

CONSULTATION BY THE ENVIRONMENTAL
AUTHORITY

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Introduction

The first two parts of the Sea basin Strategy Documents (Sea Basin Strategy Document), forming the Sea basin strategy, were adopted by an Inter-Prefectoral Order in October 2019. This strategy defines the planning for maritime spaces, 30 vocation zones for the Mediterranean coastline, and objectives to be achieved in each of these zones or for the entire coastline. The order of 11 July 2018 regarding the criteria and methods to be implemented for the preparation of the first two parts of the Sea Basin Strategy Document notes that the environmental targets (mentioned in Article R. 219-7 of the Environment Code) are defined so that the pressures exerted by human activities on the marine environment are compatible with the achievement or maintenance of good environmental status of marine waters by the end of the current cycle of the "Marine Environment Strategy" framework directive. This decree also states that the indicators associated with the environmental targets include targets against which the achievement of the objectives is assessed.

France has therefore made a commitment to the European Commission to achieve the environmental targets set out in this strategy: these are accompanied by ambitious, but realistic and measurable targets. At the time of the adoption of the coastline strategy, not all of these targets could be defined, due to a lack of data or the maturity of the consultations: 32 targets remained to be defined at national level, 26 for the Mediterranean coast. Work was carried out to evaluate and consolidate existing monitoring networks in order to define them at the time of the adoption of the action plan: coherence between these networks and those used for monitoring the objectives of the Water Framework Directive was sometimes strengthened at the same time. At the end of the consultation, it will therefore be necessary to complete the Sea basin strategy with the additional targets defined during this work and to adopt the modifications to Annex 4 of the Mediterranean Sea basin strategy, in particular Chapter 1 relating to the objectives, indicators and targets, and Chapter 3 relating to the methodology for defining the objectives, indicators and targets.

As a result of this further work, however, some targets could not be set: the reasons for this are detailed below. The indicators in question are thus designated as "candidates for the 3rd MSFD cycle", with further work to be carried out to make them operational for the following MSFD cycle. For this second cycle, however, these indicators will not be monitored and reported to the European Commission.

This addendum provides a summary of how each of the additional targets set were defined and the nature of the work carried out:

- pertaining to the definition of strong protection zones (Part A);
- for taking into account the work of local consultations in implementing the APME and the new objectives of the Sea Basin Strategy Document (Part B);
- within the framework of drawing up the Rhone-Mediterranean and Corsica water development and management master plans (River Basin Management Plan) and consistency with the Sea Basin Strategy Document (part C).

Part A - Summary of the targets defined thanks to the work of identifying candidate SPZs on the Mediterranean coast

Environmental objective	Indicator	Proposed target	Proposed SPZs * <i>(* list of acronyms used at the bottom of the table)</i>
D01-HB-OE03. Reduce the physical disturbance of intertidal rocky habitats* caused by human presence, particularly by fishing on foot *Boulder fields, intertidal mussel beds, cystoseira belts and lithophyllum pavements	D01-HB-OE03-ind1. Surface of sensitive intertidal rocky habitats located in strong protection zones	Increase in the area of intertidal rocky habitats* under strong protection. * Lithophyllum pavements and cystoseira belts ** Naming of an area intended to host a SPZ, the precise perimeter of which will be defined after local consultations.	RCB ₂ : Cerbère Banyuls RNS ₂ Partial Protection Zone: Partial zone of the Scandola reserve PNPC_16: Cap des Mèdes Zone (zones C+H) of Porquerolles Island PNPC_18 : Areas where recreational fishing is prohibited PNC ₈ : NP core area (without existing FPZs already identified)
D01-HB-OE06. Reduce physical disturbance to subtidal and circalittoral sedimentary habitats, particularly in the 3-mile zone	D01-HB-OE06-ind1. Proportion of surface area of subtidal and circalittoral sedimentary habitats located in strong protection zones	Increase in the proportion of the area of subtidal and circalittoral* sedimentary habitats under strong protection. * Coastal detritic, sand and gravel biocenoses influenced by seabed currents ** Naming of an area intended to host a SPZ, the precise perimeter of which will be defined after local consultations.	RCB_2, Partial protection area of Cerbère Banyuls- 4.2203 km ² RNS_2, Partial area of the Scandola reserve- 0.7896 km ² PNPC_15, Sèche du Langoustier and La Jeune Garde (zones E and G) - 0.2528 km ² PNPC_16, Cap des Mèdes Zone (zones C+H) of the island of Porquerolles - 0.4204 km ² PNPC_17, Strip of 300m from the Pointe du Moulin to the Pointe de la Galère - 0.5289 km ² PNPC_18, Zones where recreational fishing is not permitted - 3.1276 km ² ICC_1, Nature reserve of the islands of Cap Corse: marine part of the island of Finocchiarola - 0.0481 km ² EFV_1, Prohibited area of the APPB mouth of the River Var- 0.1648 km ² PNC_8, PN core area (without existing identified SPZs) - 270.7275 km ²
D01-HB-OE10. Avoid abrasion and smothering of areas most representative of deep-sea habitats (Vulnerable Marine Ecosystems*) and reduce abrasion of special geomorphological structures**: * Definition of Vulnerable Marine Ecosystems based on the identification of vulnerable marine ecosystems carried out under the framework of the United Nations Environment Programme Mediterranean Action Plan.	D01-HB-OE10-ind3. Proportion of known VME area located in strong protection zones	Increase in the area of vulnerable marine ecosystems under strong protection.	Cassidaigne ZNP (No-take zone) of 924m ²
D01-OM-OE06. Limit physical, noise and light disturbance to sea birds* in their functional habitat areas * Cf. sea bird species listed in the GES Order	D01-OM-OE06-ind3. Surface of functional areas for foreshore birds located in strong protection zones	Trend towards an increase in the area of functional areas for foreshore birds in strong protection zones	Marine section of the "Embouchure du fleuve Var" (Mouth of River Var) APB (Biosphere Protection Order) N.B: The issue of "areas of maximum density and functional areas identified for sea birds during the inter-breeding period" was not completed because it was difficult to define in spatial terms. As with the issue of "areas of maximum density and functional areas identified for sea birds in the inter-breeding period", it is likely that the candidate SPZs cover only a very small part of these areas. The issue will be further developed for the 3rd MSFD cycle.

D06-OE01. Limit the physical loss of generic and special habitats as a result of the artificialization of the coastal area and shallow waters	D06-OE01-ind5. Proportion of the area of each particular habitat located in strong protection zones	<p>Increase in the proportion of area of each particular habitat* under strong protection</p> <p>* Habitats of coralligenous concretions, caves, groups of rhodoliths, cymodocea and Posidonia meadows, deep-sea areas of kelp.</p>	<p><u>Coralligenous (area in km²)</u></p> <p>RCB_2 Partial protection zone of Cerbère Banyuls (0.4958) RNS_2 Partial zone of the Scandola reserve (0.0557)</p> <p>PNPC_15 Sèche du Langoustier and La Jeaune Garde (zones E and G) (0.0308)</p> <p>PNPC_16 Cap des Mèdes zone (zones C+H) of the island of Porquerolles (0.0011) PNPC_17 Strip of 300m from Pointe du Moulin to Pointe de la Galère (0.0142)</p> <p>PNPC 18 Areas where recreational fishing is prohibited (0.0724)</p>
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			<p>PNC_8 PN core area (without existing identified SPZs)(1.7661)</p> <p><u>Posidonia (area in km²)</u> RCB_2 Partial protection zone of Cerbère Banyuls (0.0165) RNS_2 Partial zone of the Scandola reserve (0.9836) PNPC_15, Sèche du Langoustier and La Jeaune Garde (zones E and G) (0.7276), Cap des Mèdes Zone (zones C+H) of the island of Porquerolles (0.2755), Strip of 300m from the Pointe du Moulin to the Pointe de la Galère (0.4439), Zones where recreational fishing is not permitted (1.3420) ICC_1 Nature reserve of the islands of Cap Corse: marine part of the island of Finocchiarola (0.2182) PNC_8 PN core area (without existing identified SPZs)(1.7661)</p> <p><u>Photophilic Algae Infralittoral Rock (area in km²) RCB_2</u> Partial protection area of Cerbère Banyuls 0.7484 RNS_2 Partial area of the Scandola reserve 0.7661 PNPC_15, Sèche du Langoustier and La Jeaune Garde (zones E and G) 0.0056, Zone Cap des Mèdes (zones C+H) of the island of Porquerolles 0.0050, Strip of 300m from the Pointe du Moulin to the Pointe de la Galère 0.0689, Zones where recreational fishing is not permitted 0.1942 ICC_1 Nature reserve of the islands of Cap Corse: marine part of the island of Finocchiarola 0.0667 PNC_8 PN core area (without existing identified pfz) 1.6858</p> <p><u>Special habitats: Mediolittoral/semi-dark caves:</u> RNS_2 Partial area of the Scandola reserve 8 caves PNPC_18 Areas where recreational fishing is prohibited (2)2 caves PNC_8 PN core area (without existing identified SPZ) 20 caves</p>
D06-OE02. Reduce disturbances and physical loss of generic and special habitats associated with maritime structures, activities and uses	D06-OE02-ind2. Proportion of the area of each particular habitat located in strong protection zones	<p>Increase in the proportion of the area of each particular habitat* under strong protection.</p> <p>* Habitats of coralligenous concretions, caves, groups of rhodoliths, cymodocea and posidonia meadows, deep-sea areas of</p>	<p><u>Coralligenous (area in km²)</u> RCB_2, Partial protection zone of Cerbère Banyuls 0.4958 RNS_2, Partial zone of the Scandola reserve 0.0557 PNPC_15, Sèche du Langoustier and La Jeaune Garde (zones E and G) 0.0056, Zone Cap des Mèdes (zones C+H) of the island of Porquerolles 0.0050, Strip of 300m from the Pointe du Moulin to the Pointe de la Galère 0.0689, Zones where recreational fishing is not permitted 0.1942 PNC_8 PN core area (without existing identified pfz) 1.7661</p> <p><u>Posidonia (area in km²)</u> RCB_2, Partial protection zone of Cerbère Banyuls 0.4958 RNS_2, Partial zone of the Scandola reserve 0.0557 PNPC_15, Sèche du Langoustier and La Jeaune Garde (zones E and G) 0.0056, Zone Cap des Mèdes (zones C+H) of the island of Porquerolles 0.0050, Strip of 300m from the Pointe du Moulin to the Pointe de la Galère 0.0689, Zones where recreational fishing is not permitted 0.1942 ICC_1 Nature reserve of the islands of Cap Corse: marine part of the island of Finocchiarola 0.2182 PNC_8 PN core area (without existing identified SPZ) 7.1749</p> <p><u>Photophilous Algae Infralittoral Rock (area in km²)</u></p>

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			RCB_2, Partial protection zone of Cerbère Banyuls 0.4958 RNS_2, Partial zone of the Scandola reserve 0.0557 PNPC_15, Sèche du Langoustier and La Jeune Garde (zones E and G) 0.0056, Zone Cap des Mèdes (zones C+H) of the island of Porquerolles 0.0050, Strip of 300m from the Pointe du Moulin to the Pointe de la Galère 0.0689, Zones where recreational fishing is not permitted 0.1942 ICC_1 Nature reserve of the islands of Cap Corse: marine part of the island of Finocchiarola 0.0667 PNC_8 PN core area (without existing identified SPZ) 1.6858 <u>Special habitats:</u> RNS_2 Partial area of the Scandola reserve 8 caves PNPC_18 Areas where recreational fishing is prohibited 2 <u>caves</u> PNC_8 PN core area (without existing identified SPZ) 20 caves
D07-OE03. Limiting pressures and barriers to sea-land connectivity in estuaries and coastal lagoons	D07-OE03-ind1. Percentage of estuaries located in strong protection zones	Increase in the percentage of estuaries under strong protection	Marine section of the "Embouchure du fleuve Var" (Mouth of River Var) APB (Biosphere Protection Order)
	D07-OE03-ind2. Percentage of coastal lagoons located in strong protection zones	(Candidate indicator) Increase in the percentage of coastal lagoons under strong protection	No candidate SPZs associated with this issue. The indicator will become a candidate.
List of acronyms: APB: Biosphere Protection Order for EFV: embouchure du fleuve Var (Mouth of River Var) ICC: Cape Corsica Islands Nature Reserve PNPC: Port-Cros National Park PNC: Calanques National Park RCB: Cerbère-Banyuls Marine Nature Reserve RNS: Scandola Marine Nature Reserve ZNP: No-take zone The map of candidate SPZs can be found in Annex 1.			

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Part A - Targets defined through the work of identifying strong protection zones on coastlines

A. Context

8 targets were adopted in 2019 as *"defined and agreed under the framework of measure M003, and adopted simultaneously with the Sea Basin Strategy Document Action Plan"*. The work carried out today under the framework of measure M003-NAT1B (adopted within the framework of the Action Plan for the Marine Environment of the first implementation cycle of the MSFD) has made it possible to define 7 of them.

Only one target, relating to lagoons, cannot be set since a strong protection zone is yet to be identified. The linked indicator will therefore be a candidate for the 3rd MSFD cycle: the iterative aspect of the reflections on the SPZs will, however, allow it to be completed in the future.

Measure M003-NAT1B provides for: *"Complete the network of marine protected areas by establishing strong protections in sectors of remarkable marine biodiversity"*. The aim of this measure is to create a coherent, connected network of strong protection zones (SPZ) that is representative of the diversity of marine ecosystems on each coastline in mainland France. These strong protections will be instituted as a priority within existing protected marine areas.

The context of the Mediterranean coast, as at a national level¹, has accelerated the implementation of the measure and the definition of a consensual and achievable protection objective so that it is to be met by 2030. The methodological work of defining and then spatially identifying potential SPZs was therefore mainly carried out in 2019 and 2020 at the same time as the work involved in drawing up the Sea Basin Strategy Document: because of this, it is now possible to submit precise zonings for consultation.

However, this work has not been completed. A consultation is to be held shortly at national level to better understand the distribution of efforts between the coastlines, both in metropolitan France and in the ultra-marine territories. In respect of the Mediterranean, this 3% target will represent 752 km² of sovereign waters and 3,347 km² including the EEZ.

The work carried out in 2019 to define these targets is set out in detail in the next two sections.

B. Definition and prior identification of existing Strong Protection Areas (SPZs) in the Mediterranean:

1. What is a SPZ?

There are 5 criteria for defining a SPZ:

- it focuses on the remarkable biodiversity defined by the ecological issues of the MSFD;

¹ The new national strategy for protected areas 2020–2030, which was launched at the beginning of January 2021, plans to increase the surface area of the national territory (both land and sea) to 30% in protected areas, of which 10% should be strongly protected, both in mainland France and in the overseas territories.

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- it is primarily implemented within a marine protected area;
- it has a regulation specifically on activities to enable a significant reduction or elimination of the main pressures on the ecological issues that justify strong protection;
- it is based on a management document, drawn up by the governance body of the marine protected area (MPA) in question, defining protection objectives and a system for evaluating the effectiveness of the system;
- it has an operational control system in place for its activities.

SPZs are neither a new MPA status nor additional MPAs. The aim is to recognise what exists and to strengthen the management or protection thereof where appropriate. That is why, in addition to analysing existing regulations and issues for the designation of SPZs, it is important that these areas are part of a representative global network, i.e. allowing for:

- each of the ecological issues identified in the sea basin documents are well represented in the network (representativeness criterion);
- several examples of the issue are represented in the network: for example, several meadow surfaces are present in the network of SPZs on the coastline (replication criterion);
- each example of the issue is of sufficient scale (viability criterion);
- each example of the target issue is linked to the others, i.e. these areas are sufficiently related (connectivity criterion).

2. Inventory and analysis of existing SPZs in the MPAs in the Mediterranean:

In respect of the Mediterranean coastline, a process for designating Marine Protected Areas and analysing the representativeness of this network was initiated by the AFB (then the OFB) in mid-2018, in close consultation with managers of Marine Protected Areas and the relevant departments and services.

This inventory takes into account the principle of "multi-stakeholder" SPZs: all ecological challenges identified as strong or major are taken into account in the analysis. Thus, within the SPZ, anthropic pressures on these issues are removed or reduced to an insignificant level by regulating activities. The identification of strong to major ecological issues has thus been used to define the environmental targets of the Sea Basin Strategy Document, upon which the manager(s) can then act at local, regional or national level.

At this stage, 35 SPZs have been identified on the Mediterranean coast covering 246 km², i.e. approximately 1% of the waters under sovereignty, as well as nearly 1% of the MPAs outside PELAGOS and nearly 3% of the EEZ.

Analysis of the current network illustrates that the Posidonia meadow and rocky habitats (coralligenous, mediolittoral rocks, cystoseires, caves, etc.) are fairly well represented and replicated, and that they are present in most of the areas of strong protection that have been identified on the coast. In respect of the Posidonia meadow, the

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recent regulations on anchorage and in particular the local decrees currently being defined constitute complementary regulatory tools to support the definition of SPZs in coastal MPAs.

The "deep sea habitats" issue is only present in one SPZ (Cassidaigne Canyon PN Calanques).

Several issues are not found in the current SPZ network, such as "land-sea interface zones and river plumes", "particular geomorphological structures", "concentration and migration sectors for amphibian fish", "locally significant populations of elasmobranchii", "nesting and feeding areas for waders", and "wintering sites for waterbirds".

The average size of existing SPZs is 7 km² which is somewhat large, although the median is 0.6 km². This macro-analysis confirms the small size of the existing SPZs.

The connectivity criterion shows geographical gaps in the distribution of SPZs, particularly in Provence-Alpes-Côte d'Azur (from Saint-Raphaël to Menton), in Corsica (Ile Rousse to Aléria, north of the Gulf of Ajaccio) and offshore.

C. Identification of potential SPZs and proposal of targets for the next cycles:

The survey of managers identified 9 candidate SPZs, covering 395 km²:

- Partial zone of the Scandola nature reserve
- Partial zone of the Cerbère Banyuls nature reserve
- Nature Reserve of the islands of Cap Corse
- Port-Cros National Park (core zone): lobster boat zone/Sainte Anne point (zones G+E) of Porquerolles Island
- Port-Cros National Park (core zone): Cap des Mèdes zone (zones C+H) of Porquerolles Island
- Port-Cros National Park (core zone): 300 m strip from Pointe du Moulin to Pointe de la Galère
- Port-Cros National Park (core zone): areas where recreational fishing is prohibited
- Calanques National Park core zone (the entire area, excluding sectors that are already SPZ)
- Marine section of the "Embouchure du fleuve Var" (Mouth of River Var) APB (Biosphere Protection Order)

The map of these candidate SPZs can be found in Annex 1 of this addendum.

The notion of "potential" SPZs for the next cycle does not take on a "priority" meaning but identifies, with figures, areas for which it is necessary to have a change in terms of the regulatory procedure or additional uses to be regulated. Thus, other projects have been identified by the managers that are currently further away from the definition of an SPZ but which could become one, if supported.

These include:

- in Occitania: the consultation carried out by the Natural Marine Park of the Gulf of Lion, a project for an SPZ on soft substrates to the north of the Park, and the project to extend the Cerbère Banyuls National Nature Reserve.

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- in Provence-Alpes-Côte d'Azur: in Natura 2000 sites including Corniche varoise, and the framework of the Port Cros National Park consultation looking at usage planning for the adjacent marine area.
- in Corsica: the Corsican national reserve projects led by the Corsican regional authority, and those within the Cape Corsica and Agriate marine park, as well as several projects for an SPZ are being considered; this would make it possible to respond to many of the challenges of the Sea Basin Strategy Document that are not currently covered, such as micro-estuaries, coralligenous atolls and offshore reef sites.

This list is not exhaustive and continues to be developed in close collaboration with the managers.

In addition, the identification of other potential candidate areas should be able to address the following issues, which are considered to be major issues in the Sea Basin Strategy Document:

- "Infralittoral Biogenic Habitats", "Rocky Habitats" and "Sedimentary Habitats" via a geographical coverage and areas meeting the connectivity and viability criteria;
- Land-sea interface zones and river plumes" such as graus and lagoons, particularly in the Occitania region and eastern Corsica.
- Deep-sea habitats", "Hydraulic dunes of the plateau and upper slope", "Special geomorphological structures": the development of the DOCOBs (management plan defining objectives and actions) of the Natura 2000 sites off the coastline (reefs) and within the two marine nature parks could help to provide protect in respect of these issues, as well as the integration of protection measures that have already been implemented, in particular the adoption of a management plan for professional trawl fishing ("CGPM box" and West-Med).
- "Functional fisheries zones" (a challenge that is currently partially taken into account in the existing FPZs, by means of the maritime fishery reserves), based in particular on the establishment of Fisheries Conservation Areas (FCAs).
- Without setting numerical targets for the functional zones of mobile species, this issue must be considered in order to improve how they are taken into account in the protection sectors. This applies in particular to functional areas near sea bird colonies (feeding, resting) and the home areas of sedentary bottlenose dolphin groups.

Target proposals:

→ Planned trajectory for 2026 i.e. the end of the 2nd cycle of the MSFD:

Support the conversion into SPZs of candidate SPZs and projects identified by MPA managers and to define objectives for the major habitats identified in the Sea Basin Strategy Document.

- A 160% increase in the surface area of the network achieved through designating 9 candidate SPZs identified in 2020, i.e. a network of 641 km², which would make it possible to meet the Tangiers objectives on waters under sovereignty (2% coverage).
- A policy of incentives and support for projects proposed by MPA managers (N2000 sites, NMCs,

National Nature Reserves, etc.) to achieve the objective of 3% SPZ coverage in waters under the jurisdiction of the European Union

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sovereignty. The inclusion of recent regulations (e.g. the maritime prefect's anchorage orders for the Posidonia meadow issue) is an additional element to support these projects.

- Taking into account the major challenges of the Sea Basin Strategy Document, particularly for deep-sea habitats and the effective establishment of Natura 2000 sites in the open sea away from the coast (definition of governance and development of DOCOBs), and special consideration within the PNMs, including these major challenges.

A mid-term evaluation (in 2023) will be carried out to confirm the achievement of these objectives and to support the SPZ candidate projects.

In order to ensure that this ambition is truly implemented at territorial level without destabilising the governance of parks and coastal N2000 sites, the best option is for potential strong protections to identify MPAs in their entirety, without second-guessing the results of local consultations. This recommendation primarily concerns the PNMs and the DOCOBs that are currently being drawn up.

→ Envisaged trajectory for 2030/2032: end of the protected areas strategy / end of the 3rd cycle of the MSFD

- Continue the extension of the SPZ network to priority habitats on the coast and extend the designation to offshore sites covering the major issues within the Sea Basin Strategy Document in order to achieve a target of 3% of the coastline being under strong protection.

In order to progress towards these two trajectories, a methodological framework will be proposed for the consultation of the Sea Basin Council on the SPZ targets to be included in the Sea Basin Strategy Document, both in order to provide optimal support in view of the 2026 deadline, and to better quantify and locally embed the SPZ 2030 projects.

Part B - Summary of the new targets defined in line with local consultation works (implementation of the APME 1st cycle) or to meet the
new objectives of the Sea Basin Strategy Document:

Environmental objective	Environmental indicator	Proposed target	Nature of the work carried out
Special habitats			
D01-HB-OE09. Avoid physical disturbance of Mediterranean phanerogam and coralligenous meadows (caused by anchoring of vessels, recreational diving and bottom fishing gear) MED	D01-HB-OE09-ind2. Proportion of the surface area of phanerogam and coralligenous meadows that are subject to physical pressures as a result of anchoring	Downward trend.	<p>This target has been defined in terms of a "trend" and not a "numerical" objective. At present, the information on future projects (regulations, technical operations, etc.) is not precise enough to be able to define a target with "numbers". It is extremely complex to set an objective in terms of surface area and in relation to local actions that will be implemented on various scales and in respect of very different themes (fishing, diving, pleasure boating). Making the target consistent with Mediterranean anchorage management policies, in particular the 2019 Mediterranean anchorage management strategy, departmental decrees and calls for projects: it is for the ZMEL (anchorage and light equipment) projects to become a reality and for these new regulatory measures to be implemented in each department. The defined target is ambitious and takes into account the work in progress and how to limit the main usage pressures at sea, all of which cause the Posidonia meadow to degrade. Within this context, we will specifically note the important actions that are under way and those to be implemented in the future in respect of pleasure boating:</p> <ul style="list-style-type: none">- Large pleasure yachts: implementation of Order 123/2019 of the Maritime Prefecture of the Mediterranean, which aims to prohibit the anchoring of boats in the Posidonia meadow (length over 24 metres); this takes into account issues surrounding the safety and security of ships. This decree is operationally implemented by the use of local decrees drawn up under the guidance of the DDTM and in consultation with all coastal and marine stakeholders;- Small craft: operational implementation of the 1st APME anchorage strategy cycle that identifies the areas in which there are issues and where to implement anchorage facilities (ZMEL). A call for projects was launched in 2020 to support the implementation of the anchorage strategy. This AAP is led by the DIRM Mediterranean and has links to the Rhône-Méditerranée Corse Water Agency, the OFB, the regions and the OEC.
<p>D01-HB-OE10. Avoid abrasion and smothering of areas most representative of deep-sea habitats (Vulnerable Marine Ecosystems*) and reduce abrasion of special geomorphological structures**:</p> <p>* Definition of Vulnerable Marine Ecosystems based on the identification of vulnerable marine ecosystems carried out under the framework of the United Nations Environment Programme Mediterranean Action (for the Mediterranean)</p> <p>** Structures defined during the identification phase of the challenges for the implementation of the MSFD</p>	D01-HB-OE10-ind2. Share of known VMEs subject to bottom fishing in the Mediterranean	No increase beyond 200m for the Bamboo Coral VME (<i>Isidella elongata</i>), cold corals and crynoid (<i>Leptometra phalangium</i>) and tall sea pen (<i>Funiculina quadrangularis</i>), the precise geographical definition of which is to be found within the Montpellier canyons, Petit Rhône, Marti, Ile Rousse, des Moines, Valinco and Sagone canyons, and beyond a depth of 60m on the eastern Corsican plateau, which will be adopted at the same time as the action plan	<p>The VMEs chosen for this Sea Basin Strategy Document cycle include Bamboo Coral (<i>Isidella elongata</i>), cold corals, crynoid (<i>Leptometra phalangium</i>) and tall sea pen (<i>Funiculina quadrangularis</i>) beyond a depth of 200m or beyond a depth of 60m in the specific case of the eastern Corsican shelf.</p> <p>Ifremer, in their role as technical contributor, is responsible for aggregating existing data on the occurrence of indicator species. Maps of the distribution of Vulnerable Marine Ecosystems in the Mediterranean were drawn up over the course of 2020 to define the location of these VMEs (see Appendix 2).</p>
Sea birds			

D01-OM-OE01. Reduce incidental catches of sea birds* (at sea and near colonies), and in particular reduce incidental catches of the most vulnerable species – such as Balearic, Yelkouan and Scopoli shearwaters – caused by longline fishing, fixed nets and small pelagic trawls	D01-OM-OE01-ind1. Proportion of maximum density zones at risk, for which incidental catch avoidance or reduction measures are planned	100.00 %	
.			
* cf. sea bird species listed in the GES Order			
D01-OM-OE04. Reduce pressure from domesticated species and species that have been introduced at sea bird breeding sites	D01-OM-OE04-ind1. Proportion of island breeding sea bird colonies facing strong challenges* for which species that have been introduced and domesticated represent a proven pressure.	0 for remote island sites with no human occupation A downward trend for the others.	The Groupement d'Intérêt Scientifique Oiseaux Marins (GISOM) has taken a position on collating this indicator at the beginning of 2019: it then carried out a methodological and technical study to define the target for this indicator and to ensure its collation by mid-2022. GISOM has defined the list of colonies facing strong and major challenges to be taken into account, as well as the species that have been introduced to be monitored and controlled. On the 4 island colonies facing strong challenges in the Mediterranean, the target recommended by GISOM is therefore to achieve a total absence of pressure on these colonies from species that have been introduced and domesticated. (See Annex 3)
D01-OM-OE05. Maintain or restore functional sea bird habitats* in coastal wetlands	D01-OM-OE05-ind1. Number and area of functional sites restored on the coastline.	Upward trend. The map of functional sites will be established during 2020 by the LPO or RNF.	The targets that are defined will correspond to the restoration of at least one functional site per marine sub-region by 2026. In the absence of a precise identification of suitable sites for this type of restoration, no figures could be proposed.
The map of functional habitats for sea birds will be drawn up on the occasion of revising the PdS or the programme of measures and will be validated in the CMF	D01-OM-OE05-ind2. Functional habitat area of sea birds in wetlands within coastal municipalities.	Maintenance The reference value will be made known in 2020 or 2021 by the LPO or RNF	
* cf. sea bird species listed in the GES Order			
Sea-floor integrity - Artificialization			
D06-OE01. Limit the physical loss of generic and special habitats as a result of the artificialization of the coastal area and shallow waters	D06-OE01-ind1. Percentage of artificialised linear* (structures and emerging developments)	a) In MPAs, < 0.1% cumulative increase following the application of the ERC sequence, as of the adoption of the Sea basin strategy (reference value: 7.6% over 6 years) b) For the entire coastline, a downward trend in the average rate of linear development compared with the average reference rate, which was evaluated at 6.5% over 6 years	The lack of a database to monitor the artificialization of the public maritime domain in a harmonised manner taking into account each maritime coastline has meant it was not possible to define a reference value and a quantified target in 2019. In the Mediterranean, the MEDAM monitoring network under the Water Framework Directive provides a quantified approach to the artificialization of the coastline using a defined method. This network has been developed over more than fifteen years within the framework of a partnership between the University of Nice and the Water Agency and is also part of the monitoring networks for the APME 1 st cycle. It aims to carry out an inventory of the developments gained in the marine domain and associated impacts. The use of the models made available in MEDAM has made it possible to raise awareness among stakeholders and to agree on a consensual target of reducing the increase in artificialization in Marine Protected Areas to less than 0.1% over the entire coastline and over the next 6 years. The DEB has entrusted the CEREMA with the task of refining these data and developing a benchmark for the other coastlines in 2019-2020 in order to establish the target and reference values. CEREMA has defined a methodology for monitoring and spatially defining artificial surfaces over time, taking into account existing data and networks, including MEDAM. In this way, a reference value and a target were established for the coastal zone: it will be defined in the near future for the coastal zone and submitted to the public during the consultation stage.
	D06-OE01-ind3. Percentage of artificial seabed (emerged and submerged structures and developments) between 0 and 20 m	a) In MPAs, < 0.1% cumulative increase following the application of the ERC sequence, as of the adoption of the Sea basin strategy (reference value [pending the results of the CEREMA study of March 2021]) b) For the entire coastline, a downward trend in the average rate of coastal land reclamation in hectares compared to the average reference rate evaluated at [awaiting the results of the CEREMA study March 2021]	
Anthropogenic pressures			
D08-OE04. Limit the discharge of contaminants and the spread of non-indigenous species into the natural environment during dry-docking (recreational and professional vessels) and maintenance of underwater equipment (buoys, breeding	D08-OE04-ind1. Number of ports equipped with dry dock areas that have an effluent treatment system	Upward trend.	Consistency between the objectives and black spots identified in the CEREMA study and all the actions already implemented and recorded in the WFD Programme of Measures. It was agreed not to put a figure on the objective at this stage since the consultation phase must continue and priorities must be shared, in particular between the various funders.

structures, etc.)			
D11-OE01. Reduce the level of noise related to impulsive emissions with regard to the risks of disturbance and mortality of marine mammals	D11-OE01-ind1. Spatial extent of events recorded as being 'strong' to 'very strong', as a percentage of the coastline	To be defined within the TG Noise framework	The TG Noise study is still in progress.

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Additional targets and associated methodologies, defined in conjunction with the work on developing the Sea Basin Strategy Document Action Plan

Part B - Targets set for taking into account the new challenges and ambitions of the Sea Basin Strategy Document in relation to the APME

Special habitats:

D01-HB-OE09:

The target relating to the reduction of the surface area of Posidonia and coralligenous meadows that are impacted by anchoring was deliberately not set for October 2019: the choice was made to postpone this definition until the action plan was adopted, thereby allowing the establishment of a local consultation and the emergence of ZMEL (anchorage and light equipment) projects, which are often costly and technically complex. An "upward trend" in areas of protected sea grass and coralligenous beds is therefore proposed.

Indeed, the governance of anchorage management was strongly structured in the Mediterranean that same year, giving rise to:

- Framework Order 123/2019 laying down the general framework for anchoring and stopping vessels in French inland and territorial waters of the Mediterranean, signed on 03 June 2019. Following intense consultation, this order marks a turning point in the management of anchorages for vessels that are over 24 metres in length in order to protect the meadows in the Mediterranean. Article 7 calls for its main principles to be applied locally, on the basis of departments or navigation basins, and paves the way for proper protection of meadows in sensitive areas. This decree is a unique step forward in the Mediterranean and requires intense technical work and consultation at local level, the first of which only took place in October 2020.
- Regarding departmental decrees regulating anchoring, there is a variation of the framework decree. Local consultations have shown either the technical difficulty of isolating areas of lesser impact while respecting maritime safety, or the steps to be taken in terms of consultation since the restriction regarding the freedom to use the water body on the grounds of environmental protection is not accepted by all marine professionals. Furthermore, the cost of the facilities (especially light equipment anchorage areas) for the communities has made it more difficult to accept these decrees; technical and financial support has needed to be provided and will still have to be provided.
- A Posidonia Commission has been set up under the coordination of the Préfecture maritime de Méditerranée, bringing together the main funders and decision-makers on the marine environment, State operators and instructors, in particular services on a departmental level. This Commission monitors the progress of the local decrees and defines the most appropriate ways of supporting the communities. A technical guide has been designed, a brochure and a communication strategy are in the process of being consolidated, and a call for projects has been put together. Postponed due to the health crisis, this call for projects will make it possible to significantly increase the number of anchorage management projects on the coast from 2021.

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All these elements justify not setting a numerical target so as not to negatively impact upon the local consultation on this Sea Basin Strategy Document cycle, but instead to indicate a "downward trend" in line with the policies and governance implemented in the Mediterranean.

The map and related methodology can be found in Annex 2.

D01-HB-OE10:

Several types of vulnerable marine ecosystems have been identified as having strong and major challenges in the Sea Basin Strategy Document. In particular, these are the deep reefs located at the level of rocky canyons (largely integrated into the Natura 2000 network at sea and on the coast), and the pennatula and crynoid corals which are present at the level of the silt canyons of the central Gulf of Lions and the eastern plateau of Corsica.

The target for indicator D01-HB-OE10-ind2 is to avoid exposing new areas of these VMEs to physical pressures to which they are particularly sensitive. It constitutes the implementation of the action plan for obscure habitats as defined in the framework of the Mediterranean Action Plan of the United Nations Environment Programme. The spatialization methodology and the associated map are annexed to this addendum. The geographical layers will soon be available in Sextant.

Sea birds:

D01-OM-OE01-ind1:

The target is to identify those areas within sea bird essential areas (area of maximum density) that are at risk from incidental catch pressure (area at risk). For all of these areas, reduction measures (regulatory, contractual or voluntary) will be implemented to minimise this risk, as is required throughout the national territory as a result of the protection status of the species (all sea bird species are protected) and within the SPZ (special protection zone) network as a result of the Birds Directive.

D01-OM-OE04-ind1:

In January 2019, the OFB consulted the Groupement d'Intérêt Scientifique Oiseaux Marins (GISOM) in its capacity as scientific expert to find out its capacity to monitor, determine the reference value and discover information (and the associated methodology) for specific indicators relating to sea birds.

GISOM therefore committed itself to three indicators (D01-OM-OE04-ind1, D01-OM-OE04-ind2, D01-OM-OE06-ind1) and in November 2019, it produced the methodological report that is associated with each of these indicators.

Concerning indicator D01-OM-OE04-ind1, GISOM first defined the list of island sea bird colonies that faced strong challenges and the list of introduced and domesticated species to be controlled. It defined the monitoring equipment, methods and devices to be used to identify whether or not there were pressures present.

The current status of the functional habitats available for sea birds (concentration of individuals on a limited number of sites and scarcity of potential carry-over sites) and the proven, but controllable impacts

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of predation on reproductive success, encouraged the setting of an ambitious target of 0 strong challenge for island colonies facing proven pressure from introduced or domesticated species.

The GISOM methodological report can be found in Annex 3.

D01-OM-OE05- ind 1 & 2:

The concentration of anthropogenic pressures on the coastal strip has, over a few decades, led to a very rapid reduction in the area of functional habitats that are available to sea birds, which has therefore resulted in a drop in numbers for the most sensitive species. For example, nearly a third of the sea bird species breeding in France are now endangered or critically endangered (14 species out of 47).

The targets that are defined will correspond to the restoration of at least one functional site per marine sub-region by 2026. In the absence of a precise identification of suitable sites for this type of restoration, no figures could be proposed.

Sea-floor integrity - artificialization:

The Sea Basin Strategy Document's targets on artificialization are innovative and ambitious. They required all players to have a perfectly shared understanding of the definition of artificialization, of the perimeters on which it is based, and finally the sharing of a realistic and shared objective regarding a sensitive policy, something upon which the coastal economy partly depends.

Under the framework of the second cycle (2018–2023) of implementing the MSFD, a new environmental target D06 OE01 specifically addresses the artificialization of the coastal and nearshore marine environment, in the sense of physical losses. A second objective concerns physical disturbances and the physical loss of generic and special habitats related to maritime works, activities and uses.

The principle of this objective D06 OE01 is to control the artificialization of the shoreline (coastal line and lower levels), by defining a limit value (target) to be reached by 2026 for each indicator. For the Mediterranean coastline, the targets of the environmental target indicators limit artificialization differently, depending on whether or not there is a marine protected area.

In this context, the indicators for objective D06 OE01 concerning the physical loss of habitat linked to the artificialization of the coastline, the foreshore and the seabed (0-20 m) that were adopted in the maritime coastline strategies in 2019 are as follows:

- indicator 1 (MED front): Percentage of artificialised linear (structures and emerging developments);
- indicator 2 (MEMN, NAMO, SA coastlines) : Percentage of artificialised linear (structures and emerging developments). For this indicator specifically, two different targets have been set:
 - A target for the upper limit relating to the foreshore (in linear km): the method for calculating the target is the same as for indicator 1 that relates to the Mediterranean coast;
 - A target for the intertidal space (in ha);
- indicator 3 (MEMN, NAMO, SA, MED coastlines) : Percentage of artificial seabed (emerged and submerged structures and developments) between 0 and 10 m;

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- indicator 3 (MEMN, NAMO, SA, MED coastlines) : Percentage of artificial seabed (submerged structures and developments) between 10 and 20 m.

In order to simplify the work of the instructive services, it was decided to merge indicators D06-OE01-ind3 and D06-OE01-ind4. This new indicator therefore takes into account the percentage of artificial seabed between 0 and 20 metres.

The characterisation of a reference rate of artificialization was therefore essential to establish these targets. This rate was established by CEREMA for linear and foreshore areas only (i.e. for indicators 1 and 2) and for the period 2002–2014, in the context of a report entitled "Artificialization of coastal and littoral marine environments, Methods for determining indicators 1 and 2" (CEREMA, 2021), which can be found in Appendix 2.

In the Mediterranean, the MEDAM monitoring network (ECOSEAS-CNRS-University of Nice), which has been deployed within the framework of the WFD and in the 1st cycle of the APME, and which was initially proposed as a way of defining the reference values and targets. The modelled data, which was made available in MEDAM, has made it possible to raise awareness among stakeholders, and in particular local authorities, of the problem posed by the artificialization of the coastline and coastal seabed during the preparation of the Sea basin strategy. This made it possible to obtain an agreement over a first target that calls for a limit on artificial development in all the Marine Protected Areas of the coastline and over the six years of the 1st Sea Basin Strategy Document cycle to less than 0.1% increase.

However, these models needed to be consolidated and deepened by sector: a database also had to be built for all maritime coastlines, including a shared model and definition. This is why it was decided that CEREMA would be responsible for the construction of this database and would propose a reference value and a target for each coastline.

The main new features brought about by defining these D06 OE1 indicators and their targets in relation to pre-existing indicators relating to the artificialization of the coastline and the coast in France are summarised below:

1. From the point of view of defining them and their use, the indicators relating to artificialization in D06 OE1 of the MSFD correspond to the rate of artificialization of the linear coastline on the one hand (in kilometres, for all coastlines, called "upper limit of artificial foreshore" for the Atlantic and Channel coastlines) and of the foreshore surface on the other hand, (in hectares, for the Atlantic and Channel coastlines only). In this respect, they differ from the rate of artificialization calculated at a specific moment and provided by other pre-existing indicators;
2. In regulatory terms, the ET indicators of the MSFD and their targets are supported by a compatibility obligation for offshore authorisations. As a result, the need for reliable results is high. They must be able to be converted into absolute values in an accurate way to enable the easier processing of permits;
3. In terms of the pressures taken into account, the indicators relating to artificialization in D06 OE1 of the MSFD focus on physical losses and do not take into account the physical disturbances caused by structures. Indeed, another MSFD ET (D06 EO02) deals with physical disturbances. Moreover, the uncertainties in the calculation methods for taking into account physical disturbances are currently significant. This is why the indicators relating to artificialization in D06 OE1 of the MSFD only take into account the area covered by the structures in the artificialization, without taking into account the zone of influence relating to the structures, unlike the assessment of artificialization carried out within the framework of the integrated management of the coastline, for which it is essential to take into account – even on an approximate basis – the zone of influence of the structures;
4. From a methodological point of view, in relation to the "artificial linear length", the length of artificial

linear length for the indicators of D06 OE1 of the MSFD is calculated without using a projection on the basis of the

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reference coastline, in order to adapt to changes in the reference land-sea boundary, which is currently being redefined (work by SHOM-IGN). This is not the case for the WFD and the SNGITC, where the rate of artificialization calculated at a given time was based on a projection of coastal structures (identified from databases, aerial photographs, etc.) and a reference coastline (Histolitt, v2, 2009, SHOM-IGN), which is now obsolete.

The CEREMA methodological report can be found in Annex 4.

Anthropogenic pressures:

D08-OE04:

A study by CEREMA looking at all the coastlines, identifies and characterises dry dock areas: this survey was carried out and delivered in July 2018, but was not shared with all the stakeholders. The results must therefore be compared on the one hand with the detailed territorial analysis carried out by the Rhone-Mediterranean-Corsica Water Agency within the framework of the WFD and the reduction of "black spots", and on the other hand with an analysis of the competent services for water policing (DREAL in Occitania, DDTM in PACA and Corsica) and the port management authorities.

The problem of a dry dock area and the technical solutions that need to be found, must therefore be discussed on a case-by-case basis. The WFD Measurement Programme has identified the black spots to be solved in terms of pollution. The target defined should not lead to all dry dock areas being equipped, but only those that present a challenge (major bases). This is why it has been defined as an "upward trend".

The Rhone-Mediterranean (OF 6C) and Corsica (OF3B) River Basin Management Plans and their programmes of measures take into account the issues associated with environmental target D08-OE04. The Rhone-Mediterranean and Corsica River Basin Management Plan projects recommend limiting the risks of disseminating invasive alien species during the dry docking of ships (pleasure craft and professionals) and submerged equipment (buoys, breeding structures, etc.).

The 2022–2027 programmes of measures of the River Basin Management Plans include measure D0501 "Implement measures aimed at reducing pollution mainly linked to port industries and nautical activities", in relation to coastal water bodies where dry dock areas still pose a problem in terms of pollutant entering the sea and which should therefore be equipped. This measure has been added to the WFD programme of measures under the section on environmental targets of the Sea Basin Strategy Document.

D11-OE01:

TG Noise has not yet set any targets and is still working on them. The next TG Noise meeting is scheduled for 17 February 2021.

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Part C - Summary of the targets defined during the preparation of the Rhone-Mediterranean and Corsica River Basin Management Plans and their consistency with the Sea Basin Strategy Document

Environmental objective	Environmental indicator	Proposed target	Comments and possible exceptions
D07-OE03. Limiting pressures and barriers to sea-land connectivity in estuaries and coastal lagoons	D07-OE03-ind3. Number of non-removable obstacles for which the impacts on currentology, sedimentology and continuity have been minimised	Upward trend	<p>The work that was carried out within the framework of the River Basin Management Plan and the PLAGEPOMI makes it possible to identify the structures on which actions must be carried out in terms of ecological and even sedimentary continuity. Measures are included in the water bodies in question. The discussions carried out under River Basin Management Plan and PLAGEPOMI do not take into account the possible issues to be dealt with in terms of hydrological continuity. Specific consideration must be given to this subject during the second cycle of the APME in order to identify whether there are particular issues to be addressed and to list any structures concerned. It is preferable to propose a target in terms of a "trend" until more precise information is available.</p> <p>No exceptions</p>
D08-OE07. Reduce discharges of land-based contaminants to the sea* * excluding dredging and reclamation activities	D08-OE07-ind1. Number not reaching the GES threshold in sediment and biota	<i>Candidate indicator</i>	The indicator has been classified as a "candidate for the 3rd MSFD cycle" due to methodological difficulties in defining a numerical target consistent with the indicator's title, particularly for sediments, and a connection with the work in progress that is looking at a harmonised WFD-MSFD method.
	D08-OE07-ind2. Number of coastal water bodies with good chemical status under the WFD	100 %	All coastal water bodies have a good WFD chemical status. Generally speaking, all the pollution reduction measures carried out in the RMC basin contribute to reducing pollutant inputs to the sea. There is a regulatory basis for the emission of substances into the environment. The measures within the WFD programme of measures are complementary to this pillar. Specific work is also being carried out at the basin level to build a global strategy regarding the reduction of hazardous substances and to target the efforts to be made in terms of substance reduction. This strategy will contribute to both the objectives of the WFD and the ETs of the Sea Basin Strategy Document in terms of reducing flows to the sea (excluding pesticide issues); the proposed measures make it possible to maintain good chemical status of coastal water bodies with a target of 100%.
D09-OE01-ind1. Reduce direct transfers of microbiological pollutants, in particular to bathing areas and shellfish production areas	D09-OE01-ind2. Proportion of REMI monitoring points on the coastline showing a deterioration in microbiological quality or showing a deteriorated quality that is not improving (general trend over 10 years)	0.00 %	The measures proposed in the 2022–2027 programme of measures should ensure that bathing and shellfish water quality is fully achieved (0% target). These networks are monitored by IFREMER in conjunction with the ARS

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Part C - Targets defined during the preparation of the Rhône-Mediterranean and Corsica River Basin Management Plans and their consistency with the Sea Basin Strategy Document

In accordance with IX of Article L212-1 of the Environment Code, the River Basin Management Plan must be compatible or made compatible with the environmental targets as defined in the APME, when it is periodically updated in accordance with Section IV of Article L. 212-2. Conversely, the APME includes environmental targets and associated indicators for achieving good environmental status of marine waters, which are compatible or have been made compatible with the River Basin Management Plan (Article L.219-9 of the Environment Code).

By virtue of the provisions mentioned in IX of Article L212-1 and insofar as many of the pressures on marine ecosystems are generated on land, the environmental targets of the Sea Basin Strategy Documents relating to these pressures on land or in relation to water policy define new results to be achieved within the framework of the River Basin Management Plans that are currently being drawn up for the third management cycle 2022-2027. As a result, the River Basin Management Plans and WFD programme of measures must define the measures contributing to the achievement of these results, within the limits of their legal scope, unless exceptions to the achievement of these objectives are integrated into the Sea basin Strategy Documents.

D07- OE03 ind3: sea-lagoon connectivity:

For the Mediterranean coast, the target is an "upward trend" of the number of non-removable obstacles for which the impacts on currentology, sedimentology and continuity have been minimised by 2026.

The work that was carried out within the framework of the River Basin Management Plan and the PLAGEPOMI makes it possible to identify the structures on which actions must be carried out in terms of ecological and even sedimentary continuity. Measures are included in the water bodies in question. The discussions carried out under River Basin Management Plan and PLAGEPOMI do not take into account the possible issues to be dealt with in terms of hydrological continuity. Specific consideration must be given to this subject during the second cycle of the APME in order to identify whether there are particular issues to be addressed and to list any structures concerned. It is preferable to propose a target in terms of a "trend" until more precise information is available.

River Basin Management Plan provisions contributing to the achievement of the objective and the definition of the target; River Basin Management Plan Rhône-Méditerranée:

Fundamental guideline 6A- Act on morphology and decompartmentalisation to preserve and restore aquatic environments

Disposition 6A-05 to 6A-10 (restore the ecological continuity of aquatic environments, implement a sediment management policy, continue the recovery of migratory fish life axes)
Disposition 6A- 16 Implement a policy of preservation and restoration of the coastal and marine environment for the management and physical restoration of environments.

River Basin Management Plan Corsica:

Fundamental guideline 3A- Preserve and restore the functioning of aquatic and coastal environments. Provision 3A-01 to 3A-09, which aim to improve ecological continuity for circulation of fish and transit of sediment

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Basic Guideline 3C - Preserve, restore and manage wetlands to ensure their functions and services

Provision 3C-02 Undertake actions to restore wetlands and in particular lagoon environments.

The RM and Corsica River Basin Management Plans recommend, in particular, "Undertaking physical restoration actions specific to lagoon environments. Promote exchanges within the lagoon and with related environments and the PLAGEPOMI...".

The River Basin Management Plans encourage, in particular, the implementation of lagoon management plans and that they include a diagnosis of the issues at stake with regard to the circulation of marine and amphihaline fish (in particular eels), so that they propose concrete actions relating to equipment or management methods to ensure continuity at sea by 2027. The link with the PLAGEPOMI is well established.

Associated WFD measures:

MIA0502- Implement maintenance or ecological restoration operations in transitional water (lagoon or estuary);

MIA0501 Restore a hydrological balance between freshwater and saltwater inputs in a transitional water body of the lagoon type I71

D08- EO7 ind2: Reduction of discharges of land-based contaminants to the sea:

Indicator 1 was defined as an indicator "candidate" because of the methodological difficulties in defining a numerical target consistent with the indicator's title, particularly for sediments, in connection with the work in progress on a harmonised WFD-MSFD method. Only indicator 2 makes up EO7.

According to the Rhone-Mediterranean and Corsica River Basin Management Plans, 100% of coastal water bodies are in a good chemical condition. The target is therefore 100%.

All coastal water bodies have a good WFD chemical status. Generally speaking, all the pollution reduction measures carried out in the RMC basin contribute to reducing pollutant inputs to the sea. There is a regulatory basis for the emission of substances into the environment. The measures of the WFD programme of measures are complementary to this pillar. Specific work is also being carried out at the basin level to build a global strategy regarding the reduction of hazardous substances and to target the efforts to be made in terms of substance reduction. This strategy will contribute to both the WFD objectives and the Sea Basin Strategy Document ETs for reducing flows to the sea (excluding pesticide issues). The proposed measures make it possible to maintain the good chemical status of coastal water bodies with a target of 100%.

River Basin Management Plan provisions contributing to the achievement of the objective and the definition of the target; River Basin Management Plan Rhône-Méditerranée:

Fundamental guideline 5A - Continue efforts to combat pollution from domestic and industrial sources

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Provision 5-01 to 5A-07;

Fundamental guideline 5B- Fight against eutrophication of aquatic environments
Provision 5B-01 Anticipate and ensure the non-degradation of fragile aquatic environments with regard to eutrophication phenomena;

Fundamental guideline 5C- Combating pollution by dangerous substances 5C-01 to 5C-05

Fundamental guideline 5D - Fight against pollution by pesticides through consistent changes in current practices
Provisions 5D-01 to 5D-05

River Basin Management

Plan Corsica:

Fundamental guideline 2A- Continue the fight against pollution Provision 2A-01 to 2A-12

[Associated WFD measures:](#)

All the measures at the scale of the RMC basin which aim to reduce the pollutant inputs from agricultural activities (AGR0101, AGR0202, AGR0302, AGR0303 AGR0401, AGR0503 AGR0801, AGR0802, AGR0804, AGR0805), industrial (IND0101, IND0201, IND0202 IND0501, IND0601 IND0701, IND0901) and domestic (ASS0101, ASS0201, ASS0302 ASS0402, ASS0502, ASS0601,

D09-OE1 ind1: Transfer of microbiological pollutants to bathing and shellfish production areas:

In order to be in line with the River Basin Management Plan strategy, it was specified that degraded quality was a worse status than a B classification (according to the Hygiene Package).

The target adopted for the Mediterranean coastline is 0% of REMI monitoring points on the coastline showing a deterioration in microbiological quality or showing a deteriorated quality that is not improving (general trend over 10 years).

The measures proposed in the 2022–2027 programme of measures should ensure that bathing and shellfish water quality is fully achieved (0% target). These networks are monitored by IFREMER in conjunction with the ARS.

[River Basin Management Plan provisions contributing to the achievement of the objective and the definition of the target;](#) River Basin Management Plan Rhône-Méditerranée:

Fundamental guideline 5E- Assess, prevent and control risks to human health Provision 5E-05 - Reduce pollution in the catchment area to achieve the quality objectives for bathing water and shellfish waters.

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River Basin Management Plan Corsica:

Fundamental guideline 2: Combating pollution by strengthening the control of health risks

Provision 2A-05 - Adapting discharge conditions to preserve receptive environments that are particularly sensitive to pollution

Provision 2A-10 - Undertake coordinated action programmes in environments that are particularly sensitive to organic and chemical pollution

Associated WFD measures:

The WFD programme of measures includes measures for the Bathing Water and Shellfish Water Directive.

ASS0302- Rehabilitation and/or creation of a wastewater treatment network outside the ERU Directive (agglomerations of all sizes);

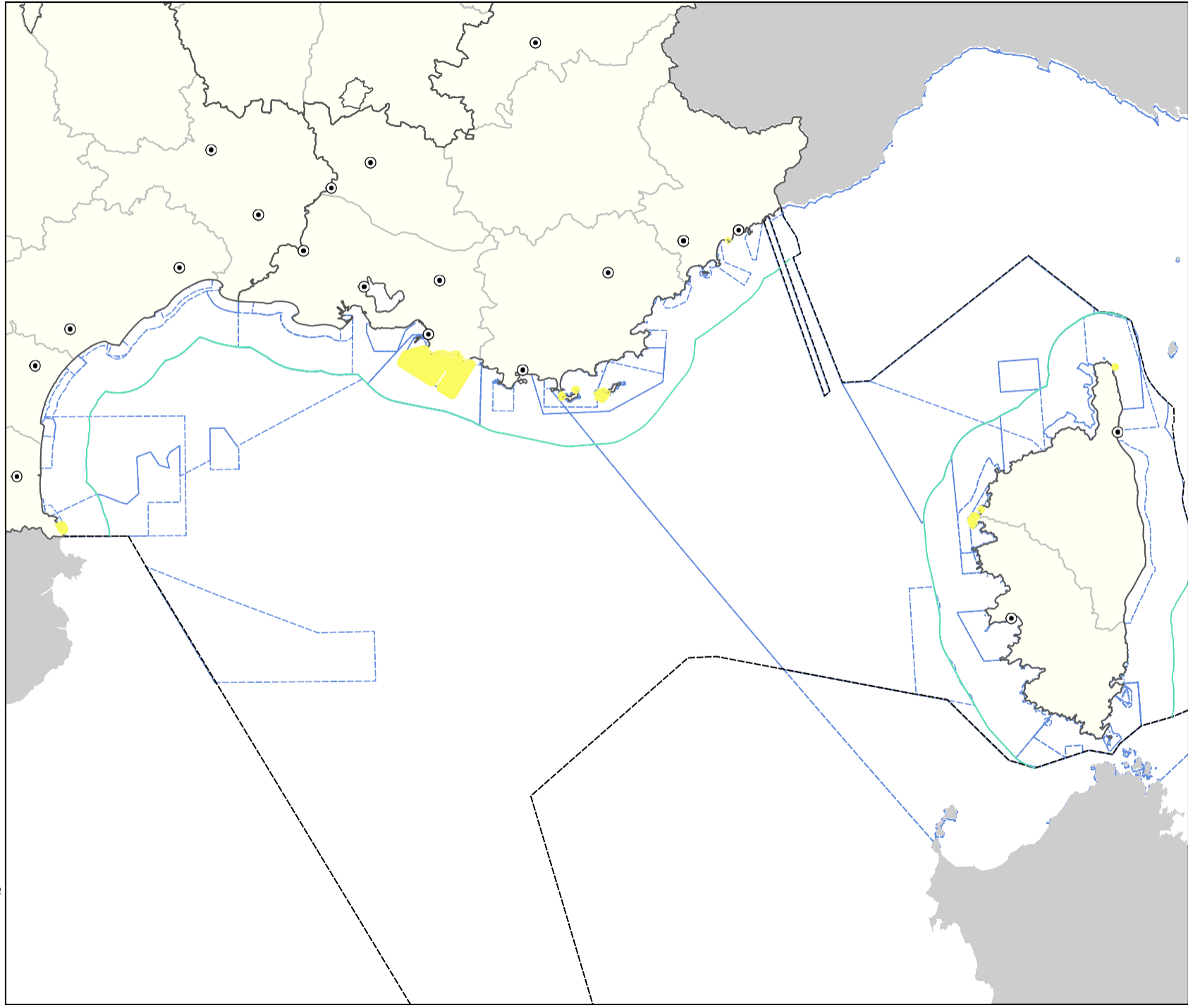
ASS0201 - Carry out strict stormwater management and treatment improvements;





ASS0801- Develop and/or implement a non-collective sanitation system

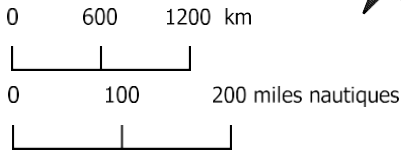
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Annex 1 -
Map of candidate Strong Protection Zones on the
Mediterranean coast



-  Candidate High Protection Area 
- MPA perimeter
-  Limit of the Territorial Sea (12 mn)
-  Maritime boundary or EEZ



Data sources:
- SPZ candidates: OFB, managers
- MPA perimeter: INPN/MNHN, CERL, OFB
- Maritime boundaries: SHOM
- Background map: IGN
Do not use for navigation

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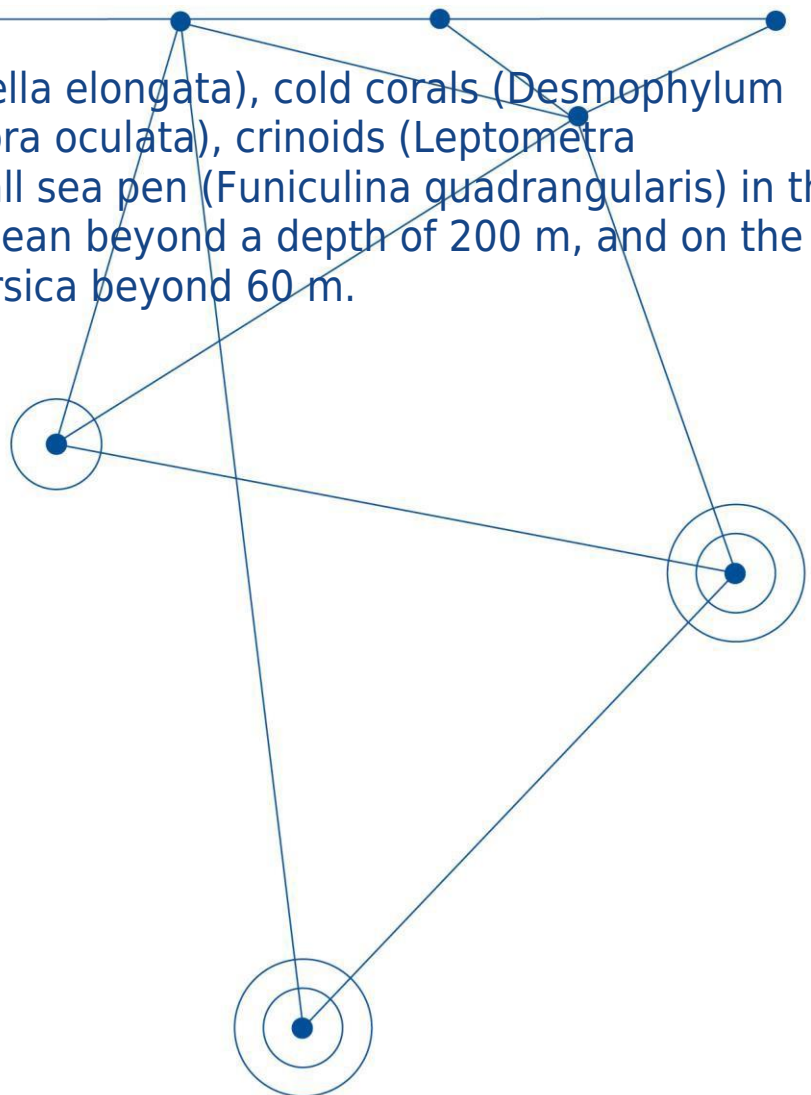
Additional targets and associated methodologies, defined in conjunction with the work on developing the Sea Basin
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Annex 1 -

Map and methodological report - Known Occurrences of Indicator
Species of Vulnerable Marine Ecosystems in the Mediterranean

Recognised occurrences of indicative species of Vulnerable Marine Ecosystems in the Mediterranean

Bamboo coral (*Isidella elongata*), cold corals (*Desmophylum pertusum*, *Madrepora oculata*), crinoids (*Leptometra phalangium*) and tall sea pen (*Funiculina quadrangularis*) in the western Mediterranean beyond a depth of 200 m, and on the eastern shelf of Corsica beyond 60 m.



Known occurrences of Vulnerable Marine Ecosystem (VME) indicator species: Bamboo coral (*Isidella elongata*), cold corals (*Desmophylum pertusum*, *Madrepora oculata*), crinoids (*Leptometra phalangium*) and tall sea pen (*Funiculina quadrangularis*) in the western Mediterranean beyond a depth of 200 m, and on the eastern shelf of Corsica beyond 60 m.

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1. Introduction

As part of the implementation of the Marine Environment Framework Directive (MEFD), one of the environmental targets is to avoid the abrasion and smothering of the most representative areas of deep-sea habitats (Vulnerable Marine Ecosystems, VME). For the Mediterranean coast, the operationalisation plan for this objective (D01-HB-OE10) defines VMEs as including Bamboo Coral (*Isidella elongata*), cold corals, crynoid beds (*Leptometra phalangium*) and tall sea pen beds (*Funiculina quadrangularis*) beyond a depth of 200 m or beyond a depth of 60 m in the particular case of the Corsican eastern plateau.

Ifremer, in their role as technical contributor, is responsible for aggregating existing data on the occurrence of indicator species. This note lists the data sources and describes the aggregation method used to produce the distribution maps of the Mediterranean Vulnerable Marine Ecosystems.

2. Source data

2.1. Bathymetry

EMODNET (3 tiles: E5, F4, F5)

<https://www.emodnet-bathymetry.eu/>

2.2. Occurrence of VME indicator species

2.2.1. Photo and video observations

Fabri Marie-Claire, Pedel Laura (2020). *Isidella elongata* (Alcyonacea) presence and absence extracted from video, from Fabri et al, 2014. Ifremer. <https://doi.org/10.12770/b71269cf-21d1-4d34-9ffe-25462a284f92>

Fabri Marie-Claire, Pedel Laura (2020). *Funiculina quadrangularis* (Pennatulacea) presence and absence extracted from video, from Fabri et al, 2014. Ifremer. <https://doi.org/10.12770/1aa1d021-9bf0-4606-b272-687782ea3def>

Fabri Marie-Claire, Pedel Laura, Beuck Lydia (2020). Scleractinian distribution (*Madrepora oculata* and *Lophelia pertusa*) reported from 1995 to 2013 in the French Mediterranean Sea. Ifremer. <https://doi.org/10.12770/1f5d1a2a-26e1-4263-82db-78ad34d0146>

Fabri Marie-Claire, Vinha Beatriz (2020). Distribution of *Madrepora oculata* colonies in the Cassidaigne canyon in 2017, Western Mediterranean. Ifremer. <https://doi.org/10.12770/f4967e89-5ed6-4b5b-857c-c88fac13bf08>

Fourt M., Goujard A., Pérez T. & Chevaldonné P. (2017). A Guide to the Deep Sea Fauna of the Mediterranean Sea: Explorations of the submarine rocks and canyons of the French coast. Muséum national d'Histoire naturelle, Paris, 184p. (Patrimoines naturels; 75).

2.2.2. Scientific trawling

Vaz Sandrine (2020). *Funiculina quadrangularis* (Pennatulacea) and *Isidella elongata* (Alcyonacea) distribution of incidental catches from scientific trawling surveys. Ifremer. <http://dx.doi.org/10.12770/27ad8f32-bd15-417c-b08d-064a713c9409>

2.2.3. Historical data

Maurin Claude (1962). Distribution of *Funiculina quadrangularis* (Pennatulacea) in the French Mediterranean Sea as described by Maurin in 1962. Ifremer. <https://doi.org/10.12770/4e8e3fb7-52e9-450c-a0c6-2acf352fcd9b2>

Maurin Claude (1962). Distribution of *Isidella elongata* (Alcyonacea) in the French Mediterranean Sea as described by Maurin in 1962. Ifremer. <https://doi.org/10.12770/ca656733-83a0-4dc3-a935-6c6dcacd9f3b>

3. Methodology

3.1. Geographical area and net size

A 1' x 1' grid was created at the scale of the area of interest (3°E-11°E, 41°N-45°N) and then divided into two geographical zones: the eastern Corsican plateau and the rest of the area of interest. For the East Corsica zone, the nets with a depth greater than 60 m were retained. For the remainder of the area, nets deeper than 200 m were retained (Figure 1).

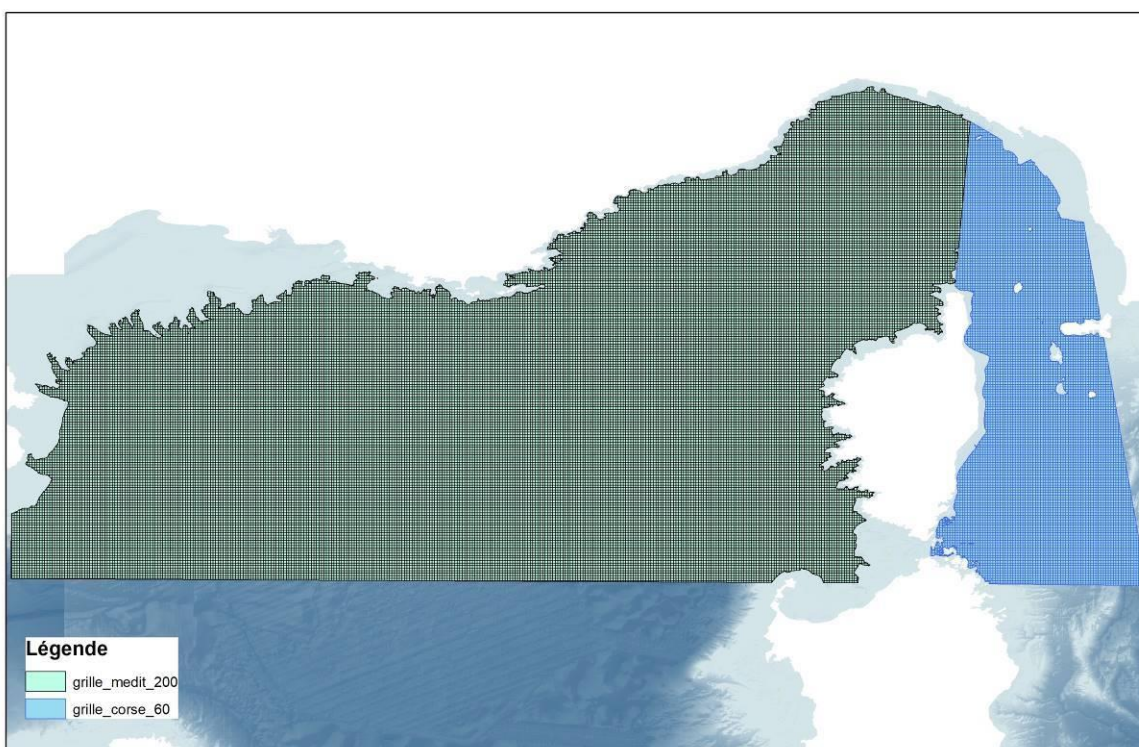


Figure 1. Mesh size of the East Corsica (> 60 m) and Western Mediterranean (> 200 m) zones.

3.2. Mapping of Vulnerable Marine Ecosystems

The occurrence data of VME indicator species were aggregated by 1' x 1' grid cell by distinguishing three data sources:

- Observations obtained by analysis of photographs or videos acquired by underwater devices, for which data on the presence of *Isidella elongata* were retained,

Funiculina quadrangularis, *Madrepora oculata*, *Desmophylum pertusum* (i.e. *Lophelia pertusa*) and *Leptometra phalangium*.

- Recent scientific trawling with a non-zero yield for the species *Isidella elongata* and *Funiculina quadrangularis*.
- The historical data for the distribution maps of deep silt at *Funiculina* and deep silt at *Isidella*.

Each net cluster was selected from recent scientific trawling and observation data was added to a buffer zone equivalent to one mesh square (1' x 1'), i.e. 1853 m latitude and 1363 m longitude at 42°N (Figure 2). This buffer zone is based on ICES recommendations for a buffer zone around VMEs that is at least twice the depth of water. The maximum depth of VME occurrences is 800 m.

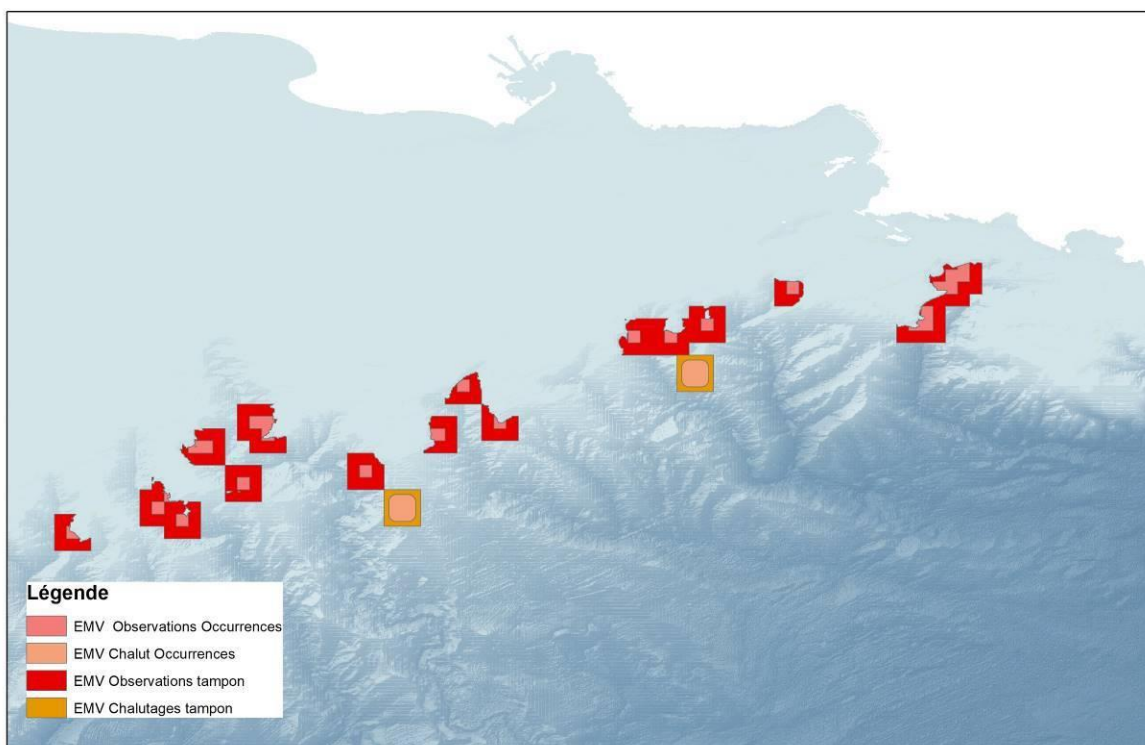


Figure 2. Example of a gridded distribution of VME occurrences based on sightings and trawling and their buffer zones.

No buffer zones have been added to the historical data, which are already surface data extrapolated from point data.

4. Distribution map of Vulnerable Marine Ecosystems in the Mediterranean

The result of the mapping of Mediterranean VMEs is shown in Figure 3. Three geographical information layers were produced and delivered:

- **EMV_Mediterranean_Observations**

Aggregations of occurrence data for the five Vulnerable Marine Ecosystem indicator species (*Madrepora oculata*, *Desmophylum pertusum*, *Funiculina quadrangularis*, *Isidella elongata*, *Leptometra phalangium*) per 1' x 1' grid cell, augmented by a buffer zone consisting of the neighbouring grid cells to each aggregate.

Related metadata:

- Campaign: Name of the oceanographic campaign
- Campaign_D: doi of the campaign or ship and operators
- Site: Name of the submarine canyon or other geological structure associated with the observation
- Species: Name of the Vulnerable Marine Ecosystem indicator species
- Source: Source of the data

- **EMV_Mediterranee_Chalut**

Aggregations per 1' x 1' grid of the occurrence data of *Funiculina quadrangularis* and *Isidella elongata* collected by scientific trawling, augmented by a buffer zone consisting of the neighbouring nets to each aggregate.

The metadata for the information layer are those of the source layer:

Vaz Sandrine (2020). *Funiculina quadrangularis* (Pennatulacea) and *Isidella elongata* (Alcyonacea) distribution of incidental catches from scientific trawling surveys. Ifremer. <http://dx.doi.org/10.12770/27ad8f32-bd15-417c-b08d-064a713c9409>

- **EMV_Mediterranean_History**

Aggregations per 1' x 1' grid of the distribution areas of *Funiculina quadrangularis* and *Isidella elongata* extrapolated from scientific trawl data from 1957 to 1961.

The metadata for the information layer are those of the source layers:

Maurin Claude (1962). Distribution of *Funiculina quadrangularis* (Pennatulacea) in the French Mediterranean Sea as described by Maurin in 1962. Ifremer. <https://doi.org/10.12770/4e8e3fb7-52e9-450c-a0c6-2acf352fcd2>

Maurin Claude (1962). Distribution of *Isidella elongata* (Alcyonacea) in the French Mediterranean Sea as described by Maurin in 1962. Ifremer. <https://doi.org/10.12770/ca656733-83a0-4dc3-a935-6c6dcacd9f3b>

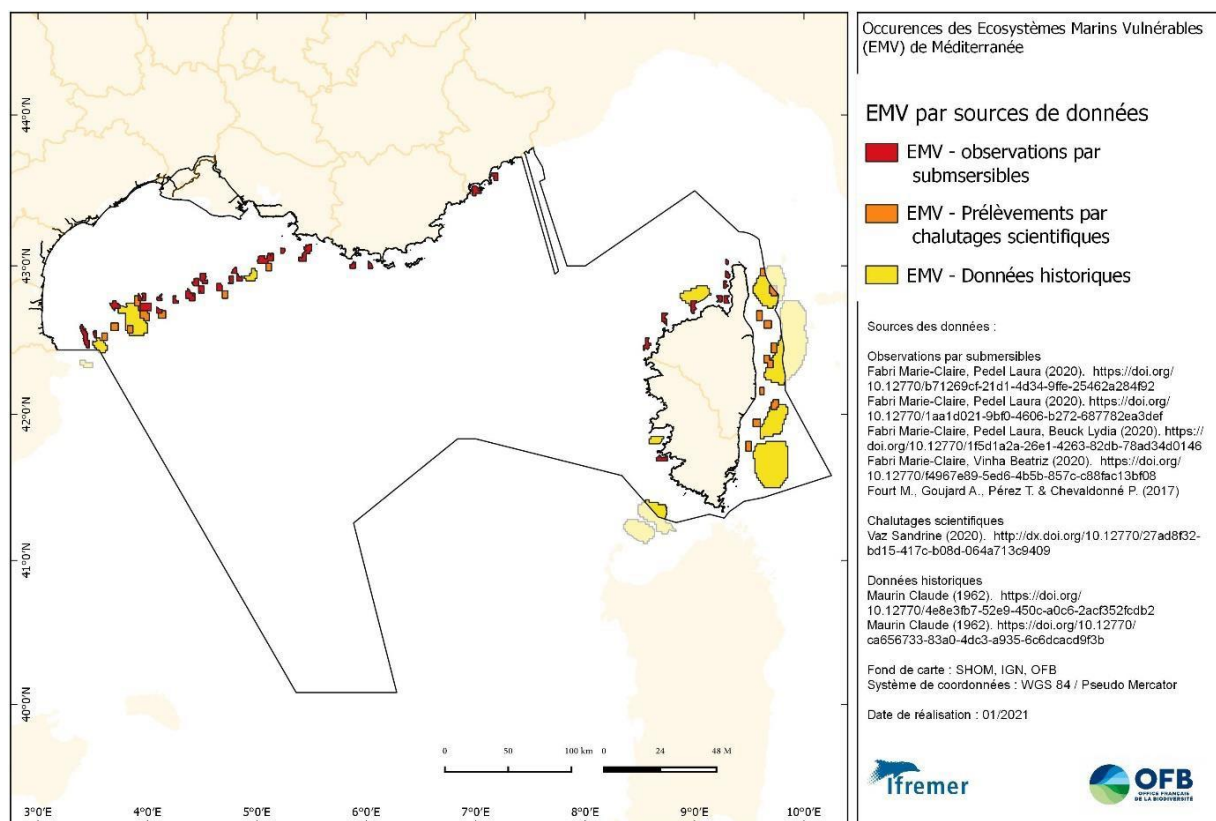


Figure 3. Maps of Vulnerable Marine Ecosystems indicated by known occurrences of Bamboo Coral (*Isidella elongata*), cold corals (*Desmophylum pertusum*, *Madrepora oculata*), crinoids (*Leptometra phalangium*) and tall sea pen (*Funiculina quadrangularis*) in the western Mediterranean beyond a depth of 200 m, and on the eastern shelf of Corsica beyond a depth of 60 m.

Addendum to the Mediterranean Coastline Strategy

Additional targets and associated methodologies, defined in conjunction with the work on developing the Sea Basin
Strategy Document Action Plan

Annex 3-
GISOM Methodology Proposal Report



SCIENTIFIC INTEREST GROUP FOR
SEABIRDS

GISOM methodological proposal

Environmental Objectives (ET) sea birds of the MSFD (2nd cycle)
Operationalisation of the following indicators:

D01-OM-OE04-ind1:

Proportion of island breeding sea bird colonies with "strong challenges" for which species that have been introduced and domesticated represent a proven pressure

D01-OM-OE04-ind2:

Proportion of island breeding sea bird colonies with "strong challenges" for which species that have been introduced and domesticated represent a proven pressure

D01-OM-OE06-ind1:

Proportion of colonies with high or strong challenges according to the AFB's classification of issues for which physical, noise and light disturbances constitute a risk to their long-term survival

Definition of the reference value and the protocol for monitoring the indicators

November 2019

GISOM referents: Marine Leicher, Nicolas Sadoul Editor:
Christophe Barbraud, Bernard Cadiou, Antoine Chabrolle

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A. Context

As part of the 2nd cycle of the Strategic Framework Directive for the Marine Environment (SFDME), the Water and Biodiversity Directorate (DEB) – in consultation with the French Biodiversity Agency (AFB) – has defined 147 indicators and associated targets, which are divided into 64 Environmental Objectives (ETs).

These indicators are integrated into the Maritime Coastlines Strategies, which will be adopted by the coordinating Prefects of the coastlines after referral to the Environmental Authority (EA) and a consultation of the official bodies and the public to take place by the end of July 2019.

In parallel to these consultations, there is still work to be done on operationalising the ETs, with a view to identifying the work, tasks and elements for future evaluation of the achievement of the ETs.

The objective of the operationalisation workstream is to define the modalities of information for the indicators, so that the maximum number of ET indicators can be completed during the second MSFD cycle.

For all indicators, the definition of how the indicators are to be reported corresponds to:

- The definition of the linked responsibilities (who collects the data, who calculates the metrics? Who interprets the values that are obtained and evaluates the achievement of the target of the indicator associated with the ET?)
- The identification of the data sets needed to calculate these indicators and how to access these data sets.

The objective is to have an action plan for each coastline defining the methods of information for each ET indicator. This action plan will detail in particular:

- The name of the structure responsible for completing the indicator,
- The data (and their link to the 1st PdS cycle) allowing information for the indicator,
- Possible developments to be foreseen in the framework of the 2nd PdS cycle and that of the SIMM,
- When the indicator is able to be calculated,
- Reference values (whenever data for their calculation is available).

Descriptor "D1" for sea birds includes 8 Environmental Objectives for 15 indicators.

In January 2019, the AFB consulted the GISOM in its capacity as scientific expert on the following topics of "sea birds" to see if it could be used to provide information on certain indicators.

GISOM has thus positioned itself on three so-called "scientific" indicators described in the following table:

Table 1. Indicators on which GISOM has positioned itself

ET Code	Wording of the Environmental Objective
D01-OM-OE04:	Reduce pressure from domesticated species and species that have been introduced at sea bird breeding sites
Indicator code	Name of the indicator
D01-OM-OE04-ind1	Proportion of island breeding sea bird colonies with "strong challenges" for which species that have been introduced and domesticated represent a proven pressure
D01-OM-OE04-ind2	Proportion of island breeding sea bird colonies with "strong challenges" for which species that have been introduced and domesticated represent a proven pressure

ET Code	Wording of the Environmental Objective
D01-OM-OE06	Limit physical, noise and light disturbance to sea birds* in their functional habitat areas * See sea bird species listed in the GES Order
Indicator code	Name of the indicator
D01-OM-OE06-ind1	Proportion of colonies facing strong or major challenges according to the AFB's classification of issues for which physical, noise and light disturbances constitute a risk to their long-term survival

AFB retro planning:

- By 26 April 2019, the "ET indicator" sheets must be completed for each indicator,
- By 7 June 2019, the Operationalisation Action Plan is finalised by AFB, to be presented to the Blue GT on 25/06 (former GCMO: Coordination Group for the Implementation of the MSFD),
- On 10 July 2019, meeting of the NSC (National Steering Committee) on the Sea Basin Strategy Documents (final instances before transfer to the prefects and final adoption of the Sea Basin Strategy Documents at the end of 2019),
- By the end of July 2019, after public consultation, these ETs must be adopted by the Prefects,
- **By the end of 2019, GISOM is to make a proposal (methodological and technical) to inform the targets that are yet to be defined,**
- **By mid 2022, GISOM will have to define/calculate and inform the reference value,**
- **By the end of 2022, GISOM will have to fill in the indicator for the 2nd cycle of the MSFD.**

It is expected that GISOM, which has positioned itself on three indicators – D01-OM-OE04-ind1, D01-OM- OE04-ind2, D01-OM-OE06-ind1 – that it defines the reference values, the target value (only for indicator D01-OM-OE04-ind1), as well as the monitoring/teaching methodology for each indicator. GISOM will also have to define the preliminary studies to be carried out if necessary, the frequency of monitoring, as well as the associated costs.

B. Preamble

1. Sea bird species under consideration

The species in question are those set out in the BBE Order (version of 22 June 2018).

Table 2. Species of the GES Order (version 22 June 2018)

Vernacular name	Latin name	GES sea birds Order	Nesting birds: D01-OM-OE04 D01-OM-OE06 indicator 1
Northern Fulmar	<i>Fulmarus glacialis</i>	Surface sea birds	yes
Herring Gull	<i>Larus argentatus</i>	Surface sea birds	yes
Glaucous Gull	<i>Larus hyperboreus</i>	Surface sea birds	
Lesser black-backed gull	<i>Larus fuscus</i>	Surface sea birds	yes
Herring Gull	<i>Larus canus</i>	Surface sea birds	yes
Audouin's Gull	<i>Larus audouinii</i>	Surface sea birds	yes
Yellow-legged Gull	<i>Larus michahellis</i>	Surface sea birds	yes
Great black-backed gull	<i>Larus marinus</i>	Surface sea birds	yes
Slender-billed Gull	<i>Larus genei</i>	Surface sea birds	yes
Great Skua	<i>Stercorarius skua</i>	Surface sea birds	
Black Tern	<i>Chlidonias niger</i>	Surface sea birds	yes
Long-tailed skua	<i>Stercorarius longicaudus</i>	Surface sea birds	
Parasitic skua	<i>Stercorarius parasiticus</i>	Surface sea birds	
Pomarine skua	<i>Stercorarius pomarinus</i>	Surface sea birds	
Sabine's Gull	<i>Xema sabini</i>	Surface sea birds	
Mediterranean Gull	<i>Larus melanocephalus</i>	Surface sea birds	yes
Pygmy Gull	<i>Larus minutus</i>	Surface sea birds	
Black-headed Gull	<i>Larus ridibundus</i>	Surface sea birds	yes
Black-legged Kittiwake	<i>Rissa tridactyla</i>	Surface sea birds	yes
Leach's Storm Petrel	<i>Oceanodroma leucorhoa</i>	Surface sea birds	
Storm Petrel	<i>Hydrobates pelagicus</i>	Surface sea birds	yes
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Surface sea birds	
Red Phalarope	<i>Phalaropus fulicarius</i>	Surface sea birds	
Scopoli Shearwater	<i>Calonectris diomedea</i>	Surface sea birds	
Yelkouan Shearwater	<i>Puffinus yelkouan</i>	Surface sea birds	yes
Scopoli's Shearwater	<i>Calonectris diomedea</i>	Surface sea birds	yes
Manx Shearwater	<i>Puffinus puffinus</i>	Surface sea birds	yes
Balearic Shearwater	<i>Puffinus mauretanicus</i>	Surface sea birds	
Sooty shearwater	<i>Puffinus griseus</i>	Surface sea birds	
Greater Shearwater	<i>Puffinus gravis</i>	Surface sea birds	
Arctic Tern	<i>Sterna paradisaea</i>	Surface sea birds	
Caspian Tern	<i>Sterna caspia</i>	Surface sea birds	
Sandwich tern	<i>Sterna sandvicensis</i>	Surface sea birds	yes
Roseate Tern	<i>Sterna dougallii</i>	Surface sea birds	yes
Hansel Tern	<i>Sterna nilotica</i>	Surface sea birds	yes
Little Tern	<i>Sterna albifrons</i>	Surface sea birds	yes
Common Tern	<i>Sterna hirundo</i>	Surface sea birds	yes
Common Eider	<i>Somateria mollissima</i>	Benthic diving birds	yes
Greater Scaup	<i>Aythya marila</i>	Benthic diving birds	
Goldeneye	<i>Bucephala clangula</i>	Benthic diving birds	
Long-tailed duck	<i>Clangula hyemalis</i>	Benthic diving birds	
Common Scoter	<i>Melanitta fusca</i>	Benthic diving birds	
Common Scoter	<i>Melanitta nigra</i>	Benthic diving birds	
European shag	<i>Phalacrocorax aristotelis</i>	Pelagic diving birds	yes
Northern Gannet	<i>Morus bassanus</i>	Pelagic diving birds	yes
Great Cormorant	<i>Phalacrocorax carbo</i>	Pelagic diving birds	yes
Black-necked Grebe	<i>Podiceps nigricollis</i>	Pelagic diving birds	
Slavonian or Horned Grebe	<i>Podiceps auritus</i>	Pelagic diving birds	
Great Crested Grebe	<i>Podiceps cristatus</i>	Pelagic diving birds	
Red-necked Grebe	<i>Podiceps grisegena</i>	Pelagic diving birds	
Iberian guillemot	<i>Uria aalge</i>	Pelagic diving birds	yes
Red-breasted Merganser	<i>Mergus serrator</i>	Pelagic diving birds	yes
Atlantic puffin	<i>Fratercula arctica</i>	Pelagic diving birds	yes
Little auk	<i>Alle alle</i>	Pelagic diving birds	
Razorbill	<i>Alca torda</i>	Pelagic diving birds	yes
Black-throated diver	<i>Gavia arctica</i>	Pelagic diving birds	
Red-throated diver	<i>Gavia stellata</i>	Pelagic diving birds	
Great northern diver	<i>Gavia immer</i>	Pelagic diving birds	

The BBE Order (version of 22 June 2018) takes into account 29 species of breeding sea birds

2. Colonies under consideration

According to the AFB classification work carried out for descriptor D1 "sea birds", colonies with "**strong challenges**" have been defined as:

- Those meeting the RAMSAR criteria of international importance (1% of the world's population),
- Sites welcoming more than 15% of the national total.

Colonies facing "**major challenges**", for significant sites with a threshold of 33% of the population of the species in France.

An "island" colony is any colony located on an island or islet not in direct contact with the mainland via a fixed infrastructure (e.g. a bridge).

The islets, which can be reached on foot during high tides, retain their "insular" character.

**Table 3. Sea bird colonies facing strong challenges:
According to the latest census coordinated by GISOM (2009-2012)¹**

Coastline	Title	SPECIES	Island colony	Continental settlement
MEMN	Boulonnais	Black-legged Kittiwake		X
MEMN	Bessin cliffs	Northern Fulmar, Black-legged Kittiwake		X
MEMN	Maritime Flanders	Common Tern		X
MEMN	Chausey Islands	Roseate Tern	X	
NAMO	Molène Archipelago	Storm petrel, Manx shearwater	X	
NAMO	Seven Isles Archipelago	Northern Gannet, Common Murre, Atlantic Puffin, Razorbill, Manx Shearwater, Roseate Tern	X	
NAMO	Cape Sizun	Black-legged Kittiwake		X
NAMO	Erquy and Fréhel	Iberian guillemot, Razorbill		X
NAMO	Belle Ile	Lesser black-backed gull	X	
NAMO	Noirmoutier Island	Mediterranean Gull, Sandwich Tern		X
NAMO	Glénan Archipelago	Lesser black-backed gull, Sandwich tern	X	
SA	Arguin bank	Sandwich tern	X	
MED	Archipelago of the Cerbicales	European shag (med), Storm petrel (med)	X	
MED	Lavezzi Archipelago	Crested Cormorant (med), Scopoli's Shearwater	X	
MED	Calvi --- Cargèse	Audouin's Gull		X
MED	Camargue of Aigues- Mortes	Black-headed Gull		X
MED	Cape Corsica	Audouin's Gull		X
MED	Capo di Roccapina and Pertusato	European shag (med)		X
MED	Cargèse --- capo di Muro	Audouin's Gull		X
MED	Ciotat & calanques (les Lecques-la madrague)	Mediterranean Gull, Black-headed Gull, Hansel Tern, Little Tern		X
MED	Ponds of Languedoc: Narbonne	Little Tern		X
MED	Etangs du Languedoc: Montpellier	Slender-billed Gull, Hansel tern		X
MED	Islands of Marseille	Yellow-legged Gull, Scopoli's Shearwater	X	
MED	Islands of Hyères	Yelkouan Shearwater	X	
MED	Presqu'île de Giens (Miramar--- Carqueiranne)	Slender-billed Gull		X

¹ CADIOU B. (COORD.), 2014. CINQUIÈME RECENSEMENT NATIONAL DES OISEAUX MARINS NICHEURS EN FRANCE MÉTROPOLITAINE - BILAN FINAL 2009-2012 [CITH NATIONAL CENSUS OF BREEDING SEABIRDS IN FRST NATIONAL CENSUS OF BREEDING SEABIRDS IN MAINLAND FRANCE - FINAL REPORT 2009-2012.], GISOM. AAMP. 78P

This reference framework of island colonies, based on the results of the last national census 2009–2011, was adopted by the coordinating Prefects in July 2019 for the 2nd cycle of the MSFD.

Note from GISOM:

In view of the risk of disappearance of certain species of breeding sea birds, in particular those classified by the IUCN France as "CR" (critically endangered) on the red list of threatened breeding species in mainland France (2016), GISOM recommends that for these species, all sites where the species breeds or attempts to breed on a regular basis should be considered as a "high issue" site.

Breeding sea birds classified as 'CR': Atlantic Puffin, Razorbill, Storm Petrel (Mediterranean subspecies), Roseate Tern and Arctic Tern.

Coastline	Title	SPECIES	Island colony	Continental settlement
NAMO	Rikard Island (Islands in the Bay of Morlaix)	Atlantic puffin	X	
NAMO	Island of Keller Vraz (Ushant)	Atlantic puffin	X	
NAMO	Cézembre Island	Razorbill	X	
NAMO	Iles aux Dames (Islets of the Bay of Morlaix)	Roseate Tern	X	
NAMO	Dovecote Island	Roseate Tern	X	

It should be noted that for each of these sites, it was found during the 2009-2012 national census that the species at least attempted to breed on these sites.

All of the sites where the storm petrel (Mediterranean subspecies) breeds are already considered as part of the initial referential for "strong challenge" colonies (see Table 3), namely the Cerbicales Archipelago.

With regard to the Arctic tern, given the fact it only rarely or occasionally breeds in our territory, it does not seem appropriate to consider the breeding site(s) of this species as a "strong challenges" site.

Based on the data reference framework of the 2009-2012 national census coordinated by GISOM and the proposal by GISOM to also include all breeding sites for species classified as "CR" by IUCN France, 30 colonies with "strong challenges" were identified, of which 15 are considered insular and 15 continental.

This inventory of colonies with "strong challenges" will be considered over the entire period of the 1st monitoring cycle of these indicators (2nd cycle of the Strategic Framework Directive for the Marine

Evolution of the colony reference framework:

At the end of the 1st monitoring cycle for this indicator, it may be proposed to re-evaluate this reference framework, which will then be effective (after adoption by the coordinating Prefects) for the 2nd monitoring cycle of the indicators (3rd cycle of the MSFD).

- **Case of species monitored annually:** For the species monitored annually, new colonies can be considered as facing "strong challenges" and could be included in this reference system. This may be the case for terns, which are mobile species.

- **Case of species monitored during exhaustive national counts (ROMN):** For those species not monitored annually, new colonies can be considered as "strong challenges" and could be included in this reference framework.

On the other hand, in order to be objective in monitoring the indicator over time, a colony that has met the criteria of a "strong challenge" colony at least once during a monitoring cycle of the indicator should remain in the reference system to be monitored for the following cycles.

Indeed, a colony X which is currently included in the reference system of "strong challenge" colonies and for which there is a case of proven pressure from introduced or domesticated species, could, in the absence of measures, see its numbers decrease to the benefit of another colony Y (case of birds being transferred to another sector). Having seen its numbers decline (even for reasons other than predation), this colony X may no longer be considered a colony facing a "strong challenge".

3. Predation by introduced and domestic species considered for ET D01-OM- E004

Predation is a natural phenomenon that can be exerted by numerous species (birds, foxes, wild boars, rats, etc.) and can be accentuated by the introduction of exotic species (American mink) or species not initially present on the islands (cats and rats). Ultimately, the reduction in potential nesting habitats for sea birds has led to a concentration of individuals on a limited number of sites and to a scarcity of potential carry-over sites.

The presence of predators at the level of the colony leads to a decrease in reproductive success (predation on eggs and chicks) and even a decrease in adult survival (predation on breeding stock). Short-living species (and therefore dependent on high reproductive success) are very sensitive to this pressure, but long-living species (such as sea birds) are also affected, particularly when predation affects adults.

An introduced species can be defined as *any species transported and released, intentionally or accidentally, by humans into an environment where it was not previously present (Triplet. P²).*

A domesticated species can be defined as *a species in which all representatives belong to selected animal populations or are descended from parents belonging to selected animal populations. A domesticated breed is a selected animal population consisting of a set of animals of the same species that share sufficient common hereditary traits, the enumeration of which and the indication of the average intensity of expression in the set defines the pattern (Triplet P.).*

The species considered in ET D01-OM-E004 are the following (according to *Thevenot's* methodology . J³) :

² TRIPLET P. 2019. DICTIONNAIRE ENCYCLOPÉDIQUE DE LA DIVERSITÉ BIOLOGIQUE ET DE LA CONSERVATION DE LA NATURE,;1145 P.

³ THEVENOT J. 2014. LISTE DE RÉFÉRENCE DES ESPÈCES DE VERTÉBRÉS INTRODUITS EN FRANCE MÉTROPOLITAINE ÉLABORÉE DANS LE CADRE DE LA MÉTHODOLOGIE DE HIÉRARCHISATION DES ESPÈCES INVASIVES [REFERENCE LIST OF VERTEBRATE SPECIES INTRODUCED INTO FIRST INTRODUCED VERTEBRATE SPECIES IN MAINLAND FRANCE, DRAWN UP AS PART OF THE METHODOLOGY FOR PRIORITISING INVASIVE SPECIES.]. RAPPORT OF STAGE N°1. SERVICE OF PATRIMOINE NATUREL, MUSÉUM

Introduced species:

- The American Mink: *Mustela vison* (Schreber, 1777)
- The Norway Rat: *Rattus norvegicus* (Berkenhout, 1769)

Domestic species:

- The Domestic Cat/Harret: *Felis silvestris catus* (Schreber, 1775)
- The Dog: *Canis lupus familiaris* Linnaeus, 1758
- The Ferret: *Mustela putorius furo* (Linnaeus, 1758)
- The Black Rat: *Rattus rattus* (Linnaeus, 1758)

4. Concept of "disturbance" considered for indicator D01-OM-OE06-ind1

According to the guide on regulatory measures and complementary means to manage the disturbance of bird colonies - the case of colonial laro-limicolae⁴,

"Disturbance is defined as any interaction that results in a change in the behaviour of an animal or group of animals. It is characterised by a succession of stages in which a source of disturbance (an intruder) induces a reaction in the colony causing an impact on nesting.

The summary proposed by Le Corre (2009)⁵ reflects the complexity of the methodological issues related to the notion of disturbance. Over the course of this work, 140 publications identifying a negative effect or impact were identified, 59 identifying a neutral effect and 1 a positive effect.

This shows that:

- 1) the impacts of disturbance can be very significant at a given site (e.g. total failure of the species to reproduce at the site);
- 2) they are not systematic;
- 3) they are not always quantifiable at the population level and are more easily understood at the site level.

⁴ PROJET LIFE+ ENVOLL. 2018. ENVIRONMENT POLICING: GUIDE SUR LES DISPOSITIFS RÉGLEMENTAIRES ET LES MOYENS COMPLÉMENTAIRES À METTRE EN ŒUVRE POUR GÉRER LE DÉRANGEMENT DES COLONIES D'OISEAUX [GUIDE ON THE REGULATORY MEASURES AND COMPLEMENTARY MEANS TO BE IMPLEMENTED TO MANAGE THE DISTURBANCE OF BIRD COLONIES' BIRDS.]. LE CAS DES LARO-LIMICOLES COLONIAUX. ARLES. 40 PAGES

⁵ LE CORRE N., 2009. LE DÉRANGEMENT DE L'AVIFAUNE SUR LES SITES NATURELS PROTÉGÉS DE BRETAGNE: ÉTAT DES LIEUX, ENJEUX ET RÉFLEXIONS AUTOUR D'UN OUTIL D'ÉTUDE DES INTERACTIONS HOMMES/OISEAUX [THE DISTURBANCE OF AVIFAUNA ON THE PROTECTED NATURAL SITES OF BRITTANY: STATE OF PLAY, ISSUES AND REFLECTIONS ON A TOOL FOR STUDY OF HUMAN INTERACTIONS/BIRDS].

C. Indicator D01-OM-OE04-ind1: Reduction of predation in island colonies

1. Framing and contextual elements

a) Indicator identifier

Corresponding environmental target					
A-CODE OF THE ET: D01-OM-OE04					
B- TITLE OF THE ET: Reduce pressure from domesticated species and species that have been introduced at sea bird breeding sites					
C-CODE INDICATOR: D01-OM-OE04-ind1					
D-LIB OF THE INDICATOR: Proportion of island breeding sea bird colonies facing strong challenges* for which species that have been introduced and domesticated represent a proven pressure.					
E-TARGET OF THE INDICATOR : Defined, concerted and adopted in the framework of the revision of the programme of measures (2021)					
F-ORIGIN OF THE DATA <input checked="" type="checkbox"/> scientific <input type="checkbox"/> administrative <input type="checkbox"/> mixed (sci &adm)					
Relevant coastlines:	MEMN <input checked="" type="checkbox"/>	NAMO <input checked="" type="checkbox"/>	SA <input checked="" type="checkbox"/>	MED <input checked="" type="checkbox"/>	

a) Species that have been introduced and domesticated species taken into consideration for this indicator

The species considered for this indicator are the following:

- The American Mink: *Mustela mink*,
- The Domestic Cat/Harret: *Felis silvestris catus*,
- The Ferret: *Mustela putorius furo*,
- The Norway Rat: *Rattus norvegicus*
- The Black Rat: *Rattus rattus*

b) Colonies under consideration

According to the AFB classification work carried out for descriptor D1 "sea birds", colonies with "**strong challenges**" have been defined as:

- Those meeting the RAMSAR criteria of international importance (1% of the world's population),
- Sites welcoming more than 15% of the national total.

GISOM recommends including all known breeding sites of certain breeding sea bird species classified by IUCN France as "CR" (critically endangered) on the red list of threatened breeding species in mainland France (2016).

Table 4. *Island colonies of sea birds with "strong challenges": According to the census coordinated by GISOM (2009-2012)*

Coastline	Title	SPECIES
MEMN	Chausey Islands	Roseate Tern
NAMO	Molène Archipelago	Storm petrel, Manx shearwater
NAMO	Seven Isles Archipelago	Northern Gannet, Common Murre, Atlantic Puffin, Razorbill, Manx Shearwater, Roseate Tern
NAMO	Belle Ile	Lesser black-backed gull
NAMO	Glénan Archipelago	Lesser black-backed gull, Sandwich tern
NAMO	Rikard Island (Islands in the Bay of Morlaix)	Atlantic puffin
NAMO	Island of Keller Vraz (Ushant)	Atlantic puffin
NAMO	Cézembre Island	Razorbill
NAMO	Iles aux Dames (Islets of the Bay of Morlaix)	Roseate Tern
NAMO	Dovecote Island	Roseate Tern
SA	Arguin bank	Sandwich tern
MED	Archipelago of the Cerbicales	European shag (med), Storm petrel (med)
MED	Lavezzi Archipelago	Crested Cormorant (med), Scopoli's Shearwater
MED	Islands of Marseille	Yellow-legged Gull, Scopoli's Shearwater
MED	Islands of Hyères	Yelkouan Shearwater

*Additional sites proposed by GISOM

Based on the data reference framework of the 2009-2012 national census coordinated by the GISOM and the GISOM's proposal to also include all breeding sites for species classified as "CR" by the IUCN France, 15 island colonies are targeted by indicator D01- OM-OE04-ind1. The distribution of colonies is as follows: 1 for the MEMN coastline, 9 for the NAMO coastline, 1 for the SA coastline, and 4 for the MED coastline.

Note: This reference framework of island colonies (excluding additional sites proposed by GISOM), based on the results of the 2009-2010 national census, was adopted by the coordinating Prefects in July 2019 for the 2nd cycle of the MSFD. Depending on the results of the various censuses that may be carried out during a cycle, a re-evaluation of this "strong challenge" colony reference system may be proposed for the following cycle.

2. Equipment and method

a) Objective

The aim of the action is to estimate the proportion of island colonies with "strong challenges" that are subject to proven pressure from introduced or domesticated species.

Within the framework of monitoring this indicator, we consider that an **island colony** is subject to pressure from introduced or domesticated species in the following cases (whatever the time of year):

- The introduced or domesticated species has been observed visually, on or near the colony (direct observation or via monitoring devices);
- Evidence of the presence of the introduced or domesticated species (tracks, burrows, droppings) was found on or near the colony;

- Indications of predation (eggs, chicks or predated adults) were observed and are characteristic of predation linked to the presence of introduced or domesticated species.

For each of the colonies, the objective is to be able to respond if:

- YES, there are potential pressures that can be induced by introduced or domesticated species;
- NO, there is potentially no pressure from introduced or domesticated species;
- DON'T KNOW.

b) Follow-up mechanisms that can be mobilised

In order to meet the objective of this indicator, GISOM will rely on existing mechanisms such as those already implemented by managers and NGOs (see Cadiou. B⁶)

Surveys and monitoring that can be mobilised:

- i: census of breeding sea birds;
- ii: monitoring of reproduction of young;
- iii: monitoring contaminants in breeding sea birds;
- iv: monitoring of macro-litter in nests and on colonies;
- v: ring programme;
- vi: food ecology programme;
- vii: assignments that can be carried out on site by managers.

c) Method

GISOM will contact the local observers identified in the framework of the census/monitoring of sea bird colonies, to gather information on the pressures caused by introduced or domesticated species.

Island colony	Predations/disturbances currently observed			Introduced or domestic species concerned (Cat, mink ferret, rat, other, not determined)					
	YES	NO	DON'T KNOW	cat	mink	ferret	rat	other!	? (not determined)

⁶ CADIOU. B, *ÉTAT DES LIEUX DES SUIVIS MENÉS SUR LES COLONIES D'OISEAUX MARINS NICHEURS DU LITTORAL DE FRANCE MÉTROPOLITAINE, SOURCES POTENTIELLES DE DONNÉES POUR RENSEIGNER DES INDICATEURS DANS LE CADRE DE LA DCSMM* [B, *STATE OF PLAY OF THE MONITORING CARRIED OUT ON THE COLONIES OF SEABIRD COLONIES ON THE COAST OF METROPOLITAN FRANCE', POTENTIAL SOURCES OF DATA*

TO INFORM INDICATORS IN THE FRAMEWORK OF THE MSFD], GISOM, 2015, 20P.

In addition, managers and NGOs will be asked to provide information (year, funding/amounts, results achieved/expected) on predator control or eradication measures, which may be:

- Completed;
- Ongoing;
- planned for the future.

3. Estimated target value

a) Value objective

The target value represents the metric that will serve as the objective to be achieved during the different cycles of the MSFD, the next evaluation of which is set for the end of 2022 (end of the 2nd cycle of the MSFD).

b) Target value proposed by GISOM

On the basis of the data reference framework of the 2009-2012 national census coordinated by the GISOM and the GISOM's proposal to include all the colonies for breeding species classified as "CR" by the IUCN France, 30 colonies with "strong challenges" were identified, 15 of which are considered to be insular.

Given the "high-stakes" character already identified for these colonies, GISOM recommends an ambitious approach with a target of "0" high-stakes colonies with no proven pressure from introduced or domestic species.

Rationale for GISOM:

The reduction in potential nesting habitats for sea birds has led to a concentration of individuals on a limited number of sites and to a scarcity of potential carry-over sites.

The presence of predators at the level of the colony leads to a decrease in reproductive success (predation on eggs and chicks) and even a decrease in adult survival (predation on breeding stock).

Short-living species (and therefore dependent on high reproductive success) are very sensitive to this pressure, but long-living species (such as sea birds) are also affected, particularly when predation affects adults.

This is one of the main pressures on sea birds.

In some cases, predation can lead to the disappearance of birds from the nesting site. Predation is the cause of the extinction of many ground-nesting bird species.

There is a real need to monitor the colonies, and moreover on sites said to be "strong challenges", and to implement appropriate management measures on these island environments in order to preserve sea birds and the maintenance of these species on these sensitive sites.

Predation management is a "controllable" pressure depending on the configuration of the sites and the techniques used.

The target being a "0" objective, the reading grid will be as follows:

Metric	bad	good
Indicator code	≥ 1	$= 0$

Objective at coastline level:

coastlines	Number of colonies facing a "strong challenge"	Objective
MEMN	1	0
NAMO	8	0
SA	1	0
MED	4	0

Given the "strong challenges" of the colonies identified, the target value proposed by GISOM is **"0" island colonies with "strong challenges"** that are under pressure from introduced or domesticated species.

c) Planning

The targets will be defined and adopted in December 2019.

4. Estimation of the reference value reference value

a) Value objective

The reference value represents the metric that will be used as a basis for comparing the evolution of the indicator over the different cycles of the MSFD.

a) Method of calculation

For the calculation of the reference value, GISOM will consider the reference of the island colonies at This is a "strong challenge".

The reference value will be determined from the monitoring that will be carried out in 2020 and 2021.

For these island colonies with "strong challenges", GISOM will contact, from September of each year, the managers and NGOs who will be able to know if YES/DON'T KNOW/NO, there was evidence of the presence of introduced or indigenous species (cat, mink, ferret, rat) on these colonies for the year in question.

Depending on the results of any monitoring carried out by managers or on "expert opinion", the following rating will be given:

- For those colonies where there is a "YES", a rating of "1" will be given.
- For those colonies where there is a "DON'T KNOW", a score of "0.5" will be given.
- For those colonies where a "NO" is obtained, a score of "0" will be given.

At the end of these two years of monitoring (2020-2021), a rating will be chosen for each colony.

- It will be retained as "1", if there was a "YES" in 2020 or 2021.
- A "0" will be retained, if there was a "NO" for 2020 and for 2021.
- For those colonies that scored a "0.5" (DON'T KNOW) in 2020, the year 2021 will provide an opportunity to clarify whether "YES" or "NO" evidence of introduced or native species was present. Otherwise, the rating of "0.5" will be retained.

For sites where there are ongoing eradication operations for introduced or native species: For sites where there are ongoing eradication operations or the maintenance of devices that effectively limit predation by introduced or native species, GISOM proposes in the event of assigning a reference value, to assign a score of "1" for these sites, taking into account that there are potentially known pressures from introduced or domesticated species due to the presence of mechanisms aimed at reducing these pressures on the site.

The quotations used as a reference value will then be added together.

$$\text{Reference value (Vref}_{\text{D01-OM-OE04-ind1}}) = (\sum C_{2020/2021})$$

Where "C" is the rating selected for a colony based on the feedback from the information collected in 2020 and 2021.

Example:

Identifier of the insular	Proven pressure from introduced or domesticated species		Quote maintained as a value reference
	Quotation (year 2020)	Quotation (year 2020)	
Colony A	0 (NO)	1 (YES)	1
Colony B	0 (NO)	0 (NO)	0
Colony C	0.5 (DON'T KNOW)	0.5 (ongoing operation)	0.5
Colony D	0.5 (DON'T KNOW)	0 (NO)	0.5
Colony E	0.5 (DON'T KNOW)	0.5 (DON'T KNOW)	0.5
Vref D01-OM-OE04-ind1			0.5

For this reference value, GISOM will base itself on the results of any monitoring carried out by managers or on "expert opinion" obtained **during the years 2020 and 2021**, for island colonies with "strong challenges".

b) Planning

In 2020-2021, on the occasion of the next census of breeding sea birds, GISOM will consult managers and NGOs on the subject of pressures from introduced and domesticated species, for colonies with "strong challenges". This will allow us to make an initial assessment of the situation at a national level for these insular colonies.

The results obtained during these two so-called "reference years" will make it possible to **determine the reference value**.

It should be noted that for the next census of breeding sea birds (2020-2022), GISOM also wishes to carry out this work for all the island colonies monitored, whatever the nature of the challenge. This voluntary approach will make it possible to have a global "reference year" for all the colonies over the same period, with a view to identifying new colonies as "strong challenge" colonies at a later date.

The reference value for island colonies with "strong challenges" should be defined by GISOM for **mid-2022**.

c) Cost of the scheme

The financing of the coordination and monitoring of this indicator for colonies with "strong challenges" by the GISOM is the subject of an "action sheet" in the framework of an AFB/GISOM agreement.

5. Monitoring of the indicator

a) Follow-up mechanisms

Within the framework of the programme of measures (PDM) 2nd cycle, it will be necessary to set up:

- 1) A monitoring network on "strong challenge" sites to ensure that there is no proven pressure from introduced or domesticated species,
- 2) Targeted control actions for colonies where pressure from introduced or domesticated species has been identified.

b) Methodology and calculation method

The indicator as such will be **monitored annually from 2022 onwards for colonies "strong challenge"**.

The methodology used to monitor the indicator will be much the same as that used to define the baseline. Namely, for each "high stake" colony, GISOM will contact the managers and NGOs to find out if YES/DON'T KNOW/NO, there was evidence of introduced or native species (cat, mink, ferret, rat) on these colonies for the year in question.

Depending on the results of any monitoring carried out by managers or on "expert opinion", the following rating will be given for each year:

- For those colonies where there is a "YES", a rating of "1" will be given.
- For those colonies where there is a "DON'T KNOW", a score of "0.5" will be given.
- For those colonies where a "NO" is obtained, a score of "0" will be given.

Management of uncertainty: Colonies with "DON'T KNOW" represent uncertainty. In order to be able to integrate this uncertainty, GISOM proposes to frame the calculated value of the indicator by a boundary corresponding to this uncertainty. This boundary would consist of two integers (*i* and *ii*), one of which would correspond to the scenario where "DON'T KNOW" would be equated with "NO" (the least penalising case), and the other corresponding to the scenario where "DON'T KNOW" would be equated with "YES" (the most penalising case).

For sites where there are ongoing eradication operations for introduced or native species: For sites where there are ongoing eradication operations or the maintenance of devices that effectively limit predation by introduced or native species, GISOM proposes to assign a score of "0" for these sites, taking into account that there are potentially no known pressures from introduced or domesticated species due to the presence of mechanisms aimed at reducing these pressures on the site.

In order to have a single value (at the scale of each coastline or at the national level) for each reporting cycle, the annual ratings will be added together. The total will be divided by the number of years of monitoring:

$$\text{Indicator value } (V_{D01-OM-OE04-ind1}) [i ; ii] = (\sum C) / N$$

Where "C" is the rating for one year; "N" is the number of years of monitoring;
"i" is the maximum number of "YES"; "ii" is the maximum number of "YES" + "DON'T KNOW".

Example:

Identifier of the insular	Proven pressure from introduced or domesticated species		
	Quotatio n (year n1)	Quotatio n (year n1)	Quotatio n (year n1)
Colony A	0 (NO)	1 (YES)	1 (YES)
Colony B	0 (NO)	0 (NO)	0 (NO)
Colony C	0.5 (DON'T KNOW)	1 (YES)	0.5 (ongoing operation)
Colony D	0.5 (DON'T KNOW)	0 (NO)	0.5 (DON'T KNOW)
Colony E	0.5 (DON'T KNOW)	0.5 (DON'T KNOW)	0 (NO)
Annual quotation	1.5 [0 ;3]	1.5 [0 ;3]	1.5 [0 ;3]

Value used for the ratio_{nx} = (1.5+2.5+1.5) / 3 = **1.83 [2 ;3]**

Where 'nx' is the reporting period.

c) Frequency of monitoring

From 2022 onwards, the assessment of the indicator may be **revised annually**, for island colonies with "strong challenges", at the end of each breeding season, at the level of the coastlines or at national level.

This will make it possible to measure the effectiveness of any monitoring or management measures implemented by the managers in relation to the problem of pressure from introduced or domesticated species.

A single value may be reported per reporting cycle, per coastline or at national level.

At the end of 2022, GISOM will produce the first value of the indicator from an assessment of "strong challenge" colonies, based on the results of surveys conducted during 2022.

D. Indicator D01-OM-OE04-ind2: Reduction of predation on mainland colonies

1. Framing and contextual elements

a) Indicator identifier

Corresponding environmental target				
A-CODE OF THE ET: D01-OM-OE04				
B-TITLE OF THE ET: Reduce pressure from domesticated species and species that have been introduced at sea bird breeding sites				
C-CODE INDICATOR: D01-OM-OE04-ind2				
D-LIB OF THE INDICATOR: Proportion of continental breeding sea bird colonies facing strong challenges* for which introduced and domesticated species represent a proven pressure.				
E-TARGET OF THE INDICATOR : Defined, concerted and adopted in the framework of the revision of the programme of measures (2021)				
F-ORIGIN OF THE DATA <input checked="" type="checkbox"/> scientific <input type="checkbox"/> administrative <input type="checkbox"/> mixed (sci &adm)				
Relevant coastlines:	MEMN <input checked="" type="checkbox"/>	NAMO <input checked="" type="checkbox"/>	SA <input checked="" type="checkbox"/>	MED <input checked="" type="checkbox"/>

b) Species that have been introduced and domesticated species taken into consideration for this indicator

The species considered for this indicator are the following:

- The American Mink: *Mustela mink*,
- The Domestic Cat/Harret: *Felis silvestris catus*
- The Dog: *Canis lupus familiaris Linnaeus*
- The Ferret: *Mustela putorius furo*
- The Norway Rat: *Rattus norvegicus*
- The Black Rat: *Rattus rattus*

c) Colonies under consideration

According to the AFB classification work carried out for descriptor D1 "sea birds", colonies with "**strong challenges**" have been defined as:

- Those meeting the RAMSAR criteria of international importance (1% of the world's population),
- Sites welcoming more than 15% of the national total.

**Table 5. Continental sea bird colonies facing strong challenges:
According to the census coordinated by GISOM (2009-2012)**

Coastline	Title	SPECIES
MEMN	Boulonnais	Black-legged Kittiwake
MEMN	Bessin cliffs	Northern Fulmar, Black-legged Kittiwake
MEMN	Maritime Flanders	Common Tern
NAMO	Cape Sizun	Black-legged Kittiwake
NAMO	Erquy and Fréhel	Iberian guillemot, Razorbill
NAMO	Noirmoutier Island	Mediterranean Gull, Sandwich Tern
MED	Calvi --- Cargèse	Audouin's Gull
MED	Camargue of Aigues-Mortes	Black-headed Gull
MED	Cape Corsica	Audouin's Gull
MED	Capo di Roccapina and Pertusato	European shag (med)
MED	Cargèse --- capo di Muro	Audouin's Gull
MED	Ciotat & calanques (les Lecques-la madrague)	Mediterranean Gull, Black-headed Gull, Hansel Tern, Little Tern
MED	Ponds of Languedoc: Narbonne	Little Tern
MED	Etangs du Languedoc: Montpellier	Slender-billed Gull, Hansel tern
MED	Presqu'île de Giens (Miramar---Carqueiranne)	Slender-billed Gull

On the basis of the GISOM 2009-2012 baseline, 15 continental colonies are targeted by indicator D01-OM-OE04-ind1. The distribution of colonies is as follows: 3 for the MEMN coastline, 3 for the NAMO coastline and 9 for the MED coastline.

Note: This reference framework of continental colonies, based on the results of the national census 2009–2010, was adopted by the coordinating Prefects in July 2019 for the 2nd cycle of the MSFD. Depending on the results of the various censuses that may be carried out during a cycle, a re-evaluation of this "strong challenge" colony reference system may be proposed for the following cycle.

2. Equipment and method

d) Objective

The aim of the action is to estimate, for continental colonies facing "strong challenges", the proportion of colonies that are subject to proven pressure from introduced or domesticated species.

For the purposes of monitoring this indicator, we consider that a **continental colony** is subject to pressure from introduced or domestic species only if signs of predation (eggs, chicks or adults predated) have been observed during the breeding period and are characteristic of predation by introduced or domestic species.

For each of the colonies, the objective is to be able to respond if:

- YES, there are proven pressures from introduced or domesticated species;
- NO, there is no proven pressure from introduced or domesticated species;
- DON'T KNOW.

e) *Follow-up mechanisms that can be mobilised*

In order to meet the objective of this indicator, GISOM will rely on existing mechanisms such as those already implemented by managers and NGOs (see Cadiou. B⁷)

Surveys and monitoring that can be mobilised:

- i: census of breeding sea birds;
- ii: monitoring of reproduction of young;
- iii: monitoring contaminants in breeding sea birds;
- iv: monitoring of macro-litter in nests and on colonies;
- v: ring programme;
- vi: food ecology programme;
- vii: assignments that can be carried out on site by managers.

f) *Method*

GISOM will contact the local observers identified in the framework of the census/monitoring of sea bird colonies, to gather information on the pressures caused by introduced or domesticated species.

Continental settlement	Predations/disturbances currently observed			Introduced or domestic species concerned (Cat, dog, mink, ferret, rat, other, not determined)						
	YES	NO	DON'T KNOW	cat	dog	mink	ferret	rat	other!	? (not determined)

In addition, managers and NGOs will be asked to provide information (year, funding/amounts, results achieved/expected) on predator control or eradication measures, which may be:

- Completed;
- Ongoing;
- planned for the future.

3. Estimated target value

a) *Value objective*

The target value represents the metric that will serve as the objective to be achieved during the different cycles of the MSFD, the next evaluation of which is set for the end of 2022 (end of the 2nd cycle of the MSFD).

b) *Target value*

The environmental authorities have set a target value of: **significant decrease.**

⁷ CADIOU. B, *ÉTAT DES LIEUX DES SUIVIS MENÉS SUR LES COLONIES D'OISEAUX MARINS NICHEURS DU LITTORAL DE FRANCE MÉTROPOLITAINE, SOURCES POTENTIELLES DE DONNÉES POUR RENSEIGNER DES INDICATEURS DANS LE CADRE DE LA DCSMM [B, STATE OF PLAY OF THE MONITORING CARRIED OUT ON THE COLONIES OF 'SEABIRD COLONIES ON THE COAST OF METROPOLITAN FRANCE', POTENTIAL SOURCES OF DATA*

TO INFORM INDICATORS IN THE FRAMEWORK OF THE MSFD], GISOM, 2015, 20P.

The target being a significant decrease, the reading grid will be as follows:

Metric	bad	medium	good
Indicator code			

4. Estimation of the reference value reference value

c) Value objective

The reference value represents the metric that will be used as a basis for comparing the evolution of the indicator over the different cycles of the MSFD.

a) Method of calculation

For the calculation of the reference value, GISOM will consider the reference of the identified "high stake" colonies.

The reference value will be determined from the monitoring that will be carried out in 2020 and 2021.

For these continental colonies with "strong challenges", GISOM will contact the managers and NGOs from September onwards each year, who will be able to find out whether YES/DON'T KNOW/NO, there have been cases of predation (eggs, chicks or adults predated) by introduced or domesticated species (cat, dog, mink, ferret, rat) during the past nesting period, or if there is any uncertainty.

Depending on the results of any monitoring carried out by managers or on "expert opinion", the following rating will be given:

- For those colonies where there is a "YES", a rating of "1" will be given.
- For those colonies where there is a "DON'T KNOW", a score of "0.5" will be given.
- For those colonies where a "NO" is obtained, a score of "0" will be given.

At the end of these two years of monitoring (2020-2021), a rating will be chosen for each colony.

- It will be retained as "1", if there was a "YES" in 2020 or 2021.
- A "0" will be retained, if there was a "NO" for 2020 and for 2021.
- For those colonies that scored a "0.5" (DON'T KNOW) in 2020, the year 2021 will provide an opportunity to clarify whether "YES" or "NO" evidence of introduced or native species was present. Otherwise, the rating of "0.5" will be retained.

For sites where there are ongoing eradication operations for introduced or native species: For sites where there are ongoing eradication operations or the maintenance of effective measures to limit predation by introduced or native species, GISOM proposes that, for the purposes of establishing the reference value, a score of "1" be assigned to these sites,

whereas there are potentially no known pressures from introduced or domesticated species, due to the presence of measures to reduce these pressures on the site.

The quotations used as a reference value will then be added together.

$$\text{Reference value (Vref}_{\text{D01-OM-OE04-ind1}}) = (\sum C_{2020/2021})$$

Where "C" is the rating selected for a colony based on the feedback from the information collected in 2020 and 2021.

Example:

Identifier of the mainland colony	Proven pressure from introduced or domesticated species		Quote maintained as a value reference
	Quotation (year 2020)	Quotation (year 2020)	
Colony A	0 (NO)	1 (YES)	0.5
Colony B	0 (NO)	0 (NO)	0.5
Colony C	0.5 (DON'T KNOW)	0.5 (ongoing operation)	0.5
Colony D	0.5 (DON'T KNOW)	0 (NO)	0.5
Colony E	0.5 (DON'T KNOW)	0.5 (DON'T KNOW)	0.5
Vref_{D01-OM-OE04-ind1}			0.5

For this reference value, GISOM will base itself on the "experts' statements" obtained **during the years 2020 and 2021**, for those continental colonies facing "strong challenges" identified through the decennial census of 2009-2012.

a) Planning

In 2020-2021, on the occasion of the next census of breeding sea birds, GISOM will consult managers and NGOs on the subject of pressures from introduced and domesticated species, for colonies with "strong challenges". This will allow us to make an initial assessment of the situation at a national level for these continental colonies.

The results obtained during these two so-called "reference years" will make it possible to **determine the reference value**.

It should be noted that for the next census of breeding sea birds (2020-2022), GISOM also wishes to carry out this work for all the island colonies monitored, whatever the nature of the challenge. This voluntary approach will make it possible to have a global "reference year" for all the colonies over the same period, with a view to identifying new colonies as "strong challenge" colonies at a later date.

The reference value for "strong challenge" continental colonies is to be defined by GISOM by **mid-2022**.

a) Cost of the scheme

The financing of the coordination and monitoring of this indicator for colonies with "strong challenges" by the GISOM is the subject of an "action sheet" in the framework of an AFB/GISOM agreement.

5. Monitoring of the indicator

a) Follow-up mechanisms

Within the framework of the programme of measures (PDM) 2nd cycle, it will be necessary to set up:

- 1) A monitoring network for "strong challenge" sites to ensure that there is no proven pressure from introduced or domesticated species,
- 2) Targeted control actions for colonies where pressure from introduced or domesticated species has been identified.

b) Methodology and calculation method

The indicator as such will be **monitored annually from 2022 onwards for colonies** facing a "strong challenge".

The methodology used to monitor the indicator on the mainland colonies will be identical to that set for monitoring the indicator on the island colonies. Namely, for each "strong challenge" continental colony, GISOM will contact the managers and NGOs to find out if YES/DON'T KNOW/NO, there was evidence of introduced or native species (cat, dog, mink, ferret, rat) on these colonies for the year in question.

Depending on the results of any monitoring carried out by managers or on "expert opinion", the following rating will be given for each year:

- For those colonies where there is a "YES", a rating of "1" will be given.
- For those colonies where there is a "DON'T KNOW", a score of "0.5" will be given.
- For those colonies where a "NO" is obtained, a score of "0" will be given.

Management of uncertainty: Colonies with "DON'T KNOW" represent uncertainty. In order to be able to integrate this uncertainty, GISOM proposes to frame the calculated value of the indicator by a boundary corresponding to this uncertainty. This boundary would consist of two integers(*i* and *ii*), one of which would correspond to the scenario where "DON'T KNOW" would be equated with "NO" (the least penalising case), and the other corresponding to the scenario where "DON'T KNOW" would be equated with "YES" (the most penalising case).

For sites where there are ongoing eradication operations for introduced or native species: For sites where there are ongoing eradication operations or the maintenance of devices that effectively limit predation by introduced or native species, GISOM proposes to assign a score of "0" for these sites, taking into account that there are potentially no known pressures from introduced or domesticated species due to the presence of mechanisms aimed at reducing these pressures on the site.

In order to have a single value (at the scale of each coastline or at the national level) for each reporting cycle, the annual ratings will be added together. The total will be divided by the number of years of monitoring:

$$\text{Indicator value } (V_{D01-OM-OE04-ind1}) [i ; ii] = (\sum C) / N$$

Where "C" is the rating for one year; "N" is the number of years of monitoring;

"i" is the maximum number of "YES"; "ii" is the maximum number of "YES" + "DON'T KNOW".

Example:

Identifier of the mainland colony	Proven pressure from introduced or domesticated species		
	Quotation (year n1)	Quotation (year n1)	Quotation (year n1)
Colony A	0 (NO)	1 (YES)	1 (YES)
Colony B	0 (NO)	0 (NO)	0 (NO)
Colony C	0.5 (DON'T KNOW)	1 (YES)	0.5 (Ongoing operation)
Colony D	0.5 (DON'T KNOW)	0 (NO)	0.5 (DON'T KNOW)
Colony E	0.5 (DON'T KNOW)	0.5 (DON'T KNOW)	0 (NO)
Annual quotation	1.5 [0 ;3]	1.5 [0 ;3]	1.5 [0 ;3]

Value used for the ratio = $(1.5+2.5+1.5) / 3 = 1.83 [2 ;3]$

c) Frequency of monitoring

From 2022 onwards, the assessment of the indicator may be **revised annually**, for island colonies with "strong challenges", at the end of each breeding season, at the level of the coastlines or at national level.

This will make it possible to measure the effectiveness of any monitoring or management measures implemented by the managers in relation to the problem of pressure from introduced or domesticated species.

A single value may be reported per reporting cycle, per coastline or at national level.

E. Indicator D01-OM-OE06-ind2: Reduction of physical, noise and light disturbances

1. Framing and contextual elements

a) Indicator identifier

Corresponding environmental target					
A-CODE OF THE ET: D01-OM-OE06					
B-TITLE OF THE ET: Limit physical, noise and light disturbance to sea birds* in their functional habitat areas					
C-CODE INDICATOR: D01-OM-OE06-ind1					
D-LIB OF THE INDICATOR: Proportion of colonies facing strong or major challenges according to the AFB's classification of issues for which physical, noise and light disturbances constitute a risk to their long-term survival					
E-TARGET OF THE INDICATOR : Defined, concerted and adopted in the framework of the revision of the programme of measures (2021)					
F-ORIGIN OF THE DATA <input checked="" type="checkbox"/> scientific <input type="checkbox"/> administrative <input type="checkbox"/> mixed (sci &adm)					
Relevant coastlines:	MEMN <input checked="" type="checkbox"/>	NAMO <input checked="" type="checkbox"/>	SA <input checked="" type="checkbox"/>	MED <input checked="" type="checkbox"/>	

b) Colonies under consideration

According to the AFB classification work carried out for descriptor D1 "sea birds", colonies with "**strong challenges**" have been defined as: (See Table 3).

- Those meeting the RAMSAR criteria of international importance (1% of the world's population),
- Sites welcoming more than 15% of the national total.

GISOM recommends that the known breeding sites of certain breeding sea bird species classified by IUCN France as "CR" (critically endangered) on the red list of threatened species in mainland France (2016) should also be considered.

Based on the data reference framework of the 2009-2012 national census coordinated by GISOM and the proposal by GISOM to include colonies for breeding species classified as "CR" by IUCN France, 30 colonies with "strong challenges" were identified, of which 15 are considered insular and 15 continental.
This inventory of colonies with "strong challenges" will be considered over the entire period of the 1st monitoring cycle of these indicators (2nd cycle of the Strategic Framework Directive for the Marine

Note: This reference framework of insular and continental colonies (excluding additional sites proposed by GISOM), based on the results of the 2009-2010 national census, was adopted by the coordinating Prefects in July 2019 for the 2nd cycle of the MSFD. Depending on the results of the various censuses that may be carried out during a cycle, a re-evaluation of this "strong challenge" colony reference system may be proposed for the following cycle.

2. Equipment and method

c) *Objective*

The aim of the action is to estimate the proportion of colonies for which physical, noise and light disturbances constitute a risk to their long-term survival.

Note: The notion of physical disturbance for avifauna is relatively well documented in the literature, and highlights the complexity of characterising and defining disturbance thresholds. The "visible" response such as colony flight, adult intimidation of the disturbing subject, change in speed and flight path varies with species, colony size, site configurations, nature and frequency of disturbance..

The notion of disturbance for light and sound sources is all the more difficult to characterise. The studies carried out on the subject nevertheless show that birds respond to this "pollution" (calls, change of trajectory, flight, attraction).

For each of the colonies, the objective is to be able to respond if:

- YES, physical, noise and light disturbances have been identified that pose a risk to the long-term maintenance of the system;
- NO, there were no reports of physical, noise and light disturbances that pose a risk to the long-term maintenance.

d) *Follow-up mechanisms that can be mobilised*

In order to meet the objective of this indicator, GISOM will rely on existing mechanisms such as those already implemented by managers and NGOs (see Cadiou. B⁸)

Surveys and monitoring that can be mobilised:

- i: census of breeding sea birds;
- ii: monitoring of reproduction of young;
- iii: monitoring contaminants in breeding sea birds;
- iv: monitoring of macro-litter in nests and on colonies;
- v: ring programme;
- vi: food ecology programme;
- vii: assignments that can be carried out on site by managers.

e) *Method*

Based on the work carried out by the Life+ ENVOLL Project. 2018, it appears that (for physical disturbances):

⁸ CADIOU. B, *ÉTAT DES LIEUX DES SUIVIS MENÉS SUR LES COLONIES D'OISEAUX MARINS NICHEURS DU LITTORAL DE FRANCE MÉTROPOLITAINE, SOURCES POTENTIELLES DE DONNÉES POUR RENSEIGNER DES INDICATEURS DANS LE CADRE DE LA DCSMM [B, STATE OF PLAY OF THE MONITORING CARRIED OUT ON THE COLONIES OF SEABIRD COLONIES ON THE COAST OF METROPOLITAN FRANCE', POTENTIAL SOURCES OF DATA TO INFORM INDICATORS IN THE FRAMEWORK OF THE MSFD], GISOM, 2015, 20P.*

- It is difficult to provide reaction distances depending on the nature of the intruder, as they depend on both the speed of approach, the noise it emits and the breeding stage of the birds;
- The distance between the intruder and the colony determines the intensity of the reaction, the frequency and duration of the disturbance determines the intensity of the impact;
- A radius of 300 m can be considered sufficient to guarantee the tranquillity of the breeding birds from the most usual human activities.

In addition, certain "strong challenge" colonies may be located within an area governed by specific regulations (e.g. a nature reserve/APB [Biosphere Protection Order]), where an access perimeter is already in place (signs/fences/buoys indicating that access to the islands is prohibited).

In the absence of a defined criterion for assessing thresholds for disturbance of sea bird colonies, GISOM proposes to base itself on a **notion of "distance"** between the source and the challenges (the colony).

In order to assess this indicator, GISOM proposes two approaches:

- 1) In the presence of a dedicated preservation perimeter, fixed by law or materialised: to retain this boundary within which no physical, sound or light disturbances should be observed;
- 2) In the absence of a dedicated preservation perimeter, set by law: a radius of 300 metres within which there must be no physical, noise or light disturbance.

Note: However, GISOM would like to make it clear that these distance concepts cannot be used as a threshold distance above which physical, noise and light disturbances constitute a risk for the long-term maintenance of sea bird colonies.

A physical, sound or light disturbance will be referenced insofar as it has been observed in the regulated perimeter dedicated to preservation (regulating access) in which the colony is present, or failing that within a radius of 300 m around the colony for those which are not concerned by a regulatory device prohibiting access.

GISOM will contact the local observers identified in the framework of the census/monitoring of sea bird colonies, to gather knowledge of the physical, sound and light disturbances that constitute a risk for the long-term maintenance of sea bird colonies.

Colony	Site where access is regulated/materialised					
	Presence of disturbance within the site					
	Physical disturbance		Noise disturbance		Light disturbance	
	YES	NO	YES	NO	YES	NO
Colony	Site where access is not regulated					
	Presence of disturbance within 300 metres of the colony					
	Physical disturbance		Noise disturbance		Light disturbance	
	YES	NO	YES	NO	YES	NO

3. Estimated target value

f) Value objective

The target value represents the metric that will serve as the objective to be achieved during the different cycles of the MSFD, the next evaluation of which is set for the end of 2022 (end of the 2nd cycle of the MSFD).

g) Target value

The environmental authorities have chosen as a target value: **no colony with a strong or major stake.**

The target being a "0" objective, the reading grid will be as follows:

Metric	bad	good
Indicator code	≥ 1	$= 0$

Objective at coastline level:

coastlines	Number of colonies facing a "strong challenge"	Objective
MEMN	0.5	0.5
NAMO	12*	0.5
SA	0.5	0.5
MED	0.5	0.5

*Including supplementary sites proposed by GISOM

4. Estimation of the reference value reference value

a) Value objective

The reference value represents the metric that will be used as a basis for comparing the evolution of the indicator over the different cycles of the MSFD.

In the context of monitoring indicator D01-OM-OE06-ind1, it will represent the number of "strong challenge" sea bird colonies for which physical, noise and light disturbance constitute a risk for the long-term maintenance of sea bird colonies during the nesting period.

b) Method of calculation

For the calculation of the reference value, GISOM will consider the reference of the identified "high stake" colonies.

The reference value will be determined from the monitoring that will be carried out in 2020 and 2021.

For these "strong challenge" colonies, GISOM will contact the managers and NGOs from September onwards each year, who will be able to determine whether YES/NO, there has been physical, noise and light disturbance that constitutes a risk for the long-term maintenance of the sea bird colonies during the nesting period.

It will be deemed that the sources of disturbance (physical, noise, light) represent an identical level of risk for the long-term maintenance of sea bird colonies.

According to the "expert opinion", for each colony, the following rating will be given for each disturbance (physical, sound, light):

- For a disturbance where there is a "YES", a rating of "1" will be given.
- For a disturbance where a "NO" is obtained, a score of "0".

At the end of these two years of monitoring (2020-2021), a rating will be chosen for each colony.

- It will be retained as "1", if there was a "YES" in 2020 or 2021.
- A "0" will be retained, if there was a "NO" for 2020 and for 2021.

The quotations used as a reference value will then be added together.

$$\text{Reference value (Vref}_{\text{D01-OM-OE06-ind1}}) = (\sum C_{2020/2021})$$

Where "C" is the rating selected for a colony based on the feedback from the information collected in 2020 and 2021.

Example:

Identifier of the colony insular	Proven pressure from introduced or domesticated species		Quote maintained as a value reference
	Quotation (year 2020)	Quotation (year 2021)	

Colony A	0 (NO)	1 (YES)	0.5
Colony B	0 (NO)	0 (NO)	0.5
Colony C	1 (YES)	1 (YES)	0.5
Colony D	0 (NO)	0 (NO)	0.5
Colony E	1 (YES)	0 (NO)	0.5
Vref D01-OM-OE06-ind1			0.5

For this reference value, GISOM will base itself on the "experts' statements" obtained **during the years 2020 and 2021**, for the continental colonies with "strong challenges" identified.

a) Planning

In 2020-2021, on the occasion of the next census of breeding sea birds, GISOM will consult managers and NGOs on the issue of physical, noise and light disturbances that pose a risk to the long-term maintenance of sea bird colonies during the nesting period.

The results obtained during these two so-called "reference years" will make it possible to **determine the reference value**.

It should be noted that for the next census of breeding sea birds (2020-2022), GISOM also wishes to carry out this work for all the island colonies monitored, whatever the nature of the challenge. This voluntary approach will make it possible to have a global "reference year" for all the colonies over the same period, with a view to identifying new colonies as "strong challenge" colonies at a later date.

The reference value for "strong challenge" colonies is to be defined by GISOM by **mid-2022**.

b) Cost of the scheme

The financing of the coordination and monitoring of this indicator for colonies with "strong challenges" by the GISOM is the subject of an "action sheet" in the framework of an AFB/GISOM agreement.

5. Monitoring of the indicator

c) Follow-up mechanisms

Within the framework of the programme of measures (PoM) 2nd cycle, it will be necessary to set up:

- 1) A monitoring network at "strong challenge" sites to ensure that there is no pressure from physical, noise or light disturbance,
- 2) Targeted reduction actions for colonies where physical, noise or light disturbance pressure has been identified.

d) Methodology and calculation method

The indicator as such will be **monitored annually from 2022 onwards for colonies** facing a "strong challenge".

The methodology used to monitor the indicator will be much the same as that used to define the baseline. For each colony with "strong challenges", GISOM will contact the managers and NGOs to find out whether YES/NO, there have been cases of physical, sound or light disturbance on these colonies in the year in question.

According to "expert opinion", the following rating will be given for each year:

- For those colonies where there is a "YES", a rating of "1" will be given.
- For those colonies where a "NO" is obtained, a score of "0" will be given.

In order to have a single value (at the scale of each coastline or at the national level) for each reporting cycle, the annual ratings will be added together. The total will be divided by the number of years of monitoring:

$$\text{Indicator value } (V_{D01-OM-OE06-ind1}) = (\sum C) / N$$

Where "C" is the rating for one year for a colony; "N" is the number of years of monitoring.

Example:

Identifier of the colony	Proven pressure from introduced or domesticated species		
	Quotation (year n1)	Quotation (year n1)	Quotation (year n1)
Colony A	0 (NO)	1 (YES)	1 (YES)
Colony B	0 (NO)	0 (NO)	0 (NO)
Colony C	1 (YES)	1 (YES)	0 (NO)
Colony D	0 (NO)	0 (NO)	0 (NO)
Colony E	1 (YES)	0 (NO)	0 (NO)
Annual quotation	0.5	0.5	0.5

$$\text{Value used for reporting} = (2+2+1) / 3 = 1.67$$

a) Frequency of monitoring

From 2022 onwards, the assessment of the indicator may be **reviewed annually**, for colonies facing a "strong challenge" at the end of each breeding season.

This will make it possible to measure the effectiveness of any monitoring or management measures that may have been deployed by the managers with regard to the problem of disturbance (physical, noise, light), which represent an identical risk for the long-term maintenance of sea bird colonies.

A single value may be reported per reporting cycle, per coastline or at national level.

Addendum to the Mediterranean Coastline Strategy

Additional targets and associated methodologies, defined in conjunction with the work on developing the Sea Basin
Strategy Document Action Plan

Annex 4 -

- Methodology Proposal Report - Artificialization of coastal and littoral marine environments

Artificialization of coastal and littoral marine environments Methods for determining indicators 1 and 2

0.5

Photo credit: Claude Guillet/Cerema



Study partner(s)



MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE
ET SOLIDAIRE



Artificialization of marine and coastal environments

Document version history

Version	Date	Comment
0.5	09/02/20 21	Presentation of method and first calculations of indicators 1 and 2
0.5	09/02/20 21	Consolidation part of indicators 1 and 2 in the English Channel, North Sea and Atlantic
0.5	09/02/20 21	Calculation of indicator 1 in the Mediterranean
0.5	09/02/20 21	Final report

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References

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OFB (M. Sylvain MICHEL)

Report	Name	Date	Visa
Prepared by	Cécile Delafenêtre, Muriel Sauvé, Sébastien Bouland, Hervé Dussart, Pierre Vigné	09/02/20 21	

Summary of the study:

Within the framework of the Marine Strategy Framework Directive (MSFD), the Environment and Biodiversity Directorate of the French Ministry of Ecology and the French Biodiversity Agency would like to develop and calculate indicators describing the level of artificialization of coastal and marine environments. Of these indicators, two concern the upper limit of the foreshore and the foreshore. This document describes the method adopted to obtain the results of artificialization per coastline.

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1 Background to the study

Adopted in 2008, the Marine Strategy Framework Directive (MSFD) establishes a framework for EU Member States to take all measures to achieve or maintain good environmental status in the marine environment by 2020. For France, the directive applies to metropolitan areas under French sovereignty or jurisdiction; reporting is carried out at the level of 4 marine sub-regions¹ (MMN) distributed between the four English Channel-Atlantic and Mediterranean coastlines. On the other hand, the strategic coastline documents, which are now the tool for implementing the MSFD, are defined at the coastline level² (different from the MRSs for the NAMO and SA coastlines). The MSFD operates in 6-year cycles. For each French coastline, a comprehensive set of environmental targets and associated indicators have been defined to guide efforts to achieve good environmental status in the marine environment. Each environmental target is associated with one or more indicators. Each indicator has a target to be reached at the end of the cycle.

As part of the second cycle (2018–2023) of implementation of the MSFD, the environmental targets have been revised. As a result, a new environmental target specifically addresses the artificialization of coastal and nearshore marine environments. The principle of this objective is to control the artificialization of the shoreline (coastal line and lower levels), by defining a limit value (target) corresponding to the rate of artificialization observed over the last few years/decades (at least, after the 1986 Coastal Law). On the Mediterranean coast, the environmental target limits artificialization differently depending on the existence of a marine protected area.

In this context, the DEB would like to develop and calculate indicators describing the level of artificialization of the coastline, the foreshore and the seabed (0-10 m and 10-20 m). The indicators identified at this stage and adopted by the coordinating Prefects of the maritime coastlines in the maritime coastline strategies in September 2019 aim to limit the physical loss of habitat linked to the artificialization of the coastal area, from the highest sea line to 20 metres depth (D06 OE01):

- indicator 1 (MED front): Percentage of linear artificiality (structures and emerging developments). The artificial linear according to MEDAM corresponds to ports, sheltered ports, groynes, platforms, contained beaches, jetties, embankments;
- indicator 2 (MEMN, NAMO, SA coastlines) : Percentage of artificialised linear (structures and emerging developments). For this indicator specifically, two different targets are to be defined:
 - A target for the upper limit of the foreshore (in linear km): the method for calculating the target must be the same as for indicator 1 concerning the Mediterranean coast, and in accordance with the databases that can be used;
 - A target for the intertidal space (in ha);
- indicator 3 (MEMN, NAMO, SA, MED coastlines) : Percentage of artificial seabed (emerged and submerged structures and developments) between 0 and 10 m;
- indicator 3 (MEMN, NAMO, SA, MED coastlines) : Percentage of artificial seabed (submerged structures and developments) between 10 and 20 m.

1 English Channel-North Sea, Celtic Seas, Bay of Biscay and Western Mediterranean

2 East of English Channel-North Sea, North Atlantic-West of English Channel, South Atlantic, Mediterranean

This document describes the method used to determine indicators 1 and 2 on the four maritime coastlines: East of English Channel North Sea, North Atlantic West of English Channel, South Atlantic and Mediterranean.

2 Definition of spatial rights-of-way

The first step, prior to calculating the indicators, is to define the geographical areas of the upper limit of the foreshore on the one hand, and the foreshore on the other. This step then allows the structures to be assigned to these two zones according to their location and typology.

2.1 Upper limit of the foreshore or "line of the coast"

Firstly, it was agreed that the two terms "upper limit of the foreshore" and "limit of the coastline" were semantically different, but reflected the same geographical space corresponding to the land-sea limit. The coastline is used in the Mediterranean for indicator 1. The upper limit of the foreshore is the term used on the other 3 coastlines.

Two proposals have been considered for defining this boundary.

The first proposal is to use a **reference coastline** that is stable over time and that allows the projection of works on it.

This solution has the advantage of having a total linear upper limit of the foreshore and measuring its artificial part in order to determine the rate of artificial upper limit of the foreshore in relation to the total linear figure.

The search for a reference limit very quickly leads to the HISTOLITT® coastline, a coproduction of IGN and Shom. It is defined by the Shom as follows:

"The coastline corresponds to the high water mark in the case of an astronomical tide of coefficient 120 and under normal meteorological conditions (no offshore wind, no atmospheric depression likely to raise the sea level). The TCH product models this theoretical entity by a set of 2D polylines"

The Shom describes the production of this limit as follows:

"The HISTOLITT® coastline is composed of elements derived from the digitisation of marine maps at scales greater than 1:25,000. In some port areas, maps at a scale of 1:5000 were used, elements of the class [tethered section] of the BDTOPPO® product and elements captured in 2D on the BDORTHO® image base"



Figure 1: HISTOLITT® coastline - Dieppe area

This is the only data currently available covering all coastlines. But this coastline is old and has been produced at different scales of resolution. IGN and the Shom therefore no longer plan to update it. It is becoming obsolete and needs to be replaced by a high resolution coastline which should be available within about 2 years and for which production has started³.

The second solution is not to **rely on any reference coastline** in particular.

In this case, the approach is to allocate the structures according to their geographical location, but also and first of all to distribute the work structures according to their orientation, either transversal or longitudinal.

This work is partly automatic for the structures in the Cerema database since the information is present in the attribute table. It is then "sufficient" to remove all longitudinal structures on the foreshore.

For the works in the BRGM database, the work has to be done manually since the information on the orientation of the structures is not present at the outset.

³ <https://www.milieumarinfrance.fr/A-propos/Actualites/Mise-en-production-de-la-Limite-terre-mer>

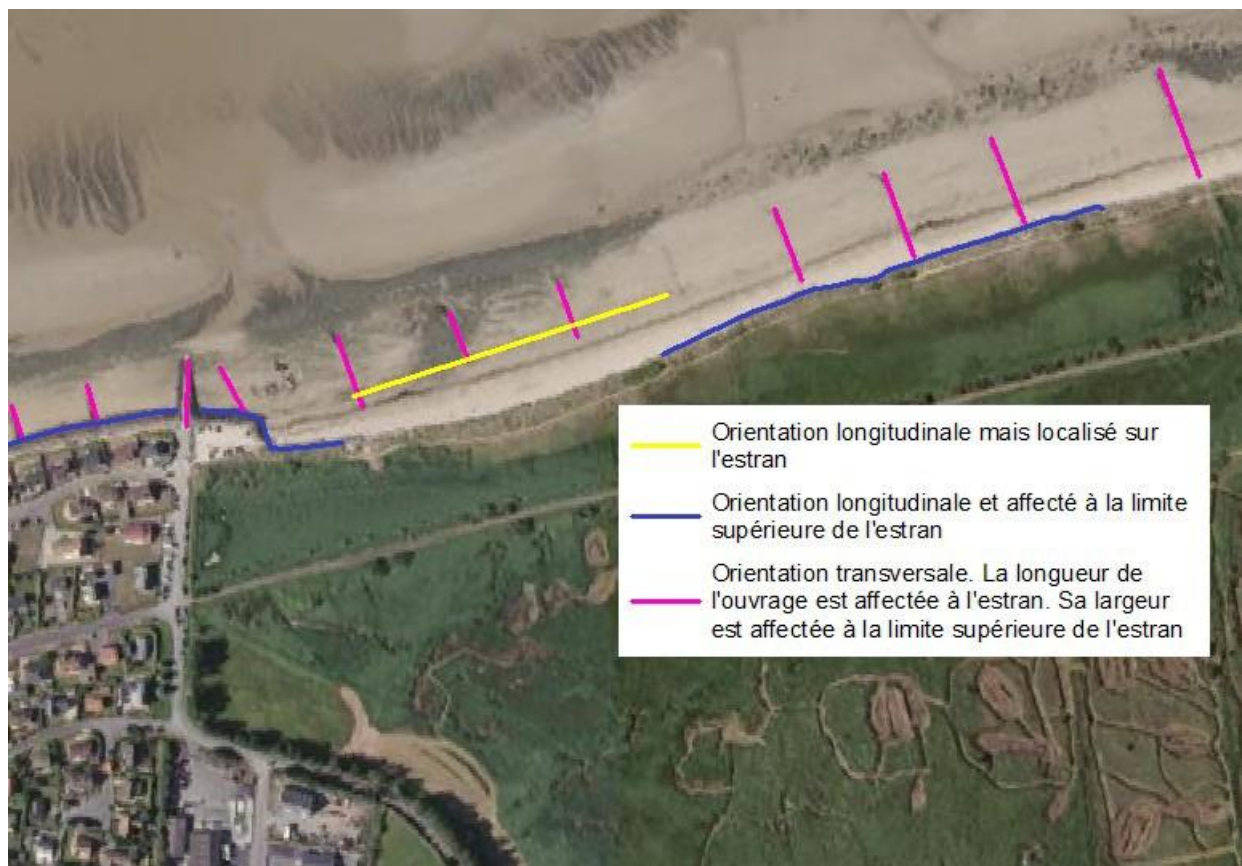


Figure 2: Assignment of structures according to their orientation and position - Asnelles sector

Choice made: after analysing the two possibilities and in order to avoid a reference coastline limit, it was decided to retain the second solution. This modifies the calculation of the rates since, initially, the objective was to calculate a percentage of artificialised linear coast in relation to a total linear of coastline. The second solution consists of calculating a line of works in 2002 and another in 2014 and measuring the delta to deduce a rate of change in structures between the two dates. It therefore provides a benchmark for the indicator targets of the environmental targets.

2.2 Foreshore delineation

The foreshore is essential for the calculation of indicator 2 for the MEMN, NAMO, SA and MED coastlines. As before, two solutions were considered.

The first solution defines the intertidal zone by taking:

- as a high limit, either the HISTOLITT® coastline or the highest water line of the IGN® Topo® database
- as a lower limit, the use of the 0 of the lowest astronomical seas.

Concerning the upper limit of the foreshore, the HISTOLITT® coastline was quickly discarded in view of the elements presented above in 2.1.

The 0 of the lowest astronomical seas was determined from the bathymetry of the HOMONIM project of the Shom.

This bathymetry is available at a resolution of about 100m on all 4 maritime coastlines and under two conditions: lowest astronomical seas on the one hand, and highest astronomical seas on the other.

The bathymetry with the lowest astronomical seas was used since this reference frame has the largest foreshore. A query resulted in the 0 line shown below.



Figure 3: Differences between the 0 PBMA and the low water mark - Area north of the Arcachon basin

The comparison of the line produced (in orange) with the low water mark of the Topo® database (in blue) provides two pieces of information:

- the bathymetry exploitation leads to obtain a "broken" line in step format, taking into account the resolution. To be aesthetically improved, this line should be smoothed by algorithms;
- In some places this 0 line extends further offshore (southern part here on the picture) than the low water mark. In other places, the opposite is true (northern part of the picture)

In conclusion, it does not seem easy to make a choice between the production of this 0 line and the low water mark already available. Further verification work would be required. This time-consuming solution was abandoned in view of the study's tight schedule.

The second solution consists of defining the foreshore on the basis of the two shorelines in the Topo® database. The two lines delimiting the intertidal zone are homogeneous and can be closed at the ends to be easily transformed into polygons.



Figure 4: Foreshore in yellow - Area south of the Arcachon basin

The illustration above clearly shows the differences that can exist between this area reconstructed by combining the two shorelines and a "real" view from the coastal outline. In the left-hand thumbnail, the foreshore should be extended seaward. In the right-hand thumbnail, it should be extended further into the ground.

Choice made: Even if some parts of the sections of the foreshore need to be updated, the solution chosen to define the foreshore is to use the low and high water marks, closing in at the ends so that polygons are made available. Locally, these lines have been modified on the basis of the coastal outline in order to better align them with the visible parts of the foreshore. However, it was not possible to carry out a comprehensive check.

Since the foreshore is a constantly changing area, as illustrated above, it was decided in the context of this MSFD exercise to "freeze" this area by 2026, and then to update it at each cycle to enable the target to be monitored.

3 Data used for the calculation of the works

As a reminder, this note is written to describe the method applied to calculate indicators 1 and 2 on the maritime coastlines. It is divided into two calculations:

- A target for the upper limit of the foreshore (in linear km);
- A target for the intertidal space (in ha).

The data on works that can be used are a database of works assembled by Cerema, called BD ouvrages Cerema, a database including ports held by BRGM, called BD ouvrages BRGM, and the use of the Medam site to visualise works in the Mediterranean produced by UMR 7035 ECOSEAS of the University of Nice.

3.1 Cerema works database

The "works" database was created in 2017 within the framework of the National Strategy for the Integrated Management of the Coastline by photo-interpretation from available sets of vintage aerial photographs, then by checking several databases managed locally by the State services. It covers the four maritime coastlines of mainland France, the French West Indies, French Guiana, Réunion and Mayotte.

For metropolitan France, Cerema's "works" database contains nearly 17,000 geo-referenced works.

Regarding the main specifications of this database:

- The works considered are those located in the predominantly natural public maritime domain, even if some works "enter" the ports;
- The works are represented by polylines that show their overall axis;
- The dates of appearance, disappearance and last seen are specified. These dates correspond to the dates of acquisition of the aerial photographs;
- A nomenclature has been put in place. The works are divided between:
 - Coastal dykes;
 - Walls, retaining walls;
 - Perimeter walls;
 - Breakwaters;
 - Groynes;
 - Access roads, paths, submersible routes;
 - Slipways;
 - Buildings, blockhouses, fortifications;
 - Personal protection;
 - Piers;
 - Docks;
 - Waterworks;
 - Security arrangements;
 - Other or undetermined.

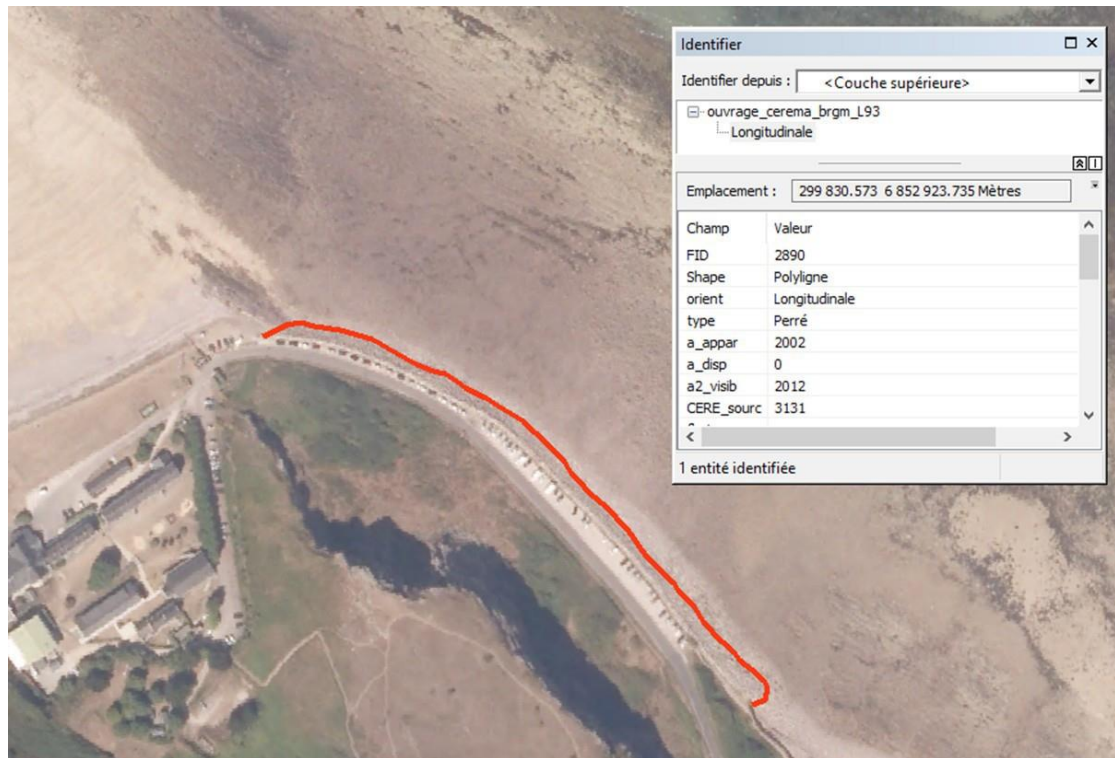


Figure 5: Extract from the Cerema Works Database - Representation of a riprap

The advantages of the Cerema works database are its availability for all the maritime coastlines of mainland France with the same method in place, but also the content of the attribute table with 3 information on dates, which is valuable in the context of the MSFD indicator.

But several limitations were identified:

1. The works are represented as linear data without information on width (see Figure 5). This poses a problem for calculating a surface indicator ... An approximation is therefore to be considered;
2. The scope of the data is not homogeneous. Some works are raised in part and stopped without any particular justification. This is especially true for ports;



Figure 6: Works not surveyed in the Cerema Works Database - Gujan-Mestras sector

3. Geometric problems exist, for example with recurrent topology errors (hanging nodes);



Figure 7: Geometric errors - Lège-Cap-Ferret and Ver-sur-Mer areas

4. Photo-interpretation errors are also found with works
The following are examples of "forgotten" or incorrectly filled in date fields;
5. Finally, it should be noted that, due to it being constructed by photo-interpretation, this database cannot aim to be exhaustive. In fact, only the works visible on the aerial photographs are taken into account. For example, a longitudinal structure under trees may not be seen by the photo-interpreter. Or a structure that is not visible on a photograph does not mean that it has been dismantled, but simply that it may have been covered by sand for a period of time.

More information:

<http://www.geolittoral.developpement-durable.gouv.fr/IMG/pdf/20171107-specif-tech-carto-ouvrages-littoraux-2.pdf>

3.2 BRGM works database

This structural database was produced by BRGM within the framework of the WFD and by assembling different data sources.

This database concerns all the structures on the English Channel and North Sea coast, including port structures. For narrow works (e.g. groynes), the features are represented as lines representing the axis of the structure. But for significant works (dyke, jetty), the Histolitt coastline goes around them, as illustrated below. This specification makes the transformation into polygons much easier.

The data used come mainly from the DDTMs, with the exception of two departments: Somme and Ille et Vilaine. BRGM then merged and added the data to the database in order to have a homogeneous database for all three maritime coastlines. MEMN, NAMO and SA.

The data collected, merged and completed represent 13,380 works on the English Channel Atlantic and North Sea coastlines. The referenced works are divided into a nomenclature containing the following values:

Windbreak	Wall	cross-cutting structure*Riprap/rockfill
k	Wall, retaining wall Offshore	cross-sectional work*
Windbreak	structure*Masonry	Groyne, piles
k Slipway	Longitudinal structure*Other	Riprap
Riprap cordon Pebble	Longitudinal structure*DYKE	pool
cordon Dyke	Longitudinal structure*Dyke	Bridge /
Lock, floodgates	longitudinal works*dykes, riprap, sand traps (Le Verdon)	footbridge
Stormwater outfall, groyne	longitudinal structure*riprap/rockfill	Pontoon
Stairs	longitudinal structure*Masonry	Personal protection
Harbour Pier		Dock
Levy		Embankment-Excavation
		Submersible road

This nomenclature, delivered as it is, reveals a heterogeneity in the naming of works, which is indicative of the action of combining layers from different sources.



Figure 8: Extract from the BRGM works database - Dieppe sector

The advantages of this database are its coverage of the three maritime coastlines, its geometric accuracy with very precise surveys overall and the fact that it contains diverted works that facilitate conversion into surfaces.

The disadvantages are threefold. Firstly, the absence of a date field, secondly, the absence of a field indicating the orientation of the works, and thirdly, the absence of some "omitted" ports.

3.3 The Medam database of the University of Nice.

This data was analysed by consulting the Medam website and more particularly its cartographic module (<http://www.medam.org/index.php/fr/medam-module-cartographie>). Medam is, in part, a database of the monitoring programme of the Marine Strategy Framework Directive (MSFD) for the Mediterranean, component "Benthic habitats and sea-floor integrity". In this sense, the inventory in the Mediterranean of the impact of developments gained on the marine domain, which allows the evaluation of the impact of the accumulation of constructions built in the sea to take various forms:

- natural ("historical": before any development) coastline, digitised from old maps. It was defined from the IGN's ortho databases (50 cm resolution) and drawn at a scale of 1:10,000, except for the reclaimed land, where the reference scale was 1:1000.
- initial areas of shallow water ("historical" areas, before any development).
- works reclaimed from the sea larger than 100 m² (8 types including harbour, open land, dyke, shelter, groynes, etc.) with a direct impact on the marine environment.

The database contains several layers of geographical information: developments, riprap and artificial shorelines. For the purposes of the study, the data referred to as developments seems to be the most relevant.

It contains the following descriptive information:

Private	Sheltered
shelter	harbour Dock
Groyne	Sediment accumulation
Containment opening	Silting
Port	Contained beach
Contained	
beach	
Embankment	

The advantages of this database are its coverage of the Mediterranean coastline and its geometric accuracy, with very precise surveys overall.

The disadvantages are twofold. Firstly, the lack of a date field, and secondly, the unavailability of this database. It was therefore necessary to use the cartographic module and to digitise the works by photo-interpretation by following the information in the module. The entities have been surveyed in the form of lines.

3.4 Joining of BRGM and Cerema databases in the English Channel, North Sea and Atlantic

The objective of this stage is to reconstitute an information layer containing the works in the two Cerema and BRGM databases.

However, prior work was carried out on the BRGM database in order to make it compatible during the combination process and for the calculation of the indicators.

Thus, the objects in the BRGM works database were supplemented with the following information by photo-interpretation from the two stages of the coastal ortho:

- visibility from the V1 ortho, visibility from the V2 coastal ortho: these two descriptions make it possible to distinguish works built up to 2002 from those built between 2002 and 2014;
- transverse or longitudinal orientation: together with the geographical position, this information ensures that the works can be assigned to the upper limit of the foreshore or to the foreshore.

For the combination of the two databases, the following priority rules were applied:

- in the case of the existence of duplicates (for example, a work present in both databases):
 - for narrow works such as groins, the choice is made to use Cerema data, which have the advantage of having a date field;
 - on wide works such as jetties, the choice is made to favour the base with the best geometry and therefore that of BRGM since it detours part of the works. However, the route of the structure contained in the Cerema database is maintained in order to keep the attribute information useful for calculating the indicator.
- if there are no duplicates, a union is applied by performing a visual check and a manual connection, if necessary, is made between the two source databases.

The information layer obtained also contains the identifiers of the two original BRGM and Cerema databases so that the source can be traced if necessary.

3.5 Union of Cerema and Medam databases in the Mediterranean

In the Mediterranean, the method used consisted in consolidating the Cerema database with the data contained in the Medam viewer. The following steps were taken to achieve this:

- On Medam
 - Display of the BD Ortho 2000 and the coastal ortho 2012
 - For each Medam structure, the presence/absence of information in relation to the orthophotographic background
- On Cerema
 - Display of the BD Ortho 2000 and the coastal ortho 2012
 - Presence/absence information in relation to orthophotographic backgrounds
- The two bases were then assembled to form a single layer.
- For each structure, measurement of the width of the transverse works on an orthophotographic background

4 Method of disaggregating works to indicators

It should be noted that pontoons or installations linked to aquaculture (shellfish storage areas, oyster beds, etc.) are not included in the calculation of indicator D06- OE01.

The previously obtained layers were used as a basis for distributing the works either on the upper limit of the foreshore, or on the intertidal space, or in both spaces.

Two fields have been created in the attribute table. The first named [sup_estran] [suppl_foreshore in English], the second [estran] [foreshore in English]. They provide information on whether the works belong to the two spaces, respectively the upper limit of the foreshore and the foreshore;

The following rules have been adopted:

- upper limit of the foreshore:
 - length of all longitudinal works according to their geographical position and orientation. It should be noted that in the Mediterranean, the longitudinal breakwater-type works that make up the tombolos were considered as belonging to the upper limit of the foreshore if the tombolo was connected to the land.
 - width of all transverse works connected to the coastline.
- Foreshore:
 - outline of all cross-sectional works;
 - supplemented by all longitudinal or other works (blockhouses) according to their geographical position.

4.1 Method of breaking down works at the upper limit of the foreshore

To assign the works to the upper foreshore limit, the following steps were taken:

- Selection of longitudinal works ;
-
- Based on this selection, a manual verification check is carried out to eliminate from the selection those works that are far from the coastline and to eliminate possible interpretation errors.



Figure 9: Example of a longitudinal structure far from the coastline - Cherbourg area

- Set the [sup_estran] field to 1 for the remaining selection.
- Transverse works are selected if they intersect the high water mark;
- A visual check allows the selection to be adapted manually;
- At the end, the selected works are assigned the value 1 in the [sup_estran] field.

4.2 Method of breaking down foreshore works

4.2.1 Method of ventilating works

The works were assigned to the foreshore in the following steps:

- Intersection of the foreshore layer with the works layer ;
- Correction necessary to adapt some works located on the outer edge of the foreshore;



Figure 10: Example of groynes located on the foreshore but not entirely included in the yellow foreshore layer - Detail of a sector located in the Vendée

- At the end, the selected works are assigned a value of 1 in the [foreshore] field.

4.2.2 From a line layer to a polygon layer

The foreshore indicator is a surface indicator expressed in hectares. It is therefore essential to convert all the works that have been selected previously into polygons. This work is carried out in several operations.

- First of all, a supplementary photo-interpretation of the foreshore layer was carried out to delimit certain works. In fact, in some cases, the foreshores go all the way around the works. It is then easy to create an automatic polygon by filling in at the end. This step creates a first layer of data;



Figure 11: Re-use of the seaward edge to transform a structure into a polygon - Tarnos sector

- Then, and on the same principle as before, the works resulting from the joining of the Cerema and BRGM structure databases, the outline of which is outlined, are selected. They come from the BRGM works database. Each structure is closed at the ends either manually or automatically by the high water mark.

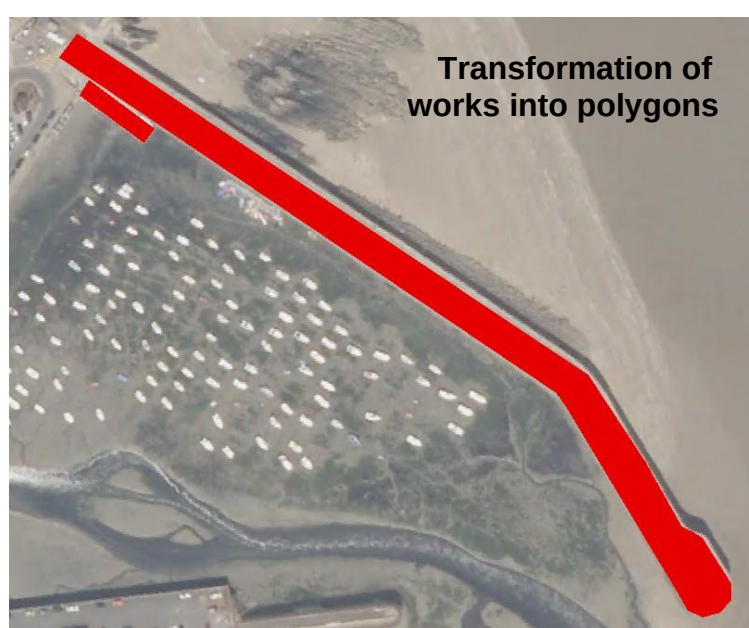
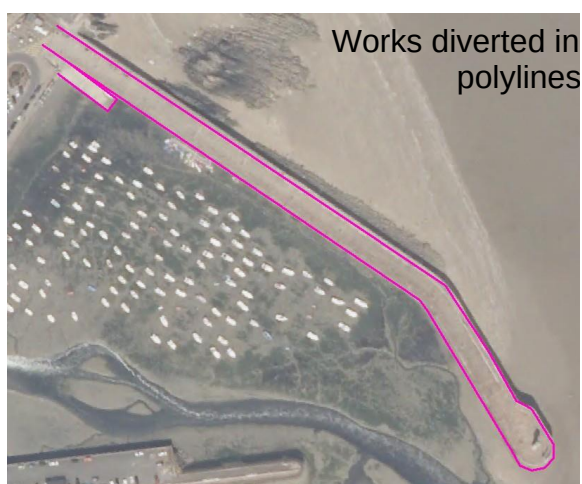


Figure 12: Conversion of works diverted by lines into polygons from the sea level limit to transform a structure into a polygon - Binic-Étables-sur-Mer sector

- Finally, works that do not fall into the first two categories are transformed into polygons by applying widths according to their typology. Buffer zones are generated from these widths, the values of which are given below.

Type	Average width adopted
Access, road, submersible route	0.5
Safety equipment (first aid station, signs, etc.)	0.5
Hydraulic installations (sluice gate, lock, dam, etc.)	0.5
Other or undetermined	0.5

Type	Average width adopted
Rainwater outfall	0.5
Groyne	0.5
Stairs	0.5
Jetty	0.5

Building, blockhouse, fortification...	0.5
Breakwater	0.5
Slipways	0.5
Riprap cordon	0.5
Coastal dyke	0.5
Lock, gate	0.5

Wall, retaining wall	0.5
Rip rap	0.5
Bridge, footbridge	0.5
Quay	0.5

5 Consolidation of databases

5.1 Findings

After integration and analysis, the data used to calculate indicators 1 and 2 are databases produced in previous work, or assembled by collecting heterogeneous data.

Errors or inaccuracies were found that may affect the final results. However, in order to guarantee results that are as accurate as possible **according to the state of knowledge**, it is essential to have reliable basic data. A check of the source data was carried out to consolidate the values obtained.

The difficulties encountered relate mainly to the following:

- Works missing from both databases. Photo interpretation of the entire coastline revealed several works that were missing from the databases for both the 2000-2002 and 2012-2014 years.
- Geometric imprecisions such as unconnected nodes, generalised entries, unclosed surfaces

The following images illustrate the anomalies detected.



Geometrically unconnected works
The three works opposite should be linked together at their starting point.



Forgotten works

At the edge of the road at the boundary with the beach there is a structure that has not been entered in the available databases.



Closing of entities

Probably captured on too small a scale, some of these works are not closed.

5.2 Consolidation phase

The consolidation phase to correct the elements was carried out solely by photo interpretation. No recourse to databases that might be held in the services has been made.

The orthophotographic backgrounds used are the two vintages of the coastal ortho V1 and V2 which correspond to the two defined reference periods, i.e. 2000-2002 and 2012-2014 (dates varying according to the territories).

Geometrically unconnected works

GIS models the real world from 3 main types of entities: lines (a road for example), points (a fire hydrant), polygons (a cadastral parcel). There are rules governing the production of linear data, including

- represent line-like infrastructures (roads, dykes, jetties, etc.) by their axis;
- prohibit hanging or dangling nodes.

For the works using the above example and respecting the two rules, the three works must be extended to be connected as follows.



Forgotten works

In the first phase of the study, the random photo-interpretation check revealed omissions. Some works are not included in the "Cerema" or "BRGM" databases.

The correction of these anomalies was done by photo-interpretation by reviewing the entire study area from the Belgian border to the Spanish border.

Closing of entities

Many works such as blockhouses and aquaculture product storage areas need to be closed. The random check revealed a relatively large number of errors. These errors were corrected by photo-interpretation.

6 Results obtained

6.1 Artificial line of the upper limit of the foreshore

The consolidations made to the works database have enabled the indicator sought to be calculated for the English Channel, North Sea, Atlantic and Mediterranean coastlines. This indicator, expressed in kilometres, is calculated by first measuring the total length of the relevant works present until 2002. Then, in a second step, the linear of the works present in 2014. Then the evolution is calculated in absolute and relative values.

For information, the linear of the high water marks is shown in the table.

The **final results after consolidation** are shown below:

	Status 2002 (in km)	Status 2014 (in km)	Length of high water mark (in km)	Delta (in km)	Rate
MEMN	0.5	0.5	0.5	0.5	0.5
NAMO	0.5	0.5	0.5	0.5	0.5
SA	0.5	0.5	0.5	0.5	0.5
MED	0.5	0.5	0.5	0.5	0.5

Specifically in the Mediterranean, the artificially constructed length of the upper limit of the foreshore **within the marine protected areas** was also calculated.

	Status 2002 (in km)	Status 2014 (in km)	Length of high water mark (in km)	Delta (in km)	Rate
MED	0.5	0.5	0.5	0.5	0.5

6.2 Foreshore artificialization indicator

The results for the foreshore indicator are expressed in hectares and concern only the English Channel, North Sea and Atlantic coastlines. The surface area of the works present in 2002 is calculated after selection of the works whose date of presence on the coastal orthos is prior to 31 December 2002. The same calculation is made for works present in 2014. The evolution is highlighted in absolute and relative values. For information, the total area of the foreshore is shown.

The **final results after consolidation** are shown below:

	Status 2002 (in ha)	Status 2014 (in ha)	Foreshore area (in ha)	Delta (in ha)	Rate
MEMN	417	422.1	84153	5.1	1.22
NAMO	187.7	208.2	118267	20.5	10.9
SA	62.1	66.2	59477	4.1	6.6



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