aiming to improve and increase data collection.

5.1.1.2 - Madeira: Current approach

The process to select cetacean species to be indicators of GES in Madeira archipelago marine ecosystem was carried out at the beginning of 2014 (SRA 2014). The species were selected according to the following criteria:

1. The species should be as far as possible representative of different ecological niches and use differently the Madeira marine coastal waters (coastal species, oceanic species; deep divers);

2. There should be enough data, or be possible to collect enough data, within a 6 year cycle to assess the GES for those species, based on the criteria stated on the Commission Decision of 2010 - criteria and methodological standards on GES of marine waters (2010/477/EU);
3. The species as far as possible should also be relevant according to other legislation regarding management and conservation (European Directives, National and Regional legislation);
4. Species that might be more subject to the impact of human activities in the archipelago.
5.

Four species stood out as fulfilling the four criteria, namely: bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*) (hereafter called simply common dolphin), Atlantic spotted dolphin (*Stenella frontalis*) and short-finned pilot whale (*Globicephala macrorhynchus*). The bottlenose dolphin prefers shallower coastal waters, the short-finned pilot whale prefers deeper offshore waters whilst common dolphin and Atlantic spotted dolphin have a broader use of the coastal waters of Madeira exploring mostly the pelagic environment. Although these last two species have a similar habitat and trophic level their presence is seasonal and complementary in the archipelago.

There were abundance estimates and distribution maps of those four species for the Madeira archipelago, based on robust methodologies with reasonable accuracy to detect trends (Alves *et al*. 2014, Dinis 2014, Freitas *et al*. 2014a).

The bottlenose dolphin and short-finned pilot whale have island-associated groups for which there are also abundance estimates. In the IA report these groups were considered in the species overall assessment, although abundance estimates were provided as baseline values.

Two more species were considered as MU candidates, namely the fin whale (*Balaenoptera physalus*) and the Bryde's whale (*Balaenoptera edeni*). They fulfilled criteria I, II and IV, but there were no abundance estimates, demographic data or enough data to understand their distribution patterns in the archipelago and thus were not included as indicators in the IA. The brief presence of fin whales in Madeira's waters as they migrate across the Atlantic makes it difficult to obtain enough data on this species locally. On the other hand, the Bryde's whale, that occurs in Madeira's waters at least half of the year, could be considered a suitable MU for the next assessment cycle. There are already photo-identification data taken which could be analysed to obtain an abundance estimate for this species.

The species previously mentioned are the most frequently sighted in the archipelago and probably the most subject to the impact of human activities. A total of nine types of threats and human activities with impacts on cetaceans were identified for Madeira waters (Freitas *et al.* 2004a). Probably the biggest sub-lethal impact is from whale-watching (commercial, recreational) and scientific research that has unknown consequences at the population level. For the remaining identified impacts (e.g. litter, acoustic impact from military naval sonars, ship strikes, fisheries by-catch) there is evidence of lethal consequences but at low levels, although possibly these estimates are underestimated for some of them. The four cetacean species selected as MUs are the most targeted by the whale-watching industry together with the Bryde's whale (Freitas *et al.* 2014b).

In light of the previous information six MUs were considered in the IA to assess GES in Madeira archipelago:

- *Tursiops truncatus* – population using the coastal waters of Madeira, Porto Santo and Desertas Islands;
- *Tursiops truncatus* – island-associated groups using the south coast of Madeira;
- *Globicephala macrorhynchus* - population using the coastal waters of Madeira, Porto Santo and Desertas Islands;
- *Globicephala macrorhynchus* - island-associated groups using the south coast of Madeira;
- *Delphinus delphis* - population using the coastal waters of Madeira, Porto Santo and Desertas Islands seasonally;
- *Stenella frontalis* - population using the coastal waters of Madeira, Porto Santo and Desertas Islands seasonally.
-

In the Madeira IA report, the Mediterranean monk seal was also proposed as one of the indicator species for D1. A general description was given on the historical evolution of species conservation status in Madeira archipelago as well as a local population size range, without explaining however how that estimate range was obtained.

No specific GES definition was adopted in the IA report for each of these MUs. A general definition was considered for the D1- Biodiversity.

For cetaceans, the indicators adopted followed the Commission Decision of 2010 on the criteria and methodological standards on GES of marine waters (2010/477/EU). For the four species the following criteria and indicators were considered:

Criterion 1.1 Species Distribution

- Distribution pattern in Madeira coastal waters

Criterion 1.2 Population size

- Population abundance in Madeira coastal waters

For the island-associated MUs only data for the criteria 1.2 was provided. These data were considered the baseline values for these indicators. An abundance estimate was provided together with the respective distribution map for the remaining MUs.

1. The evaluation of GES for each MU was done considering the following assumptions:

2. Species to which MUs belong were not targeted in the past by a large scale whaling industry or hunting practices that could have driven the populations down or forced shifts in the population distribution;
3. Present impacts on these MUs are not significant;
4. Present MU sizes and distribution reflect mostly the natural/ecological conditions and not the impacts from human activities.

These assumptions were used to consider the present abundances and distribution patterns as baseline values. No ETs were provided for the Mediterranean monk seal and no GES assessment values were proposed in the IA report for the indicators.

5.1.1.3 - Canary Islands: Current approach

The identification of cetacean species as indicators of GES in Spain was first addressed in 2012 during development of the document "Initial Evaluation of the GES document for cetaceans". In this first approach five species were selected for all Spanish demarcations: bottlenose dolphin, harbour porpoise (*Phocoena phocoena*), common dolphin, sperm whale (*Physeter macrocephalus*), Cuvier´s beaked whale (*Ziphius cavirostris*), and other five for specific demarcations: orca (*Orcinus orca*) for the "SudAtlántica" and "Estrecho y Alboran" demarcations, long-finned pilot whale (*Globicephala melas*) for the "Estrecho y Alboran" and "Levantino-Balear" demarcations, short-finned pilot whale and Bryde´s whale for the "Canaria" demarcation, and fin whale for the "Noratlantica" demarcation.

In 2014, during the development of the document "Monitoring Programmes", it was stressed that most of these species are highly mobile, with distribution ranges wider than demarcation limits or even member states frontiers. To take account of this fact, MUs, which would mean the set of animals of one species that inhabit an area in which the management of human activities applies, were adopted (ICES 2014).

To ensure that the subset of selected species was a representative sample of the whole community of cetaceans in Spanish waters, an expert workshop on cetaceans was held in Madrid at the headquarters of the IEO, to choose MUs within this functional group. The criteria for selection of these units were:

1. Representation of different ecological niches: coastal canyons and slope-deep water;
2. Existence of absolute abundance estimates, with some degree of accuracy to detect population trends;
3. Priority for other legislation (the bottlenose dolphin and harbour porpoise for example, both included in Annex II of the Habitats Directive);
4. Identifying threats where impacts could be related to the total population abundance (either by monitoring its entire range because it occurs in Spanish waters or through collaboration with other countries).

As a result of this process of discussion the following MUs were selected for the "Canarian" demarcation:

- Tursiops truncatus;
- Ziphius cavirostris (western islands);
- Ziphius cavirostris (eastern islands);
- Mesoplodon densirostris (western islands);
- Mesoplodon densirostris (eastern islands);
- Physeter macrocephalus;
- Globicephala macrorhynchus (Tenerife and La Gomera islands).

For the assessment of cetaceans, several MUs were identified in Spain. Besides the selection of criteria, and GES definition for each GES criteria, was addressed in 2012 during development of the document "Initial Evaluation of the GES document for cetaceans". This whole process was based on the outputs from the OSPAR/MSFD Workshop on Approaches to Determining GES for Biodiversity (OSPAR 2012) that was organized to assess and discuss different indicators proposals and associated objectives to define GES for D1- Biodiversity. The results of this workshop are resumed in Table 8.

Based on available information and gaps, four characteristics were proposed to define and assess GES of the cetaceans group in Spanish waters. These characteristics were:

1. The area and distribution pattern of the populations are maintained
2. The current population size is maintained without significant loss.
3. The impact on populations of anthropogenic activities (accidental by-catch, collision with vessels, noise in hunting areas with passive hearing, whale-watching activities, etc.) remains below those levels that pose a risk to the populations in the long-term
4. Population parameters (offspring survival, reproduction, mortality, age at maturity, etc.) are maintained at levels consistent with stable or increasing populations.
5.

As required by the MSFD, taking into account the IA, and the GES definition, a set of ETs (and associated indicators) for mammals were also proposed in 2012.

The ETs proposed were:

A.1.4: Reduce the main causes of mortality and of reduction of the populations of groups of species at the top of the trophic web (marine mammals, reptiles, sea birds, pelagic and demersal elasmobranchs), such as accidental capture, collisions with vessels, in taking of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.

A.3.3 (NOR, SUD, LEBA, ESAL): Maintain the distribution range of species so it does not decrease for a number of species that statistically cannot be considered to be due to natural and climatic variability.

A.3.4 (NOR, SUD, LEBA, ESAL), A.3.1(CAN): Maintain positive or stable trends for the populations of key species or apex predators (marine mammals, reptiles, seabirds and fish) and maintain commercially exploited species within safe biological limits.

And the GES indicators and GES definition proposed for the selected GES criteria were:

GES Criterion 1.1 Species distribution

GES indicators: 1.1.1 Distributional range and 1.1.2 Distributional pattern: In the Spanish monitoring programme both indicators were combined and denominated as "MM-DIST"

GES Definition: The current range and distribution pattern of the populations are maintained.

GES Criterion 1.2 Population size

GES indicator: 1.2.1 Population abundance: in the Spanish monitoring programme this indicator is denominated as "MM-ABU"

GES Definition: The current population size is maintained without significant loss.

GES Criterion 1.3 Population condition

GES indicator: 1.3.1 Population demographic characteristics: in the Spanish monitoring programme this indicator is denominated as "MM-DEM"

GES Definition: Population parameters (calf survival, reproduction, mortality, age of maturity, etc.) are maintained at consistent levels with a stable or increasing population.

These three defined indicators named as "MM-DIST". "MM-ABU" and "MM-DEM" in the document "Monitoring Programmes" are consistent with those proposed by the Intersessional Correspondence Group for the Coordination of Biodiversity Assessment and Monitoring of OSPAR (ICG-COBAM 2012) for this functional group, and with those proposed in the process of the Ecosystem Approach ECAP (Barcelona Convention).

Later in 2014, during development of the document "Monitoring Programmes", two indicators (from the GES Decision) were selected for cetaceans with the suggestions that, the third previously selected, distributional range, should be subsumed in the abundance indicator and its monitoring to take place as part of the monitoring for abundance. The rationale for this proposal was due to the difficulties in establishing quantifiable baselines, targets and assessment values for this indicator.

Baselines and assessment values

The baseline and assessment value values are needed to make the indicators operational, but for cetaceans, in most of the cases there are not historical reference data for these indicators. Because of this, the MAGRAMA organized a Workshop at the headquarters of the Spanish Institute of Oceanography in May 2014 with Spanish cetacean experts to try to establish baselines values for each selected MU. Table 9 shows the results of the Workshop 1.

Table 8 - Proposed common parameters and GES/Objectives for cetacean indicators (OSPAR, 2012).

COMMISSION DECISION GES CRITERIA	COMMISSION DECISION INDICATOR	PARAMETER	GES/OBJECTIVE
1.1. Species distribution	**1.1.1. Species distributional range** **1.1.2. Species distributional pattern**	**Distribution range of common cetacean species present and distribution pattern at relevant timescale of common cetacean species.**	**It does not occur a decrease from the reference level due to anthropogenic activities**
1.2. Population size	**1.2.1. Population size**	**Abundance at the relevant time scale for common cetacean species.**	**It does not occur a statistically significant decrease with respect to the reference level due to anthropogenic activities.**
1.3 Population condition	**1.3.1 Demographic characteristics of the population (mortality rate)**	**Number of individuals captured accidentally in relation to the population estimates.**	**The annual rate of By-catch [marine mammals species] is reduced to less than [X]% the best available estimate of the population**

Table 9 - MUs and baseline values for cetaceans proposed by the Expert Workshop held at the headquarters of the IEO in Madrid on May 7, 2014.

PROPOSED MANAGEMENT UNITS			PROPOSED BASELINES VALUES						
Specie	**Demarcación**	**Management Units**	**Reference**	**Method**	**Estimate**	**CV**	**IC 95%**	**Year/period**	**Reference**
Tursiops truncatus	Canary Islands	Canary Islands	Tobeña et al., 2014, Vidal Per.com.						
Ziphius cavirostris	Canary Islands	Eastern Islands	Schiavi et al, submitted (2014)						
	Canary Islands	Western Islands		Photoid	44 (El Hierro)				Aguilar de Soto et al. 2010 a,b
Physeter macrocephalus	Canary Islands	Canary Islands	Natasha ¿?	Acoustic survey	220	0,32	108-378	Winter 2009-2010	Fais et al., submitted
Globicephala macrorhyncus	Canary Islands	Tenerife/La Gomera	Servidio, PhD 2014						
Mesoplon densirostris	Canary Islands	Eastern Islands		Photoid[d]	Vidal (in progress)				
	Canary Islands	Western Islands		Photoid[d]	59 El Hierro				Aguilar de Soto et al., 2010 a, b

[d] *Acoustic survey carried out in Canary Islands, data analysis in progress (Aguilar Soto et al., 2010a)*

5.1.2 - Recommended MISTIC SEAS approach

5.1.2.1 - Management Units

The three archipelagos of the Macaronesia hold one of the highest marine mammal diversity within European Atlantic waters, with nearly 40 species recorded so far. Many of these species are rarely or only occasionally sighted and thus difficult to monitor systematically. Even species regularly found in Macaronesian waters are part of larger biological populations whose range extend beyond Macaronesian waters.

For the purposes of assessing GES for the Marine Mammal component, populations of marine mammals should be divided into MUs, such that "a MU refers to the animals of a particular species in a geographical area to which management of human activities is also applied" (ICES 2014). Thus, delineation of MUs can reflect both the spatial preferences of individuals and the spatial differences in human activities that could impact them.

The criteria proposed for selection of MUs to be assessed under the MSFD adapted those of Spain (see Santos and Pierce 2015) and are:

1. Representativeness of different environmental (coastal/slope waters, oceanic waters, submarine canyons) or trophic (zooplanktivorous, piscivorous, teuthophagous) niches;
2. Existence of absolute abundance estimates (sufficiently precise to allow trend detection);
3. Priority for other legislation, i.e. species listed under EU Habitats Directive and other international agreements;
4. Identification of threats where impacts could be related to the total population abundance/status and quantified using one of the indicators proposed.
5.

MUs proposed for Canaries in the IA were reviewed in light of these criteria. A recommendation is made to (I) eliminate the two MUs for *Mesoplodon densirostris* because they were considered to provide the same information as MU for *Ziphius cavirostris*, and to (II) include a new MU for *Stenella frontalis*, in order to assess GES of the pelagic ecosystem which was not represented for Canaries in the previous selection. A total of 26 MUs are proposed for assessing GES in Macaronesian waters (Table 10, Appendix).

Table 10 - Recommended MUs for assessing GES for Marine Mammals in Macaronesia. MUs marked with an asterisk are proposed for consideration in the 2018 assessment round, depending on data availability.

MUs	Proposed MUs by Archipelago			Total
	Azores (PT)	Madeira (PT)	Canaries (SP)	
Tursiops truncatus (island-associated)	Faial/Pico S. Miguel	Madeira	ZEC ES7010017 Franja marina de Mogán ZEC ES7020017 Franja marina de Teno-Rasca ZEC ES7020057 Mar de las Calmas ZEC ES7020122 Franja marina de Fuencaliente ZEC ES7020123 Franja marina Santiago-Valle del Gran Rey ZEC ESZZ15002 Espacio marino del Oriente y Sur de Lanzarote - Fuerteventura	9
Tursiops truncatus **(island-associated and offshore)**	Azores	Madeira		2
Stenella frontalis	Azores	Madeira	Canaries	3
Delphinus delphis		Madeira		1
Grampus griseus **(island-associated)**	Faial/Pico			1
Globicephala macrorhynchus (island-associated)		Madeira	ZEC ES7020017 Franja marina de Teno-Rasca ZEC ES7020122 Franja marina Santiago-Valle Gran Rey	3
Globicephala macrorhynchus **(island-associated and offshore)**		Madeira		1
Ziphius cavirostris **(island-associated)**			ZEC ESZZ15002 Espacio marino del Oriente y Sur de Lanzarote - Fuerteventura	1
Physeter macrocephalus	Azores		Canaries	2
Balaenoptera physalus*	Azores			1
Balaenoptera edeni *		Madeira	Canaries	2
Total	7	7	12	26

Coordinated by: Governo dos Açores
Partners: FRCT; Região Autónoma da Madeira; Secretaria Regional do Ambiente e Recursos Naturais; dgrm; Gobierno de España Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente; Fundación Biodiversidad
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For bottlenose dolphins and short-finned pilot whales, distinct MUs were defined for island-associated and offshore animals in some archipelagos. A single MU was defined for island-associated Risso's dolphins and Cuvier's beaked whales, and for Atlantic spotted dolphins, common dolphins and sperm whales. MUs for baleen whales are proposed for consideration in the 2018 assessment round, depending on data availability.

The Mediterranean monk seal (*Monachus monachus*) was not initially considered in the review process carried out by MISTIC SEAS of the IA reports and the re-evaluation of the proposed indicators. This omission may have been the result of the species distribution in Macaronesia confined to Madeira archipelago, excluding the need to coordinate related indicators with the remaining archipelagos. The absence of a monk seal expert in the Marine Mammals Working Group seems to reflect this initial approach.

However, the MISTIC SEAS project constitutes a unique opportunity to revise the Madeira monk seal as an important species to be used as indicator of GES in Macaronesia. The Marine mammals' experts participating at the first MISTIC SEAS workshop were unanimous in including the monk seal in the project review exercise, recommending the Steering Committee to contact "Instituto das Florestas e Conservação da Natureza, IP-RAM" (relevant Authority in Madeira dealing with this species and partner of this project) to get involved in the process. The re-evaluation process for the monk seal could be carried out until the second (Azores) and/or third (Madeira) workshops in order to be validated by the working group and included in the present report as an updated version or an annex.

5.1.2.2 - Indicators and Indicator metrics

Marine mammals found in Macaronesian waters usually have large ranges that often extend to several islands and offshore waters. For these highly mobile taxa, the distributional range and pattern of populations are difficult to determine and quantify, and measurable baselines, metrics and targets for distribution indicators cannot be established with any certainty. Thus, the two indicators proposed by the Commission concerning Species Distribution, 1.1.1 Distributional range and 1.1.2 Distributional pattern within range, should not be assessed separately and should be removed from the list of indicators for Marine Mammals. Still, monitoring of the MU's distributional range and pattern should be carried out as part of the monitoring for abundance estimation. Changes in distribution should act as warning signals and causes of change should be investigated (ICES 2014).

Abundance is perhaps the most important parameter when trying to assess the status of a population (ICES 2014) and the indicator Population abundance should be used to assess GES of all MUs (Table 11, Appendix).

Table 11 - Recommended indicators and indicator metrics for assessing GES for Marine Mammals in Macaronesia. Indicator metrics marked with an asterisk are proposed for consideration in the 2018 assessment round, depending on data availability.

Commission Decision GES criteria	Commission Decision Indicator	Proposed Indicator name	Proposed Indicator metric	Indicator category
1.2 Population size	1.2.1 Population abundance	MM-ABU	Absolute number of individuals	State
1.3 Population condition	1.3.1 Population demographic characteristics	MM-DEM	Survival rate Birth rate*	State
1.3 Population condition	1.3.1 Population demographic characteristics	MM-DEM	Mortality rate from ship strikes	Pressure

Although indices of relative abundance could be used to assess changes in population size of MUs, there are many caveats associated with this metric, which often produces unreliable and imprecise results. Thus, the preferred metric to estimate population size of MUs is the absolute number of individuals. Furthermore, estimates of absolute abundance are required to calculate demographic characteristics of populations (survival/mortality and birth rates) and to assess impact of anthropogenic activities on these characteristics. Nevertheless, it is recommended that indices of relative abundance also be developed to monitor MUs between surveys conducted to obtain absolute estimates (ICES 2014).

One indicator of state and one indicator of pressure are proposed to monitor the condition of MUs in Macaronesian waters (Table IV, Appendix). Changes in survival and birth rates can arise from multiple influences, some natural and some related to human activities, either lethal (e.g. ship strikes, by-catch) or sub-lethal (e.g. disturbance from whale-watching, physical or biological changes in habitats). These Demographic characteristics are indicators of state and can be estimated from stranding/by-catch data or from photographic mark-recapture studies. Since strandings and by-catches are uncommon in the Macaronesia, survival and birth rates can only be obtained for MUs amenable to photo-identification studies: island-associated bottlenose dolphins, Risso's dolphins, short-finned pilot whales and Cuvier's beaked whales, and sperm whales (Table IV, Appendix). It remains unclear if photo-identification data currently available allows estimating birth rates for these MUs. Therefore, before the next MSFD assessment cycle, each region should evaluate the usefulness of existing datasets to estimate birth rates, so a decision can be made about the inclusion of this indicator metric to monitor Population condition.

In its IA, Canaries adopted "Mortality rates due to anthropogenic mortality" as a pressure indicator. This indicator included mortality due to by-catch, ship strikes, etc. It is believed that present rates of by-catch in Macaronesian waters are unlikely to compromise the long-term viability of any MU. Nevertheless, it is recommended that in future assessments this indicator should be re-considered in light of new data (e.g. increase in reported by caught cetaceans or increase in proportion of stranded animals with signs of interactions with fishing gear) or changes to less selective fishing gear used by fishing fleets operating in the Macaronesian sea. Contrarily to by-catch, mortality from ship strikes may have already reached levels that are unsustainable for some MUs, namely sperm whales. Thus, "Mortality rate from ship strikes" is proposed as a pressure indicator to assess GES of sperm whale MUs across all archipelagos.

5.1.2.3 - Baseline Values

Since there are no past estimates of abundance or demographic parameters for the proposed MUs that could reflect least impacted conditions, it is recommended to use current values of indicators as baseline values. It is important to stress, however, that these baseline values may already reflect a deteriorated state of MUs in Macaronesia.

Baseline values for indicators of the proposed MUs were taken from published literature and unpublished sources (Appendix). Robust estimates of abundance are available for all MUs in Madeira, for three MUs in Canaries and two MUs in Azores. For the Canaries, establishment of baseline values for the remaining MUs is pending (awaiting data analysis), while for two Azorean MUs (offshore bottlenose dolphins and spotted dolphins) establishment of baselines requires further collection of data.

Reliable estimates of survival rate are provided only for one MU in Azores (Risso's dolphins) and one in Madeira (short-finned pilot whales). For the remaining MUs for which an indicator of population condition was proposed, the necessary data exist but have not been analysed yet.

Mortality from ship strikes should be assessed in relation to the population size of the MU. That information is available for sperm whale MUs in Canaries and Azores. Still, it is recommended that numbers of individuals killed from ship strikes are reviewed and, if necessary, mortality rates updated and a monitoring programme established.

5.1.2.4 - Environmental Targets

When defining ETs and setting indicators to measure distance from GES, it is important to bear in mind that GES will be evaluated in reference to baseline values set to be equal to current status and that these may already reflect a deteriorated state of the environment. Thus indicators of state of MUs in Macaronesia waters must be maintained at their current level or improved.

Different ETs are proposed for the indicator 1.2.1. Population abundance, depending on the conservation status of populations to which the MUs belong (IUCN 2015) (Appendix).

For MUs classified as threatened by the IUCN Red List (categories "Critically Endangered", "Endangered" or "Vulnerable") at a global or regional level, the proposed ET is: "Population size attains levels allowing it to qualify to the Least Concern Category of IUCN".

This is the case of sperm whales in the Azores and Canaries, and fin whales in the Azores, for which the global and regional populations of mature individuals have declined by more than 50% and 70%, respectively, over the last three generations, due to commercial whaling (IUCN 2015).

The proposed ET for the remaining MUs, classified in non-threatened categories, is: "The population size does not deviate from the natural fluctuations of the population".

Regarding the indicator 1.3.1 Population demographic characteristics, a single environmental objective is proposed for all MUs: "Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population".

5.1.2.5 - GES Assessment values

A problem with assessment values setting is understanding the limits of natural variability in populations and deciding when changes in abundance or demographic parameters are indicative of a change in the status of the population and represent a deviation from GES. Thus, assessment values should incorporate to some extent the possibility of natural fluctuations in the measured parameters. However, some MUs probably are already below GES and assessment values setting must ensure no further decline.

Therefore, different assessment values are recommended for the indicator 1.2.1. Population abundance depending on the conservation status of populations to which the MUs belong (IUCN 2015) (Appendix).

For MUs belonging in non-threatened categories, the assessment value proposed is: "Maintain population size at or above the baseline (i.e. current) levels, with no observed, estimated or projected reduction ≥10% over a 20-year period".

This target is based on ICES WGMME recommendations for setting targets for cetaceans (which in turn were based on IUCN's approach for defining a taxon as vulnerable) but adopts a more precautionary approach by allowing a lower decline, stipulating a shorter time-scale for the assessment and incorporating inference and projection into the assessment.

Currently, for OSPAR mammal common indicator M-4 "abundance at the relevant temporal scale of cetacean species regularly present, the target proposed is "Maintain populations in a healthy state, with no decrease in population size with regard to the baseline (beyond natural variability) and restore populations, where deteriorated due to anthropogenic influences, to a healthy state".

ICES (2014) suggested target (which is considered as an assessment value for the purpose of this document) is: Maintain population size at or above the baseline levels, with no decrease of ≥30% over a three-generation period. This adapts the IUCN criterion for identifying a vulnerable species (IUCN 2016). Assuming a 30% decline rate over three generations for each MU (generation length taken from Taylor *et al.* 2007), the percentage reduction in baseline values of abundance for MUs in Madeira was calculated for consecutive assessment cycles of 6 years (maximum interval between assessments recommended by ICES (2014). All MUs reached a 10% reduction in population size in a period of time ranging from 18 to 24 years (see Appendix for further information).

Setting a lower assessment value in the decline rate and allowing it to be determined by observation, estimation or projection (see the Glossary for a definition of these terms) will potentially enable detecting a reduction in the size of MUs at an earlier stage and avoid further deterioration of the GES.

This assessment value is not yet operational in the case of *Ziphius cavirostris* MU, for which there is no published information on generation length and percentage reductions in baseline values cannot be estimated. It is therefore recommended that data necessary to estimate generation length be compiled or collected in the next few years, to assess feasibility of adopting this assessment value.

For MUs classified as threatened by IUCN Red List (categories "Critically Endangered", "Endangered" or "Vulnerable") at a global or regional level, the assessment value proposed for the Population abundance indicator is: "Maintain a positive population growth rate until GES is reached" (Appendix).

The rationale for this assessment value is that no further decrease in numbers can be allowed for these threatened MUs and measures must be adopted to ensure a net population growth.

Following the same rationale, it is recommended that the assessment value for the pressure indicator "Mortality from ship strikes" for the sperm whale MU (1.3.1 Population demographic characteristics) be set as "Mortality rate from ship strikes is close to zero" (Appendix).

The assessment value recommended for the 1.3.1 Population demographic characteristics for all MUs is "No statistically significant decrease in survival rate from baseline values" (Appendix). At present, no quantitative value can be set for this target. Further research is needed to understand natural variability in survival rates and to specify a value for this parameter representing the assessment value between environmental conditions that will achieve GES and those that will not achieve GES.

5.1.3 - Rationale for the selection of Management Units and Baseline Values

5.1.3.1. Data sources

Azores

The only government funding programme that operates regularly is the “Azores Fisheries Observer Programme” (POPA). POPA started in 1998 and every year, from April to October, places 10-12 trained observers aboard tuna-fishing vessels. These observers collect data on cetacean distribution, group sizes and behaviour while the fishing vessels are navigating. Between 1998 and 2015, 2,727,860 km were travelled during on-effort periods dedicated to cetacean surveying (Figure 2) and a total of 25,079 sightings of cetaceans were recorded. POPA covers an extensive geographic area within the Azorean EEZ but observation effort is mostly concentrated around the islands and offshore seamounts.

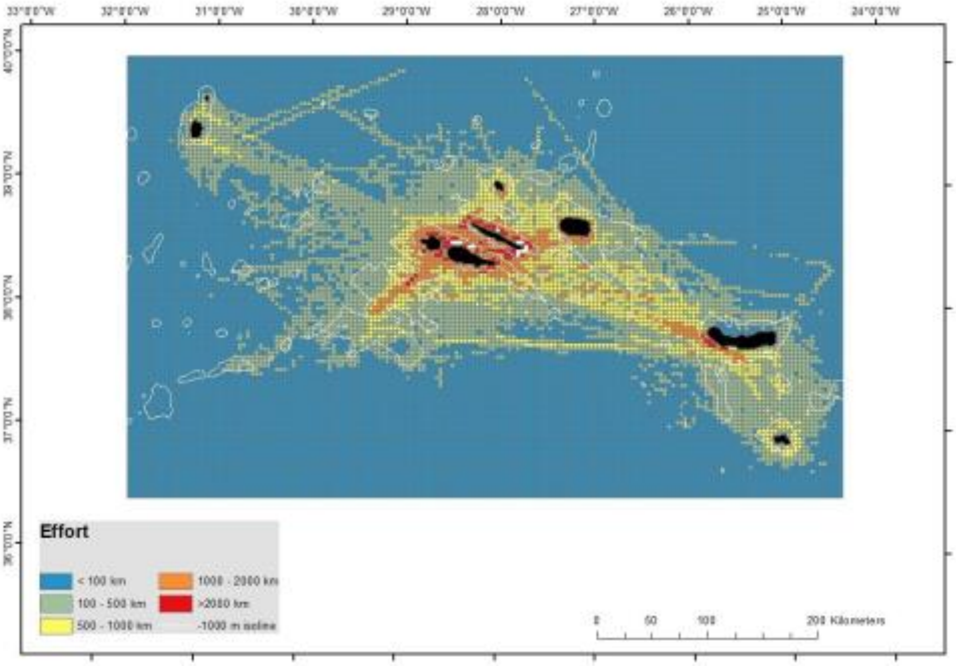

Figure 2 – Survey effort carried out by POPA between 1998 and 2015.

Aside from this regional scheme, other project- or institutional-funding programmes collect information on cetacean distribution. Since 1999 to present, the Institute of Marine Research of the University of the Azores (IMAR-UAç) has conducted dedicated and opportunistic surveys for cetaceans in the scope of different research programmes. MONICET compiles cetacean sightings and photo-identification data collected from whale-watching vessels in São Miguel (since 2009), Faial and Pico (since 2011) and Terceira (since 2015). The Nova Atlantis Foundation carries out land and ship-based research on the Risso’s dolphin population off the South of Pico since 2000.

Madeira

The data on cetacean absolute abundances and distributions that were included in the IA report for Madeira archipelago was provided by the Madeira Whale Museum (MWM). It was the result of 12 years of designed based visual surveys and random visual surveys for photo-identification carried out by the institution in Madeira's coastal waters (Freitas *et al*. 2014a). Figure 3 shows the combined effort of the two types of surveys around Madeira archipelago main islands between 2001 and 2012, in a total of 24,868 km of track line on effort. The designed-based visual surveys (14,271 km; 527 sightings on effort) were carried out all year-round and covered the coastal waters of Madeira, Desertas and Porto Santo islands up to the 2000 m bathymetry. These surveys are part of the Madeira Cetaceans Monitoring Programme that has been implemented by MWM in the past decade, and were carried out in three periods: 2001-2004; 2007-2009; 2010-2012. The visual random surveys (10,597 km; 533 sightings) were mainly conducted in the south coast of Madeira, sheltered from the northeast prevailing winds.

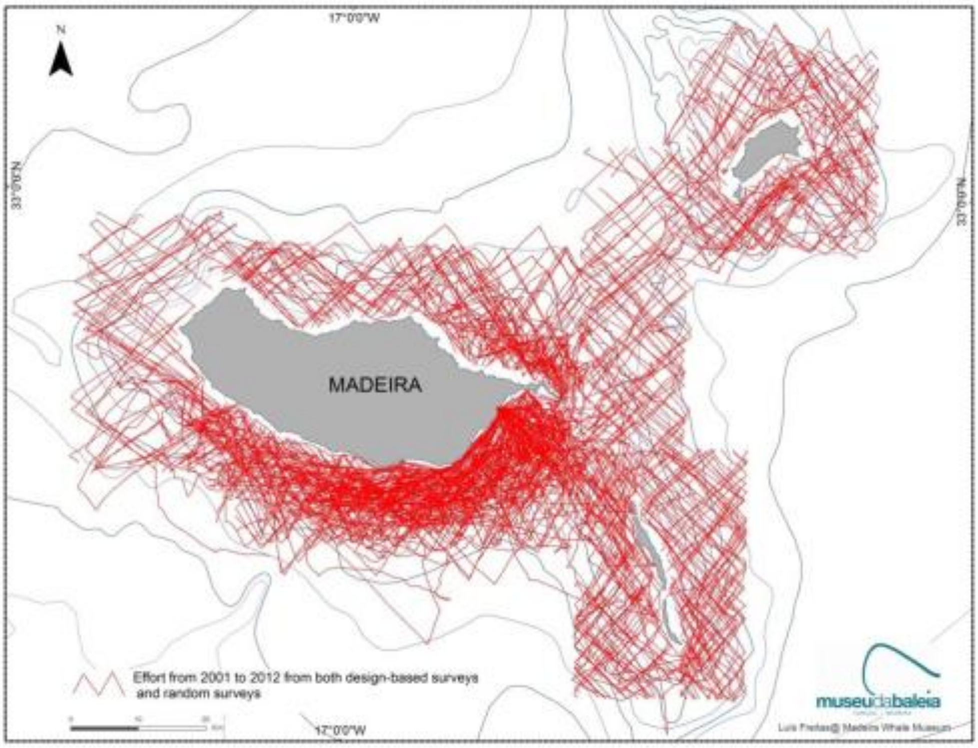

Figure 3 - Survey effort carried out by the MWM between 2001 and 2012.

Canaries

The information included in the IA for the Canary Islands was taken mainly from the Society for Study of Cetaceans in the Canary Archipelago (SECAC) organization and from the University of La Laguna (ULL). Being aware that there are more organizations developing cetacean studies in the region and, therefore, data on distribution and abundance are available, there is no published paper or report in which all this information has been gathered and analysed together. Because of this, and due to the impossibility of pooling all the information in a short period of time, it was decided to include in the IA the information obtained by SECAC in the last 20 years. As shown in Figure 4, except to "Gran Canaria" island the main survey effort has been carried out in the leeward side of the islands: western and southern areas in the western islands, and eastern and southern areas in the eastern islands. Between 1980 and 2012, 1,348 days of sample effort have been carried out summarizing 4,711 hours and 58,849 km on effort, and 3,904 cetacean sightings recorded.

ULL has concentrated most effort in the same lee areas of the western islands of El Hierro and Tenerife. In addition, it performed an archipelagic survey covering the deep waters of the full archipelago (from the 500 m isobath to 27 km from this line) (Figure 5). The survey followed standard line-transect DISTANCE methodology and the acoustic survey coverage is shown in Figure 6 (Aguilar *et al.* 2010, Fais *et al.* 2016).

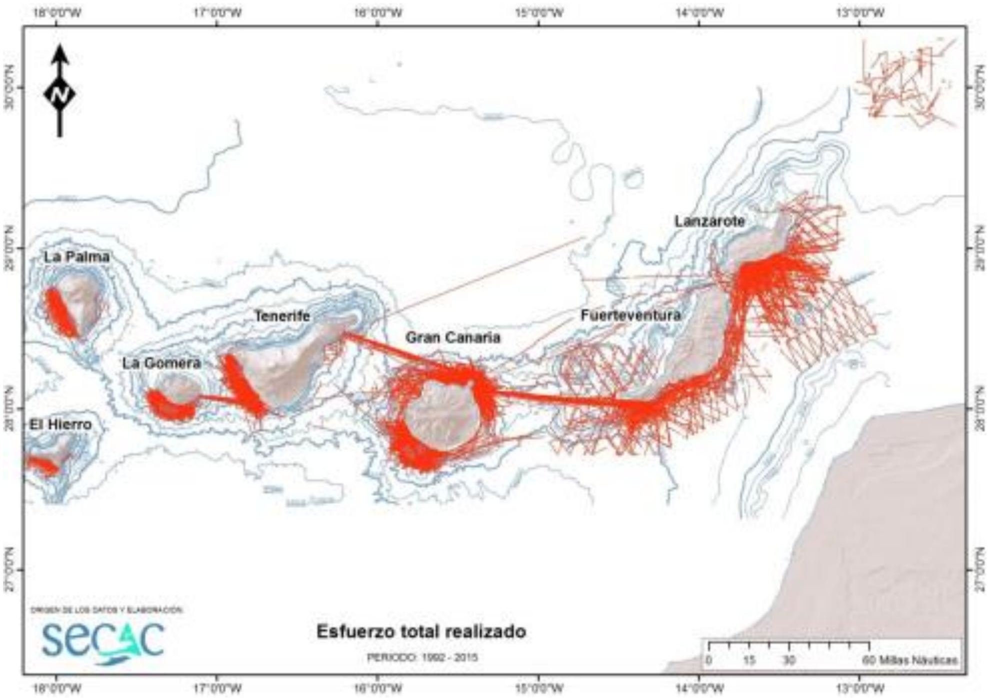

Figure 4 - Survey effort carried out by SECAC between 1999 and 2015.

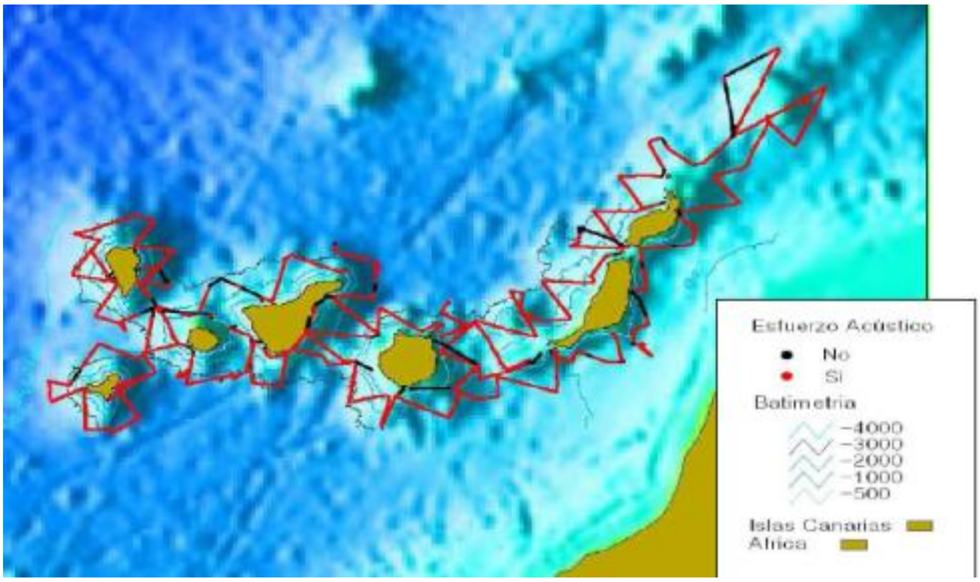

Figure 5 - Acoustic survey effort (red lines) carried out by ULL in winter 2009-2010. The frequency response of the array covered delphinids, sperm whale and beaked whale vocalizations.

5.1.3.2. Tursiops truncatus

Azores

This species is present all year-round in the Azores, mainly over shallower areas (median =673 m) around the islands and offshore seamounts (Silva *et al*. 2014) (Figure 6). Photo-identification and genetic data indicate that bottlenose dolphins in the Azores constitute a single, open population composed of several geographic communities that interact with neighbouring communities and with dolphins from outside the archipelago (Quérouil *et al*. 2007, Silva *et al*. 2008). Genetic studies show that there is no population structure within the Azores archipelago and that dolphins from the Azores are not genetically differentiated from dolphins occurring in Madeira or in the offshore waters of the North-west Atlantic (Quérouil *et al*. 2007). A recent study further suggests that dolphins from the Azores are part of the same population of dolphins sampled in offshore European Atlantic waters, but are genetically distinct from dolphins found in coastal waters of the UK, Ireland, France and South Galicia, as well as from dolphins from the Strait of Gibraltar and Alboran Sea (Louis *et al*. 2014). Thus, bottlenose dolphins occurring in the Azores are part of the offshore bottlenose dolphin population of the North Atlantic.

Nevertheless, photo-identification data indicates that within the bottlenose dolphin population using the Azores waters, there are several groups that are island-associated. One of these groups, composed of 44 dolphins, has a home range centred at the islands of Faial and Pico, and shows strong site fidelity to this area (Silva *et al*. 2008, 2009, 2012). A second group is known from S. Miguel (Silva *et al*. 2008). Although these resident groups are not genetically differentiated from the offshore dolphin population, they have distinct ranging and habitat patterns from the offshore population and may be a unique ecological or demographic unit.

The resident's groups range overlap areas used intensively by whale-watching operators, and dolphins are exposed to these boats on a daily basis (Silva *et al*. 2012). Repeated encounters of these dolphins with whale-watching boats may result in chronic stress and/or repeated disruption of critical behaviours, eventually leading to reduced fitness of individuals, which may compromise the long-term viability of the resident group. Being island-associated, these groups are also exposed to other impacts such as marine traffic and noise, as well as habitat loss and damage, litter, fisheries by-catch and prey depletion.

The bottlenose dolphin was chosen as a MU, because it is one of the most frequently sighted species in all the Macaronesia archipelagos and is also included in Annex II of the Habitats Directive. The species is representative of coastal and island shelf habitats, and can be used to assess environmental state of ecosystems therein. This species is frequently involved in interactions with demersal fisheries and is therefore at increased risk of incidental mortality (Silva *et al*. 2011). Furthermore, resident groups may be used to assess impacts from sub-lethal pressures of whale-watching activity.

Using mark-recapture models applied to photo-identification data, Silva *et al*. (2009) estimated the bottlenose dolphin population of Faial and Pico as consisting of 334 adults (95% CI=237-469; CV=0.10) and 311 sub-adults (95%CI=212-456; CV=0.13). These datasets can also be used to provide estimates of survival rates for this population.

There are no baseline values for the abundance of bottlenose dolphins for the whole archipelago of the Azores.

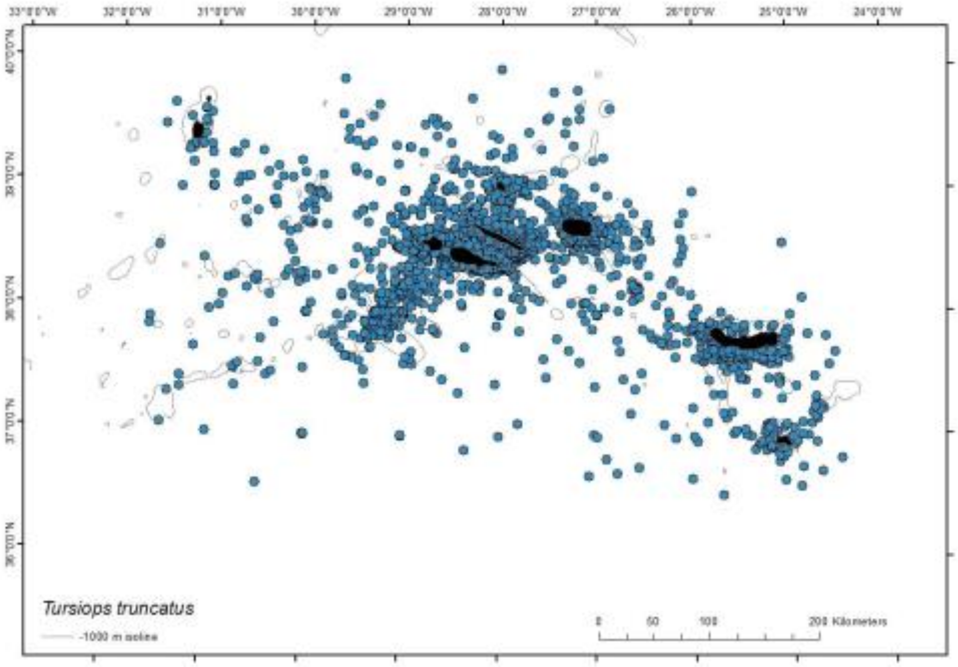

Figure 6 – Sightings of bottlenose dolphins recorded by POPA between 1998 and 2015.

Madeira

The bottlenose dolphins have a permanent presence in Madeira coastal waters, with preferential use of waters with less than 1000 m depth southeast, east and northeast of Madeira Island (Figure 7). Genetic and photo-identification studies over the last decade have shown that bottlenose dolphins using Madeira waters are part of a larger oceanic population (Quérouil *et al.* 2007), with most animals being identified once in these waters (transient animals) and a much smaller proportion being re-sighted (animals associated to the islands) (Dinis 2014). These two ecotypes mix and interact with each other contributing to a complex social and population structure, avoiding however the genetic isolation of the animals more associated with the islands. Both these ecotypes use Madeira waters for feeding, socialising, resting, breeding and calving, but the island associated animals are more vulnerable to local human impacts due to much higher use of this area (Dinis *et al.* in press, Freitas *et al.* 2014b).

The abundance and distribution pattern of this species in offshore waters of Madeira archipelago (EEZ) is unknown, although the results from data collected by observers on board tuna fishing boats in offshore waters shows evidence of mostly coastal distribution of the species in the archipelago (Nicolau *et al.* 2014).

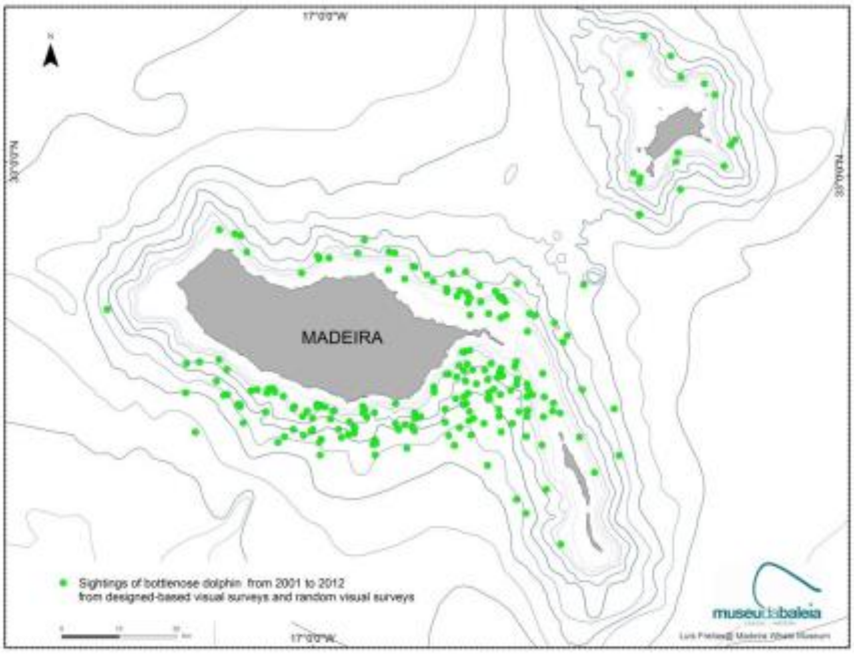

Figure 7 – Sightings of bottlenose dolphins recorded by MBM between 2001 and 2012.

The bottlenose dolphin was proposed as a MU for Madeira due to its more coastal distribution, occupying a specific ecological niche associated with shallower waters and bottom feeding, and thus a higher expected susceptibility to local human impacts. The bottlenose dolphin is one of the species subject to more human pressure in Madeira waters, namely whale-watching and local marine traffic. Thirty-five percent of all whale-watching boats sightings are of bottlenose dolphins, being the most observed cetacean species (Freitas *et al.* 2014b). This species is also listed in Annex II of the Habitats Directive.

Taking in consideration what was previously mentioned, two MUs were considered in Madeira waters to this species, namely: I – all bottlenose dolphins using the Madeira archipelago coastal waters (transients and island-associated animals); II – island-associated animals. Methodological limitations prevent the use of a common methodology to estimate abundance of offshore and island-associated animals. To overcome this limitation, an overall estimate of abundance is obtained for the bottlenose dolphins using Madeira inshore waters (MU1 - transients and island-associated animals) using design-based distance sampling methods, while the more vulnerable island associated groups are monitored resorting to photo-identification/mark-recapture. By adopting these two local MUs it will be possible to monitor changes in the abundance of transients using the area as well as of island-associated animals and possibly to understand if the factors driving eventual changes are local or not.

There are baseline values (absolute abundances and related distribution maps) for these MUs, being however important to improve the reliability of the present survival rate estimate for the "islands associated animals" in order to be considered as baseline value for this MU demography indicator (Dinis 2014; Freitas *et al.* 2014b).

Those baseline values are:

- population using the coastal waters of Madeira, Porto Santo and Desertas Islands - 482 animals (95%CI=365-607, CV=0,135);
- island-associated groups using the south coast of Madeira - 183 animals (95%CI=155-218, CV=016).

Canaries

Bottlenose dolphins are present all year-round in the Canary Islands, mainly distributed in coastal areas not deeper than 600 m (Figure 8). They are present in all Special Areas of Conservation (SAC) declared in Canary Islands, of which five represent important feeding and breeding areas for this species. Although there is no bottlenose dolphin abundance estimate for whole Canary Islands, a recent study highlights the movements of individuals among western islands (El Hierro, La Palma, La Gomera and Tenerife) (Tobeña *et al*. 2014), indicating that at least 20% of the dolphins in the western islands travel among different SACs.

One of the criteria used to select this MU was "the priority for other legislation (the bottlenose dolphin and harbour porpoise for example, both included in Annex II of the Habitats Directive)". In addition, bottlenose dolphins in the Canary Islands move in the oceanic channels between islands, and around coastal areas, where it is exposed to anthropogenic pressures such as marine traffic, whale-watching, fishing activity, etc. For all these reasons a coastal *Tursiops truncatus* MU was selected for Canary Islands. There is the need to analyse the available data of different organizations to get a baseline value for this MU.

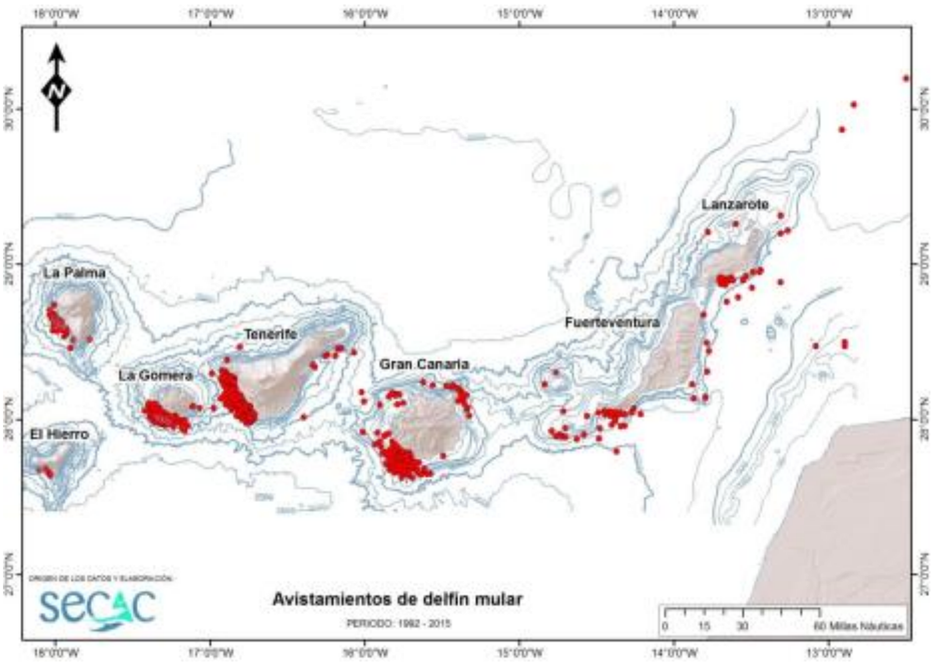

Figure 8 – Sightings of bottlenose dolphins recorded by SECAC between 1999 and 2015.

5.1.3.3 Delphinus delphis

Madeira

The common dolphin has a seasonal presence in Madeira coastal waters, mainly in winter and spring. Still, some groups are seen year-round. To our knowledge, this species uses all waters around Madeira from shore to the high seas, although recent models of the species distribution in the archipelago (GAMs) points out for a preference within the coastal waters for eastern and western waters of Madeira Island and the east of Desertas and Porto Santo Islands (Freitas *et al.* 2014a) (Figure 9). These animals belong to a larger oceanic population that includes common dolphins from Azores, as shown by the absence of genetic structure between animals of the two archipelagos (Quérouil *et al.* 2010).

The abundance and distribution pattern of this species in offshore waters of Madeira archipelago (EEZ) is unknown, although it was the most sighted species by observers on board tuna fishing boats in offshore waters (Nicolau *et al.* 2014).

The common dolphin uses Madeira archipelago inshore waters for feeding (mainly small pelagic fish), resting, socialising and calving (Freitas *et al.* 2014a). Although their seasonal presence reduces the exposure to local human impacts in the coastal waters, its wide movements and considerable use of offshore waters makes it potentially vulnerable, directly or indirectly, to fisheries and other human activities in the open ocean. This species is also targeted by whale-watching boats, being the fourth most observed with 11% of all sightings (Freitas *et al.* 2014a).

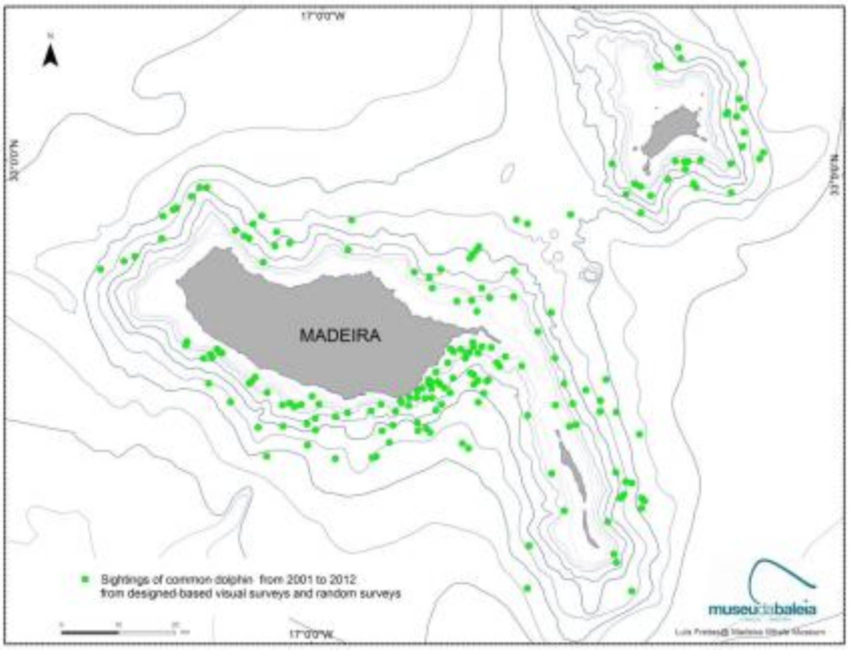

Figure 9 – Sightings of common dolphins recorded by MBM between 2001 and 2012.

The common dolphin was proposed as indicator species for Madeira due to its more oceanic distribution, occupying a specific ecological niche associated with pelagic waters, feeding on prey also targeted by fisheries (small pelagic fish) and interacting more often than other cetacean species with the tuna fishing boats (Nicolau *et al.* 2014). The examination of stranded animals over the years has shown evidence of mortality in this species related with human activities, namely, impact from litter, by-catch and intentional killing, although those impacts seem to be at a very low level (MBM unpublished data).

There are baseline values (absolute abundances - 741 animals (95%CI=496-1032, CV=0.266); and distribution maps) for this MU - animals using Madeira archipelago coastal waters seasonally (Freitas *et al.* 2014a).

5.1.3.4 Stenella frontalis

Azores

This species is seasonally abundant in the Azores. First sightings usually occur in early May, the highest relative abundance is reached in July/August, depending on the years, and by October the species disappears from the area (Silva *et al.* 2014). Atlantic spotted dolphins are widely distributed in the Azores and occupy a broad range of habitat types but typically have a more oceanic distribution than bottlenose dolphins (Silva *et al.* 2014) (Figure 10). The population of Atlantic spotted dolphins of the Azores is not genetically differentiated from the population of Madeira archipelago (Quérouil *et al.* 2010). There have been no studies comparing the genetic structure of Atlantic spotted dolphins from Azores and Canaries, but given the wide-ranging movements of the species and their seasonal presence in the Azores, a single population is expected to occur in Macaronesian waters.

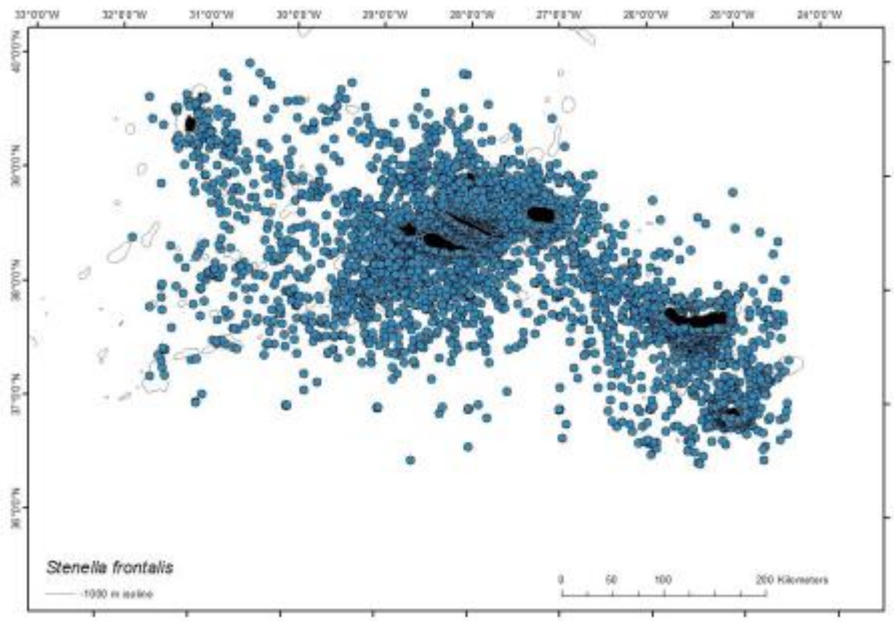

Figure 10 – Sightings of Atlantic spotted dolphins recorded by POPA between 1998 and 2015.

Atlantic spotted dolphins were selected as a MU because they are one of the most abundant species in Macaronesia. They feed on small epi- and mesopelagic fish and squid and, at the Azores, explore mostly offshore habitats, being a good indicator of GES of pelagic ecosystems. In addition, the distribution of the species seems to be strongly linked to water temperature (which possibly affects the distribution of their preferred prey) and abundance of the species may provide a good indicator of climate-induced changes in marine ecosystems of the region.

There are no baseline values for the abundance of Atlantic spotted dolphins in the archipelago of the Azores.

Madeira

The Atlantic spotted dolphin has a seasonal presence in Madeira coastal waters, mainly in summer and autumn, but is also observed the rest of the year. This species uses all waters around Madeira, although recent models of the species distribution in the archipelago (GAMs) points out for a preference for the southern and northern coast of the island (Freitas *et al.* 2014a) (Figure 11). Like the common dolphin, these animals belong to a larger oceanic population that includes the animals from Azores, as shown by the absence of genetic structure between animals of the two archipelagos (Quérouil *et al.* 2010).

The abundance and distribution pattern of this oceanic species in offshore waters of Madeira archipelago (EEZ) is unknown, although it was the second most sighted species by observers on board tuna fishing boats in offshore waters (Nicolau *et al.* 2014).

The Atlantic spotted dolphin uses Madeira archipelago inshore waters for feeding (mainly small pelagic fish), resting, socialising and calving (Freitas *et al.* 2014a). Although their seasonal presence reduces the exposure to local human impacts in the coastal waters, its wide movements and considerable use of offshore waters makes them potentially vulnerable, directly or indirectly, to fisheries and other human activities in the open ocean. This species is also targeted by whale-watching boats, being the second most observed with 23% of all sightings (Freitas *et al.* 2014a).

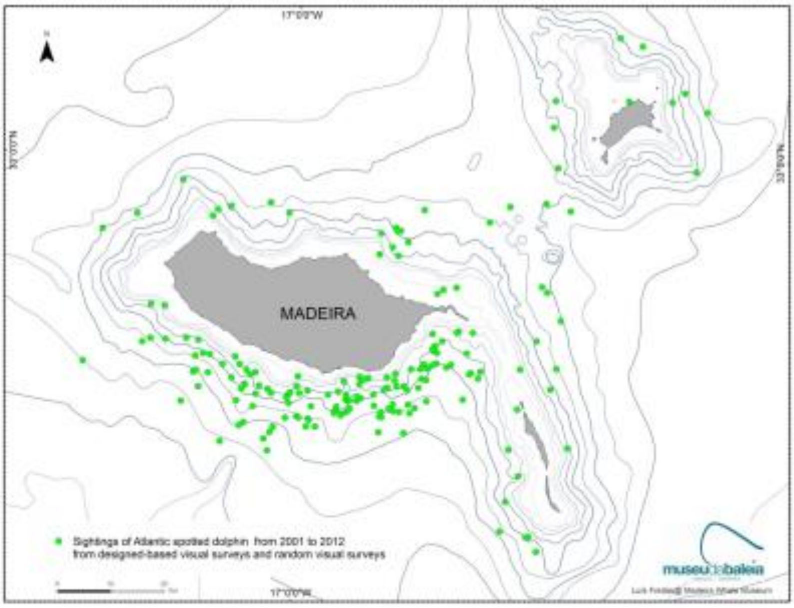

Figure 11 – Sightings of Atlantic spotted dolphin recorded by MBM between 2001 and 2012.

The Atlantic spotted dolphin was proposed as an indicator species for Madeira for the same reasons as the short-beaked common dolphin, but with a complementary seasonal presence. Additionally, this species is also important because it will be the only common species to be monitored in the three Macaronesian archipelagos.

There are baseline values (absolute abundances - 1067 animals (95%CI=717-1378; CV=0.217); and distribution maps) for this MU - animals using Madeira archipelago coastal waters seasonally (Freitas *et al.* 2014a).

Canary Islands

This species is present throughout the year in the islands, with relative fewer sightings during the summer months, and is distributed all over the area (Figure 12). The main threat to the Atlantic spotted dolphin is interactions with fisheries.

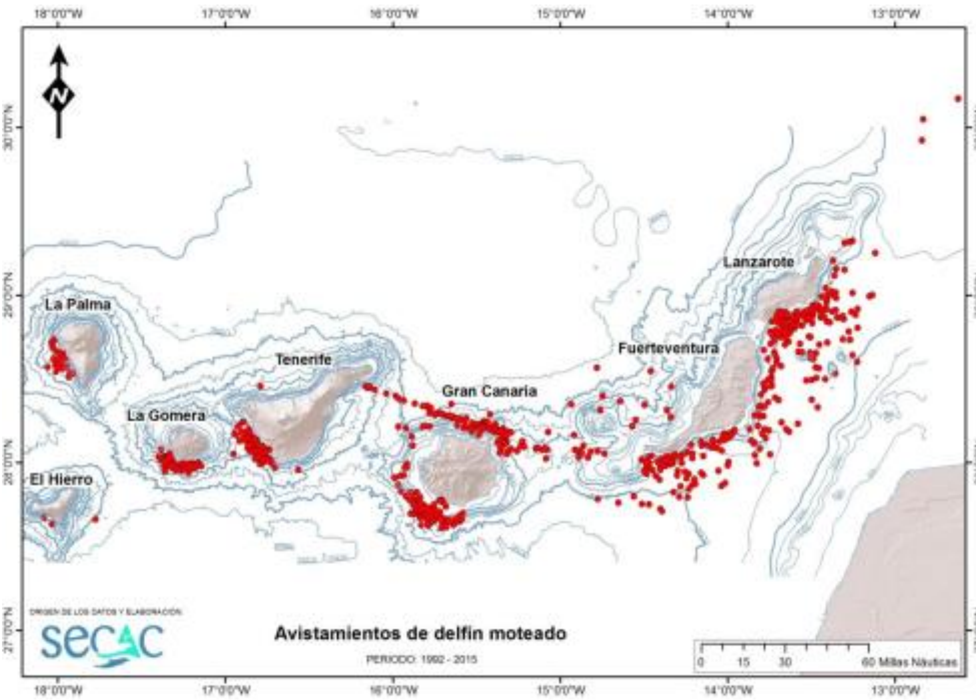

Figure 12 – Sightings of Atlantic spotted dolphins recorded by SECAC between 1999 and 2015.

Despite not being included previously as a MU for Canary Islands, it was decided that it is necessary to include a cetacean species to indicate the GES of the pelagic habitat in the Archipelago. Although there are no baseline values of abundance for Canary Islands, available data exist and should be analysed as soon as possible.

5.1.3.5 Grampus griseus

Azores

Risso's dolphins are present year-round in the Azores where they tend to occupy waters deeper than 1000 m, as well as island shelves (Silva *et al.* 2014) (Figure 13). This species feeds mostly on mid- and deep-water cephalopods and is therefore a good indicator of GES of deep pelagic systems. One resident population is known to inhabit coastal waters off the southern coast of Pico Island, showing site fidelity and relatively restricted home ranges (Hartman *et al.* 2014, 2015). This area is intensively used by whale-watching boats and presence of boats has been shown to disrupt resting patterns of Risso's dolphins (Visser *et al.* 2010).

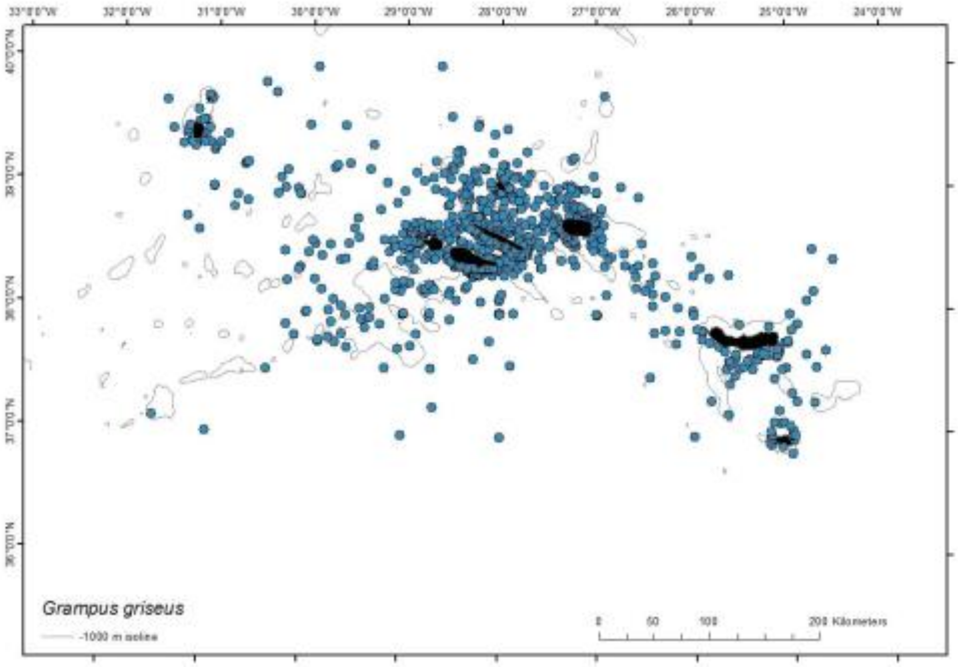

Figure 13 – Sightings of Risso's dolphins recorded by POPA between 1998 and 2015.

The group of Risso's dolphins inhabiting Pico Island was selected as a MU to assess the state of pelagic ecosystems on island shelves. Given the group's sensitivity to whale-watching boats, it also provides a useful indicator of pressure from this human activity. This MU can be regarded as the equivalent to *Globicephala macrorhynchus* that was selected for Madeira and Canaries.

Mark-recapture analysis of photo-identification data resulted in estimates of abundance of 452 (95%CI=408 – 496) individuals and survival rates of 0.97 (95%CI=0.79-0.99) for the island-associated Risso's dolphins (van der Stap and Hartman, pers. comm.).

5.1.3.6 Globicephala macrorhynchus

Madeira

Short-finned pilot whale like the bottlenose dolphin has a permanent presence in Madeira coastal waters. However, this deep diving species explores a completely different ecological niche with a preferential use of waters deeper than 1000 m. Their use of Madeira coastal waters is uneven, with a much higher presence in the southeast of Madeira (Figure 14).

Photo-identification studies over the last decade has shown that short-finned pilot whales using Madeira waters belong to a larger oceanic population with most animals being identified once in these waters (transient animals) and a much smaller proportion being re-sighted (visitors and animals associated to the islands) (Alves *et al.* 2013). These two ecotypes mix and interact with each other contributing to a complex social and population structure, and preventing genetic isolation of the island-associated animals. Both these ecotypes use Madeira waters for feeding, socialising, resting, breeding and calving, but the island-associated animals are more vulnerable to local human impacts due to much higher use of this area (Freitas *et al.* 2014a). This species is also targeted by whale-watching boats, being the third most observed with 12% of all sightings (Freitas *et al.* 2014a).

The distribution pattern and the extent to which this species uses the offshore waters of Madeira archipelago (EEZ) are presently unknown (Nicolau *et al.* 2014).

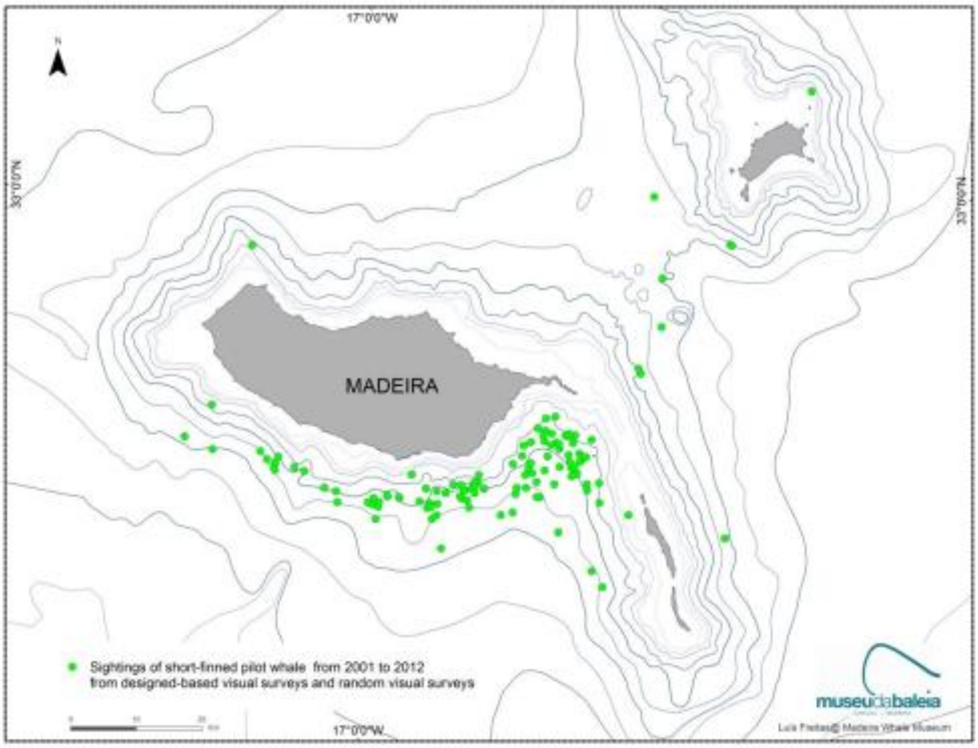

Figure 14 – Sightings of short-finned pilot whales recorded by MBM between 2001 and 2012.

The short-finned pilot whale was proposed as indicator species for Madeira due to its more offshore distribution in the coastal waters of Madeira, occupying a specific ecological niche associated with deep waters and bottom feeding. Taking in consideration what was previously mentioned, two MUs are proposed for Madeira waters namely: I – all short-finned pilot whales using the Madeira archipelago coastal waters (transients, visitors and island-associated animals); II –island-associated animals. Methodological limitations prevent the use of a common methodology to estimate abundance of offshore and island-associated animals. To overcome this limitation, an overall estimate of abundance is obtained for the bottlenose dolphins using Madeira inshore waters (MU1 - transients and island-associated animals) using design-based distance sampling methods, while the more vulnerable island associated groups are monitored resorting to photo-identification/mark-recapture. By choosing these two local MUs it will be possible to monitor changes in the abundance of transients using the area as well as of island-associated animals and possibly understand if the factors driving eventual changes are local or not.

There are baseline values (absolute abundances and related distribution maps) for these MUs, as well as survival rate estimate for the “islands associated animals” (Alves *et al.* 2014, Freitas *et al.* 2014a). Those baseline values are:

- population using the coastal waters of Madeira, Porto Santo and Desertas Islands - 151 animals (95%CI=99-201, NCV=0.227);

- population of island-associated groups using the south coast of Madeira - 140 animals (95%CI=131-151, CV=0.05);
- Survival rate of island-associated groups using the south coast of Madeira - 0.960 (95%CI=0.853–0.990, SE=0.028).

Canary Islands

Temporal distribution of short-finned pilot whales in Canary Islands is similar to that of bottlenose dolphins, because they are present all year-round. However short-finned pilot whales prefer the slope, being more abundant in waters with depths between 700 m and 2000 m (Figure 15). This is probably the most studied cetacean species in the Canaries archipelago, with resident groups in the southern part of Tenerife where a very important whale-watching industry has been created based on their presence.

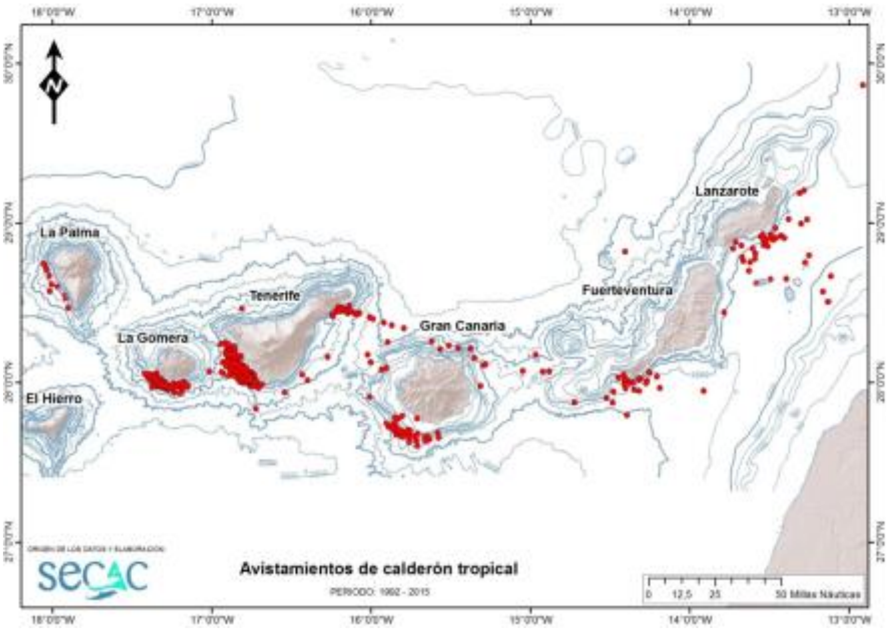

Figure 15 – Sightings of Short-finned pilot whales recorded by SECAC between 1999 and 2015.

So, this species, and mainly the MU corresponding to Tenerife and La Gomera islands, constitutes a very good indicator of the GES due to the amount of long data series, and because is under great pressure of the whale-watching industry.

Servidio (2014) has obtained through spatial model analysis an abundance estimate for the whole Canary Islands of 1980 animals (95%CI=1442-2324, CV=0.33) and for Tenerife and La Gomera islands an abundance estimate of 636 animals (95%CI= 602-671, CV=0.028) based on mark-recapture analysis. This estimate is higher than previous estimates by Heimlich Boran (1993).

5.1.3.7 Ziphius cavirostris

Canary Islands

Cuvier´s beaked whales are deep-diving species targeting very different deep-water resources than pilot whales and sperm whales. Cuvier´s beaked whales are present all year-round in the Canary Islands, with some high level of residency in some areas like in southern area of El Hierro island (Reyes *et al*. 2015), and the eastern areas of Lanzarote and Fuerteventura Islands. The data collected by SECAC between 1998 and 2012 show that the sightings recorded in the eastern areas of Lanzarote and Fuerteventura islands are mainly distributed in deep waters between 1200 m and 1500 m (Figure 16)

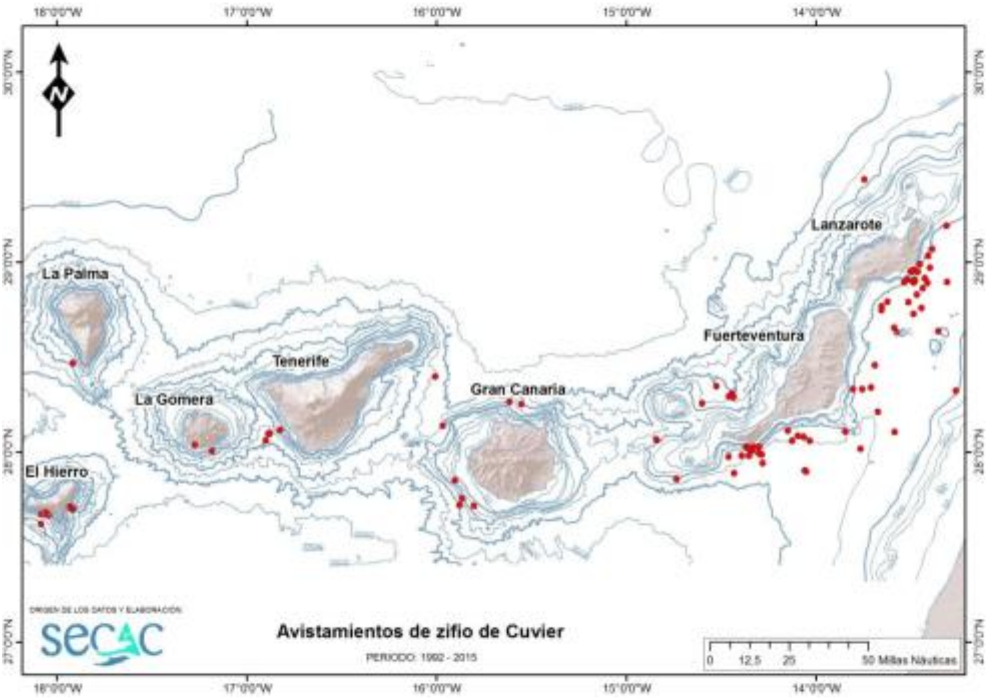

Figure 16 – Sightings of Cuvier´s beaked whales recorded by SECAC between 1999 and 2015.

The Cuvier´s beaked whale is the most abundant Ziphiid species implicated in mass stranding events that occurred in different parts of the world, including the Canary Islands on several occasions. Some of these events have coincided with the celebration of naval exercises (Fernandez *et al*.2005, Santos *et al*. 2007, Martín and Tejedor 2009). Due to this, in 2004 a moratorium to the use of naval sonar was declared by the Spanish Ministry of Defence within 50 nautical miles of the Canary Islands. Since then, no more atypical mass stranding's of beaked whales have been recorded in the archipelago. Beaked whales are susceptible to other noise sources also, and for this reason they are among the best cetacean species to indicate pressure from anthropogenic noise, a pressure with potential population level effects in some cases. Beaked whales are also very susceptible to plastic ingestion. The Strandings Network in Canary Islands has recorded several stranded Cuvier´s beaked whales with plastics in their digestive system.

As pointed out previously in this document (see 6.1.1.3 Canarias: Current approach) two species of beaked whales were initially selected as MUs: Cuvier´s beaked whale and Blainville´s beaked whale. During the cetacean experts working group in WP1 meeting it was agreed that both species were indicators of the same habitat and anthropogenic pressures and because of this it was decided to eliminate one of them. It was decided to select Cuvier´s beaked whale as the MU indicator of GES indicator in deep water habitats and a low caloric trophic niche, and to divide this MU into two separated ones based on the existence of two main hot spots in the archipelago: eastern islands (mainly in El Hierro Island) and western islands (mainly in eastern areas of Lanzarote and Fuerteventura Islands).

Reyes *et al*. (2015) have obtained an abundance estimate of 61 animals (95% CI=55-76, SE=4.9) for the southern area of El Hierro Island based on the mark-recapture analysis of photo-identification data collected between 2003 and 2014.

5.1.3.8 Physeter macrocephalus

Azores

Sperm whales are the third most frequently sighted cetacean in the Azores. The species is present throughout the year being frequently observed in deep waters (approximately 1500 m) (Silva *et al*. 2014) (Figure 17). They feed on a variety of mesopelagic cephalopods and fish (Clarke *et al*. 1993).

About two-thirds of the sightings of the species comprise groups of adult females, sub-adults and calves of both sexes, which remain in the area 2-3 weeks foraging. Adult males, observed singly or in aggregations, are also common in the area. New-born calves are observed mostly in summer months. Thus, the Azores is one of the most important habitats for the species in the North Atlantic, used for feeding, mating and calving. Genetic studies confirmed that sperm whales observed in the Azores belong to the same unique North Atlantic population (Pinela *et al*. 2009).

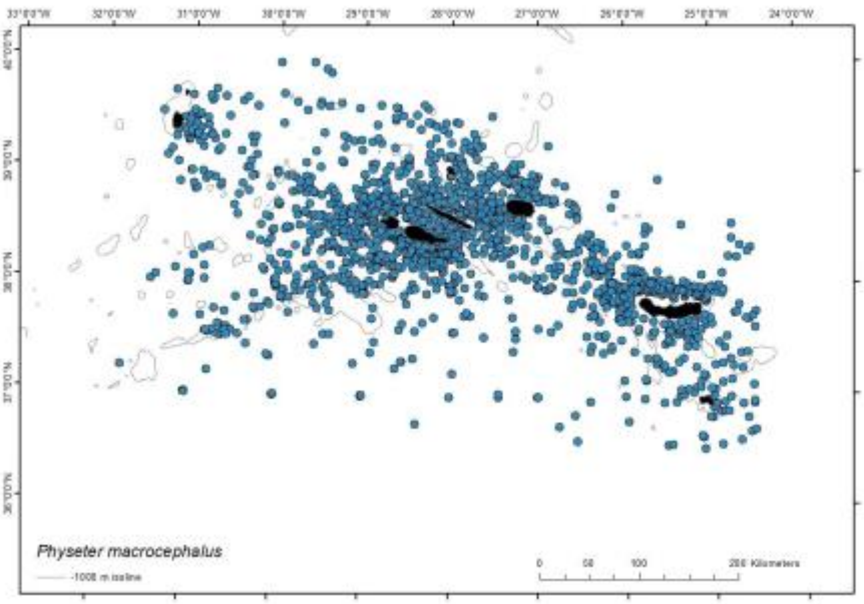

Figure 17 – Sightings of sperm whales recorded by POPA between 1998 and 2015.

This species was chosen to be a MU because they can be used to assess the environmental state of deep mesopelagic marine waters, a type of ecosystem that is difficult to monitor directly. Being one of the main targets of the whale-watching industry (Oliveira 2005), this MU may also be used to monitor impact from this pressure. Additionally, four incidents of ship collisions in the Azores that resulted in the confirmed death of four out of six sperm whales struck, point to a new pressure in this region. Ship collisions are also known to affect other cetaceans, as baleen whales, and needs to be closely monitored. The species may also be affected by underwater noise, especially from seismic surveys widely used in geophysical research and mining exploration.

Using data collected until 1995, Matthews *et al*. (2001) estimated that 227 (SD=99) adult females and 332 (SD=140) immature sperm whales use the area around Faial, Pico and S. Jorge each year. Photo-identification data collected in recent years is being analysed to update abundance estimates and provide survival rates for this population.

Canaries

Sperm whales are present all year-round in the Canary Islands. The data collected by SECAC between 1998 and 2012 show that the sightings recorded in the southern areas of Lanzarote and Fuerteventura islands are mainly distributed in deep waters between 1200 m and 1500 m (Figure 18). In a survey carried out in Canary Islands between September 2009 and February 2010, that covered a wider area, Fais *et al*. (2016) registered a total of 85 acoustic detections distributed mainly between 1500 m and 3500 m (Figure 19).

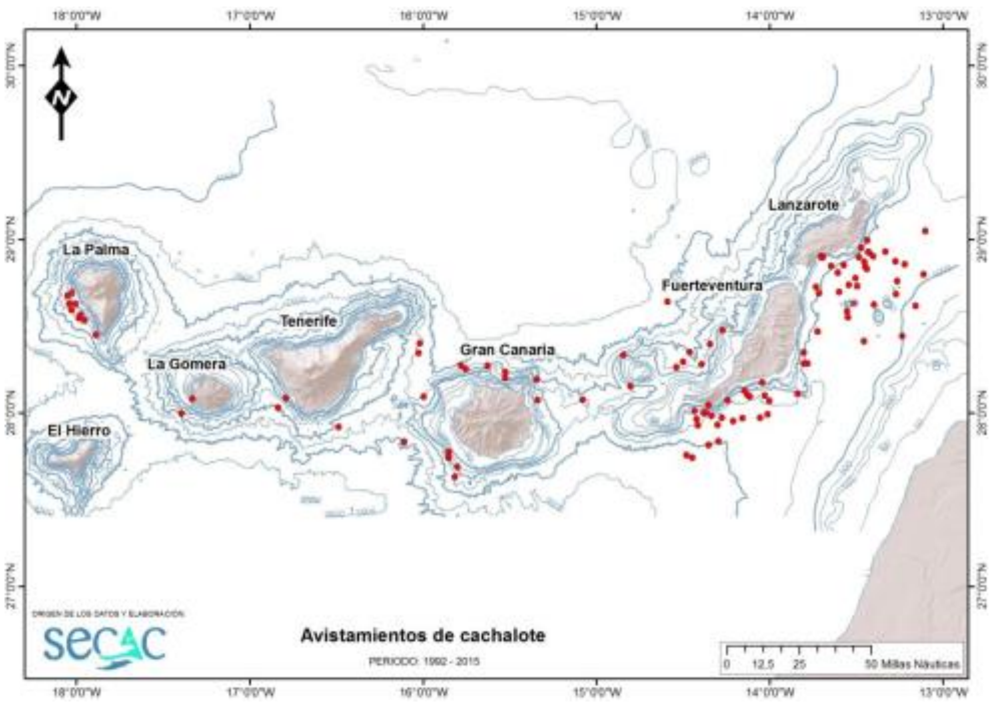

Figure 18 – Sightings of sperm whales recorded by SECAC between 1999 and 2015.

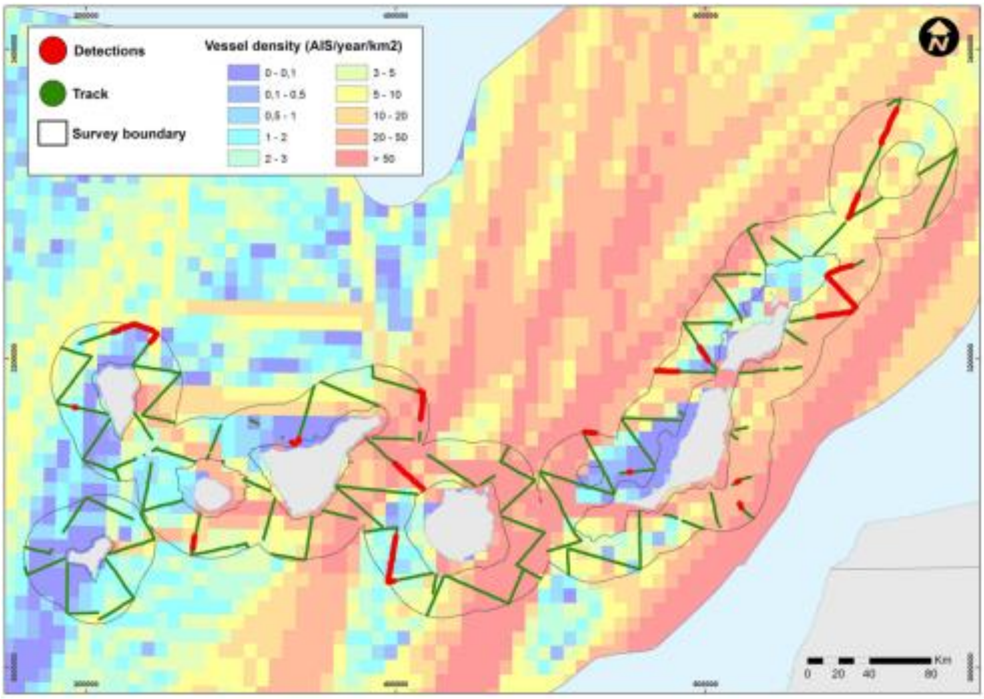

Figure 19 – Acoustic detections of sperm whales recorded by ULL between September 2009 and February 2010.

Fais *et al.* (2016) estimated an abundance of 224 animals (95%CI=120-418, CV=0.32). On the other hand, an average of 2.33 annual stranded sperm whales were involved in ship strikes from 2000 to 2014 (Gobierno de Canarias 2015). Despite there isn't a complete knowledge about the abundance and population condition parameters of sperm whales in the Canary Islands, ship strike data seems to highlight an important pressure of marine traffic over this species. Due to all these factors it was decided to select sperm whales of the Canary Islands as another MU for GES assessment.

5.1.3.9 Balaenoptera physalus

Azores

Fin whales are mostly observed from spring to early summer in the Azores archipelago, along the banks off the central islands and in the open waters between groups of islands (Silva *et al.* 2014) (Figure 20). This species has been acoustically detected also during autumn and winter (Silva *et al.* 2014). This is a pelagic species that occurs mostly over 1000-2000 m water depths, while feeding on zooplankton and small epipelagic fish. Satellite telemetry studies show that the region around the Azores constitutes a mid-latitude foraging ground for this species (Silva *et al.* 2013). Fin whales encountered in the Azores in spring and summer belong to the Greenland-Iceland foraging stock. However, genetic analysis suggests a single population of fin whales exists in the North Atlantic (Bérubé *et al.* 1998).

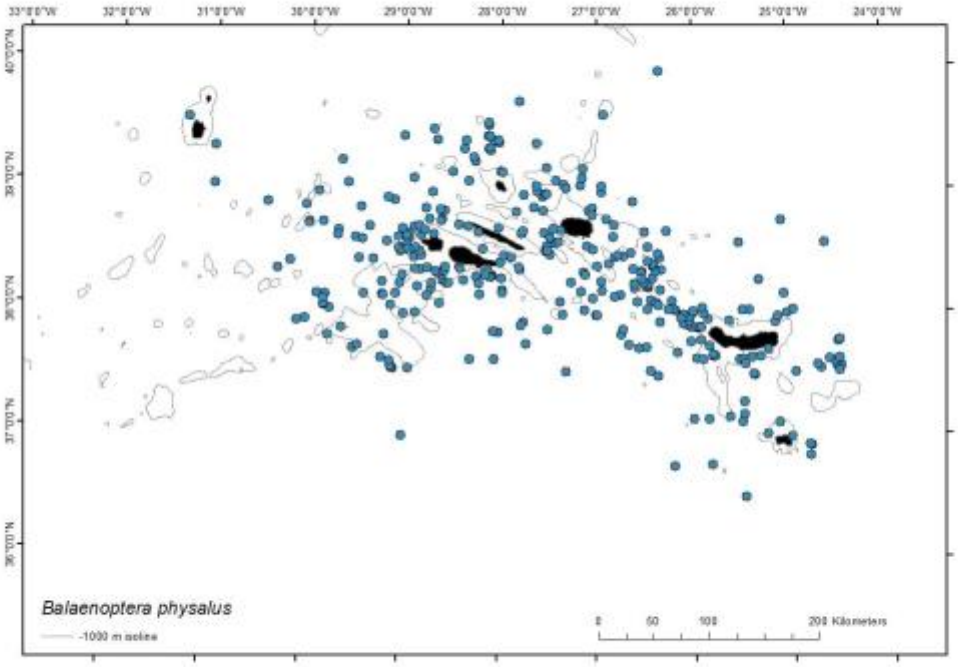

Figure 20 – Sightings of fin whales recorded by POPA between 1998 and 2015.

Fin whales are proposed for consideration as a MU mostly because they occupy a unique niche, at the base of the food web. As such, this species is expected to respond rapidly and strongly to changes in physical, chemical and hydrographic properties of the pelagic ecosystem, as well as to contamination. Additionally, this species may also serve to monitor impacts from ship collisions, low- to mid-frequency underwater noise and whale-watching.

At present there are no data to establish baseline values for abundance of this population and it remains unclear whether precise and robust estimates can be obtained before 2018. Consequently, the decision to include this MU in the list of Marine Mammal MUs for the Azores is conditioned on data availability.

5.1.3.10 Balaenoptera edeni

Madeira

As far as the records show, the Bryde's whale is a species with a recent presence in Madeira waters (Alves *et al*. 2010, Freitas *et al*. 2004b). The first confirmed sighting was only in 2003 in spite of the visual sea survey effort in the previous two years (2001-2002) covering all coastal waters around Madeira, Porto Santo and Desertas Islands (Figure 21), and the operation year-round of whale-watching boats in the south coast of Madeira. To date, this species has been regularly sighted between June and November, during visual nautical and aerial surveys carried out by the MWM and by whale-watching operators (Freitas *et al*. 2012). Some animals, including calves, have been observed in winter time in these coastal waters. Although Madeira archipelago is located at the northern limit of this species range in the East Atlantic a rapid increase in the number of sightings over the last years has been observed (Freitas *et al*. 2012), suggesting Madeira may be used as a feeding and calving area for this species.

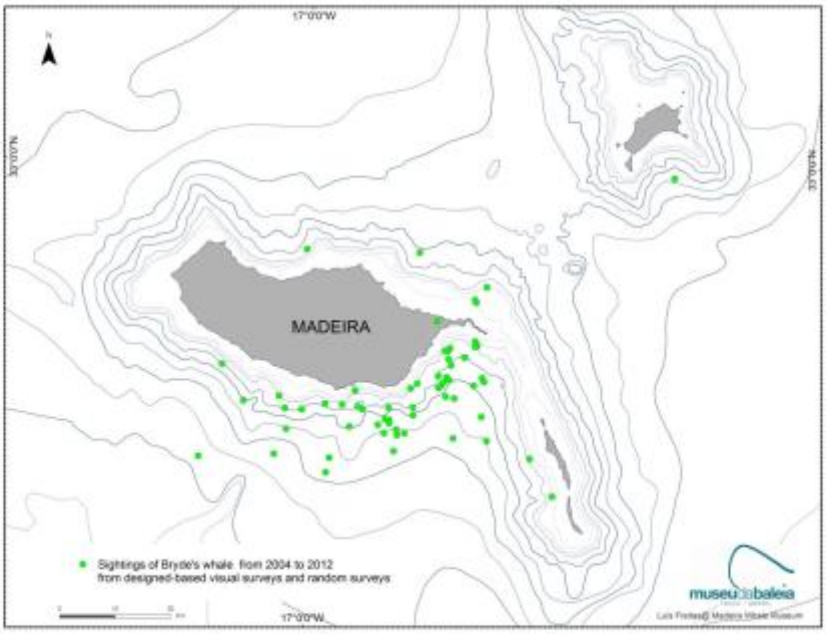

Figure 21 – Sightings of Bryde's whales recorded by MBM between 2004 and 2012.

This species is a good candidate for an indicator species for Madeira waters as it occupies a specific ecological niche in oceanic pelagic waters at lower trophic level in the marine food chain than the common dolphin and the Atlantic spotted dolphin and has higher susceptibility to marine traffic. Five percent of all whale-watching boats sightings are of Bryde's whales, making it the fifth most observed cetacean species (Freitas *et al*. 2014a).

Presently there are no abundance or survival estimates for this species for Madeira waters. However, there are photo-identification data covering the period from 2004 to 2015 that will soon be analysed and used to produce those estimates.

Canaries

This species is restricted to the warm tropical waters of all oceans. However, there is an information gap for the species in the eastern Atlantic and its taxonomy is currently under review. The species exhibits considerable variation among populations and in some regions two forms have been described: a coastal and an oceanic form, with differences in the size and other morphological features. It is the most common baleen whale in the Canary waters (Figure 22), present throughout the year, with a greater number of sightings between April and October. The archipelago is a breeding and feeding area for this species as highlighted by the observations at sea carried out by the SECAC.

The main threats to this species in the region are collisions with high-speed boats. At present photo-identification data are being analysed to provide baseline values for this species.

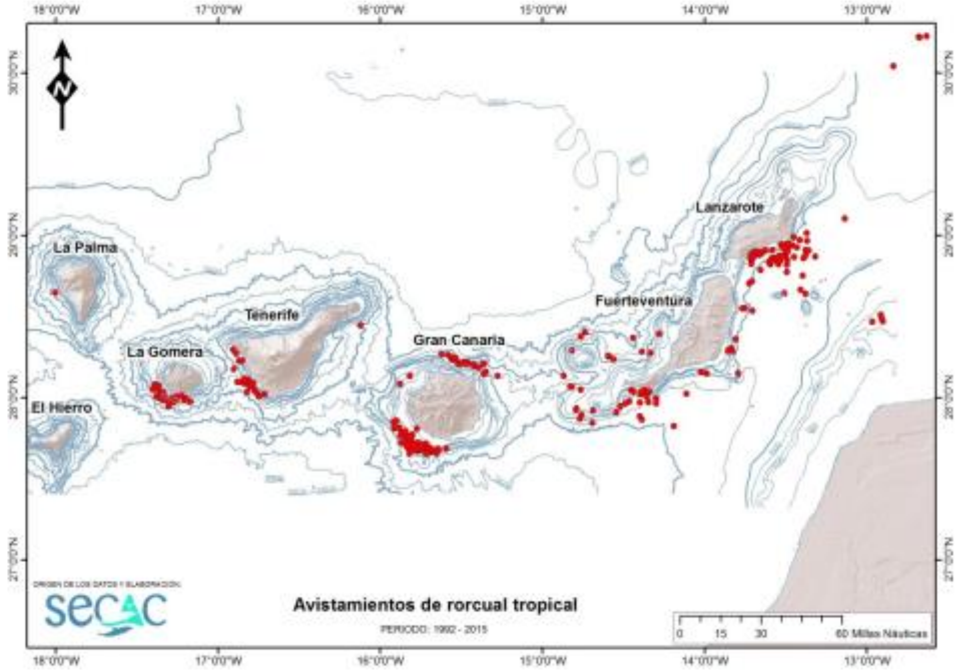

Figure 22 – Sightings of Bryde´s whales recorded by SECAC between 1999 and 2015.

This species could give us information about the GES of the pelagic habitat in a complementary way to that coming from the Atlantic spotted dolphin. Although there are no baseline values, data available can provide those values. The decision about if this MU is selected or not would be conditioned on the results coming from the analysis of that available data.

5.2. Seabirds

5.2.1 - Regional Initial Assessment

5.2.1.1 Azores: Current approach

Azores archipelago is uniquely positioned between temperate and tropical climates, as well as between the land masses of Europe and North America, presenting characteristics and species from both regions. From all the Macaronesian archipelagos Azores is the one with the most complete datasets and databases on distribution and demographic characteristics of its breeding seabird's community (Procellariiformes and Charadriiformes). It is also the archipelago with the widest use of standard methodology and where most testing of new technological approaches have taken place.

The first legal action towards the conservation of wild birds in the region was the adoption of the Birds Directive in 1990 by the Autonomous Region of the Azores designating a total of 15 Special Protection Areas (SPAs). Management plans for seven SPAs (Santa Maria, Terceira, Faial, São Jorge, Graciosa, Flores and Corvo) were produced to be implemented by the Governmental Nature Conservation Department. Management actions such as the eradication of introduced mammals from SPAs (Vila Franca do Campo islet, São Miguel; Praia in Graciosa island), habitat restoration (Vila Franca do Campo islet, São Miguel; Topo islet, São Jorge and Praia islet) and the allocation of rangers, interpretation signs and educational programs have been developed since 1995 with funding from the European Union. Based on that information a proposal to enlarge the SPAs by approximately 80% was produced (Groz *et al.* 2005).

Annual surveys of Common and Roseate Terns have been yearly conducted, in all the nine islands, since 1991 (with the exception of 2005 and 2013). This feat though, is hindered by inaccessibility of most colonies and/or intense predation (by European starling *Sturnus vulgaris granti*, seagulls *Larus cachinnans atlantis* and Ruddy turnstone *Arenaria interpres*) in the more important ones (e.g. Praia and Vila islets), making data collection and research on breeding terns extremely hard.

Each year, the SOS-Cagarro (Cory's shearwater campaign), generates large amounts of data including mass index and sex ratios, with over 1200 birds ringed and 4000 volunteers participating during the 2015 campaign. Despite this effort, a general census for Cory's shearwater *Calonectris borealis* is currently lacking as the latest (2001) showed a significant decrease from the previous (1996/7) census, indicating a steep decline for this species. If this was caused by non-standardized methodologies being used, or a true decline of population abundance, still needs to be clarified. Since 2009 Cory's shearwater breeding success has been monitored at Corvo island (except in 2013) under LIFE Project and After-LIFE Project "Safe islands for seabirds". During 2009 to 2011 the impact of invasive mammals on Cory's population and biology was also evaluated (Hervías *et al.* 2013a). For other Procellariiformes (Macaronesian shearwater *Puffinus lherminieri (assimilis) baroli*; storm-petrel's, *Hydrobates castro* and Bulwer's petrel *Bulweria bulwerii*) there is data from 1997 on call-rates at selected sampling points and capture-mark-recapture (CMR) at Praia and Vila islets since 2001.

Several projects and programmes (MoniAves, Preventing Extinctions, LIFE EuroSAP, etc.) have contributed to the conservation and study of the Azores endemic Monteiro storm-petrel *Hydrobates monteiroi*, therefore gathering and updating baseline values to achieve GES.

All previous and current monitoring programmes were integrated within the MSFD for Azores and data and knowledge gaps were identified. No GES definitions were proposed for the Azores. Programmes like MONIAVES aim to monitor breeding seabirds and to carry out census on seabirds, enabling assessment of variation in annual recruitment. Indicator species used in MONIAVES were Cory's Shearwater (*Calonectris borealis*), Roseate tern (*Sterna dougallii*) and Common tern (*Sterna hirundo*), with parameters studied being population dynamics and structure, contamination, introduced predators (i.e. rodents) and their effects on breeding populations.

In the initial Azores MSDF report, D1 level - biodiversity indicators were chosen for 1.1 Species distribution (distribution area; distribution model), 1.2 Population size (abundance) and 1.3 Population condition (demographics; genetics). Two targets were defined for the Azores regarding seabirds:

- Increase the number of breeding pairs and the area occupied by them in relevant protected areas for breeding seabirds, by installing artificial nests, conducting habitat restoration (invasive plant species control and native plants production) and performing introduced predator control;
- Increase knowledge on population dynamics and demographic characteristics of pelagic migratory species such as breeding seabirds. Analysis of Azorean targets identified more gaps, in particular that the second target was not defined in terms of increase rate or timeline, thus presenting a problem of not being measurable.

5.2.1.2 Madeira: Current approach

Madeira is an internationally important area for seabirds. A total of 10 different species breed in the different islands, small islands and islets of the archipelago distributed over several colonies. Despite the absence of accurate assessment information, it is possible to notice a general positive trend for some species. This is in part due to a very extensive and effective network of marine protected areas. It is also important to stress the existence of very good awareness programmes and campaigns carried out by many different NGOs and public entities. Nevertheless, no GES definition was determined in the initial Madeira MSFD report and the only species selected in that assessment were the two breeding *Pterodroma* species and the Cory's shearwater that were presented without objective indicators or defined targets.

Madeira has very good examples of successful conservation programmes aimed at seabirds. Amongst these the management of the two endemic birds of the genus *Pterodromas sp.* of the archipelago. These threatened species are now stable or recovering, mostly due to the intense work that is being carried out at their breeding grounds. Although there is now a much better knowledge of their life cycle, namely their at-sea areas, little has been done to overcome the challenge of a global effective protection.

There are a few monitoring programmes in Madeira that have been in place for several decades. A good example of this is the follow-up of the Cory shearwaters colony in Selvagens Islands. On the other hand, recent monitoring techniques and methods have been applied, with relative success, in Desertas Islands. Catry *et al.* (2014) using a very labour intense capture-mark-recapture technique (CMR method), managed to estimate breeding bird numbers for the Bulwer's Petrel colony at Desertas islands.

Despite the efforts set in the field throughout the years, little is known regarding seabird number and distribution. Madeira, the largest and more complex island of the archipelago, is by far where the knowledge gap is bigger.

On a long-term approach there are no doubts that it is important to intensify the efforts to update the population estimates and distribution of all breeding seabird species in Madeira archipelago. However, on the short-term, some other quicker and cheaper sources of information should be set up to answer the MSFD questions in time. Monitoring samples of existing colonies, determining trends within those samples and comparing parameters such as breeding success, survival rate or presence absence in some areas is the recommended approach.

5.2.1.3 Canarias: Current approach

Canary Islands are an internationally important area for seabirds. Despite the importance of this territory, most of the information needed for an accurate assessment is still missing. The population estimates for most of the species in Canary Islands is from 1980's (Martín and Hernandez 1985) and didn't follow a standardised and replicable methodology. Hence, it should be regarded as a rough approach. Some other smaller projects have dealt with particular species in selected areas for a short period of time, and this information is the most likely to be used as a baseline value for future research, including the MSFD.

The projects currently running include a Macaronesian shearwater monitoring programme by GIC (with new census at colonies, acoustic monitoring and PTT-tagging); the research carried by the University of Barcelona (nowadays focused on Bulwer's petrel foraging ecology and Cory's shearwater population genetics and migration); a tracking programme of Cory's shearwater carried out by SEO/BirdLife in two LIFE projects that has allowed to identify their foraging areas; a network of observers aboard the ferries that link the islands (CetAvist) obtaining at-sea data of both seabirds and cetaceans distribution; a project focused on analysing the impact that artificial lights have on seabirds and some campaigns promoted by the local governments focused on raising awareness about birds attracted by artificial lights, their rescue and release. As can be seen, there's almost no actual management of the colonies; some of them are infested with introduced predators (such as cats and rats, even in some small islands that could potentially benefit from eradication programmes) and other threats such as the increase of artificial lighting and/or other human-related disturbances affect to the welfare of the populations.

Some references (e.g. Rodríguez *et al.* 2012) have also pointed out the serious decline that some species such as Macaronesian shearwater are experiencing in Canary Islands, whereas some colonies are still predicted to become extinct before any action plan takes part (Bécares *et al.* 2015).

The initial MSFD report for the Canary Islands was focused on the Procellariiformes species breeding in the Archipelago (all included in the Annex I of the Birds Directive). It included all the GES definitions required and even a list of species to which each indicator could apply. Even though the definitions are very accurate and suitable (and thus were agreed by the EU) and the document is highly valuable and an extremely useful guide when it comes to unfold the marine strategy, the knowledge and data gaps on most of the indicator's baseline values difficult GES measurement following the accepted definitions.

Therefore, there is an urgent need to update the population estimates and distribution of all seabird species in the Canary Islands and it will take time and resources to evaluate the current situation. At the same time, some other quicker and cheaper sources of information should be set up to answer the MSFD questions in time. Furthermore, it's worth keeping in mind the need for more sensitisation and awareness campaigns, especially in the eastern islands where, for instances, Cory's shearwaters are still being illegally harvested by locals.

5.2.2 - Recommended MISTIC SEAS approach

Since not all the background data is available from seabird species (population distribution, population abundance and population condition) the MISTIC SEAS seabirds group followed a stoplight methodology in order to find common grounds between archipelagos and determine the indicators reachability.

After this process, 21 MUs, distributed among the different archipelagos, were selected to evaluate the GES, comprising eight species of Procellariiformes and two species of Charadriiformes. While some species can be used in all three archipelagos, some will only be used in one or two, according to breeding distribution, location and/or data/logistic available (Table 12). In total, seven MUs were selected for the Azores, eight for Madeira (with a high number of endemism's) and six for the Canary Islands.

Table 12 - MUs selected for each archipelago (Azores, Madeira and Canary Islands).

COMMON NAME	SCIENTIFIC NAME	AZORES	MADEIRA	CANARY ISLANDS
Bulwer's petrel	Bulweria bulwerii	X	X	X
Cory's shearwater	Calonectris borealis	X	X	X
Band-rumped storm-petrel	Hydrobates castro	X	X	X
Monteiro's storm-petrel	Hydrobates monteiroi	X	-	-
Macaronesian shearwater	Puffinus lherminieri (assimilis) baroli	X	X	X
Zino's petrel	Pterodroma madeira	-	X	-
Desertas petrel	Pterodroma deserta	-	X	-
White-faced storm-petrel	Pelagodroma marina	-	X	X
Roseate tern	Sterna dougallii	X	-	-
Common tern	Sterna hirundo	X	X	X

The major challenge in achieving GES based on seabirds MUs is the difficulty to survey the colonies, as many, if not most, are not easily accessible (or at all) to researchers. Other challenges for researchers, even when the colonies are reachable, are the high density of different species in the same area, as well as some vocal behaviours (i.e. low-vocal nocturnal species) that aren't as easily recorded as others. This results in overlapping of calls, that will create bias towards those species who are more vocal, higher numbered or louder.

Methodologies such as autonomous recording units (ARUs) are useful to population monitoring, with some successful examples, as they are not dependent on the constant and operational presence of the researchers themselves (Oppel *et al.* 2014). These techniques, although crucial when studying certain species or when accessing certain colonies, need to be applied with restrain and caution in order to become a widely used methodology, this way ensuring that the data collected is of the highest possible quality and highly transferable.

Other setbacks that need to be considered when developing general Macaronesian (or regional) methodologies are the threats that some seabird colonies experience, such as predation from introduced predators and light pollution. Predation is a big problem for seabirds, particular those whose nests are easily accessible. For instance Cory's shearwater excavates/uses nests in the floor, and their eggs and chicks are easily predated by introduced predators (i.e. rodents *Rattus sp.* and *Mus musculus*, weasels *Mustela sp.*, feral cats *Felis catus*) and reptiles (i.e. Madeira's lizards *Teira dugesii*) as demonstrated by Igual *et al.* (2005), Matias *et al.* (2009), Amaral *et al.* (2010), Hervías *et al.* (2013a) and Neves *et al.* in press. Breeding failure due to predation has been studied for many species with smaller species being more vulnerable and therefore being restricted to inaccessible islet or cliffs free from introduced predators (Monteiro *et al.* 1996b).

A study by Hervías *et al.* (2013a) showed that the main cause for breeding failure in Cory's shearwaters at Corvo Island was predation by introduced predators, where cats were responsible for over 84% of predated nests, and black rats *Rattus rattus* for 16%. These mammals also influence ectoparasitic intensity in Cory's shearwaters, which in turn decreases their overall fitness (Hervías *et al.* 2013b). Procellariiformes are very sensitive to artificial lights (Imber 1975) because they attend breeding colonies at night. Artificial lights can attract and disorientate birds (Verheijen 1981; Longcore and Rich 2004; Poot *et al.* 2008), particularly fledglings during their first flight to the sea, and many of them thus fall to the ground incurring in fatal injuries, subsequently killed by introduced predators or die of starvation (Le Corre *et al.* 2002; Miles *et al.* 2010). According to Rodrigues *et al.* (2012), 16.7% of fledglings are attracted to lights on São Miguel island (Azores) with 87% of the grounded birds fledged from the four colonies studied. In Terceira Island (Azores), 14 types of lights were found at the 21 locations studied around the coast, Lages having the highest values of light pollution and also the highest percentage of grounded birds (25.6%; Goulart 2014).

Overlapping colonies of Cory's shearwater, the largest Procellariiform in Macaronesia, present disadvantages to smaller species such as Bulwer's petrel, Macaronesian shearwater and storm-petrels, where cases of competition between nest sites (killing to intent of enlarging and using their nest cavities) were documented (Ramos *et al.* 1997). These aspects need to be taken into account when devising the monitoring strategies for different species/colonies.

As a future measure, there is a need to increase the network of Important Bird Areas (IBAs) namely the number of SPA on the Azores as proposed. Currently SPAs proposed under Bird Directive protection are only in effect in Faial and Corvo Islands, which represent 5% of the planned proposal. Rodrigues and Cunha (2012) suggest an increase to 16.8% of the islands area to protect birds and their habitats. Conservation of birds on islands is expensive and requires managers to simultaneously address habitat loss, exotic species (Descriptor 2) and diseases. The decline of seabird's population on Macaronesian islands is a major issue and effective management would be able to protect those populations.

Some areas of Canary Islands and islets (Famara in Lanzarote, Montaña Clara, Alegranza, La Graciosa, Roque del Oeste and Roque del Este) were declared Natural Reserve in 1994 and the access is only allowed for research and conservation purposes. Since 1998 the Natural Reserve was also recognized as an IBA and as a SPA under the EU Birds Directive (Directive 79/409/EEC1979).

However, despite all seabird species being legally protected, some Cory's shearwaters are still harvested illegally, mainly on Alegranza and La Graciosa (Rodríguez *et al.* 2003) so further work should be done on monitoring and law enforcement, to ensure seabirds get the necessary protection from direct and indirect human actions.

GES definitions, indicators and environmental targets

Human exploration and use of oceanic islands has long been a hindrance, when not a direct threat, to seabird populations around the world. Most species of seabirds in Macaronesia breed either in ground cavities, or on easily accessible locations to introduced predators, such as rock cliffs as in the case of the tern species. In contrast, for researchers these areas are often inaccessible or logistically very difficult to survey, thus for many seabird species we still lack basic data on population status. Having available methodology, feasibility of surveys, data quality and quantity gathered, existing datasets, and coordinated efforts of monitoring across borders, the seabird expert group defines, at this stage, GES for seabirds as follows (summed in Table VI):

The MUs were chosen using specifications and standardized methods for monitoring assessment as proposed and previously conducted by the JNCC, the OSPAR commission and other bodies with relevance to seabird monitoring within the MSFD directive, as the Proposal for Commission Revision report.

Procellariiformes

(Bulwer's petrel; Cory's shearwater; Band-rumped storm-petrel; Monteiro's storm-petrel; Macaronesian shearwater; Zino's petrel; Desertas petrel; White-faced storm-petrel**)**. Check Table to see the correspondence between archipelago and MUs.

GES indicator: 1.1.1. Distributional range (corresponding GES criteria 1.1. Species distribution).

- **GES Definition/ET:** The natural distribution range of species remains stable, excluding shifts caused by climate change.
- Indicator category: state
- **Indicator name:** Seabirds distribution AV-DIST.
- **Metric:** Distribution range of colonies.
- **Baseline Value:** Set for each species/MUs.
- **Assessment Value:** Not a single colony has disappeared, as long it's not due to in-land natural events such as land subsidence's or eruptions.

This GES indicator is defined for all species selected (see table 13) with the exception of Cory's shearwater that is not used as a MU for criteria 1.1. This is due to the non-discrete nature of the colonies, making it impossible in most cases to discern any trends.

GES indicator: 1.2.1. Population abundance (corresponding GES criteria 1.2. Population size).

- **GES Definition/ET:** The seabird populations are stable or increase.

- Indicator category: state.
- **Indicator name:** Abundance of breeding seabirds AV/RT-ABU.
- **Metric:** Relative abundance (equal to abundance estimate divided by baseline value).
- **Baseline Value:** Set individually for each species/MUs.
- **Assessment Value:** The decrease should not be statistically significant over 30 years.

GES indicator: 1.3.1. Population condition (corresponding GES criteria 1.3. Population demographic characteristics).

- **GES definition:** Reduce the main causes of mortality and reduction of the populations of breeding seabirds, such as by-catch, marine litter, introduced terrestrial predators, pollution, habitat destruction, overfishing.

Breeding success

- **ET:** Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.
- Indicator category: state
- **Indicator name:** Seabirds demography breeding success AV-DEM-BS.
- **Metric:** Breeding success.
- **Baseline value:** Set for each species/MUs.
- **Assessment Value:** The breeding success of the well-monitored and free of introduced predators' colonies can't be significantly lower compared to the average of the last 10 years, at least in 3 out of 5 years. In at least 25% of the monitored colonies with predators, breeding success must be improved to reach breeding success values that should not be 10-15% lower than at free-predator colonies in the same archipelago and with similar characteristics (for example situated in small islets or in cliffs, etc.).

Survival rate

- **ET:** The survival rate of the species is maintained at levels that ensure the stability of the population.
- Indicator category: state
- **Indicator name:** Seabirds demography survival rate AV-DEM-SR.
- **Metric:** Survival rate.
- **Baseline Value:** Set for each species/MUs.

- **Assessment Value:** The average survival rate of the well-monitored and free of introduced predators' colonies is not significantly lower than 0.9. In at least 25% of the monitored colonies with introduced predators, survival rate must be improved to reach values not significantly lower than 0.9

Introduced predators

- **ET:** Maintain colonies currently without introduced predators permanently predator-free, and eradicate introduced predators in most important colonies affected by them.
- Indicator category: pressure
- **Indicator name:** Seabirds demography introduced predators AV-DEM-IP.
- **Metric:** Presence or absence of introduced predators in colonies.
- **Baseline Value:** Set for each archipelago.
- **Assessment Value:** Maintain predator-free colonies. Eradicate introduced predators when present from top-priority colonies (in green in Table 14) in 10 years and in 25% of medium-priority colonies (in orange in Table 14) in 20 years.

Light pollution

- **ET:** Light intensity near colonies decreases, as to not increase mortality of species, and wherever possible light intensity will be decreased at maximum at more sensitive periods (when fledglings leave the nest and/or migration depending on the location).
- Indicator category: pressure
- **Indicator name:** Seabirds demography light pollution AV-DEM-LP
- **Metric:** Light intensity.
- **Baseline Value:** Areas to be modelled between light intensity in different islands and closeness of colonies.
- **Assessment Value:** Light intensity near colonies decreases at least by 25% in the next 6 years, and keeps decreasing steadily every 6 years.

Charadriiformes

(Roseate tern; Common tern).
Check Table 13 to see the correspondence between archipelago and MUs.

GES indicator: 1.1.1. Distributional range (corresponding GES criteria 1.1. Species distribution).

- **GES definition/ET**: Maintain the distribution range of species so it does not statistically decrease below levels that cannot be considered as due to natural and climatic variability.
- Indicator category: state
- **Indicator name:** Seabirds distribution AV-DIST.
- **Metric:** Number of islands with colonies.
- **Baseline Value:** (Roseate tern) - all islands in the Azores; (Common tern) - all islands in all archipelagos;
- **Assessment Value:** Breeding is maintained in all the islands where the terns currently breed, as long as it's not due to in-land natural events such as land subsidence's or eruptions.

GES indicator: 1.2.1. Population abundance (corresponding GES criteria 1.2. Population size).

- **GES Definition/ET:** The 6-year-period average of the population size of the well-monitored colonies (breeding population) shows no significant decline compared to the previous 6-year-period (so natural annual oscillations are taken into account).
- Indicator category: state
- **Indicator name:** Seabirds population abundance AV/RT-ABU.
- **Metric:** 6-year period population size average.
- **Baseline Value:** Set for each species/MUs.
- **Assessment Value:** The decrease should not be statistically significant over 30 years.

This GES indicator is defined for all species included with the exception of Common tern, that is not used as a MU in Madeira for this criterion.

GES indicator: 1.3.1. Population condition (corresponding GES criteria 1.3. Population demographic characteristics).

- **GES definition:** Reduce the main causes of mortality and reduction of the populations of seabirds, such as by-catch, marine litter, introduced terrestrial predators, pollution, habitat destruction, overfishing.

Breeding success

- **ET:** Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.
- Indicator category: state

- **Indicator name:** Seabirds demography AV-DEM-BS.
- **Metric:** Breeding success.
- **Baseline Value:** Set for each species/MUs.
- **Assessment Value:** The breeding success of the well-monitored and free of introduced predators' colonies can't be significantly lower compared to the average of the last 10 years, at least in 3 out of 5 years. In at least 25% of the monitored colonies with predators, breeding success must be improved to reach breeding success values that should not be 10-15% lower than at free-predator colonies in the same archipelago and with similar characteristics (for example situated in small islets or in cliffs, etc.).

Introduced predators

- **ET:** Maintain colonies currently without introduced predators permanently predator-free, and eradicate introduced predators in most important colonies affected by them.
- Indicator category: pressure
- **Indicator name:** Seabirds demography AV-DEM-IP.
- **Metric:** Presence or absence of predators in colonies.
- **Baseline Value:** Set for each species/MUs/archipelago.
- **Assessment Value:** Maintain predator-free colonies. Eradicate predators in all priority colonies with introduced predators in 10 years and in 25% of medium priority colonies in 20 years.

Table 13 - description of the different MUs and their respective designations for all three GES criteria for each archipelago. For 1.3 (Species condition) BS: Breeding success, SR: Survival rate, IP: Introduced predators, LP: Light pollution. Colour indicates reachability: green-easy, orange-medium, and red-difficult. *Introduced predators reachability is explained in more detail in table VI, where colonies with and without introduced predators are listed. "All species" denomination means that the indicator is not measured directly on a given species but as an external factor (presence or absence of predators), thus it will apply to all species as described in Table V. *1 Light Pollution reachability has not yet been determined. "Procellariiformes" denomination was chosen as this indicator is not measured directly on a given species but as an external factor (light intensity in selected areas), thus it will apply to all species as described in Table V.

COMMON NAME	AZORES	MADEIRA	CANARY ISLANDS
Bulwer's petrel	1.1 1.2 1.3 BS, SR	1.1 1.2 1.3 BS, SR	1.1 1.2 1.3 BS, SR
Cory's shearwater	- 1.2 1.3 BS, SR	- 1.2 1.3 BS, SR	- 1.2 1.3 BS, SR
Band-rumped storm-petrel	1.1 1.2 1.3 BS, SR	1.1 - -	1.1 - -
Monteiro's storm-petrel	1.1 1.2 1.3 BS, SR	- - -	- - -
Macaronesian shearwater	1.1 1.2 1.3 BS, SR	1.1 1.2 1.3 BS, SR	1.1 1.2 -
Zino's petrel	- - -	1.1 1.2 1.3 BS, SR	- - -
Desertas petrel	- - -	1.1 1.2 1.3 BS, SR	- - -
White-faced storm-petrel	- - -	1.1 - -	1.1 1.2 -
Roseate tern	1.1 1.2 1.3 BS	- - -	- - -
Common tern	1.1 1.2 1.3 BS	- - -	1.1 1.2 -
All species*	1.3 IP	1.3 IP	1.3 IP
Procellariiformes*1	1.3 LP	1.3 LP	1.3 LP

The following table 14 contains seabird breeding areas with predator pressure ordered by a combination of how reachable the 1.3 GES Criteria for each area is and what difference at a population level introduced predator management in each area would make.

Recommendation: Besides the control or eradication on areas with introduced predators it is very important to conduct further work on introduced predators, namely to 1) check for the presence of introduced predators at places where this has never been done and 2) regularly monitor (at least every 6-years) that important sites free from introduced predators remain like that over time; priority places where this bio monitoring should take place are Vila islet (Santa Maria island), Vila Franca do Campo islet (São Miguel island), Praia and Baixo islets (Graciosa island), Santo António (Pico island), Topo islet (São Jorge island) and Alagoa and Baixa do Moinho islets (Flores island).

Table 14 – Listing of introduced predators occurring by colony and by island. A) Canary Islands, B) Azores and C) Madeira. Green are islets where management actions such as predator eradication could be easily deployed and would probably represent a significant increase in the population of the species listed; Orange are areas on main islands with a high diversity of breeding seabirds. Although a complete eradication would require huge amounts of time and resources, predator control should be taken in order to guarantee GES Criteria is reached. These actions can be limited to the colonies present within these areas and not extended to the whole area; Red are areas in main islands that are important for seabirds in terms of numbers but not as much in terms of diversity.

Although ideally the introduced predators in these areas should also be managed, priority should be given to orange and especially green areas.

Location (A)	Island	Favoured species	Introduced predators present
Lobos	Fuerteventura	Hydrobates pelagicus Hydrobates castro Pelagodroma marina Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Mus musculus
Alegranza	Lanzarote	Hydrobates pelagicus Hydrobates castro Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Pelagodroma marina Calonectris borealis	Mus musculus
La Graciosa	Lanzarote	Hydrobates pelagicus Pelagodroma marina Bulweria bulwerii Calonectris borealis	Felis catus Rattus sp.

Anaga	Tenerife	Hydrobates pelagicus Hydrobates castro Bulweria bulwerii Puffinus puffinus Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa oeste	El Hierro	Hydrobates pelagicus Hydrobates castro Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Teno	Tenerife	Bulweria bulwerii Puffinus puffinus Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa Norte	El Hierro	Hydrobates castro Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa de Timanfaya	Lanzarote	Hydrobates castro Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Ajaches	Lanzarote	Hydrobates castro Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa Sur	La Gomera	Hydrobates pelagicus Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa nordeste	El Hierro	Hydrobates pelagicus Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Veneguera	Gran Canaria	Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa Norte	Tenerife	Bulweria bulwerii Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Famara	Lanzarote	Hydrobates castro Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa de Tindaya	Fuerteventura	Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp.

			Mus musculus
La Isleta	Gran Canaria	Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Costa de Sardina	Gran Canaria	Puffinus lherminieri (assimilis) baroli Calonectris borealis	Felis catus Rattus sp. Mus musculus
Guaza	Tenerife	Bulweria bulwerii Calonectris borealis	Felis catus Rattus sp. Mus musculus
Barrancos del Norte y Nordeste	La Palma	Puffinus Puffinus	Felis catus Rattus sp. Mus musculus
Barrancos de Arona y Adeje	Tenerife	Calonectris borealis	Felis catus Rattus sp. Mus musculus

Location (B)	Island	Favoured species	Introduced predators present
Contendas islets	Terceira	Sterna hirundo Sterna dougallii	Mus musculus Rattus sp.
Santo António islet	Pico	Calonectris diomedea Sterna hirundo Sterna dougallii	Mus musculus Rattus sp.
Ponta do Norte	Santa Maria	Calonectris borealis Hydrobates castro	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Ponta da Malbusca	Santa Maria	Calonectris borealis Hydrobates castro	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Baía do Cura	Santa Maria	Calonectris borealis Sterna hirundo Sterna dougallii	Mus musculus Rattus sp.
Priority sites within Natura 2000 to define later	São Miguel	Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo Sterna dougallii	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Ilhéu da Caloura	São Miguel	Calonectris borealis Sterna hirundo Sterna dougallii	Mus musculus Rattus sp
Priority sites within Natura 2000 to define later	Santa Maria	Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo	Felis catus Mus musculus Rattus sp. Mustela nivalis

		Sterna dougallii	Mustela furo
Priority sites within Natura 2000 to define later	Terceira	Calonectris borealis Hydrobates castro Sterna hirundo Sterna dougallii	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	Pico	Hydrobates castro Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo Sterna dougallii	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	Faial	Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo Sterna dougallii	Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	Graciosa	Hydrobates castro Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo Sterna dougallii	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	São Jorge	Puffinus iherminieri Calonectris borealis Sterna hirundo Sterna dougallii	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	Flores	Hydrobates castro Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo Sterna dougallii	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	Corvo	Hydrobates castro Puffinus lherminieri (assimilis) baroli Calonectris borealis Sterna hirundo Sterna dougallii	Felis catus Rattus rattus Mus musculus

Location (C)	Island	Favoured species	Introduced predators present
Ilhéu Chão	Desertas	Calonectris borealis Bulweria bulwerii Hydrobates castro Puffinus lherminieri (assimilis) baroli Sterna hirundo	Mus musculus
Central Mountain Massif	Madeira	Pterodroma madeira	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo
Priority sites within Natura 2000 to define later	Madeira	Puffinus puffinus Puffinus lherminieri (assimilis) baroli Calonectris borealis Bulweria bulwerii Hydrobates castro Pterodroma madeira Sterna hirundo	Felis catusMus musculus Rattus sp. Mustela nivalis Mustela furo
Deserta Grande	Desertas	Calonectris borealis Bulweria bulwerii Hydrobates castro Sterna hirundo	Mus musculus
Priority sites within Natura 2000 to define later	Porto Santo	Puffinus lherminieri (assimilis) baroli Sterna hirundo	Felis catus Mus musculus Rattus sp. Mustela nivalis Mustela furo

5.2.3.1 - Bulweria bulwerii

Geographic distribution

Bulwer's Petrel has a wide distributional range both in tropical and subtropical environments (Figure 23). They form breeding colonies in all three archipelagos of Macaronesia, but in the Azores, which represents the northern limit of distribution for this species, only one colony is known - Vila islet in Santa Maria. Madeira archipelago holds the largest colony of all the Atlantic for this species, in Desertas Islands. In Madeira this species can also be found in small colonies in Porto Santo and adjacent islets. In the Canary Islands Bulwer's petrel spreads over 31 colonies (SEO/BirdLife, 2012). Albeit not abundant it has been found in most islands, including most recently in Gran Canaria (Luzardo *et al*. 2008), other breeding locations have been suggested but are yet to be confirmed.

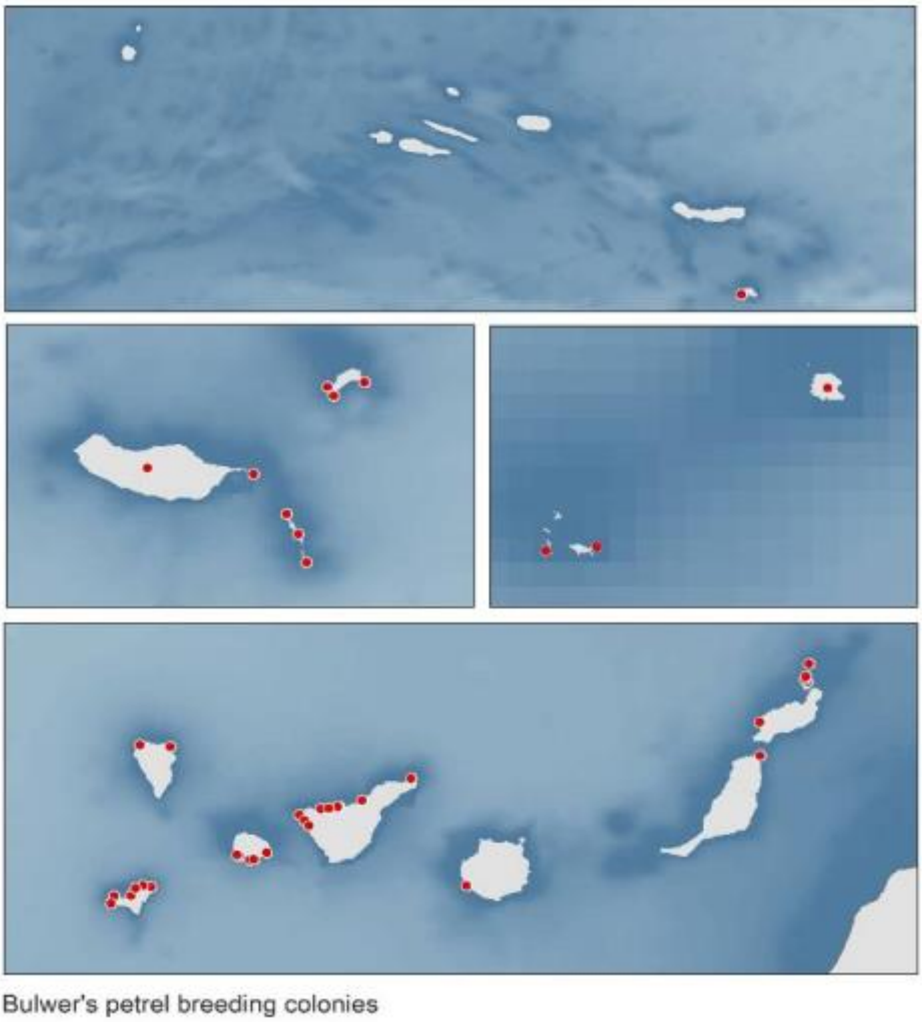

Figure 23 - Bulwer's petrel known colonies for all three archipelagos. Madeira's main island colony is represented by a sole point in the centre due to lack of specific identification of the colonies' location.

GES indicators and baseline

Population distribution

Despite the fact that the sole Azorean colony is small (50 breeding pairs) it is of great importance to the species and to Macaronesia as well, representing the northern most limit of this species.

Baseline for the Azores is the only confirmed colony (Vila islet), but further work should be done to confirm breeding in Graciosa Island, namely at Praia and Baixo islets where individuals are regularly caught in mist nets. In Madeira the baseline value is nine colonies and in Canary Islands is 31 (SEO/BirdLife 2012).

Population abundance

In Macaronesia the last overall estimation pointed for over 11,000 breeding pairs, although this value is most likely underestimated (Luzardo *et al*. 2008), given a recent study in Madeira (Catry *et al*. 2014). In the Azores the population trend is stable and estimated at 50 breeding pairs. In Madeira the breeding population is estimated at over 45,000 breeding pairs in Desertas islands (Catry *et al*. 2014) and 5000 breeding pairs in Selvagens islands (Costa *et al*. 2003). As a whole Canary Islands hold around 1000 breeding pairs (SEO/BirdLife 2012).

While it has an overall classification of "least concern" by IUCN, in Spain (Madroño *et al*. 2004) and Portugal (Portuguese Vertebrate Red Book) this species is listed as endangered (Luzardo *et al*. 2008) after a moderate decline was observed in the last decades. Overall, Bulwer's petrel is easy to assess and study in the three archipelagos making it a very good GES indicator.

30 burrows are expected to be the baseline value at Vila islet colony (Azores). This indicator is only operational in Vila Islet, but will be operational in Madeira and Canary Islands within two years from the beginning of the monitoring.

Population condition

Breeding success baseline value is only known for Vila islet, data gathered between 2002-2004 where the average breeding success was 37.83% (Bried and Bourgeois 2005). In Madeira and Canary Islands baseline values are unknown and thus further development and research is needed in order for the monitoring to become operational (expected to be operational in ten years). For these two archipelagos baseline values research has a high reachability.

Regarding survival rate in particular, baseline research is expected to become operational in 5 years for all the archipelagos.

5.2.3.2 - Calonectris borealis

Geographic distribution

Cory's shearwater has a widespread distribution in all the three archipelagos. In the Azores the species breeds throughout the nine islands and in most islets. In Madeira this species breeds in all islands, with small colonies in Porto Santo and adjacent islets, in Desertas, and in Selvagens (the largest world colony). This is also the most common seabird in the Canary Islands, spanning through all the islands. Due to the indistinct and non-discrete characteristics of Cory's shearwater colonies in all three archipelagos it is not possible to create a distribution map with colony location.

GES indicators and baseline

Population distribution

Cory's shearwater is the quintessential species for Azores to act as a GES indicator due to the large amount of data collected each year via the SOS-Cagarro. As their colonies are not discrete, it is not a good species for the distribution indicator (GES 1.1), but its abundance and breeding success & survival rate could be good indicators for GES criteria 1.2 and 1.3.

Population abundance

Azores population is estimated at 223.646 individuals (Bolton 2001). In the Canary Islands its population is estimated as >30.000 breeding pairs (Le Grand *et al*. 1984) but is surely underestimated. Although present in all the three archipelagos, Cory´s shearwater from the Canary Islands feeds mainly off the coast of Africa and the fact that their wintering grounds are not within Macaronesia, fails to meet the characteristics for a good indicator for the whole year, and will present bias towards feeding grounds. For this, the team has decided to clarify "foraging grounds" variable, by implementing a specific monitoring in Canary Islands. If there's a decrease all over the Macaronesia, the cause might be due to problems in the wintering grounds or to climatic change or to another global threat. If the decrease is detected only in Canary Islands, the cause could be in the African platform where the population feeds during the breeding season. If the decline is in Madeira and Azores, the cause might be due to threats in oceanic waters. This approach attempts to isolate and identify the bias caused by the feeding grounds.

To monitor the population abundance (GES 1.2), specific colonies could be selected, for example Vila and Praia islets in the Azores. These islets could also be used to calibrate ARUs (automated recording units) and call rates for different species like it was done by Oppel *et al*. 2014 for Cory's shearwater at Corvo Island, Faial Island and Vila Franca do Campo Islet. In Vila and Praia Islets, breeding population has been estimated at 350 and 200 breeding pairs, respectively, and this will serve as the baseline values for Azores. In Madeira, the baseline will be 30,000 breeding pairs.

Population condition

Baseline value for survival rate in Azores is 0.934 (mean adult annual survival rate) at Vila islet. Vila Islet Cory's shearwater breeding success was measured at 59% between 2002 and 2008. In Corvo, breeding success for this species was measured at 39% between 2009-2011 (Hervías *et al*. 2013a) and for Vila Franca do Campo Islet a value of 72% was determined during the 2015 breeding season. In Canary Islands no data on breeding success and survival rate is available, but the indicators will be operational in ten and five years respectively from the beginning of the monitoring. In the selected colonies population abundance, breeding success and survival rate will be estimated every year.

5.2.3.3 - Hydrobates castro

Geographic distribution

Band-rumped storm-petrel breeds in most oceanic islands in tropical Atlantic and Pacific Oceans. In Azores five main islands have islets with confirmed breeding colonies – Santa Maria, São Jorge, Graciosa, Flores and Corvo. In Madeira this species has small colonies in Porto Santo, adjacent islets, Desertas and Selvagens Islands. In the Canary islands, this species breeds on Lanzarote and surrounding islets and rocks, and also on some small rocks off Tenerife and El Hierro; however, potential sites (rocks and other areas that are inaccessible from land) in other parts of the islands have not been examined in winter (the breeding season), due to difficult sea conditions.

GES indicators and baselines

Population distribution

Breeds in all three archipelagos (**Error! Reference source not found.**4) and could be a good indicator, but it hasn't been well studied in Madeira and the Canary Islands.

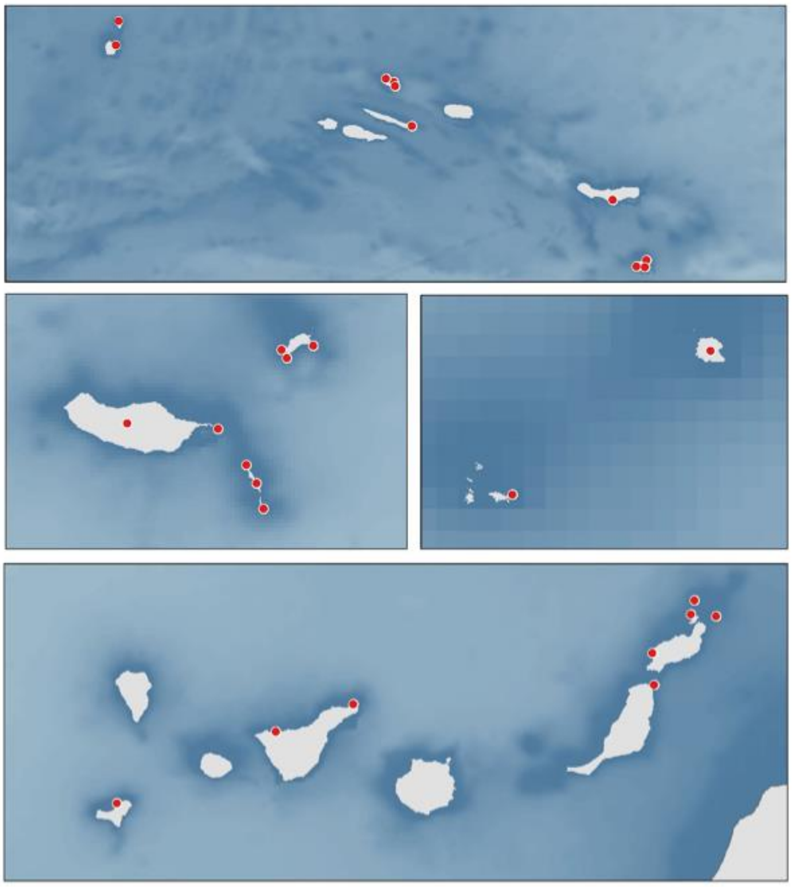

Figure 24 - Band-rumped storm-petrel known colonies distribution for all three archipelagos. Madeira's main island colony is represented by a sole point in the centre due to lack of specific identification of the colonies' location.

In Azores the eight colonies used for the baseline of the distributional range (GES criteria 1.1) are: Praia, Baixo and Ponta da Barca islets off Graciosa island; Vila islet, Ponta do Norte and Ponta da Malbusca at Santa Maria island, Corvo and Flores island (already operational but still in need of further monitoring); finally there are two sites where breeding hasn't been confirmed (data taken solely from calling): 1. Vila Franca do Campo islet, São Miguel island and 2. Topo islet at São Jorge island (Monteiro *et al*. 1999). For Madeira baseline data will come from the Atlas census.

Population abundance

This species has a global IUCN classification of "least concern" but in Portugal it is classified as "Vulnerable" (Vertebrates Red Book, Mendes 2013) and in Spain it is considered endangered (Spanish Red Book, Madroño *et al.* 2004). In Azores the population of Vila, Baixo and Praia Islets is estimated at 800 breeding pairs and for the whole archipelago it is estimated between 1000 and 2000 breeding pairs (Monteiro *et al.* 1996a). Baseline value for population abundance (GES criteria 1.2) is the estimated population of 665-740 breeding pairs in Azores (Monteiro *et al.* 1999). Madeira's population is estimated at over 10,000 individuals (Equipa Atlas 2013). In Canary Islands population is estimated at 373 breeding pairs in eight colonies (SEO/BirdLife 2012).

Population condition

This indicator is operational at Praia islet, where artificial nest boxes have been successfully deployed 15 years ago (Bolton *et al.* 2004). The baseline value is unknown for Madeira and Canary Islands, albeit personal communications reveal low numbers, with a ratio of 100 breeding attempts to 30/40 fledglings surviving.

This indicator is only relevant for Azores with baseline data coming from Praia Islet where the average breeding success between 2007 and 2012 was 39.73 %.

5.2.3.4 - Hydrobates monteiroi

Geographic distribution

Monteiro's storm-petrel is an endemic species from the Azores (Figure 26). Colonies have been identified in Graciosa (Praia, Baixo and Baleia islets) and Flores island, Alagoa islet (Oliveira *et al.* 2016), and suspected in Corvo island (Ponta do Marco islets). Although Monteiro's storm-petrels leave their colonies by the end of the breeding period, stable isotopes analysis and at-sea observations indicate that the species may remain in the Azorean waters the whole year round (Bolton *et al.* 2008).

GES indicators and baselines

Population distribution

Baseline value is the three colonies in islets off Graciosa island. The proposed target is operational but it is important to do further prospecting work at Corvo and Flores islands.

Population abundance

Baseline value of total population size on Praia islet is 328-378 breeding pairs recently updated (Oliveira *et al.* 2016) from the 942 birds during April-August 2001, Oppel *et al.* (2013). Occupied burrows in the sample area for this species need to be further prospected at Corvo and Flores Island is needed. In Praia islet where a large proportion of the population breeds in artificial nest boxes (Monteiro *et al.* 1999) (Figure 25).

Population condition

The research for this criterion (both indicators: breeding success and survival rate) is operational at Praia islet, although only breeding success data is available, and the baseline value is 74.14% (average 2007-2012) at Praia islet. The size of the non-breeding population remains unknown for the entire archipelago, and therefore, globally. Annual breeding success was found to be quite variable but never exceeded 55% in natural or artificial nests, with a minimum value in artificial nests around 39% (Bried and Neves 2015).

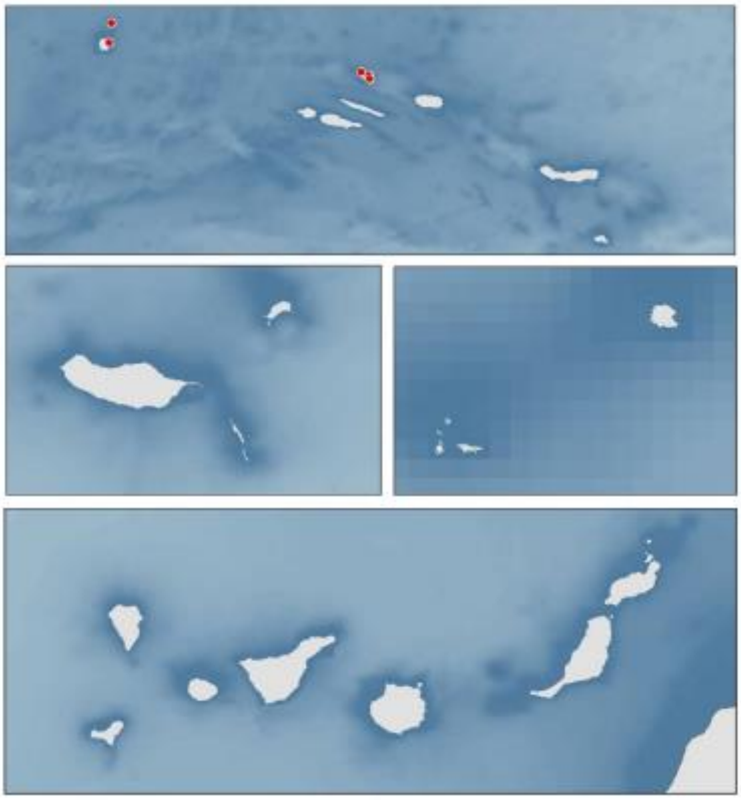

Figure 25 - Monteiro's storm-petrel known colonies distribution for Azores.

5.2.3.5 - Pelagodroma marina

Geographic distribution

The White-faced storm-petrel breeds from Australia and New Zealand to the northern Indian Ocean and the northwest coast of South America (del Hoyo *et al.* 1992). There are north Atlantic colonies including in Macaronesia. White-faced storm-petrel breeds in the Selvagens (in the Madeira archipelago) and in islets off Lanzarote (in the Canary Islands), with Europe accounting for less than a quarter of its global breeding population (Figure 26).

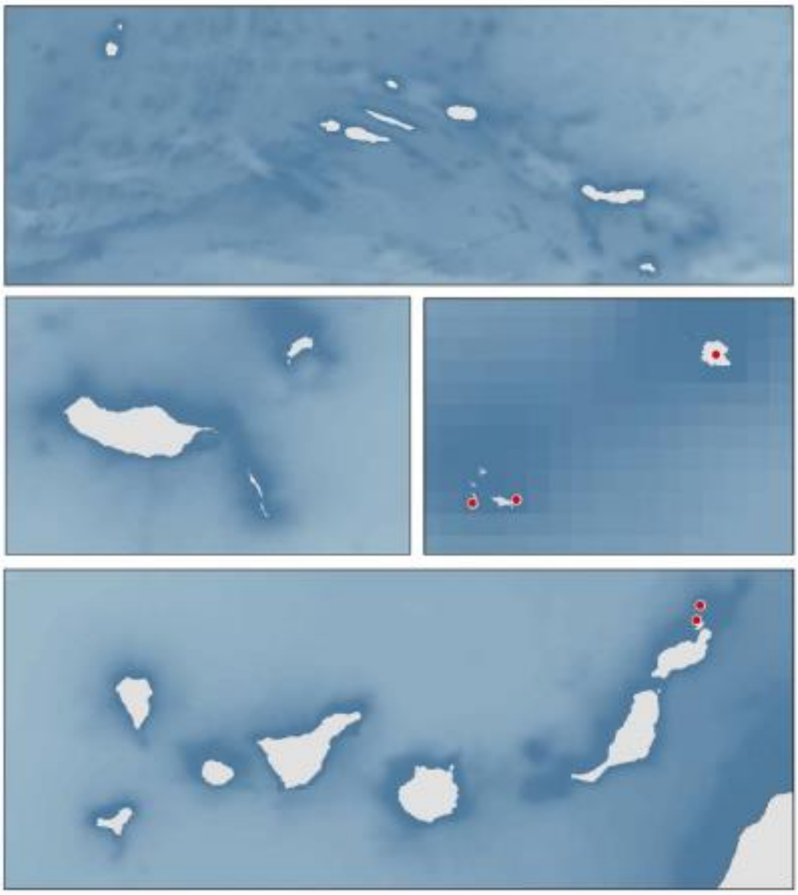

Figure 26 - White-faced storm-petrel known colonies distribution for Madeira and the Canary archipelagos.

Global population trends have not been quantified, but the species is not believed to approach the assessment values for the population decline criterion of the IUCN Red List. For these reasons, the species is evaluated as Least Concern (IUCN).

GES indicators and baselines

Population distribution

The baseline value for this indicator is the number of colonies, which in Madeira is four (Selvagens islands) and in Canary Islands is two.

Population abundance

The number of White-faced storm-petrels may be higher than previously thought, with a new estimate of at least 62,550 pairs on the Selvagem Pequena and Fora islet, and 36,000 on Selvagem Grande (Campos and Granadeiro 1999). This estimate still holds a considerable margin of uncertainty, and more studies are needed (Catry *et al*. 2010). In Selvagens this value is partial, due to erosion of the nests that prevents the monitoring of the whole colony. Further development is needed (expected to be operational in five years from the beginning of the monitoring). The number of nests is low in Canary Islands, approximately 55 (SEO/BirdLife 2012) and have several access constraints.

Population condition

This species is not used as a MU for GES criteria 1.3. - Population condition because there is no data available and monitoring of nests varies between years due to nest erosion.

5.2.3.6 - Pterodroma deserta

Geographic distribution

Deserta's petrel is distinct from its counterpart in Cape Verde Islands (Jesus *et al.* 2009), breeding only on the south plateau of Bugio island, one of the three islands from Desertas, in Madeira (Figure 27) (Ramírez *et al.* 2013).

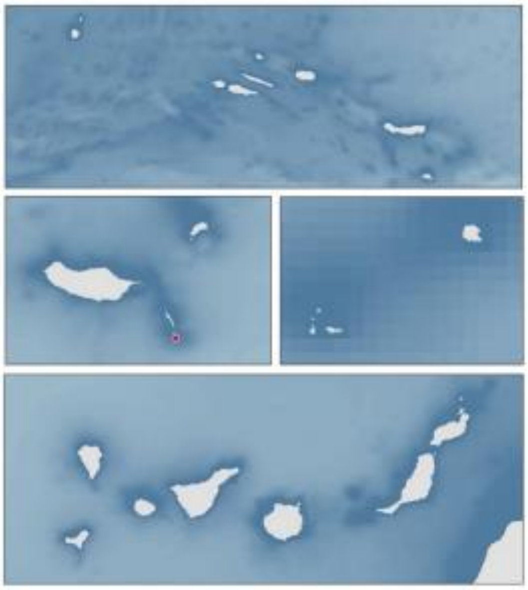

Figure 27 - Deserta's petrel known colonies distribution for Madeira archipelago.

GES indicators and baseline

Population distribution

Baseline value is the one colony in Bugio - Madeira.

Population abundance

This species has a very small breeding population, of between 160 and 180 breeding pairs (D. Menezes, unpublished data). There is a big lack of data for this species, but efforts of intense monitoring have been put forth since 2004 by Portuguese organizations (including PNM and SPEA). Population trend seems to be stable within the few years of monitoring (Ramírez *et al.* 2013). Baseline values are all the breeding pairs, roughly estimated at 180-220. This value is a little over the original rough estimate for this population, believed to be underestimated.

Population condition

The only organization in Madeira Island systematically recording data is the PNM, and they will gather the baseline data for GES criteria 1.3 (currently unknown).

5.2.3.7 - Pterodroma madeira

Geographic distribution

Zino's petrel has a focal distribution on land, but wide at sea. Its endemic to Madeira Island, and its only colony worldwide is located there, on the main island, at the eastern mountain massif (Figure 28).

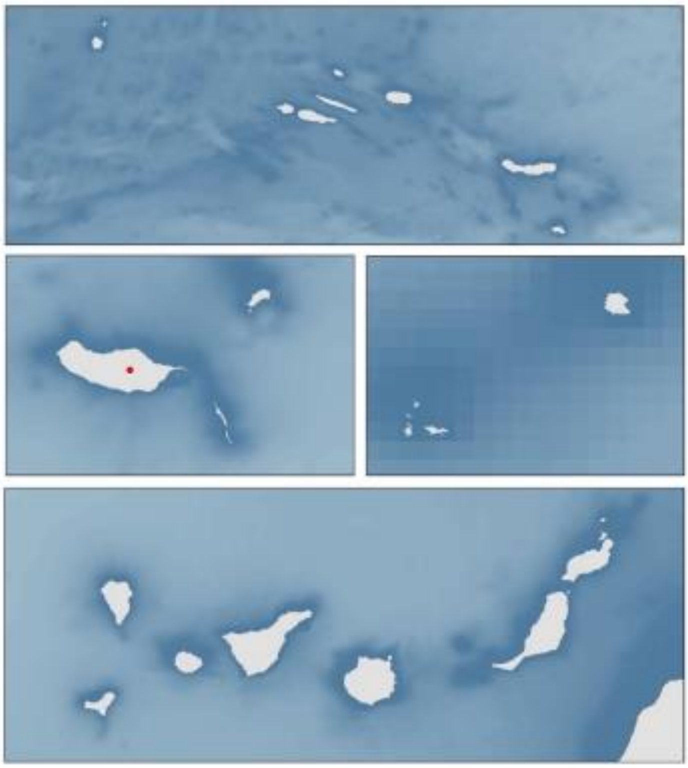

Figure 28 - Zino's petrel known colonies distribution for Madeira archipelago.

GES indicators and baseline

Population distribution

Baseline is the single colony.

Population abundance

This species is classified as "Endangered" by IUCN, with a small global population of around 65-80 breeding pairs (Menezes 2005). In 2010 the population suffered a blow when a forest fire decimates fledgling numbers (65%), breeding adults and decreased habitat suitable for nesting (Birdlife International 2016). The effects of this fire on the population haven't yet been studied, suggesting that new surveys and monitoring are needed to assert population trend and status. Having been considered extinct until it resurfaced in 1960, its population is very small and as such, vulnerable. If it decreases due to external causes it could be a good GES indicator of oceanic waters, as they feed on plankton. Baselines are the 85 breeding pairs, as with *Pterodroma deserta* a little over the current population estimate.

Population condition

It also presents as a good tool for invasive species indicator, as the current status of this population (extremely small numbers of nests and breeding adults) is attributed to the introduction of small mammals (cats and rats) in Madeira Island (Zino *et al.* 2001). For criteria 1.3, as well as with *Pterodroma deserta,* the only organization in Madeira Island systematically recording data is the PNM, and they will gather the baseline data for this criterion (currently unknown).

5.2.3.8 - Puffinus lherminieri (assimilis) baroli

Geographic distribution

Macaronesian shearwater is mostly distributed along the Northeastern Atlantic and in the South Pacific. In Azores it has small colonies in all islands except Terceira (Monteiro *et al.* 1996a). In Madeira this species has small colonies in Porto Santo and adjacent islets; it also breeds in Desertas Islands. It seems that this species breeds in all the islands but confirmation only exists for some.

GES indicators and baseline

Population distribution

Good indicator (GES criteria 1.1) as it is a resident in the three archipelagos (Figure 29), does not migrate to the African coast and during the non-breeding period the species remains on the waters surrounding Macaronesia.

The species is under OSPAR protection and even tough birds from Madeira and Canary Islands occur on area OSPAR V, this species has a wide range of more than 4000 km (Hobbs *et al.* 2003). The baseline is the number of colonies in Macaronesia islands. There are 28 known colonies in the Azores (Monteiro *et al.* 1999), nine on Madeira (SPEA) and 38 at Canary Islands (Tenerife, La Gomera, Lanzarote and its surrounding islets of Montaña Clara, Alegranza, El Hierro, Fuerteventura and La Palma (Martín and Lorenzo 2001)).

Population abundance

Population size for Azores is estimated roughly at 500-1000 breeding pairs for the whole archipelago (Monteiro *et al.* 1996a). In the Canary Islands new estimates pointed to 95-291 breeding pairs (Bécares *et al.* 2015), below the 400 pairs estimated in 1987 (Martín and Lorenzo 2001).

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Partners: FRCT; Região Autónoma da Madeira; Secretaria Regional do Ambiente e Recursos Naturais; dgrm; Gobierno de España Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente; Fundación Biodiversidad
Supported by the: European Commission
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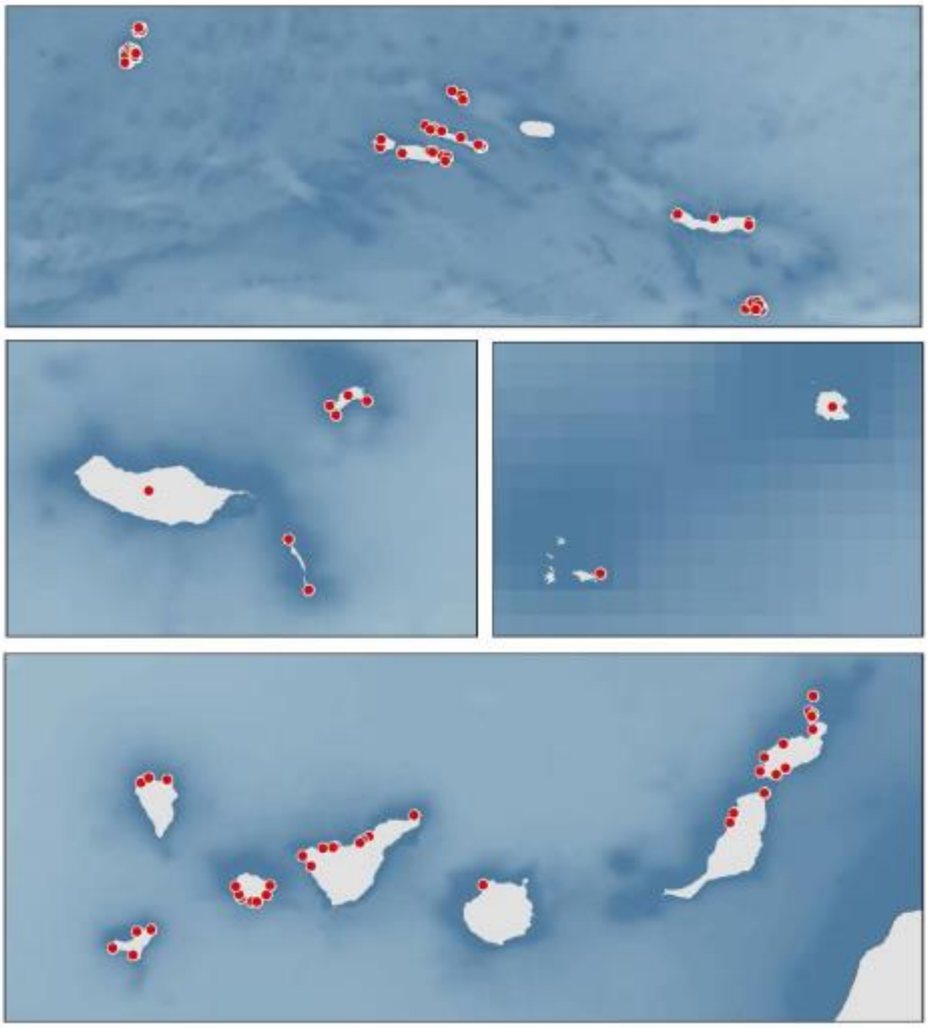

Figure 29 - Macaronesian shearwater known colonies distribution for all three archipelagos. Madeira's main island colony is represented by a sole point in the centre due to lack of specific identification of the colonies' location.

The baseline is only valid for the Azores archipelago with a population abundance estimated at 50 breeding pairs in Vila islet and 58-130calls/10min at Vila, Praia and Baixo islets (Monteiro *et al.* 1999). For the Canary Islands some information on call rates exists but is pending upon further investigation into inter-annual variability.

Population condition.

Baselines are unknown.

5.2.3.9 - Sterna dougallii

Geographic distribution

Roseate terns are found widely spread in Atlantic, Indic and Pacific oceans. About half of the European population of Roseate terns breed in Azores and their colonies are located in the nine islands but the highest numbers are found in Flores, Terceira, Graciosa and Santa Maria islands. This species rarely in Madeira and Canaries (Figure 30).

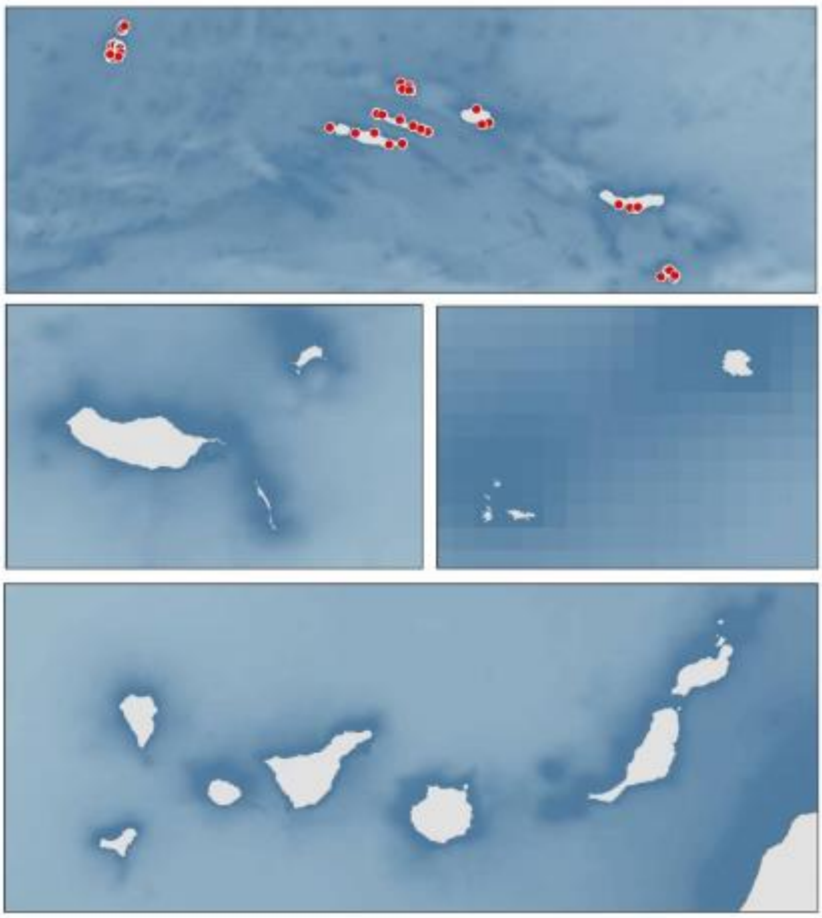

Figure 30 - Roseate tern known colonies distribution for all three archipelagos.

GES indicators and baseline

Population distribution

Baseline is all the nine islands of the Azores.

Population abundance

In the Azores the breeding population fluctuates widely between years. In Praia Islet for example, Roseate terns were virtually absent from 1991 to 2000, then 31 breeding pairs moved into the Islet, and between 2001 and 2006 their breeding numbers increased by 15 fold, dropping until 2009 when apparently the species stopped breeding in this islet again, and finally increasing to 62 breeding pairs in 2010 and 500 breeding pairs in 2011 (Bried and Neves 2015). Numbers increased due to habitat management efforts conducted by DOP-UAç within the framework of LIFE projects (fewer disturbances, more vegetation) and later on decreased due to predation (by European starlings and turnstones). Baseline is the average from 2009-2015 (except 2013) of 997 breeding pairs.

Population condition

There are no baseline data for breeding success.

5.2.3.10 - Sterna hirundo

Geographic distribution

Common tern is found around the world, and it occurs in all the three Macaronesian archipelagos (Figure 31). In Azores there are over 100 colonies in all islands, with the higher numbers concentrated in Flores, Santa Maria and Graciosa Islands. In Canary Islands there are 17 localities where breeding has been confirmed between 1997 and 2002 period (Situated in La Palma, El Hierro, La Gomera, Tenerife and Gran Canaria) (Lorenzo and Barone 2007). In Madeira this species has known colonies in Selvagem Pequena.

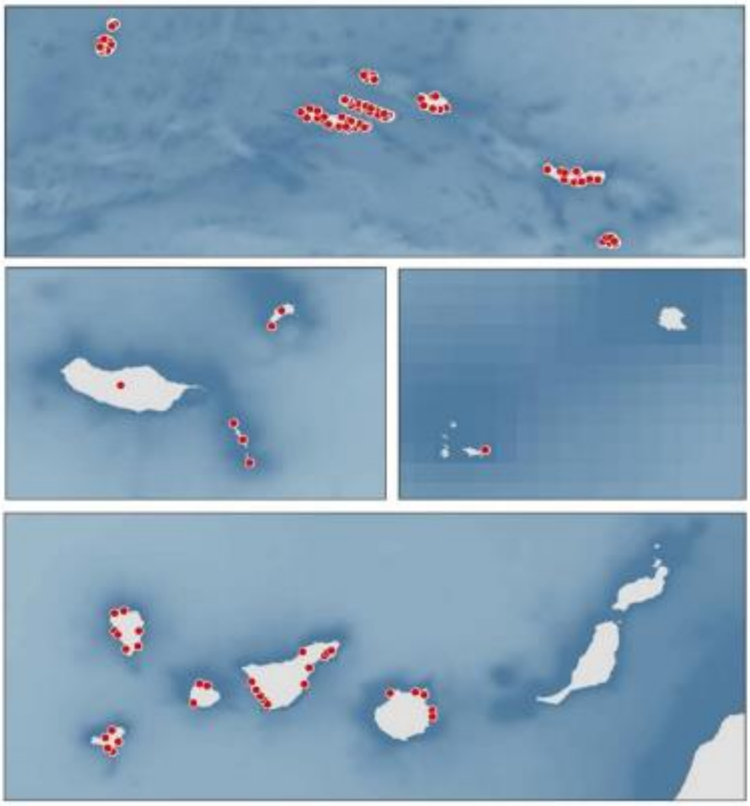

Figure 31 - Common tern known colonies distribution for all three archipelagos. Madeira's main island colony is represented by a sole point in the centre due to lack of specific identification of the colonies' location.

GES indicators and baseline

Population distribution

Baseline for the Canary Islands is the number of islands with colonies (five islands) and all nine islands for Azores.

Population abundance

For Madeira there are two estimates for this species: in 2005 population was estimated as 38 breeding birds in Selvagem Pequena and in 2010 the population was estimated at 25 individuals, including juveniles (Catry *et al*. 2010). At Praia Islet, Azores, under LIFE project habitat management, the Common tern colony is the largest one in the Azores, representing one-third of the Azorean population between 2003 and 2006, with estimates from 689-1196 breeding pairs (Bried and Neves 2015).

As with Roseate tern, Common tern population exhibits population fluctuations within a number of years. From 2007 and 2009 the species was not observed breeding in Praia Islet, decreasing the local and overall (archipelago) breeding population number (Bried and Neves 2015). In 2010 Common terns returned to Praia Islet presenting 213 breeding pairs, in 2011 350 breeding pairs, and in 2012, 300 nests were counted in addition to 254 eggs found predated (probably representing an extra 104 pairs) (Bried and Neves 2015).

In Canary Islands the population is estimated to be around 50-93 breeding pairs for all the islands (Lorenzo and Barone 2007).

Baseline for Azores is the 2009-2015 (except 2013) average corresponding to 2627 breeding pairs.

5.3. Sea Turtles

5.3.1 - Regional Initial Assessment

5.3.1.1 - Azores: Current approach

In the IA from the Azores archipelago ("Diretiva-Quadro Estratégia Marinha – Estratégia Marinha para a subdivisão dos Açores"; 2014) a review was presented on the occurrence, movements and distribution of sea turtles in the archipelago. The loggerhead sea turtle (*Caretta caretta*) was identified as the most frequently observed species and therefore proposed as best suited MU for assessing GES, notwithstanding that the population is made up solely of juveniles and that abundance estimates are lacking. The document further identifies the pressures affecting populations (e.g. fisheries by-catch, entanglement in marine debris, litter ingestion), but without categorizing the risk levels (low, medium, high).

Similarly, to marine mammals, the environmental status of marine turtles was not assessed in the Azores due to their migratory nature and extended distribution. Instead, their IUCN status, which is set as vulnerable, was used. The proposed ET was the same for marine mammals and, likewise, it was criticised for not contributing to reach GES and being dependent on measures to gather better data. For the Biodiversity descriptor (D1), no definition of GES, criteria, indicators, ETs, baseline levels, environmental assessment values and monitoring requirements were proposed.

5.3.1.2 - Madeira: Current approach

A review concerning the species richness and abundance of sea turtles in Madeiran waters was made in the IA of Madeira archipelago ("Directiva Quadro Estratégia Marinha – Estratégia Marinha para a subdivisão da Madeira – 2014").

This initial report, indicates that despite the existence of five sea turtle species registered for Madeira's waters -leatherback (*Dermochelys coriacea*); loggerhead (*Caretta caretta*); kemp's ridley (*Lepidochelys kempii*), hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*), the loggerhead sea turtle is the most abundant species in these waters, which represent an important feeding ground for its juvenile/oceanic stage. A complete review of the state of the art regarding loggerhead sea turtle was made focusing mainly on abundance; distribution; origin, migration patterns and feeding ecology.

The sighting rate of loggerhead sea turtles has been decreasing until 2013 and is now recovering, which could be caused by various factors, both local and large scale. The IA of the Madeira archipelago pointed out some threats for loggerhead sea turtles in this region, for instance the threat of interaction, entanglement and ingestion of marine litter and the threat of boat collision. The importance of long-term monitoring is highlighted since long-lived widely migrating species do not usually react rapidly to deteriorating conditions. It is assumed that the observed abundance variation is due to natural causes, since loggerhead sea turtles are abundant in Madeira's waters, and thus are indicative of GES for Madeira's pelagic waters.

There were some ET proposed in the report, regarding D1, where target 3 was: "Study and understand the migratory routes of species with a wide geographic distribution in order to emphasize the ecological relevance and importance of the archipelagic seas and seamounts within the ecosystem and their oceanic and global dimension" where sea turtles could be included, but no specific reference was made for this taxonomic group.

In conclusion, the IA of the Madeira archipelago lacked a number of definitions concerning sea turtles at the level of D1, namely: MUs, GES, indicators, criteria, ET, baselines, environmental assessment values and monitoring requirements.

5.3.1.3 - Canaries: Current approach

On the first phase of implementation of the MSFD from the Canarias archipelago, and specifically in the document "Part IV. D1: Biodiversity. Initial Assessment and good environmental state" (MAGRAMA 2012a), the lack of information is noticeable, as well as its occasional nature and the lack of monitoring for the study of the marine environment. This circumstance affects the sea turtles too, and influences their assessment.

In this document the presence of four sea turtle species in the Canary Islands is mentioned: hawksbill, green turtle, loggerhead, and leatherback (although there are records of the olive ridley (*Lepidochelys olivacea*) sea turtles, so actually five species of sea turtles could inhabit these waters). The loggerhead and leatherback sea turtles were selected as the MUs for the reptile functional assessment group, because those were the species that appeared in the sources of information used for the IA.

From the indicators and criteria proposed by the Commission at the level of species for assessing progress towards GES, only the criteria 1.1 Species distribution and its indicators 1.1.1 Distributional range and 1.1.2 Distributional pattern within range, were used in the IA. Distribution data of by-catch were used, coming from the observers on board fishing vessels that took place in the long-line fisheries, carried on by the IEO between 1999 and 2010. Data coming from a wildlife recovery centre and available bibliography from another were analysed too.

Regarding the criteria 1.3 Population condition, the document just gathers bibliographic information about fecundity rates, mortality rates, and genetic structure of these species, some of them being not specific to the turtles present in Canary Islands.

Nevertheless, this information did not turn out to be enough. Different indicators were developed as far as the available data in the area allowed. Neither baseline nor assessment values could be established for the proposed indicators, and therefore the state of the sea turtle populations was not assessed. Consequently, GES could not be defined in a quantitative manner, but in a qualitative or generic manner. Thus, the necessary conditions for the GES of the turtles to be achieved were established as follows:

- The area and distribution pattern of the reptile population is stable or increases within the marine sub-region (Criterion 1.1)
- The size of the populations of reptile species is kept at a level that ensures their sustainability within the sub-region, including adequate demographic characteristics, the maintenance of the genetic variability and of the ecological processes in which they participate (Criteria 1.2 and 1.3);

- The mortality ratio due to accidental catch, collisions, noise impacts and due to other anthropogenic causes, do not affect the demographic situation and the population size of reptiles considered necessary to achieve GES (Criterion 1.3).

In the referred document, some monitoring requirements were proposed in order to get the necessary information: stranding and by-catch data gathering campaigns, stranding network using a standardized protocol and data gathering, observational and tagging campaigns in commercial vessels for estimating abundance, and acquire a better knowledge about the ecology of the species involved.

ETs proposed for this sub-region (Part V. ETs, MAGRAMA 2012b), and specific for sea turtles and other components of D1, were the following:

- Maintain positive or stable trends of key species and top predators (marine mammals, reptiles, seabirds and fish) and in the case of commercially exploited species, keep them within safe biological limits (A.3.1);
- Reduce the main causes of mortality of the populations or group of species at the top of the trophic web (marine mammals, reptiles, sea birds, pelagic and demersal elasmobranchs), such as accidental capture, collisions with vessels, intake of litter at sea, introduced terrestrial predators, pollution, habit destruction, overfishing (A.1.4).

Other proposed targets, not classified as specific for sea turtles, but related to them, were the following:

- Establish a national coordination system of the accidental catch monitoring programmes of birds, reptiles, marine mammals, and mammal and reptile stranding and bird tracking (A.1.10)
- Strengthen the Spanish Marine Protected Areas Network in the sub-region, in order to adequately protect the biogenic habitats, protected habitats and other identified in the initial evaluation as of being of special interest, including a sufficient amount of habitats and applying specific management measures (A.2.1)
- Complete the Natura 2000 network in the sub-region, through the designation of marine IBA as Special Protection Areas (SPA) for Birds, proposal of new Sites of Community Importance and the elaboration and implementation of management plans that ensure the maintenance of values that led to their classification (A.2.2.)
- Maintain updated the lists of the threatened species and the evaluation of their populations (C.1.1)
- Promote international cooperation on studies and monitoring of populations of groups with broad geographic distribution (e.g. cetacean and reptiles) (C.1.2)

- Elaborate regulatory plans for the recreational marine activities and/or associated uses, such as vessel anchoring, diving, sport fishing, marine sports, whale-watching, etc. for each zone of the sub-region where these activities are relevant (C.1.5).

The targets A.1.10 and C.1.2 were assigned to the second group, although it seems more appropriate to include them in the first one.

5.3.2 - Recommended MISTIC SEAS approach

5.3.2.1 - Management Units

Within the MSFD framework, there exists a need to choose a reduced group of MUs that are representative of the marine environment. Under this premise, four MUs are proposed: three for loggerhead sea turtle (one for each archipelago) and one for green sea turtle (Canaries).

Both species breed outside the European North-East Atlantic and mainly consist of juvenile individuals within this area. Moreover, and notwithstanding distinct patterns of movement and habitat usage, both species are highly migratory and individual movements are generally not restricted to European Macaronesian waters. Population parameters in these waters will therefore be influenced by external factors, in particular hatchling production by the nesting populations. Furthermore, both species are generally present in relatively low densities and few dedicated and standardized monitoring programmes are currently established (see 5.3.3. Madeira and Azores sections).

Nevertheless, strong arguments exist to include both species as MUs for consideration under the MSFD:

1. Both species are listed under the Habitats Directive (amongst other agreements);
2. Two species are representative of different ecological niches: Loggerhead sea turtle – pelagic environments, green turtle – neritic/coastal environments;
3. Pressures are identifiable, can be managed and their impacts are related to one or more of the proposed indicators; moreover, in some cases, sea turtle indicators appear to be the best suited or even the only available indicators for assessing the impacts of certain pressures (e.g. surface and deep pelagic long-line fisheries);
4. Baseline information exists or can be obtained within a reasonable time frame.

Loggerhead sea turtle is the most abundant sea turtle species in the pelagic waters of Macaronesia, and is proposed as MU for each archipelago. Green sea turtle is only proposed as MU for the Canary Islands, which probably harbour the most important developmental area for this species in the European Atlantic. Low frequency of sightings and a lack of knowledge preclude its inclusion as MUs for Azores and Madeira.

5.3.2.2 - Indicators and metrics

Sea turtles are highly mobile species and their ranges extend well beyond the jurisdictional waters of the three archipelagos. Distributional range (indicator 1.1.1) and Distributional pattern within range (indicator 1.1.2), both indicators proposed by the Commission and included in the Species distribution criterion (1.1), were thus not considered suitable indicator criteria. Distribution and range will be difficult to determine and quantify, and measurable baselines, metrics and targets for these indicators cannot be established. Yet, this information should be considered as additional information for the assessment of population abundance. The criteria Population abundance (1.2) and Population condition (1.3) were considered suitable for assessing GES.

A wide range of studies, often using different methodologies, have been conducted in each of the three archipelagos, generating many valuable data. However, many of these studies were punctual and thus lacking the necessary continuity to establish relevant reference values (assessment values and baselines). Nevertheless, in some archipelagos repeated or continuous monitoring programmes have been established, e.g. POPA observer programmes in the Azores (surface long-line by-catch; visual sightings from tuna fishery), or long-term sighting and biometry studies at Madeira.

These constraints determined the developmental stage of the indicators and associated metrics for each archipelago. Even so, the indicators shown in the table 15 have been selected for loggerhead and green turtles, all in need of assessment values development and baseline values.

Table 15 - Indicators proposed for sea turtles and theirs associated codes.

MUs	Indicator metric	Metrics	Indicator code
Caretta caretta (Azores, Madeira, Canaries)	Population abundance	Abundance Correction factor of nesting populations Genetic variability	TM-ABU
	Mortality rate due to by-catch	Several metrics related to by-catch Sex ratio Population abundance	TM-DEM-BYC
	Entanglement prevalence	Turtles affected by entanglement*	TM-DEM-ENT
	Body condition index	Frequency of turtles with good BCI	TM-DEM-BCI
Chelonia mydas (Canaries)	Population abundance	Abundance Correction factor of nesting populations Genetic variability	TM-ABU
	Interaction with recreational activities	Turtles affected by collision* Turtles affected by angling by-catch*	TM-DEM-REC
	Body condition index	Frequency of turtles with good BCI	TM-DEM-BCI

*Different metrics are proposed to approach these indicators. Analyses are needed for choosing the most appropriate option.

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Some of the metrics (e.g. sex ratio, correction factor of nesting populations, genetic variability, incidence of different anthropogenic pressures such as by-catch, entanglement, collision, etc.) associated with these indicators need further development to evaluate their utility to assess GES. Meanwhile, ingestion of marine litter, which had been considered as a possible indicator at the beginning of the WP1, has finally been considered more appropriate to be dealt with under the Descriptor 10 instead of the D1.

Indicator: Population abundance. TM-ABU

Type indicator: state

MUs: *Caretta caretta* (Azores, Madeira, Canaries) and *Chelonia mydas* (Canaries)

Abundance estimation is proposed in order to assess the quantitative trends in the juvenile aggregations in each of the archipelagos (Azores, Madeira and Canaries).

The hatchling production in nesting beaches influences the juvenile recruitment in developmental and feeding areas of Macaronesian waters. This recruitment is in turn reflected in the genetic composition of this aggregation. Therefore, these two metrics should be considered in the interpretation of abundance results, in order to separate the effects of nesting beaches production and recruitment from local effects. In addition, studies should provide data to verify if changes in the distribution range and pattern have likely influenced the observed abundance trends (e.g. satellite telemetry).

Besides, the population abundance indicator (TM-ABU) is necessary to estimate metrics of TM-DEM indicators.

Metrics

- Abundance. Number of individuals estimated for area (distance sampling) and/or relative abundance (sightings rate)
- Correction factor of nesting population
- Genetic variability

Abundance

Different methods (distance sampling and sighting rates) are proposed to calculate the abundance of juvenile loggerheads. Both must be tested and compared in order to establish their suitability to respond to this indicator. In the case of the green turtle, because of its coastal habitat and limited time at the surface, different methods are proposed and should be tested.

Methodology:

- *Caretta caretta*: aerial or ship based surveys.
- *Chelonia mydas*: possible methodologies: diving surveys, photo-identification, drone surveys, others.

Correction factor of nesting population

Available information on productivity in the nesting populations (e.g. number of nesting females, number of nests, hatchling success, number of nests, others) should be analysed to choose that or those that best fit the correction factor.

Genetic variability

Juveniles of loggerhead and green turtle in Macaronesian waters are characterized by high levels of genetic diversity due to the mixing of different nesting populations in these waters. Genetically, loggerhead nesting populations are characterized by a few common haplotypes that are shared by several populations, and a number of uncommon or rare haplotypes that originate the distinctiveness among populations. Consequently, juvenile aggregations present both common and rare haplotypes. A contraction or reduction in the aggregation would imply the disappearance of rare haplotypes. Hence, genetic variability as a metric would enable: (a) the determination of the main nesting populations that are contributing juveniles to the aggregation and the detection of any change in the composition, and (b) the identification of a reduction in the juvenile aggregation when the number of haplotypes, the haplotype diversity and/or the nucleotide diversity is significantly reduced. As a reduction in the production of nesting populations could affect this metric, it is necessary to correct for the possible effects of nesting populations. This metric needs further development to evaluate its suitability as metric.

Indicator: Mortality rate due to by-catch. TM-DEM-BYC

Type indicator: state and pressure

MUs: *Caretta caretta* (Azores, Madeira, Canaries)

By-catch

Fisheries by-catch is one of the main anthropogenic pressures affecting sea turtle populations, and is considered one of the main causes of anthropogenic mortality (Lewison and Crowder 2007). Estimation of total mortality rates due to fisheries interactions should therefore be a priority. To this end, capture mortality as well as post-release mortality must be estimated (e.g. Swimmer *et al.* 2014).

The main fisheries impacting the MUs vary significantly between archipelagos, from industrial surface long-line fisheries (Azores) and deep pelagic long-line fisheries (Madeira) to artisanal coastal fisheries (Canary Islands). Consequently, methodologies to estimate mortality rates will vary accordingly (e.g. observer programmes, interviews questionnaire, etc.). It should also be noted that the surface long-line fishery is probably one of the main threats for juvenile loggerheads and leatherbacks in the North Atlantic. Although large part of its effort is exerted in areas beyond national jurisdiction, this fishery impacts the MUs, and their GES, within these areas. Yet, having one of the largest fleets operating in the North Atlantic (in particular Spain and Portugal), the EU possesses the instruments to take pertinent measures if necessary.

Sex ratio

The knowledge about the overall sex ratio of sea turtle aggregations within a long-term monitoring scheme is essential to assess the GES of Macaronesian waters. This indicator will serve as an important reference value to estimate differential mortality due to anthropogenic causes (e.g. selectivity in deep pelagic (*Aphanopus carbo*) long-line fishery).

Metrics

Different metrics are required to calculate this indicator:

- Catch per unit effort (CPUE) for the different fisheries, and % mortality for those caught
- Number and condition (dead/alive) of captured turtles

- Post-release mortality rates
- Population abundance
- Sex ratio

Indicator: Entanglement prevalence TM-DEM-ENT

Type indicator: state and pressure

MUs: *Caretta caretta* (Azores, Madeira, Canaries)

Entanglement in derelict fishing gear and/or plastics (synthetic *raffia*) is one of the main causes of stranding of loggerhead sea turtles in the Canary Islands, representing the 50% of the admission causes in the wildlife recovery centres (Orós *et al*. 2016). Data of stranding causes are recorded annually by several centres in this archipelago, and information for more than 15 years is available and could potentially be used. The potential suitability of this indicator in Madeira and Azores needs to be evaluated.

Metrics

At this moment, two different methods, using different metrics, are proposed to analyse this indicator:

Method A:

- Number of turtles affected by entanglement compared to abundance

Method B:

- Proportion of turtles affected by entanglement to total stranded turtles affected by anthropogenic causes, except for cases of specific phenomena (e.g. oil spill or others)

These different options need to be analysed for their appropriateness as indicator.

Indicator: Body condition index TM-DEM-BCI

Type indicator: state

MUs: *Caretta caretta* (Azores, Madeira, Canaries) and *Chelonia mydas* (Canaries)

The body condition index (BCI) is an indicator of the animal's health and is based on a reference weight-length relationship. The BCI of sea turtles has traditionally been obtained by the formula: BCI = [weight (Kg)/ straight carapace length^3 (cm^3)] x 10000 but other morphological condition indices may prove to perform better.

A BCI classification (range of values) is required in order to interpret any given BCI figure, obtained according to the sea turtle condition. This will allow the classification of each sampled specimen as an animal with a good BCI or not. BCI data are available for the aggregation found in Madeira waters (Dellinger, unpublished), based on a time series between 1994 and 2015. Additional analyses are necessary to define baselines and assessment values. For Azores and Canary archipelagos it will be necessary to sample healthy juvenile loggerhead sea turtles (animals that do not show signs of disease or lesions/wounds). Meanwhile, other reference values for other populations could be used (e.g. Madeira's reference values).

Metrics

- Frequency of turtles caught at sea with a good BCI

Indicator: Interaction with recreational activities TM-DEM-REC

Type indicator: state and pressure

MU: *Chelonia mydas* (Canaries)

In the Canary Islands green turtles use neritic waters close to the coast, where they interact with several recreational and professional activities (swimmers, divers, fishermen and boats). The analysis of preliminary data has revealed that the interaction with recreational activities represents the 80% of the stranding's, being hooks and boat strikes or collisions the most frequent causes.

Metrics

Two different anthropogenic impacts are considered in this indicator: collision and angling by-catch. At this moment, two different methods, using different metrics, are proposed to analyse each one of them:

- Turtles affected by collision:

Method A:

- Number of turtles affected by collision corrected by the abundance

Method B:

- Proportion of turtles affected by collision to total stranded turtles affected by anthropogenic causes, except for cases of specific phenomena (e.g. oil spill or others)

These different methods need to be analysed when data are available for consider the most appropriate option to respond at this indicator.

- Turtles affected by angling:

Method A:

- Number of turtles affected by angling corrected by the abundance

Method B:

- Proportion of turtles affected by angling to total stranded turtles affected by anthropogenic causes, except for cases of specific phenomena (e.g. oil spill or others)
-

These different options need to be analysed when data are available to consider the most appropriate option that responds to this indicator.

5.3.2.3 - GES Definition and Environmental Targets

The same GES definitions for reptiles have been proposed for the three archipelagos, based on the IA of the Canary Islands (MAGRAMA 2012b):

- The population abundance of reptile species is kept at a level that ensures their sustainability within the sub-region.
- Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES.

The inclusion of '…*consistent with a population in GES*' in the second definition instead of "stability" is motivated by the different conservation status of sea turtle populations. For threatened populations, "stability" would not promote recovery, while this should be the ambition in order to reach GES.

Similarly, the same ETs were chosen for the three archipelagos. These targets were proposed from the IA for the Canary Islands archipelago (MAGRAMA 2012b). The original A.3.1 objective was modified to accommodate the different conservation status of sea turtle populations and to allow for increasing trends of threatened populations. The objective was further restricted to "key species or apex predators". The A.1.4 objective was adopted without amendment:

- TM-ABU: Maintain trends consistent with the GES of populations of key species or apex predators
- TM-DEM: Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.

5.3.2.4 - Baselines and Assessment Values

The information available about the indicators is case specific. In some cases, there is information about some metric of the indicator but in no case on all metric that compose it, or is not currently available. So far it has not been able to establish any baseline or assessment values. All indicators need more development and with some of them it needs to evaluate the suitability of the proposed metrics to assess GES.

5.3.2.5 - Monitoring requirements

Besides monitoring requirements that are specific of each archipelago (see 5.3.3), some common needs were identified:

1. Aerial or ship-based surveys to infer population abundance of loggerhead turtle
2. Improvement or implementation, depending of the archipelago, the studies of by-catch, including artisanal fishing where necessary. Creation of a coordinated stranding network
3. Sea surveys to capture and sample sea turtles
4. Sea and/or land surveys to infer population abundance of green turtle

In particular, it is essential to develop or adapt monitoring strategies and analytical methods to infer population abundance for sea turtles in Macaronesia, since the abundance indicator is a key element for assessing GES.

5.3.3 - Rationale for the selection of Management Units and Baseline Values

5.3.3.1 - Caretta caretta

Azores

Loggerheads are the most frequently observed species in the Azores, are found throughout the year, and consist exclusively of juveniles. Curved carapace lengths range from approximately 10 to 65 cm (Bolten 2003). The majority of these animals originate from the Northwest Atlantic (e.g. Florida) (Bolten *et al.* 1998; Bolten 2003).

Indicator: Population abundance TM-ABU

Abundance

Abundance estimates for the loggerhead population are currently unknown, but within a short-term period data from opportunistic platforms could be made available, i.e. from the POPA visual sightings database and MONICET programme. The "Azores Fisheries Observer Programme" (POPA) is a regular programme funded by the regional government since 1998. On a yearly basis (from April to October), observers on board of tuna-fishing vessels carry out dedicated visual census transects for sea turtles. Between 2001 and 2015, 635 sightings were registered during a total of 26,345 transect (Figure 32 e 33). MONICET is a structure to gather long term cetacean and sea turtle sightings from commercial tourism operators, which has been continuously growing over the last years. Nonetheless, dedicated aerial or ship based surveys have the potential to critically improve abundance estimates.

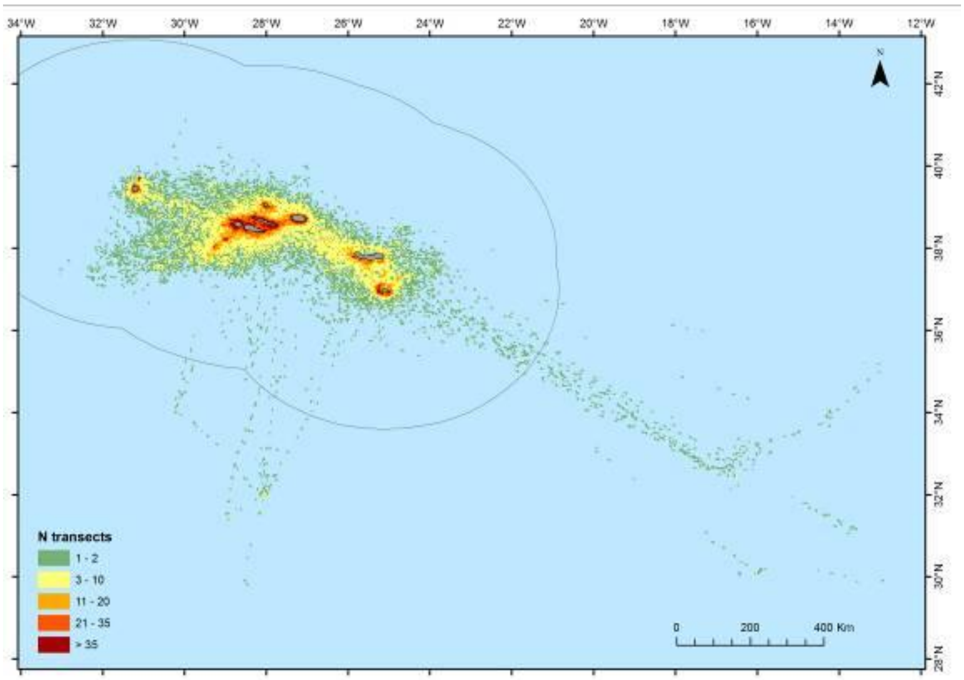

Figure 32 – Survey effort carried out by POPA between 2001 and 2015.

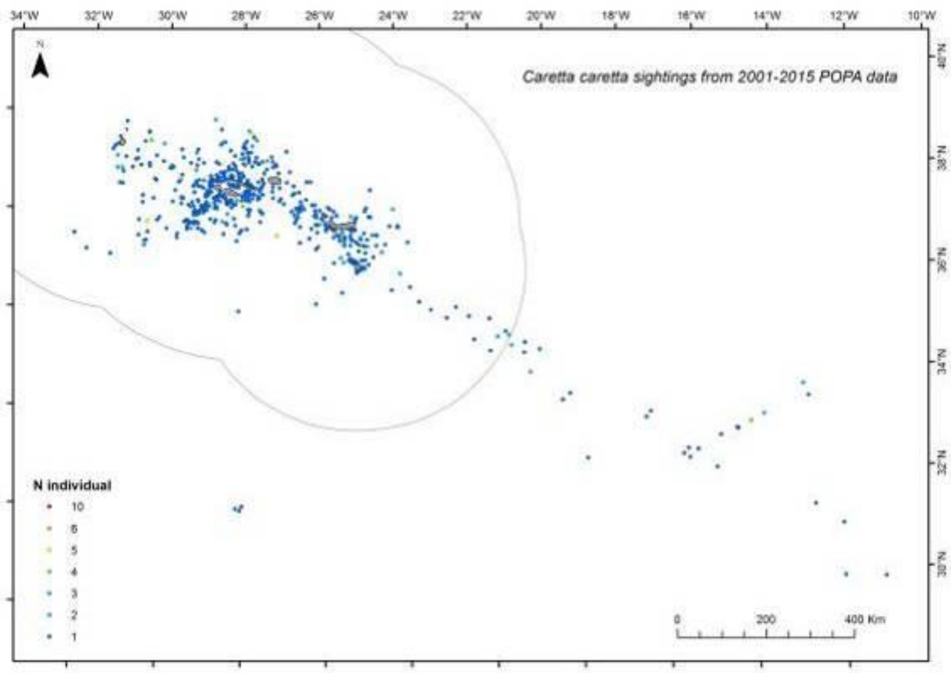

Figure 33 – Sightings of loggerhead sea turtles between 2001 and 2015.

Genetic variability

While genetic studies documented the origin of juveniles in the Azores (e.g. Bolten *et al.* 1998, Bolker *et al.* 2003, Okuyama and Bolker 2005), more recent studies are lacking. The possibility to measure genetic variability and apply it as metric for the abundance indicator in the Azores should be further investigated.

Baseline

- Not established, sighting data from opportunistic platforms available

Assessment Values

- Not established, sighting data from opportunistic platforms available

Monitoring requirements

- Periodic aerial and/or ship-based surveys with appropriate frequency to infer population abundance.
- Sea surveys to capture and sample sea turtles for genetic analysis

Indicator: Mortality rate due to by-catch TM-DEM-BYC

By-catch

The main anthropogenic pressure in the Azores is the pelagic long-line fishery, which is mainly operated by Portugal and Spain. This fishery has been monitored intermittently over the past 20 years (e.g. Ferreira *et al.* 2001, Bolten and Bjorndal 2005). Currently, POPA is coordinating an observer programme on Portuguese long-liners (2 full time observers) (Figure 34). This programme still depends on annual project funding and its continuity is uncertain. While estimates of hooking mortality can be obtained within a short time frame, no estimates exist of post-release mortality.

Figure 34 – Map of set locations from the POPA observer programme from 2009-2011 (yellow) and 2015 – 2016 (red).

Sex ratio

Sex ratio is one of the main parameters that allow us to know population demography. Yet, to our knowledge, there are no recent studies on the sex ratio and eventual sources of sexually biased mortality (e.g. in the long-line fishery).

Baseline

- Not established, data on hooking mortality available

Assessment Values

- Not established, data on hooking mortality available

Monitoring requirements

- Continuity of the observer programme on Portuguese long-liners; access to VMS data; observer data from Spanish long-liners
- Study of post-release mortality
- Sexing by-catch sea turtles
- Sea surveys to capture and sexing sea turtles

Indicator: Entanglement prevalence TM-DEM-ENT

The Azores Stranding Network (RACA – Rede de Arrojamentos de Cetáceos dos Açores) registers all stranding's of marine turtles in the archipelago. Generally, the number of turtle stranding's is relatively low and the causes of death are undetermined. This indicator needs further development to evaluate its suitability in the MU of Azores.

Baseline

- Not established, few data available

Assessment Value

- Not established, few data available

Monitoring requirements

- Functional stranding's network

Indicator: Body condition index TM-DEM-BCI

The juvenile fraction of the loggerhead population that appears in the Azores has a curved carapace length between 10 and 65 cm (Bolten 2003). This information is essentially obtained from loggerhead tagging programmes that have about 30-years of morphometric data, yet weight data remains scarce. Additional data will be needed to assess the variability of loggerhead BCI values in the Azores and to evaluate the suitability of the proposed indicator.

Baseline

- Not established, few data available

Assessment Values

- Not established, few data available

Monitoring requirements

- Continuity of the conventional tagging programme
- Sea surveys to capture, measure and weight sea turtles

Madeira

Loggerheads are the most abundant sea turtle species in Madeira's waters (Table 16; Figure 35), are found throughout the year, and consist exclusively of juveniles (Oliveira *et al.* 2005, Dellinger 2008). Curved carapace lengths range from approximately 15 to 76 cm (Dellinger 2007). The Madeira's aggregation consists in a large degree of animals that originate from the Northwest Atlantic coasts (e.g. Florida) (Bolten *et al.* 1998; Bjorndal *et al.* 2003), but Madeira's tagged turtles have been observed nesting in Cape Verde. The exact proportion from these source populations and the seasonal variation of this mixture are still unknown.

Species	Freq	% freq
Caretta caretta	1865	98.99
Lepidochelys kempii	1	0.05
Eretmochelys imbricate	2	0.11
Chelonia mydas	2	0.11
Dermochelys coriacea	10	0.53
unidentified	4	0.21

Table 16 - Species composition as sighted in sea turtle searches starting from Funchal (Dellinger, unpublished).

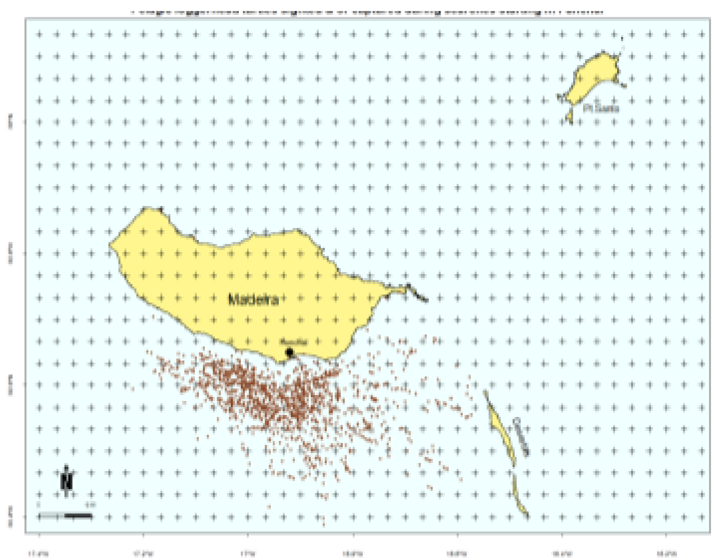

Figure 35 - Healthy wild loggerhead sea turtles captured and released based on searches starting in Funchal harbour. The distribution is limited by the range of the survey vessel, and most probably does not reflect densities elsewhere around the island.

Indicator: Population abundance TM-ABU

Relative Abundance

Since 2007, there is collaborative work between University of Madeira and various nautical-tourism companies in a monitoring programme to obtain relative abundance, based on sighting frequency, for sea turtles along the south coast of Madeira island where these operators navigate daily (Figure 36).

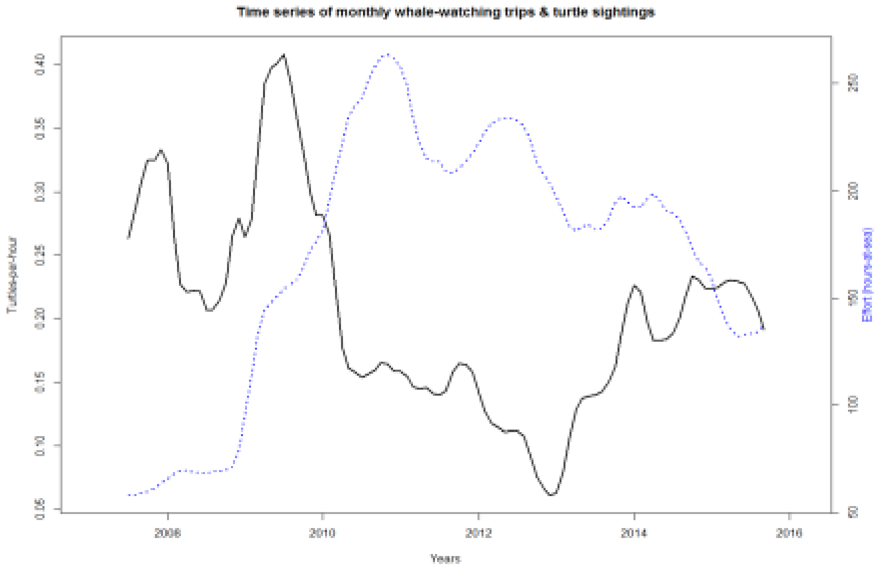

Figure 36 – Long-term trends of turtle sightings and search effort calculated from a time series of daily whale-watching trips, summarized by month, and corrected for seasonality using STL decomposition. ©Dellinger (SRA 2014).

1. Inter-annual relative abundance variation between [2007-ongoing]: The sighting rate, corrected for search effort and measured as turtles-per-hour-at-sea, has decreased until 2013 although it seems to be recovering (Figure 36, SRA 2014, updated with the most recent data (©Dellinger)). The yearly average of sea turtles sighted/hour-at-sea is 0.15 (Dellinger unpublished; SRA 2014). Possible causes of the 2013 decline are being evaluated and are most probably external to Madeira's waters.
2. Seasonal relative abundance variation: Seasonal abundance variation has been assessed by various methods, i.e. through catch per unit effort (Figure 37 – SRA 2014 (Ferreira 2001; Dellinger in prep.), and also using the nautical tourism time series (see figure below). Turtle abundance peaks usually in July/August and has its lowest point in December/January. This pattern could confirm the existence of seasonal migratory routes, consistent with satellite telemetry data (Dellinger and Freitas 2000).
3. The minimum average distance that sea turtles occur from the coast of Madeira Island. The data is showing that the sea turtles usually do not get close to the shore (Figure 38).

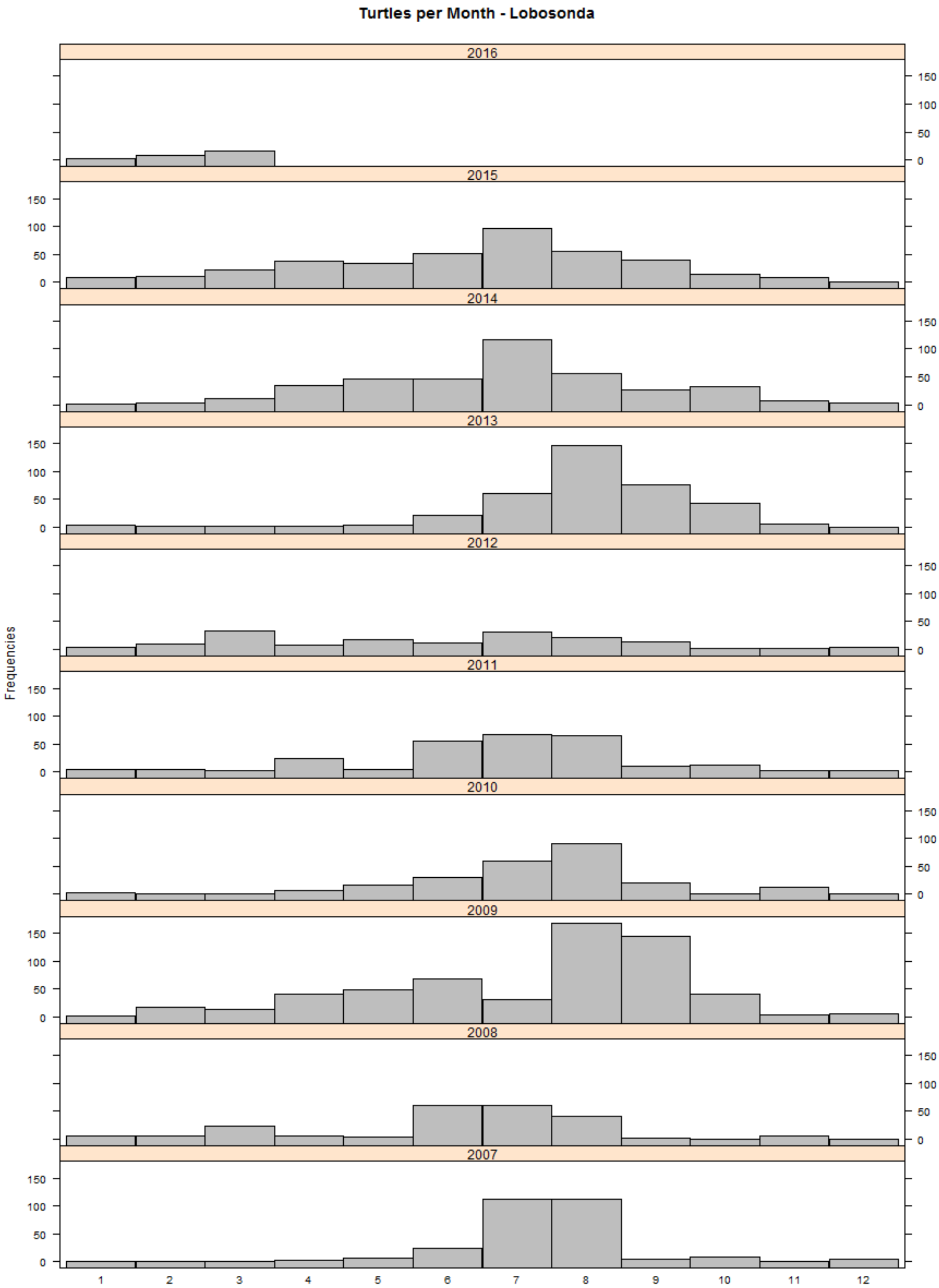

Figure 37 – Seasonal abundance of sea turtles by year in Madeira's waters [2007-2016] – (ongoing monitoring programme).

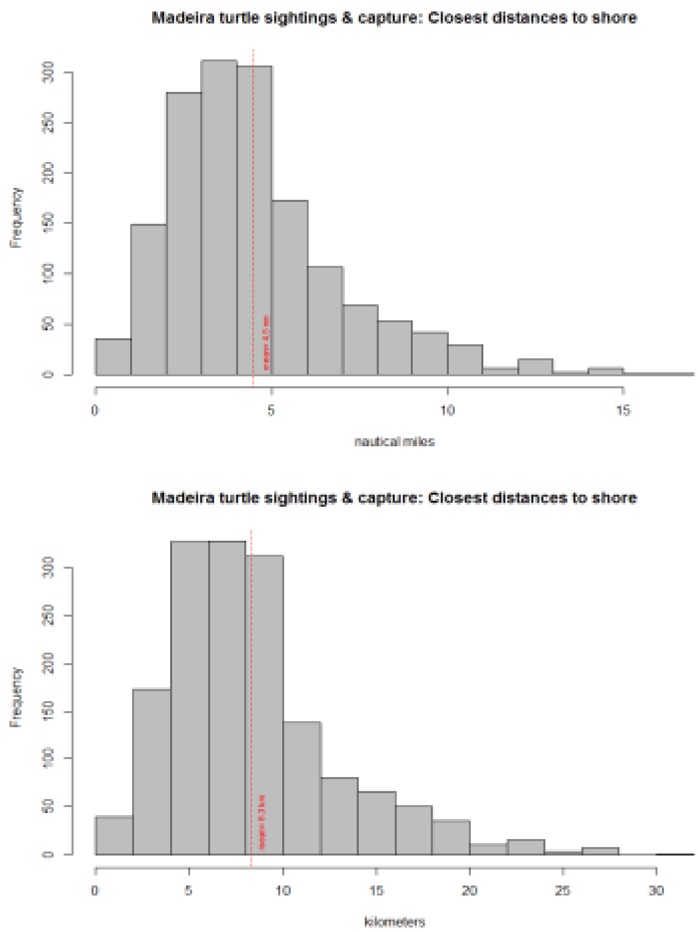

Figure 38 – Closest distance to the shore of sea turtle sightings and captures in Madeira's waters.

Absolute Abundance

The Madeira Whale Museum (MWM) collected sea turtle abundance data, within the Madeira Cetaceans Monitoring Programme, using distance sampling methodology. This MWM monitoring programme covered coastal waters of Madeira, Desertas and Porto Santo islands during the periods: 2001-2004; 2007-2009; 2010-2012 (see 5.1.3.1. Madeira). Currently, data analysis is in progress.

Genetic variability

Genetic analysis has shown that the majority of the loggerhead sea turtles that are found in Madeira's waters come from the nesting beaches of the United States of America, mainly Florida, Cape Verde and Mexico (Bolten *et al.* 1998; Monzón-Argüello *et al.* 2009). Although, some loggerhead sea turtles tagged in Madeira were found nesting at Cabo Verde, therefore the second most important nesting source of the North Atlantic should be taken into account (Dellinger unpublished).

Baseline

- Not established.

Assessment Values

- Not established.

Monitoring requirements

- Continuation of the present monitoring system using the nautical-tourism industry which provides a very cost-efficient detailed and data-dense (various trips per day and very few gaps) coverage and is proving useful on a long-term for population abundance.
- Aerial or ship-based surveys, using distance-sampling, to infer population abundance
- Sea surveys to capture and sample sea turtles for genetic analysis

Indicator: Mortality rate due to by-catch TM-DEM-BYC

By-catch in deep long-line fishery

The black scabbard-fish (*Aphanopus carbo*) long-line fishery is the main cause of sea turtle by-catch in Madeira's waters, where about 500 loggerhead sea turtles are captured annually (Dellinger and Encarnação 2000; Ferreira 2001). Despite, the fishing gear and the fishing effort has not changed since these studies were conducted (Dellinger and Encarnação 2000; Ferreira 2001), more research should be carried out in order to update information concerning the impact of this long-line fishery over sea turtles. Through the gonads analysis of sea turtles' victims of by-catch it was observed a differential mortality towards females (4F:1M) (Delgado 2008).

Sex ratio

Between 2000 and 2006, the sex of 224 wild caught juvenile loggerhead sea turtles were analysed, in Madeira waters. The overall sex ratio of the aggregation was 2F:1M (Delgado 2008; Delgado *et al*. 2010). This study provided the first data about the sex ratio of the sea turtles that are found in this Macaronesia sub-region. Although it is extremely vital to have a continuity of this study analysis in a long-term base, establishing a programme of sampling and capture is also necessary. In Madeira's waters the sex ratio recorded for wild caught sea turtles was 2F:1M, representing the juvenile phase of the aggregation. A completely different sex ratio (4F:1M) was obtained for accidentally caught turtles in the black scabbard-fish long-line fishery, thus indicating a heavy differential mortality bias towards females (Delgado 2008). Identifying the reasons (behaviour or physiological needs - food intake, for instance) related to this differential mortality is essential in order to create better management decisions to decrease the pressure of by-catch mortality by fisheries of this apex predator that is directly correlated with a better GES of Madeira's waters, and should be further investigated (Delgado 2008).

Baseline

- Not established

Assessment Values

- Not established

Monitoring Requirements

- Implementation of a long-line observer programme
- Study of post-release mortality
- Continuation of the sexing by-catch sea turtles
- Sea surveys to capture and sexing sea turtles

Indicator: Entanglement prevalence TM-DEM-ENT

At Madeira, turtle strandings are not very frequent and/or not reported frequently. We have recorded the number of strandings as well as its possible cause, one of which is entanglement. This data have been analysed together with continental strandings (Dellinger 2008), but not separately for Madeira. However, stranding frequency for Madeira is given in Table 17.

Table 17 - Stranding frequency of recorded loggerhead sea turtles at Madeira´s shores.

	Year	Stranding frequency
1	1996	18
2	1997	12
3	1998	6
4	1999	3
5	2001	12
6	2002	6
7	2003	15
8	2005	3
9	2007	6
10	2008	27
11	2012	3
12	2014	12

Because the reporting rate may not be constant for stranded turtles, the creation of a stranding network is essential to establish baseline values. This indicator needs further development to evaluate its suitability in the MU of Madeira.

Furthermore, experiments have been made at Madeira to establish turtle decomposition both on land and at sea (Dellinger *et al*. 2009) and thus better interpret each stranding event.

Baseline

- Not established

Assessment Values

- Not established

Monitoring requirements

- The creation of a functional stranding network (with participation, coordination and methodology unification across all participating entities).

Indicator: Body condition index TM-DEM-BCI

Since 1994, the Body Condition Index (BCI) of the wild-caught sea turtles has been recorded. This dataset provides important information to access the aggregation/population health, as it was explained in 5.3.2 (Figure 39).

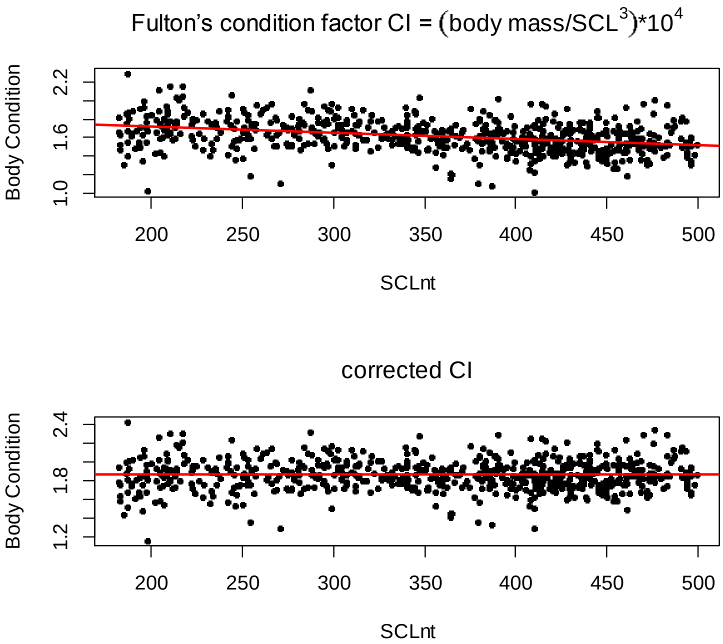

Figure 39 - A) Fulton's condition factor; B) Corrected Body Condition Index; Data are based on all healthy, wild loggerheads between sizes SCLnt [180-500 mm].

BCIs (Stevenson and Woods 2006) have not been widely used in sea turtles. Bjorndal *et al.* (2000) simply use Fulton's condition factor CI = body mass/SCL^3 (SCL=straight-carapace-length). Since this index is size biased for our turtles (Figure 39 A) we corrected its trend to obtain an unbiased index over the entire size range of turtles at Madeira (Figure 30 B) based on data without the both size extremes.

Our corrected BCI was calculated as [Weight (g)/Straight Carapace Length – notch to tip $(SCLnt)^3$ (mm)+SCL*-0.0068. This body condition index can now be applied to all data and used to compare seasonal and inter-annual variability (Figure 40).

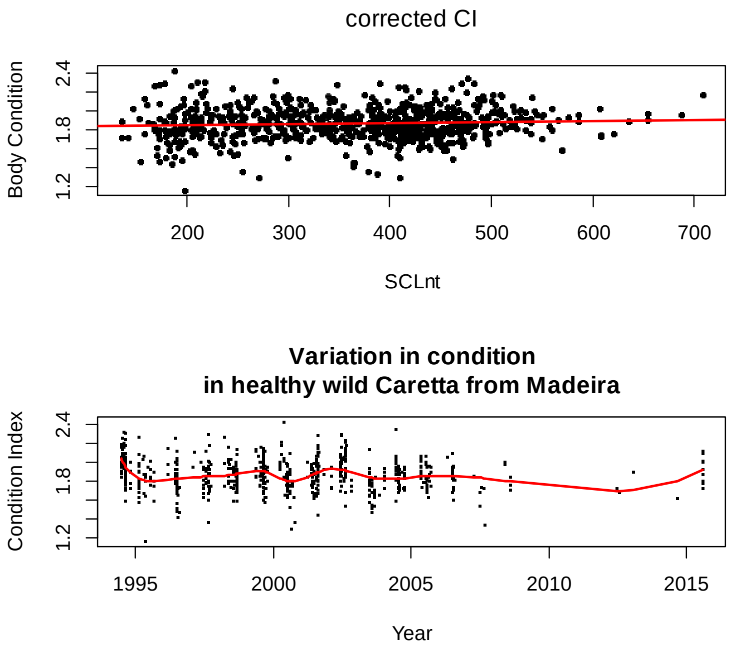

Figure 40 – Corrected Body Condition Index and Variation in condition in all captured healthy, wild loggerhead sea turtles in Madeira's waters.

Baseline

- Not established

Assessment Values

- Not established

Monitoring requirements

- Sampling and capture programmes that allow the continuation of the previous work.

Canary Islands

Indicator: Population abundance TM-ABU

With regard to the distributional range and pattern of juvenile loggerheads present in the archipelago, telemetry studies (n = 24) have shown that they use a huge oceanic area (2.5 million km^2) during their stay in the Eastern Atlantic, with particular high usage around the Canary Islands, Spain, Portugal, Morocco and Western Sahara (Figure 41). They remain principally in oceanic waters (96.8% of locations) and make short (78.5 % of the dives) and shallow dives (87.2% of the dives < 6m in depth). The turtles make deeper but shorter dives in autumn and summer, and shallower but longer dives in spring and winter. In spring and summer, turtles generally move further north towards the Iberian Peninsula (Varo-Cruz *et al.* 2016).

There are also some records of loggerhead turtles using the neritic habitat of the archipelago, so it seems possible that a habitat shift may be present in some individuals before migration, although this was not the case of the three registered individuals that migrated to the western Atlantic.

A model for habitat suitability was created considering bathymetry, slope of the bottom, sea surface temperature and net primary production. The sea surface temperature was identified as the most important contributory variable (Varo-Cruz *et al.* 2016).

There are records of sightings of sea turtles in the waters of the archipelago from different sources such as the sea surveys of various projects focused on the study of cetaceans (e.g. SECAC data). In addition, since 2010, the Granadilla Environmental Observatory develops an annual sea survey of 4-5 days on three islands of the archipelago, being the target species the sea turtles.

This data could be analysed to assess its validity for estimating abundance, although several features such as the reduced sampling area, their localised character, and differences in methodologies, and scarce frequency, could lower the value of these data to obtain abundance estimates.

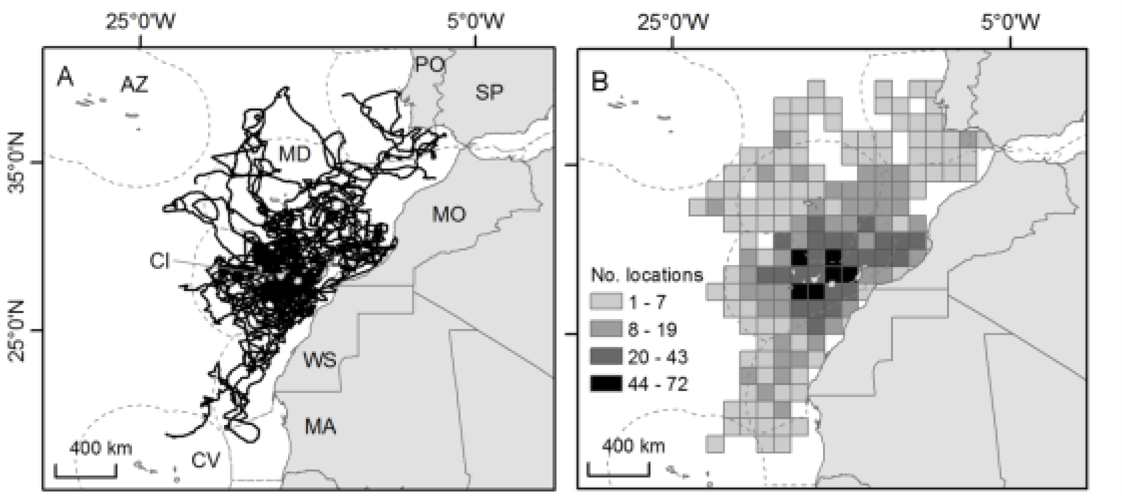

Figure 41 – (A) Tracks (excluding migration) of 24 juvenile loggerheads captured and released in the Canary Islands (Spain). Broken line polygons show European Economic Zone (EEZ). CI: Canary Islands (Spain), AZ: Azores (Portugal), MD: Madeira (Portugal), CV: Cape Verde, PO: Portugal, SP: Spain, MO: Morocco, WS: Western Sahara, MA: Mauritania. (B) Density mapping of juvenile loggerhead movements. Raster shows 1-degree grid cells. Source: Varo-Cruz *et al.* 2016.

Genetic variability

The Canary archipelago is a major developmental ground for juvenile loggerheads. Genetic studies have shown that these waters harbour turtles born in America and Africa, with low contribution of Mediterranean populations. The vast majority come from the populations of South Florida (44%), the largest population in the Atlantic, though other populations like, Northeast Florida-North Carolina (26%), Mexico (9%) and Cape Verde (12%) also contribute (Figure 42, Monzón-Argüello *et al.* 2009). This composition, similar to the those found in Azores and Madeira, could vary from year to year due to variations in the nesting populations, changes in oceanographic currents or even as a result of storms and hurricanes (Monzón-Argüello *et al.* 2012). It is necessary the sampling during a period of 4-6 years, although depending on the sampled animals, to determine the genetic variability values of the stock that enable to detect changes in the abundance (Figure 42).

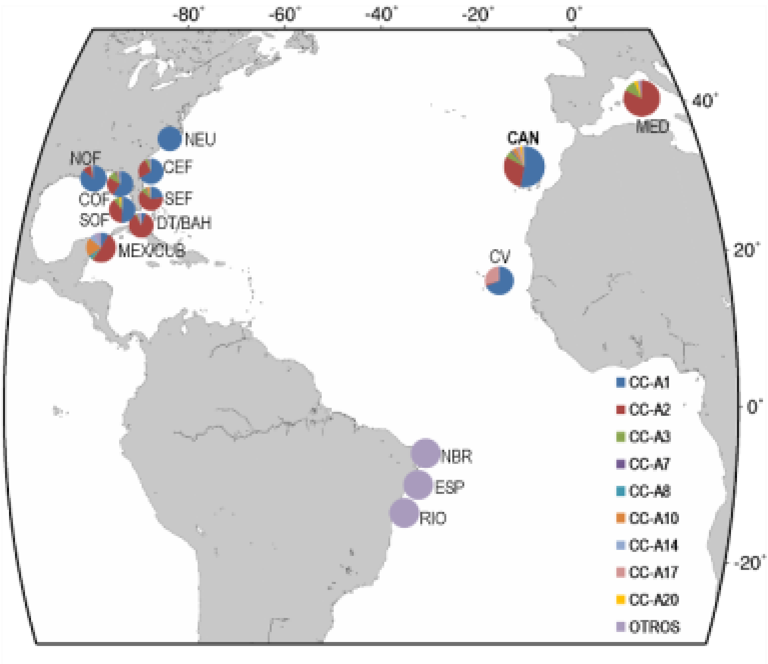

Figure 42 - Frequencies of mitochondrial DNA haplotypes found in loggerhead turtles in the Canary Islands (CAN) and the 12 Atlantic nesting populations considered: NEU, North of USA; CEF , Central-East Florida; SEF , Southeast Florida; DT / BAH, Dry Tortugas and the Bahamas; SOF , Southwest Florida; COF , Central-West Florida; NOF , Northwest Florida; MEX/CUB , Mexico and Cuba; NBR, Northern Brazil; ESP, Espírito Santo, Brazil; RIO , Rio de Janeiro , Brazil; CV , Cape Verde; CAN, Canary Islands. All Mediterranean populations are grouped as MED, Mediterranean. Map created with MapTool (www.seaturtle.org/maptool).

Baseline

- Not established

Assessment Values

- Not established

Monitoring requirements

- Periodic aerial and/or ship-based surveys with appropriate frequency to infer population abundance.

- Sea surveys to capture and sample sea turtles for genetic analysis

Indicator: Mortality rate due to by--catch TM-DEM-BYC

By-catch in surface long-line fishery

Spanish surface long-line fishing fleet work around Canarian waters (MAGRAMA 2012a) but, at least currently, activity does not seem to be too intensive because there is a seasonal pattern of few months, shifting for the rest of the year to Mediterranean Sea.

To date, abundance estimations of sea turtles have not been made in the area simultaneously to the by-catch records, and it is not known how catches could be affecting to the sea turtle populations. The analysis of the data from IEO observer programmes on board fishing vessels will allow us to decide if data obtained will be used to calculate some of the variables needed to achieve this metric, which in turn will need the simultaneous record of other values.

By-catch in recreational and artisanal fisheries

Most of the Canarian fishing fleet is made up of artisanal fishing vessels (87.5%). This fleet is not too specialized, and uses various types of fishing gears and target different species in the same vessel. The main declared gears used are: bottom long-line, trawl, drifting long-line and trammel-net (Popescu and Ortega 2013). Fishing traps are also used and hook fishing includes, apart from long-lines, hand-line, tuna pole, trolling and squid jigging (Báez 2015). During the last two decades Canarian fleet has evolved towards a 50% reduction in number of vessels, and a 30% reduction in fishing fleet.

It is not known how many turtles are being affected by artisanal fisheries in these waters, and the consequences of these captures, and the removal number that this activity means to the population (mortality due to by-catch and post-release).

Sex ratio

Sex ratio is one of the main parameters that allow us to know population demography. There are sex ratio data from the necropsies of individual loggerheads in Canary Islands (F:7 M:1, Orós *et al.* 2016), but currently it is not known whether this ratio is representative of turtles present in the waters of the archipelago, or if otherwise there is a mortality biased by sex.

Baseline

- Not established

Assessment Value

- Not established

Monitoring requirements

- Improving or implementation studies of by-catch, including artisanal fishing
- Study of post-release mortality
- Sexing by-catch sea turtles

- Sea surveys to capture and sexing sea turtles

Indicator: Entanglement prevalence TM-DEM-ENT

In the Canary Islands there are different organisms and entities, specific or not, that collect the injured and dead turtles. Although there are several wildlife recovery centres in the archipelago (Gran Canaria, Tenerife, Fuerteventura and La Palma), there are others that also attend to these cases, for example, municipal cleaning services that collect the carcasses, or coastal monitoring services that could attend to some mild cases, mainly in those islands without specific centres. Despite its enormous value, part of this information is not collected, it is insufficient or does not come from the same methodological criteria.

In a recent publication, Orós *et al.* (2016), analysed the causes of admission of the registered turtles (1998-2014) in the CRFS of Tafira, Gran Canaria, with the following results: 50.8% fishing gear entanglement and/or plastic (*raffia*), 11.9 % ingestion of hooks and monofilament lines, 5.2% trauma (boat strikes), 5.5% infections disease, 2.8% crude oil, 3.4% other causes. The study highlighted the high incidence of cases of entanglement, being half of the causes of death. However, the study did not distinguish between entanglements in fishing gear and those in plastic or other garbage not related to fishing.

In order to use effectively all these information sources and valuable data, it is essential to coordinate all the actors involved in collecting and caring for wounded and dead turtles and collaborate collecting the necessary information to identify and quantify the pressures affecting sea turtles.

Baseline

- Not established

Assessment Value

- Not established

Monitoring requirements

- To make all the information compatible, it is necessary the creation of a coordinated stranding network. The network should handle the design and distribution of the same sheet for data collection, registering information from both injured and dead animals. An action protocol for dead animals should be designed and information campaigns with the involvement of security services acting on the coast, Red Cross, the local police, local government, councils and other organisms or entities responsible for collecting dead animals.

The most appropriate metrics to respond to this indicator must be established when the information will be available and can be analysed (see 5.3.2).

Indicator: Body condition index TM-DEM-BCI

Currently, there are few data of BCI from animals captured at sea. The main source of biometric data in the archipelago, up to date, has been the wildlife recovery centres, where injured or sick animals are attended. Nowadays, there are not available reference indices for healthy animals in these waters, but bibliographic data could be used until our own indexes are available.

Baseline

- Not established for the archipelago but could use other reference values of healthy animals available in the literature.

Assessment Value

- Not established for the archipelago but could use other reference values of healthy animals available in the literature.

Monitoring requirements

- Sea surveys to sample animals

5.3.3.2 - Chelonia mydas

Canary Islands

The first and unique studies of green turtles in the Canary Islands started in 2014, as part of a one year-project (Monzón-Argüello *et al.* 2015). Up to date, the information is still scarce, although important knowledge on various aspects of their biology and ecology is available.

Indicator: Population abundance TM-ABU

Green turtles in the Canary Islands use coastal waters as feeding areas and developmental areas, where they feed on sea-grass, algae and animal prey. Some turtles show an opportunistic behaviour, eating resources provided by the man - using fishing discards or being fed (feeding) - although they also seek their food. It is unknown what proportion of the green turtle stock in the archipelago shows this behaviour.

There have been sightings of the species on the coast of the islands of Lanzarote, Fuerteventura, Gran Canaria, Tenerife, La Palma and El Hierro, corresponding to healthy or stranded animals (Figure 43). At the moment, we have identified several concentration points of the species: Alcalá (Guia de Isora), El Puertito (Adeje) and El Médano (Granadilla de Abona), in Tenerife; El Pajar (San Bartolomé de Tirajana) and the port of Arguineguin (Mogán), Gran Canaria. Recapture data and preliminary telemetry studies suggest that, at locations of residence, individuals could occupy reduced areas (<45 km^2), staying for several years.

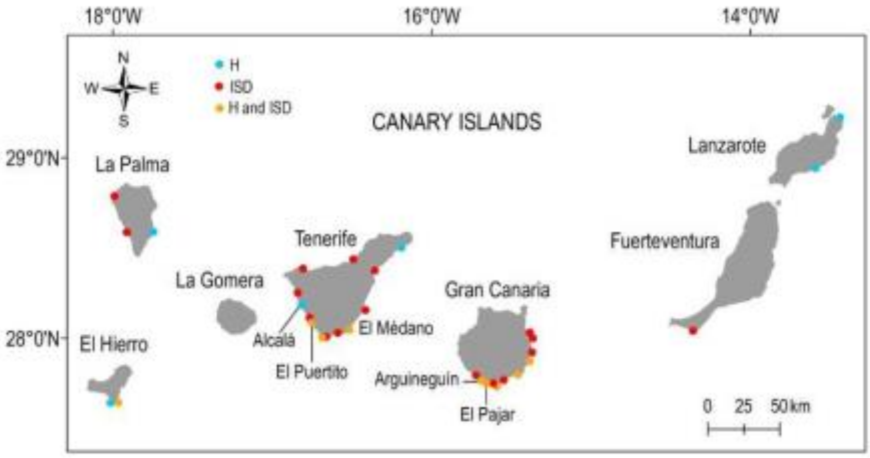

Figure 43 - Map of places in the Canary Islands where green turtles have been registered. H: healthy individuals, ISD: injured, sick or dead individuals. Source: Monzón-Argüello *et al.* 2015.

Genetic variability

Green turtles present in these waters are juveniles in their neritic phase, born in different populations from the eastern and western Atlantic, mainly Guinea Bissau, Surinam and Costa Rica (Figure 44).

It is necessary the sampling during a period of 4-6 years, although depending of the sampled animals, to determine the natural genetic variability. Genetic variability using different indicators (number of haplotypes, haplotype diversity and nucleotide diversity) will be estimated.

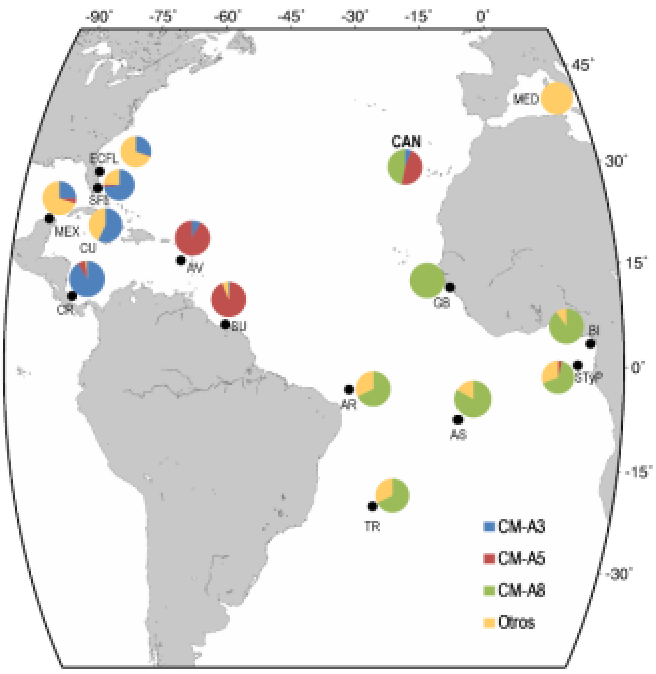

Figure 44 - Frequencies of mitochondrial DNA haplotypes found in green turtles in the Canary Islands (CAN) and the 14 nesting populations considered: Central-East Florida (ECFL); South Florida

(SFL); Mexico (MEX); Cuba (CU); Costa Rica (CR); Aves (AV); Surinam (SU); Atoll das Rocas, Brasil (AR); Trinidad island, Brasil (TR); Ascensión island, United Kingdom (AS); Guinea Bissau (GB); Bioko, Guinea Ecuatorial (BI); São Tomé and Príncipe (STP); Chipre and Turquía, Mediterráneo (MED). The location of Mediterranean populations is not real due to space-size constrictions. Map created with Maptool (www.seaturtle.org/maptool).

Baseline

- Not established

Assessment Value

- Not established

Monitoring requirements

- Periodic surveys with appropriate frequency to infer population abundance (possible methodologies: diving surveys, photo-identification, drone surveys, others).
- Sea surveys to capture and sample sea turtles for genetic analysis.

Indicator: Interaction with recreational activities TM-DEM-REC

In the Canary Islands green turtles use neritic waters close to the coast, where they interact with swimmers, divers and fishermen (recreational and professional). The species shows affinity for specific sites, including some ports where individuals feed opportunistically. The threats and pressures, that they are exposed, vary depending on the locality of residence, some of which are: habitat deterioration, the practice of feeding, by-catch, ship strikes and marine pollution (Monzón-Argüello *et al*. 2015).

The analysis of the causes of turtles admitted to three wildlife recovery centres (WRC) in the archipelago (1998-2014, n = 49) showed the following results: 49% hook, 16% penetrating injury, 14% entanglement, 6% harpoon, 6% illness and 4% knock. There are differences among cause frequencies of different island, although the hook is the most frequent in the two centres with the highest number of admissions (Figure 45, Monzón- Argüello *et al*. 2015).

Similar to the loggerhead turtle, the coordination of all stakeholders involved in the collection and care of injured and dead green turtles, and the collaboration in the data collection are essential for obtaining useful and comparable information.

Baseline

- Not established

Assessment Value

- Not established

Monitoring requirements

- To make all the information compatible, it is necessary the creation of a coordinated stranding network. The network should handle the design and distribution of the same sheet for data collection, registering information from both injured and dead animals. An action protocol for dead animals should be designed and information campaigns with the involvement of security services acting on the coast, Red Cross, the local police, local government, councils and other organisms or entities responsible for collecting dead animals.

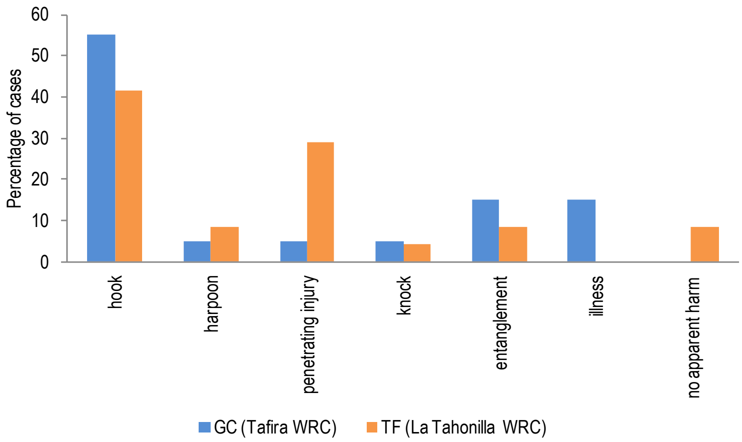

Figure 45 - Frequency distribution of green turtles admitted to wildlife recovery centres (WRC) in Gran Canaria (GC: Tafira WRC) and Tenerife (TF: La Tahonilla WRC). Source: Monzón-Argüello *et al*. 2015.

The most appropriate metrics to respond to this indicator must be established when the information will be available and can be analysed (see 5.3.2).

Indicator: Body condition index TM-DEM-BCI

Green turtles present in this waters are juveniles (CCL = 53.7 ± 12.6, mean ± SD; range = 28.3-79.9 cm, n = 38) in their neritic phase. Currently, the number of weighted turtles is limited hindering the estimation of BCI.

Baseline

- Not established

Assessment Value

- Not established

Monitoring requirements

- Sea surveys to sample animals

6. Conclusions

This Workpackage allowed the experts from all three archipelagos of European Macaronesia to standardize a common approach and to check the knowledge gaps. It is considered that the first Workpackage is completed, and that this will allow the following Workpackage 2 to reach its aim in defining common monitoring approaches within Macaronesia.

This initial report clarifies the general position of the different indicators (GES) amongst the three archipelagos. The work developed under this Workpackage enabled development of a common understanding of MSFD concepts and criteria which is fundamental to achieve a coherent and consistent approach among archipelagos of Macaronesia with respect to selection of MU, indicators and targets for marine mammals, seabirds and sea turtles. The main conclusions for each taxonomical group were as follows.

6.1. Marine mammals

The report puts in evidence significant gaps in our understanding of marine mammals in Macaronesia. There is insufficient data to develop robust indicators for the abundance and for demographic parameters of most cetacean species and many of the proposed indicators will not be made operational until further work is carried out to set baseline values (especially for abundance indicators in Azores and Canaries) and targets. Further research is also needed to assess if existing monitoring data will enable detecting trends in the proposed indicators.

The only pressure indicator proposed for marine mammals is mortality from ship strikes, applicable only for sperm whale MUs. Still, the sub-lethal effects of whale-watching and underwater noise in Macaronesia should not be overlooked and there is a need to develop robust indicators to monitor impacts from these activities on a wide range of MUs.

Knowledge gaps identified in this report should be taken into consideration when proposing the Programme of Measures. In addition to including measures to help achieving or maintaining GES, the programme of measures should also list measures needed to make the proposed indicators operational.

6.2. Seabirds

We performed a stoplight methodology to identify the priority sites, species and the distributional and demographic features to include in the evaluation of GES using seabirds as indicators. Suggestions for colonies to be assessed for the different archipelagos and indicators were compiled. Additionally, baseline values were identified for all the indicators and, in their absence, gaps were recognised, providing a solid framework to build upon for the next development phase.

In total 10 species corresponding to 21 MUs and 37 indicators for Macaronesia were chosen to provide a global assessment of the three main GES for Macaronesia. The GES indicators, GES definitions, targets and baseline values were identified following MSFD criteria and adapted to the Macaronesian seabird community features. Differences in the use of the several species as indicators depend on the characteristics of the archipelagos, for example, the two *Pterodroma* species assigned as indicators (population distribution, population abundance and population condition) are only represented in Madeira, due to their endemism. The same happens for Azores, the only archipelago where *Sterna dougallii* and the endemic *Hydrobates monteiroi* breed.

The definition of specific and globally applicable methodologies to survey our indicators is the next logical step and it is going to be a challenge. The discussions led so far clarified the directions to develop and avoid in order to successfully use seabirds as GES indicators; for example, how to adapt the acoustic monitoring to colonies with different characteristics, how to address land predation, protected area usage and effectiveness, and finally, how to reinforce monitoring requirement on protected areas, amongst others.

6.3. Sea turtles

Discussions within this Workpackage have enabled the working teams to homogenise concepts and criteria of the MSFD for sea turtles among the archipelagos of Macaronesia. Based on sighting frequency only the loggerhead sea turtle (*Caretta caretta*) was proposed as MUs for Azores and Madeira, while the Canaries also considered the inclusion of the green sea turtle (*Chelonia mydas*).

Macaronesian waters hold mixed feeding aggregations from different geographic nesting origins, and their composition varies between archipelagos. This spatial and temporal dynamic is still not well understood. On the other hand, archipelagos vary in the amount, type and quality of collected data and implemented programmes. Thus there are still significant knowledge gaps.

Many of the proposed indicators will not be made operational until further work is carried out to set baseline and assessment values. Furthermore, there are three metrics (genetic variability, sex ratio and turtles affected by entanglement) that need further research to determine their applicability. Two state indicators are proposed for sea turtles: population abundance and body condition index (BCI) and three state and pressure indicators are recommended: mortality rate due to by-catch (Macaronesia), entanglement prevalence (Macaronesia) and interaction with recreational activity (Canary Islands).

Knowledge gaps identified in this report should be taken into consideration when proposing the Monitoring Programmes and the Programme of Measures. In addition to including measures to help achieving or maintaining GES, the programme of measures should also list measures needed to make the proposed indicators operational.

7. Glossary

Baseline is the value of state at a specific point in time, against which subsequent values of state are compared. In the absence of reference values, at which impacts from anthropogenic pressures are absent or negligible, the degree of change in state from a baseline is used to assess whether the desired target state has been achieved.

Birth rate is the number of calves born per year as a percentage of the total number of animals in the population.

Descriptor 1 (D1) in the Marine Strategy Framework Directive is described as "Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions."

Environmental Target (ET) means a qualitative or quantitative statement on the desired condition of the different components of, and pressures and impacts on, marine waters in respect of each marine region or sub-region.

Estimated reduction in population size is based on calculations that may include statistical models and assumptions about sampling. Estimation may also involve interpolation in time to calculate the variable of interest for a particular time step (e.g., a 10-year reduction based on observations or estimations of population size 5 and 15 years ago).

Good Environmental Status (GES) means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

Island-associated animal refers to the individual animals encountered in the study area in more than one sampling occasion, as defined in open capture-recapture models. It is the equivalent of 'resident' and opposite of 'transient' animals in the terminology of capture-recapture methods.

Management Unit (MU) typically refers to animals of a particular species in a geographical area to which management of human activities is applied. A MU may be smaller than what is believed to be a population to reflect differences in spatial preferences of individuals and/or spatial differences in human activities.

Mortality rate is the reverse of the survival rate: it is the estimated proportion of animals alive in time t that will have died before time t+1.

Observed reduction in population size is directly based on well-documented observations of all known individuals in the population.

Projected reduction in population size is same as "estimated", but the variable of interest is extrapolated in time towards the future, or in space.

Survival rate is the estimated proportion of animals alive in time t that is still alive in time t+1.

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Appendix

Table I.I – Characteristics of the distinct indicators of the marine mammal MUs in the Azores archipelago.

AZORES		Proposal	Management unit		Commission classification		Good Environmental Status				Targets		Comments	Monitoring requirements
Component	Descriptor	Existing/ New	Species	Geographic area	GES criteria	GES Indicator	GES definition	Proposed Indicator	Indicator Metric	Baseline value	Proposed target	Development stage of indicator and target		
Marine mammals	1	New	T. truncatus - island-associated	coastal waters of Faial-Pico and S. Miguel	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	REFERENCE: Silva et al. (2009); ESTIMATE: Adults=334 (CI=237-469; CV=0.10); Subadults=311 (CI=212-456; CV=0.13). AREA: Faial-Pico; METHODOLOGY: Mark-recapture (Photo-id); STUDY PERIOD: 1999-2004 All seasons	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Operational	Funding needed for monitoring program implementation	Photo-id program within coastal waters to collect data every year
Marine mammals	1	New	T. truncatus - island-associated	coastal waters of Faial-Pico and S. Miguel	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Survival rate, Birth rate	Data available; analysis needed	No statistically significant decrease in survival rates from baseline values	Further development needed to refine the proposed target based on results from population models and viability analysis (expected to be operational by 2020)	Funding needed to provide baseline values. Funding needed for data monitoring program implementation	Photo-id program within coastal waters to collect data every year
Marine mammals	1	New	T. truncatus - island-associated and offshore	coastal waters of Azores	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	No data available	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)	Funding needed for monitoring program implementation	Dedicated line-transect survey every 6-years to provide estimates of absolute abundance; Fisheries monitoring programs and land-based surveys to monitor trends in relative abundance between dedicated surveys
Marine mammals	1	New	S. frontalis - North Atlantic	coastal waters of Azores	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	No data available	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)	Funding needed for monitoring program implementation	Dedicated line-transect survey every 6-years to provide estimates of absolute abundance; Fisheries monitoring programs and land-based surveys to monitor trends in relative abundance between dedicated surveys
Marine mammals	1	New	B. physalus - North Atlantic	coastal waters of Azores	1.2 Population size	1.2.1 Population abundance	Population size attains levels allowing it to qualify to the Least Concern Category of IUCN	MM-ABU	Absolute number of individuals	No data available	Maintain positive population growth rate until GES is reached	Further development needed (expected to be operational by 2020)	Funding needed for monitoring program implementation	Dedicated line-transect survey every 6-years to provide estimates of absolute abundance; Fisheries monitoring programs, land-based surveys and passive acoustic monitoring to monitor trends in relative abundance between dedicated surveys
Marine mammals	1	New	P. macrocephalus - North Atlantic	coastal waters of Azores	1.2 Population size	1.2.1 Population abundance	Population size attains levels allowing it to qualify to the Least Concern Category of IUCN	MM-ABU	Absolute number of individuals	REFERENCE: Mathews et al. (2001); ESTIMATE: Females=227 (SD 99), Immatures=332 (SD 140); AREA: Faial-Pico-S.Jorge; METHODOLOGY: Mark-recapture (Photo-id); STUDY PERIOD: 1995 Spring-Summer	Maintain positive population growth rate until GES is reached	Operational	Funding needed for monitoring program implementation	Photo-id program within coastal waters to collect data every year
Marine mammals	1	New	P. macrocephalus - North Atlantic	coastal waters of Azores	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Mortality rate from ship strikes	No data available	Mortality rate from ship strikes is close to zero	Further development needed (expected to be operational by 2018)	Funding needed for monitoring program implementation	Mandatory ship reporting system
Marine mammals	1	New	P. macrocephalus - North Atlantic	coastal waters of Azores	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Survival rate, Birth rate	No data available	No statistically significant decrease in survival rates from baseline values	Further development needed to refine the proposed target based on results from population models and viability analysis (expected to be operational by 2020)	Funding needed for monitoring program implementation	Photo-id program within coastal waters to collect data every year
Marine mammals	1	New	G. griseus - island-associated	coastal waters of Faial-Pico	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	REFERENCE: van der Stap & Hartman, pers. comm.; ESTIMATE: 452 (CI=408-496); AREA: Pico; METHODOLOGY: Mark-recapture (Photo-id); STUDY PERIOD: 2006 May-October	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational before 2018)	Funding needed for monitoring program implementation	Photo-id program within coastal waters to collect data every year
Marine mammals	1	New	G. griseus - island-associated	coastal waters of Faial-Pico	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Survival rate, Birth rate	REFERENCE: van der Stap & Hartman, pers. comm.; ESTIMATE: 0.97 (CI=0.79-0.99); AREA: Pico; METHODOLOGY: Mark-recapture (Photo-id); STUDY PERIOD: 2004-2007 May-October	No statistically significant decrease in survival rates from baseline values	Further development needed to refine the proposed target based on results from population models and viability analysis (expected to be operational by 2020)	Funding needed for monitoring program implementation	Photo-id program within coastal waters to collect data every year

Table I.II – Characteristics of the distinct indicators of the marine mammal MUs in the Madeira archipelago.

MADEIRA		Proposal	Management unit		Commission classification		Good Environmental Status				Targets		Comments	Monitoring requirements
Component	Descriptor	Existing/ New	Species	Geographic area	GES criteria		GES definition	Proposed Indicator	Indicator Metric	Baseline value	Proposed target	Development stage of indicator and target		
Marine mammals	1	Existing	Tursiops truncatus - all	Coastal waters Madeira, Porto Santo and Desertas	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	REFERENCE: Freitas et al. (2014). ESTIMATE: 482 animals (IC95% 365-607, CV=0,135). AREA: Madeira, Porto Santo and Desertas coastal waters. METHODOLOGY: Line visual transect. STUDY PERIOD: 2007-2012	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Operational	Funding needed for monitoring program implementation	Dedicated line-transect survey around Madeira, Desertas and Porto Santo - every 3 months (7 days) during 5 years for every reporting cycle - to provide estimates of absolute abundance
Marine mammals	1	Existing	Tursiops truncatus - island associated	Coastal waters Madeira, Porto Santo and Desertas	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	REFERENCE: Dinis (2014). ESTIMATES: 183 animals (95% IC 155-218, CV=016); AREA: South of Madeira island. METHODOLOGY:photo-identification/mark-recapture. STUDY PERIOD: 2011-2012	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Further development needed to establish new baseline values that include the main area of occurence of the species in Madeira archipelago (northeast of Madeira)	Funding needed for monitoring program implementation	Photo-id program within Madeira coastal waters to collect data every year
Marine mammals	1	New	Tursiops truncatus - island associated	Coastal waters Madeira	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population	MM-DEM	Survival rate, Birth rate	No enough data available	No statistically significant decrease in survival rates from baseline values	Further development needed to refine the proposed target based on results from population models and viability analysis	Funding needed for monitoring program implementation	Photo-id program within Madeira coastal waters to collect data every year
Marine mammals	1	Existing	Globicephala macrorhynchus - all	Coastal waters Madeira	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	REFERENCE: Freitas et al. (2014). ESTIMATE: 151 animais (IC 95% 99-201 animais, NCV=0,227). AREA: Madeira, Porto Santo and Desertas coastal waters. METHODOLOGY: Line visual transect. STUDY PERIOD: 2007-2012	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Operational	Funding needed for monitoring program implementation	Dedicated line-transect survey around Madeira, Desertas and Porto Santo - every 3 months (7 days) during 5 years for every reporting cycle - to provide estimates of absolute abundance
Marine mammals	1	Existing	Globicephala macrorhynchus - island associated	Coastal waters Madeira	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	REFERENCE: Alves et al., 2015. ESTIMATES: 140 animals (IC 95% 131-151; CV=0.05); AREA: South of Madeira island. METHODOLOGY: photo-identification/Mark-recapture. STUDY PERIOD: 2005-2011	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Operational	Funding needed for monitoring program implementation	Photo-id program within Madeira coastal waters to collect data every year
Marine mammals	1	New	Globicephala macrorhynchus - island associated	Coastal waters Madeira	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population	MM-DEM	Survival rate, Birth rate	REFERENCE: Alves et al., 2015. ESTIMATES: Survival rate=0.960 (95% CI: 0.853–0.990; SE = 0.028). AREA: South of Madeira island. METHODOLOGY: photo-identification/Mark-recapture. STUDY PERIOD: 2005-2011	No statistically significant decrease in survival rates from baseline values	Operational	Funding needed for monitoring program implementation	Photo-id program within Madeira coastal waters to collect data every year
Marine mammals	1	Existing	Delphinus delphis	Coastal waters Madeira, Porto Santo and Desertas	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	REFERENCE: Freitas et al. (2014). ESTIMATE: 741 animals (IC95%=496-1032, CV=0,266). AREA: Madeira, Porto Santo and Desertas coastal waters. METHODOLOGY: Line visual transect. STUDY PERIOD: 2007-2012	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Operational	Funding needed for monitoring program implementation	Dedicated line-transect survey around Madeira, Desertas and Porto Santo - every 3 months (7 days) during 5 years for every reporting cycle - to provide estimates of absolute abundance
Marine mammals	1	Existing	Stenella frontalis	Coastal waters Madeira, Porto Santo and Desertas	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	REFERENCE: Freitas et al. (2014). ESTIMATE: 1067 animals (IC95%=717-1378; CV=0,217). AREA: Madeira, Porto Santo and Desertas coastal waters. METHODOLOGY: Line visual transect. STUDY PERIOD: 2007-2012	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Operational	Funding needed for monitoring program implementation	Dedicated line-transect survey around Madeira, Desertas and Porto Santo - every 3 months (7 days) during 5 years for every reporting cycle - to provide estimates of absolute abundance
Marine mammals	1	New	Balaenoptera edeni	Coastal waters Madeira	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population	MM-ABU	absolute number of individuals	Data available; analysis needed	Maintain population size at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over 20 years	Further development needed	Funding needed for monitoring program implementation	Photo-id program within Madeira coastal waters to collect data every year
Marine mammals	1	New	Balaenoptera edeni	Coastal waters Madeira	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population	MM-DEM	Survival rate, Birth rate	Data available; analysis needed	No statistically significant decrease in survival rates from baseline values	Further development needed	Funding needed for monitoring program implementation	Photo-id program within Madeira coastal waters to collect data every year
Marine mammals	1	New	P. macrocephalus	North Atlantic	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Mortality rate from ship strikes	No data available	Mortality rate from ship strikes is close to zero	Further development needed		Mandatory ship reporting system

Table I.III – Characteristics of the distinct indicators of the marine mammal MUs in the Canaries archipelago.

CANARIES		Proposal	Management unit		Commission classification		Good Environmental Status				Targets		Comments	Monitoring requirements
Component	Descriptor	Existing/ New	Species	Geographic area	GES criteria	GES Indicator	GES definition	Proposed Indicator	Indicator Metric	Baseline value	Proposed target	Development stage of indicator and target		
Marine mammals		Existing	Tursiops truncatus	Canary Islands Coastal (ZEC)	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	REFERENCE: Carrillo & Tejedor, (2002). ESTIMATE 122 (95% CI 78-193). AREA: ZEC Teno-Rasca. METHODOLOGY: Line transect visual. STUDY PERIOD: 1998-2000.All seasons.	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)		Photo-id program within coastal waters to collect data every year
Marine mammals		Existing	Tursiops truncatus	Canary Islands Coastal (ZEC)	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-ABU	Survival rate, Birth rate	Data available; analysis needed	No statistically significant decrease in survival rates from baseline values	Further development needed (expected to be operational by 2018)		Photo-id program within coastal waters to collect data every year
Marine mammals	1	Existing	Globicephala macrorhynchus	Tenerife and La Gomera islands	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	REFERENCE: Servidio PHD (2014). ESTIMATE 1: 1980 CV0.33 (1442-2324) AREA 1:Canary Islands. METHODOLOGY 1: GAM. STUDY PERIOD 1: 1999-2012. All seasons ESTIMATE 2: 636 CV0.028 (602-671) AREA 2: Tenerife y La Gomera. METHODOLOGY 2:Mark-recapture (Photo-id). STUDY PERIOD 2: 1999-2012. All seasons	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)		Photo-id program within coastal waters to collect data every year
Marine mammals	1	Existing	Globicephala macrorhynchus	Tenerife and La Gomera islands	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Survival rate, Birth rate	Data available but not still processed	No statistically significant decrease in survival rates from baseline values	Further development needed (expected to be operational by 2018)		Photo-id program within coastal waters to collect data every year
Marine mammals	1	Existing	Physeter macrocephalus	Canary Islands	1.2 Population size	1.2.1 Population abundance	Population size attains levels allowing it to qualify to the Least Concern Category of IUCN	MM-ABU	Absolute number of individuals	REFERENCE: Fais et al. (2016). ESTIMATE: N = 224 (CV = 0.32) (CI = 120-418). AREA: Canary Islands. METHODOLOGY: Acoustic distance survey. STUDY PERIOD: November 2009 to January 2010.	Maintain positive population growth rate until GES is reached	Further development needed (expected to be operational by 2018)		Dedicated line-transect survey every 6-years to provide estimates of absolute abundance
Marine mammals	1	Existing	Physeter macrocephalus	Canary Islands	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Mortality rate from ship strikes	REFERENCE: Gobierno Canarias (2015). ESTIMATE:An average of 2.33 annual stranded sperm whales involved in ship strikes. AREA: : Canary Islands. METHODOLOGY: Necropsy. STUDY PERIOD: from 2000 to 2014	Mortality rate from ship strikes is close to zero	Further development needed (expected to be operational by 2018)	Study the possibility to stablish a threshold based on the net natural poroductivity of sperm whale stock sensu (Whitehead, 2002)	Mandatory ship reporting system
Marine mammals	1	Existing	Ziphius cavirostris	Western Canary islands (El Hierro)	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	REFERENCE:Reyes et al. (2016). ESTIMATE: N = 61 . AREA: El Hierro. METHODOLOGY: Mark-recapture (Photo-id). STUDY PERIOD: seasonally from 2003 to 2014.	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)		Photo-id program within selected areas to collect data every year
Marine mammals	1	Existing	Ziphius cavirostris	Western Canary islands (El Hierro)	1.3 Population condition	1.3.1 Population demographic characteristics	Population demographic characteristics (productivity, survival rate, calf survival, etc.) are not adversely affected by human activities and ensure the long-term viability of the population.	MM-DEM	Survival rate, Birth rate	Data available; analysis needed	No statistically significant decrease in survival rates from baseline values	Further development needed (expected to be operational by 2018)		Photo-id program within selected areas to collect data every year
Marine mammals	1	Existing	Ziphius cavirostris	Eastern Canary islands (Lanzarote and Fuerteventura)	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	Data available; analysis needed	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)		Photo-id program within selected areas to collect data every year
Marine mammals	1	New	Stenella frontalis	Canary Islands	1.2 Population size	1.2.1 Population abundance	The population size does not deviate from the natural fluctuations of the population.	MM-ABU	Absolute number of individuals	Data available; analysis needed	Population size is at or above the baseline levels, with no observed, estimated or projected reduction ≥10% over a 20-year period	Further development needed (expected to be operational by 2018)		Dedicated line-transect survey every 6-years to provide estimates of absolute abundance

Table I.IV – Characteristics of the distinct indicators of the seabird MUs in the Azores archipelago

Azores		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
Birds	1	New	*Bulweria bulwerii*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	1 (confirmed at Vila islet)	(= GES definition)	Operational	Nest checking, vocal detection (presence/absence) 1 every 6 years
Birds	1	New	*Bulweria bulwerii*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increasing.	AV/RT-ABU (state)	Occupied burrows in sample area	30	(= GES definition)	Operational at Vila islet (Santa Maria island); Further development needed (expected to be operational in 2 years from the beginning of the monitoring) at Praia and Baixo islets (off Graciosa island) to confirm breeding.	Nest checking (sample).1 every 2 years
Birds	1	New	*Bulweria bulwerii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, marine litter, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Vila islet=37,5%	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 10 years from the beginning of the monitoring)	Nest checking (sample).Yearly
Birds	1	New	*Bulweria bulwerii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	mark-recapture the adults in the same nests as indicators 1.2 and for breeding success 1.3.1Yearly
Birds	1	New	*Calonectris borealis*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Occupied burrows in sample area	350 BP at Vila; 200 BP at Praia	(= GES definition)	Further development needed (expected to be operational in two years from the beginning of the monitoring	Nest checking in sample areas. (with and without predators). Call rates (to be developed). Yearly
Birds	1	New	*Calonectris borealis*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Average BS at Vila between 2002 and 2008=59%; 39% at Corvo island on 6 colonies (Pão-de-açucar; Miradouro, Fonte Velha, Fajã, Pico João de Moura e Cancela do Pico) data from 2009-2011; 30,4% on Pão-de-açucar, Fonte Velha and Miradouro colonies data from 2015	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Operational at Corvo island, Pico island and Vila and Praia islets	Nest checking (sample).Yearly
Birds	1	New	*Calonectris borealis*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter	AV-DEM-SR (state)	Survival rate in sample area	Mean adult annual survival at Vila islet=0.934	The survival rate of the species is maintained at levels that ensure the stability of the	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	mark-recapture the adults in the same nests as indicators 1.2 and for breeding success 1.3.1Yearly

Azores		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
						at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.				population		
Birds	1	New	*Hydrobates castro*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	8	(= GES definition)	Mostly operational but there might be a few more unknown colonies.	Vocal surveys in moonless nights in October1 every 6 years
Birds	1	New	*Hydrobates castro*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Relative abundance	665-740 BP	(= GES definition)	Mostly operational but there might be a few more unknown colonies.	Nest checking, mist-netting and testing acoustic monitoring1 every 2 years
Birds	1	New	*Hydrobates castro*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Average 2007-2012 at Praia islet=39,73%	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Operational for Praia islet (Graciosa island)	Nest checking (sample).Yearly
Birds	1	New	*Hydrobates castro*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Available? Check recent papers JB	The survival rate of the species is maintained at levels that ensure the stability of the population	Operational for Praia islet (Graciosa island)	Nest checking (sample).Yearly
Birds	1	New	*Hydrobates monteiroi*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	3	(= GES definition)	Operational, but important to do further prospecting work at Corvo and Flores island	Nest checking 1 every 6 years
Birds	1	New	*Hydrobates monteiroi*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Occupied burrows in sample area	328-378 BP at Praia islet	(= GES definition)	Operational, but important to do further prospecting work at Corvo and Flores island	Nest checking, mist-netting and testing acoustic monitoring1 every 2 years
Birds	1	New	*Hydrobates monteiroi*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Average 2007-2012 at Praia islet=74,14%	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Operational at Praia islet (Graciosa island)	Nest checking (sample).Yearly
Birds	1	New	*Hydrobates monteiroi*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unsuccessful breeders (0.90 ± 0.023, mean ± SE), successful breeders (0.97 ± 0.015) and (low-quality) non breeders (0.83 ± 0.028).	The survival rate of the species is maintained at levels that ensure the stability of the population	Operational at Praia islet (Graciosa island)	Nest checking (sample).Yearly
Birds	1	New	*Puffinus lherminieri (assimilis)*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable,	AV-DIST (state)	Distribution range of	28	(= GES definition)	Operational	Checking the colonies1 every 6 years

Azores		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
			baroli			excluding shifts caused by climate change.		colonies				
Birds	1	New	*Puffinus lherminieri (assimilis) baroli*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Call rate in sample area	50 pairs at Vila islet; 58-130 calls/10min	(= GES definition)	Operational but further prospection work needed at Terceira island	Nest checking and Acoustic monitoring through the whole breeding season in sample colonies1 every 2 years
Birds	1	New	*Puffinus lherminieri (assimilis) baroli*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	Nest checking (sample).Yearly
Birds	1	New	*Puffinus lherminieri (assimilis) baroli*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	Nest checking (sample).Yearly
Birds	1	New	*Sterna dougallii*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: Maintain the distribution range of species so it does not statistically decrease below levels that cannot be considered as due to natural and climatic variability.	AV-DIST (state)	n islands with colonies	9 islands	(= GES definition)	Operational	clutch direct counting, flushing counts, apparently occupied nestsYearly
Birds	1	New	*Sterna dougallii*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The 6-year-period population size average of the well-monitored colonies breeding population shows no significant decline compared to the previous 6-year-period (so natural annual oscillations are taken into account).	AV/RT-ABU (state)	6-year-period population size average	Average 2009-2015 (no data for 2013)=997 BP	(= GES definition)	Operational	clutch direct counting, flushing counts, apparently occupied nestsYearly
Birds	1	New	*Sterna dougallii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	breeding success	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 6 years from the beginning of the monitoring	chick and egg direct counting, flushing counts, apparently occupied nestsYearly
Birds	1	New	*Sterna hirundo*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: Maintain the distribution range of species so it does not statistically decrease below levels that cannot be considered as due to natural and climatic variability.	AV-DIST (state)	n islands with colonies	All the 9 islands	(= GES definition)	Operational	clutch direct counting, flushing counts, apparently occupied nestsYearly

Azores		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	**Descriptor**	**Existing/ New**	**Species**	**GES criteria**	**GES Indicator**	**GES definition**	**Proposed Indicator Name**	**Indicator Metric**	**Baseline Value**	**Proposed Environmental Target**	**Development stage of indicator and target**	**Survey type and periodicity**
Birds	1	New	*Sterna hirundo*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The 6-year-period population size average of the well-monitored colonies breeding population shows no significant decline compared to the previous 6-year-period (so natural annual oscillations are taken into account).	AV/RT-ABU (state)	6-year-period populatio n size average	Average 2009-2015 (no data for 2013)=2627 BP	(= GES definition)	Operational	clutch direct counting, flushing counts, apparently occupied nestsYearly
Birds	1	New	*Sterna hirundo*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	breeding success	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 6 years from the beginning of the monitoring	chick and egg direct counting, flushing counts, apparently occupied nestsYearly

Table I.V – Characteristics of the distinct indicators of the seabird MUs in the Madeira archipelago.

Madeira		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	**Descriptor**	**Existing/ New**	**Species**	**GES criteria**	**GES Indicator**	**GES definition**	**Proposed Indicator Name**	**Indicator Metric**	**Baseline Value**	**Proposed Environmental Target**	**Development stage of indicator and target**	**Survey type and periodicity**
Birds	1	Modified	*Bulweria bulwerii*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	9	(= GES definition)	Operational	Nest checking, vocal detection (presence/absence) 1 every 6 years
Birds	1	New	*Bulweria bulwerii*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increasing.	AV/RT-ABU (state)	Occupied burrows in sample area	Unknown	(= GES definition)	Further development needed (expected to be operational in 2 years from the beginning of the monitoring)	Nest checking (sample). 1 every 6 years
Birds	1	New	*Bulweria bulwerii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	67% (n=57 fledging success) in Selvagem Grande and 71% (n=56 fledging success) on Deserta Grande	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 10 years from the beginning of the monitoring	Nest checking (sample). Yearly
Birds	1	New	*Bulweria bulwerii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	mark-recapture the adults in the same nests as indicators 1.2 and for breeding success 1.3.1Yearly
Birds	1	Modified	*Calonectris borealis*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Total nest count	30000 BP	(= GES definition)	Operational	Nest checking in sample areas. Call rates (to be developed) in Selvagem Grande.1 every 6 years
Birds	1	Modified	*Calonectris borealis*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 2 years from the beginning of the monitoring	Nest checking (sample).Yearly
Birds	1	Modified	*Calonectris borealis*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 2 years from the beginning of the monitoring	mark-recapture the adults in the same nests as indicators 1.2 and for breeding success 1.3.1Yearly
Birds	1	Modified	*Hydrobates castro*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	Atlas data	(= GES definition)	Further development needed (expected to be operational in 2 years from the beginning of the monitoring	Vocal surveys in moonless nights in October and April (for both summer and winter populations)1 every 6 years
Birds	1	Modified	*Pelagodroma marina*	1.1 Species distribution	1.1.1 Distributional	GES def/ET: The natural distribution range of	AV-DIST (state)	Distribution range	4	(= GES definition)	Operational	Checking the colonies1 every 6

Madeira		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
					range	species remains stable, excluding shifts caused by climate change.		of colonies				years
Birds	1	Modified	*Pterodroma deserta*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	1	(= GES definition)	Operational	Checking the colony1 every 6 years
Birds	1	Modified	*Pterodroma deserta*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Occupied burrows in sample area	180-220 pairs	(= GES definition)	Needs continuation of efforts in the following years	Nest checking (sample).1 every 2 years
Birds	1	Modified	*Pterodroma deserta*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	PNM data	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Operational	Nest checking (sample).1 every 2 years
Birds	1	Modified	*Pterodroma deserta*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	PNM data	The survival rate of the species is maintained at levels that ensure the stability of the population	Needs continuation of efforts in the following years	Nest checking (sample).Yearly
Birds	1	Modified	*Pterodroma madeira*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	1	(= GES definition)	Operational	Checking the colony1 every 6 years
Birds	1	Modified	*Pterodroma madeira*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Occupied burrows in sample area	85 pairs	(= GES definition)	Needs continuation of efforts in the following years	Nest checking (sample). 1 every 2 years
Birds	1	Modified	*Pterodroma madeira*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	PNM data	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Needs continuation of efforts in the following years	Nest checking (sample). 1 every 2 years
Birds	1	Modified	*Pterodroma madeira*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	PNM data	The survival rate of the species is maintained at levels that ensure the stability of the population	Needs continuation of efforts in the following years	Nest checking (sample).Yearly
Birds	1	New	*Puffinus lherminieri (assimilis) baroli*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	SPEA data (5?)	(= GES definition)	Operational	Checking the colonies1 every 6 years

Madeira		Proposal	Management Unit	Commission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
Birds	1	Modified	*Puffinus lherminieri (assimilis) baroli*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Call rate in sample area	Unknown	(= GES definition)	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	Acoustic monitoring through the whole breeding season in sample colonies1 every 2 years
Birds	1	Modified	*Puffinus lherminieri (assimilis) baroli*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	Nest checking (sample).Yearly
Birds	1	Modified	*Puffinus lherminieri (assimilis) baroli*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 10 years from the beginning of the monitoring	Nest checking (sample). Yearly
Birds	1	New	*All species*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-IP (pressure)	Presence absence of predators	n colonies with introduced predators	Maintain colonies without introduced predators free of them forever. Eradicate predators in all priority colonies with introduced predators in 10 years and in 25% of medium priority colonies in 20 years.	Further development needed (expected to be operational in 1 year from the beginning of the monitoring	Presence and absence.1 every 6 years
Birds	1	New	*Procellariidae*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-LP (pressure)	Sensitive area (depending on the distance to colonies)	unknown	Light intensity near colonies decreases, as to not increase mortality of species, and wherever possible light intensity will be decreased at maximum at more sensitive periods (when fledglings leave the nest and/or migration depending on the location).	Further development needed (expected to be operational in 1 year from the beginning of the monitoring	creating maps of light intensity together with distance to colonies for all islands.1 every 6 years

Table I.VI – Characteristics of the distinct indicators of the seabird MUs in the Canaries archipelago.

Canarias		Proposal	Management Unit	Comission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
Birds	1	Modified	*Bulweria bulwerii*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	31	(= GES definition)	Operational	Nest checking, vocal detection (presence/absence) 1 every 6 years
Birds	1	Modified	*Bulweria bulwerii*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increasing.	AV/RT-ABU (state)	Occupied burrows in sample area	Unknown	(= GES definition)	Further development needed (expected to be operational in 2 years from the beginning of the monitoring)	Nest checking (sample).1 every 2 years
Birds	1	Modified	*Bulweria bulwerii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 10 years from the beginning of the monitoring	Nest checking (sample).Yearly
Birds	1	Modified	*Bulweria bulwerii*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	mark-recapture the adults in the same nests as indicators 1.2 and for breeding success 1.3.1Yearly
Birds	1	Modified	*Calonectris borealis*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Occupied burrows in sample area	Unknown	(= GES definition)	Further development needed (expected to be operational in two years from the beginning of the monitoring	Nest checking in sample areas. (with and without predators). Call rates (to be developed). 1 every 2 years
Birds	1	Modified	*Calonectris borealis*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-BS (state)	Productivity in sample area	Unknown	Breeding success of species is maintained at natural levels, adequate for the population characteristics to remain stable.	Further development needed (expected to be operational in 10 years from the beginning of the monitoring	Nest checking (sample) (as close to each other as possible)Yearly
Birds	1	Modified	*Calonectris borealis*	1.3 Population condition	1.3.1 Population demographic characteristics	Reduce the main causes of mortality and reduction of the populations of seabirds, such as incidental capture, intake of litter at sea, introduced terrestrial predators, pollution, habitat destruction, overfishing.	AV-DEM-SR (state)	Survival rate in sample area	Unknown	The survival rate of the species is maintained at levels that ensure the stability of the population	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	mark-recapture the adults in the same nests as indicators 1.2 and for breeding success 1.3.1Yearly
Birds	1	Modified	*Hydrobates castro*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	8	(= GES definition)	Further development needed (expected to be operational in 2 years from the beginning of the monitoring	Nest checking, vocal detection (presence/absence) 1 every 3 years
Birds	1	Modified	*Pelagodroma marina*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable,	AV-DIST (state)	Distribution range of	2	(= GES definition)	Operational	Nest checking, vocal detection (presence/absence

Canarias		Proposal	Management Unit	Comission classification		Good Environmental Status					Targets	Methodology Requirements
Component	Descriptor	Existing/ New	Species	GES criteria	GES Indicator	GES definition	Proposed Indicator Name	Indicator Metric	Baseline Value	Proposed Environmental Target	Development stage of indicator and target	Survey type and periodicity
						excluding shifts caused by climate change.		colonies				) 1 every 2 years
Birds	1	Modified	*Pelagodroma marina*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Occupied burrows in sample area	72 pairs (Montaña Clara 2016; Felipe Rodriguez Godoy com pers) + 4 pairs (Alegranza, 2011)	(= GES definition)	Operational	Nest checking1 every 2 years
Birds	1	New	*Puffinus lherminieri (assimilis) baroli*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: The natural distribution range of species remains stable, excluding shifts caused by climate change.	AV-DIST (state)	Distribution range of colonies	38	(= GES definition)	Operational	Checking the colonies1 every 6 years
Birds	1	Modified	*Puffinus lherminieri (assimilis) baroli*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The seabird populations are stable or increase.	AV/RT-ABU (state)	Call rate in sample area	Unknown	(= GES definition)	Further development needed (expected to be operational in 5 years from the beginning of the monitoring	Acoustic monitoring in sample colonies1 every 2 years
Birds	1	New	*Sterna hirundo*	1.1 Species distribution	1.1.1 Distributional range	GES def/ET: Maintain the distribution range of species so it does not statistically decrease below levels that cannot be considered as due to natural and climatic variability.	AV-DIST (state)	n islands with colonies	All the 9 islands	(= GES definition)	Further development needed (expected to be operational in 1 year from the beginning of the monitoring	Checking the coloniesYearly
Birds	1	New	*Sterna hirundo*	1.2 Population size	1.2.1 Population abundance	GES Definition/ET: The 6-year-period population size average of the well-monitored colonies breeding population shows no significant decline compared to the previous 6-year-period (so natural annual oscillations are taken into account).	AV/RT-ABU (state)	6-year-period population size average	Unknown	(= GES definition)	Further development needed (expected to be operational in 6 years from the beginning of the monitoring	flushingYearly

Table I.VII – Characteristics of the distinct indicators of the sea turtle MUs in the Azores archipelago.

AZORES		**Proposal**	**Management unit**		**Commission classification**		**Good Environmental Status**				**Targets**		**Comments**	**Monitoring requirements**
Component	Descriptor	Existing/ New	Species	Geographic area	GES criteria	GES Indicator	GES definition	Proposed Indicator	Indicator Metric	Baseline value	Proposed target	Development stage of indicator and target		
Turtles	1	New	Caretta caretta	Azores	1.2 Population size	1.2.1 Population abundance	The abundance of reptile species is kept at a level that ensures their sustainability within the sub-region	TM-ABU	Population abundance (abundance, correcting factor of nesting populations, genetic variability)	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Genetic variability need further development to evaluate their suitability as metric	Periodic aerial and/or ship-based surveys with appropiate frequency to infer population abundance. Sea surveys to capture and sample sea turtles for genetic analysis
Turtles	1	New	Caretta caretta	Azores	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BYC	Mortality rate due to bycatch (several metrics related to bycatch, sex ratio, population abundance)	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Sex ratio need further development to evaluate their suitability as metric	Improvement of bycatch studies, including post-release mortality; continuity of the observer program on Portuguese longliners; access to VMS data; observer data from Spanish longliners; Sexing bycatch sea turtles; Sea surveys to capture and sexing sea turtles
Turtles	1	New	Caretta caretta	Azores	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-ENT	Turtles afected by entanglement	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Different options of metrics need to be analyzed when data are available for consider the most appropriate option to respond at this indicator.	The creation of a stranding network (with participation, coordination and methodological uniformisation across all participating entities) and population abundance data
Turtles	1	New	Caretta caretta	Azores	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BCI	Frequency of turtles with good body condition index	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator.	Sampling and capture programmes (studying compatibility with existing programmes and whale-watching tours); continuity of the conventional tagging program

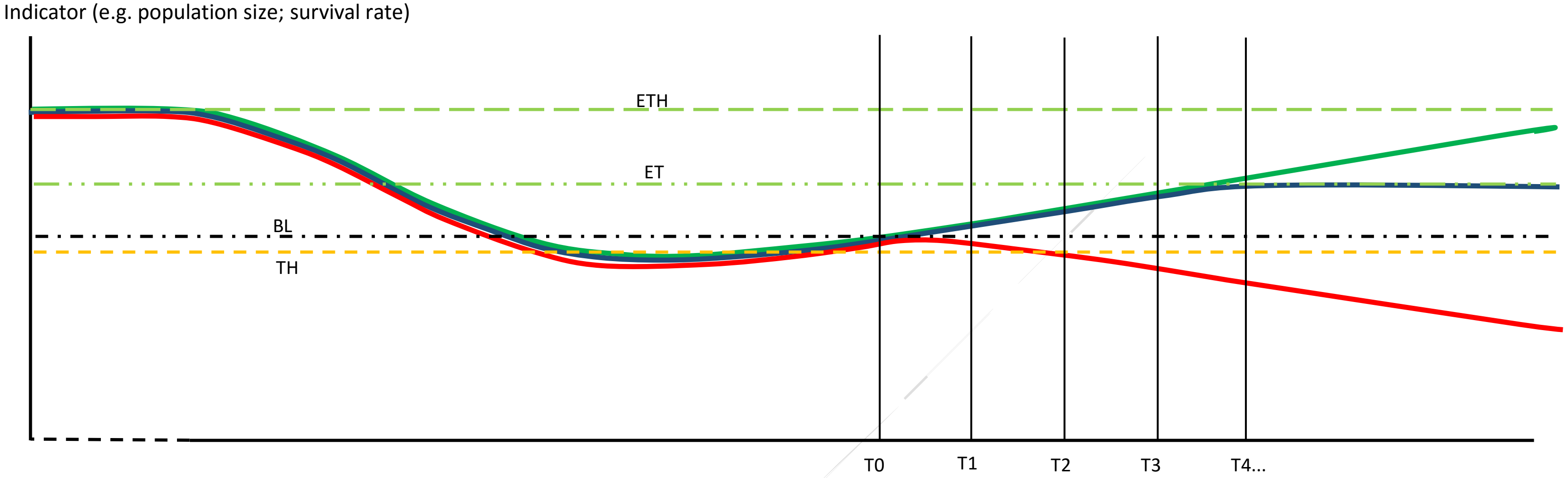
Table I.VIII – Characteristics of the distinct indicators of the sea turtle MUs in the Madeira archipelago.

MADEIRA		Proposal	Management unit		Commission classification		Good Environmental Status				Targets		Comments	Monitoring requirements
Component	Descriptor	Existing/ New	Species	Geographic area	GES criteria		GES definition	Proposed Indicator	Indicator Metric	Baseline value	Proposed target	Development stage of indicator and target		
Turtles	1	New	Caretta caretta	Madeira	1.2 Population size	1.2.1 Population abundance	The abundance of reptile species is kept at a level that ensures their sustainability within the sub-region	TM-ABU	Population abundance (abundance, correcting factor of nesting populations, genetic variability)	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Genetic variability need further development to evaluate their suitability as metric	Periodic aerial and/or ship-based surveys with appropiate frequency to infer population abundance; Continuation of the present monitoring system using the nautical-tourism industry which provides a very cost-efficient detailed and data-dense coverage; sea surveys to capture and sample sea turtles for genetic analysis
Turtles	1	New	Caretta caretta	Madeira	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BYC	Mortality rate due to bycatch (several metrics related to bycatch, sex ratio, population abundance)	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Sex ratio need further development to evaluate their suitability as metric	Improvement of bycatch studies, including post-release mortality; implementation of a longline observer program; continuation of the sexing bycatch sea turtles; sea surveys to capture and sexing sea turtles
Turtles	1	New	Caretta caretta	Madeira	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-ENT	Turtles afected by entanglement	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Different options of metrics need to be analyzed when data are available for consider the most appropriate option to respond at this indicator	The creation of a stranding network (with participation, coordination and methodological uniformisation across all participating entities) and population abundance data
Turtles	1	New	Caretta caretta	Madeira	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BCI	Frequency of turtles with good body condition index	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator	Sampling and capture programs that allow the continuation of the previous work

Table I.IX – Characteristics of the distinct indicators of the sea turtle MUs in the Canaries archipelago.

CANARIES		Proposal	Management unit		Commission classification		Good Environmental Status				Targets		Comments	Monitoring requirements
Component	Descriptor	Existing/ New	Species	Geographic area	GES criteria	GES Indicator	GES definition	Proposed Indicator	Indicator Metric	Baseline value	Proposed target	Development stage of indicator and target		
Turtles	1	New	Caretta caretta	Canarias	1.2 Population size	1.2.1 Population abundance	The abundance of reptile species is kept at a level that ensures their sustainability within the sub-region	TM-ABU	Population abundance (abundance, correcting factor of nesting populations, genetic variability)	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Genetic variability need further development to evaluate their	Periodic aerial and/or ship-based surveys with appropiate frequency to infer population abundance. Sea surveys to capture and sample sea turtles for genetic analysis
Turtles	1	New	Caretta caretta	Canarias	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BYC	Mortality rate due to bycatch (several metrics related to bycatch, sex ratio, population abundance)	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Sex ratio need further development to evaluate their	Improvement of bycatch studies, including artisanal fishing; study of post-release mortality; sexing bycatch sea turtles; sea surveys to capture and sexing sea turtles
Turtles	1	New	Caretta caretta	Canarias	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-ENT	Turtles affected by entanglement	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Different options of metrics need to be analyzed when data are available for consider the most appropriate option to respond at this indicator.	The creation of a stranding network (with participation, coordination and methodological uniformisation across all participating entities) and population abundance data
Turtles	1	New	Caretta caretta	Canarias	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BCI	Frequency of turtles with good body condition index	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator.	Sampling and capture programmes (studying compatibility with existing programmes and whale-watching tours)
Turtles	1	New	Chelonia mydas	Canarias	1.2 Population size	1.2.1 Population abundance	The abundance of reptile species is kept at a level that ensures their sustainability within the sub-region	TM-ABU	Population abundance (abundance, correcting factor of nesting populations, genetic variability)	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Genetic variability need further development to evaluate their	Periodic submarine and/or fotoidentification surveys with appropiate frequency to infer population abundance; sea surveys to capture and sample sea turtles for genetic analysis
Turtles	1	New	Chelonia mydas	Canarias	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-REC	Interaction with recreational activities (turtles affected by collisons and angling bycatch)	Not established	Reduce the main causes of mortality and of reduction of the populations of sea turtles, such as accidental capture, entanglements and collisions with vessels.	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator. Different options of metrics need to be analyzed when data are available for consider the most appropriate option to respond at this indicator.	The creation of a stranding network (with participation, coordination and methodology unification across all participating entities) and population abundance data
Turtles	1	New	Chelonia mydas	Canarias	1.3 Population condition	1.3.1 Population demographic characteristics	Population parameters (body condition, genetic variability, mortality, etc.) are consistent with a population in GES	TM-DEM-BCI	Frequency of turtles with good body condition index	Not established	Mantain trends consistent with the GES of populations of key species or apex predators	Further development needed (expected to be operational by XXXX	Establishment of baseline and thresholds depends on further development of this indicator.	Sampling and capture programmes (studying compatibility with existing programmes and whale-watching tours)

Graphic 1 - Applicable to MUs/populations that had significant human impacts before the IA (T0) (Type A), which affected the parameter being measured by the indicator (e.g. pop. size). Population natural fluctuations are not represented in the graph. If we are dealing with Indicators like mortality rates the graphic will be the inverse, with the TH on top and ETH on the bottom and the curves evolving the inverse way.



- Time before human activities started having impact on the conditions/parameters measured by this indicator (X axis)
- Time when human activities started having impact on the conditions/parameters measured by this indicator (X axis)
- Scenario 1 - Evolution of the indicator values over time for a population that has been impacted by human activities (e.g. whaling) before T0 (MFSD initial assessment) and has no significant impact of human activities afterwards; the population has the possibility of returning to its original historical size considering that its ecological niche has not been occupied and there are enough food resources to sustain the original population size;
- Scenario 2 - Evolution of the indicator values over time for a population that has been impacted by human activities (e.g. whaling) before T0 (MFSD initial assessment) and has no significant impact of human activities afterwards or the impact still allows population growth ; the population has no possibility of returning to its original historical size because the ecological niche has been partially occupied and there are not enough food resources to sustain the original population size, e.g. competition with fisheries;
- Scenario 3 - Evolution of the indicator values over time for a population that has been impacted by human activities (e.g. whaling) before T0 (MFSD initial assessment) and continues to have a serious impact of human activities afterwards (e.g. by catch, ship strikes);
- ETH - <u>ET based on historical data</u> that could be hypothetically the value before human impact began (e.g. pop. size before whaling, pop.size before by-catch started).
- ET - <u>ET</u> could be a value based on expert judgement or other grounds to define the limit above which the GES for this indicator is reached (e.g. pop. size 20% above present level; pop. size above which the MU is consider "Least Concern" according to IUCN criteria). It could also be defined as the slope of the indicator curve (growth rate) avoiding this way the possible use of arbitrary values and being applicable to Scenario 1 and 2;
- BL – Baseline value of the indicator as defined at the initial assessment;

Graphic ... iations are
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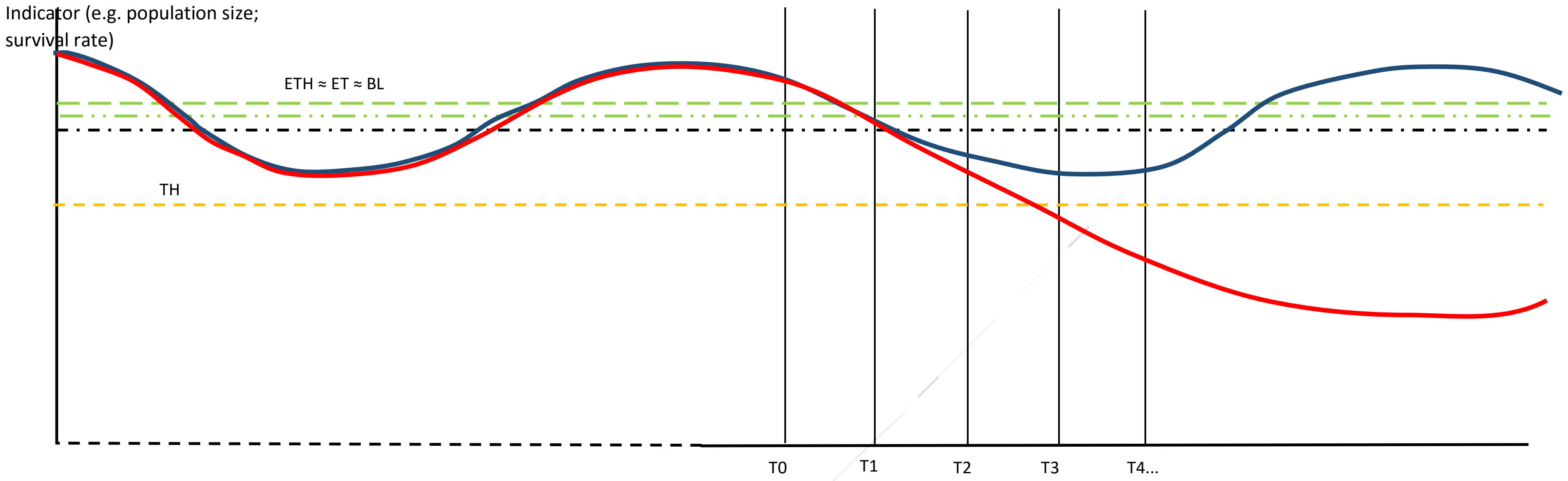
the curve

- TH – Assessment value below which measures should be taken in order to reverse the conditions (human impact) that are driving the indicator's values away from ET. In heavy impacted populations TH should be equal or very close to BL, because the population is already depleted. Some of these populations have already IUCN vulnerable or endangered statuses.



Time before human activities started having impact on the conditions/parameters measured by this indicator (X axis)

Time when human activities started having impact on the conditions/parameters measured by this indicator (X axis)

Scenario 1 - Evolution of the indicator values over time for a population that has not been significantly impacted by human activities before T0 (MFSD initial assessment) and has no significant impact of human activities afterwards or the impact still allows population growth;

Scenario 2 - Evolution of the indicator values over time for a population that has not been significantly impacted by human activities before T0 (MFSD initial assessment), but started to be impacted by human activities afterwards (e.g. by catch, ship strikes).

In populations/MUs that have not been seriously impacted by human activities before T0, it is reasonable to assume that ETH ≈ EH ≈ BL.

TH – Assessment value below which measures should be taken in order to reverse the conditions (human impact) that are driving the indicator's values away from the ETH ≈ EH ≈ BL. If there are no time series data to determine the indicator's natural fluctuations (just a BL value), then TH value should be set further away from the BL to accommodate those natural fluctuations. As the assessment cycles progress and the natural cycles are better understood the TH value should be set closer to the BL. However, the TH should not be set so far as to allow a population with a "least concern" status change to "vulnerable" status because of the impact of human activities.

Mus and indicators for Macaronesia

Having this conceptual framework in mind, next it will be discussed more specifically the Macaronesian MUs and proposed indicators and metrics.

Table I.X – The indicators proposed by Portugal and Spain in their IA reports of the MFSD for the Macaronesia Region and new ones proposed by the cetaceans' experts during the WP1 workshop of MISTIC SEAS project, based on several cetaceans' species MUs for Madeira, Azores and Canaries archipelagos. The MUs that had serious human impacts before the IA (T0) are identified as Type A and the ones that did not have that impact as type B.

	MUs	Indicator	Methodology	metrics	Type A	Type B	BL value
1.	Archipelago Azores						
1.1	T. truncatus - Coastal	Abundance	Mark-recapture	Abs. value		X	X
1.2	T. truncatus - Coastal	Survival rate	Mark-recapture	Rate		X	X
1.3	T. truncatus – Oceanic	Abundance	Distance sampling	Abs. value		X	
1.4	S. frontalis	Abundance	Distance sampling	Abs. value		X	
1.5	B. physalus	Abundance	Mark-recapture	Abs. value	X		
1.5	P. macrocephalus	Abundance	Mark-recapture	Abs. value	X		X
1.6	P. macrocephalus	Survival rate	Mark-recapture	Rate	X		X
1.7	G. griseus	Abundance	Mark-recapture	Abs. value		X	X
1.8	G. griseus	Survival rate	Mark-recapture	Rate		X	X
2.	Archipelago Madeira						
2.1	T. truncatus – all	Abundance	Distance sampling	Abs. value		X	X
2.2	T. truncatus – coastal	Abundance	Mark-recapture	Abs. value		X	X
2.3	T. truncatus – coastal	Survival rate	Mark-recapture	Rate		X	
2.4	G. macrorhynchus - all	Abundance	Distance sampling	Abs. value		X	X
2.5	G. macrorhynchus - coastal	Abundance	Mark-recapture	Abs. value		X	X
2.6	G. macrorhynchus - coastal	Survival rate	Mark-recapture	Rate		X	X

2.7	S. frontalis	Abundance	Distance sampling	Abs. value		X	X
2.8	D. delphis	Abundance	Distance sampling	Abs. value		X	X
2.9	B. edeni	Abundance	Mark-recapture	Abs. value		X	
2.10	B. edeni	Survival rate	Mark-recapture	Rate		X	
3.	Archipelago Canaries						
3.1	T. truncatus - coastal	Abundance	Mark-recapture	Abs. value		X	X
3.2	T. truncatus - coastal	Mortality rate and others	Mark-recapture	Rate		X	?
3.3	G. macrorhynchus – Tenerife and La Gomera	Abundance	Mark-recapture	Abs. value		X	X
3.4	G. macrorhynchus – Tenerife and La Gomera	Mortality rate and others	Mark-recapture	Rate		X	X
3.5	P. macrocephalus	Abundance	Distance sampling	Abs. value	X		X
3.6	P. macrocephalus	Mortality rate and others	Mark-recapture	Rate	X		X
3.7	Z. cavirostris – West Canaries	Abundance	Mark-recapture	Abs. value		X	?
3.8	Z. cavirostris – West Canaries	Mortality rate and others	Mark-recapture	Rate		X	?
3.9	Z. cavirostris – East Canaries	Abundance	Mark-recapture	Abs. value		X	X
3.10	Z. cavirostris – East Canaries	Mortality rate and others	Mark-recapture	Rate		X	?
3.11	S. frontalis	Abundance	Distance sampling	Abs. value		X	?
3.12	B. edeni	Abundance	Mark-recapture	Abs. value		X	?

Mus TYPE A

From what it is presently known there are only 3 MUs considered for Macaronesia that are type A (had serious human impacts before the IA (T0) that affected the parameter being measured by the indicator) - the sperm whale and fin whale in Azores and sperm whale in the Canaries which had their population sizes reduced by whaling. These species have Vulnerable and Endangered IUCN statutes, respectively. **No further reduction in population size due to human pressures should be accepted for these populations** as they are already far below their historical population sizes and with a higher natural growth potential, i.e., the present values are expected to be below the lower population sizes resulting from natural fluctuations if the population was at GES.

The ET value could be:

- Population size before whaling started (if it is known or estimated) (ETH), although it would be very difficult to translate it into a value at the level of the MUs that we are dealing with.
- A value based on expert judgement or other grounds to define the limit above which the GES for this indicator is reached, e.g.:
- MU abundance 20% (or other value) above present level;
- abundance, above which the MU is considered "Least Concern" according to IUCN criteria
- Positive net growth rate of the MU size over time ("MU size at T0" < "MU size at T1" < "MU size at T2"… = positive slope of the indicator curve over T). This option does not require having an absolute value defined, although it will have to be changed eventually to an absolute value (the MU will not grow forever) once the population has stabilized and/or there is a long enough time series to establish an ET.

It should be kept in mind that the indicators are established to measure indirectly (indicators of state) or more directly (indicators of pressure) the impact of human activities on specific elements of the marine ecosystem. In the case of the sperm whale in Macaronesia the only presently known serious impact are ship strikes in the Canary Islands. Although theoretically that impact might be measured through the indicators 3.5 or 3.6 (table 1), other unknown impacts might also be affecting the behaviour of those indicators. For that reason, an indicator of pressure should be considered in order to monitor possible changes in the pressure. That indicator could be the total number of whales killed by ship strikes (N) over a defined period of time (e.g. 6 years), based for example on recorded stranding's, or N expressed in percentage of MU size over the same period. Expressing N as percentage of MU size seems to be a better option because reduces the higher variability derived from the indicator metrics being based a small number of animals. For example, if 2 animals die from ship-strikes in one year and 3 animals the year after that will represent an 50% increase in mortality from ship-strikes when in reality it was one animal more.

The same reasoning considered above for ship strikes could also be applied to other human pressures that are known, even if they have low impacts at the moment (closer to GES), like by-catch on fisheries.

For these MUs, the **BL** value serves just as a reference (T0) for comparison with the indicator values over time (T1, T2…) in order to understand if the indicator is evolving in the right direction – has the same role as ET

The **TH** value is of particular importance when we are dealing with threatened species as indicators. The TH should be very close to **BL** in order to trigger measures in case there is a known or suspected source of human impact on the species that is driving the evolution of the indicator. On the other hand, the assessment value may be crossed without a source of the impact being identified (natural causes, indirect human impact or unidentified human impact), making it impossible to take concrete measures to reverse the indicator progress. Again it is important to have indicators of pressure measuring some of the main known human impacts in the region of interest (see section 6)

The **TH** value could be a value based on expert judgement or other grounds to define the value below which the measures should be taken to tackle an identified impact, e.g.:

- MU abundance 0%, 5% or other value below BL level;
- Negative net growth rate of the MU size over a defined unit of time ("MU size at T0" > "MU size at T1" > "MU size at T2" … = negative slope of the indicator curve over T). This option does not require having an absolute value defined.

MUs TYPE B

It is reasonable to assume that ET ≈ ETH ≈ BL for the remaining cetacean MUs (type B - table 1) considering the following:

- in general, we are dealing with MUs belonging to oceanic populations with wide ranges and offshore distribution with generally lower densities, and more coastal MUs associated with the Macaronesian Islands that occur at higher densities;
- for the oceanic MUs it is assumed that impacts on animals outside Macaronesia do not affect significantly the demography of the oceanic population because of the size and extent of spatial distribution of populations;
- for the smaller island-associated MUs, it is also assumed that impacts outside Macaronesia will not affect them significantly because of their preference for coastal Macaronesia waters;
- the lack of evidence of commercial exploration of these oceanic MUs within or outside Macaronesia, that would have driven the population sizes drastically down;
- the low cetacean by-catch rates of fishing gear traditionally used in the Macaronesia;
- the lack of evidence of serious impacts from ship strikes on these MUs in Macaronesia;
- No other recent or past major threats known for these MUs, apart from the very recent sub lethal pressure of whale-watching with still unknown long term effects;
- none of these MUs has a threatened IUCN conservations status, although some of them are considered DD;

In this case the **ET** value could be:

- The **BL** value established at IA or to be established in the near future;
- A value based on expert judgement or on other grounds, above which the GES for this indicator is reached - e.g. MU abundance 5% or other value above present BL level. One must keep in mind that the BL might have been measured in any part of the natural fluctuation cycle and thus the ET should be adjusted once there is more information on natural fluctuation as the assessment progresses;
- Positive or zero net growth rate of the MU size over time ("MU size at T0" =< "MU size at T1" =< "MU size at T2" … = zero or positive slope of the indicator curve over T). Assuming that these populations are stable and not severely impacted by human activities then it is expected the growth rate to be zero.

The **TH** value should be set further away from the BL value in order to take into account natural fluctuations and not trigger measures as a result of those natural fluctuations.
The **TH** value could be a value based on expert judgement or other grounds (when the MU would be considered "Near Threat" according to IUCN, although there are no numeric references at present for this category) to define the value, below which the measures should be taken to tackle an identified impact, e.g.:

- MU abundance 0%, 10% or other value below BL level;
- Negative net growth rate of the MU size over a defined unit of time ("MU size at T0" > "MU size at T1" > "MU size at T2" … = negative slope of the indicator curve over T). This option does not require having an absolute value defined.

The precautionary principle should be present when defining these values.

ICES (2014) suggested the target "Maintain population size at or above the baseline levels, with no decrease of ≥30% over a three-generation period". This definition includes both the target ("Maintain population size at or above the baseline levels") and an assessment value ("with no decrease of ≥30% over a three-generation period", which is the IUCN limit for a species to be considered vulnerable based on criteria A). While the definition of the target is clear and acceptable (option a. of possible ET definitions), the definition of the assessment value asks for some clarification and precautionary approach in its application, in order to be effective in prompting action before a population size reduces to levels that change its status to vulnerable.

In order to find a possible coherent and precautionary limit to be used as an assessment value it was made an exercise using generation length data from Taylor *et al.* (2007) to find out what would be the percentage of decline of the population size over consecutive assessment cycles for a 30% population decline over a three generation period (Table I: XI). This exercise was made for all type B species for which there was generation length data. With this exercise it was possible to identify for these species a common 10% population size reduction in a period of time going from 18 to 24 years. It was also calculated the population size reduction for Madeira MU for which there are baseline values and confidence intervals (Table I: XII).

Species	T(r=0)	3xT(r=0)	1y	6y	12y	18y	24y	20y
Balaenoptera edeni	18.4	55.2	0.54%	3%	7%	**10%**	13%	**11%**
Delphinus delphis	14.8	44.4	0.68%	4%	8%	**12%**	16%	**14%**
Globicephala Macrorhynchus	23.5	70.5	0.43%	3%	5%	8%	**10%**	**9%**
Grampus griseus	19.6	58.8	0.51%	3%	6%	**9%**	12%	**10%**
Stenella frontalis	18.3	54.9	0.55%	3%	7%	**10%**	13%	**11%**
Tursiops truncatus	21.1	63.3	0.47%	3%	6%	9%	**11%**	**9%**

Table I.XI – Proposed values of TH for the abundance indicator of cetaceans' species of Type B, based on generation length data from Table 4 (Annex I, Taylor *et al.* 2007).

	Decrease per assessment cycle given a 30% decrease rate in 3 generations	Proposed TH

Table I.XII – The expected decrease in Madeira MU absolute sizes of each species (type B) for the next assessment cycles considering, the baseline values and a 30% decrease rate in 3 generations, having as reference generation length data from Table 4 (Annex I, Taylor *et al.* 2007).

	Madeira BL values		Expected N at each assessment cycle given a 30% decrease rate in 3 generations							N at proposed TH
Species	**N BL**	CI95%	CV	1y	6y	12y	18y	24y	30% decrease	**20y**
Balaenoptera edeni	**-**	-	-	-	-	-	-	-	-	-
Delphinus delphis	**741**	496-1032	0.27	736	711	681	651	621	519	**641**
Globicephala Macrorhynchus	**151**	99-201	0.23	150	147	143	139	136	106	**138**
Grampus griseus	**-**	-	-	-	-	-	-	-	-	-
Stenella frontalis	**1067**	717-1378	0.22	1061	1032	997	962	927	747	**950**
Tursiops truncatus	**482**	365 - 607	0.14	480	468	455	441	427	337	**436**

The "10% population size reduction over 20 years" assessment value is clearer and adopts a more precautionary approach in relation to the ICES (2014) proposed assessment value by allowing a lower decline, stipulating a shorter time-scale for the assessment and incorporating inference and projection into the assessment. This exercise also points out to the abundance estimates precision limitations in order to detect statistically significant changes in population abundances as already pointed out by ICES (2014). In table 3, abundance estimates of several species are presented for Madeira archipelago coastal waters, with CVs ranging from 0.14 to 0.27. Comparing the expected N if the population has decreased 30% (N30%) to the lower

95%CI (LCI) value of corresponding baseline values, we verify that for most species N30% falls within the LCI, and thus is not statistically significant.

References

ICES. 2014. Report of the Working Group on Marine Mammal Ecology (WGMME), 10–13 March 2014, Woods Hole, Massachusetts, USA. ICES CM 2014/ACOM: 27. 234 pp.

Taylor, B. L., Chivers, S.J., Larese, J., Perrin, W.F. (2007). Generation length and percent mature estimates for IUCN assessments of cetaceans. Administrative Report LJ-07-01, National Marine Fisheries Services, Southwest Fisheries Science Center, 24p.

Generation length and percent mature estimates for IUCN assessments of cetaceans

Table I: XIII - Values for the five-parameter model together with output for growth rate (r) and estimates of generation length (T) and percent mature (P) for current conditions (at the calculated r) and pre-disturbance conditions (when r = 0). Parameters are: AFR—age of first reproduction, IBI—inter-birth interval, O--oldest age of a reproducing female, Oe–oldest age of a reproducing female but estimated from the relationship in Figure 1, S0—calf survival rate, SA—annual non-calf survival rate, r—population growth rate given the preceding parameters, T(r)—generation length at that value of r, P(r)—percent mature at that value of r, and T(r=0)—generation length under pre-disturbance conditions with an assumed stable population. The parameters used in IUCN criteria are in bold: P(r) and T(r=0). Empirical estimates are in bold with sources in the Appendix.

Species	AFR	IBI	O	Oe	S0	SA	r	T(r)	P(r)	T(r=0)	P(r=0)
Balaenoptera edeni	***9***	***2.50***		53	***0.840***	***0.925***	0.00	18.0	51	18.4	52
Balaenoptera physalus	***10***	***2.24***		62	0.806	0.960	0.04	19.6	48	25.9	66
Delphinus delphis	***9***	***2.10***	***26***	31	0.798	0.950	0.02	14.1	48	14.8	54
Globicephala Macrorhynchus	***11***	***6.90***	***40***	43	0.828	0.986	0.01	22.7	53	23.5	53
Grampus griseus	***11***	***2.40***		37	0.798	0.950	0.02	18.6	46	19.6	53
Physeter macrocephalus	***12***	***5.00***	***59***	51	0.828	0.986	0.03	26.5	56	31.9	65
Stenella frontalis	***12***	***3.00***		31	***0.760***	0.950	0.01	18.6	48	18.3	46
Tursiops truncatus	***9.5***	***3.80***	***48***	37	***0.760***	***0.950***	0.00	20.6	60	21.1	62
Ziphius cavirostris				46	0.798	0.950					

SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).[1]

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.

A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) *[(a) cannot be used for A3].*

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(a) direct observation *[except A3]*
(b) an index of abundance appropriate to the taxon
(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality
(d) actual or potential levels of exploitation
(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)	Critically Endangered	Endangered	Vulnerable
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

C. Small population size and decline	Critically Endangered	Endangered	Vulnerable
Number of mature individuals	< 250	< 2,500	< 10,000
AND at least one of C1 or C2			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals			

D. Very small or restricted population	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	D1. < 1,000
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	D2. typically: AOO < 20 km² or number of locations ≤ 5

E. Quantitative Analysis	Critically Endangered	Endangered	Vulnerable
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

DG ENV/MSFD Action plans 2014

Best practices for action plans to develop integrated regional monitoring programmes, coordinated programmes of measures and addressing data knowledge gaps in costal and marine waters.

Horta, 29, 30,31th March 2016 - Technical Workshop 1Report

<u>Table of Contents</u>

<u>Annexes</u>

1. Workshop Aim

The main objective of the meeting was the establishment of the technical works according to the **Workpackage 1 (WP1) goal:**

Review of initial assessment, including knowledge gaps, GES definition and ETs established for the three Macaronesia Archipelagos initial reports. The initial MSFD assessment reports will be re-evaluated and compared for adequacy coherence and consistency. The European Commission's Article 12 report does not tackle the initial reports of the Azores and Madeira, this WP will fill-up that lack of analysis. This will be performed following the analysis made on the EC report. The partner leading is DRAM (Azores) with the all partners' participation and the expert's teams.

The Workshop expected to discuss:

- **General discussion of common approach:** Identification of main methodological difficulties in getting a common approach for the MSFD implementation in Macaronesia and abroad;
- **Knowledge Gaps:** Evaluation of knowledge and data gaps in the Macaronesia initial assessments reports and in the European Commission's Article 12 report for the functional groups in other regions and abroad European waters;
- **GES definition and methodologies:** Review and harmonized the reference baseline definition and the methodologies to be used for GES definition (Article 9) and assessment (Art 8);
- **ETs:** Common assessment of the whole set of targets previously identified by each of the Macaronesia initial assessment reports; Update GES and the targets to be reached by 2018, if needed.

2. Workshop 1 (WK1) objectives

A common methodology to address this goal was designed by the WP1 Leader for the taxonomic groups. During this **first Technical Workshop** (WK1) this methodology was tested and established by the experts, for each region: Canaries, Madeira and Azores and for the 3 taxonomic groups.

This WK1 also integrates officially and in collaborative way the Experts teams on the Mystic Seas project (see table of participants)

During the WK1 the Steering Committee was met to agree on any important matters in relation to project work, timelines, deliverables, administrative work and reporting.

3. Welcome and Introduction

The partners and experts were received by the Coordination Board (FRCT and DRAM) on the *Museu da Baleia*.

3.1. Institutional Presentation of MISTIC SEAS Project.

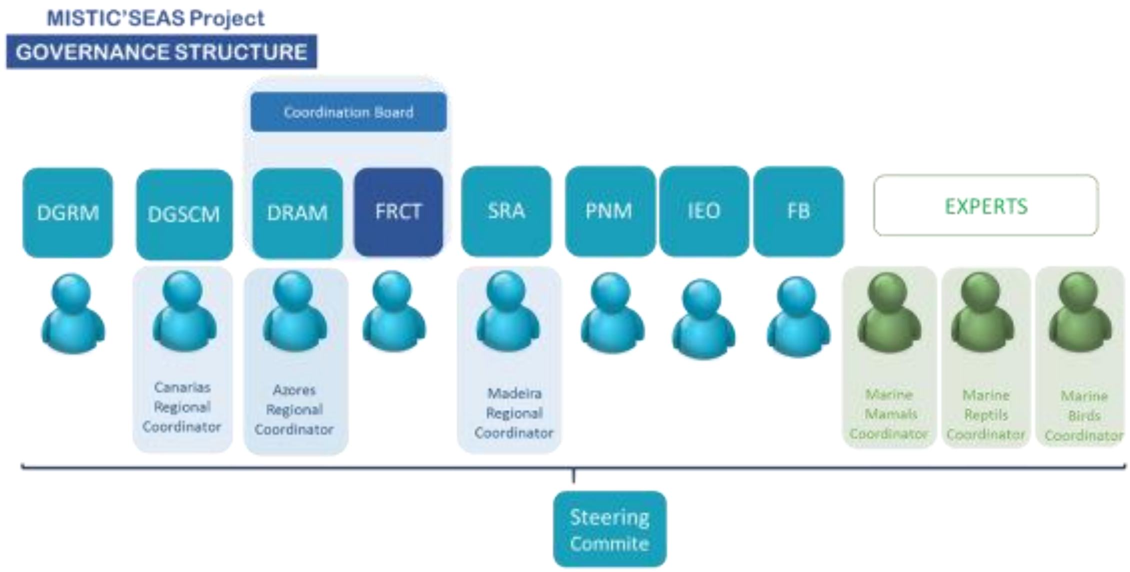
3.1.1. Filipe Porteiro, Maritime Affairs Regional Director, opened the Workshop (WK1) as representative of Regional Secretary of Marine Science and Technology, Fausto Pinto de Abreu. The welcome and introductory speech highlighting the Importance of the MISTIC SEAS Action Plan.

3.2. Antonio Teixeira as representative of General Directorate of Natural Resources, Security and Maritime Services (DGRM), Portugal Government, explain the importance and responsibilities of the MISTIC SEAS project at national and European level. Appointed the importance of the MISTIC SEAS for the Marine Strategy Framework Directive (MSFD) implementation.

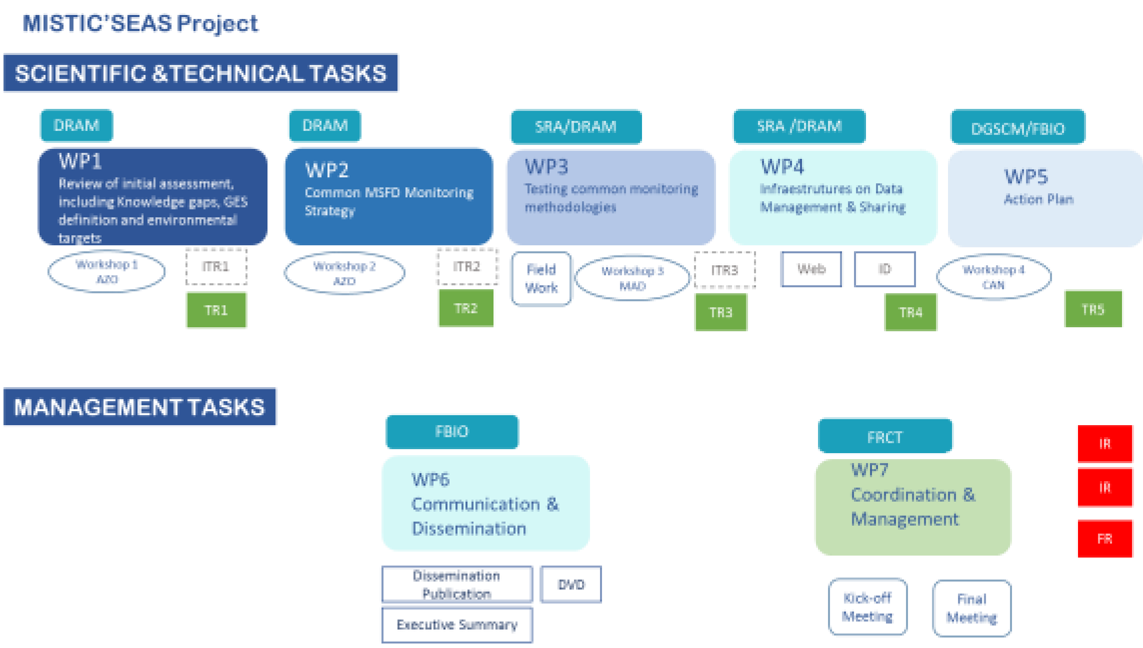
3.3. Isabel Lopez, as representative of General Directorate of Sustainability of the Coast and the Sea Ministry of Agriculture, Food and Environment (MAGRAMA- DGSCM), from Spanish Government appointed the need to develop effective MSFD action plans according to the regional specifies. The importance of the transnational cooperation between member states related to the implementation of the environmental and conservation policies.

4. Participation and Roles in the MISTIC SEAS Project

4.1 Luz Paramio from Regional Science and Technology Fund (FRCT), Azores Government, as project coordinator presented the consortium, introducing the partners, the expert's teams and the guests. Luz presented an overview of the MISTIC SEAS Governance Structure.



4.2 FRCT also presented the main responsibilities of MISTIC SEAS at Scientific and Technical level, including the Grant agreement planned actions.



5. Workpackage 1 - DRAM

5.1. Gilberto Carreira as Workpackage 1 Leader, from Maritime Affairs Regional Directorate, presented the Workpackage and the Workshop (WK1) goals.

5.2. **All of the presentations made during WK1 were posted on** MISTIC SEAS Google Drive, WP1, and WK1. https://drive.google.com/open?id=0B2XRMughetrsMTBrcF9ZaGRuamc

Workshop dynamics

5.3. FRCT distributed the experts and the guest in three discussion tables according to the three functional groups that were supported at technical level by partner's (IEO, DGRM and DGSCM) representation in each group.

Marine Mammals Group

Sea Turtles Group

Marine Birds Group

5.4. The WP1 Leader incorporated its technical staff as facilitators for in each group.

5.5. A representative coordinator was chosen by each taxonomic group in order to have representation in the Steering Committee.

6. Steering Committee Meeting

6.1. Deliberations- Session 1

6.1.1. Introduction of Steering Committee representatives:

FRCT: Francisco Pinto

DRAM: Gilberto Carreira

SRA-DROTA: Paulo Oliveira in representation of Manuel Ara

SRA-PNI: Paulo Oliveira

DGRM: António Teixeira

DGSCM: Isabel Lopez in representation of Sagrario Arrieta

FBIO: Reyes del Rio in representation of Ignacio Torres Ruiz-Huertas

IEO: M. Begoña Santos Vázquez

Coordinator Luz Paramio (FRCT)

6.1.2. Workpackage 7 FRCT presented an overview of the state of development of the Project. General issues, management and financial was discussed.

6.1.3. Workpackage 6- FBIO presented the state of developments regarding communication and Reyes del Rio review the distribution o of task between FBIO and SRA responsibilities

6.2. Steering Committee Deliberations Session 2

6.2.1. The experts' representatives chosen by each taxonomic group were introduced in the Steering Committee, nominally:

- Marine mammals, Mónica Silva
- Sea Turtles, Frederic Vandeperre
- Marine Birds, Juan Becares
-

6.2.1. **Workpackage 1**- DRAM

6.2.2 **Workpackage 2**- DRAM

Aims to define the monitoring methodologies. The WP2 includes a Workshop2 to be realised in São Miguel, 18-20 of May.

6.2.3. Workpackage 3- SRA

SRA and PNM will work in the campaign planning with the collaborations of the partners. Paulo Oliveira asked for a detail description of the testing methodologies requirements in field in order, to provide the logistic support in Madeira. It was suggested by the coordination to create a Google Drive document to collect these requirements during the period 25-30th April/New date until 7th May

6.2.4 Experts representatives

Monica Silva did an overview about the Marine Mammals populations and distribution at the Macaronesia Region. Monica also explained the methodologies proposed and main constrains found to implement the MSFD.

Frederic Vandeperre explained the sea turtles state in the Macaronesia, and remarks the limitations concerning this taxonomic group relative to the others as is the case of Marine Mammals.

Juan Bécares present the Marine Birds populations and distribution in the Macaronesia and explain the main difficulties to monitoring effectively this taxonomic group.

All of three experts remarked the difference between species at the three regions and the importance of choose them carefully.

6.3. Steering Committee deliberations- Session 3

6.3.1. Workpackage 4- SRA/DRAM

Paulo Oliveira in representation of Susana Fontinha from, SRA, explain the WP planning.

Susana Fontinha has informed previously to the Coordinator, about the time constrains to prepare the sub-contracting process. Also, it is expected that the web will be launched at the Workshop 3, in Madeira. The SC discuss about the data infrastructure typology, it was appointed the need to have a reporting scope. He will confirm the date for the Web. Paulo Oliveira strengthened the lack of representation of the Madeira, in particular the Madeira Natural Park (PNM) in the Steering Committee. All members accept this representation.

6.3.2. Workpackage 5- DGSCM/FBIO

Isabel Lopez as representative of MAGRAMA-DGSCM explained the Workpackage 5 including the main activities planned to achieve the Action Plan. Isabel also transmitted the Sagrario Arrieta message about the action plan will be participated addressing the objectives of the Project. It was also discussed about the meeting that will be hosted in Canaries in October.

6.3.3. Workpackage 5- FBIO/SRA

Reyes del Rio explained the main dissemination and communication activities of the Workpackage 5.

FBIO called for the need to distribute the activities between the both WP leaders: FBIO and SRA. Both leaders agreed to FBIO send by mail a proposal with responsibilities distribution.

- 6.3.4. Partners
- Antonio Teixeira, from DGRM, done a review of the Wk1
- Begoña Santos, from IEO, highlighted the need to reinforce the technical support along the project.

7. Experts Working Groups

The experts' groups work during 3 days making a review of the initial assessment, including Knowledge gaps, GES definition and ETs established for the three Macaronesia and addressing each taxonomic group. A minute of the discussions for each group are included in the Annex 3.

8. Conclusions and Next Steps

At the last day, the Workshop 1 was closed in a highly participative session. The partners and the coordinator acknowledged the efforts and their contributions to all the experts, internals and externals.

ANNEX 1 AGENDA

HOSTING: Horta, Faial 29, 30, 31 March. Fábrica da Baleia- **OBSERVATÓRIO DO MAR DOS AÇORES (OMA)**

29 March

Morning- Open Session

Institutional Presentation of MISTIC SEAS Project

10h 30m	**Secretariat Sea, Science and Technology, Government of Azores**
	DGRM,
	MAGRAMA
	DRAM, Project Presentation
	FRCT, consortium, partners and experts
11h 30m	**Coffee Break**
12h 30m	FRCT, MISTIC SEAS Project developments
13h 30m	Lunch

Afternoon

14h 00m	DRAM, Workpackage 1
15h 00m	**Coffee Break**
15h 30m	Experts Groups: Marine Mammals, Turtles, Marine Birds
	Steering Committee (partners)

End of the first day

Social Events

17h 30m	Visit to the Fábrica da Baleia (Whaling Station), Porto Pim
19h 30m	MISTIC SEAS Partners Dinner

30 March

Morning

09h 30m	Experts Groups: Marine Mammals, Turtles, Marine Birds
11h 00m	Coffee Break
11h 30m	Experts Groups: Marine Mammals, Turtles, Marine Birds
13h00m	**Lunch**

Afternoon

14h 00m	Experts Groups: Marine Mammals, Turtles, Marine Birds Selection of representation at the Steering Committee
15h 30m	**Coffee Break**
16h 00m	**Steering Committee (partners and experts)** Experts Groups: Marine Mammals, Turtles, Marine Birds

End of the second day

31 March

Morning

09h 30m	Experts Work's Integration
11h 00m	**Coffee Break**
11h 30m	Experts Work's Integration
13h00m	**Lunch**

Afternoon

14h 00m	Experts Output presentations
15h 30m	**Coffee Break**
16h 00m	Validation of the Works
16h 30m	Conclusions and next steps
17h 00m	**End of the Workshop**

List of Participants

PARTNERS		
AZORES	FRCT	Luz Paramio
		Francisco Pinto
	DRAM	Gilberto Carreira
		Marco Santos
		Sara Santos
		Vanda Carmo
		Filipe Mora Porteiro
MADEIRA	SRA	Paulo Oliveira
NATIONAL	DGRM	António Teixeira
	FB	Reyes del Rio
	IEO	Begoña Santos
		Camilo Saavedra
	DGSCM MAGRAMA	Isabel López
EXPERTS		
AZORES	DOP / Imar Açores	Verónica Neves
		Cristina Nava
	SPEA	Tânia Pipa
	IMAR-Açores	Mónica Silva
		Cláudia Oliveira
		Frederic Vandeperre
MADEIRA		Luís Freitas
		Cláudia Ribeiro
		Ana Dinis
		Thomas Dellinger
		Cláudia Moreira
		Paulo Oliveira
		Pedro Geraldes
CANARIAS	ADS Biodiversidad	Nuria Varo Cruz
		Ana Liria Loza
		Adolfo Marco llorente
	ALNILAM	Jose Antonio Vázquez
	SECAC	Vidal Martin Martel
	Asociacion GIC	Marcel Gil Velasco
		Juan Bécares de Fuentes
GUESTS		
	Gobierno de Canarias	Erika Urquiloa
	Universidad de La Laguna	Natacha Aguilar

Minutes of the Sea Turtle Expert Panel

Participants: Nuria Varo, Ana Liria, Adolfo Marco (Canaries), Thomas Dellinger, Cláudia Moreira (Madeira), Marco Santos, Frederic Vandeperre (Azores)

Day 1

The first task of the sea turtle expert panel was to identify knowledge gaps and review the GES definitions, targets, baselines and assessment vlaues in the initial assessments of the 3 archipelagos. Since no assessment had been performed for sea turtles in any of the archipelagos, the discussion moved on directly to defining MUs for assessing the GES. Yet, because their assessment was somewhat more advanced, many elements were analysed based on the elements of the MSFD for the Canaries.

The panel also shortly discussed the OSPAR advice on the application of MSFD for sea turtles (OSPAR 2012). This document presents arguments to apply pressure targets rather than state targets, due to the paucity of available data and the monitoring requirements necessary to fill this gap. Yet, the panel agreed to try developing realistic state indicators, notwithstanding the inherent limitations.

In order to define MUs, we listed the sea turtle species occurring in the 3 archipelagos. The panel discussed what their status could tell us about the environmental state of Macaronesian waters, notwithstanding that no marine turtle breeds within the area and individuals are exclusively juveniles. This discussion highlighted the limited knowledge and different interpretations of the expert panel of the MSFD and its concepts.

4. Loggerhead, *Caretta caretta* - best “population” indicator (common, longest data time series)
5. Loggerhead - proportion of population genetic signatures as indicator of global change
6. Green turtle, *Chelonia mydas* (present in Canaries & Azores) as indicators of global change
7. Green turtle as indicator of neritic habitat
8. Olive ridley, *Lepidochelys olivacea* as indicators of global change
9. Leatherback, *Dermochelys coriacea* (“population” indicator, only by-catch)
10. Kemp’s ridley, *Lepidochelys kempii* (not really a good indicator)
11.

The MUs the panel selected were loggerheads (Azores, Madeira, Canaries) and green turtles (Canaries). Loggerheads are the most common species, are relatively abundant in all three archipelagos and their status can be linked to the state of the local pelagic environment. Green turtles are common in the Azores and the Canaries, yet very few information exists for the Azores. For the Canaries, green turtles were retained as MU, as its status can be linked to the state of the local neritic environment. Leatherbacks had been chosen as MU in the initialinitial assessment of the Canaries, but were discarded due to its relatively low abundance and lack of information. In addition, loggerheads appeared the better choice as indicator of the pelagic environment and its most important threats.

Next, we listed the types of data that exist for sea turtles and identified which are available in each archipelago. The list fed a first discussion on the possible indicators and metrics for which baseline data are available and which can be applied across the 3 archipelagos.

- Fisheries by-catch data (CPUE, distribution, direct mortality)
- Visual sightings
- Scientific surveys (abundance, distribution)
- Observer programmes (e.g. POPA) (abundance, distribution)
- Citizen science (abundance, distribution)
- Tourist operators (e.g. MONICET) (abundance, distribution)
- Land-based sightings – vigias (abundance)
- Telemetry (range and pattern of distribution)
- Stranding data (number, types and frequencies of threats, litter ingestion)
- Biometry (life cycle stage, size frequency distributions)
- Marc-recapture (size classes, tag recapture)
- Genetic data
- Sex-ratio

Fishing mortality and fishing effort data were identified as additional data sources of interest, because they relate to a specific threat.

Day 2-3

After the short presentations on the progress achieved by the different taxonomic groups at the end of day 1, the expert panel revisited the MUs identified during day 1 and applied the set of criteria developed by the marine mammal expert panel.

1. Representative of ecological niche:

   Loggerhead – pelagic environment

   Green turtle – neritic environment

2. Data available to define baselines and assessment values:

   Loggerhead – Madeira and Azores (relative abundance from opportunistic platforms)

   Green turtle – Canaries

3. Listed in other legal instruments:

   Loggerhead – OSPAR, Habitats Directive

   Green turtle – Habitats Directive

4. Specific threats exist:

- Fisheries by-catch: pelagic long-line (Azores, Madeira, Canaries), black-scabbard fish long-lining (Madeira), artisanal fisheries (Canaries)
- Marine pollution (entanglement, ingestion)
- Marine traffic
- Global change

5. Viable measures against threats can be implemented:

- by-catch reduction
- implementation of the existing ban on harbour fishing
- maritime traffic regulation
- regulation of recreational activities (diving, snorkelling, sport fishing) in coastal areas with presence of turtles
- pollution reduction (legislation, enforcement)
-

The application of the above criteria worked for both MUs, i.e. loggerheads and green turtles.

Next, the expert panel discussed the possible indicator criteria, indicators and indicator metrics for sea turtles which could be pertinent to assess GES.

Indicator criterion "1.1 Species distribution" was discarded. Oceanic stage loggerheads display wide ranging movements with only a fraction of their habitat/distribution enclosed within areas under jurisdiction and generally occur in low densities. Establishing baselines and targets and interpreting trends of distribution indicators therefore appeared unrealistic. In contrast, green turtles display high residency in confined neritic areas, but establishing baselines and targets for distribution criteria was deemed unrealistic due to a lack of information. In general, it was considered that for sea turtles' information on distribution was better suited as complementary information for assessing "1.2 Species abundance" indicators.

Indicator criterion "1.2 Species abundance" was considered a key indicator for inclusion under the MSFD. The panel acknowledged the difficulties of estimating abundance listed in the OSPAR advice document (OSPAR 2012), but also emphasized the relevance of existing time-series of relative abundance estimates gathered by opportunistic platforms. It is also the panel's opinion that efforts should be made, eventually within the framework of MISTIC SEAS, to assess the suitability of scientific survey methods, i.e. aerial and ship-based surveys, to estimate sea turtle abundance across Macaronesia.

Indicator criterion "1.3 Population condition" was also identified as relevant to assess GES. In particular, it was found that data that can be used to assess population condition are systematically collected in all three archipelagos and/or are relatively easy to obtain. Furthermore, population condition indicators appeared to be more easily relating to specific threats then Species abundance indicators. In particular, the panel noted that sea turtle fishing mortality is the only indicator of pelagic longline fishing pressure on by-catch species considered under MSFD, while the EU (mainly Spain and Portugal) has one of the largest industrial fleets in the North Atlantic. Moreover, fishing mortality as a population condition indicator closely approximates the pressure indicator proposed by OSPAR (2012).

Coordinated by: Governo dos Açores
Partners: FRCT; Região Autónoma da Madeira; Secretaria Regional do Ambiente e Recursos Naturais; dgrm; Gobierno de España; Fundación Biodiversidad
Supported by the: European Commission
Grant Agreement No. 11.0661/2015/712629/SUB/ENVC.2

The panel compiled the following extensive list of possible indicator metrics:

- Body condition Index (local population health)
- Epibiont biomass or % cover (local population health)
- % turtles with plastic pollution (e.g. % turtles with plastic in longline by-catch turtles)
- Relative population abundance (local & global, additional information must be included, e.g. nesting production)
- Stranding frequency & stranding mortality causes
- Size-frequency distribution of the local population
- Sex-ratio, eventually in relation to gender-selective pressures
- Genetic origin, eventually in relation to origin-selective pressures due to different migratory pathways.
- Genetic variability, disappearance of rare haplotypes indicative of aggregation reductions.
- Genetic variability, reduction of variability indicative of aggregation reductions.
- Fishing mortality (hooking mortality + post-release mortality)

During and after the workshop, this list was reduced taking into account the feasibility of defining a single metric (e.g. size-frequency distribution), feasibility of determining baselines and assessment values, and the relationship with identifiable pressures and possible measures. During this task, the panel was again faced with a lack of understanding and different interpretations of MSFD, and a general lack of clear criteria of what a good indicator should look like (e.g. sensitivity, etc.).

The panel further proposed:

- new GES definitions and targets that were adapted from the MSFD of the Canaries
- new indicator names that start with “TM” as reference to “Tartaruga marinha/Tortuga marina”, rather than MT (Mammals and Turtles)
- Change of the indicator Tam (Tamanho/Tamaño) to Abu (Abundância relativa/Abundancia relativa)
-

In conclusion, the panel identified the following points as the most important difficulties/obstacles to define and harmonise GES definitions, indicators, criteria, etc. for D1 across the 3 archipelagos:

- the panel’s lack of knowledge on the MSFD and its concepts
- differences in interpretation of elements of MSFD, including regional differences
- lack of clear guidelines/criteria of what good GES indicators and metrics should look like

- regional differences in the knowledge on sea turtles and the monitoring methodologies that are used (in particular in relation to opportunistic platforms)
- the priority sea turtle research and monitoring received within past European and national scientific programmes and projects, often to the advantage of or accessory to cetacean research, notwithstanding the apparent importance given to sea turtles in conservation conventions and directives (Habitats Directive, Natura 2000, etc.).

Minutes of the Marine Mammals expert panel

The Working Group on Marine Mammals (hereafter simply called WG) included 8 technical experts from the three archipelagos (Açores: Mónica Silva (IMAR), Cláudia Oliveira (IMAR), Rui Prieto (IMAR); Madeira: Luis Freitas (Museu da Baleia da Madeira), Cláudia Ribeiro (CIIMAR-Madeira), Ana Dinis (CIIMAR-Madeira); Canarias: Jose Antonio Vázquez (ALNILAM), Vidal Martin (SECAC), 2 technical experts from IEO (Begoña Santos, Camilo Saavedra) and 2 technical and policy experts from Observer organizations (Erika Urquiola (Gobierno de Canarias, Spain); Natacha Aguilar de Soto (University of La Laguna, Spain)).

Preparation

The workshop was preceded by an inventory of the MUs, indicators and targets for the Marine Mammal Component of D1 proposed by each archipelago in its Initial Assessment (IA) Report. In the case of the Azores and Madeira, where the IA did not include MUs, indicators or targets for marine mammals, experts were asked to propose new ones. This information was summarized in tables for each archipelago before the workshop, which formed the basis for an initial analysis of commonalities and data gaps.

Approach followed during the Workshop

The three-day workshop began with a brief presentation by the IEO on how the process had run in Spain from the IA to the design of the monitoring programmes (which generally followed the recommendations of both OSPAR and the ICES Working Group on Marine Mammal Ecology (WGMME)). A second presentation by experts from Madeira focused on the criteria used to select MUs, pressures and impacts, and the information available to set baseline values.
The WG then decided to address the following issues, in turn:

1. Identification of Species/MUs to be assessed
2. Selection of Indicators for Marine Mammals
3. Definition of baseline values, GES assessment values and ETs

In the discussions of each of these topics, the WG was asked to:

1. Analyse what was proposed by each archipelago (included in the table prepared before the workshop)
2. Take into account recent recommendations from OSPAR and ICES WGMME concerning MUs, indicators and targets (ICES, 2014)

3. c) Agree on a set of criteria to select MUs, indicators and targets
4. d) Select common MUs, indicators and targets, whenever possible
5. e) Consider knowledge gaps, data needs and the timelines expected for obtaining the required information
6. f) Consider the most suitable methods for monitoring the indicators proposed

Summary of Discussions

Identification of Species/MUs to be assessed

The three archipelagos of the Macaronesia hold one of the highest marine mammal diversity within European Atlantic waters, with about 34 species having been recorded overall. Several of these species are recorded rarely or only occasionally and are thus difficult to monitor systematically. The Marine Strategy Framework Directive (MSFD) assessment should be based on a subset of species for which robust information on abundance and distribution can be obtained.

In their IA, Spain used the following criteria for the selection of MUs for marine mammals (presented by the IEO; see Santos & Pierce, 2015):

1. Representativeness of different ecological niches (coastal/slope waters, oceanic waters, submarine canyons)
2. Existence of absolute abundance estimates (sufficiently precise to allow trend detection)
3. Priority for other legislation (e.g., Habitats Directive)
4. Identification of threats where impacts could be related to total abundance

The WG agreed on criteria a) and c). As for criteria b), the WG acknowledged that precise absolute abundance estimates for cetaceans are difficult to obtain and that, with the exception of Madeira, that information is lacking for most species occurring in the Macaronesia. However, the WG also acknowledged that lack of baseline information shouldn't prevent including MUs that fulfil other criteria and that a MU could be proposed for consideration even if some years of research would be needed to obtain the information needed to determine baselines /assessment values (see rorqual example below).

The WG also noted that, while criteria d) may be easily applied to by-catch in fishing gear or ship strikes, it is much more difficult to apply in the case of other threats that may be more prevalent in Macaronesia (e.g., underwater noise, disturbance from whale-watching). Species sensitivity to specific threats (IGC COBAM, 2012) may be an alternative in such cases.

The WG agreed that different biological or ecological population units (as evidenced by genetic or ecological markers; demographic data, movements) of the same species should be separated into distinct MUs, as these may differ in evolutionary trajectories and be subjected to different pressures or degrees of pressure. Moreover, as MUs of the same species may differ in ranging patterns and site fidelity, they may be monitored using different methods. Island-associated groups of *Tursiops truncatus, Grampus griseus, Globicephala macrorhynchus, Ziphius cavirostris* and *Physeter macrocephalus* could be surveilled frequently over regular intervals using photo-identification techniques to provide annual abundance and survival estimates.

The WG also noted that different studies used distinct criteria to assess individual residency within a given area and that researchers need to agree on common criteria to be used in future monitoring programmes.

Finally, the WG agreed on the necessity to include an MU that would be representative of lower trophic niches (baleen whales) but acknowledged that a few years will be necessary to establish baseline levels or propose targets. As such, the WG suggests that these MUs (*Balaenoptera physalus* for Azores; *Balaenoptera edeni* for Madeira and Canaries) are considered in the next assessment round in 2018.

Selection of Indicators for Marine Mammals

The WG started by reviewing and discussing ICES WGMME advice to a request by OSPAR on implementation of MSFD for marine mammals (ICES, 2014):

"With one exception, the populations of cetacean species present in OSPAR regions II, III, and IV are wide-ranging and have ranges that extend beyond these regions. Range boundaries within the OSPAR regions could only be established roughly and it is difficult to determine exact position at the low density edges of the range. ICES, thus, does not advise establishing targets for the range of cetaceans, with one exception. Equally the pattern of distribution within the range appears to be variable in these highly mobile species and at present baselines would be very difficult to establish with any confidence and therefore it is difficult to establish scientifically valid targets."

As a result, ICES WGMME advised OSPAR to merge their indicator M2 - Distributional range and pattern of cetacean species regularly present within their indicator M4 -Abundance at the relevant temporal scale of cetacean species regularly present.

The WG agreed with this line of reasoning and decided to drop the two indicators proposed by the Commission concerning Species Distribution: 1.1.1 Distributional range and 1.1.2 Distributional pattern within range. The WG stressed that the methods used to obtain information on the abundance of MUs will nevertheless provide information on their distribution. However, information on MUs' distribution should not be used per se to evaluate GES, but should be analysed and interpreted together with information on abundance and condition of the population.

"The exception to the wide-ranging nature of most cetacean species is the bottlenose dolphin when present as 'resident' inshore populations" (ICES 2014). Thus, ICES recommends to keep the indicators "distributional range" and "distributional pattern within the range" for coastal bottlenose dolphins.

The WG noted that resident or island-associated populations of bottlenose dolphins present in the Macaronesia usually range widely, often moving between distant islands. Consequently, unless monitoring extended to the whole archipelagos including offshore waters, it would be equally difficult to monitor the whole ranging area of these coastal populations. Thus, the WG considered that the distribution indicators are also inappropriate for coastal populations of bottlenose dolphins in Macaronesia.

The WG agreed that the Indicator 1.2.1 Population abundance is currently the most adequate to assess GES for cetaceans. However, obtaining robust and precise estimates of absolute abundance for oceanic/offshore cetaceans and those that cannot be monitored by photo-identification techniques, require dedicated aerial or shipboard surveys. The WG briefly addressed the possibility of using estimates of relative abundance (obtained by opportunistic platforms, land-based observations, passive acoustic monitoring, etc.) to monitor MUs but concluded that there's no evidence of the reliability of those data to monitor changes in population size. However, indices of relative abundance may complement information collected by dedicated surveys. This information may be particularly useful to monitor MUs between dedicated surveys and to alert of sudden or severe events affecting populations.

The WG emphasized that, regardless of the method used, estimates of cetacean abundance often suffer from poor precision making it difficult to detect changes in population size with reasonable statistical confidence. Power analysis should be undertaken to determine the monitoring frequency needed to detect changes in abundance for the selected MUs, and this must be taken into account when designing future monitoring programmes.

Of the two Indicators proposed by the Commission to assess Population condition (Criteria 1.3), the WG agreed that Indicator 1.3.2 Population genetic structure should not be used at this stage because: i) we lack information on the genetic diversity and structure of most MUs, ii) we still don't know how environmental conditions and impacts relate to genetic structure of populations, so we cannot define GES or targets, iii) we don't understand the relationship between genetic traits and demography of populations (and the two indicators may lead to conflicting assessments). However, this may be revised in the future if more information becomes available on the genetic structure and diversity of MUs in Macaronesia.

Most Contracting Parties adopted a by-catch mortality indicator under 1.3.1 Population demographic characteristics, since incidental mortality in fishing gear is one of the most severe threats to cetaceans in European Atlantic and Mediterranean waters. This indicator has the advantage that it can be directly linked to a human-related impact in the environment. Spain in its IA adopted a mortality caused by anthropogenic pressure indicator without specifying the origin of the mortality, i.e. by-catch would be part of the pressures but it was not restricted to by-catch.

The WG noted that, although present, current levels of by-catch are unlikely to threaten the long-term viability of cetaceans within the Macaronesia. The most important impacts identified by the WG were ship strikes (especially in the Canaries but also known to occur in the Azores), but also disturbance from whale-watching activities and underwater noise. Ship strikes mostly affect large baleen and sperm whales that are already classified as Endangered or Vulnerable by IUCN. Disturbance from whale-watching may be more severe for populations/groups of cetaceans inhabiting areas (or using these areas for critical activities) intensively used by whale-watching vessels. Although disturbance effects from whale-watching are not lethal, the WG noted that studies from other areas indicate that continuous/routine exposure to whale-watching vessels may negatively affect survival and productivity rates of individuals, potentially leading to long-term effects at the population level. The WG also discussed impacts from underwater noise. While this is the focus of Descriptor 11, the WG emphasizes the need to closely monitor cetacean mortality events or disturbance that may indicate use of high-intensity human noise sources.

The WG noted the difficulties of estimating mortality rates for most (if not all) cetacean species in Macaronesia. Stranding's of marine mammals are relatively uncommon in all Macaronesian archipelagos, and sample sizes from strandings make obtaining a reliable estimate of mortality/survival rates or any other demographic parameter not viable. However, the WG agreed that strandings may be useful for monitoring certain impacts (such as ship strikes) or for detecting extreme events (such as mortality from acoustic trauma, oil spills, etc) and thus have a sentinel role to play. In the case of ship strikes from fast ferries, as most mortality is likely to occur close to the islands, there's a greater chance that cetacean carcasses end up washed ashore or are detected by whale-watching, fishing or other vessels.

Demographic parameters (such as survival and birth rates) of coastal MUs that can be regularly monitored over time can be estimated from models applied to photo-identification data.

Definition of baseline values, GES assessment values and ETs

Although the WG acknowledged that current values of indicators may already reflect deteriorated conditions of the environment, it concluded that we lack precise and robust estimates from pre-impact conditions to assess GES. Members of the WG proposed that the carrying capacity of the marine ecosystem likely changed as a result of anthropogenic impacts, so that restoration of cetacean populations to historical conditions may no longer be possible. Other members proposed that we lack sufficient data to make precise predictions about the carrying capacity of the marine ecosystem and that it was clear that some species were now below abundance estimates from pre-whaling data, and were recovering (e.g. the humpback whale). To solve this disagreement, the WG accepted current values as baseline values to work within the MSFD again stressing that these values bare not a definition of GES. One WG member proposes that this issue should be revisited in the next revision in 2018, and to clarify this in the report to national and EU competent authorities.

The WG discussed the appropriateness of setting quantitative targets for marine mammals. In most cases we don't have enough information to set the assessment value/boundary between acceptable and unacceptable conditions, or to distinguish natural fluctuations from variations from pressure-related impacts. Precision of estimates of abundance or demographic parameters is also generally low, compromising the ability to detect deviations (with statistical confidence) from baseline conditions at an early stage.

Given the absence of a most appropriate target for the abundance indicator, the WG discussed the possibility of adopting the target proposed by ICES WGMME: "Maintain population size at or above the baseline levels, with no decrease of ≥30% over a three-generation period". The limit of 30% reduction is based on the IUCN criteria to classify a species as threatened of extinction. However, the WG introduced several changes to the recommendation put forward by ICES to take a more precautionary approach. These will be explained in detail in the report.

Regarding the indicator of 1.3.1 Population demographic characteristics, the WG suggests using the parameter mortality/survival rate, calculated from photo-identification data if available. However, the WG is unable to set a quantitative target for this indicator at present, although it discussed the possibility of using the ASCOBANS and IWC mortality assessment value proposed for harbour porpoises (1.7%-2% of the best population estimate). The WG noted that this assessment value was developed for a different species in a different area and that it requires knowledge of the population size which is not always available. Population models and viability analysis of existing data may provide the information necessary to set a assessment value value for several MUs. Alternatively, data from other regions or similar species could be used to define the target for survival rate.

The WG defined different GES and targets for MUs that are classified by IUCN "at risk of extinction" such as sperm whales and baleen whales. These MUs cannot be considered in GES, and for these MUs no further deterioration can be permitted.

References:

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Minutes of the Marine Birds Expert Panel

The Working group of Seabirds includes: Verónica Neves (DOP), Cristina Nava (DOP), Tânia Pipa (SPEA);

Pedro Geraldes (SPEA/PNM), Paulo Oliveira (PNM), Vanda Carmo (DRAM), António Teixeira (DGRM) Marcel Gil Velasco (GIC) Juan Bécares (GIC)

Day 1 - 29 March

- Determination of the species that will be considered for the project, being the most common in all three archipelagos:
- Madeiran/Band-rumped storm-petrel - Paínho-da-Madeira – *Hydrobates castro*
- Cory's shearwater - Cagarra – *Calonectris borealis*
- Audubon's/Macaronesian shearwater - Frulho – *Puffinus lherminieri (assimilis) baroli*
- Yellow-legged-gull - Gaivota-de-patas-amarelas - *Larus michaelis atlantis*
- Bulwer's petrel - Alma-negra - *Bulweria bulwerii*
- Integrate DQEM with the other platforms (OSPAR, RN2000, ICES) in order to define:
- Main goals.
- Indicators.
- Methods.
- GES baselines.
- Targets for each taxonomic group.
- Macaronesian setting suitability and whenever possible, the articulation between the different Macaronesian archipelagos.
- Review ICES and OSPAR recommendations concerning environmental objectives, indicators, Eco-QOs (Ecological Quality Objectives) methods to set baseline values and targets for marine mammals, seabirds and turtles and discuss their appropriateness for Macaronesia.
- Define a common approach for selecting Species and Assessment Units (Sps-AAU).
- Review and harmonize methodologies and the data used to establish reference baselines for GES in each archipelago.
- Review and harmonize targets for common indicators and MUs.
- Assess monitoring requirements and feasibility of alternative monitoring methodologies.

Canary Islands

- The existing populational data is limited to old rough estimations (1987), also there are no standardized methodologies to estimate colony size, thus they are not comparable. For example, a rough estimate of Macaronesian shearwater was conducted via sound recorders resulting in around 400 pairs id.
- There isn't a baseline for the various breeding colonies.
- Seabird rafts have never been estimated.
- Data collected at sea, apart from the IBAs, is only a few months long, is not comprehensive of the whole archipelago, there was not enough effort and data range is very wide, changing every year. Cannot be used as baseline.
- No data on breeding rates and success.
- Impossible to define baselines.
- Use the current chick-rearing colonies distribution as a GES indicator?
- There is some information which can be used as a baseline for GES, albeit dependent on the species.
- In Lanzarote Island we can follow up on *Pelagodroma marina* (≈ 60 breeding pairs, 2 colonies), *Bulweria bulwerii* and *Calonectris borealis*. The use of Cory's shearwater as a good indicator for the Canary Islands region is not indicated: in opposition with the Azores, where this species feeds in oceanic waters surrounding the islands, in the Canary Islands these birds feed mainly on the continental shelf and African coast fishing industry activity. This will bias the GES data and results by aggregating data from outside Macaronesian geographical boundaries. Additionally, as the birds feed on the fishing landings, and if these landings increase, the subsequent increase of feeding birds on that area will not be representative of a Macaronesia GES.

Azores archipelago

- Archipelago with the best database.
- Annual surveys of terns in all islands since 1991, with the exception of the years 2005 and 2013.
- Extremely hard to research the breeding success of terns due to over-predation (European starling, seagulls and Ruddy turnstone).
- Procellariiformes (Macaronesian shearwater, storm-petrels and Bulwer's petrel): sound recording, call rates at sampling points, ringing and raft counts.
- There is a need to retake the census of Cory's shearwater. The latest on, 2001, showed a large difference with the previous one of 1996/1997, indicating a steep population

decline, which may be partially explained by the non-standardization of the census methodology. Nevertheless, these numbers indicate levels of uncertainty and possible negative effects on the population, as such actions should be taken to mitigate/prevent further decrease.

- There is a need to study seabird raft characteristics and behaviour. See unpublished thesis by Rogério Feio (DOP) in 1996; there are also data from Flores and Corvo, although not robust.
- GPS data on IBAs for the behaviour and size of rafts.
- 100 breeding pairs ringed in Corvo, Faial e Graciosa.
- For terns, colony size shows large variation between years.
- Use two types of colonies with different interpretations for the definition of the baseline - intact and pristine colonies such as the Praia islet or Vila islet vs colonies that are or have been affected by predation and anthropogenic factors.
- Calonectris borealis - hatching success rate is a good GES. The main difference from reproductive success is that, at colonies with high levels of predation, even if the number of hatched eggs is high, the reproductive success will be low due to young failing to succeed in leaving the nest. This difference then represents shifts and conditions in the sea, thus working well as a GES.
- Macaronesian shearwater is a good candidate for a chosen common species, as it is abundant in all 3 archipelagos (1400 breeding pairs in Madeira, 895-1741 in the Azores and 400 (95-291 identified through their callings) in the Canary Islands. Furthermore, the methodology for data gathering is coherent amongst the different archipelagos, and they feed in oceanic waters.
- Apart from the Cory's shearwater that are caught and released as part of the SOS campaign, other species are found dazzled: juveniles of storm-petrels and Macaronesian shearwater are often caught in Graciosa; Macaronesian shearwaters in Pico; Manx shearwaters are caught in Corvo. Dozens of Cory's shearwaters are found dead in Azorean roads, more heavily within the triangle islands.

Madeira

- Solid data on population size for Cory's shearwater in the Selvagens, since 1980.
- Data for *Pterodroma* and *Bulweria* genus are not very robust.
- Manx shearwaters – data is from 20 years ago, estimates are weak and based on sound recordings from 1999 (1500-2000 breeding pairs). To note that in the Canary Islands there are very few Manx shearwaters (less than 200 breeding pairs) and in the Azores it is very difficult to assess as the colonies (Corvo and Flores) are located in very inhospitable and remote areas.

- There is no data at all for Madeira Island, only for the Selvagens and Desertas Islands.

Other interactions with the MSFD

Along with D1 – Biodiversity, there are other descriptors of the MSFD we can contribute to, namely:

D2 – Non-indigenous species

D4 – Food webs

D10 – Marine litter (ex. plastic is present in different species stomach samples)

D11 – Energy (ex: light pollution)

These notes should integrate the MISTIC SEAS report (as an annex maybe?). How to approach this secondary data and results from the other MSFD descriptors that will be useful for reporting in the future?

Summary of day 1:

- The baselines for the different archipelagos are not well known: very rough estimates for the Canaries, medium level for Madeira and better for the Azores.
- Definition of the MU: some species are common to the three archipelagos but have a very low abundance in one or are only abundant in one out of the three.
- We opted for the use of a comparative table, where anyone can cross data about anything related to the MSFD indicators and what is being done. Data for the three archipelagos using the traffic lights methodology with a three-color scale (red, yellow and green, representing the difficulty in gathering information from very hard, hard to easy, in this order).
- Once completely filled, search in the table the most common occurrences for the three archipelagos.

Day 2 - 30 March

Joint discussion amongst the three groups: Madeira, Azores and Canaries.

Identification of the best indicator species:

Madeira suggests only two species: Cory's shearwater (Calonectris borealis) and Deserta's petrel (Pterodroma deserta).

- *Calonectris borealis*, has a wide distribution and is present in all three archipelagos. For the Azores it is the essential species to act as a GES indicator due to the large amount of data collected each year via the SOS Cagarro campaign (mass index, nest identification, over 1200 birds ringed and over 4000 volunteers participating); breeding success and number of nests are good GES indicators when used as a whole. For the Canary Islands: as these shearwaters species feed mainly off the coast of Africa when in the Canaries and the Selvagens Islands, it isn't a good GES indicator. Adding to the fact that this species spends the winter in the southern hemisphere it prevents them from becoming a good indicator for the whole year. The Canary team suggests that the study of their (Cory's shearwater) productivity is important within the frame of MISTIC SEAS. Not a good indicator for distribution (1.1.1.3) as most colonies are not discrete. To monitor abundance (1.2.1.1), specific colonies could be selected, for example Vila and Praia islets in the Azores. These islets could also be used to calibrate ARUs and call rates for different species. In Madeira and in the Canaries UTM study areas could be defined. To monitor breeding success, 30 random nests could be selected and monitored every year.

- *Pterodroma deserta*, narrow distribution but endemic.
- *Pterodroma madeira*, focal distribution on land, but wide at sea. If it decreases due to causes external to the colonies it could be a good GES indicator of oceanic waters, as they feed on plankton. It doesn't have any natural predators, so it might be possible to conduct estimates using thermal cameras. Population estimates in Madeira are of: 150-180 000 in total, of which 65 000 are located in Selvagem Pequena and 95-120 000 in Selvagem Grande. This species was suggested by the Canary team as it also exists there.
- *Puffinus lherminieri (assimilis) baroli* – good indicator (indicator 1.1.1.3) as it is resident in the three archipelagos and does not travel to the African coast. During the non-breeding period the species remains on the waters surrounding Macaronesia. Would be important to study call rates through the breeding season and through the night to identify hours of higher activity (sonograms with Raven). This has been done in the Canaries but could also be done in Vila and Praia islets. In the Canaries there are very few nests of Macaronesian shearwaters known but in the Azores there are at least 13 artificial nests at Praia islet and 25-30 at Vila islet. This was also recommended by the Canary team, with plans of acoustic monitoring (this technique won't work for Madeira). With this methodology we could determine abundance through vocalization rates (via sound recording 1min/H) as it would be possible to identify specific individuals this way. When hatching the thermal camera could be used. There are around 35-45 identified nest in Vila and Praia islets. In the Azores it is possible to study the breeding success for two islets - Praia and Vila. This species overlaps in territory and behaviour with Band-rumped Storm-petrel (Hydrobates castro), allowing for simultaneous monitoring.
- *Puffinus puffinus* can't be used as a GES indicator as we don't know where their feeding grounds for the winter are. They also present distinct ecological preferences than that of other northern European populations and different behaviour on land as well (they feed on mesopelagic prey but don't seem to feed on fishing landings). The colonies in the Azores are very remote and hard to study, despite being very abundant in Madeira (>360 000 breeding pairs).
- *Hydrobates pelagicus*, only in the Canaries, very tricky to use as an indicator as it does not exist in Madeira or Azores. It isn't a priority.

- *Hydrobates castro* breeds in all three archipelagos and could be a good indicator, but it hasn't been well studied in Madeira and Canary Islands. Probably one of the few species where one can study direct dependence from ocean conditions. In the Azores it is possible to study indicator 1.1.1.3 in specific colonies within some islets (Graciosa, Flores, Santa Maria). In Madeira and in the Canary Islands it is possible to conduct acoustic studies for this species, but very hard to assess the nests (very remote location and very deep). We could get relative abundance and use it as the indicator through mist-netting (ex. 5 days in December for WP2), mark-recapture methods 10 days before or after the new moon in December (2 sessions). If there are problems they most likely arise from the marine component. The Canary Islands have an IBA, Banco da Conceição. This species is a good indicator but hard to study in the Canaries.
- *Bulweria bulwerii*. Easy to assess and study in the three archipelagos, being a good GES indicator for that reason. In the Azores there is only one well known colony (representing the northern limit for this species) and it provides a very easy-access study location.
- *Sterna hirundo* – Very important species for the Azores but in Madeira only very few pairs nest. In the Canary Island there are also a few breeding pairs, the team suggests this species as a good indicator for the littoral fringe.
- It was suggested that for some species 1.1.2.1 could be used through species distribution models and comparing kernel distributions, however the Canary team doesn't recommend this indicator.
- For the Azores any species that the three teams choose are OK as long as there is enough flexibility to consider some species that are very important but only regionally, instead of globally. The Azorean Report will include all species with Azorean distribution; in the common report some species can be chosen and further discuss their placement, but Azores intends to complete the whole task.
- Common species for all three archipelagos: Macaronesian shearwater, Bulwer's petrel, Madeiran storm-petrels, Cory's shearwater?
- Calonectris A+M
- Pelagodroma M+C
- Hydrobates castro A+M+C
- Puffinus barolis A+M+C
- Bulweria A+M+C

- 1.1.2.1 Not recommended as an indicator for seabirds.
- 1.1.2.2 Madeira and Azores do not recommend using this item; the Canary team says it is ok.

- 1.1.2.3 Canary team considers the integration of the Cory's shearwater very hard as an indicators species. For Madeira and Azores, it is OK.
- Suggestion: a series of breeding success surveys every year, 30 nest, 30-40 years in length for HC, HM, PI, CB e BB.
- MSFD: Study the ecosystem and the sustainable use of the marine environment.
- Anthropogenic impact
- Coastal
- Oceanic
- Surface
- Bottom
- Minimum number of individuals
- Day 3 - 31 March
- Procellariiforms
- GES - No colony of procellariiforms within the IBAs will disappear.
- GES - In 30 years the population hasn't reduced more than 10%
- GAP? - If a colony disappears due to: introduced species (predation); anthropogenic impacts on land or in the wintering grounds outside the IBAs.
- Azores can be used as indicators due to the number of predators.
- Charadriiformes
- GES - The 6 years' average abundance is stable, seeing that terns display inter-annual fluctuations. Breeding success should not be inferior to the previous 10 years average.
- GAP - Some colonies need to be predator free so that the population characteristic, including the breeding success, can be assessed.
- Sterna dougalii
- GES - Key-colonies keep their status quo: Graciosa, Terceira, Santa Maria, Pico e Flores
- Sterna hirundo
- GES - Island distribution remains stable.
- Coordination of the working groups
- Representative of the different functional groups in the Steering Committee: Mónica Silva (marine mammals), Fréderic Vandeperre (sea turtles) e Juan Bécares (seabirds)
- Marine Mammals:
- Data needs to be processed in view of the indicator(s); data does not exist.
- Baseline:

- No human interaction whatsoever;
- Previous values, or our own assumptions;
- The current value according to the directive, or if not possible, our best estimate.
- GES value should not decrease more than 30%, after that IUCN will engage actions to correct.
- To note that anthropogenic pressures are the ones most likely to change.
- Use of a baleen whale (mysticeti) as an indicator, as they are the base of the food chain, although it doesn't present any GAP.
- GAP: population distribution indicators (demographic), huge inadequacy, recommendations to achieve by 2018.
- Suggestion: guidelines for the WP2.
- Sea Turtles:
- Caretta caretta
- Chelonia mydas
- Organization: GES indicators of Macaronesia VS individuals GES
- How many individuals are retrieved or affected by human activity in order to evaluate GES?
- MSFD:
- Indicator monitoring every 6 years;
- Anthropogenic impact monitoring;
- Sea Birds:
- Compile and organize data from the three archipelagos in order to compare between the three.;
- Methodology (WP2): Study an area to verify the colony's tendencies: size, marked area, occupied nest; population abundance as a GES indicator; mark-recapture method at Praia islet to calibrate the method; breeding success to be obtained by following 30 nests along the three archipelagos; population condition as a GES indicator; distribution, absence and presence as GES indicators; ARU (automatic recording unit) - area of reach 25m, can lead up to mistake due to the low resolution.