MISTIC SEAS II MACARONESIA

MACARONESIAN ROOF REPORT 2018

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GLOSSARY

Assessment

An analysis of the essential features, characteristics, pressures, impacts and current environmental status of the marine waters and the elements that compose them (Directive 2008/56/EC, 2008).

Assessment area

An individual, defined area that is used for assessments. These may be defined at different spatial scales as part of a nested approach. For an assessment at a specified spatial scale, some assessment areas may not be relevant and would not need to be assessed (WG GES, 2017).

Aggregation

The spatial and/or temporal combining of information on the same scientific indicator (or higher-level indicator, or species group, or criterion etc.) (WG GES, 2017).

Baseline

A specific value of state (or pressure/impact), against which subsequent values are compared: essentially a standard (articulated in terms of both quality and/or quantity) against which various parameters can be measured (e.g. reference state with negligible impacts, past state or current state) (ICG COBAM, 2012).

Competent authorities

Designated authority or authorities competent for the implementation of Directive 2008/56/EC (2008) with respect to their marine waters.

Criteria

Distinctive technical features that are closely linked to qualitative descriptors, defined in Commission Decision 2017/848/EU (2017) to be used by the Member States to determine the Good Environmental Status of their marine waters and to guide their assessments of that status in the first implementation cycle of Directive 2008/56/EC (2008).

Descriptor

Each of the eleven (11) qualitative groups listed in Annex I of Directive 2008/56/EC (2008) that Member States shall consider to determine Good Environmental Status of their waters.

Element

Concrete ecosystem component covered in the assessment such as a given species, stock or specific Management Unit.

Environmental targets

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 subregion (Art. 3.7 Directive 2008/56/EC, 2008).

Feature

Group of ecosystem components, elements or species to which the indicator applies.

Good Environmental Status (GES)

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 are at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

Indicator

Parameter that enable measurement of progress towards or maintenance of Good Environmental Status and from which the assessment is extracted.

Indicator species

Species selected for monitoring Good Environmental Status of Member States marine waters.

Integration

The combining of information from different (scientific) indicators into one higher-level indicator or to criterion-level, or the combining of information from two or more criteria to descriptor level or to an alternative grouping of criteria (e.g. for an ecosystem component, or for a grouping of criteria below descriptor level) (WG GES, 2017).

Macaronesian Archipelagos

The three European archipelagos (Azores, Madeira and Canary Islands) in which the application of Directive 2008/56/EC (2008) is mandatory (in order to simplify the concept the archipelago of Cabo Verde to which the Directive does not apply is excluded from this definition).

Management Unit (MU)

Element or subelement (e.g. population/subgroup/subpopulation/ of a particular indicator species) of a given geographical area to which assessment of the Good Environmental Status and management of human activities are applied.

Marine Strategy Framework Directive (MSFD)

Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (2008).

Marine region

A sea region defined in Article 4 of the MSFD. Marine regions and their subregions are designated for the purpose of facilitating implementation of the MDFD and are determined considering hydrological, oceanographic and biogeographic features.

Marine waters

The waters, seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Member State has and/or exercises jurisdictional rights, in accordance with the United Nations Convention on the Law of the Sea (UNCLOS), with the exception of waters adjacent to the countries and territories mentioned in Annex II to the Treaty and the French Overseas Departments and Collectivities; and coastal waters as defined by Directive 2000/60/CE (2000), their seabed and their subsoil, in so far as particular aspects of the environmental status of the marine environment are not already addressed through that Directive or other Community legislation.

Measures

Actions developed and applied by the competent authorities as part of a programme of measures designed to achieve or maintain Good Environmental Status.

Member States

Each of the 28 countries/states that is party to the founding treaties of the European Union and thereby subject to the privileges and obligations of membership.

Monitoring programmes

Programmes of data collection and assessment, enabling the environmental status of the marine waters concerned to be evaluated on a regular basis.

Pressures

Anthropogenic impacts affecting the marine waters and their elements.

Regional cooperation

Cooperation and coordination of activities between Member States and, whenever possible, third countries sharing the same marine region or subregion, for the purpose of developing and implementing marine strategies.

Regional sea convention

Any of the international conventions or international agreements together with their governing bodies established for the purpose of protecting the marine environment of the marine regions referred to in Article 4 of the Directive 2008/56/EC (2008).

Spatial scale

The geographical scale at which assessments should be carried out, for example, region or subregion, national waters (i.e. under a country's jurisdiction), coastal water bodies etc. (WG GES, 2017).

Species group

Group of species belonging to a given functional group, such as marine birds, mammals and reptiles.

Threshold

A value or range of values that allows for an assessment of the quality level achieved for a particular criterion, thereby contributing to the assessment of the extent to which good environmental status is being achieved as referred in Article 2 of the Commission Decision 2017/848/EU (2017).

MARINE STRATEGY FRAMEWORK DIRECTIVE (MSFD)

MACARONESIAN ROOF REPORT
DESCRIPTOR 1 – BIRDS, MAMMALS AND REPTILES

1. Introduction

Directive 2008/56/EC of the European Parliament and of the Council of 17 June (2008), the Marine Strategy Framework Directive (MSFD), establishes the legal framework for Community action in the field of marine environmental policy. The MSFD aims to achieve a healthy marine environment in Europe while ensuring the continuation of sustainable exploitation of the marine resources upon which marine-related economic and social activities depend. To achieve this objective, the MSFD requires Member States (MS) to achieve Good Environmental Status (GES) of their waters by 2020. The Directive defines GES as: "The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive".

GES will be based in 11 descriptors, and the anthropogenic pressures and impacts on the marine environment, following the criteria established by the Commission Decision (EU) 2017/848 of 17 May (2017) laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment; repealing Commission Decision 2010/477/EU (2010).

The MSFD requires MS to structure the reporting of their activities into five consecutive phases: an initial assessment of the current environmental status of their waters and of the pressures faced (Article 8), definition of what GES means for their waters (Article 9), establishment of environmental targets and associated indicators (Article 10), establishment and implementation of monitoring programmes to collect the data needed to determine environmental status (Article 11) and finally the establishment of a programme of measures designed to achieve or maintain GES (Article 13).

The first cycle of the MSFD started on 15th July of 2012 and finished on 15th July 2018 (6 years). Currently, MS are entering into the second cycle, in which they should produce updates of the initial assessment, the definition of GES and the established environmental targets.

Article 5 of the MSFD specifies the need of MS sharing a marine region or subregion to cooperate, making use of existing regional cooperation structures, to ensure that, within each marine region or subregion, coherence is achieved. This report is the result of the coordinated work between scientists, technical teams and all the competent authorities involved in the implementation of the MSFD in the Macaronesian sub-region. The MS with jurisdiction in this subregion are Portugal, through the national competent authority (Directorate-General for Natural Resources, Safety and Maritime Services - DGRM) Regional Governments of Azores (Regional Directorate for Sea Affairs - DRAM) and Madeira (Regional Directorate for Territorial Ordering and Environment - DROTA), and Spain, through the Ministry for the Ecological Transition (MITECO), and the Regional Government of the Canary Islands, the latter having the competence on the conservation of inland ecosystem components, such as marine bird colonies.

This collaborative work started already in 2015 with the Project MISTIC SEAS: Macaronesia Islands Standards Indicators and Criteria: Reaching Common Understanding on Monitoring Marine Biodiversity in Macaronesia No. 11.0661/2015/712629/SUB/ENVC.2 (MISTIC SEAS, 2015). The main objective of this project was to join efforts to develop a common set of methodologies to be shared across the Macaronesia marine subregion in order to ensure consistency and to allow comparison between MS within the same marine regions, as recommended by the MSFD, as well as the design and implementation of an Action Plan to ensure the GES of the waters of this region.

As a result of MISTIC SEAS, a common methodology for the monitoring of three functional groups of Descriptor 1 (marine birds, mammals and turtles), was developed focusing on the populations of the species shared among the three archipelagos.

The project MISTIC SEAS II: Applying a subregional coherent and coordinated approach to the monitoring and assessment of marine biodiversity in Macaronesia for the second cycle of MSFD No. 11.0661/2017/750679/ SUB/ENV.C2 (MISTIC SEAS II, 2017a) aimed to implement most of the common pilot monitoring programmes designed in MISTIC SEAS. It also reinforces the need of a regional coherence for updating the initial assessment, GES definitions and environmental targets for the 2nd cycle of the MSFD in the Macaronesia subregion, in a coordinated and consistent manner. The results of this task would be reflected in the Macaronesian Roof Report (MRR), which is one of the deliverables included in the project.

This document, the MRR, includes the description of the criteria and species assessed, along with compilation of the results obtained during the implementation of the pilot monitoring programmes under the MSFD for marine birds, mammals and turtles in the three Macaronesian archipelagos (Azores, Madeira and Canary Islands) but also from other additional data available from other projects or governmental management programs. This report will be the basis for the MS, Portugal and Spain, to fulfil the obligations of the MSFD article 17 implementation.

A. REGION

The MSFD, on its Article 4, lists the marine regions and subregions that should be taken into consideration by MS when implementing their obligations under this Directive (**Figure 1**).

The main marine regions and subregions are:

- The Baltic Sea
- The North East Atlantic Ocean
    - The Greater North Sea
    - The Celtic Seas
    - The Bay of Biscay and the Iberian Coast
    - The Macaronesian waters
- The Mediterranean Sea
    - The Western Mediterranean Sea
    - The Adriatic Sea
    - The Ionian Sea and the Central Mediterranean Sea
    - The Aegean-Levantine Sea
- The Black Sea

The MSFD requires that GES is determined at the level of the marine region or subregion (Art. 3.5). However, in most cases assessment and reporting requires smaller scales (Prins et al., 2014). Assessments should make it possible to inform managers and policymakers on the environmental impacts of human activities. Areas that are too large can mask local pressures and their impacts and are therefore not suitable for management. Very small areas result in a high monitoring burden and may lead to inadequate assessments when the spatial distribution of ecosystem components is not sufficiently covered.

Appropriate spatial scales differ according to the ecosystem component under consideration. When separate populations of a species coexist within a particular region, they were assessed individually. The Guidance for Assessment under Article 8 of the MSFD (WG GES, 2017) recommends the following assessment scales for the Northeast Atlantic Ocean:

- Birds – Subregion
- Mammals
    - Deep-diving toothed cetaceans and baleen whales – Region
    - Small-toothed cetaceans – Subregion
    - Seals – Subregion
- Reptiles – Subregion

Wherever possible, the same scale for all species within a species group has been used in the current report. Several hierarchical spatial scales with three levels were defined for the Macaronesian subregion:

- The whole subregion (Macaronesia)
- Three national subdivisions/archipelagos (Azores, Madeira, Canary Islands)
- Monitoring sites (bird colonies, oceanic waters, coastal waters, specific location of resident populations, etc.)

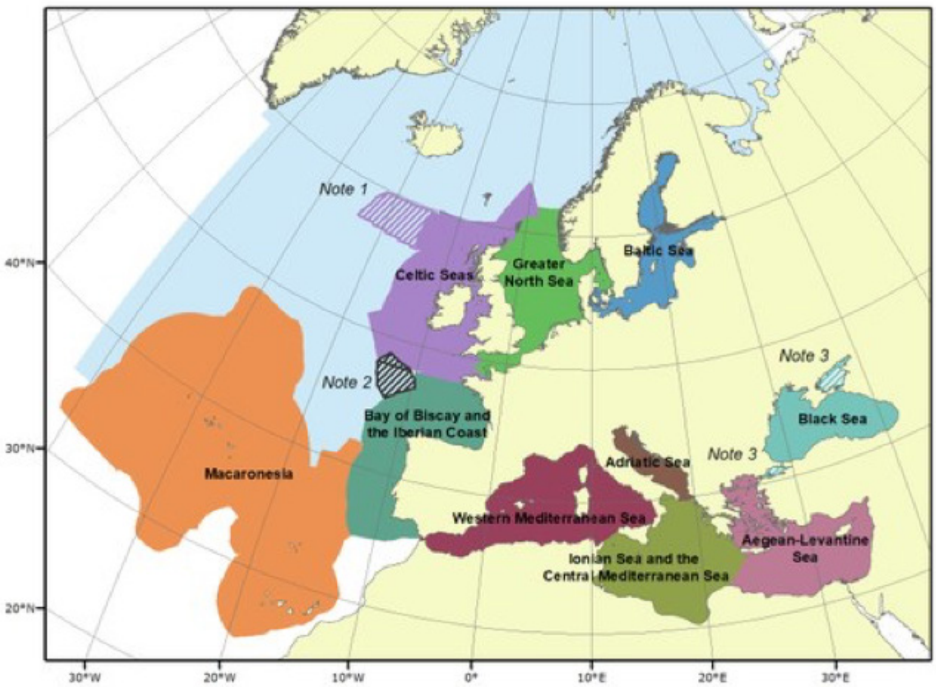

Figure 1: Representation of the marine regions and subregions of the MSFD as defined in its Article 4.
From: https://water.europa.eu/marine/regions

Macaronesian subregion

Macaronesia is the name given to the four archipelagos located on the Northeast Atlantic: Azores, Madeira, Canary Islands and Cape Verde. Cape Verde does not form part of the European Union and therefore, the MSFD does not apply to its waters and was not considered in this document. Azores and Madeira archipelagos are Autonomous Regions of Portugal whiled the Canary Islands is an Autonomous region of Spain. Of the three archipelagos, only the Azores is covered by the OSPAR Regional Sea Convention (RSC) (**Figure 2**). However, although Madeira is not included in OSPAR, Portugal also applies the convention to that territory, and the Madeira authorities participate in all the OSPAR committees. The islands have many natural features in common, such as a volcanic origin and a particularly rich and diverse flora and fauna. The Portuguese extended continental shelf subdivision, not assessed in this project, is also included in the Macaronesian subregion.

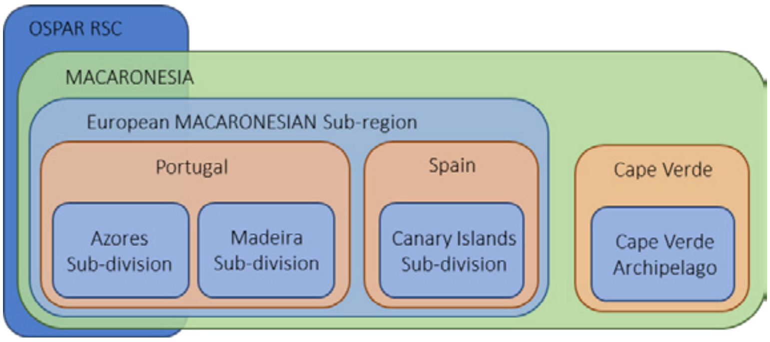

Figure 2: Schematic representation of the nested set of scales proposed for assessing the Macaronesian subregion.

Azores

The archipelago of Azores is an autonomous region of the Portuguese Republic located in the Northeast Atlantic. The Azores archipelago has nine islands of volcanic origin and some other coastal and oceanic islets making up a total area of approximately 2,344 km2. The islands are grouped intoan Eastern (Santa Maria and São Miguel Islands), Central (Terceira, Graciosa, São Jorge, Pico and Faial Islands) and Western Group (Flores and Corvo Islands). The Portuguese Exclusive Economic Zone (EEZ) around the Azores Archipelago comprises a marine surface area of approximately 1 million km2 (930,687 km2) representing about 30% of the EEZ surface of all the coastal states that are part to the European Union. It is one of the largest in the European Union (Bessa Pacheco, 2013).

Madeira

The archipelago of Madeira is an autonomous region of the Portuguese Republic located in the Northeast Atlantic. It consists of two major islands (Madeira and Porto Santo) and two smaller islands and islets (the Desertas and the Selvagens). The archipelago has a total land area of 801 km2 and is encircle by one part of the Portuguese EZZ with a marine surface area of approximately 442,248 km2 (Bessa Pacheco, 2013).

Canary Islands

The Canary Islands are a Spanish autonomous region located in the Northeast Atlantic. The archipelago is composed by eight islands with a total surface area of 7,273 km2 and a coastline length of approximately 1,291 km, with an EZZ of approximately 494,192 km2. The islands are divided into the Eastern (Lanzarote, La Graciosa and Fuerteventura), Central (Gran Canaria and Tenerife), andWestern Islands (La Gomera, La Palma and El Hierro). In addition, five islets also belong to the archipelago: Alegranza, Lobos, Montaña Clara, Roque del Este and Roque del Oeste (BOE-A-2018-15138, 2018).

B. DESCRIPTOR

The MSFD in its Annex 1 establishes eleven qualitative descriptors to help MS determine the GES of their national marine waters. The first descriptor, Descriptor 1, specifically refers to biodiversity stating that *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.*

In MISTIC SEAS II, the species groups considered were marine birds, mammals and reptiles. The Commission Decision 2017/848/EU (2017) states that for these species groups:

- Member states shall establish the list of species through regional or subregional cooperation.
- The criteria that should be evaluated on marine birds, mammals and reptiles are:
    - **D1C1** - Primary: the mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long-term viability is ensured.
    - **D1C2** - Primary: the population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.
    - **D1C3** - Secondary: the population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity, and survival rates) of the species are indicative of a healthy population which is not adversely affected due to anthropogenic pressures.
    - **D1C4** - Primary/Secondary: the species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.
    - **D1C5** - Primary/Secondary: the habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.

C. CRITERIA, PARAMETERS MEASURED AND METHODOLOGIES USED:

1. BIRDS

D1C1 Bycatch rate

Since 2013, the European Commission acknowledged that seabird bycatch was a major problem for the conservation of seabirds (Birdlife International, 2013). Bycatch mortality of seabirds is a primary criterion established by Commission Decision 2017/848/EU (2017) for MS to use in their assessment of the extent to which GES is being achieved. However, in the Macaronesian region, bycatch has not been identified as important threat for seabirds. Although, this can be partly attributed to a lack of observer programs specifically focusing on obtaining data on seabird mortality that contribute to the lack of information on seabird bycatch.

In the Azores, anecdotal evidence from the program of observers and local boat captains, as well as a small number of publications, show little to no records of bycatch incidences and no event of bycatch mortality. Both surface and demersal longline fisheries take place. A review of bycatch events until the year 2000 reported only 1 individual, presumed Cory's shearwater (*Calonectris borealis*), found dead in a demersal longline (Cooper *et al*., 2003). POPA is a fishery monitoring program for the tuna industry that has been running since 1998. This program reports a very low number of seabird bycatch events, zero accounts of bycatch mortality, with an average of 5 hooked (but not killed) great shearwater (*Ardenna gravis*), a passage migrant in the Azores (Moore, 1994), per 150 fishing events (pers. Comm. Miguel Machete, POPA Coordinator) in pole-and-line fisheries, since its beginning in 1998.

In Madeira the bycatch mortality is low (Zino and Biscoito, 1994) and Le Grand *et al*. (1984) does not mention any evidence of seabird bycatch at Selvagens islands.

In the Canary Islands, Cory's shearwater feeding grounds are within African waters where seabird bycatch has been reported (Brothers *et al*., 1999); however, measuring possible indirect effects such as bycatch in the wintering grounds (e.g. south Atlantic) is not currently possible.

An overall bycatch evaluation was made by Lewison *et al*. (2014) from 1999-2008 with no evidence found of seabird bycatch in the Macaronesian subregion.

The evaluation of other parameters (fluctuations in breeding parameters and analysis of the effect of other pressures) might indirectly inform on the nature of this impact. There is an urgent need for understanding the nature and extent of interactions between seabirds and fisheries (Anderson *et al*., 2011; Žy-delis *et al*., 2013) in all European waters. The following recommendations are made in order to fulfil possible knowledge gaps in terms of bycatch impact/interaction and to obtain accurate information of this impact in the region. Specific seabird bycatch forms should be added to the current POPA forms to ensure observers register any bycatch event. According to Oliveira *et al*. (2005), a preliminary interview-based survey should be implemented in order to get solid data on related variables that can be used to explain the variability in bycatch (e.g. gear, number of boats, fishing effort, main bycatch species, fishing areas).

D1C2 Population abundance

Population abundance is another primary criterion for seabirds (Commission Decision 2017/848/EU, 2017). Population abundance was monitored in the breeding colonies using two methodologies according to accessibility:

- Nest Count (NC) - when access to the nests was possible.
- Call Rates (CR) - recording used for those colonies to which access was not possible.

- Nest Count (NC)

To monitor abundance, specific colonies were selected based on colony accessibility and presence/absence of introduced (mammalian) predators, as defined in MISTIC SEAS technical report (MISTIC SEAS, 2016a).

To assess population abundance at each colony, a set of accessible nests were selected and marked (for consistency between methodologies/archipelagos, the minimum nest count for each colony was set as 30-40 accessible nests). The nests were selected within an area that showed signs of occupation (faeces, feathers, excavation and/or individual on the nest). Due to the inherent nocturnal behaviour and steep habitat preference of Procellariiformes, proper robust censuses are often difficult or impossible to implement. Thus, for the majority of the selected MU, an index of abundance is presented. For some species, however, full censuses are possible within the monitored colonies (e.g. Bulwer's petrel *Bulweria bulwerii* or Cory's shearwater *Calonectis borealis* at Vila islet, Azores).

Population abundance parameter is measured in breeding pairs (BP) by species/colony. BP is calculated by systematically monitoring the selected nests/areas at each colony, and count, throughout the season, the nests that are occupied by both adults (both adults present simultaneously, or when both adults are ringed and identified in the same nest during the season, even if not observed together), egg and/or chicks.

- Call Rate (CR)

Procellariforms nest on inaccessible islets and cliffs, only visiting the colonies at night and during the breeding season. Fieldwork is often constrained by weather and accessibility conditions, creating logistical and operational difficulties that hinder data collection. Alternative and autonomous methodologies usage is increasing thus enabling more data collection at previously inaccessible locations.

To assess population abundance in remote colonies and to complement NC methodology, Autonomous Recording Units (ARUs) were installed at selected islets. These tools record seabird calls within a set time interval (Oppel *et al.*, 2014), and determine abundance based on the assumption that the number of calls per interval is correlated with the number of breeding pairs (Borker *et al.*, 2014). ARUs increase the spatial and temporal scale of data collection, lower the cost of field work and decrease inter observer and temporal biases in data collection (Scott Brandes, 2008; Blumstein *et al.*, 2011). It also decreases researcher impact on colonies/individuals and provides alternative data collection whenever constraints prevent access to the colony (Carey, 2009). Data collected is dependent on colony activity/number of calls (Buxton and Jones, 2012) which is itself influenced by lunar phase, visits to the colony, synchronization of breeding species, occurrence of several species in the colony, climatic conditions (Piatt et al., 2007; Ramírez, 2017) and other variables independent of the colony abundance (Borker et al., 2014).

Since the use of ARUs is still a recent methodology, the seabird field teams from Azores and Canary Islands tested different methodologies and equipment to compare the estimates and determine the efficiency and accuracy of both.

Methods used in the Azores

In the Azores, MISTIC SEAS II shares much of the temporal and geographic scale as the project LuMinAves (Interreg MAC/4.6d/157). Taking advantage of this synergy, results from this complementary project are presented within this report. Capture-mark-recapture (CMR) using mist-nets was used following the methodology tested by Ramírez (2017) and applied in the project LIFE EuroSAP LIFE14 PRE/UK/000002 to define Monteiro's storm-petrel (*Hydrobates monteiroi*) Action Plan to standardize the method and provide a better evaluation.

ARUs were deployed at the beginning of Monteiro's storm-petrel and band-rumped storm-petrel (*Hydrobates castro*) breeding season (May and October, respectively) until the end of the season (September and February, respectively). The equipment was programmed to start recording as soon as the Storm-petrels arrive at the colony until the period of highest activity (21:00-01:00) and recording again before the Storm-petrels return to the sea (03:00-05:00). Recording 1 min every 10 min, that is, for each programmed hour, 6 minutes of calls are obtained, a total of 36 min/day/ARU. The data was analysed using Song Scope Bioacoustics Software 4.0 (Wildlife Acoustics, Concord, Massachusetts; Buxton *et al.* 2013).

MONIAVES, a seabird monitoring program of common (*Sterna hirundo*) and roseate (*S. dougallii*) terns proposed in the frame of MSFD, is usually performed between the 25th of May and the 10th of June each year in the Azores Archipelago. The census takes place regularly, since 2009 (except in 2013) to 2015 under research projects of DOP-UAc and IMAR (Department of Oceanography and Fisheries of the University of the Azores), and from 2016 to the present by the Regional Government of the Azores (coordinated by the Regional Directorate for the Sea Affairs and operated by the Regional Directorate of the Environment). The methods followed were designed for Charadriiformes. A previous assessment of the tern colonies (either by visiting accessible ones or by observing the behaviour of the birds with binoculars) determines the optimal period for the census which is about 3 weeks after the first eggs are laid. Colonies vary in terms of occupation and are not necessarily spotted in the same place every year. Moreover, the reproduction peak varies slightly between years and islands within the same year. Therefore, 3 different methods are applied for monitoring common and roseate tern breeding pairs in the Azores. If the colonies are accessible, *in situ* direct counting of nests, eggs and chicks is performed (**Method 1**). To avoid disturbance, visitation is limited to 20 min or less preferably by 2 or 3 observers that count, photograph, and register data side by side. Abandoned and broken eggs and predation evidence of eggs, chicks, or adults is also registered. **Method 2** is applied to inaccessible colonies that allow the counting of apparently occupied nests using binoculars or a telescope from a vantage point. If possible, the number of individuals and/or the proportion of birds of each species is estimated. Inaccessible colonies with no visibility from land are monitored via flush counts from a boat (**Method 3**). Thus, a tern boat census around the 9 islands of the Azores is performed using a gas horn close to the colonies to induce flight. The total number of flying birds and/or the proportion of each species is estimated by averaging the estimates of the different observers. To determine the number of breeding pairs, a proportion of 3 flying birds to 2 breeding pairs are assumed. This correction is applied to account for the birds that do not react to the sound and the ones that are feeding away from the colony.

Methods used in the Canary Islands

The ARUs used were prototypes of the terrestrial version of the *SoundTrap* recorders, a device extensively used by cetologists (Mark Johnson, pers. com.). Since the shearwaters only visit the colony at night, the recording period is restricted to nighttime hours in order to extend battery life. The period covered was the species breeding season from early December to mid-May except for some days with bad weather or technical issues. However, 80.4% of the breeding period days were surveyed. The recordings were scanned visually using Raven Pro 1.5 (Bioacoustics Research Program, Cornell Lab of Ornithology).

D1C3 Population demographic characteristics

Population demographic characteristics is a secondary criterion for seabirds (Commission Decision 2017/848/EU, 2017). It is related and informs the two primary criteria D1C1 and D1C2.

The assessment of population demographics is based in the productivity (breeding success and survival rate) of seabirds because these characteristics are expected to reflect changes in environmental conditions long before there are evident as changes in the population size of these long-lived species (Parsons *et al.*, 2008).

- Breeding success (BS)

Breeding success is determined using the same NC methodology and registering the state of the nest throughout the breeding season. The same nests identified in D1C1 are used for this parameter, as such selected in the same way (nests with signs or presence of faeces, feathers, egg fragments and/or body fragments (e.g. old beaks), as well as direct or indirect presence of adult/egg/chick, were considered active). Selected active nests were identified and marked (D1C1) using epoxy or paint, and they were georeferenced to make it easier to monitor them over time. At least 30-40 nests for each species and colony were chosen as statistically relevant for obtaining breeding parameters in each colony.

To monitor breeding success, it is necessary to conduct at least two visits to the colonies during incubation and a third one after chick hatching. The breeding success is reported as the number of chicks fledged divided by the number of eggs laid (N° fledged chicks/N° laid eggs). Breeding failures are registered by observing predation evidence (e.g. dead chicks or broken eggs with evidence of bites) as well as mortality resulting from other causes such as non-viable eggs (embryo still inside the egg), a nest collapsed over the egg/chick, and chicks that died from disease or starvation, amongst others.

- Survival rate (SR)

TThe Capture-Mark-Recapture methodology (CMR) is used to obtain data to calculate survival rates (SR). This is conducted by ringing adults at the colony and re-capturing them (and check ring numbers) during subsequent years ideally in the same 30 nests selected for other monitoring. During the first year of monitoring, the main objective was to ring as many adults as possible at the colonies, even if not in a nest. When unringed adults are found, they are, whenever possible, ringed and the brood patch is observed to reduce bias and confirm if it is a breeder (adult) and not a prospector (prospecting for a nest and/or a mate in order to breed the next year) (Brooke, 2004; Rayner *et al.*, 2013).

D1C4 Distributional range

Distributional range is a secondary criterion for seabirds (Commission Decision 2017/848/EU, 2017). Procellariiformes are very philopatric (Coulson & Coulson, 2008). Since they return to the same colony year after year, colony losses are a major indicator of unhealthy populations. Some species still possess a large enough distribution in the islands. As such, their colonies are not discrete, and thus, its limits are hard to define. In the Azores, this occurs with Cory's shearwater island colonies, and thus, this MU was excluded from this criterion. On the other hand, Charadriiformes are very mobile and often change their breeding locations from year to year taking sabbaticals often (ICES, 2013). Therefore, the distribution criterion for these MUs operates at a higher geographical level and cannot be assessed at colony level.

- Range (RG)

During MISTIC SEAS I it was proposed to include all but Cory's shearwaters in this criterion due to non-discrete colonies of the species at the Macaronesia level. Due to limitations in logistics and budget for MISTIC SEAS II, only a few smaller-ranged species could be assessed by default since evaluation of the effects of oceanic conditions on population dynamics is better monitored by the distributional limit than the core of species ranges due to segregation at sea driven by energetic constraints, competition or use of local information (Hipfner *et al.*, 2007). We proposed to report on the distribution of Bulwer's petrel in the Azores and of the Azores-endemic Monteiro's storm-petrel. Bulwer's petrel reaches the northern limit of its distribution at this archipelago, and recent confirmation of a more northern colony (Baixo islet) makes it a good indicator for distributional changes. Another indicator will be the distribution of Monteiro's storm-petrel. So far, this species was known to breed only on two islets situated off Graciosa island, but colonies have just been found off Flores island (Oliveira *et al.*, 2016), and there are suspicions of breeding attempts at Corvo island where it has been heard through point calls (acoustic monitoring). This small breeding range is considered a robust distribution indicator.

D1C5 Habitat for the species

Habitat for the species is a secondary criterion for seabirds (Commission Decision 2017/848/EU, 2017). No information or monitoring schemes were available on seabird habitat. This criterion concerns the state of aquatic habitats. In the case of these seabird species as migratory seabirds, this can reflect threats in their foraging grounds/wintering areas which are not integrated within our current monitoring schemes due to the lack of knowledge about at-sea distribution of individuals across species, sex and age classes and the monitoring challenges (Lewison *et al.*, 2012).

2. MAMMALS

D1C1 Bycatch rate

Bycatch rate is a primary criterion for marine mammals (Commission Decision 2017/848/EU, 2017). Although bycatch has been reported in Macaronesian waters, it is believed that the present bycatch rate is unlikely to compromise the long-term viability of any marine mammal, with the exception of monk seals (*Monachus monachus*) in Madeira. Nevertheless, it is recommended that in future assessments and to comply with Council Regulation (EC) 812/2004 (2004), this criterion should be reconsidered in light of new data (e.g. increase in reported bycaught cetaceans or increase in proportion of stranded animals showing signs of interactions with fishing gear) or if current fishing practices and effort change (e.g. alterations or new fishing gears). Furthermore, it should be stressed that fishing fleets operating outside the EEZ are seldom monitored and bycatch rates in these fisheries are still unknown. Fishery data is also widely misreported (Watson and Pauly, 2001), and illegal, unreported, and unregulated fisheries are responsible for unknown but potentially high levels of bycatch around the world (Reeves *et al.*, 2013; ICES, 2017a, 2017b). In addition to fishery observer programs carried out under the Data Collection Framework (DCF) on fisheries in the Azores, there is a program on fishery bycatch called POPA which has been extended to cover Madeira. In the Azores, POPA has collected data continuously since 1998 specifically for bycatch. This data is not only for tuna fisheries (pole and line), but also for the other fisheries currently ongoing such as handline, bottom and pelagic longlining as well as for any experimental fishing that might occur throughout the Azores EEZ. Data provided by this program has allowed quantifying the occurrence of bycatch in longline fisheries in the Azores for the last two decades. In the Azores, fishing involving bottom trawling is banned.

- Bycatch rate (BR)

Monitoring of fishing activities (through, for example, observer programmes) should cover all fisheries and gears to ascertain whether bycatch is an important threat for the populations. Marine mammal strandings is currently the only way to assess the minimum level of bycatch in these fisheries, and thus have a sentinel role to play. However, observer programs on board the fishing fleet are needed to estimate bycatch rate accurately. In Azores, bycatch rates of the tuna fishery are provided as the number of cetaceans captured each year per observed tonnage of tuna landed.

- Mortality rate (MR)

Contrarily to bycatch, mortality from ship strikes may have already reached levels that may be unsustainable for sperm whales (*Physeter macrocephalus*) mainly around the Canary Islands where these events are considered an important threat to the species (Fais *et al.*, 2016), and also in Azores where incidents have recently increased (unpublished data from the Azorean Stranding Network).

Criterion D1C1 is mortality rate due to fishing mortality (bycatch), but in this document, "Mortality rate from ship strikes" is proposed as part of this criterion. This suggestion could be considered by the Commission in order to include in D1C1 other mortality due to non-natural causes (anthropogenic threats, such as boat strikes) in future decisions.

D1C2 Population abundance

Population abundance is a primary criterion for marine mammals (Commission Decision 2017/848/EU, 2017). Abundance is the most important parameter when trying to assess the status of a population (ICES, 2014). Although indices of relative abundance could be used to assess changes in population size of marine mammals, there are many caveats associated with this metric which often produces unreliable and imprecise results. Thus, the preferred metric to estimate population size of marine mammals 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.

Pilot line-transect surveys carried out during the MISTIC SEAS II project tested sampling strategies (area to be sampled, period to be sampled and effort needed) following the methodologies proposed in the project MISTIC SEAS to monitor Macaronesian oceanic cetacean species in Madeira, Azores and Canary Islands.

Two methodologies were proposed for estimating cetacean abundance in the Macaronesia: Distance sampling (Buckland *et al.*, 2015) and photo identification (Hammond, 2009). These two methodologies can give different estimates that should not be compared directly.

- Distance sampling (DS)

LLine-transect distance sampling shipboard surveys are used to collect sightings data to estimate the abundance of cetacean species in Macaronesian waters. The study area is divided into several blocks and random transects are designed to maximize equal probability of coverage of the study area using the software Distance (Thomas *et al.*, 2010). During the search effort, observers scan the horizon covering an angle of 180° centered at the bow of the boat. Data on cetacean sightings (i.e. angle and distance from the boat to the animals) is recorded as well as other environmental data. For further information on the sampling protocol, consult Technical Report on Abundance of Oceanic Cetaceans and Loggerhead Census of project MISTIC SEAS II (2017b).

Distance software is used to estimate the detection function and the effective strip width (ESW) (results obtained are termed as “design-based estimates”). The abundance of groups and the group size is also modelled using Generalized Additive Models (GAM) with a logarithmic link function including the ESW in the offset (results obtained are termed as “model-based estimates”). Non-parametric bootstrap techniques are used to obtain confidence intervals (CI) and coefficient of variation (CV) of the estimated abundances.

- Capture-Mark-Recapture (CMR)

Capture-Mark-Recapture methods based on photo identification of natural markings can be a useful technique for estimating abundance of populations of cetaceans that aggregate at given locations. CMR methods provide an estimate of the numbers of animals using the study area during the study period (Hammond, 2009).

Study areas are separated into sampling blocks and transects are designed within each block to ensure the entire area is homogeneously surveyed in the minimum time possible. Photo identification surveys are carried out over two temporal scales, following the Robust Design approach (Pollock, 1982), consisting of multiple sampling occasions close in time (secondary periods) which are then separated by longer intervals (primary periods).

All individuals encountered should be photographed irrespective of the distinctiveness of their natural markings or behaviour. Photographs are graded for quality and each dorsal fin visible on the photograph is assigned a distinctiveness or marking score. Only the best photographs of well-marked individuals are analysed. Data on the proportion of well-marked individuals in each group encountered is used to estimate the proportion of marked animals in the population and to correct estimates of abundance (Wilson *et al.*, 1999). Sightings of individual animals are compiled into encounter histories which are subsequently analysed with the program Mark (or package RMark for R). Under the Robust Design framework (Pollock *et al.*, 1990; Kendall *et al.*, 1997), abundance is estimated using closed population models that use data from primary periods.

The data is tested for population closure with the software CloseTest (Stanley and Richards, 2005) and the maximum number of occasions is used while maintaining population closure. The most parsimonious model is chosen from the ones tested which accounted for the effect of time, individual heterogeneity (both as random effect and finite mixture) and their combination on the probability of capture. Two data sets are created: a first one with only "island-associated" individuals (i.e. seen at least 2 times, as defined in previous baseline estimates) (Alves *et al.*, 2013; Dinis, 2014); and a second with all individuals considering the possibility to leave out resident individuals with low capture probability. Correction factors are calculated using the number of dorsal fins analysed in good (Q1) and medium (Q2) quality to correct the estimates for unmarked and slightly distinctive individuals not used in the mark-recapture models. The methodology followed is the one defined in the Technical Report 1 (TR1) of the project MISTIC SEAS II elaborated during a workshop of Madeira in July 2017 (MISTIC SEAS II, 2017c) following on the MISTIC SEAS project which established the general design of the surveys (MISTIC SEAS, 2016b).

With CMR data, a total number of individuals that would use an area over a survey period is estimated while DS would estimate an average density of individuals that would use the area in a precise moment (snapshot).

D1C3 Population demographic characteristics

Population demographic characteristics is a secondary criterion for marine mammals (Commission Decision 2017/848/EU, 2017). Demographic characteristics are indicators of the state of a population and can be used to assess impact of anthropogenic activities. 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, bycatch) or sub-lethal (e.g. disturbance from whale-watching, physical or biological changes in habitat).

- Survival rate (SR)

CMR methods applied to photo identification data use observations of individually marked animals over time to estimate the survival rate of the population. Under the Robust Design framework (Pollock *et al.*, 1990; Kendall *et al.*, 1997), survival probability is estimated from open population models applied to data from between primary periods providing an estimate of the survival rate over that time interval.

Annual survival rate is usually estimated based on capture probability of marked individuals using Cormack-Jolly-Seber (CJS) models (Cormack, 1964; Jolly, 1965; Seber, 1965; Lebreton *et al.*, 1992) with data from photo identification. However, a Robust Design (RD) sampling strategy (Pollock, 1982) enables the estimation of population size, annual survival rate and emigration and re-immigration rates (Kendall *et al.*, 1997) in the same model. The RD combines sampling over two temporal scales: the primary periods are temporally spaced over a long-time frame (usually a year) in which the population is open to births, deaths, emigration and immigration; secondary periods, conducted within the primary periods, are a short-term sampling over which the population is considered closed. Data from primary periods is used to estimate survival and movement rates, while information from secondary sessions is used to estimate population size.

Under the RD, a minimum of 3 primary periods, each with a minimum of 3 secondary sessions, is required. The entire survey area should be covered during a secondary session and these should be designed in a way that at least 50% of the population is sampled at each primary period. Finally, secondary sessions should be temporally spaced to allow for mixing of animals between sessions without risk of violating the closure assumption within primary periods.

D1C4 Distributional range

Distributional range is a primary criterion for marine mammals (Commission Decision 2017/848/EU, 2017). Cetacean species found in Macaronesian waters usually have large ranges that often extend to the waters of several islands and offshore waters. For these highly mobile taxa, the distributional range and pattern of distribution are difficult to determine and quantify with accuracy, and measurable baselines, metrics and targets for distribution indicators cannot be established with certainty. Thus, it has been proposed that these criteria, namely, *Distributional range and Distributional pattern within range*, should be removed from the list of indicators for marine mammals in the Macaronesia. Changes in distribution could act as warning signals and causes of change should be investigated (ICES, 2014), for example, in coastal populations that maintain well-defined ranges in most geographic areas. However, resident or island-associated populations of cetaceans present in the Macaronesia usually range widely and often move between distant islands. Consequently, unless monitoring is extended to the whole archipelagos, including offshore waters, it would be equally difficult to monitor the whole range of these coastal populations. Thus, the distribution indicator is considered to be also inappropriate for coastal cetacean populations in the Macaronesia. Still, monitoring of the marine mammal distributional ranges could be part of the monitoring for abundance (D1C2). This position is in line with the previous statement of experts in MISTIC SEAS Technical Report 1 (MISTIC SEAS, 2016a).

D1C5 Habitat for the species

For the purpose of Directive 2008/56/EC (2008), the term habitat addresses both the abiotic characteristics and the associated biological community treating both elements together in the sense of the term biotope. Additional efforts for a coherent classification of marine habitats supported by adequate mapping are essential for assessment at habitat level. This also takes into account variations along the gradient of distance from the coast and depth (e.g. coastal, shelf and deep sea). The three criteria for the assessment of habitats are their distribution, extent and condition (for the latter, in particular the condition of typical species and communities) accompanied with the indicators related respectively to them. The assessment of habitat condition requires an integrated understanding of the status of associated communities and species that are coherent with the requirements laid down in Council Directive 92/43/EEC (1992) and Directive 2009/147/EC (2009). This includes, where appropriate, an assessment of their functional traits. The same reasoning presented for the previous criterion (i.e. D1C5) also applies to this criterion on what concerns cetaceans.

3. REPTILES

D1C1 Bycatch rate

Bycatch rate is a primary criterion for sea turtles (Commission Directive 2017/845/CE, 2017). Fishery bycatch 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). The mortality rate due to interactions with fisheries, instead of just the bycatch rate, is proposed to assess this criterion. To this end, capture mortality as well as post-release mortality should be estimated (e.g. Swimmer *et al.*, 2013).

In the North Atlantic, bycatch is probably one of the main threats for juvenile sea turtles. Although, much of the fishing effort is exerted outside national jurisdictions.

The main fisheries impacting sea turtles vary significantly between Macaronesian archipelagos, from industrial surface longline fisheries (Azores) and deep pelagic longline fisheries (Madeira) to artisanal and recreational coastal fisheries (Canary Islands). Consequently, methodologies used to estimate mortality rates will vary accordingly (e.g. observer programs, questionnaires, information from wildlife recovery centres).

- Mortality Rate (MR)

Estimation of mortality rate due to bycatch requires information from the fishing activity and the population dynamics of the concerned species. Data on the fishing activity can be obtained through different methodologies depending on the type of activity. Large scale commercial activities are best monitored through at-sea observer programs (e.g. pelagic long-line fisheries) while alternative methodologies (e.g. interviews) are necessary for small scale activities (e.g. artisanal and recreational fisheries). Mortality estimates should include post-release mortality rate; e.g. of 28% (95% bootstrap CI: 16-52%) for loggerhead sea turtles (*Caretta caretta*) in the pelagic longline fleet (Swimmer *et al.*, 2013) to calculate the actual mortality rate of the populations.

D1C2 Population abundance

Population abundance is a primary criterion for sea turtles (Commission Decision 2017/848/EU, 2017). Juvenile turtles form aggregations in the Macaronesian archipelagos, but these animals originate from nesting beaches outside the European territories in Macaronesia (Cape Verde) and further west in the Caribbean Sea. Variation in hatching success influences the juvenile recruitment in feeding areas in Macaronesian waters. This recruitment is in turn reflected in the genetic composition of these aggregations. Therefore, these two factors should be considered when interpreting the abundance results. In addition, studies should provide data to verify if changes in the distributional range and pattern have likely influenced the observed abundance trends (e.g. via satellite telemetry).

- Distance sampling (DS)

The same line-transect distance sampling methodology as the one used for cetaceans is applied for turtles. Details of the methodology used in this joint monitoring program for oceanic cetaceans and sea turtles are described under D1C2 Population abundance for Marine Mammals.

- Photo-identification (PI)

The identification of individuals within a population is used for demographic studies. Photo identification is a useful technique for sea turtles living in small areas (Schofield *et al.*, 2008). The facial scale patterns (shape and arrangement) allow turtles to be identified because it is exclusive to each individual in the family Chelonidae (and different on either side of the head). This technique has been used to estimate population sizes of juvenile sea turtles occupying coastal foraging grounds and has already been used in other places (Su *et al.*, 2015) and demographic studies (Schofield *et al.*, 2008; Hays et al., 2010).

D1C3 Population demographic characteristics

Population demographic characteristics are a secondary criterion for sea turtles (Commission Decision 2017/848/EU, 2017).

- Body condition (BCI)

The population demographic parameter considered for assessing sea turtle under this criterion is the Body Condition Index (BCI). This characteristic provides information on the health and pressures affecting

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the populations. Data is collected in dedicated sampling surveys. The 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 developed by Bjorndal *et al.* (2000) (see Clukey *et al.*, 2017, 2018).

D1C4 Distributional range

Distributional range is a primary criterion for sea turtles (Commission Decision 2017/848/EU, 2017). The criterion is not considered appropriate for oceanic sea turtles that display wide ranging movements (often dependent on the prevailing currents) with only a fraction of their distribution enclosed within areas under national jurisdiction and occurring generally in low densities. Establishing threshold values and targets and interpreting trends in distribution therefore appeared unrealistic.

D1C5 Habitat for the species

Habitat for the species is a primary criterion for sea turtles (Commission Decision 2017/848/EU, 2017). This criterion is not considered suitable for oceanic sea turtles who are highly dependent on the prevailing currents and temperature. Moreover, only a fraction of their habitat is enclosed within areas under the jurisdiction of the European Union countries and generally occurs in low densities. Establishing threshold values and targets and interpreting trends in habitat therefore appeared unrealistic. Notwithstanding, this criterion would be suited for neritic coastal habitats in the Canary Islands. However, establishing thresholds and targets for the habitat criterion was deemed unrealistic at this moment due to the limited information available for the marine turtle species.

D. ELEMENTS AND FEATURES (SPECIES AND GROUPS)

Macaronesian indicator species and species groups have been selected through international cooperation. This selection was based on the following criteria, as proposed by the Guidance for Assessment under Article 8 of the MSFD (WG GES, 2017) and adopted in the Commission Decision 2017/848/EU (2017) (see also MISTIC SEAS, 2016a).

1. Ecological relevance criteria:

    (a) Representative of the ecosystem component (species group or broad habitat type), and of ecosystem functioning (e.g. connectivity between habitats and populations, completeness and integrity of essential habitats).

    (b) Relevant for assessment of a key anthropogenic pressure to which the ecosystem component is exposed, being sensitive to the pressure and exposed to it (vulnerable) in the assessment area.

    (c) Present in sufficient numbers or extent in the assessment area to be able to construct a suitable indicator for assessment.

    (d) The set of species shall cover, as far as possible, the full range of ecological functions of the ecosystem component and the predominant pressures to which the component is subject.

    (e) If species of species groups are closely associated to a particular broad habitat type they may be included within that habitat type for monitoring and assessment purposes; in such cases, the species shall not be included in the assessment of the species group.

2. Additional practical criteria (which shall not override the scientific criteria):

    (a) Monitoring/technical feasibility.

    (b) Monitoring costs.

    (c) Adequate time series of the data.

For the purposes of assessing GES, the selected species were divided into Management Units (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, 2015). Thus, delineation of MUs can reflect both the spatial preferences of individuals and the spatial differences in human activities that could impact them. Management units can also represent a subset of a given population artificially divided to facilitate their monitoring and management.

1. BIRDS

Seabirds are considered highly suitable as indicators for marine environment due to their long lives, being highly mobile with a wide foraging and habitat range, conspicuous manner at sea and at their breeding colonies (Piatt *et al.*, 2007). Changes in lower trophic levels or in the physiochemical state of the environment are likely to be manifested in their populations, and these taxa are also affected by anthropogenic pressures (both at their breeding colonies), invasive species (Hervías *et al.*, 2013), human disturbance (Vi-blanc *et al.*, 2012), human infrastructure developments (Hill, 1995) and habitat loss (Bost and Le Maho, 1993)) and within their foraging and non-breeding habitat at sea (fishery bycatch (Baker *et al.*, 2007), chemical and litter pollution (Montevecchi *et al.*, 2012), climate change and severe weather phenomena (Sydeman *et al.*, 2012)).

The Macaronesia is an internationally important area for seabirds; however, most of the information needed for an accurate assessment is still missing. While the main islands were important breeding places in the past, most seabird populations are now restricted to small islets due to anthropogenic pressures (e.g. Monteiro *et al.*, 1996a). Some authors have pointed out the serious decline that some species, such as the Macaronesian shearwater (*Puffinus lherminieri*), are experiencing on the Canary Islands (e.g. Rodríguez *et al.*, 2012). Whereas, some colonies are still predicted to become extinct before any action plan is implemented (Bécares *et al.*, 2015).

Table 1 of the Commission Decision 2017/848/EU (2017) defines the species groups of Descriptor 1 of the MSFD. Five different groups based on how seabirds feed (see ICES, 2013) at sea are defined as listed below. However, only two of these groups are well represented in the Macaronesia. It is important to note that these definitions based on the feeding behaviour are not exclusive (i.e. some species might feed on different taxa even within the same functional group, and the different populations might present different diving depths and foraging behaviours (Burger, 2001). Nevertheless, the following seabird indicator species were selected as indicator species for the Macaronesian subregion based on the classification proposed:

- **Grazing birds:** There are no known breeding species of this group for the subregion, thus no indicator species were chosen for this group.

- **Wading birds:** Species of this group were not considered as good indicators species due to the difficult standardization. Only one species is known to breed in the Azores archipelago, the Kentish plover *Charadrius alexandrinus*. This species breeds in beaches and forages on mudflats, tidal areas and saltpans, so it was not considered to be indicative of the marine environment state.

- **Pelagic-feeding birds:** Pelagic feeders dive below the surface to feed on fish and invertebrates (e.g. squid, zooplankton) at a broad range of depths or close to the seabed. ICES (2013) defined this group as 'birds that feed across a broad depth range in the water column'. Five indicator species (**table 1**) were selected as good indicators for the Macaronesia, based on the criteria listed in the Guidance for Assessment under Article 8 of the MSFD (WG GES, 2017).
    - Bulwer's petrel (*Bulweria bulwerii*)
    - Desertas petrel (*Pterodroma deserta*)
    - Cory's shearwater (*Calonectris borealis*)
    - Macaronesian shearwater (*Puffinus lherminieri baroli*)
    - Zino's petrel (*Pterodroma madeira*)
- **Surface-feeding birds:** Forage on small fish, zooplankton and other invertebrates at or within the surface layer (the upper 1–2 m). ICES (2013) defined this functional group as 'birds that are mostly restricted to the surface layer of the water column'. Five indicator species (**table 1**) were selected as good indicators for the Macaronesia, based on the criteria listed in the Guidance for Assessment under Article 8 of the MSFD (WG GES, 2017).
    - Band-rumped storm-petrel (*Hydrobates castro*)
    - Common tern (*Sterna hirundo*)
    - Monteiro's storm-petrel (*Hydrobates monteiroi*)
    - Roseate tern (*Sterna dougallii*)
    - White-faced storm-petrel (*Pelagodroma marina*)
- **Benthic-feeding birds:** There are no known breeding species of this group for the subregion, thus no indicator species were chosen for this group.

There are still large knowledge gaps regarding the Macaronesian seabird species, especially robust data that is systematically collected and validated for all species and representative number of colonies (population distribution, population abundance and population condition, for example). In the frame of MISTIC SEAS I, the seabird group followed a stoplight methodology in order to find common grounds between archipelagos and determine the indicators reachability, taking this lack of knowledge into account as well as the feasibility of the monitoring schemes proposed. After this process, twenty-one MUs were selected, comprising eight species of Procellariiformes and two species of Charadriiformes. While some species can be assessed in all three archipelagos, some will only be assessed in one or two, depending on the breeding colony's location and/or data/logistic available. Almalki *et al.* (2017) identified that Macaronesia archipelagos have unique populations based on genetics and morphometric differences suggesting that each archipelago is better assessed as an independent MUs. In total, 19 MUs of 8 indicator species were selected for the Azores, 7 for Madeira belonging to 7 indicator species and another 9 MUs of 6 indicator species for the Canary Islands (see **table 1**).

The species and the parameters measured were chosen based on standardized methods for monitoring as proposed by the Joint Nature Conservation Committee (JNCC), the OSPAR Sea Convention and other bodies relevant to seabird monitoring within the MSFD.

Table 1: Sea bird species (elements) and species groups (features) proposed for monitoring in the Macaronesian archipelagos of Azores, Madeira and Canary Islands. Only criteria in blue have been assessed in this document.

Feature	Common name	Scientific name	Azores	Madeira	Canary Islands
Pelagic feeding birds	**Bulwer's petrel**	*Bulweria bulwerii*	**D1C1**/**D1C2**/**D1C3**/**D1C4**	D1C2/D1C3/D1C4	**D1C2**/**D1C3**/D1C4
	Desertas petrel	*Pterodroma deserta*		D1C2/D1C3/D1C4	
	Cory's shearwater	*Calonectris borealis*	**D1C1**/**D1C2**/**D1C3**/D1C4	D1C2/D1C3/D1C4	**D1C2**/**D1C3**/D1C4
	Macaronesian shearwater	*Puffinus lherminieri*	**D1C1**/**D1C2**/**D1C3**/D1C4	D1C2/D1C3/D1C4	**D1C2**/D1C4
	Zinos's petrel	*Pterodroma madeira*		D1C2/D1C3/D1C4	
Surface feeding birds	**Brand-rumped storm petrel**	*Hydrobates castro*	**D1C1**/**D1C2**/**D1C3**/**D1C4**	D1C4	D1C2/D1C4
	Common tern	*Sterna hirundo*	**D1C1**/D1C2/D1C3/D1C4		D1C2/D1C4
	Monteiro's storm petrel	*Hydrobates monteiroi*	**D1C1**/**D1C2**/D1C3/**D1C4**		
	Roseate tern	*Sterna dougallii*	**D1C1**/D1C2/D1C3/D1C4		
	White-faced storm petrel	*Pelagodroma marina*		D1C2/D1C3/D1C4	**D1C2**/**D1C4**

Pelagic-feeding birds

Bulwer's petrel - *Bulweria bulwerii*

The Bulwer's petrel (*Bulweria bulwerii*) is a pantropical species which breeds in the three oceans. Its breeding distribution extends from the eastern Atlantic (Azores) to the southern Pacific (Marquesas islands) (Brooke, 2004).

The species is highly pelagic. Its diet includes mainly fish and squid, although crustaceans and sea-striders have also been found in the diet. It feeds largely at night by surface-seizing (Neves *et al.*, 2011a).

The Macaronesian populations of Bulwer's petrels largely overlap during the non-breeding season in tropical waters north of Saint Paul's Rocks, and only birds from the northern populations exploit the sub-tropical Atlantic Ocean further south than 20° (Ramos *et al.*, 2015). The breeding season begins in late April-early May and lasts until September.

In the Azores, Bulwer's petrel is only monitored on Vila islet. Regular monitoring was conducted between 2002 and 2012 (Joël Bried unpublished data). Vila islet holds the largest known breeding population for the archipelago and until recently the northernmost limit for this species. In 2017 the existence of a second colony further north was confirmed, Baixo islet off Graciosa Island. Also off Graciosa, Praia islet is suspected to hold a small colony, however breeding was never confirmed (Monteiro *et al.*, 1999).

Bulwer's petrel is an abundant breeder in the archipelago of Madeira, particularly in the Desertas' islands (45.000 breeding pairs, Catry *et al.*, 2014), nesting in smaller numbers in Selvagens (5000 breeding pairs (Zino and Biscoito, 1994), and few breeding pairs in Farol Islet (in the eastern tip of Madeira) and in the islets of Porto Santo. The scarce data on post-nuptial dispersion (obtained in Selvagem Grande) suggest that the birds migrate southwest to deep equatorial waters. Bulwer's petrel colonies in the Desertas, and also in the Selvagens, are considered the main breeding areas in the Atlantic Ocean (Catry *et al.*, 2014). Bulwer's petrel will only be monitored in Selvagem Grande. This is a predator-free colony.

Although the species breeds in most islets and main islands, two colonies on the Canary Islands have been selected for the monitoring: La Graciosa (with introduced predator presence) and Montaña Clara (free of introduced predators). The breeding areas within these two locations are, nonetheless, fragmented, so a number of polygons were drawn in order to include a significant number of pairs.

Bycatch rate (D1C1), abundance using nest count (D1C2), demographic parameters such as breeding success and survival rate (D1C3) and distribution range (D1C4) are proposed to be monitored for this species in the Macaronesian subegion (1 MU in the Azores, 1 MUs in Madeira and 2 MUs in the Canary Islands).

Desertas petrel - *Pterodroma deserta*

The Desertas petrel (*Pterodroma deserta*) is a relatively recent split species (Jesus *et al*. 2009) and is considered one of the rarest procellariiform species in the world with 160-180 breeding pairs (BP). Population estimation shows a trend that is considered to be stable. Breeding occurs between early June and mid-November (Ramírez *et al*., 2013). It is considered as 'Vulnerable' according to IUCN criteria. Endemic breeding occurs only on a single plateau at Bugio Island (Madeira archipelago, Portugal). Its distribution range covers both subtropical and tropical temperatures with intermediate wind speeds and oligotrophic waters and includes wintering areas identified at the Southwest, Central Tropical and Northwest Atlantic Ocean (Ramírez *et al*., 2013). It is also a species with high individual wintering site fidelity (Giménez *et al*., 2016) which according to the same author can bring conservation issues heavily dependent on an adult's flexibility and future generation's capacity to disperse and use new wintering areas.

The "Instituto das Florestas e da Conservação da Natureza – IFCN" monitors abundance using nest count (D1C2), demographic parameters such as breeding success and survival rate (D1C3) and distribution range (D1C4) in Madeira since 2004 (1MU Madeira).

Cory's shearwater - *Calonectis borealis*

TThere were two global censuses regarding Cory's shearwater (*Calonectris borealis*) in the Azores showing a decrease in 2001 compared to 1996/7, which is not significant due to 50% variation from annual occupancy rates without mortality. Whenever the environmental/oceanic conditions are not ideal, adult seabirds can, and often do, choose to postpone reproduction to the following year, i.e. take a gap year (Newell *et al*., 2016). The decrease presented in this study can be explained, and thus discarded, by the use of non-standardized methodology between both censuses or by the gap year behaviour. Whether the Cory's Azorean population is in a true decline, or the disparity of results can be explained by external factors, still needs to be clarified. Thus, it is critical to repeat archipelago-wide, Cory's shearwater census in order to determine current population state and to evaluate past results, updating population trend and abundance baseline. The breeding success (BS) of Cory's shearwater has been determined for some colonies in the Azores, including Vila islet, Santa Maria Island, where during MISTIC SEAS II field work, a full census of this colony (one of the few discrete ones) was conducted and population estimate for the islet updated. This species BS has also been determined on Corvo I sland since 2009 (except in 2013) under LIFE Project and After-LIFE Project "Safe islands for seabirds". During 2009 to 2011 the impact of invasive mammals on the Cory's shearwater population and biology was also evaluated (Hervías *et al*., 2013).

In Selvagens, Granadeiro *et al*., (2006) estimated 29,540 BP in 2005. There are no precise estimates for the remaining islands of Madeira, Desertas and Porto Santo. In the case of Selvagem Grande, there has been a growth of 4.6% per year in the number of breeding pairs since the beginning of the 1980's, and the population is still recovering from the massacres of 1975 and 1976. Selvagem Grande holds a good density of accessible nests, fairly easy to monitor. Most nests are in walls, and a perimeter including all these nests was drawn and should be prospected again in order to track down the abundance of the species in the area. Regular monitoring has been performed in the last 20 years, and it is a predator-free colony.

There is not much data available for the Canary Islands although the species abundance seems to be stable (Rodrigues *et al*., 2012). The only population estimate for the whole archipelago dates from the late 1980's when around 30.000 pairs were estimated (Martín *et al.*, 1987). However, recent and more local estimates seem to indicate that the Canary Islands population must be much bigger. For instance, over 10.000 pairs were estimated only on Alegranza Islet (Rodríguez *et al.*, 2003).

Bycatch rate (D1C1) abundance using nest count (D1C2) demographic parameters such as breeding success and survival rate (D1C3) and distribution range (D1C4) are proposed to monitor this species in the Macaronesian subegion (7 MUs in the Azores, 1 MUs in Madeira and 2 MUs in the Canary Islands).

Macaronesian shearwater - *Puffinus lherminieri*

The Macaronesian shearwater (*Puffinus lherminieri*) is pelagic and normally found in offshore waters. It breeds on oceanic islands and rocky offshore islets, occupying cliffs and earthy slopes, usually with little more than herbaceous vegetation, or amongst rocks. Recent revision of the taxonomy of the *P. assimilis / P. lherminieri complex* led BirdLife International (2014) suggests that *P. baroli* breeding on the Azores, Madeira, Selvagens and Canary Islands and *P. boydi* on the Cape Verde Islands should be regarded as subspecies of *P. lherminieri*. The Macaronesian shearwater is colonial, often nesting at low densities and in small numbers and sometimes in mixed colonies with other species, for example, Cory's shearwater, which can take over their burrows (Monteiro *et al.*, 1996b). The Macaronesian shearwater is a non-migratory shearwater that feeds at the lowest trophic level among Macaronesian seabirds, shows diurnal and nocturnal activity and feeds deeper in the water column on small schooling squid and fish. Presenting different behaviour after the breeding period, the birds dispersed offshore in all directions and up to 2500 km from the breeding colony (off North America), fed at higher trophic levels and foraged mainly South of the colony and North in the Canary islands (Bécares *et al.*, 2016) while feeding at lower trophic levels during chick-rearing period (Neves *et al.*, 2012). It breeds from December-January until late May, in rock crevices or self-excavated burrows.

Selvagem Grande holds the largest population of the species with 2050 to 4900 breeding pairs (Oliveira and Moniz, 1995), and in the remaining islands of the archipelago, occurs in apparently smaller numbers. Recent data suggest a marked decrease in population in Selvagens.

Bycatch rate (D1C1), abundance using nest count (D1C2), demographic parameters such as breeding success and survival rate (D1C3) and distribution range (D1C4) are proposed to monitor this species in the Macaronesian subegion (2 MUs in the Azores, 1 MUs in Madeira and 2 MUs in the Canary Islands).

Zino's petrel - *Pterodroma madeira*

The Zino's petrel (*Pterodroma madeira*) is burrow nesting seabird, endemic to the island of Madeira, and listed as `Endangered' (Groombridge, 1993; BirdLife International, 2018a). In addition, it is included in Annex I of the EU Wild Birds Directive (Directive 2009/147/EC (2009)). Their breeding area is restricted to the central mountains of Madeira (Zino *et al.*, 1995) known as "Maciço Montanhoso Oriental" a designated Special Protected Area (SPA), and the only known breeding area of Zino's petrel. It contains some unique habitats, with high conservation value, where several management actions who contributed to and increased population size from 30-40 BP to 65-80 BP under Project LIFE00 NAT/P/007097 conservation of Zino's Petrel through restoration of its habitat in 2001/2006 coordinated by IFCN-RAM. This gadfly petrel is a colonial species and, in the pre-breeding season, carries out nocturnal flights above the nesting grounds during which it emits characteristic flight calls. Breeding occurs between March and October in burrows on cliff ledges where the vegetation is unaffected by grazing (Zino *et al.*, 2001). In 2010, due to a major fire, SPEA and Birdlife International through Just Giving and the Mark Constantine Fund collected funds to support IFCN-RAM management actions and to understate the damages and restore habitat.

Abundance using nest count and call rates (D1C2), demographic parameters such as breeding success and survival rate (D1C3) are monitored in Madeira by IFCN-RAM since 1986 and management actions have been implemented by IFCN-RAM (control of invasive mammals) which led the species to slowly recover.

Surface-feeding birds

Band-rumped storm petrel - *Hydrobates castro*

The band-rumped storm-petrel (*Hydrobates castro*) breeds on most oceanic islands in tropical and subtropical Atlantic and Pacific Oceans. This marine species is highly pelagic, occurrs in warm waters and rarely approaches land except near colonies. It feeds mostly on planktonic crustaceans, fish and squid but will also feed on human refuse. It mainly feeds during the day by pattering, dipping and also by surface-seizing. Its breeding season varies locally in colonies on undisturbed islets, in flat areas near the sea or inland on cliffs (del Hoyo *et al.*, 1992).

In the Azores, five main islands have islets with confirmed breeding colonies – Santa Maria, São Jorge, Graciosa, Flores and Corvo, with 8 colonies in total (Monteiro *et al.*, 1999). This species breeds on surrounding islets and inaccessible cliffs on the islands, which makes the monitoring of its abundance difficult.

There is no accurate estimation on band-rumped storm-petrels (winter and summer population). It breeds on the Desertas Islands and on the Selvagens Islands. The last census indicates 10,000 birds around Madeira but most gathered on the Desertas and Selvagens Islands (Equipa Atlas, 2008a).

Bycatch rate (D1C1), abundance using nest count (D1C2), demographic parameters such as breeding success and survival rate (D1C3) and distribution range (D1C4) are proposed to monitor this species in the Macaronesian subegion (4 MU in the Azores, 1 MUs in Madeira and 2 MUs in the Canary Islands).

Common tern - *Sterna hirundo*

TThe common tern (*Sterna hirundo*) has been annually censed on the nine Azorean islands since 1991 (except in 2005 and 2013) and started to be monitored at Praia islet in 1989 (Bried and Neves, 2015). This feat though, is hindered by the inaccessibility of most colonies and/or over-predation of eggs and chicks (by European starlings, yellow-legged gulls and ruddy turnstones) in the more accessible ones (e.g. Praia and Vila islets) making data collection and research on breeding of terns extremely difficult.

The population of common terns in the Azores archipelago is substantial (~3000 pairs Neves *et al.*, 2011a) as well as breeds on all the Azorean islands mostly on the coast and small islets (inaccessible). Common terns breeding in the northwest spend the non-breeding period along the West African coast (Wernham *et al.*, 2002) and some terns from the Azores migrate to the coast of South America (Neves *et al.*, 2015). Breeding season starts in April until September. Terns forage very close to the colonies and do shallow dives through plunge diving.

Bycatch rate (D1C1), abundance using nest count, apparently occupied nests and flush counts (D1C2), breeding success (D1C3) and distribution range (D1C4) are monitored in Azores mainly through MONIAVES and POPA by DRAM. Due to Madeira residual population there is no current monitoring program for the species. Abundance (D1C2) and range (D1C4) have been proposed to be monitored in the Canary Islands.

Monteiro's storm petrel - *Hydrobates monteiroi*

TThe Monteiro's storm-petrel (*Hydrobates monteiroi*) is a small procellariiform species endemic to the Azores. The species breeds from April to September in a small population that is restricted to three islets: Praia and Baixo islet off the Graciosa island (Bolton *et al.*, 2008), and Sentado islet (Alagoa) off the Flores island where breeding was recently confirmed through point-counts and recording intense call activity during the entire breeding season (through autonomous recording units; Oliveira *et al.*, 2016). Its limited breeding range and small population, estimated between 250-999 individuals (BirdLife International, 2018b), makes this species highly susceptible to stochastic events, and despite successful eradication efforts, its breeding habitat remains at risk of mammalian re-introduction and is vulnerable toexisting threats such as reptile or avian predators. This species' global/European population is listed as Vulnerable' by IUCN (Bolton *et al.*, 2008).

The species was recently split from the Band-rumped storm-petrel, which breeds in winter, based on morphometric and vocal differentiation and subsequent genetic analyses (Bolton *et al.*, 2008). Nests are burrows excavated in the soil (Fjeldså and Kirwan, 2014). Its diet is poorly known but thought to consist of small fish and squid, and it generally feeds on prey of a higher trophic level than Band-rumped storm-petrel (Bolton *et al.*, 2008). The movements of this species are virtually unknown but it is thought to forage throughout the year in local seas around the Azores (Fjeldså and Kirwan, 2014). During the breeding season, the adults from Praia islet forage up to 500 km away from the colony (Paiva *et al.*, 2018). Food is taken at the surface and by performing shallow dives (Bried, 2005).

Bycatch rate (D1C1), abundance using nest count or call rate (D1C2), demographic parameters such as breeding success and survival rate (D1C3) and distribution range (D1C4) are proposed to be monitored in three colonies of Azores. Sentado and Baixo islets are only monitored for D1C2 criteria by call rate.

Roseate tern - *Sterna dougallii*

The Roseate tern (*Sterna dougallii*) European population abundance is between 1,900 to 2,400 BP; 53-63% of it is in the Azores; 31-39% is in Ireland, and 2-3% is in Britain (Wernham *et al.*, 2002). Population trends in Europe and North America are well documented, but in the Azores, annual monitoring only started in 1989. The population in the archipelago has fluctuated since then between 400 and 1,200 BP (Neves, 2005). Conservation status is considered as "Endangered". The breeding season starts in April and lasts until September. Terns forage very close to the colonies and do shallow dives through plunge diving. Since 1991 (except in 2005 and 2013) tern censuses have been carried out annually on the nine Azorean islands. This monitoring is difficult due to the inaccessibility of most colonies and/or over-predation of eggs and chicks (by European starlings *Sturnus vulgaris granti*, yellow-legged gulls *Larus michahellis atlantis* and ruddy turnstones *Arenaria interpres*) in the more accessible ones (e.g. Praia and Vila islets) making data collection and research on breeding of terns extremely difficult.

Bycatch rate (D1C1), abundance using nest count, apparently occupied nests and flush counts (D1C2), breeding success (D1C3) and distribution range (D1C4) are monitored in the Azores through MONIAVES and POPA by DRAM. Due to Madeira residual population there is no current monitoring program for the species.

White-faced storm petrel - *Pelagodroma marina*

The white-faced storm-petrel (*Pelagodroma marina*) breeds on several tropical, subtropical and temperate islands in both hemispheres, but some aspects of its breeding biology are still poorly known. The European subspecies *hypoleuca* is almost confined to a small archipelago, the Selvagens Islands, about 300 km south of Madeira Island. Due to this restricted distribution, this subspecies is relatively vulnerable to extinction. Breeding season occurs from mid-December to mid-August (Campos and Granadeiro, 1999) and the estimated Selvagem Grande population is 36,000 BP.

The number of white-faced storm petrels Pelagodroma marina may be higher than previously thought with a new estimate of at least 62,550 pairs on the two islets, Selvagem Pequena and Fora (Catry *et al.*, 2010). This estimate still holds a considerable margin of uncertainty, and more studies are needed to determine the size of this population.

Abundance, demography and distribution range of the white-faced storm petrel has been monitored since 1996 by Granadeiro & Catry research teams in Madeira. Distribution range (D1C4) is proposed to be monitored in the Canary Islands and also abundance using nest count (D1C2) in the later.

2. MAMMALS

The three archipelagos of the Macaronesia hold one of the highest diversities of marine mammals recorded in European Atlantic waters, with almost 40 species recorded so far (Martín *et al.*, 2009; Prieto and Silva, 2010; Freitas *et al.*, 2012; Silva *et al.*, 2014). However, many of these species are rarely or only occasionally sighted and thus difficult to monitor systematically. In addition, even those species regularly found in Macaronesian waters are generally part of larger biological populations whose range extend beyond Macaronesian waters. For these reasons, MSFD assessment has been based on a subset of species/populations for which robust information on abundance can be obtained.

More specific criteria, based on the Spanish Initial Assessment of marine mammals (see Santos and Pierce, 2015) were used for selecting marine mammal MUs (**table 2**) to be assessed under the MSFD in the Macaronesian subregion:

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.

Table 1 of the Commission Decision 2017/848/EU (2017) defines the species groups of Descriptor 1 of the MSFD. Four different groups based the characteristics and habitat uses of marine mammals are listed. The following marine mammal indicator species were selected as indicator species for the Macaronesian subregion based on the classification proposed:

- **Small toothed cetaceans:**
    - Atlantic spotted dolphin (*Stenella frontalis*)
    - Bottlenose dolphin (*Tursiops truncatus*)
    - Common dolphin (*Delphinus delphis*)
- **Deep-diving toothed cetaceans:**
    - Cuvier's beaked whale (*Ziphius cavirostris*)
    - Risso's dolphin (*Grampus griseus*)
    - Short-finned pilot whale (*Globicephala macrorhynchus*)
    - Sperm whale (*Physeter macrocephalus*)
- **Baleen whales:**
    - Bryde's whale (*Balaenoptera edeni*)
    - Fin whale (*Balaenoptera physalus*)
- **Seals:**
    - Monk seal (*Monachus monachus*)

Table 2: Marine mammal species (elements) and species groups (features) proposed for monitoring in the Macaronesian archipelagos of Azores, Madeira and Canary Islands. Only criteria in blue have been assessed in this document.

Feature	Common name	Scientific name	Azores	Madeira	Canary Islands
Small toothed cetaceans	**Atlantic spotted dolphin**	*Stenella frontalis*	**D1C1**/**D1C2**	**D1C2**	**D1C2**
	Bottlenose dolphin	*Tursiops truncatus*	**D1C1**/**D1C2**/ D1C3	**D1C2**/D1C3	**D1C2**/D1C3
	Common dolphin	*Delphinus delphis*		D1C2	
Baleen whales	**Bryde's whale**	*Balaenoptera edeni*		**D1C2**	D1C2
	Fin whale	*Balenoptera physalus*	**D1C1**/D1C2		
Deep-diving toothed cetaceans	**Cuvier's beaked whale**	*Ziphius cavirostris*			**D1C2**/D1C3
	Risso's dolphin	*Grampus griseus*	**D1C1**/D1C2/ D1C3		
	Short-finned pilot whale	*Globicephala macrorhynchus*		**D1C2**/D1C3	**D1C2**/D1C3
	Sperm whale	*Physeter macrocephalus*	**D1C1**/D1C2/ D1C3	D1C1	**D1C1**/D1C2/ D1C3
Seals	**Monk seal**	*Monachus monachus*		D1C1/D1C2/ D1C3	

Small toothed cetaceans

Atlantic spotted dolphin - *Stenella frontalis*

TThe Atlantic spotted dolphin (*Stenella frontalis*) is a small delphinid endemic to the tropical and warm-temperate Atlantic, ranging between 50°N to about 25°S. In the Northeast Atlantic, it is mainly found in pelagic waters, where it feeds on small epi- and mesopelagic fish and squid (Herzing and Perrin, 2018).

The Atlantic spotted dolphin was identified as a common MU for the three Macaronesian archipelagos, being one of the most abundant species in Macaronesia. Given their oceanic distribution and reliance on pelagic prey, it was considered a good indicator species to assess the GES of pelagic ecosystems. In addition, the distribution of the species seems to be strongly linked to water temperature and primary productivity (Griffin and Griffin, 2004; Tobeña *et al.*, 2016) (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 in the region.

This species is seasonally abundant in the Azores. First sightings in the Azores usually occur in early May with the highest relative abundance being reached in July/August, depending on the year, 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 with a typical oceanic distribution (Silva *et al.*, 2014; Tobeña *et al.*, 2016). The population of Atlantic spotted dolphins of the Azores is not genetically differentiated from the population of the Madeira archipelago (Quérouil *et al.*, 2010). Although there have been no comparisons with dolphins from the Canary Islands, the wide-ranging movements of the species and their seasonal presence in Azores and Madeira suggests that a single population occurs in Macaronesian waters. Atlantic spotted dolphins are also seasonally abundant in Madeira appearing mainly in summer and autumn but are also observed the rest of the year (Freitas *et al.*, 2014a). The Atlantic spotted dolphin uses the Madeira archipelago inshore waters for feeding (mainly small pelagic fish), resting, socialising and calving (Freitas *et al.*, 2014a). The seasonal presence of Atlantic spotted dolphins reduces the exposure to local human impacts in coastal waters, but 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 species in Madeira with 23% of all sightings (Freitas et al., 2014a). In the Canary Islands, this species is present throughout the year all over the archipelago with relative fewer sightings during the summer months when it is seasonally more abundant in Azores and Madeira.

The assessment of this species is focused on the bycatch rate (D1C1) and its abundance (D1C2), and the monitoring is performed using the line-transect distance sampling methodology in the three Macaronesian archipelagos.

Bottlenose dolphin - *Tursiops truncatus*

Bottlenose dolphins (*Tursiops truncatus*) inhabit temperate, subtropical and tropical oceans worldwide. They are primarily found in coastal areas (lagoons, bays, estuarine and marine habitats) and over the continental shelf, but some populations live mainly in pelagic waters. Coastal bottlenose dolphins preferentially feed on benthic fish while offshore bottlenose dolphins rely more on epipelagic and mesopelagic prey (Wells and Scott, 2018).

The bottlenose dolphin is one of the most frequently sighted species in all the three European Macaronesian archipelagos. This species is representative of coastal island shelf habitats, offshore seamounts, and can be used to assess the environmental state of ecosystems therein.

This species is presentyear-round in the Azores mainly over shallow areas around the islands and offshore seamounts (Silva *et al.*, 2014; Tobeña *et al.*, 2016). Photo identification and genetic data indicate that bottlenose dolphins in the Azores constitute a single but open population composed of several geographic communities that interact with neighbouring communities and with dolphins from outside the archipelago (Quérouil *et al.*, 2007; Silva, 2008). Genetic studies show that there is no more than one population 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 Northeast Atlantic (Quérouil *et al.*, 2007; Louis *et al.*, 2014). They are genetically distinct from coastal populations living in the UK, Ireland, France and Spain, and from Mediterranean dolphins of the Strait of Gibraltar and Alboran Sea (Louis *et al.*, 2014). Thus, bottlenose dolphins occurring in the Azores are part of the North Atlantic offshore population of bottlenose dolphins.

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 and may be a unique ecological or demographic unit.

The residents group's range overlaps areas used intensively by whale-watching operators, and dolphins are exposed to these boats on a daily basis (Silva *et al.*, 2012). Repeated encounters 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 bycatch and prey depletion.

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.

Bottlenose dolphins have a permanent presence in the Madeira coastal waters with preferential use of waters shallower than 1000 m depth southeast, east and northeast of Madeira Island. They are part of a larger North Atlantic oceanic population (Quérouil *et al.*, 2007) with most animals (82%) being seen only once in these waters (transient animals), and a much smaller proportion being re-sighted (island-associated animals) (Dinis, 2014). 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 the area (Freitas *et al.*, 2014b; Dinis *et al.*, 2016).

Two MUs for each archipelago were considered in Madeira and the Canary Islands for this species: MU-I – all bottlenose dolphins using the Madeira and Canary Islands coastal waters (transients and island-associated animals); MU-II – island-associated animals. Only one MU was considered in Azores. 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 was obtained for MU-I (i.e. transients and island-associated animals) using design-based distance sampling methods (DS) while the more vulnerable island-associated groups (MU-II) are monitored using photo identification/mark-recapture methodology (ID). By adopting these two local MUs, it will be possible to monitor changes in the abundance of transients using the area as well as island-associated animals in an attempt to understand if the factors driving eventual changes are local or not.

Some movements of individuals among western islands of the Canary Islands (El Hierro, La Palma, La Gomera and Tenerife) (Tobeña *et al.*, 2014) were recorded indicating that at least 20% of the dolphins in the western islands travel among different Special Areas of Conservation (SACs). While a high proportion of bottlenose dolphins are seen only once in these waters (transient animals), others have been re-sighted multiple times and could belong to island-associated communities.

Due to its coastal distribution and year-round presence, island-associated bottlenose dolphins may be highly susceptible to local, human impacts including those derived from regular exposure to whale-watching boats, marine traffic, habitat loss and fishery bycatch. In addition, island-associated bottlenose dolphins may constitute unique ecological or demographic units and should be monitored separately from offshore populations. Therefore, two MUs were considered for this species in the three Macaronesian archipelagos: MU-I – all bottlenose dolphins using the Madeira and Canary Islands coastal waters (includes offshore and island-associated dolphins); MU-II – island-associated bottlenose dolphins.

The assessment of this species is focused on the bycatch rate (D1C1) and its abundance. Population abundance (D1C2) of MU-I is estimated using design-based distance sampling methods (DS). Population abundance (D1C2) and demographic characteristics (survival rate) (D1C3) of island-associated groups (MU-II) is monitored using capture-mark-recapture (CMR) methods.

Common dolphin - *Delphinus delphis*

The common dolphin (*Delphinus delphis*) has a seasonal presence in Madeira and Canary coastal waters mainly in winter and spring. Still, some groups are seen year-round. These animals belong to a larger oceanic population that includes common dolphins from Azores as shown by the absence of genetic differences between then (Quérouil *et al.*, 2010).

The common dolphin is present year-round in the Azores and is the most frequently sighted species from late autumn to early spring. However, sightings of the species decline significantly in spring and summer (Silva *et al.*, 2014) when line-transect surveys to monitor marine mammal abundance are likely to take place due to better weather conditions and could be insufficient for robust abundance estimation. Thus, this species was not considered a suitable indicator for the Azores.

The common dolphin is proposed as indicator species for Madeira due to its 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, bycatch and intentional killing; although those impacts seem to be at a quite low level (unpublished data from the Museu da Baleia, Madeira).

The assessment of this species is focused on its abundance (D1C2) and the monitoring should be done using the line-transect distance sampling methodology.

Baleen whales

Bryde's whale - *Balaenoptera edeni*

The Bryde's whale (*Balaenoptera edeni*) is proposed to be assessed as a MU for Madeira with a photo identification monitoring program (MISTIC SEAS, 2016a), but not for the Azores because it is rarely sighted in the area (Silva *et al.*, 2014).

This species occupies a specific ecological niche in oceanic pelagic waters at a low trophic level in the marine food chain. Its assessment can add extra information that will be helpful in the overall assessment of the environmental status of the pelagic environment in Macaronesia complementing the information arising from the assessment of the status of the Atlantic spotted dolphin and common dolphin MUs.

Bryde's whales were only recently described from Madeira waters (Freitas *et al.*, 2004, 2014b; Alves *et al.*, 2010). The first confirmed sighting was in 2003 in spite of previous survey efforts both from dedicated platforms and whale watching boats. This species has been regularly sighted since then from June to November (Freitas *et al.*, 2012). Some animals, including calves, have also been observed in winter suggesting that Madeira may be used as a feeding and calving area for the species.

It is the most common baleen whale in the Canary Islands waters, present throughout the year, with a greater number of sightings recorded 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.

Enough sightings of these species were obtained during the OCEANIC pilot monitoring program in Madeira, so it was possible to obtain an abundance estimate. The assessment of this species is focused on its abundance (D1C2) and the monitoring is performed using the line-transect distance sampling methodology and may also be estimated from photo as proposed in MISTIC SEAS TR 1 (2016a).

Fin whale - *Balaenoptera physalus*

The fin whale (*Balaenoptera physalus*) has been reported from all the oceans of the world. Its global distribution includes temperate and polar latitudes, with a hiatus in equatorial waters. The species is believed to undertake regular seasonal migrations between low-latitude breeding areas in winter and high-latitude feeding grounds in summer. Fin whales feed on a wide variety of organisms including euphausiids and schooling fishes (Aguilar and García-Vernet, 2018).

The fin whale is proposed for consideration as a MU in the Azores mostly because it occupies a unique niche at an intermediate-low position in 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.

In the Azores, fin whales are observed mostly from spring to early summer along the banks off the central islands and in the open waters between groups of islands, but the species has been acoustically detected also during autumn and winter (Silva *et al.*, 2014). Satellite telemetry studies show that the region around the Azores constitutes a mid-latitude foraging ground for this species (Silva *et al.*, 2013) and its occurrence in the area is associated with seasonal productivity (Tobeña *et al.*, 2016). Fin whales encountered in the Azores in spring and summer migrate to Greenland-Iceland foraging grounds (Silva *et al.*, 2014) and belong to a single population of fin whales that is considered to exist in the North Atlantic based on genetic analysis (Bérubé *et al.*, 1998).

The criteria proposed to monitor this MU is bycatch rate (D1C1) and population abundance (D1C2) of fin whales using the coastal waters of the Azores archipelago, using line-transect distance sampling methodology.

Deep-diving toothed cetaceans

Cuvier's beaked whale - *Ziphius cavirostris*

Cuvier's beaked whales (*Ziphius cavirostris*) occur in the Azores and Madeira, but in most years, sightings are insufficient to enable obtaining robust abundance estimates through distance sampling methods. Unlike what happens in the Canary Islands, Cuvier's beaked whales in the Azores and Madeira are very elusive and only rarely can be approached for photo identification. For the above reasons, the species was considered difficult to monitor and a poor indicator of the GES in these archipelagos.

Cuvier´s beaked whales are present year-round in the Canary Islands with high degree of residency reported in some areas (e.g. the southern area of El Hierro Island, (Reyes *et al.*, 2015), and the eastern areas of Lanzarote and Fuerteventura Islands). Based on the existence of these main hot spots in the archipelago, two separated MUs were identified in the Canary Islands: MU-I Eastern islands (mainly in El Hierro Island) and MU-II Western islands (mainly in eastern areas of Lanzarote and Fuerteventura islands).

The Cuvier´s beaked whale is the most abundant beaked whale species implicated in mass stranding events that occurred in different parts of the world including the Canary Islands on several occasions (Santos *et al.*, 2007; Fernández *et al.*, 2009). Beaked whales are considered especially susceptible to noise sources and for this reason they are the best indicator among the cetacean species to detect pressure from anthropogenic noise, a pressure with potential population level effects in some cases.

For this reason, Cuvier's beaked whales were selected as an indicator species in the Canary Islands to assess GES for deep water habitats (MISTIC SEAS, 2016a). The method proposed for monitoring this MU are both distance sampling (DS) and photo identification (ID) to assess its abundance (D1C2) and demographic parameters (D1C3).

Risso's dolphin - *Grampus griseus*

Risso's dolphins (*Grampus griseus*) are distributed worldwide in temperate and tropical oceans with an apparent preference for steep shelf-edge habitats between 400 and 1000 m deep. This species feeds mostly on mid- and deep-water cephalopods (Hartman, 2018).

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). This species feeds mostly on mid- and deep-water cephalopods and it was therefore proposed as a good indicator of GES for Azorean deep pelagic systems.

One resident population is known to inhabit the coastal waters off the southern coast of the Pico Island - Azores showing site fidelity and relatively restricted home ranges (Hartman *et al.*, 2014, 2015). This area is intensively used by whale-watching boats, and the presence of boats has been shown to disrupt the resting patterns of Risso's dolphins (Visser *et al.*, 2011).

The MU proposed is the island-associated population of Risso's dolphins inhabiting the coastal waters of Faial and Pico. Monitoring of this MU is based on the assessment of bycatch rate (D1C1), population abundance (D1C2) and demographic parameters (survival rate) (D1C3) using capture-mark-recapture.

Short-finned pilot whale - *Globicephala macrorhynchus*

The short-finned pilot whale (*Globicephala macrorhynchus*) is a deep diving species that explores the deep pelagic ecological niche with a preferential use of waters deeper than 1000 m.

The species is a regular visitor to the Azores but sightings vary greatly across months and years consistent with their transitory presence in the area (Silva *et al*., 2014). This would make it difficult to obtain robust absolute abundance estimates for short-finned pilot whales in the Azores and use the species as an indicator of GES of deep-diving toothed cetaceans.

Short-finned pilot whales were proposed as indicator species for Madeira due to its permanent presence and offshore distribution in the coastal waters of Madeira occupying a specific ecological niche associated with deep waters (>1000m) and bottom feeding. They belong to a larger oceanic population with most animals (71.7%) being seen only 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). Both of these ecotypes use the 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). Two MUs of short-finned pilot whales were proposed for Madeira waters namely: MU-I – all short-finned pilot whales using the Madeira archipelago coastal waters (transients, visitors and island-associated animals); MU-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 pilot whales using Madeira inshore waters (MU-I – transients and island-associated animals) and byusing design-based distance sampling methods, while the more vulnerable island associated groups are monitored using 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.

The short-finned pilot whale also has a permanent presence in the Canary Islands coastal waters with a preferential use of waters deeper than 700 m. Its distribution along the islands is uneven with a much higher presence in the southwest waters of Tenerife and La Gomera where resident populations use these waters for feeding, socialising, resting, breeding and calving (Servidio, 2014). Photo identification studies over previous decades have shown that short-finned pilot whales using the archipelago belong to a larger oceanic population with most animals being identified as transient animals (seen once) and a smaller proportion of re-sighted animals (visitors and animals associated to the islands; Servidio, 2014). These two ecotypes mix and interact with each other contributing to a complex social and population structure and prevent genetic isolation of the island-associated animals. The extent to which this species uses the offshore waters of the archipelago is unknown. Two MUs for the pilot whales from the Canary Islands were proposed as in Madeira: MU-I – all short-finned pilot whales using the Canary Islands archipelago coastal waters (transients, visitors and island-associated animals); MU-II – island-associated animals to the islands of Tenerife and La Gomera.

The island-associated animals are strongly vulnerable to local human impacts due to much higher use of the area and also due to being the target of a highly developed whale-watching industry (Servidio, 2014).

Therefore, the resident short-finned pilot whales were considered to constitute potentially good MUs for assessing GES for both Madeira and the Canary Islands due to the availability of a long data series of data taken with photo identification methods (D1C2) that also allow the estimation of demographic parameters (D1C3) such as the survival rate.

Sperm whale - *Physeter macrocephalus*

Sperm whales (*Physeter macrocephalus*) are widely distributed from the tropics to near the ice edges in both hemispheres but males and females occupy distinct parts of this range. Females stay in tropical and subtropical waters year-round where they live in long-term social groups with their immature offspring. Males disperse from their natal group as they approach puberty and gradually move to higher latitudes reaching as far as polar waters. In their late twenties, males start migrating periodically to the warm waters inhabited by females to mate (Whitehead, 2003). The diet of sperm whales is mainly comprised of deep-water cephalopods and fishes (Clarke *et al.*, 1993).

Social units of sperm whales are nomadic and their distribution is driven by the distribution of their deep-water prey (Whitehead, 2003). Hence, sperm whales were proposed as an indicator of mesopelagic and bathypelagic ecosystems in the Macaronesia. In addition, sperm whales are one of the main targets of the whale-watching industry (Oliveira, 2005) which makes it useful to monitor the impact from this pressure.

The Azores is an important feeding, calving and possibly mating ground for sperm whales in the North Atlantic, and the species is the third most frequently sighted cetacean in the region (Silva *et al.*, 2014). Sperm whales occur year-round in the Azores (Silva *et al.*, 2014) mainly over deep waters (1000-3000 m depth) and in areas with high densities of seamounts where primary productivity is elevated (Tobeña *et al.*, 2016). About two-thirds of the sightings are of social units which, on average, remain 2-3 weeks in the area. Adult males observed singly or in aggregations are also common in the area. Newborn calves are observed mostly in summer months. Sperm whales observed in different years and islands of the Azores belong to the same population (Pinela *et al.*, 2009).

The Madeira archipelago is also used year-round by sperm whales. Photo identification studies confirm these movements (Steiner *et al.*, 2015). Animals stay for several days in the archipelago coastal waters feeding, socializing and resting; individual or small groups of adult males as well as social groups comprising adult females, sub-adults and calves of both sexes are sighted (Freitas *et al.*, 2014a). No abundance estimates are presently available for the archipelago. However, the sperm whale is the 5th most sighted species in line-transect surveys carried out over the last 17 years (Freitas *et al.*, 2014a). Although ship strikes of cetaceans do not seem to be a major issue in Madeira inshore waters, the same cannot be said about offshore waters because of lack of data (Cunha *et al.*, 2017).

Steiner *et al.* (2015) found 13 matches of female and immature whales between the Azores and Canary Islands, one between Azores and Madeira, and one between the Canary Islands and Madeira. No matches were found from any of these sites to Cape Verde, the Caribbean, Gulf of Mexico or the Mediterranean. These results suggest that sperm whales seen in the Azores, Madeira and Canary Islands may belong to a single population that has a core habitat within Macaronesian waters. Mortality rates from ship strikes in the Canary Islands may be threatening this population (Fais *et al.*, 2016). Ship strikes are also a growing concern in the Azores where four sperm whales are known to have died from collisions with vessels (unpublished data). Although ship strikes do not seem to be a major issue in Madeira inshore waters, the same cannot be said about offshore waters because of lack of data (Cunha *et al.*, 2017). The population may also be adversely affected by underwater noise especially from seismic surveys widely used in geophysical research and mining exploration.

The MU proposed for each archipelago is the population of sperm whales using the coastal waters of that archipelago. Different criteria and monitoring methods have been proposed for each archipelago to enable use of existing data and comparison with available estimates. In the Azores, monitoring of the sperm whale MU is based on the assessment of bycatch rate (D1C1), population abundance (D1C2) and demographic parameters (survival rate) (D1C3) using capture-mark-recapture methods. In the Canary Islands, population abundance (D1C2) is monitored through distance sampling and CMR as well as the survival rate (D1C3). A novel criterion was proposed to monitor sperm whales in the three archipelagos – Mortality from ship strikes (D1C1) – but, at present, no monitoring programme has been established to assess this criterion.

Seals

Monk seal - *Monachus monachus*

The Mediterranean monk seal (*Monachus monachus*) is a critically endangered species. With less than 600 individuals throughout its distribution range, it is considered one of the most endangered mammals in the world (Karamanlidis and Dendrinos, 2015). It is priority species of Community interest listed in Annexes II and IV of the Habitats Directive (Council Directive 92/43/EEC, 1992).

The species has two clearly differentiated populations. The Mediterranean one is mostly distributed in Greek and Turkish territory. The Atlantic population is divided into two isolated sub-populations: one in Africa (Mauritania and Morocco) and the other in Europe (Madeira). From the 1950s, fishing activities caused a sharp decline in the Madeiran sub-population. By 1988 only 6-8 individuals were left.

Conservation efforts since the 1980s, however, have increased the European Atlantic population to an estimated at 30-40 individuals (5-7% of the global population). Nevertheless, the gradual growth in population and distribution of the species in the archipelago of Madeira is creating new tensions with different users of the marine environment, especially fishermen, tour operators and local inhabitants.

The species is currently monitored and assessed under the LIFE13 NAT/ES/000974 project and other governmental management plans coordinated by the SRA (Secretaria Regional do Ambiente e Recursos Naturais) and the SPNM (Serviço do Parque Natural da Madeira.

3. REPTILES

Six of the seven species of sea turtles have been recorded in Macaronesian waters (Bolten *et al*., 1993; López Jurado, 2007; Varo-Cruz *et al*., 2015, 2017; Freitas *et al*., 2018), but only 3 (loggerhead sea turtle *Caretta caretta*; green sea turtle *Chelonia mydas* and leatherback sea turtle *Dermochelys coriacea*) can be observed regularly. All sea turtles share a long and complex life cycle with distinct life stages and a late age maturity. Sea turtles are a highly mobile species with a distributional range that is not limited to Macaronesian waters. The MUs were selected based on the following criteria:

1. The species is listed under the Habitats Directive (amongst other agreements).
2. The species is representative of an ecological niche.
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 appears to be the best suited or even the only available indicator species 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.
5. The species is sufficiently frequent, preferentially in all three archipelagos, in order to be assessed.

Table 1 of the Commission Decision 2017/848/EU (2017) defines the species groups of Descriptor 1 of the MSFD. Only one group is defined for marine reptiles in European waters. Two species were selected as MUs: loggerhead sea turtles as representative of the pelagic environment (in all three archipelagos) and green turtle as representative of the neritic environment (only in Canary Islands) (**table 3**):

- **Turtles:**
    - Loggerhead turtle (*Caretta caretta*)
    - Green Turtle (*Chelonia mydas*)

Table 3: Sea turtle species (elements) and species groups (features) proposed for monitoring in the Macaronesian archipelagos of Azores, Madeira and Canary Islands. Only criteria in blue have been assessed in this document.

Feature	Common name	Scientific name	Azores	Madeira	Canary Islands
Sea turtles	**Loggerhead turtle**	*Caretta caretta*	D1C1/**D1C2**/**D1C3**	D1C1/**D1C2**/**D1C3**	D1C1/**D1C2**/**D1C3**
	Green turtle	*Chelonia mydas*			D1C1/D1C2/D1C3

Sea turtles

Loggerhead turtle - *Caretta caretta*

The loggerhead turtles (*Caretta caretta*) are highly migratory animals that use a wide range of broadly separated areas and habitats during their lifetime (Bolten and Witherington, 2003). Upon leaving the nesting beach, hatchlings begin an oceanic phase in major current systems (gyres) that act as open-ocean developmental grounds (Bolten and Witherington, 2003; Putman and Mansfield, 2015). After 6.5 - 11.5 (Bjorndal *et al.*, 2000) in this oceanic zone, loggerheads recruit and migrate to neritic areas rich in benthic prey or epipelagic prey notwithstanding that individuals may be moving between oceanic and neritic environments. Age at maturity varies considerably, and it is estimated at 10-42 years (Avens and Snover, 2013). Once loggerhead turtles reach sexual maturity they undertake breeding migrations between foraging grounds and nesting areas at remigration intervals of one to several years with a mean of 2.5 - 3 years for females (Schroeder *et al.*, 2003). Males would have a shorter remigration interval (Wibbels *et al.*, 1990; Hays *et al.*, 2010). Both males and females migrate and, in doing so, may traverse oceanic zones (Plotkin, 2003). Loggerhead turtles are the most common species in all three archipelagos, and their status can be linked to the state of the local pelagic environment and associated pressures (e.g. oceanic fisheries).

Loggerhead turtles in this region are found throughout the year and consist mainly of juveniles with curved carapace lengths (CCL) ranging from approximately 8.5 to 82 cm (e.g. Bolten, 2003). The vast majority belong to two distinct Regional Management Units (RMU): the NW Atlantic RMU with a current estimated abundance of 83,717 nests/year representing 41.8% of the global population, and the NE Atlantic RMU with a current estimated abundance of 15000 nests/year representing 7.5% of the global population (Casale and Tucker, 2017). The contribution of the Mediterranean RMU is low. The main rookeries that contribute to the local aggregation are South Florida, the largest nesting population in the Atlantic and second largest worldwide, Northeast Florida-North Carolina, Mexico and Cape Verde (Bolten *et al.*, 1998; Okuyama and Bolker, 2005).

Currently, abundance estimates for the loggerhead population from Azores are lacking. Genetic studies have documented the origin of juveniles in the Azores (Bolten *et al.*, 1998; Okuyama and Bolker, 2005), but a contemporary characterization is necessary. There are no studies on the sex ratio and eventual sources of sexually biased mortality (e.g. in the longline fishery). The main anthropogenic pressures in the Azores for this species are the pelagic longline fishery, which is operated by Portugal and Spain, and interactions with marine litter (Pham *et al.*, 2017). The pelagic longline fishery has been monitored intermittently over the past 20 years (e.g. Ferreira *et al.*, 2001; Bolten and Bjorndal, 2005), and is been continuously monitored since 2015. Impact of other threats such as collisions is not documented.

Contemporary abundance estimates for loggerhead turtles are lacking in Madeira. The high dispersal of the feeding ground of the juveniles that arrive to these waters is reflected in the area the animals occupy (Freitas *et al.*, 2018). The overall sex ratio of loggerhead sea turtles calculated from 2000 to 2006 in Madeira was 2 female : 1 male (Delgado *et al.*, 2010). A recent study provides insights on the foraging behaviour of juvenile loggerheads turtles (Freitas *et al.*, 2018). The main threat in this region is bycatch in the black scabbard-fish (*Aphanopus carbo*) deep longline fishery, with an estimated 500 loggerhead turtles captured annually (Dellinger and Encarnaçâo, 2000).

No contemporary abundance estimates for the loggerhead population are available in the Canary Islands. The juveniles that arrive to the Canary waters have a very large movement dispersal in search of feeding grounds ranging from the coast of Portugal to Mauritania and north of Cape Verde (Varo-Cruz *et al.*, 2016). A sex ratio of 7 females : 1 males was obtained using data from the necropsies of individual loggerheads in the Canary Islands (Orós *et al.*, 2016), but it is not currently 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. Spanish surface longline fishing fleet work around Canary waters but, at least currently, the activity does not seem to be too intensive and it is limited to a few months per year (MAPAMA, 2012). Most of the Canary fishing fleet is made up of artisanal fishing vessels (87.5%). This fleet is mixed and uses various types of fishing gears and targets different species.

The monitoring of loggerhead turtles is proposed in the three Macaronesian Archipelagos. These monitoring and assessments include mortality rate due to bycatch (D1C1), abundance (D1C2) using distance sampling methodology (DS) and the estimation of demographic parameters (D1C3) such as body condition (BC).

Green Turtle- *Chelonia mydas*

The green turtle (*Chelonia mydas*) has a global distribution, occurring throughout tropical and, to a lesser extent, subtropical waters. This species is also highly migratory and occupies different habits during its life cycle.

After hatching, green turtles disperse from their natal beaches and typically spend 3–5 years in open-ocean pelagic habitats, feeding mainly on planktonic animals (Bjorndal, 1997; Musick and Limpus, 1997). When their curved carapace length (CCL) is 20–40 cm, turtles settle into neritic/benthic habitats to which they show fidelity for at least several months (Hart and Fujisaki, 2010; Meylan *et al.*, 2011). Settlement is typically associated with a shift from a carnivorous diet to an omnivorous or herbivorous diet consisting of macroalgae and seagrasses. Nevertheless, some individuals could stay in the pelagic environment during their whole life (Hatase *et al.*, 2002). Individuals forage in distinct areas as juveniles and adults and migrate to other areas once they are close to reaching sexual maturity. During the adult stage, green turtles undertake periodic migrations between foraging grounds and nesting areas generally every 2-3 years. The age of sexual maturation is estimated around 19-50 years (Avens and Snover, 2013).

Canary waters constitute a feeding and developmental area for juveniles that occupy neritic coastal habitat. Green turtles in the Canary Islands are juveniles in their neritic phase (CCL = 53.7 ± 12.6, mean ± SD; range = 28.3-79.9 cm, n = 38), and born in different populations from the eastern and western Atlantic, mainly Guinea Bissau, Surinam and Costa Rica. However, it is necessary to sample during a period of 4-6 years to determine the natural genetic variability (although this depends on the sampled animals) The distribution doesn't seem to be uniform along the coasts of the archipelago and isconcentrated in certain localities. In each locality, a reduced number of individuals have been registered using reduced areas (<45 km2) for several years (Monzón-Argüello *et al.*, 2015). *Phanerogam seagrass* beds are used as feeding areas, including *Cymodocea nodosa*, in its diet. Some individuals show a link with the ports where they feed opportunistically (Monzón-Argüello *et al.*, 2015, 2018a, 2018b). Studies of this species started recently in this area (2014) and available information is therefore limited. Up-to-date information is still scarce although important knowledge on various aspects of their biology and ecology is available. Green turtles in the Azores and Madeira are quite common, but no systematic information is available due to their cryptic behaviour and low research priority. The green turtle has therefore not been retained as MU for the region, but data collection on the species will be the objective of future projects.

The methods proposed for monitoring the status of this MU are mortality rate due to bycatch (D1C1), photo identification (D1C2) and body condition (D1C3). Low frequency of sightings and a lack of knowledge preclude its inclusion as MUs for the Azores and Madeira.

2. Objective of the MSFD - Good Environmental Status [Art. 9]

In 2012, on the basis of the initial assessment of their marine waters made pursuant to Article 8 (1) of Directive 2008/56/EC (2008), MS reported on the environmental status of their marine waters and notified to the Commission their determination of good environmental status and their environmental targets in accordance with Articles 9 (2) and 10 (2) of Directive 2008/56/EC (2008), respectively. The results showed the necessity to significantly improve the quality and coherence of the determination of good environmental status by the MS.

On the basis of Commission evaluation of the three first phases of the MSFD 1st cycle and its recommendations, there was the need to clarify, revise and introduce criteria, methodological standards, specifications and standardized methods at a subregional scale in order to further determine the environmental status of the marine environment coherently across marine subregions, namely, the Macaronesia.

The project MISTIC SEAS was the first project between Portugal and Spain with the goal of establishing a coordinated approach for monitoring and assessing biodiversity at the subregional scale (i.e. among Macaronesia shared archipelagos) and under MFSD.

The bilateral work resulted so far in the development of common methods of data collection and analysis designed to substantially reduce the existing data gaps in the Macaronesia GES determination. Also, GES criteria, GES definitions, Environmental Targets (ET) and baseline values were determined and, in their absence, gaps were identified.

The project MISTIC SEAS II continued with the work carried out during the MISTIC SEAS project by directly applying the previously established common methodologies and update GES definitions to contribute to the reporting requirements. The second periodic assessment in 2018 will therefore be an evaluation of the progress made since the 2012 initial assessment taking into account the objective of taking measures to achieve or maintain GES by 2020 at the latest.

Before the Commission repealed the Commission Decision 2010/477/EU (2010) and adopted the Commission Decision 2017/848/EU (2017), the GES definition had been set by MS at the indicator level, and this was adopted also by the project MISTIC SEAS II in order to have a common set of GES definitions at the indicator level. However, several definitions were being drafted and used for the same indicator, particularly between each ecosystem component, and not fulfilling the coherence recommended by the Commission Decision 2010/477/EU (2010) itself.

MISTIC SEAS II adopted the new Commission Decision 2017/848/EU (2017) to solve these inconsistencies by aiming to set the Common GES definitions at the Criteria level becoming simpler, coherent and common between MS, functional groups and species.

Annex I of the MSFD listed the qualitative descriptors for determining GES in marine environment. Definition of Descriptor 1 was adopted as definition of GES for the whole Descriptor:

> **Descriptor 1** – "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".

In PART II of Commission Decision 2017/848/EU (2017) the proposed criteria for assess Descriptor 1 were listed. Descriptions of these criteria were used for defining GES as follows:

> **Criterion D1C1** – Mortality rate – "The mortality rate per species from incidental bycatch is below levels which threaten the species, such that its long- term viability is ensured".

> **Criterion D1C2** – Abundance – "The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured".

Criterion D1C3 – Demographic characteristics – “The population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity, and survival rates) of the species are indicative of a healthy population which is not adversely affected due to anthropogenic pressures”.

Criterion D1C4 – Distributional Range – “The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions”.

Criterion D1C5 – Habitat Distribution – “The habitat for the species has the necessary extent and condition to support the different stages of the life history of the species”.

Specific GES definitions were also adopted for indicators measured for assessing the various criteria selected for seabirds (**table 4**), marine mammals (**table 5**) and sea turtles (**table 6**):

Table 4: Criteria assessed in seabirds, indicators and GES definitions.

Criteria	Indicator	GES definitions
Criteria D1C1 Bycatch	Bycatch	Bycatch of seabirds does not increase and/or is infrequent.
Criteria D1C2 Abundance	Population abundance	The average population size in a 6-year-period do not show significant decrease compared to the previous 6-year-period (taken into account natural oscillations).
Criteria D1C3 Demographic characteristics	Breeding success	The breeding success cannot be significantly lower compared to the average of the last 10 years, at least in 3 out of 5 years.
	Survival rate	The average survivals rate is not significantly lower than 0.9.
Criteria D1C4 Distributional Range	Range	The distribution range (number of colonies) is maintained.

Table 5: Criteria assessed in marine mammals, indicators and GES definitions.

Criteria	Indicator	GES definitions
Criteria D1C1 Mortality rate	Mortality rate (collisions)	Number of bycaught marine mammals is under a limit of 1% of the best abundance estimate. For sperm whales, mortality from boat collisions is close to zero.
Criteria D1C2 Abundance	Abundance	The population size of marine mammals is maintained at or above the baseline (i.e. current) levels, with no observed, estimated or project reduction >=10% over a 20-year period.
Criteria D1C3 Demographic characteristics	Survival rate	Population survival rate, calf survival, etc., are not adversely affected by human activities and ensure the long-term viability of the populations.

Table 6: Criteria assessed in sea turtles, indicators and GES definitions.

Criteria	Indicator	GES definitions
Criteria D1C1 Mortality rate	Bycatch rate	The mortality level due to bycatch does not achieve rates that compromise the viability of the populations.
Criteria D1C2 Abundance	Abundance	Abundance of sea turtles is kept at a level that ensures their sustainability within the subregion.
Criteria D1C3 Demographic characteristics	Body condition	The body condition index of sea turtles is consistent with a population in GES.

3. Pressures and Impacts on the Marine Environment [Art. 8.1b]

For each target group, a list of the pressures and associated activities potentially affecting the selected management units was produced by MISTIC SEAS II experts at the Faial Workshop, using Annex III of the MSFD (Commission Directive 2017/845/CE, 2017). Given its relevance, the pressure "Death or injury by collision" was added to Annex III list of pressure, and, therefore, is not considered under "Extraction or mortality/injury to wild species" but separately. The last includes both bycatch and prey depletion as well as other injuries resulting from interactions with commercial and recreational fishing. Although climate change, is not identified in MSFD Annex III as an element to be taken into account in the preparation of marine strategies, all experts have highlighted the importance of understanding its effects to assess the management units. From this list, experts selected the three to five most relevant pressures.

Pressures can result in a range of effects from short-term changes in physiology or behaviour of individuals to long-term effects on species' abundance and distribution. Key behaviours such as breeding and feeding are directly linked to survival and reproductive success and therefore, a pressure not causing immediate death but affecting behaviour or health may threaten the long-term viability of a population. For a number of pressures, however, both short-term responses and long-term effects remain poorly understood. Despite this, experts have attempted to identify both the direct lethal and sub-lethal effects of each pressure on the selected management units. To provide a clearer analysis of the impacts of each pressure it was agreed that only direct effects were to be considered. For example, a change in behaviour due to physical damage would be an indirect effect and therefore not considered. A summary of the pressures identified as present and relevant by MU and archipelago is provided in **table 7**. Following a precautionary approach, unless otherwise stated, pressures considered relevant at the archipelago were considered relevant at the Macaronesia level as no analysis of risk has yet been performed, i.e., the level of risk is unknown.

Table 7: Pressures affecting the management units selected. Pressures identified across Macaronesia are highlighted. (Mac. - Macaronesia; 0 - pressure not considered as potentially affecting the MU; 1- pressure may affect the MU but is not considered relevant; 2 - pressure identified as relevant. NIS: non-indigenous species.

Pressures	Azores	Madeira	Canarias	Mac.
SEABIRDS				
Bulweria bulwerii				
Input of contaminants	1	1	1	1
Input of forms of energy (light from land)	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Input or spread of NIS (terrestrial)	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	1	1
Disturbance due to human presence	1	**2**	**2**	**2**
Calonectris borealis				
Input of contaminants	1	1	1	1
Input of forms of energy (light from land)	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Input or spread of NIS (terrestrial)	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	1	1
Disturbance due to human presence	1	**2**	**2**	**2**
Puffinus lherminieri				
Input of contaminants	1	1	1	1
Input of forms of energy (light from land)	**2**	**2**	**2**	**2**

Pressures	Azores	Madeira	Canarias	Mac.
Marine litter	**2**	**2**	**2**	**2**
Input or spread of NIS (terrestrial)	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	1	1
Disturbance due to human presence	**2**	**2**	**2**	**2**
Pterodroma deserta				
Input of contaminants		1	**?**	1
Input of forms of energy (light from land)		**2**		**2**
Marine litter		**2**		**2**
Input or spread of NIS (terrestrial)		**2**		**2**
Extraction or mortality/injury to wild species		1		1
Disturbance due to human presence		**2**		**2**
Pterodroma madeira				
Input of contaminants		1		1
Input of forms of energy (light from land)		**2**		**2**
Marine litter		**2**		**2**
Input or spread of NIS (terrestrial)		**2**		**2**
Selective extraction of species		1		1
Disturbance due to human presence		**2**		**2**
Hydrobates castro				
Input of contaminants	1	1	1	1
Input of forms of energy (light from land)	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Input or spread of NIS (terrestrial)	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	1	1
Disturbance due to human presence	**2**	**2**	**2**	**2**
Hydrobates monteiroi				
Input of contaminants	1			1
Input of forms of energy (light from land)	**2**			**2**
Marine litter	**2**			**2**
Input or spread of NIS (terrestrial)	**2**			**2**
Extraction or mortality/injury to wild species	1			1
Disturbance due to human presence	**2**			**2**
Pelagodroma marina				
Input of contaminants		1	1	1
Input of forms of energy (light from land)		**2**	**2**	**2**
Marine litter		**2**	**2**	**2**
Input or spread of NIS (terrestrial)		**2**	**2**	**2**
Extraction or mortality/injury to wild species		1	1	1
Disturbance due to human presence		**2**	**2**	**2**
Sterna hirundo				
Input of contaminants	1	1	1	1
Marine litter	**2**	**2**	**2**	**2**
Input or spread of NIS (terrestrial)	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	**2**	**2**	1	**2**
Disturbance due to human presence	**2**	**2**	**2**	**2**

Pressures	Azores	Madeira	Canarias	Mac.
Sterna dougallii				
Input of contaminants	1			1
Marine litter	**2**			**2**
Input or spread of NIS (terrestrial)	**2**			**2**
Extraction or mortality/injury to wild species	**2**			**2**
Disturbance due to human presence	**2**			**2**
MARINE MAMMALS				
Tursiops truncatus – coastal MUs				
Input of contaminants	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	**2**	1
Death or injury by collision	0	0	1	1
Anthropogenic sound	**2**	**2**	**2**	**2**
Disturbance due to human presence	**2**	**2**	**2**	**2**
Physical loss of seabed habitat	1	0	1	1
Tursiops truncatus – oceanic MUs				
Input of contaminants	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	**2**	1
Anthropogenic sound	1	1	1	1
Disturbance due to human presence	1	0	0	1
Stenella frontalis				
Input of contaminants	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Extraction or mortality/injury to wild species	1	1	1	1
Input of anthropogenic sound	1	1	1	1
Disturbance due to human presence	1	1	0	1
Physeter macrocephalus				
Input of contaminants	**2**	**2**	**2**	**2**
Marine litter	**2**	**2**	**2**	**2**
Death or injury by collision	**2**	**2**	**2**	**2**
Anthropogenic sound	**2**	**2**	**2**	**2**
Disturbance due to human presence	1	1	1	1
Globicephala macrorhyncus – island MUs				
Input of contaminants		**2**	**2**	**2**
Marine litter		**2**	**2**	**2**
Extraction or mortality/injury to wild species		1	**2**	1
Death or injury by collision		1	1	1
Anthropogenic sound		**2**	**2**	**2**
Disturbance due to human presence		**2**	**2**	**2**
Physical loss of habitat		0	1	1

Pressures	Azores	Madeira	Canarias	Mac.
Globicephala macrorhyncus – oceanic MUs				
Input of contaminants		**2**	**2**	**2**
Marine litter		**2**	**2**	**2**
Extraction or mortality/injury to wild species		1	**2**	1
Death or injury by collision		1	1	1
Anthropogenic sound		**2**	**2**	**2**
Disturbance due to human presence		1	1	1
Grampus griseus				
Input of contaminants	**2**			
Marine litter	**2**			
Extraction or mortality/injury to wild species	1			
Anthropogenic sound	**2**			
Disturbance due to human presence	**2**			
Physical loss of habitat	1			
Delphinus delphis				
Input of contaminants		**2**		
Marine litter		**2**		
Extraction or mortality/injury to wild species		1		
Anthropogenic sound		1		
Disturbance due to human presence		1		
Balaenoptera edeni				
Input of contaminants		1		
Marine litter		**2**		
Death or injury by collision		**2**		
Anthropogenic sound		**2**		
Disturbance due to human presence		**2**		
Ziphius cavirostris				
Input of contaminants			**2**	
Marine litter			**2**	
Death or injury by collision			**2**	
Anthropogenic sound			**2**	
Physical loss of seabed habitat			1	
Monachus monachus				
Input of contaminants		**2**		
Input of contaminants		**2**		
Death or injury by collision		**2**		
Anthropogenic sound		**2**		
REPTILES				
Caretta caretta				
Input of contaminants	1		1	1
Marine litter	**2**		**2**	**2**
Extraction or mortality/injury to wild species	**2**		**2**	**2**
Death of injury by collision	1		**2**	**2**
Disturbance due to human presence	1		1	1

Pressures	Azores	Madeira	Canarias	Mac.
Chelonia mydas				
Input of contaminants			1	
Marine litter			**2**	
Extraction or mortality/injury to wild species			**2**	
Death of injury by collision			**2**	
Disturbance due to human presence			**2**	
Physical loss of seabed habitat			**2**	

1. SEABIRDS

Input of forms of energy, which here refers exclusively to light from land, **marine litter, input or spread of terrestrial non-indigenous species** and **disturbance due to human presence** have been selected as the most important pressures affecting most seabird species in Macaronesia. Only light pollution has not been considered a pressure effecting tern species (*Sterna hirundo* and *Sterna dougallii*), for which prey depletion was considered a relevant pressure instead. The potential impact of climate change has also been highlighted, especially on the species of terns feeding in Macaronesian waters.

INPUT OF LITTER
The most visible effect of marine litter on seabirds concerns entanglement often on discarded or lost fishing gear and ropes. The ability to breath, move and forage of entangled seabirds may be hindered and directly affect chances of survival and breeding if not causing direct mortality. Plastic ingestion may cause physical damage, induce starvation and general debilitation and affect individual fitness too with potential consequences at a population level. Pelagic-diving birds have the highest frequency of plastic uptake, followed by surface-seizing and dipping seabirds (Kühn et al., 2015 and references therein). MSFD TG marine litter considers highly likely that plastic ingestion and entanglement have population level effects for many seabird species and especially in the family of tubenoses (Werner et al., 2016). In tub enosed seabirds only plastics from the proventriculus are regurgitated while items from the gizzard are retained and therefore accumulate.
NIS (terrestrial)
Seabirds have natural predators, usually other birds, which may affect populations' breeding success and abundance without, however, compromising the long-term viability of a population. Depredation of seabirds (eggs, chicks and adults) by birds or introduced predators (such as mammals and reptiles) becomes a threat when the presence and number of predators causes mortality rates that populations cannot sustain. Special concern has been expressed regarding predatory species that benefit from human activities (e.g. gulls, rats and starlings) (Neves *et al.*, 2011b). As, most procellariiforme species evolved in oceanic islands free of mammalian predators, these species lack the ecological, behavioural and life-history traits to cope with such introduced taxa. Growing numbers of predators affect seabirds by directly predating on chicks and adult seabirds, and/or depleting native vegetation, increasing soil erosion, and competing for burrows. Introduced rodents, namely, black and brown rats, are known to predate eggs and chicks. Feral cats *Felis silvestris catus* were considered as a major factor in the extinction of several island seabird species (Medina and Nogales, 2009). As a result, most seabird populations are confined to inaccessible islets and cliffs. For long-lived seabirds species, adult survival is likely more important to population stability than juvenile survival rates but actions focused on increasing breeding success are usually more feasible (Hervías *et al.*, 2013). In the past decades, eradication campaigns have been conducted to safeguard seabird populations mostly on islands not permanently inhabited by humans (Oppel *et al.*, 2011).

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INPUT OF FORMS OF ENERGY (light from land)
Seabirds, in particularly procellariiformes (petrels and shearwaters), are affected by light pollution due to tourism and urban sprawl. Fledglings of burrow-nesting seabirds, and to a lesser extent adults, are attracted to and then grounded by artificial lights. This phenomenon, called *fallout*, can cause mass-mortality events (Rodríguez *et al.*, 2017). Light-induced grounding can be fatal due to collisions with human-made structures or the ground and if not fatal, grounded birds may be unable to flee and become vulnerable to predation, vehicle collisions, starvation or dehydration (Rodríguez *et al.*, 2017). Procellariiformes have been shown to exhibit a relatively low sensitivity to changes in fecundity compared to changes in adult survival (in Oliveira *et al.*, 2016 and references therein). Nevertheless, rescue campaigns decrease the mortality of these events by systematically searching for and rescuing hundreds of fallen birds (Rodríguez *et al.*, 2012).
DISTURBANCE DUE TO HUMAN PRESENCE
Recreation and tourism have the potential to impact some seabird species largely through disturbance of nesting sites and disturbance of feeding birds by recreational boat traffic. If affecting survival and breeding success, this pressure may lead to a decrease in population abundance and changes in distribution.

The activities identified as contributing to each pressure and their impacts on seabirds in Macaronesia at the individual and populations levels are summarized in **table 8**.

Table 8: Overview of the activities exerting the pressures identified as most important for seabirds in the Macaronesia and their potential impacts at the individual and population level.

<table>
<tr><th colspan="2">ACTIVITIES</th><th rowspan="2">PRESSURES</th><th colspan="3">IMPACTS</th></tr>
<tr><th>Terrestrial</th><th>Marine</th><th colspan="2">Individual level</th><th>Population level</th></tr>
<tr><td rowspan="8">Tourism infrastructure and leisure activities
Urban & industrial uses</td><td rowspan="2">-</td><td rowspan="2">Input of forms of energy (LIGHT)</td><td>Sub-lethal</td><td>Behavioural
Physical damage
Physiological</td><td rowspan="2">Survival rate
Mortality rate
Reproductive success
Population abundance
Population structure
Distributional range</td></tr>
<tr><td>Lethal</td><td>Direct mortality</td></tr>
<tr><td rowspan="2">Transport-shipping</td><td rowspan="2">Input or Spread of (terrestrial) NIS</td><td>Sub-lethal</td><td>Behavioural
Physical damage
Physiological</td><td rowspan="2">Survival rate
Mortality rate
Reproductive success
Population abundance
Population structure
Distributional range</td></tr>
<tr><td>Lethal</td><td>Direct mortality</td></tr>
<tr><td rowspan="2">Fishing
Transport-shipping
Leisure activities</td><td rowspan="2">Marine Litter</td><td>Sub-lethal</td><td>Physical damage
Physiological</td><td rowspan="2">Survival rate
Mortality rate Reproductive success
Population abundance
Population structure
Distributional range</td></tr>
<tr><td>Lethal</td><td>Direct mortality</td></tr>
<tr><td rowspan="2">-</td><td rowspan="2">Disturbance due to Human Presence</td><td>Sub-lethal</td><td>Behavioural
Physical damage
Physiological</td><td rowspan="2">Survival rate
Mortality rate
Reproductive success
Population abundance
Distributional range</td></tr>
<tr><td>Lethal</td><td>Direct mortality</td></tr>
</table>

2. MAMMALS

In most cases the pressures considered relevant were selected by the experts of all three archipelagos. The main exception was "Extraction or mortality/injury to wild species" which was considered relevant for both bottlenose dolphins and short-finned pilot whales only by the Canary Islands expert group. This pressure has, however, not been considered relevant across Macaronesia for these species (Freitas *et al.*, 2004; Silva *et al.*, 2011; Santos *et al.*, 2012; Nicolau *et al.*, 2014; Cruz *et al.*, 2018). Regarding the other pressures considered relevant across Macaronesia, the main conclusions are:

Input of contaminants and input of litter - were identified by experts as relevant pressures affecting most marine mammal species under assessment. Only for the Bryde's whale, the input of contaminants has not been considered a relevant pressure.

INPUT OF CONTAMINANTS

The accumulation of contaminants in marine mammals has been associated with several toxicological responses such as immunotoxicity (associated with high susceptibility to infectious diseases), reproductive impairment, teratogenicity, endocrine disruption and carcinogenic effects. The prevalence of high levels of contaminants across a population may affect its reproductive success and survival rates, its abundance and structure (García-Álvarez *et al.*, 2014, 2015). Contaminants are present in the marine environment worldwide as a consequence of their wide use and long-range transport. Priority environmental pollutants include:
• **Heavy metals** are released to the environment through natural and (or anthropogenic processes, including, urban and industrial discharges, agriculture, mining and combustion. Due to their toxicity, persistence, and bioaccumulation characteristics, the most dangerous heavy metals for the marine environment are cadmium (Cd), mercury (Hg) and lead (Pb).
• **Persistent organic pollutants (POPs)**, resistant to chemical and biological degradation, these contaminants lead to bioaccumulation and biomagnification in the food chain and include:
  ◦ **Dioxins**: 2, 3, 7, 8 - tetrachlorodibenzo-p-dioxin (TCDD). Also include the family of structurally and chemically related polychlorinated dibenzo-ρ-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs).
  ◦ **Polychlorinated biphenyls (PCBs)**: produced for specific industrial purposes. Phasing-out process was initiated in late 1970s. Include dioxin-like PCBs (DL-PCBs) and non-dioxin like PCBs (NDL-PCBs).
  ◦ **Organochlorine pesticides (OCPs)**: produced for agriculture and health purposes, have been phased-out progressively since the 1970s.
  ◦ **Brominated flame retardants (BFRs):** commonly added to plastics, textiles and electrical/electronic equipment. In the European Union the use of certain BFRs has been banned or restricted.
• **Polycyclic aromatic hydrocarbons (PAHs):** produced by combustion of organic matter and fossil fuels; they enter the marine environment through atmospheric deposition, road run-off, industrial discharges and as a result of oil spills and are highly prevalent. Because animals are able to metabolize PAHs efficiently, they are not considered as POPs.

MARINE LITTER
For marine mammals, the primary impacts of marine debris are associated with **ingestion** and **entanglement**. Ingestion can cause starvation, malnutrition, loss of body condition, limited predator avoidance capabilities and therefore reduced growth rates, longevity, and reproductive capacity as well as general debilitation due to bleeding ulcers, obstructions, impaction and/or perforation of the digestive tract (Puig-Lozano *et al.*, 2018 and references therein). In addition, ingested plastics, namely, microplastics, are also an additional source of persistent, bioaccumulative and toxic chemicals. Entanglement can result in drowning, suffocation or strangulation or affect behaviour compromising feeding, reproduction or migration causing malnutrition, disease and reduced reproductive output, growth rates and longevity (Baulch and Perry, 2014).

Input of anthropogenic sound – was selected as a potentially relevant pressure for coastal units of bottlenose dolphins, short-finned pilot whales, Risso's dolphin, Bryde's whales and Cuvier's beaked whale.

ANTHROPOGENIC SOUND
Marine mammals use sound to navigate, communicate, feed and avoid predators in a wide range of frequencies. When man-made activities overlap with the hearing range of marine mammals, ***masking*** of sounds can occur and hinder the reception of biologically relevant information. In the proximity of sound sources marine mammals may react to sound by displaying ***avoidance*** behaviours. High intensity sounds, like those produced by airguns in geophysical surveys, may damage the auditory system, lead to permanent or temporary hearing threshold shifts (PTS or TTS), and to ***displacement*** (short and long term). All these may affect diving patterns, interrupt foraging, breeding, nursing and social behaviours and/or disorient marine mammals affecting their survivorship and reproductive success and, in extreme cases, lead to death (OSPAR, 2009).

Disturbance due to human presence - may affect coastal units of bottlenose dolphins, island associated short-finned pilot whales, Risso's dolphin and Bryde's whales. Whale-watching activities, specifically, has been highlighted as an activity which may affect the individuals using more frequently Macaronesia coastal waters.

DISTURBANCE DUE TO HUMAN PRESENCE
Disturbance due to whale-watching activities is associated with changes in surfacing, acoustic, and swimming behaviours and changes in direction, group size, and coordination (likely horizontal and vertical avoidance tactics). Disturbance has also been linked to temporary or permanent displacement of individuals. These behavioural changes can have biologically significant effects by affecting feeding, mating, nursing or resting and eventually have long-term consequences for individuals and populations (Parsons, 2012 and references therein).

Death or injury by collision - was selected as a potentially relevant pressure for sperm whales, Cuvier's beaked whales and Bryde's whales.

DEATH OR INJURY BY COLLISION
Collisions with vessels may result in blunt or sharp trauma, in the form of severe cuts to the skin and adjacent subcutaneous and musculoskeletal layers as well as amputation and/or evisceration of the affected animals (Sierra et al., 2014 and references therein). Collisions include hits by the bow and keel of vessels, contact with propellers and blunt traumas by hits with vessels' hulls. Because the occurrence of collisions seems to increase with size and speed of vessels, most reported cases involve large or high-speed vessels such as cargo and cruise ships and high-speed ferries, and species that swim slowly and spend long periods near the surface.

The activities contributing to each pressure occurring in each archipelago and also their impacts for the different cetacean management units vary with the management units biological and population characteristics but an overview is provided in **table 9.**

Table 9: Overview of the activities exerting the pressures identified as most important for the selected cetacean MUs in Macaronesia and their potential impacts at the individual and population level.

ACTIVITIES		PRESSURES	IMPACTS		
TERRESTRIAL	MARINE		INDIVIDUAL LEVEL		POPULATION LEVEL
Agriculture Tourism infrastructures Urban & industrial uses	Aquaculture Transport - shipping Leisure activities Extraction of minerals	**Input of contaminants**	**Sub-lethal**	Physiological	Survival rate Reproductive success Population abundance Population structure
Tourism infrastructures Urban & industrial uses	Fish & shellfish harvesting Transport- shipping Leisure activities	**Marine litter**	**Sub-lethal**	Behavioural Physical damage Physiological	Survival rate Mortality rate Reproductive success Population abundance Population structure
Tourism infrastructures Urban & industrial uses	Fish & shellfish harvesting Transport- shipping Leisure activities	**Marine litter**	**Lethal**	Direct mortality	
-	Dredging Extraction of minerals Fishing Shipping Leisure activities Survey activities Military operations	**Input of anthropogenic sound**	**Sub-lethal**	Behavioural Physiological	Survival rate Reproductive success Population abundance Population structure Distributional range
-	Transport – shipping Leisure activities	**Death or Injury by collision**	**Sub-lethal**	Physical damage	Survival rate Mortality rate Population abundance Population structure
-	Transport – shipping Leisure activities	**Death or Injury by collision**	**Lethal**	Direct mortality	
-	Fish harvesting Leisure activities Survey activities	**Disturbance due to human presence**	**Sub-lethal**	Behavioural Physiological	Survival rate Reproductive success Population abundance Population structure Distributional range

3. REPTILES

Extraction or mortality/injury to wild species (bycatch), **marine litter** and **death or injury by collision** were selected as the most important pressures affecting both loggerhead and green turtles in Macaronesia.

EXTRACTION OR MORTALITY/INJURY TO WILD SPECIES
Marine turtles can be captured in a wide variety of fisheries and fishing gear, from small scale, artisanal fisheries, to industrial fleets, including fishing longlines, purse seines and driftnets in the pelagic environment and trawls and gillnets in more coastal waters (Coelho *et al.*, 2015 and references therein). In Macaronesia waters, oceanic juvenile sea turtles are caught in drifting longlines targeting swordfish and blue shark. The habitat of loggerheads is strongly linked to fronts and eddies which represent an important habitat for commercial pelagic species causing an overlap between loggerheads and fishing vessels (Ferreira *et al.*, 2011). Turtles are captured through becoming hooked when preying on baited hooks or through entanglement in monofilament branchlines. Green turtles, in the Canary Islands are present in coastal areas and may be affected by recreational and professional fishing occurring in these areas mainly due to the ingestion of hooks and, in a lesser extent, to entanglement according to data from Wildlife Rescue Centers.
MARINE LITTER
MSFD TG Marine litter considers highly likely that plastic ingestion and entanglement have population level effects for all species of marine turtles. Entanglement may prevent marine turtles from resurfacing or to forage leading to death by asphyxiation and starvation. Entanglement is also known to cause skin lesions, amputation of flippers and septic processes (Orós *et al.*, 2005; Barreiros and Raykov, 2014) reducing marine turtles' mobility and health condition. Plastic ingestion, in turn, may cause intestinal obstruction, internal gut injuries and changes in buoyancy and swimming behavior affecting body condition, survival rates and potentially reproductive success. Studies suggest that marine turtles ingest more debris during younger oceanic life stages possibly due to the fact that young turtles linger along drift lines, where plastic accumulates (Kühn *et al.*, 2015 and references therein; Schuyler et al., 2016). Foraging behavior too may also affect likelihood of ingestion. Debris ingestion is, however, rarely reported as directly responsible for the death of sea turtles. Due to their wide digestive tract, loggerheads have the ability to defecate most of the ingested debris (Pham *et al.*, 2017 and references therein). Direct lethal effects from ingestion do not likely occur at a frequency relevant at the population level while sub-lethal effects are probably more relevant (Kühn *et al.*, 2015).
DEATH OR INJURY BY COLLISION
For marine turtles as for marine mammals, collisions with watercraft, ships and boats represent a source of mortality and morbidity. Injuries typically concern severe fractures of the carapace/plastron and traumatic lesions and are usually lethal (Orós *et al.*, 2016).

Green turtles show high levels of site fidelity to coastal foraging grounds associated with seagrass meadows and therefore **disturbance due to human presence** and **physical loss of habitat** were also identified as important pressures for this species.

DISTURBANCE DUE TO HUMAN PRESENCE
Interactions with divers and snorkels practitioners, may affect behaviour and therefore distribution (Monzón-Argüello *et al.*, 2015). The practice of supplementary feeding, can encourage marine turtles to spend more time, nearby areas with increased boat traffic, increasing incident of collision (Green and Giese, 2004; Varo-Cruz *et al.*, 2017). It may also result into higher interaction with baited longlines (Monzón-Argüello *et al.*, 2018b).

PHYSICAL LOSS OF HABITAT
Green turtles in the Canary Islands occur mainly in areas of shallow sand banks with vegetation (e.g. meadows of seagrass *Cymodea nodosa*) which have been declining in the archipelago (Ruíz de la Rosa *et al.*, 2015). These habitats are resting and feeding grounds for green turtles and therefore their decline may affect turtle distribution in the archipelago.

The activities identified as contributing for each pressure and the impacts on the selected turtle species in Macaronesia are summarized in **table 10.**

Table 10: Overview of the activities exerting the pressures identified as most important for the selected turtle species in Macaronesia and their potential impacts at the individual and population level.

ACTIVITIES		PRESSURES	IMPACTS		
Terrestrial	**Marine**		**Individual level**		**Population level**
Agriculture Tourism infra-structures Urban & industri-al uses	Fish & shellfish har-vesting (professional, recreational) Transport – shipping and infrastructure Leisure activities	**Marine litter**	**Sub-lethal**	Physical damage Physiological	Survival rate Mortality rate Reproductive success Population abundance Population structure
			Lethal	Direct mortality	
-	Fish & shellfish har-vesting (professional, recreational) /by-catch	**Extraction or mortality/injury of species**	**Sub-lethal**	Physical damage Physiological	Survival rate Mortality rate Population abundance Population structure
			Lethal	Direct mortality	
-	Fish & shellfish har-vesting (professional, recreational) Transport-shipping Leisure activities	**Death or Injury by collision**	**Sub-lethal**	Physical damage	Survival rate Mortality rate Population abundance Population structure
			Lethal	Direct mortality	
-	Leisure activities	**Disturbance due to human presence**	**Sub-lethal**	Behavioural Physiological	Distributional range
-	Dredging & deposit-ing of materials Coastal defence and flood protection Transport infrastruc-ture Leisure activities	**Physical loss of habitat**	**Sub-lethal**	Behavioural	Distributional range

4. STATE OF THE MARINE ENVIRONMENT [ART. 8.1A]

A. BIRDS

Pelagic feeding birds

Bulwer's petrel - *Bulweria bulwerii*

The IUCN classifies the Bulwer's petrel populations as of 'Least Concern'. The global population is considered to be stable in the absence of evidence for any declines or substantial threats. The trend of the European population is unknown (BirdLife International, 2018a).

Azores

In the Azores this species is classified as 'Endangered' according to the Portuguese Vertebrates Red List Book (Almeida *et al.*, 2005). Bulwer's petrel from Azores is only monitored in Vila islet. Vila islet holds the largest known population for the archipelago and is one of the two known breeding locations (the other being Baixo islet). The University of Azores (J. Bried, unpublished data) conducted regular monitoring at Vila islet between 2002 and 2012. From 2013 onward, a few occasional visits were carried out. Praia islet is suspected to hold a tiny colony but breeding has never yet been confirmed.

D1C1 – SB_BYC_BR: No bycatch of Bulwer's petrels has been detected in the Azorean fishing monitoring program (Cooper *et al.*, 2003).

D1C4 – SB_DIS_RG: Monteiro *et al.* (1999) confirmed 1 breeding colony for the Azores, as the northern most limit of this species. Two islets, Praia and Baixo were later identified as possible breeding colonies (10 BP), and in 2017 breeding was confirmed by SPEA in both colonies under the MISTIC SEAS II project, thus the species is increasing its distributional range.

Preliminary results show that this species is in GES in Azores for criterion D1C1 and D1C4, with an apparent stable or increasing trend.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	0 individuals [1993-1999; Cooper *et al.*, 2003]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	1 colony [1999]	Trend	2 colonies [2017; MISTIC SEAS II]

- Vila Islet, Santa Maria

Vila islet is a rocky islet of basalt, with steep slopes and cliffs, located about 300 m southwest of Santa Maria Island, it has an area of 10, a maximum altitude of 60 m and a Special Protected Area (SPA) (Monteiro, 2000).

D1C2 – SB_ABU_NC: Population size on Vila islet was estimated at ≈50 BP, and the total Azorean population estimated at 70 BP (Monteiro *et al.*, 1999). Prospections at this islet from 2002 to 2012 recorded a maximum of 57 breeding attempts during a single breeding season (from late April to early May until September) (J. Bried, unpublished data). This updated value was selected as the baseline. During the MISTIC SEAS II project (year 2017) 54 BP were counted. This value indicates a small decrease in the number of breeding pairs, but a longer time series is necessary to evaluate if there is actually a negative trend in the colony.

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D1C3 – SB_DEM_BS: This is a predator-free colony with an average breeding success (BS) from previous years of 45.7% (2002-2012 J. Bried, unpublished data). This value has been set as the baseline for this colony/species. In 2008, the maximum breeding success value calculated for this colony was 56.4% (J. Bried, unpublished data). During the MISTIC SEAS II project (year 2017), a breeding success of 70% was determined. Breeding success has significantly increased compared with the previous sampling period, so the colony seems to be in GES for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exist for this colony. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

Preliminary results show that this MU is in GES, with an apparent positive trend. However, this assessment relies in only one breeding season survey. Researchers and natural population variability can bias the results. The GES of this MU cannot be accurately assessed until after 6-breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	57 BP [2002-2012; J. Bried unpublished data]	Trend	54 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	45.7% BS [2002-2012; J. Bried unpublished data]	Trend	70% BS [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	Not available	0.9	Not available

Madeira

Bulwer's petrel is an abundant breeder in the archipelago of Madeira, particularly in the Desertas islands (45,000 breeding pairs, Catry *et al.*, 2014), nesting in smaller numbers in Selvagens (5,000 breeding pairs (Zino and Biscoito, 1994) and few breeding pairs in Farol Islet (in the eastern tip of Madeira) and in the islets of Porto Santo. The breeding season begins in late April to early May and lasts until September. The scarce data on post-nuptial dispersion suggests that the birds migrate southwest to deep equatorial waters. Bulwer's petrel colonies in the Desertas and also in the Selvagens are considered the main breeding areas in the Atlantic Ocean (Catry *et al.*, 2014).

D1C4 – SB_DIS_RG: Range of Bulwer's petrels has not still been assessed in Madeira.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Selvagem Grande

The colony of Selvagem Grande is the biggest of Madeira. This is a predator-free colony.

D1C2 – SB_ABU_NC: Regular monitoring of Bulwer's petrel is scarce in the Selvagem Grande Island. The last estimates suggest a population of 5,000 breeding pairs (Zino and Biscoito, 1994). However, abundance of Bulwer's petrels has not been still assessed with the current agreed methodology in the Madeira. Therefore, assessment cannot be done for this colony.

D1C3 – SB_DEM_BS: Breeding success of Bulwer's petrels has not still been assessed in Madeira.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exist for this colony. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	5,000 BP [Zino & Biscoito, 1994]	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Canary Islands

In the Canary Islands Bulwer's petrel spreads over 31 colonies (SEO/BirdLife, 2012). Although it is not abundant, it has been found in most islands, including recently in Gran Canaria (Luzardo *et al.*, 2008). Other breeding locations have been suggested but are yet to be confirmed. In the Spanish Iberian Peninsula this species is listed as endangered after a moderate decline was observed in the last decades (Madroño *et al.*, 2004).

D1C4 – SB_DIS_RG: Current range of Bulwer's petrels has not still been assessed in the Canary Islands.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	31 colonies [SEO/BirdLife, 2012]	Trend	Not available

- La Graciosa, Lanzarote

D1C2 – SB_ABU_NC: There are big patches of suitable habitat in the area, but the pressure coming from introduced predators (mainly cats) is affecting the species with several dead adults found during the 2017 MISTIC SEAS II fieldwork. Only one active nest was found during 2017, the first ever in the island. Although fieldwork was carried mainly during September which is already too late for the species. 2018 MISTIC SEAS II fieldwork was carried during the peak vocal activity (June - July) and was much more successful with a total of 20 nests found. However, the monitoring in this area is still in an embryonic stage and further prospections are needed in order to locate the most important areas to properly assess the colony.

D1C3 – SB_DEM_BS: The only nest found in 2017 successfully produced a chick and so did 12 of the 13 nests found in 2018 giving a stunning 92.3% breeding success. However, since this colony has just been discovered and the data available is still scarce, we recommend being cautious and carry on monitoring the colony for a few more years to establish a suitable baseline value.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exists for this colony. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	20 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	Not available	Trend	92.3% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	Not available	0.9	Not available

- Montaña Clara, Lanzarote

D1C2 – SB_ABU_NC: Montaña Clara islet is probably the main stronghold for the species nowadays in the Canary Islands. The rocky shore in the SE of the islet holds the highest densities and is currently monitored by the Seabird Ecology Team from the University of Barcelona. Therefore, the current monitoring effort was concentrated on the SW of the islet (Cuevas Coloradas) and the patches of rocks inside the Caldera (the main volcano crater). During 2017, a total of 30 active nests were found and labelled in these areas with four perimeters being drawn in order to include all the identified active nests. During the 2018, some more extra nests were found, accounting a total of 75 nests of which 60 were active during 2018 breeding season. Although this figure is much bigger than that of 2017, it's worth mentioning that the 2018 fieldwork took part during the species' peak vocal period leading to optimal results but making the comparison with the previous year impossible.

D1C3 – SB_DEM_BS: The breeding success at Montaña Clara was much lower during 2018 than it was back in 2017. While the figure obtained in 2017 was a very good 70.4% (n = 30 nests to evaluate the BS) breeding success, in 2018 a fairly low 41.7% was reported (n = 48 nests to evaluate the BS). The causes of such a difference are still unknown.

D1C3 – SB_DEM_SR: Not available yet.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	60 BP [2018; MISTIC SEAS II]	Trend	60 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	Not available	Trend	41.67% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	Not available	0.9	Not available

Desertas petrel - *Pterodroma deserta*

The Desertas petrel is an endemic seabird breeding only on a single plateau at Bugio Island and considered as 'Vulnerable' according to the IUCN criteria (Orrell and Nicolson, 2018).

Madeira

D1C4 – SB_DIS_RG: Range of Desertas petrels has not still been assessed in the Madeira.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Bugio Island

D1C2 – SB_ABU_NC: A total of 160-180 BP were estimated in the colony (Jesus *et al.*, 2009). However, abundance of Desertas petrels has still not been assessed with the current agreed methodology in the Madeira. Therefore, assessment cannot be carried out for this colony.

D1C3 – SB_DEM_BS: Breeding success of Desertas petrels has still not been assessed in the Madeira.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exist for this colony. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Cory's shearwater - *Calonectris borealis*

The species currently holds the 'Least concern' status for both the European and the global assessment (IUCN 2018). But due to data gaps the trend of the Cory's shearwater population is currently 'unknown' (BirdLife International, 2018a).

Azores

Cory's shearwater breeds in all Azorean islands. The Azorean population represents 75% of the world breeding population (BirdLife International, 2018a).

Breeding starts in March-April on offshore islands, cliffs, caves and boulder fields (del Hoyo *et al.*, 1992) and ends in late October-early November when the fledglings abandon the nest.

The last population census carried out in 2001 estimated a total of 223,646 individuals for the whole Azores archipelago indicating a 43% decrease since the previous estimate of 1996-1997 (Bolton, 2001). This population decrease may have been caused by inter-annual variation in colony attendance (Jenouvrier *et al.*, 2016) and/or behavioural differences between census years (Bolton, 2001; Fontaine *et al.*, 2011), and thus cannot be used to classify population trend.

D1C1 – SB_BYC_BR: Only one bycatch of Cory's shearwater was detected in the past, but none during 2018 (POPA project).

D1C4 – SB_DIS_RG: Several colonies exist in the Azores archipelago, but the total range (number of colonies) has still not been assessed.

Results show that this species is in GES in Azores for criterion D1C1, but D1C4 could not be assessed due to the non-discreet aspect of the colonies.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	1 individual [1993-1999; POPA]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Corvo Island

Corvo is the smallest (1,700 ha) inhabited island of the Azores of volcanic origin and the maximum elevation is 718 m with steep cliffs 200 m in height surrounding most of the island. The selected 3 colonies' distance from the Village is 180-500 m with soil as dominant substrate and the majority of the nests with chamber (Hervías *et al.*, 2013).

D1C2 – SB_ABU_NC: Corvo island has the largest colony in the Azores in terms of number breeding pairs/area with more than 6,000 BP (3,735 - 10,524) in 2012 although it is believed that the colony may have been much larger in the past (Oppel *et al.*, 2014). The current colony abundance seems stable. During MISTIC SEAS II, 96 BP were counted using the current agreed methodology. This value will be use as baseline for future assessments.

D1C3 – SB_DEM_BS: Breeding success in Corvo island was estimated at 39% between 2009 and 2011 (Hervías *et al.*, 2013). Current breeding success (estimated during MISTIC SEAS II project) is 58%, which indicate a positive increase.

D1C3 – SB_DEM_SR: Baseline survival rate was set using data collected between 2002 and 2008 by Fontaine *et al.* (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

A slight decrease detected by Oppel *et al.* (2012) can be explained by occupation rate (gap years), natural fluctuations and even by the fact that the three colonies monitored are the ones with the highest density of cats. Cats are responsible for 84% of the predated chicks and consequent breeding failure (Hervías *et al.*, 2013). Preliminary results show that this species is in GES However, it is necessary to get data from 6 breeding seasons to accurately assess GES in this colony.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	96 BP [2018; MISTIC SEAS II]	Trend	96 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	39% [2009-2011; Hervías *et al.*, 2013]	Trend	58% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine *et al.*, 2011]	0.9	Not available

- Vila Franca do Campo Islet, São Miguel

Vila Franca do Campo Islet (VFCI) is located 1 km from Vila Franca do Campo off the southeast coast of São Miguel Island and is part of the Natural Park of São Miguel Island. It has an area of about 7 ha and rises to an altitude of 62 m above the sea level (Rodrigues *et al.*, 2012). There is a predator-free colony of Cory's shearwater in this Islet.

<u>D1C2 – SB_ABU_NC</u>: Cory's shearwater population size was estimated at 500 BP in the past (SPEA, unpublished data). During MISTIC SEAS II, 37 BP were counted using the current agreed methodology. This value will be use as baseline for future assessments.

<u>D1C3 – SB_DEM_BS</u>: During MISTIC SEAS II, a BS of 81% (2018) was calculated for this colony. This value will be use as baseline for future assessments.

<u>D1C3 – SB_DEM_SR</u>: Baseline survival rate was set using data collected between 2002 and 2008 by Fontaine *et al.* (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	37 BP [2018; MISTIC SEAS II]	Trend	37 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	81% [2018; MISTIC SEAS II]	Trend	81% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine et al., 2011]	0.9	Not available

- Mistério da Prainha, Pico

Cory's shearwaters were never systematically monitored at this colony. Nevertheless, over the years around 100 active nests and a maximum of 100 breeding pairs were identified (J. Bried unpublished data). As part of the MISTIC SEAS II project, monitoring started in June 2017.

This is a colony with predators, including main introduced mammals such as cats, dogs, rats, mice and ferrets.

<u>D1C2 – SB_ABU_NC</u>: There are no abundance estimates from previous years; thus, the baseline value for this colony/species is the first-year results from MISTIC SEAS II field work (2017). This value was obtained using the number of nests observed with either both adults, an egg or a chick. During 2017 a total of 75 nests were occupied, but only one adult could be seen in 5 out of those. Thus, breeding could not be confirmed, and these nests were non-counted, not adding possible prospectors to the BP estimate. During the second nest count performed in 2018, only 58 BP could be counted. Despite the decrease in abundance, a longer time series is necessary to assess the trend of this colony.

D1C3 – SB_DEM_BS: During MISTIC SEAS II, a BS of 65% was calculated in 2017 and 92% in 2018. The first value was used as baseline for future assessments.

D1C3 – SB_DEM_SR: Baseline survival rate was determined using data collected between 2002 and 2008 by Fontaine *et al.* (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	70 BP [2017; MISTIC SEAS II]	Trend	58 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	65% [2017; MISTIC SEAS II]	Trend	92% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine *et al.*, 2011]	0.9	Not available

- Praia Islet, Graciosa

Praia islet lies 1 km east of Graciosa island, 0.12 km2 and holds six seabird species, four of which are classified as species of "Conservation Concern" in Europe and another one is considered globally "Vulnerable" (Bried and Neves, 2015). Cory's shearwaters were never systematically monitored at this colony. A few capture-mark-recapture sessions were conducted between 2003 and 2012. As part of the MISTIC SEAS II project, monitoring started in June 2017. However, the data is still unavailable as such no criteria can be reported here.

This is a predator-free colony. However, predation by Madeiran lizards (Neves *et al.*, 2017) and fire-ants have been reported.

D1C2 – SB_ABU_NC: There is not any abundance estimate available for this colony.

D1C3 – SB_DEM_BS: The BS has still not been calculated for this colony.

D1C3 – SB_DEM_SR: Baseline survival rate was determined using data collected between 2002 and 2008 by Fontaine *et al.* (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine *et al.*, 2011]	0.9	Not available

- Vila Islet, Santa Maria

Vila islet is a rocky islet of basalt, with steep slopes and cliffs, located about 300 m southwest of Santa Maria Island, it has an area of 10, a maximum altitude of 60 m and a Special Protected Area (SPA) (Monteiro, 2000). Vila islet is free of introduced predators.

D1C2 – SB_ABU_NC: Nest checking was conducted each year between 2003 and 2012 by the University of the Azores (J. Bried unpublished data), generating an estimate of 331 BP which was set as baseline. Monitoring was interrupted but restarted in June 2017 as part of the project MISTIC SEAS II. 272 BP were counted during fieldwork. This value represents a slight decrease in the abundance of the population, but a longer series is needed to assess this parameter, taking into consideration possible natural variations.

D1C3 – SB_DEM_BS: The best estimate of BS for this colony is 58.6%, obtained from 2002 to 2008 (Fontaine *et al.*, 2011). This value was used as baseline for this parameter. The last BS estimate, during the MISTIC SEAS II project was 83% (year 2018), which shows a slight increase. However, a longer time series is needed to assesses this parameter in order to take into consideration possible natural variations.

D1C3 – SB_DEM_SR: Baseline survival rate was set using data collected between 2002 and 2008 by Fontaine *et al*. (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	331 BP [2003-2012; J. Bried unpublished data]	Trend	272 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	58.6% [2003-2008; J. Bried unpublished data]	Trend	83% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine *et al*., 2011]	0.9	Not available

- Capelinhos, Faial Island

Cory's shearwaters were never systematically monitored at this colony, apart from some scattered studies.

Monitoring programs started in this colony during the Interreg project LuMinAves MAC/4.6d/157, aimed to determine artificial night light pollution in the seabird populations of Macaronesia by measuring artificial light pressure identified during MISTIC SEAS I.

D1C2 – SB_ABU_NC: There are no abundance estimates from previous years, thus the baseline value for this colony/species used the first-year results from LuMinAves field work (2017). During 2017, 42 BP were counted. During the second nest count performed in 2018, only 38 BP could be counted. Despite the decrease in abundance, a longer time series is necessary to assess the trend of this colony.

D1C3 – SB_DEM_BS: During LuMinAves, a BS of 96% was calculated in 2017 and 92% in 2018. The first value was use as baseline for future assessments.

D1C3 – SB_DEM_SR: Baseline survival rate was determined using data collected between 2002 and 2008 by Fontaine *et al*. (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	42 BP [2017; LuMinAves]	Trend	34 BP [2018; LuMinAves]
D1C3	SB_DEM_BS	96% [2017; LuMinAves]	Trend	92% [2018; LuMinAves]
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine *et al*., 2011]	0.9	Not available

- Morro Castelo Branco, Faial Island

Morro Castelo Branco colony is a reserve with 16 ha and is a trachytic dome, connected to land by an isthmus with elevated plateaus of vertical cliffs full of fissures forming small caves and ending in pebble beaches and rock blocks. Cory's shearwaters were never systematically monitored at this colony until fieldwork carried out during the LuMinAves project.

This colony has two areas, the lower and the top part of the rock face. During the second year of monitoring (2018), the top area wasn't monitored due to the precariousness of the path and the nest type. At the top of Morro there are hundreds of Cory's shearwater nests. However, they are either on a steep cliff face, inaccessible to the researchers, or in sandy holes in the ground which collapse easily just by walking around them.

Monitoring programs started in this colony during the Interreg project LuMinAves MAC/4.6d/157, aiming to determine artificial night light pollution in the seabird populations of Macaronesia by measuring artificial light pressure identified during MISTIC SEAS I.

D1C2 – SB_ABU_NC: There are no abundance estimates from previous years. Thus, the baseline value for this colony/species was set as the first-year results from LuMinAves field work (2017). During 2017, 46 BP were counted. During the second nest count performed in 2018, only 29 BP could be counted because, as explained above, it was not possible to access one of the areas of the colony.

D1C3 – SB_DEM_BS: During LuMinAves, a BS of 81% was calculated in 2017 and 96% in 2018. The first value was used as baseline for future assessments.

D1C3 – SB_DEM_SR: Baseline survival rate was set using data collected between 2002 and 2008 by Fontaine *et al.* (2011) (survival rate = 0.934). Current survival rate has not been calculated yet. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	49 BP [2017; LuMinAves]	Trend	29 BP [2018; LuMinAves]
D1C3	SB_DEM_BS	81% [2017; LuMinAves]	Trend	96% [2018; LuMinAves]
D1C3	SB_DEM_SR	0.934 [2002-2008; Fontaine *et al.*, 2011]	0.9	Not available

Madeira

D1C4 – SB_DIS_RG: Range of Cory's shearwaters has not still been assessed in the Madeira.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Selvagem Grande

Selvagem Grande holds a good density of accessible nests, fairly easy to monitor. Regular monitoring has been performed during the last 20 years, and Cory's shearwater population has been estimated at 29,540 BP in 2005 (Granadeiro *et al.*, 2006). Selvagem Grande is a predator-free colony where most nets are located in walls.

D1C2 – SB_ABU_NC: Abundance of Cory's shearwaters has not been still assessed with the standardized methodology agreed for the Macaronesia. Therefore, abundance assessment cannot be done for this colony.

D1C3 – SB_DEM_BS: Breeding success of Cory's shearwaters was calculated to be 52% for 1992 to 1999 (Mougin, 2001). However, the current BS has still not been calculated.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exist for this colony. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	52% [1992-1999; Mougin, 2001]	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Canary Islands

The species breeds in all the islands of the Canary archipelago in very high numbers. However, the only population estimate, 30,000 pairs, is very old and probably underestimates the actual numbers. As an example, Rodríguez, *et al.* (2014) estimated the population of Tenerife to range from 8,200 to 16,600 pairs some years ago which is three times the previous estimates for the island.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- El Golfo – Timanfaya, Lanzarote

The area holds a good density of accessible nests that are fairly easy to monitor. Most nests are found by the trail that goes from El Golfo village into the Timanfaya National Park.

<u>D1C2 – SB_ABU_NC:</u> A total of 46 BP were reported in the surveyed area in 2017 and 44 BP in 2018 during the MISTIC SEAS II monitoring programs. The first estimate was set as the baseline value for future assessments. The colony abundance seems stable but a longer time series is needed to assesses this parameter to take into consideration possible natural variations.

<u>D1C3 – SB_DEM_BS:</u> A breeding success of 88.6% were reported in 2018 during the MISTIC SEAS II monitoring programs, very similar to the 78.3% reported in 2017 and used as baseline value. The BS slightly increased during the sampling period, but a longer time series is needed to assesses this parameter to take into consideration possible natural variations.

<u>D1C3 – SB_DEM_SR:</u> Survival rate is still not available for this colony.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	46 BP [2017; MISTIC SEAS II]	Trend	44 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	78.3% [2017; MISTIC SEAS II]	Trend	88.6% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	Not available	0.9	Not available

- Montaña Clara, Lanzarote

The area holds a good density of accessible nests and is fairly easy to monitor. The nests are located in the SE shore, some in crevices and some in solid sand caves dug by the birds themselves.

<u>D1C2 – SB_ABU_NC:</u> A total of 30 BP were reported in the surveyed area in 2017 and 24 in 2018 during the MISTIC SEAS II monitoring programs. The first estimate was set as the baseline value for future assessments. A slight decrease has been detected. However, a longer time series is needed to assesses this parameter and to take into consideration possible natural variations.

<u>D1C3 – SB_DEM_BS:</u> A breeding success of 53.3% was reported in 2017 and 72.7% in 2018 calculated from the MISTIC SEAS II fieldwork. The first estimate was set as the baseline value for future assessments. The BS increased during the sampling period, but a longer time series is needed to assesses this parameter to take into consideration possible natural variations.

<u>D1C3 – SB_DEM_SR:</u> Survival rate is still not available for this colony.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	30 BP [2017; MISTIC SEAS II]	Trend	24 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	53.3% [2017; MISTIC SEAS II]	Trend	72.7% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	Not available	0.9	Not available

Macaronesian shearwater - *Puffinus lherminieri*

The IUCN worldwide status of the Macaronesian shearwater is of ‘Least Concern’. In Europe, it is listed as ‘Near Threatened’ with decreasing population trends (BirdLife International, 2018a). According to BirdLife International (2018a), populations are suspected to decline due to the impact of introduced species with an estimated declining rate of about 10% in 66.9 years (three generations).

Azores

The presence of the Macaronesian shearwater in the Azores was first documented at the beginning of the XX century in Graciosa (in Praia Islet; Hartert and Ogilvie-Grant, 1905).

D1C1 – SB_BYC_BR: No bycatch of Bulwer’s petrels has been detected in the Azorean fishing monitoring program (Cooper *et al.*, 2003).

D1C4 – SB_DIS_RG: Population size was estimated at 840-1530 breeding pairs (from 1996 to 1998) distributed in 28 colonies (Monteiro *et al.*, 1999). The current number of colonies is not available.

Results show that this species is in GES in Azores for criterion D1C1, but D1C4 could not be assessed.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	0 individuals [1993-1999; Cooper *et al.*, 2003]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	28 colonies (Monteiro *et al.*, 1999)	Trend	Not available

- Praia Islet, Graciosa

Praia islet lies 1 km east of Graciosa island, 0.12 km2 and holds six seabird species, four of which are classified as species of “Conservation Concern” in Europe and another one is considered globally “Vulnerable” (Bried and Neves, 2015). On Praia islet, Macaronesian shearwaters have not been monitored on a systematic basis, and there is very little information available although some nests had been identified through the years.

D1C2 – SB_ABU_NC: The population size of the colony was estimated in 50 BP (Monteiro *et al.*, 1999) and due to the installation of storm-petrels artificial nests the population it could increase (Bried and Neves, 2015). During January 2018, 50 BP were also counted. During the second nest count, only 15 BP were found. Despite this abundance decrease in abundance observed, a longer time series would be necessary to assess the actual trend of this colony.

D1C3 – SB_DEM_BS: During MISTIC SEAS II, a BS of 64% was calculated in January 2018, and the same figure was obtained later during the same year. These values were used as the baseline for future assessments.

D1C3 – SB_DEM_SR: Baseline survival rate was set using data collected between 1998 and 2005 by Precheur et al. (2016) (survival rate = 0.943). The current survival rate has not been calculated yet. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	50 BP [2018; MISTIC SEAS II]	Trend	15 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	64% [2018; MISTIC SEAS II]	Trend	64% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.943 [1998-2005; Precheur *et al.*, 2016]	0.9	Not available

- Vila Islet, Santa Maria;

Vila islet is a rocky islet of basalt, with steep slopes and cliffs, located about 300 m southwest of Santa Maria Island. It has an area of 10 ha, a maximum altitude of 60 m and a Special Protected Area (SPA) (Monteiro, 2000). This species is highly sensitive to disturbance especially during incubation. Few monitoring schemes were conducted on Vila islet in order not to disrupt breeding in the few identified nests. Nevertheless, occasional ringing and capture-mark-recapture activities were conducted.

D1C2 – SB_ABU_NC: The population estimate at Vila islet consists of 50 BP (Monteiro *et al.*, 1999). During the project MISTIC SEAS II, monitoring started in January 2018. Old nests were identified as much as possible (many were not found and many of those that were found were no longer suitable for breeding). New nests were also prospected and marked. The first nest count of 2018 resulted in 16 BP. However, this value is not comparable with previous counts. This figure was used as the baseline value for future assessments.

D1C3 – SB_DEM_BS: During MISTIC SEAS II, a BS of 50% was determined. This value was used as the baseline for future assessments.

D1C3 – SB_DEM_SR: Baseline survival rate was set using data collected between 1998 and 2005 by Precheur *et al.* (2016) (survival rate = 0.943). Current survival rate has not been calculated yet. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	16 BP [2018; MISTIC SEAS II]	Trend	16 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	50% [2018; MISTIC SEAS II]	Trend	50% [2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.943 [1998-2005; Precheur *et al.*, 2016]	0.9	Not available

Madeira

Selvagem Grande holds the largest population of the species in Madeira with 2,050 to 4,900 breeding pairs (Oliveira and Moniz, 1995). Abundance in the remaining islands of the archipelago is apparently smaller. Recent data suggests a marked decrease of the population abundance in Selvagens.

D1C4 – SB_DIS_RG: Range of Cory's shearwaters has not still been assessed in the Madeira.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Selvagem Grande

D1C2 – SB_ABU_NC: Abundance of Macaronesian shearwater has not been still assessed with the standardized methodology agreed for the Macaronesia. Therefore, the assessment of the abundance of this colony has not been carried out.

D1C3 – SB_DEM_BS: Breeding success of Macaronesian shearwater was calculated to be 80% in 2011 (Fagundes *et al.*, 2016). However, the current BS has still not been calculated.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exist for this colony. Threshold has been set as 0.9 for al seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	80% [2011; Fagundes *et al.*, 2016]	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Canary Islands

Macaronesian shearwater is experiencing a strong decline in the Canary Islands, described at least in Tenerife (Rodríguez *et al.*, 2012). The causes are still unknown but the sad reality is that it was not possible to find nests of the species despite a pretty intensive search (Bécares *et al.*, 2016). Therefore, only call rate is currently used to infer abundance trends. Two colonies were selected and monitored during winter 2017-2018, fitting with the species peak vocal activity.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- El Golfo - Timanfaya, Lanzarote

The colony is placed in an inaccessible vertical cliff, so direct nest counting is nearly impossible. However, given the relatively low height of the cliff, acoustic monitoring allows the recording of the vocal activity of the whole colony. Therefore, an automated recording system was placed on the top of the cliff during the courtship period (second half of December).

D1C2 – SB_ABU_CR: Maximum call rates were obtained in December 2017 during the MISTIC SEAS II monitoring programs, but how these data are integrated to give a single reference value is still under debate. The options are (i) to build a model to predict the best days in terms of vocal activity or (ii) select the best 5 days of each survey period and report their mean or median. A combination of values (N = 226) obtained was used as current and baseline abundance value.

No GES assessment is still available for this colony.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	226 individuals [2017-2018; MISTIC SEAS II]	Trend	226 individuals [2017-2018; MISTIC SEAS II]

- Montaña Clara, Lanzarote

Although the main area for the species on the islet is placed in theoretically accessible areas of the Caldera (main volcano crater of the islet), no nests have been found so far despite intensive search. Hence, an automated recording system was placed in the middle of the main breeding area during the courtship period (second half of December).

D1C2 – SB_ABU_CR: Maximum call rates were obtained in December 2017 during the MISTIC SEAS II monitoring programs, but how these data will be integrated to give a single reference value is still under debate. The options are (i) to build a model to predict the best days in terms of vocal activity or (ii) select the best 5 days of each survey period and report their mean or median. A combination of values (N = 81) obtained was used as current and baseline abundance value.

No GES assessment is still available for this colony.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	81 individuals [2017-2018; MISTIC SEAS II]	Trend	81 individuals [2017-2018; MISTIC SEAS II]

Zino's pretrel - *Pterodroma Madeira*

The Zino's petrel is a burrow nesting seabird, endemic to the island of Madeira. This petrel is listed as 'Endangered' in the IUCN list (Groombridge, 1993; BirdLife International, 2018c). In addition, it is included in Annex I of the EU Wild Birds Directive (Directive 2009/147/EC (2009)).

Madeira

D1C4 – SB_DIS_RG: The breeding area is restricted to the central mountains of Madeira (Zino *et al.*, 1995), known as "Maciço Montanhoso Oriental", a designated Special Protected Area (SPA). Therefore, there is only one known colony of this species that is currently maintained, which indicate a good environmental status with respect to this criterion.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	1 [Zino *et al.*, 1995]	Trend	1 [Zino *et al.*, 1995]

- Maciço Montanhoso Oriental

D1C2 – SB_ABU_NC: The population size is considered to range from 30-40 BP to 65-80 BP estimated as part of the project LIFE00 NAT/P/007097 Conservation of Zino's Petrel through restoration of its habitat in 2001/2006 coordinated by IFCN-RAM. However, the abundance of the Zino's petrel has still not been estimated with the standardized methodology agreed for Macaronesia. Therefore, the assessment of the abundance cannot be done for this colony.

D1C3 – SB_DEM_BS: There are no values of BS available for this species. Therefore, it is not still possible to set a baseline value or perform an assessment for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exists for this colony. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Surface-feeding birds

Storm-petrels are widespread, but dramatic population declines could go unnoticed unless they are routinely monitored throughout their range (Lormee *et al.*, 2012).

Band-rumped storm petrel - *Hydrobates castro*

The species is classified as of 'Least Concern' by IUCN, globally and in Europe (BirdLife International, 2018a). However, the species is decreasing globally because of anthropogenic pressures, such as direct exploitation, light pollution and depredation (Bried *et al.*, 2009; Carboneras *et al.*, 2014; BirdLife International, 2018a). The species forages on mesopelagic prey at a lower trophic level than the Monteiro's storm petrel.

Azores

Population size was estimated during the 90s to be between 665 and 740 BP out of which 440 to 480 are located in Graciosa island (200 on Praia islet, 200 on Baixo islet, 40 to 80 on Ponta da Barca islet), 5 to 10 BP in São Jorge island (on Topo islet), 0 to 10 in São Miguel island (on Vila Franca do Campo islet), and 220 to 245 in Santa Maria island (200 on Vila islet, 0 to 5 at Ponta do Norte, 20 to 40 at Malbusca) (Monteiro *et al.*, 1999). However, numbers on Praia islet may have increased since 2001 due to the installation of artificial nests (Bried *et al.*, 2009; Bried and Neves, 2015).

D1C1 – SB_BYC_BR: No bycatch of Bulwer's petrels has been detected in the Azorean fishing monitoring program (Cooper *et al.*, 2003).

D1C4 – SB_DIS_RG: Monteiro *et al.* (1999) confirmed 8 breeding colonies for the Azores. In 2017, a new breeding colony was confirmed at Sentado islet (Flores island) by SPEA under the MISTIC SEAS II project, thus increasing the known distributional range of the species.

Preliminary results show that this species is in GES for D1C4, with an apparent increasing trend.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	0 individuals [1993-1999; Cooper *et al.*, 2003]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	8 colonies [1999]	Trend	9 colonies [2017; MISTIC SEAS II]

- Baixo Islet, Graciosa

Baixo islet is a basaltic islet off Graciosa with an area of 7 ha and 74 m elevation where currently seven seabird species breeds. It is a mammal free islet with the only breeding yellow-legged gull colony (320 BP; Neves *et al.*, 2006) of Graciosa island which can have an impact for the small Procellariiformes breeding on the islet such as Storm-petrels and Bulwer's petrel.

D1C2 – SB_ABU_NC: The population abundance is currently estimated through acoustic surveys (i.e., by call rate using autonomous recording units). However, this data is still being processed.

D1C3 – SB_DEM_BS: The BS has not been still calculated for this colony.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, but a baseline of 0.97 calculated by Robert *et al.* (2012) has been used. The Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	0.97 [Robert *et al.*, 2012]	0.9	Not available

- Praia Islet, Graciosa

Fieldwork has been annually conducted in this colony since 1989 to determine breeding tern numbers, and, since 2000, to monitor the band-rumped and Monteiro's storm petrels breeding in artificial nests. Storm petrels have been studied on Praia islet at least since the 90s. Praia islet was declared a natural reserve in 2008. It is a predator-free colony. Between 2000 and 2001, 150 artificial nests were installed increasing suitable habitat availability and protection whilst facilitating the monitoring of Storm-petrels (Bolton *et al*., 2004). Band-rumped storm-petrel population from Praia islet was the most systematically studied population of this species during the period 2000-2012. Monitoring has continued under the MISTIC SEAS II.

D1C2 – SB_ABU_NC: Monteiro *et al*. (1999) estimated 200 BP using acoustic surveys between 1996 and 1999. It is a good target as it represents the estimated maximum for this population/site. However, the methodology applied in MISTIC SEAS II is nest checking, which, due to inaccessibility of most nests, will generate lower values for BP. Thus, the current number of BP (66 BP) was used as the baseline value for future assessments.

D1C3 – SB_DEM_BS: A breeding success of 39.7% was measured between 2002 and 2012 (J. Bried, unpublished data). Thus, it was used as the baseline for this criterion. The current monitoring carried out during the MISTIC SEAS II project produced a BS of 83% (2017-2018). Breeding success has shown an increase. However, this only represents one breeding season survey and a longer time series is necessary to properly assess this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, but a baseline of 0.97 calculated by Robert *et al*. (2012) has been used. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

The global GES of this colony will be only accurately assessed after 6 breeding seasons.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	66 BP [2017-2018; MISTIC SEAS II]	Trend	66 BP [2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	39.7% [2002-2012; J. Bried unpublished data]	Trend	83% [2017-2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.97 [Robert *et al*., 2012]	0.9	Not available

- Sentado Islet, Alagoa, Flores

Sentado islet is a small islet off Flores Island (area of 0.15 ha), with a restricted and inaccessible area where a band-rumped storm-petrel colony was recently confirmed through autonomous recording units in 2017.

D1C2 – SB_ABU_NC: During MISTIC SEAS II project, the first monitoring of the colony was carried out. However, these data are still being processed and no abundance results are available yet.

D1C3 – SB_DEM_BS: There are no values of BS available for this species. Therefore, it is still not possible to set a baseline or perform an assessment for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, but a baseline of 0.97 calculated by Robert *et al*. (2012) has been used. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

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Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	Processing data	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	0.97 [2000-2010; Robert *et al.*, 2012]	0.9	Not available

- Vila Islet, Santa Maria

Vila islet is a rocky islet of basalt, with steep slopes and cliffs, located about 300 m southwest of Santa Maria Island. It has an area of 10 ha, a maximum altitude of 60 m and a Special Protected Area (SPA) (Monteiro, 2000).

D1C2 – SB_ABU_NC: From 2002 to 2012 this colony was monitored by the University of Azores every year using capture-mark-recapture methods and census of the accessible nests. More than 100 BP were identified over this time period. However, the methodology used is not comparable with the current standardized methodology proposed for the Macaronesia and, therefore, the baseline value (43 BP) is the result of the monitoring scheme designed in the MISTIC SEAS II project.

D1C3 – SB_DEM_BS: A breeding success of 39.7% was calculated from 2002 to 2012 (J. Bried, unpublished data). Thus, this figure was used as the baseline for this colony. The current monitoring carried out during the MISTIC SEAS II project produced a BS of 73% (2017-2018). Breeding success has shown an increase. However, this only represents the trend and not its state as it relies in only one breeding season survey, and the result could be explained by natural population fluctuations. This GES can only be assessed after 6 breeding seasons.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, but a baseline of 0.97 calculated by Robert *et al.* (2012) has been used. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	43 BP [2017-2018; MISTIC SEAS	Trend	43 BP [2017-2018; MISTIC SEAS II]
D1C3	SB_DEM_BS	39.7% [2002-2012; J. Bried unpublished data]	Trend	73% [2017-2018; MISTIC SEAS II]
D1C3	SB_DEM_SR	0.97 [2000-2010; Robert *et al.*, 2012]	0.9	Not Available

Madeira

Band-rumped storm-petrels (winter and summer population) breed on the Desertas and Selvagens islands. Although there is not and accurate abundance estimate, the last census indicated 10,000 birds around Madeira and most of them gathered on the Desertas and Selvagens islands (Equipa Atlas, 2008b).

D1C4 – SB_DIS_RG: At least two colonies are described in Madeira for this species (Equipa Atlas, 2008b) but assessment of its current range has not been performed.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	2 colonies [Equipa Atlas, 2008]	Trend	Not available

Canary Islands

The total population was quantified by Delgado *et al.* (1989) in about 300 pairs, but more recently, it is estimated that the population should be about 550-600 pairs (Madroño *et al.*, 2004). In Spain, this species is listed as endangered (Madroño *et al.*, 2004).

D1C4 – SB_DIS_RG: The colonies of this species are still under study.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- El Golfo, Lanzarote

D1C2 – SB_ABU_CR: There are no abundance values for this colony. Therefore, it is not still possible to set a baseline or perform an assessment for this criterion.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	Not available	Trend	Not available

- Montaña Clara, Lanzarote

D1C2 – SB_ABU_ CR: There are no abundance values for this colony. Therefore, it is not still possible to set a baseline or perform an assessment for this criterion.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	Not available	Trend	Not available

- Roques de Anaga, Tenerife

D1C2 – SB_ABU_CR: There are no abundance values for this colony. Therefore, it is not still possible to set a baseline or perform an assessment for this criterion.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	Not available	Trend	Not available

Common tern - *Sterna hirundo*

According to Birdlife International (2018a) is evaluated as Least Concern. The common tern (*Sterna hirundo*) breeds on all the Azorean islands ad mostly on the coast and small islets (inaccessible). Common Terns breeding in the northwest spend the non-breeding period along the West African coast (Wernham *et al.*, 2002) and some terns from the Azores migrate to the coast of South America (Neves *et al.*, 2016). The breeding season starts in April and lastsuntil September. The Azorean population is estimated in ≈ 3000 pairs (Neves *et al.*, 2011a).

Azores

D1C1 – SB_BYC_BR: No bycatch of the Common tern has been detected in the Azorean fishing monitoring program (POPA project).

D1C4 – SB_DIS_RG: The colonies of this species are still under study.

Preliminary results show that this species is in GES for D1C1, and the range status still cannot be assessed.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	0 individuals [1993-1999; POPA]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- All Azorean Islands

D1C2 – SB_ABU_NC: There are no abundance values for this colony. Therefore, it is not possible to set a baseline or perform an assessment for this criterion.

D1C3 – SB_DEM_BS: There are no values of BS available for this species. Therefore, it is not possible to set a baseline or perform an assessment for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated, and no baseline exists for this colony. The threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Canary Islands

In the Canary Islands, it is a scarce species. Although, in the past, they have been much more abundant. It breeds mainly in the western islands (La Palma, El Hierro, La Gomera, Tenerife and Gran Canaria) although some pair has been detected occasionally in Lobos (Fuerteventura).

Two criteria have been proposed for assessing this species in the Canary Islands: the abundance (D1C2) and distribution (D1C4). However, the associated monitoring programs have not started yet.

D1C4 – SB_DIS_RG: The colonies of this species are still under study.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Occidental Canary Islands

Nesting areas are very mobile and do not present clear colonies. The entire coast suitable for nesting will be sampled in the 5 occidental islands (La Palma, El Hierro, La Gomera, Tenerife and Gran Canaria). There is currently no information on the distribution or abundance of the species in the Canary Islands. In 1987, its population was estimated at about 38-51 couples Lorenzo (Lorenzo and Barone, 2007).

D1C2 – SB_ABU_NC: There are no accurate abundance values for this colonies. Therefore, it is not possible to set a baseline or perform an assessment for this criterion.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available

Monteiro's storm petrel - *Hydrobates monteiroi*

Monteiro's storm-petrel is a small procellariiform species endemic to the Azores archipelago. It has a very small population restricted to breeding on three islets: Praia and Baixo islets, both off Graciosa island (Bolton *et al*., 2008), and the Sentado islet (Alagoa, Flores island). With a breeding season from April to September, it is highly susceptible to stochastic events and remains at risk of mammalian introductions and avian predators. It is listed as 'Vulnerable' in Europe (Bolton *et al*., 2008).

Azores

Population size was monitored based on two methodologies according to colony accessibility: nest count for accessible colonies (Praia islet) and call rate measured using ARUs at inaccessible colonies (Baixo and Alagoa islets).

D1C1 – SB_BYC_BR: No bycatch of Monteiro's storm petrels has been detected in the Azorean fishing monitoring program (POPA project).

D1C4 – SB_DIS_RG: Monteiro *et al*. (1999) confirmed 2 breeding colonies for the Azores, and in 2016, breeding was confirmed at Sentado islet, Flores Island by SPEA under the LIFE EuroSAP thus increasing the known distributional range of the species.

Preliminary results show that this species is in GES for D1C1 and D1C4.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	0 individuals [1993-1999; POPA]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	2 colonies [1999; Monteiro *et al*., 1999]	Trend	3 colonies [2017; MISTIC SEAS II]

- Baixo Islet, Graciosa

Baixo islet is a basaltic islet off Graciosa with an area of 7 ha and 74 m elevation where seven seabird species currently breed. There is a mammal-free islet that has the only breeding yellow-legged gull colony (320 BP; Neves *et al*., 2006) of Graciosa island which can have an impact for the small Procellariiformes breeding on the islet such as Storm-petrels and Bulwer's petrel. There are almost no accessible nests of Monteiro's storm-petrel. In the past, the population abundance was estimated through acoustic surveys (point calls; Monteiro *et al*., 1999). Nowadays, it is estimated by call rate using autonomous recording units (MISTIC SEAS II project).

D1C2 – SB_ABU_NC: Breeding in the Sentado islet was recently confirmed by intense call activity during the entire breeding season, and the total population size was updated to 328-378 BP (Oliveira *et al*., 2016). A baseline of 125 BP was estimated in 2016 using the current standardized methodology (Ramírez, 2017). Current values (2017) indicate a slightly higher number (138 BP), so GES is apparently stable. But, a longer time series should be used to properly assess this criterion. Data from 2018 is still being processed.

D1C3 – SB_DEM_BS: There are not values of BS available for this species. Therefore, it is not possible to set a baseline or perform an assessment for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, and no baseline exists for this colony. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	125 BP [2016; Ramírez, 2016]	Trend	138 BP [2017; MISTIC SEAS II]
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

- Praia Islet, Graciosa

Praia islet lies 1 km east of Graciosa island, 0.12 km2 and holds six seabird species, four of which are classified as species "of Conservation Concern" in Europe, and another one is considered globally "Vulnerable" (Bried and Neves, 2015). However, predation by lizards (Neves *et al.*, 2017) and fire ants (pers. Comm.) have been reported for Monteiro's storm-petrel only.

Monteiro's storm-petrel population from Praia islet was the most systematically studied population of this species during the period 2000-2012. Monitoring has continued under the MISTIC SEAS II. However, the data is still unavailable as such no criteria can be reported here.

D1C2 – SB_ABU_NC: There was as estimation of abundance of 178 BP from 2016 using acoustic surveys (Oliveira *et al.*, 2016). Acoustic surveys using autonomous recorders were installed in 2017. Analysis of the acoustic surveys is still ongoing, so no assessment can be done.

D1C3 – SB_DEM_BS: There are not values of BS available for this species. Therefore, it is not still possible to set a baseline or perform an assessment for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, but a baseline of 97% calculated in Praia Islet from 2000 to 2010 (Robert *et al.*, 2012) was used for this colony. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	• 178 BP [2016; Oliveira *et al.*, 2016]	• Trend	• Not available
D1C3	SB_DEM_BS	• Not available	• Trend	• Not available
D1C3	SB_DEM_SR	• 0.97 [2000-2010; Robert *et al.*, 2012]	• 0.9	• Not available

- Sentado Islet, Alagoa, Flores

Sentado islet is a small islet off Flores Island (area of 0.15 ha), with a restricted and inaccessible area where Monteiro's storm-petrels breed and was only recently confirmed through autonomous recording units in 2016.

D1C2 – SB_ABU_NC: An abundance of 20-40 BP was estimated by Monteiro *et al.* (1999) using acoustic surveys. In 2016, 15 BP were estimated using autonomous recording during the MISTIC SEAS II project.

D1C3 – SB_DEM_BS: There are not values of BS available for this species. Therefore, it is not possible to set a baseline or perform an assessment for this criterion.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exists for this colony. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not a GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_CR	• 20-40 BP [Monteiro *et al.*, 1999]	• Trend	• 15 BP [2016; MISTIC SEAS II]
D1C3	SB_DEM_BS	• Not available	• Trend	• Not available
D1C3	SB_DEM_SR	• Not available	• 0.9	• Not available

Roseate tern - *Sterna dougallii*

The Roseate tern European population abundance is between 1,900 to 2,400 BP, 53-63% in the Azores, 31-39% in Ireland and 2-3% in Britain (Newton 2004). Population trends in Europe and North America are well documented, but in the Azores, annual monitoring only started in 1989. The population in the archipelago has fluctuated since then between 400 and 1,200 BP (Neves, 2005). Conservation status is "Endangered". Breeding season starts in April and lasts until September.

Azores

Abundance using nest count, apparently occupied nests and flush counts (D1C2) and distribution range (D1C4) are monitored in Azores through the MONIAVES program by DRAM.

D1C1 – SB_BYC_BR: No bycatch of the Common tern has been detected in the Azorean fishing monitoring program (POPA project).

D1C4 – SB_DIS_RG: The number of colonies of this species is still being studied.

Preliminary results show that this species is in GES for D1C1, and range status cannot still be assessed.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	SB_BYC_BR	0 individuals [1993-1999; POPA]	Trend	0 individuals [2018; POPA]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- All Azorean Islands

D1C2 – SB_ABU_NC: Abundance of the Roseate tern has not been assessed with the standardized methodology agreed for the Macaronesia. Therefore, abundance assessment cannot be done for this colony.

D1C3 – SB_DEM_BS: Breeding success of the Roseate tern is not currently available in the Azores.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet and no baseline exists for the Azores.

Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

White-faced storm petrel - *Pelagodroma marina*

Madeira

The White-faced storm-petrel breeds on several tropical, subtropical and temperate islands in both hemispheres, but some aspects of its breeding biology are still poorly known. The European subspecies *Pelagodroma marina hypoleuca* is almost confined to the Selvagems Islands and Madeira. Due to restricted distribution, this subspecies is relatively vulnerable to extinction. Breeding season occurs from mid-December to mid-August (Campos and Granadeiro, 1999).

Campos & Granadeiro (1999) estimated the population of Selvagem Grande at 36,000 BP. However, the number of White-faced storm petrels may be higher than previously thought with a new estimate of at least 62,550 BP on the two islets of the Selvagems (i.e. Selvagem Pequena and Fora islet; Catry *et al.*, 2010).

D1C4 – SB_DIS_RG: Range of White-faced storm petrel has not still been assessed in Madeira.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	Not available	Trend	Not available

- Selvagem Grande

D1C2 – SB_ABU_NC: Abundance of White-faced storm petrels has not been assessed with the standardized methodology agreed for the Macaronesia. Therefore, abundance assessment cannot be done for this colony.

D1C3 – SB_DEM_BS: The BS of this colony has not been calculated.

D1C3 – SB_DEM_SR: Current survival rate has not been calculated yet, and no baseline exists for this colony. Threshold has been set as 0.9 for all seabird colonies of the Macaronesia.

There is not GES assessment for the whole colony available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	Not available	Trend	Not available
D1C3	SB_DEM_BS	Not available	Trend	Not available
D1C3	SB_DEM_SR	Not available	0.9	Not available

Canary Islands

D1C4 – SB_DIS_RG: There were 2 colonies of White-faced storm petrels in the Canary Islands. One of those, sited in Alegranza, was very small (around 5 BP) and no occupied burrows were active during the last visit in 2016 (Rodríguez-Godoy and Padrón, 2016). Therefore, although it cannot be still confirmed, it is possible that the breeding range of this species has decreased and could not be considered in GES.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C4	SB_DIS_RG	2 colonies [2016; Rodríguez-Godoy and Padrón 2016]	Trend	0 colonies [2016; MISTIC SEAS II]

- Alegranza

D1C2 – SB_ABU_NC: The monitoring of abundance in this colony is carried out by the Canary Islands government. The abundance is estimated by direct counting of active nests. This colony has always been very small (5 BP, set as baseline), but no nests were found during the last visit during the MISTIC SEAS II fieldwork (2016). The area has been colonised by Cory's Shearwater, and the habitat seems to be depredated due to the presence of rabbits (Rodríguez-Godoy and Padrón, 2016). It cannot be currently considered in GES.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	5 BP [2016; Rodríguez-Godoy and Padrón 2016]	Trend	0 BP [2016; MISTIC SEAS II]

- Montaña Clara

D1C2 – SB_ABU_NC: This is the main colony of the Archipelago. The monitoring of abundance in this colony is carried out by the Canary Islands government. The number of active nests is assessed by direct counting. The population seems to be increasing. The colony is estimated to be of about 73 BP (data from 2016). Its trend seems to be positive with an increase in the number of BP since 1987 when the monitoring program took off (Rodríguez-Godoy and Padrón, 2016). Therefore, this colony can be considered in GES for this criterion.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	SB_ABU_NC	20 [1987; Rodríguez-Godoy and Padrón 2016]	Trend	73 [2016; Rodríguez-Godoy and Padrón 2016]

B. MAMMALS

Pilot monitoring programs carried out as part of the MISTIC SEAS II project obtained baseline abundance figures for some marine mammal populations. However, it should be noted that these values originate from surveys designed to test the viability of the methodology proposed, and as such, care should be taken when comparing these baselines with previous or future values. No formal assessment has yet been carried out to validate the adequacy and efficiency of the sampling strategy, but the results point out that, for at least some species/MUs, more search effort is needed (over a wider sampling period within a year and over multiple years) to reduce the CVs of the abundance estimates and increase the power to detect trends to the levels needed for MSFD assessment.

In the case of the population estimates obtained with the photo-ID surveys, previous estimates encompassed a larger period (7 years in the case of Madeira) and surveys took place year around and not during a particular season like in MISTIC SEAS II pilot monitoring surveys. With a longer dataset, more island-associated individuals would be considered and would eventually increase the population abundance estimates. Therefore, the estimates presented here should not be used to deduce any trend and should be considered to represent minimum estimates.

For the line-transect pilot monitoring surveys, previous estimates encompassed a larger period, and moreover, during the design of the line-transect surveys using distance sampling methodology, it was decided to concentrate the effort in high density areas of the Madeira archipelago. Thus, the abundance estimates given here (values) are for these areas and not for the all the Madeira archipelago inshore waters. For these reasons, no direct comparison with the previous baseline values should be made, and consequently, no trends should be obtained from the values obtained from the pilot monitoring programs of the MISTIC SEAS II project.

Small toothed cetaceans

Atlantic spotted dolphin - *Stenella frontalis*

The Atlantic spotted dolphin is listed as 'Least Concern' (Braulik and Jefferson, 2018). There is no estimate of the global abundance of the species, and the only estimates available are from the western North Atlantic. Based on aerial and shipboard surveys, 55,436 (CV = 0.32) individuals were estimated on the shelf, slope and offshore waters from Florida to the Scottish Shelf, and 47,488 (CV = 0.13) individuals in the Gulf of Mexico (Roberts *et al.*, 2016). Population trends are unknown for any area where the species occurs.

Azores

In the Azores, Atlantic spotted dolphins are considered as of 'Least Concern' (Cabral *et al.*, 2005).

D1C1 – MM_BYC_BR: Information on bycatch rates of this species is available for the pole-and-line tuna fishery, purseseine fishery for small pelagic fish, demersal fishery (using handlines and bottom longlines) and the Portuguese surface longline fishery (Silva *et al.*, 2011; Cruz *et al.*, 2018). Between 1998 and 2012, 9 Atlantic spotted dolphins were incidentally captured (Cruz *et al.*, 2018) yielding an average bycatch rate of 0.00048 (SD = 0.0014) dolphins per year. From 2013 to 2017, 14 Atlantic spotted dolphins were incidentally captured yielding a bycatch rate of 0.0041 (SD = 0.0057) dolphins and representing nearly a 10-fold increase relative to the previous period. It should be stressed, however, that these estimates represent bycatch rates and not mortality rates because all animals were released alive by cutting the fishing line, and it was not possible to determine whether they died or not as a result of the interaction. From 1998 to 2006, a total of 2670 fishing events for small pelagic fishes were monitored. There were no reports of cetacean bycatch associated with this fishery (Silva *et al.*, 2011). 271 sets and 22,997 hooks were observed in the demersal fishery from 2004-2006, and 384 sets and 586,300 hooks were observed in the longline fishery between 1998 and 2004. No bycatch was recorded in any of these fisheries (Silva *et al.*, 2011). Since 2015, bycatch of the Portuguese longline fleet has been monitored through COSTA projects: 135 sets and 133,712 hooks were observed, and there was no bycatch of Atlantic spotted dolphins.

D1C2 – MM_ABU_DS: No distance sampling survey has been conducted in the past, so there are no previous estimates of abundance of the species. Abundance values obtained during MISTIC SEAS II pilot survey in July-August 2018 are proposed as baseline values for assessing GES in the future. These values slightly differ depending on the method used: Design-based (2,328 individuals; CV = 0.20) Model-based (2,324 individuals; CV = 0.15).

Although it is not possible to predict with certainty whether abundance of the Azorean MU is in GES until a longer data series is available (at least three abundance estimates), bycatch levels do not seem to be problematic taking into account the current abundance estimates.

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Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	MM_BYC_BR	• Tuna-fishery: 9 individuals; 0.00048 ± 0.0014 dolphins/ton of tuna [1998-2012; Cruz *et al.*, 2018] • Purse-seine fishery: 0 [1998-2006; Silva *et al.*, 2011] • Demersal fishery: 0 [2004-2006; Silva *et al.*, 2011] • Longline fishery: 0 [1998-2004; Silva *et al.*, 2011]	Not set	• Tuna-fishery: 14 individuals; 0.0041 ± 0.0057 dolphins/ton of tuna [2013-2017; POPA] • Longline fishery: 0 [2015-2018; COSTA]
D1C2	MM_ABU_DS	• Design-based estimate: 2,328 individuals (95% CI =1,579-3,432; CV = 0.20) [July-August 2018; MISTIC SEAS II] • Model-based estimate: 2,324 individuals (95% CI= 1,937-2,698; CV = 0.15) [July-August 2018; MISTIC SEAS II]	Trend	• Design-based estimate: 2,328 individuals (95% CI =1,579-3,432; CV = 0.20) [July-August 2018; MISTIC SEAS II] • Model-based estimate: 2,324 individuals (95% CI= 1,937-2,698; CV = 0.15) [July-August 2018; MISTIC SEAS II]

Madeira

This species was categorized in 2005 as 'Data Deficient' for Madeira (Cabral *et al.*, 2005). In the first assessment of the MSFD for Madeira, the species was considered in GES based on the expert judgement and taking into consideration the low level of impacts perceived at the time (SRA, 2014).

<u>D1C2 – MM_ABU_DS:</u> Abundance of this MU – namely animals using all Madeira's coastal waters seasonally (summer and autumn) – was estimated at 1,067 individuals (CV = 022) between 2007 and 2012 (Freitas *et al.*, 2014b). This value was used as the baseline. The abundance estimates of Atlantic spotted dolphins obtained from the MISTIC SEAS II project are the result of a pooled analysis of all *S. frontalis* and the unidentified small dolphins with the assumption that all sighted small dolphins belonged to this species. This assumption is strongly supported by the fact that all non-identified small dolphins with similar behaviour that were approached to confirm the species in the oceanic survey were of this species. The abundance of 863 dolphins (CV = 0.40) and 933 dolphins (CV = 0.49) estimated using designed-based and model-based methods were obtained in 2017 only for the high-density areas of the archipelago of Madeira. Future estimates should take this into consideration in the comparison of estimates and interpretation of trends. Although a baseline has been set, the current values presented are not comparable to the previously proposed baseline values due to overall geographic (survey areas) and temporal coverage differences between the surveys (MISTIC SEAS II surveys were done in 1 year covering a few months in summer and autumn while the previous surveys were done from 2007 to 2012 covering all months of the year).

It is not possible presently to determine trends and assess GES for this species in Madeira. In case the abundance estimates given here are used as baseline data for future estimates, a precautionary approach should be taken considering the pilot nature of the MISTIC SEAS II surveys and that the estimates given here are for the high-density area of Madeira and not for the all Madeira archipelago inshore waters. To allow comparison between the current values (MISTIC SEAS II estimates) and previous estimates (Freitas *et al.*, 2014a), at least based on the same geographic coverage, new model-based abundance estimates will be available in the near future for the period 2007-2012 for this species for the same area sampled in MISTIC SEAS II surveys and thus to be proposed as baseline values for the abundance of this species in the Madeira archipelago.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Model-based: 1,067 individuals (95%CI = 717-1378; CV = 0.22) [2007-2012; Freitas *et al.*, 2014b]	Trend	• Design-based: 853 individuals (95% CI =400-1,821; CV = 0.40) [2017; MISTIC SEAS II] • Model-based: 933 individuals (95% CI = 400-2,519; CV = 0.49) [2017; MISTIC SEAS II]

Canary Islands

Atlantic spotted dolphins are distributed all over the Canary Island waters year-round, with relative fewer sightings during the summer months.

D1C2 – MM_ABU_DS: Besides the many studies previously conducted in the Canary Islands, the vast amount of data regularly collected by different research groups is scattered in time and space and obtained by applying different searching methodologies. Therefore, no baseline values can be used for the whole archipelago or for a specific area or island. The abundance estimates obtained during the MIS-TIC SEAS II project can instead be treated as baseline values for future studies and status evaluation. The current (2017) abundance of Atlantic spotted dolphins of the Canary Islands is 39,306 individuals (CV = 0.32) using the designed-based method and 39,306 individuals (CV = 0.18) using the model-based method.

Since only one abundance value is available for this MU, no judgements about its current status can be assessed, and it remains unknown if this species can be considered in GES.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Design-based: 39,306 individuals (95% CI = 20,988-73,612; CV = 0.32) [2017; MISTIC SEAS II] • Model-based: 34,851 individuals (95% CI = 22,462-42,090, CV = 0.18) [2017; MISTIC SEAS II]	Trend	• Design-based: 39,306 individuals (95% CI = 20,988-73,612; CV = 0.32) [2017; MISTIC SEAS II] • Model-based: 34,851 individuals (95% CI = 22,462-42,090, CV = 0.18) [2017; MISTIC SEAS II]

Bottlenose dolphin - *Tursiops truncatus*

Bottlenose dolphin status is classified by the IUCN as "Least Concern" on a worldwide level (Hammond *et al.*, 2012). Abundance has been estimated for several parts of the range of the species. Pooling available figures, a minimum world-wide estimate is 600,000 (Wells and Scott, 2018). Three wide-scale surveys - SCANS-II, CODA and SCANS-III surveys in in 2005, 2007 and 2016 respectively - covering almost all shelf waters and offshore waters of European, estimated 35,900 (CV = 0.21), bottlenose dolphins in 2005-2007 and 27,700 (CV = 0.23) in 2016 (Hammond *et al.*, 2013, 2017). There is no information on global or European trends in abundance.

Azores

Bottlenose dolphins are classified as 'Least Concern' in the Azores (Cabral *et al.*, 2005).

D1C1 – MM_BYC_BR: Assessment of bycatch rates of bottlenose dolphins is based on the same monitoring programs and follows the same methods described for Atlantic spotted dolphins. Between 1998 and 2012, 1 bottlenose dolphin was incidentally captured in the tuna fishery (Cruz *et al.*, 2018), and 11 individuals were bycaught in 2013 to 2017 representing nearly a 100-fold increase in bycatch rate between the two periods. It should be stressed, however, that these estimates represent bycatch rates and not mortality rates because all animals were released alive by cutting the fishing line, and we have no way of determining whether they died or not as a result of the interaction. There was no bycatch of bottlenose dolphins in the purse seine, demersal or surface longline fisheries. The current bycatch values are over the 1% of the best abundance estimate for the area. However, dolphins are often released alive, so the mortality rate may be lower.

D1C2 – MM_ABU_DS: Abundance of MU-I is proposed to be assessed using DS methods. No distance sampling survey has been conducted in the past, so there are no previous estimates of abundance of the species. Abundance values obtained during MISTIC SEAS II pilot survey are proposed as baseline values for the parameter for assessing this criterion in the future. The number of sightings in the distance survey did not allow spatial analysis for the calculation of abundance in Azores and only designed-based abundance could be estimated as 431 individuals (CV = 0.41).

D1C2 – MM_ABU_CMR: Abundance of MU-II is proposed to be assessed using CMR methods. Baseline estimates of the absolute abundance of the island-associated individual (MU-II) were calculated using the coastal waters around Faial and Pico (Silva *et al.*, 2009). Estimates of the annual abundance was calculated by applying a Jolly-Seber model to photo identification data collected between 1999 and 2004. The estimate of annual abundance for 2003 was 312 adults and 300 sub-adults (CV = 0.11 and 0.13). This value is proposed as baseline value. Current values for population abundance were obtained with Robust Design models applied to data collected during the MISTIC SEAS II pilot survey. Although these estimates are very similar to the combined baseline estimates of adult and subadult bottlenose dolphins, care should be taken when comparing these estimates due to differences in sampling protocol and analytical approaches used.

D1C3 – MM_DEM_SR: Survival rate of MU-II is proposed to be assessed using CMR methods. Baseline estimates of survival rates was calculated between 1999 and 2004 for coastal waters around Faial and Pico using a Cormack-Jolly-Seber model applied to photo identification data (Silva *et al.*, 2009). A survival rate of 0.97 for adults and 0.82 for sub-adults was calculated for the period 1999-2004. The MISTIC SEAS II pilot survey spanned over a few months and did not enable estimating annual survival rates. In conclusion, estimates are insufficient to calculate a trend and assess GES.

Criterion	Parameter	Baseline	Threshold	Current Value [year]
D1C1	MM_BYC_BR	• Tuna-fishery: 1 individual; 0.000003 ± 0.000121 dolphins/ton of tuna [1998-2012; Cruz *et al.*, 2018] • Purse-seine fishery: 0 [1998-2006; Silva *et al.*, 2011] • Demersal fishery: 0 [2004-2006; Silva *et al.*, 2011] • Longline fishery: 0 [1998-2004; Silva *et al.*, 2011]	Not set	• Tuna-fishery: 11 individuals; 0.0033 ± 0.0046 dolphins/ton of tuna [2013-2017; POPA] • Longline fishery: 0 [2015-2018; COSTA]
D1C2	MM_ABU_DS	• MU-I: 431 individuals (95% CI = 197-941, CV = 0.41) [July-August 2018 MISTIC SEAS II]	Trend	• MU-I: 431 individuals (95% CI = 197-941, CV = 0.41) [July-August 2018; MISTIC SEAS II]
D1C2	MM_ABU_CMR	• MU-II: 312 adults (95% CI = 254-384; CV = 0.11). 300 sub-adults (95% CI = 232-387; CV = 0.13) [2003]	Trend	• MU-II: 640 individuals (95% CI = 397-1030, CV: 0.25) adults and sub-adults [August 2017-April 2018; MISTIC SEAS II]
D1C3	MM_DEM_SR	• MU-II: adults: 0.97 (0.029 SE); sub-adults: 0.82 (0.083 SE) [1999-2004]	Not set	• Not available

Madeira

This species was categorized as 'Least Concerned' for the Madeira subdivision in 2005 (Cabral *et al.*, 2005). In the first assessment of the MSFD for Madeira, the species was considered in GES based on the expert judgement and taking in consideration the low level of impacts perceived at the time (SRA, 2014).

D1C2 – MM_ABU_DS: Abundance of MU-I is proposed to be assessed using DS methods. There are previous abundance estimates (calculated with DS between 2007 and 2012) that can be used as baselines for coastal waters of the Madeira, Porto Santo and Desertas Islands (482 individuals; CV = 0.14) (Freitas *et al.*, 2014a). However, the current abundance estimates obtained in 2017 during the oceanic surveys of the MISTIC SEAS II project were calculated only in high-density areas of Madeira and, therefore, cannot be compared to the previous baseline due to the differences in the geographical coverage used.

D1C2 – MM_ABU_CMR: Abundance of MU-II is proposed to be assessed using CMR methods. There are also previous estimates that can be used as baselines values of absolute abundance for the southern island-associated individuals (183 individuals; CV = 0.16) obtained using photo identification and mark-recapture models during the period 2011-2012 (Dinis, 2014; Freitas *et al.*, 2014b). Care should be taken because the population was only studied at the southern part of Madeira.

D1C3 – MM_DEM_SR: Survival rate of MU-II is proposed to be assessed using CMR methods. Data for calculating survival rates of coastal bottlenose dolphins from Madeira have been collected and are available for analyses. However, the MISTIC SEAS II pilot survey spanned over a few months and did not enable estimating annual survival rates.

The current values presented are not comparable to the previously proposed baseline values due to overall geographic (survey areas) and temporal coverage differences between the surveys (MISTIC SEAS surveys were done in 1 year covering a few months in summer and autumn, while the previous surveys were done from 2007 to 2012 covering all months of the year). Therefore, it is not possible presently to determine trends and assess GES for this species in Madeira. However, to allow comparison between the current values (MISTIC SEAS II estimates) and previous estimates (Freitas *et al.*, 2014a) at least based on the same geographic coverage, new model-based abundance estimates will be available in the near future for the period 2007-2012 for this species for the same area sampled in MISTIC SEAS II surveys and thus to be proposed as baseline values for the abundance of this species in the Madeira archipelago.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Model-based: 482 individuals (95% CI = 365-607; CV = 0.14) [2007-2012]	Not set	• Design-based: 226 individuals (95% CI = 113-450, CV = 0.36) [2017; MISTIC SEAS II] • Model-based: 197 individuals (95% CI = 171-265, CV = 0.30) [2017; MISTIC SEAS II]
D1C2	MM_ABU_CMR	• MU-II south: 183 individuals (95% CI = 155-218; CV = 0.16) [2011-2012]	Trend	• MU-II south: 103 individuals (95% CI = 99-115; CV= 0.04) [2017; MISTIC SEAS II] • MU-II north and south: 164 individuals (95% CI = 158-177; CV = 0.03) [2017; MISTIC SEAS II] • MU-II and transients south: 734 individuals (95% CI = 514-1189; CV = 0.22) [2017; MISTIC SEAS II] • MU-II and transients, north and south: 794 individuals (95% CI = 621-1101, CV = 0.15) [2017; MISTIC SEAS II]
D1C3	MM_DEM_SR	• Not available	Not set	• Not available

Canary Islands

In the Canary Islands, there is considered to be resident populations, but some movements of individuals among the western islands (El Hierro, La Palma, La Gomera and Tenerife) has been reported indicating that at least 20% of the dolphins in the western islands travel among different Special Areas of Conservation - SACs (Tobeña *et al.*, 2014). While a high proportion of bottlenose dolphins are identified once in these waters (transient animals), others have been re-sighted multiple times (animals associated to the islands) where resident coastal communities have been recorded feeding, breeding and calving (Tobeña *et al.*, 2014).

D1C2 – MM_ABU_DS: Abundance of MU-I is proposed to be assessed using DS methods. There are not previous DS estimates for this area. Abundance estimated during the MSITIC SEAS II project (summer of year 2017) is proposed to be used as the baseline value for future assessments of its status. Current abundance estimates are 2,590 (CV = 0.34) and 2,808 (CV = 0.27) using designed-based and model-based model respectively.

D1C2 – MM_ABU_CMR: Abundance of MU-II is proposed to be assessed using CMR methods. Only bottlenose dolphins of the Teno-Rasca SAC area has been proposed to be assessed due to the presence of a semi-resident population and the human impact that suffers such as whale watching companies operating in the area. There are not previous abundance estimates available for the area. In project MISTIC SEAS data was collected, but due to the low number of recaptures, it was not possible to perform robust abundance estimates.

D1C3 – MM_DEM_SR: Survival rate of MU-II is proposed to be assessed using CMR methods. Only bottlenose dolphins of the Teno-Rasca SAC area has been proposed to be monitored. There are not previous survival rates calculated for the area. In project MISTIC SEAS II, data was collected, but due to the low number of recaptures it was not possible to estimate survival rates for this species.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Design-based: 2,590 individuals (95% CI =1,347-4,982; CV = 0.34) [2017; MISTIC SEAS II] • Model-based: 2,808 individuals (95% CI =1,878-3,449; CV = 0.27) [2017; MISTIC SEAS II]	Trend	• Design-based: 2,590 individuals (95% CI =1,347-4,982; CV = 0.34) [2017; MISTIC SEAS II] • Model-based: 2,808 individuals (95% CI =1,878-3,449; CV = 0.27) [2017; MISTIC SEAS II]
D1C2	MM_ABU_CMR	• Not available	Trend	• Not available
D1C3	MM_DEM_SR	• Not available	Not set	• Not available

Common dolphin – *Delphinus delphis*

Common dolphins are world-wide distributed in almost all shelf (and oceanic) template waters. Its status is classified as "Least Concern" by the IUCN (Hammond *et al.*, 2012).

Madeira

This species was categorized as Least Concerned for the Madeira subdivision in 2005 (Cabral *et al.*, 2005). In the first assessment of the MSFD for Madeira, the species was considered in GES based on the expert judgement and taking in consideration the low level of impacts perceived at the time (SRA, 2014).

D1C2 – MM_ABU_DS: There is a previous abundance estimate that could be used as baseline for this MU - 741 (CV = 0.266) animals using Madeira archipelago coastal waters seasonally (Freitas *et al.*, 2014a). It was not possible to obtain abundance estimates for this species during the MISTIC SEAS II project due to limited yearly coverage of the surveys. While the surveys were carried out during summer and autumn, the common dolphin is mostly present in Madeira during winter and spring. The absence of updated abundance for the species in Madeira renders impossible to asses GES of the species in the archipelago.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Model-based: 741 (95% CI = 496-1032; CV = 0.266) [2007-2012]	Trend	• Not available

Baleen whales

Bryde's whale - *Balaenoptera edeni*

Bryde's whale world-wide status is classed as "Least Concern" by the IUCN (Cooke, 2018).

Madeira

The conservation status of Bryde's whale has not been assessed in Madeira (Cabral *et al.*, 2005; SRA, 2014).

<u>D1C2 – MM_ABU_DS:</u> There are not previous baseline values for this species in the Madeira archipelago. The current abundance estimates of Bryde's whales are the result of a pooled analysis of all baleen whales (Bryde's whales and unidentified baleen whales) observed during the DS oceanic surveys of 2017 performed during the MISTIC SEAS II project in the archipelago of Madeira with the assumption that all sighted baleen whales belonged to this species. This assumption is strongly supported by the fact that all baleen whales for which it was possible to confirm the species were Bryde's whales. The current (2017) abundance estimates are 37 (CV = 0.26) and 29 (CV = 0.28) individuals using design-based and model-based models respectively. These values correspond to the high-density area of Madeira and are therefore not applicable to the whole Madeira archipelago waters. These values can be used as baseline values for future assessments.

The current data is not enough to assess the environmental status of this indicator species.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Design-based: 37 individuals (95% CI = 22–62; CV = 0.26) [2017; MISTIC SEAS II] • Model-based: 29 individuals (95% CI = 20-44; CV = 0.28) [2017; MISTIC SEAS II]	Trend	• Design-based: 37 individuals (95% CI = 22–62; CV = 0.26) [2017; MISTIC SEAS II] • Model-based: 29 individuals (95% CI = 20-44; CV = 0.28) [2017; MISTIC SEAS II]

Canary Islands

<u>D1C2 – MM_ABU_DS</u>: There are not data on abundance of Bride's whale in Canary Islands. Therefore, its environmental status cannot be assessed.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Not available	Trend	• Not available

Fin whale - *Balaenoptera physalus*

The Red List category of fin whales has recently changed from 'Endangered' to 'Vulnerable' (Cooke, 2018). The cause of the population reduction in fin whales (commercial whaling) that occurred in the 20th century is reversible, understood, and has been brought under control. The current global population size is uncertain due to lack of data from major parts of the range. However, plausible projections of the global mature population size indicate that it has probably recovered to over 30% of the level of three generations ago (1940) (i.e. reduction of <70% over the last three generations) but has not necessarily reached 50% of that level yet (Cooke, 2018). The most recent estimate from SCANS-III survey for the NE Atlantic is 18,142 (CV = 0.32) individuals (Hammond *et al.*, 2017).

Azores

Fin whales are classified as 'Endangered' in the Azores (Cabral *et al.*, 2005).

D1C1 – MM_BYC_BR: Assessment of bycatch rates of fin whales is based on the same monitoring programs described above for Azores. There was no bycatch of fin whales in any of the fisheries monitored in the region neither in the past nor in the present, so the MU is in GES for this criterion.

D1C2 – MM_ABU_DS: No baseline abundance value exists for this species because there has never been a previous distance sampling survey in the Azores. The distance sampling survey done in the MISTIC SEAS II project was carried out outside the period of occurrence of the species in the region and could not estimate their abundance. Hence, there are no estimates of abundance of this MU to assess GES.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	MM_ BYC_BR	• Tuna-fishery: 0 [1998-2012; Cruz *et al.*, 2018] • Purse-seine fishery: 0 [1998-2006; Silva *et al.*, 2011] • Demersal fishery: 0 [2004-2006; Silva *et al.*, 2011] • Longline fishery: 0 [1998-2004; Silva *et al.*, 2011]	Not set	• Tuna-fishery: 0 [2013-2017; POPA] • Longline fishery: 0 [2015-2018; COSTA]
D1C2	MM_ABU_DS	• Not available	Trend	• Not available

Deep-diving toothed cetaceans

Cuvier's beaked whale - *Ziphius cavirostris*

Cuvier's beaked whales are classed globally as 'Least Concern' by the IUCN (Taylor *et al.*, 2008a).

Canary Islands

Based on the existence of two main hot spots in the archipelago, two separated MUs were identified in the Canary Islands: MU-I Eastern islands (mainly in El Hierro Island) and MU-II Western islands (mainly in eastern areas of Lanzarote and Fuerteventura islands).

D1C2 – MM_ABU_DS: During the surveys carried out as part of MISTIC SEAS II, sightings of this species were analysed, and an abundance estimate was obtained using line-transect methodology. An abundance of 56 individuals (CV = 0.73) was estimated using design-based methods for the whole area (MU-I and MU-II). Because no estimates have been ever done in the same area and with the same methodology, a previous baseline is not available. The abundance estimates obtained for this species during the MISTIC SEAS II project can instead be treated as baseline values for future studies and status evaluation. At the moment, no judgements about its current status can be assessed, and it remains unknown if this species can be considered in GES or not.

D1C2 – MM_ABU_CMR: The baseline for MU-I is based on the studies of Reyes *et al*. (2015) between 2003 and 2014 for the southern area of El Hierro using photo identification methods. It is the only estimate available nowadays, and therefore, no trends can be estimated nor assessment performed.

D1C3 – MM_DEM_SR: There are no survival rate estimates for Cuvier´s beaked whales in the Canary Islands.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• Design-based: 56 individuals (95% CI = 15-212; CV = 0.73) [2017; MISTIC SEAS II]	Trend	• Design-based: 56 individuals (95% CI = 15-212; CV = 0.73) [2017; MISTIC SEAS II]
D1C2	MM_ABU_CMR	• 61 individuals (95% CI = 55-76; SE = 4.9) [2003-2014]	Trend	• Not available
D1C3	MM_DEM_SR	• Not available	Not available	• Not available

Risso's dolphin - *Grampus griseus*

Risso's dolphins are listed as 'Least Concern' (Kiszka and Braulik, 2018). There are no estimates of global abundance for the species, but there are estimates for a few regions. In US waters, 7,732 (CV = 0.09) Risso's dolphins were estimated along the Atlantic coast, and 3,137 (CV = 0.10) in the Gulf of Mexico (Roberts *et al*., 2016). Aerial surveys on the European continental shelf in summer 2016 (SCANS-III) estimated 11,069 (CV = 0.51) Risso's dolphins with highest densities off eastern Ireland and northwestern Scotland (Hammond *et al*., 2017). There is no information on global trends in abundance.

Azores

Risso's dolphins are classified as 'Data Deficient' (Cabral *et al*., 2005).

D1C1 – MM_BYC_BR: Assessment of bycatch rates of Risso's dolphins is based on the same monitoring programs described for the Azores and follows the same methodology. There was no bycatch of fin whales in any of the fisheries monitored in the region neither in the past nor in the present, so the MU is in GES for this criterion.

D1C2 – MM_ABU_DS: The only estimates of abundance available were provided by Nova Atlantis Foundation for the (http://www.nova-atlantis.org) island-associated Risso's dolphins inhabiting the waters south of Pico island. 452 individuals (95% CI = 408 – 496) were estimated from mark-recapture analysis of photo identification data (van der Stap and Hartman, pers. Comm.). This value has been proposed as baseline for future assessments of this MU. As there are no other abundance estimates, GES of this MU cannot be assessed for this criterion.

D1C2 – MM_ABU_CMR: The only estimates of survival rate available were provided by Nova Atlantis Foundation for the (http://www.nova-atlantis.org) island-associated Risso's dolphins inhabiting the waters south of Pico island. 0.94 (95%CI = 0.85-0.98) was estimated from mark-recapture analysis of photo identification data (van der Stap and Hartman, pers. Comm.). This value has been proposed as the baseline for future assessments of this MU. As there are no other survival rate estimates, GES of this MU cannot be assessed for this criterion.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	MM_ BYC_BR	• Tuna-fishery: 0 [1998-2012; Cruz *et al.*, 2018] • Purse-seine fishery: 0 [1998-2006; Silva *et al.*, 2011] • Demersal fishery: 0 [2004-2006; Silva *et al.*, 2011] • Longline fishery: 0 individuals [1998-2004; Silva *et al.*, 2011]	Not set	• Tuna-fishery: 0 [2013-2017; POPA] • Longline fishery: 0 [2015-2018; COSTA]
D1C2	MM_ABU_CMR	• 452 individuals (95%CI = 408 – 496) [2004-2007]	Trend	• Not available
D1C3	MM_DEM_SR	• 0.94 (95%CI = 0.85-0.98) [2004-2007]	Not set	• Not available

Short-finned pilot whale - *Globicephala macrorhynchus*

Short-finned pilot whales are classed as 'Least Concern' by the IUCN (Minton *et al.*, 2018).

Madeira

This species was categorized as 'Least Concerned' in waters of Madeira in 2005 (Cabral *et al.*, 2005). In the first assessment of the MSFD for Madeira, the species was considered in GES based on the expert judgement and taking in consideration the low level of impacts perceived at the time (SRA, 2014).

D1C2 – MM_ABU_DS: Abundance of MU-I is proposed to be assessed using DS methods. There is an estimate already available for MU-I (namely population using the coastal waters of Madeira, Porto Santo and Desertas Islands) that is proposed to be used as baseline. This baseline value of 151 (CV=0.23) bottlenose dolphins was estimated between 2007 and 2012 using distance sampling methods (Freitas *et al.*, 2014b). During MISTIC SEAS II, new abundances of 95 and 131 individuals were estimated in 2017 using design-based and model-based methodologies respectively. The abundance estimates given here are for the high-density area of Madeira and not for the whole of the Madeira archipelago inshore waters as is the case of the baseline. Although the species is present year-round with most of its distribution falling in the high-density area, these values could be comparable. However, care should still be taken when comparing these values with previous baselines and in the interpretation of the data to assess GES.

D1C2 – MM_ABU_CMR: Abundance of MU-II is proposed to be assessed using CMR methods. There is an estimate already available for MU-I (namely population abundance and survival rate of island-associated groups using the south coast of Madeira) that is proposed to be used as a baseline. This baseline value of 140 (CV = 0.05) short-finned pilot whales was estimated between 2005 and 2011 based on photo identification methodologies (Alves *et al.*, 2013. During MISTIC SEAS II, new abundances of 108 (CV = 0.04) island-associated individuals (of the southern coast of Madeira) and 662 (CV = 0.24) island-associated individuals including transients were provided. The first study encompassed a much longer time period and different seasonal coverage (7 years of sighting data collected during summer and autumn) than estimates obtained during the MISTIC SEAS II project (data collected from August 2017 until February 2018). Therefore, these values should not be compared directly. With a longer dataset, more island-associated individuals would be considered and would eventually increase the estimate. A comparable estimate for island-associated animals would probably fall somewhere between the two current value estimates. However, care should be taken when comparing with previous baselines and in the interpretation of the data to assess GES.

D1C3 – MM_DEM_SR: Survival rate of MU-II is proposed to be assessed using CMR methods. A survival rate of 0.96 was provided by Alves *et al.* (2013) for the island associated individuals (of the southern coast of Madeira) between 2005 and 2011. Data for calculating survival rates has been collected and is available for analyses. However, the MISTIC SEAS II pilot survey spanned over a few months and did not enable estimating annual survival rates.

Therefore, the current status of this MU cannot be assessed yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• MU-I: Model-based: 151 individuals (95% CI = 99-201; CV = 0.23) [2007-2012; (Freitas *et al.*, 2014b]	Trend	• MU-I: Design-based: 95 individuals (95% CI = 59–151; CV = 0.24) [2017; MISTIC SEAS II] • MU-I: Model-based: 131 (95% CI = 60-128; CV = 0.19) [2017; MISTIC SEAS II]
D1C2	MM_ABU_CMR	• MU-II: Island associated south: 140 individuals (95% CI = 131-151; CV=0.05) [2005-2011; Alves *et al.*, 2013]	Trend	• MU-II: Island associated south: 108 (95% CI = 104-121; CV = 0.04) [2017; MISTIC SEAS II] • MU-II: Island-associated and transients: 662 (95% CI = 455-1129; CV: 0.24) [2017; MISTIC SEAS II]
D1C3	MM_DEM_SR	• MU-II: Island associated south: 0.960 (95% CI = 0.853-0.990; SE = 0.028) [2005-2011; Alves *et al.*, 2013]	Not set	• Not available

Canary Islands

Photo identification studies over previous decades have shown that short-finned pilot whales using the archipelago belong to a large oceanic population with most animals being identified as transient animals (seen once) with a small proportion of animals as re-sighted (visitors and animals associated to the islands Servidio, 2014). These two ecotypes mix and interact with each other contributing to a complex social and population structure and prevents genetic isolation of the island-associated animals. The island-associated animals are strongly vulnerable to local human impacts due to their much higher use of this area and also being the target of a highly developed whale-watching industry (Servidio, 2014).

<u>D1C2 – MM_ABU_DS:</u> Abundance of MU-I (all short-finned pilot whales using the Canary Islands archipelago coastal waters; i.e. transients, visitors and island-associated animals) is proposed to be assessed using DS methods. Spatial modeling analysis carried out with data collected between 1999 and 2012 gave a mean estimate of 1,980 (CV = 0.33) individuals for the whole archipelago with higher presence during the warmer months (Servidio, 2014). This value has been proposed as baseline. During the MISITC SEAS II project, model-based estimates produced a mean of 2,344 (CV = 0.24) animals using data collected during 2017. Baseline values and model-based abundance estimates produced in MISTIC SEAS II are quite similar with almost no variation in abundance during the warmer months. However, care should be taken when comparing and in the interpretation of the data to assess GES since the covered areas were not exactly the same. A longer time series would be necessary to accurately assess this MU.

<u>D1C2 – MM_ABU_CMR:</u> Abundance of MU-II (island-associated animals to the islands of Tenerife and La Gomera) is proposed to be assessed using CMR methods. Abundance of MU-II was estimated by Servidio (2014) using data of the southwest of Tenerife and La Gomera from 2007 to 2009. The value of 636 (CV = 0.028) individuals is used as baseline for this MU. During MISTIC SEAS II, data was collected but it still being processed. The baseline estimation was provided from a much longer time period and different seasonal coverage (2 years of sighting data, from 2007 to 2009 collected every month) than values being processed under MISTIC SEAS II project (data collected between August and September 2017). Therefore, these values should not be compared directly. With a longer dataset, more island-associated individuals would be considered and would eventually increase the estimate.

D1C3 – MM_DEM_SR: Survival rate of MU-II is proposed to be assessed using CMR methods. However, no survival rates have been still calculated for these MUs.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C2	MM_ABU_DS	• MU-I: Model-based whole archipelago: 1,980 individuals (95% CI = 1442-2324; CV = 0.33) [1999-2012] • MU-I: Model-based warmer months: 2,510 individuals (95% CI = 2,046-3,094; CV = 0.32) [1999-2012] • MU-I: Model-based colder months: 1,926 individuals (95% CI = 1,270-2,799; CV = 0.35) [1999-2012]	Trend	• MU-I: Design-based: 2,445 individuals (95% CI = 1,398-4,275; CV = 0.29) [2017; MISTIC SEAS II] • MU-I: Model-based: 2,344 individuals (95% CI =1,450-2,910; CV = 0.24) [2017; MISTIC SEAS II]
D1C2	MM_ABU_CMR	• MU-II: Southwest of Tenerife and La Gomera resident population: 636 individuals (95% CI = 602-671; CV = 0.028) [2007-2009]	Trend	• Not available
D1C3	MM_DEM_SR	• Not available	Not set	• Not available

Sperm whale - *Physeter macrocephalus*

Sperm whales are considered "Vulnerable" at a global level (Taylor *et al.*, 2008b). The pre-whaling global population of about 1,100,000 is believed to have been to approximately 360,000 (67% reduction from initial) through modern whaling, although much uncertainty is associated with these estimates (Whitehead, 2002). There is no evidence that the population has or hasn't recovered since the end of whaling, but in some areas, there is concern that populations are continuing to decline (Whitehead, 2002). About 5, 300 (CV = 0.12) and 2,128 (CV = 0.08) sperm whales were estimated along the US Atlantic coast and in the Gulf of Mexico respectively (Roberts *et al.*, 2016). SCANS-III 2016 survey yielded a population abundance estimate for sperm whales along European shelf and offshore waters of 13,518 (CV = 0.41) (Hammond *et al.*, 2017).

Azores

Sperm whales are classified as 'Vulnerable' in the Azores (Cabral *et al.*, 2005).

D1C1 – MM_BYC_BR: Assessment of bycatch rates of sperm whales is based on the same monitoring programs and follows the same methods described for Atlantic spotted dolphins. There was no bycatch of fin whales in any of the fisheries monitored in the region neither in the past nor in the present, so the MU is in GES for this criterion.

D1C2 – MM_BYC_BR: It was proposed to monitor the ship strike mortality of this species. However, the current data is not enough to assess its environmental status regarding this criterion.

D1C2 – MM_ABU_CMR: The only reliable estimates of the absolute abundance for the population of sperm whales in the Azores are those reported by Boys *et al.* (2019). These authors used photo iden-ification data of adult females and immatures of both sexes collected opportunistically in the coastal waters around Faial and Pico in the summer months (July-August) between 2011 and 2015 and applied a multi-state open robust model (MSORD) to estimate demographic and movement parameters of the population. Therefore, these estimates are not for the MU of sperm whales using the coastal waters of the Azores but only for the part of the MU that uses the waters around Faial and Pico islands. Estimates of abundance varied between years ranging from 367 (95% CI = 230-585) individuals in 2012 to 275 (95% CI = 174-436) in 2014 (Boys *et al.*, 2019). However, no clear trend was apparent in the data and the more precise estimate (with the lower CV), i.e. 45 adult female and immature CV = 0.19 calculated in 2011, is proposed as a baseline value for the parameter. As there are no other updated abundance estimates, GES of the MU cannot be assessed.

D1C3 – MM_DEM_SR: The only reliable estimates of survival rates available for the population of sperm whales in the Azores are also those reported by Boys *et al.* (2019). Annual survival probability of sperm whales did not vary over the study period and the average survival rate for the period 2011-2015 is proposed as the baseline value for the parameter (i.e. survival rate of 0.93; CV = 0.12). As there are no other updated survival rate, GES of the MU cannot be assessed.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	MM_BYC_BR	• Tuna-fishery: 0 individuals [1998-2012; Cruz *et al.*, 2018] • Purse-seine fishery: 0 individuals [1998-2006; Silva *et al.*, 2011] • Demersal fishery: 0 individuals [2004-2006; Silva *et al.*, 2011] • Longline fishery: 0 individuals [1998-2004; Silva *et al.*, 2011]	Not set	• Tuna-fishery: 0 individuals [2013-2017; POPA] • Longline fishery: 0 individuals [2015-2018; COSTA]
D1C1	MM_BYC_BR	• Not available	Trend	• Not available
D1C2	MM_ABU_CMR	• 345 adult female and immature individuals (95% CI = 238-502; CV = 0.19) [July-August 2011]	Trend	• Not available
D1C3	MM_DEM_SR	• 0.93 (95% CI = 0.74-1; CV = 0.12) [July-August 2011-2015]	Trend	• Not available

Madeira

This species was categorized as 'Vulnerable' in Madeira in 2005 (Cabral *et al.*, 2005), but it was not considered in the MSFD initial assessment for Madeira subdivision (SRA, 2014).

D1C2 – MM_BYC_BR: During MISTIC SEAS II, it was proposed to monitor the ship strike mortality to complement the monitoring effort considered for this parameter in the other two archipelagos (MISTIC SEAS, 2016a). The current data is not enough to assess its environmental status regarding this criterion.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	MM_BYC_BR	• Not available	Trend	• Not available

Canary Islands

No new abundance estimates were produced after the survey conducted in 2009 (Fais *et al.*, 2016), and therefore, it is not possible to assess the status of this species in the Canary Islands.

D1C1 – MM_BYC_MR: A total of 19 sperm whales that were stranded between 1999 and 2007 (including 11 calves-juveniles) showed signs of collisions (Carrillo and Ritter, 2010). This corresponds to more than 2 individuals killed by ship collisions per year on average, representing 0.9% of the estimated population (ranging from 1.7 to 0.48, based on the CI) which is probably underestimating the true mortality rate as some carcasses never achieve the coast. This estimate of mortality rate from ship-strikes alone exceeds the maximum annual rate of increase of the population which has been calculated at 1% (Reijnders, 1997). Therefore, although accurate values are not available, Canary sperm whales seem to be not in GES according this criterion.

D1C2 – MM_ABU_DS: Abundance of sperm whales around the Canary Islands was estimated to be around 224 individuals from a survey carried out in 2009 (Fais *et al.*, 2016) with the 95% CI ranging from 120 to 418 animals. This value has been proposed as a baseline. As there are no other updated abundance estimate, GES of the MU cannot be assessed.

D1C2 – MM_ABU_CMR: The current data is not enough to assess the current environmental status of this indicator species.

D1C3 – MM_DEM_SR: Survival rate have not been still calculated for these MUs.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	MM_BYC_MR	• Not available	1 individual	• Not available
D1C2	MM_ABU_DS	• 224 individuals (95% CI = 120-418) [2009; Fais *et al.*, 2016]	Trend	• Not available
D1C2	MM_ABU_CMR	• Not available	Trend	• Not available
D1C3	MM_DEM_SR	• Not available	Not set	• Not available

Seals

Monk seal - *Monachus monachus*

The Mediterranean monk seal (*Monachus monachus*) is a 'Critically endangered' species. With less than 600 individuals throughout its distribution range, it is considered one of the most endangered mammals in the world (Karamanlidis and Dendrinos, 2015). It is priority species of Community interest listed in Annexes II and IV of the Habitats Directive (Council Directive 92/43/EEC, 1992).

Madeira

By 1988 only 6-8 individuals were left in the Madeiran sub-population. Conservation efforts since the 1980s, however, have increased the European Atlantic population to an estimated at 30-40 individuals (5-7% of the global population). Nevertheless, the gradual growth in population and distribution of the species in the archipelago of Madeira is creating new tensions with different users of the marine environment, especially fishermen, tour operators and local inhabitants.

The species is currently monitored under the LIFE13 NAT/ES/000974 project and other governmental management plans coordinated by the SRA (Secretaria Regional do Ambiente e Recursos Naturais) and the SPNM (Serviço do Parque Natural da Madeira).

Although the species is being monitored, no data has been provided for this document and, therefore, GES assessment has not been done.

C. REPTILES

Sea turtles

Loggerhead turtle - *Caretta caretta*

Loggerheads have an IUCN status of "Least Concern" for the NW Atlantic population and of "Endangered" the NE Atlantic population (Casale and Marco, 2015).

Azores

D1C2 – ST_BYC_MR: Bycatch data for the Portuguese longline fleet operating in Azorean waters have been collected intermittently since 2008 and, since 2015, Azorean fisheries are being monitored continuously as part of the COSTA project (Consolidating Sea Turtle conservation in the Azores). Within the Azores EEZ, the activity of the Portuguese fleet and the bycatch rates of loggerhead sea turtles display a pronounced seasonal, but asynchronous, pattern. Observer coverage is not fully representative of the fishing effort and as a consequence the data from 2008 onwards was pooled. The average nominal bycatch rate recorded between 2008 and 2018 inside the EEZ was 0.17 SD = 0.55 turtles/1000 hooks (257 sets, 269,426 hooks). Hooking or at-haulback mortality was 17% with an additional 15% of the turtles retrieved in weak condition. No estimate exists for the Portuguese fishery, but post-release mortality is likely relevant given the reported rates in other fisheries (US North Pacific: 28% - CI 16-52% Swimmer *et al.*, 2013). The mortality rate due to bycatch could not be estimated because effort data from both the Spanish and Portuguese fleets was not yet available for the period 2012-2018, and the abundance estimate for the region was still preliminary.

D1C2 – ST_ABU_DS: 46 loggerhead sea turtles were found during the abundance surveys carried out in the MISTIC SEAS II project. The number of sightings of turtles did not allow spatial analysis for the calculation of abundance in Azores, and therefore only a design-based estimate is presented. The total estimated abundance is 5,187 (95% CI = 2,170-12,399; CV = 0.46). This is the first abundance estimate of loggerhead sea turtles in the Azores, and therefore, it was set as baseline for future assessments.

D1C3 – ST_DEM_BCI: Morphometric data for loggerhead turtles in the Azorean archipelago has been recorded in the region since 1969 as part of the conventional sea turtle tagging. A mean BCI of 1.76 ± 0.25 n=828 calculated from 1984 to 2016 was set as baseline value. BCI were collected as part of the MISTIC SEAS II project during 2007 and 2018. The mean BCI during this period was 1.82 ± 0.30 n=29. The BCI seems to increase, but threshold still needs to be defined beforehand to be able to assess the health and GES of the turtle aggregation. Body condition classifications of individual health exist for other areas and species (e.g. for green turtle Bjorndal *et al.*, 2000), yet indices for assessing the health of the loggerhead still require further development. Average values presented here are therefore indicative but may need to be amended in light of future research.

There is not GES assessment for the whole Azorean loggerhead turtle aggregation available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	ST_BYC_MR	• Not available	Not set	• Not available
D1C2	ST_ABU_DS	• Design-based: 5,187 (95% CI = 2,170-12,399; CV = 0.46) [2018; MISTIC SEAS II]	Trend	• Design-based: 5,187 (95% CI = 2,170-12,399; CV = 0.46) [2018; MISTIC SEAS II]
D1C3	ST_DEM_BCI	• 1.76 ± 0.25 n=828 [1984-2016]	Not set	• 1.82 ± 0.30 n=29 [2017-2018; MISTIC SEAS II]

Madeira

D1C1 – ST_BYC_MR: Mortality rate of loggerhead sea turtles has not been assessed in Madeira.

D1C2 ST_ ABU_DS: During MISTIC SEAS II project, surveys were conducted to estimate abundance of sea turtles in Madeira. The total estimated abundance of loggerhead in the surveyed area of Madeira in 2017 was on average 149 – 160 depending of the method used. This is the first abundance estimate of loggerhead sea turtles in Madeira, and therefore, it was set as baseline for future assessments.

D1C3 - ST_DEM_BC: A BC classification (range of values) is required in order to interpret any given BC figure obtained according to the sea turtle condition. This will allow the classification of each sampled specimen as an animal with a good BC or not. BC data is available for the aggregation of loggerhead turtles found in Madeira waters (Dellinger, T., unpublished data) based on a time series from 1994 to 2015, and the Azores. Additional analysis is necessary to define baselines and assessment values. To be able to access GES state with confidence, a larger sample size is needed, and the threshold has to be defined and baseline available. Although there are definitions for thresholds (e.g. Bjorndal *et al.* 2000 defined the poor condition threshold as BCI < 1.0) as our values are considerably higher, we need to rectify the class for the different locations. The major setback is the difficulty to link the body condition index to the MU's general trend. To move in that direction, genetic and hormone samples have also been collected during MISTIC SEAS II and are being processed to better understand what is the weigh/impact specific regions in the overall MUs.

There is not GES assessment for the whole Madeira loggerhead turtle aggregation available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	ST_BYC_MR	• Not available	Not set	• Not available
D1C2	ST_ABU_DS	• Design-based abundance estimation: 149 individuals (95% CI = 70–320; CV = 0.40) [2017; MISTIC SEAS II] • Model-based abundance estimation: 160 individuals (95% CI = 78 -307; CV = 0.39) [2017; MISTIC SEAS II]	Trend	• Design-based abundance estimation: 149 individuals (95% CI = 70–320; CV = 0.40) [2017; MISTIC SEAS II] • Model-based abundance estimation: 160 individuals (95% CI = 78 -307; CV = 0.39) [2017; MISTIC SEAS II]
D1C3	ST_DEM_BCI	• 1.74 ± 0.08 (n = 7) [2017; MISTIC SEAS II]	Not set	• 1.74 ± 0.08 (n = 7) [2017; MISTIC SEAS II]

Canary Islands

D1C1 – ST_BYC_MR: There is currently no information available on how bycatch affects the loggerhead turtle in the Canary Islands.

D1C2 – ST_ABU_DS: No systematic abundance studies of loggerhead turtles have been performed in the past in the archipelago. The MISTIC SEAS II project allowed obtaining the first estimate of abundance (1,462 individuals) for the entire archipelago using DS methods.

D1C3 – ST_DEM_BCI: Body condition data was collected as part of the MISTIC SEAS II project, but no previous data was available. Average values presented here are indicative and may need to be amended in light of future research on the BCI classification for the aggregation (see Azores description).

There is not a GES assessment for the whole Canary loggerhead turtle aggregation available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	ST_BYC_MR	• Not available	Not set	• Not available
D1C2	ST_ABU_DS	• Design-based: 1,462 individuals (95% CI = 561-3,810; CV = 0.51) [2017; MISTIC SEAS II]	Trend	• Design-based: 1,462 individuals (95% CI = 561-3,810; CV = 0.51) [2017; MISTIC SEAS II]
D1C3	ST_DEM_BCI	• 1.66 ± 0.24 (n = 18) [2017; MISTIC SEAS II]	Not set	• 1.66 ± 0.24 (n = 18) [2017; MISTIC SEAS II]

Green Turtle – *Chelonia mydas*

The green sea turtle has a global status "Endangered" (Seminoff, 2004). A revision and update is currently underway that will also include the status of the different subpopulations (Annette Broderick pers. comm.), although it is already known that some of them are increasing (e.g. Chaloupka *et al.*, 2008).

Canary Islands

D1C1 – ST_BYC_MR: Canary wildlife recovery centres have information on animals affected by fishing hooks, but the availability of this data to assess the bycatch indicator should be analyzed.

D1C2 – ST_ABU_PI: Some localities with presence of the species have been identified, but abundance estimates are not available yet (Monzón-Argüello *et al.*, 2015, 2018a).

D1C3 – ST_DEM_BCI: Data on BCI has been collected from several projects (e.g. Monzón-Argüello *et al.*, 2015, 2018a). However, a reference value for BCI of healthy animals (threshold value) has not been estimated yet due to the fact that part of the turtles analysed were sick individuals admitted to wildlife recovery centers.

There is not GES assessment for the whole Canary green turtle population available yet.

Criterion	Parameter	Baseline [year]	Threshold	Current Value [year]
D1C1	ST_BYC_MR	• Not available	Not set	• Not available
D1C2	ST_ABU_PI	• Not available	Trend	• Not available
D1C3	ST_DEM_BCI	• Not available	Not set	• Not available

D. INTEGRATION

The management and conservation of highly migratory marine predators such as the assessed indicator species depends on understanding how their movements and life history relate to ocean processes (Block *et al.*, 2011). Currently, there is a general lack of baseline data with few estimates available only for one or two of the metrics which could lead to an incorrect interpretation of the results, and it is unclear if it will reflect local or large-scale environmental changes (Mallory *et al.*, 2010). For a better assessment and integration of the environmental state/indicators, it is critical to gather a broader and more diverse ensemble of data to fill the identified gaps and provide an accurate assessment of ocean condition.

Some constraints arise when trying to integrate seabird criteria and levels. For example, productivity (breeding success) is directly dependent on prey availability. For Macaronesia, this variable cannot be assessed with the current methods despite its potential as the main pressure affecting the Macaronesian seabird population as it happens with the Roseate tern Britain populations where their population fluctuations are linked with prey availability which represent changes as a consequence of climate change (Green, 2017). Moreover, since the seabird's assessment occurs at a colony level, an extra level of aggregation will be necessary (see Prins *et al.*, 2014) since the potential sub-colony effects have largely been ignored and may be of fundamental importance and can determine what proportion of a population is likely to be affected by an anthropogenic pressure (Bogdanova *et al.*, 2014).

The suggested integration rule, One-Out-All-Out (OOAO), proposed in the Guidance for Assessment under Article 8 of the MSFD (WG GES, 2017), is based upon the assumption that the worst status of the elements used in the assessment determines the final status of the ecosystem under evaluation. It follows the precautionary principle and could offer a reliable and robust integration method if the status of each element and indicator could be evaluated without error, which is hardly ever the case. In practice, severe knowledge gaps and the inevitable uncertainty associated with assessing GES for each element and metric leads to a high probability of downgrading the true overall status of the evaluated components resulting in a very conservative assessment. Moreover, as the number of elements, indicators, metrics and assessment areas increase, so does the probability of misclassifying the overall state of the ecosystem as outside GES. Thus, the OOAO approach entails the risk of requiring unpractical programmes of measures to achieve or maintain the GES, imposing the costs of management measures that may ultimately be ineffective at meeting MSFD targets.

Issues associated to the application of the OOAO method became evident in the assessment exercise done during a MISTIC SEAS II workshop where experts were asked to apply this approach to assess GES for the seabird, marine mammal and turtle indicator species in Macaronesia. The group of experts found that the existence of a single criterion in a MU that did not reach GES would cause the entire species, and therefore, the entire group of species, the entire functional group and the entire ecosystem to be outside GES or unknown if assessed criteria are not considered. Therefore, integration of seabirds, marine mammal and turtle levels without a larger scope of effects will generate potential erroneous evaluations.

A more sensible THRES (Threshold Dependent Classification) could be applied with more representation since there is still a tremendous gap in knowledge of the marine environment and of the management units. However, further work on integration methods is necessary so that a solution is found to minimize or eliminate the negative aspects of the OAOO approach.

Due to the reasons given, the assessment results of this report have not been integrated because it was considered inadequate or, at least, premature with the current level of information and knowledge.

5. Environmental Targets to Achieve GES [Art. 10]

As defined in the MSFD (Art. 3.7), an "Environmental Target 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 subregion". MS shall, in respect of each marine region or subregion, establish a comprehensive set of Environmental Targets (ET) and associated indicators for their marine waters so as to guide progress towards achieving good environmental status in the marine environment taking into account the indicative lists of pressures and impacts set out in Table 2 of Annex III and of characteristics set out in Annex IV. MS shall take into account the continuing application of relevant existing ET laid down at national, community or international level in respect of the same waters ensuring that these ET are mutually compatible and that relevant transboundary impacts and transboundary features are also taken into account to the extent possible.

ET should, where possible, be based on the characteristics of GES and therefore should be established having regard to the GES criteria and indicators established by the Commission Decision 2017/848/EU (2017).

The Technical Assessment of the MSFD 2012 obligations (Article 12) provided by the European Commission for Spain (Dupont *et al.*, 2014a) and Portugal (Dupont *et al.*, 2014b), reported that no ET had been provided by Portugal while Spanish ET received a positive evaluation but highlighted that "Some environmental targets for Descriptor 1 are more related with Descriptor 2 and 4; most ET are pressure or impact related; several targets relate to the implementation of existing agreements; targets addressing specific activities; general terms used e.g. "reduce", "maintain"; no thresholds/baselines are defined; and several targets are related to increasing knowledge and monitoring but lack of specific timeline to make them useful to achieve GES".

The MISTIC SEAS II project reviewed and harmonized ET for the selected common criteria and MUs among the three archipelagos of the Macaronesian subregion. The existing scientific knowledge and results of the current monitoring and assessment were reviewed to assess what would be the most suitable common ETs for seabirds, marine mammals and sea turtles in the subregion and took into consideration the proposals for improvement listed in the Technical Assessment reported by the Commission (Dupont *et al.*, 2014a, 2014b). However, it was noted that since many indicators are still missing precise baselines and thresholds due to the lack of previous information, the limitations of the monitoring and the short time series of data, it is not possible to define concrete and measurable ET at this stage. Because of this, specific time periods necessary to achieve most ET are also unknown.

The common ETs proposed below are derived from the outcomes of the update of the initial assessment and take into account the main anthropogenic pressures identified for seabirds, marine mammals and sea turtles. However, the environmental state of most of the MUs assessed is still unknown, and other milder and/or unknown pressures may put populations at risk and prevent them from reaching or maintaining GES. Therefore, some monitoring programs necessary for its evaluation should be still implemented and the parameters necessary for its assessment should be calculated.

1. GENERAL - ET

General - ET	Type	Related criteria
Establish a Macaronesian international group involving scientists, technicians and policy makers, to coordinate the monitoring programs for the assessment of seabirds, marine mammals and sea turtles.	• Operative	• All D1
Develop management plans (when necessary) to minimise the impact of marine recreational activities, and/or uses derived from these activities, such as boat anchorage, diving, recreational fishing, water sports, etc. on marine mammals, seabirds and turtles.	• Operative	• All D1
Implement the monitoring programs necessary for assessing the criteria of all MUs proposed for seabirds, marine mammals and sea turtles.	• Operative	• All D1
Maintain viable populations of key species and apical predators (marine mammals, reptiles, seabirds and fish), keep them within safe biological limits.	• State	• All D1
Keep updated the lists of threatened species as well as the evaluation of their populations.	• Operative	• All D1
Encourage international cooperation in the study and monitoring of the populations of those groups with a wide geographic distribution (e.g. ICES, OSPAR).	• Operative	• All D1
Increase knowledge of trophic networks including the study of apex predators, with a view to developing new indicators to evaluate the status of marine trophic networks.	• Operative	• D4C1
Take the necessary actions to maintain or improve the demographic parameters of seabirds, marine mammals and sea turtles (e.g. breeding rate and survival rate) in order to increase their numbers.	• State	• D1C3
Reduce marine litter to reduce the risk of ingestion and entanglement of seabirds, marine mammals and sea turtles.	• Pressure	• D10C3-4

2. SEA BIRDS - ET

Seabirds - ET	Type	Related criteria
Reduce light intensity near colonies affected by this pressure, at least during the most sensitive periods (i.e. when fledglings leave the nest and/or migration, depending on the species and location).	• Pressure	• D1C1
Maintain seabird colonies without introduced predators (e.g. cats and rats) permanently free of them.	• Pressure	• D1C1
Eradicate predators (e.g. cats and rats) in priority colonies of all islets and reduce the impact in major islands in 10 years, and in 25% of medium priority colonies in 20 years.	• Pressure	• D1C1
Increase the number of breeding pairs 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.	• State	• D1C5

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3. MARINE MAMMALS - ET

Marine mammals - ET	Type	Related criteria
Mortality of sperm whales due to boat strikes (i.e. from fast ferries) to be kept close to zero.	• Pressure	• D1C1
Mortality of cetaceans caused by bycatch must be maintained below the recommended inter-national values (no more than 1% of the population abundance).	• Pressure	• D1C1
Population size should be at or above the baseline levels with no observed estimated or projected reduction ≥10% over a 20- year period.	• State	• D1C2
The survival rates of marine mammals should not suffer statistically significant decreases with respect to reference values.	• State	• D1C3
Ensure proper management of whale watching companies and ensure compliance with national and international legislation.	• Operative	• D1C3

4. SEA TURTLES - ET

Sea turtles - ET	Type	Related criteria
Reduce the main causes of anthropogenic turtle mortality such as accidental catch in fishing gear, entanglements and collisions with vessels.	• Pressure	• D1C1
Increase the monitoring of sea turtles' bycatch in fishing vessel.	• Operative	• D1C1

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MISTIC SEAS II
MACARONESIA

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