

# Baseline Study of the NOSTRA project

## Bonifacio Strait



Source: Nostra website



Source: Reserves Naturelles de France website

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The views expressed in this report are purely those of the authors and may not necessarily reflect the views or policies of the partners of the NOSTRA network. The methodological approach that was applied during the baseline study is presented in the final report of the study. The analysis that is provided in this report is based on the data collected and reported by the Nostra partners, a complementary literature review conducted by the consultants, and the results provided by the methodological toolkit developed in the framework of the baseline study.

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**Limitations of the analysis:**

The consultants faced a limited amount of data. In general, on both sides of the strait, involved partners are facing difficulties in collecting socio-economic data.

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# 1 General presentation of the strait



## 1.1 Geographical area

The Bonifacio strait separates Corsica (Fr) in the North, from Sardinia (It) in the South. The two islands are only 11 km apart from each other. The strait also connects the sea of Sardinia in the west to the Tyrrhenian Sea in the east, and it is 100 m deep. Two MPA (Marine Protected Areas) are located in the area: “*Réserve Naturelle des Bouches de Bonifacio*” on the French side and “*il Parco Nazionale dell’Acipelago di La Maddalena*” (Maddalena Archipelago National Park) on the Italian side.

### ► Corsica, France

The French side of the strait of Bonifacio is located in South Corsica County (Corse-du-Sud) and includes three coastal cantons: the Canton of Figari, the Canton of Bonifacio and the Canton of Porto-Vecchio.

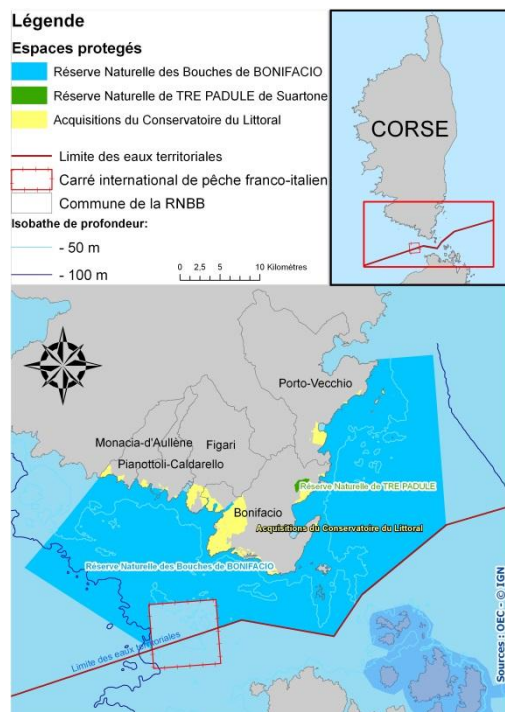


Figure 1: Map of the French side of the Bonifacio Strait

## ► Sardinia, Italy<sup>1</sup>

The Italian side includes, in addition to part of the northern coast of the main island, the archipelago of La Maddalena formed by several small islands almost completely part of the national park (*Parco Nazionale dell'Arcipelago di La Maddalena*). The Italian area of the strait includes, in fact, the National Park and the close coastal areas (as shown on Figure 2) of Sardinia. The strait covers important marine areas, as well as the islands of the Archipelago: the mains are La Maddalena, Caprera, Santo Stefano, Spargi, Budelli, Santa Maria, Razzoli. The park is administratively part of the province of Olbia-Tempio and it is the only marine and terrestrial protected area, in Italy, whose territory is in only one township.



Figure 2: Italian side of the strait of Bonifacio<sup>2</sup>

## ► Cross-border overview

Table 1: Key geographical data

Key geographical data	Unit	Bonifacio strait, France	Bonifacio strait, Italy <sup>3</sup>
Landscape area	ha	49,400	25,200
Seascape area	ha	79,203 <sup>4</sup>	114,600
Length of coastline	km	90 km <sup>5</sup>	300 km
Maximal depth of the strait	m	100m	
Width of the strait	km	11 km	
Urbanized areas	km <sup>2</sup>	n/a	n/a

<sup>1</sup>European straits presentations, strait of Bonifacio: [www.fr.europeanstraits.eu](http://www.fr.europeanstraits.eu)

<sup>2</sup>Toolkit

<sup>3</sup>Data from the toolkit for the analysis of the biodiversity value and integrated management of biodiversity in European straits, Bio by Deloitte, 2013

<sup>4</sup>Surface marine de la réserve des Bouches de Bonifacio. Source : Observatoire du Patrimoine naturel des Réserves Naturelles de France, milieux marins et côtiers, 2007

<sup>5</sup>Coastline length approximate value. Source: Google Earth

## 1.2 Level of urbanization

### 1.2.1 Cities

#### ► Corsica, France

The French side of the strait includes five main cities: Porto-Vecchio (11,005 inhabitants), Figari (1,217 inhabitants), Bonifacio (2,919 inhabitants), Pianottoli-Caldareello (864 inhabitants) and Monnacia-d'Aullène (471 inhabitants). (Table 2) The area is characterised by **limited urban uses** and a good **preservation of the natural coastline**.

Table 2: Population of main cities in the French side of the Strait<sup>6</sup>

NOM	CODE_INSEE	STATUT	CANTON	ARRONDISST	POPUL	Superficie/ ha
Bonifacio	2A041	Chef-lieu de canton	BONIFACIO	SARTENE	2919	14076,1612
Monacia-d'Aullène	2A163	Commune simple	FIGARI	SARTENE	471	4001,02811
Pianottoli-Caldareello	2A215	Commune simple	FIGARI	SARTENE	864	4300,96601
Figari	2A114	Chef-lieu de canton	FIGARI	SARTENE	1217	10057,9264
Porto-Vecchio	2A247	Chef-lieu de canton	PORTO-VECCHIO	SARTENE	11005	16924,884
					<b>TOTAL</b>	<b>TOTAL</b>
					16476	49361

#### ► Sardinia, Italy

The Italian side of the strait embraces four cities; three of them - Santa Teresa di Gallura (5,003 inhabitants), Arzachena (11,532 inhabitants), Palau (3,774 inhabitants) – are on the coast of Sardinia, the fourth is La Maddalena (10,884 inhabitants<sup>7</sup>) situated on the main island of the archipelago.<sup>8</sup>

## 1.3 Infrastructure

### 1.3.1 Ports<sup>9</sup>

#### ► Corsica, France

Two major Corsican ports can be found in the Bonifacio strait: **the port of Porto-Vecchio and the port of Bonifacio**. These ports provide connection to the mainland and Italy. The port of Porto-Vecchio, a cargo port, regularly hosts SNCM<sup>10</sup>'s cargo and ferries, Italian merchant vessels and cruise ships. In 2006, the port processed around 225 arrivals and departures, 98,120 passengers (including 10,158 cruise passengers) and 202,607 tons of merchandise. The port of Bonifacio, being both a **marina and cargo port**, hosts Italian vessels to and from Santa Teresa in Sardinia, as well as cruise ships and yachts. For the year of 2006, its activity represents about 1,613 arrivals

<sup>6</sup> Source : Insee

<sup>7</sup> "Popolazione residente al 1° Gennaio 2013 per età, sesso e stato civile Comune: La Maddalena" <http://demo.istat.it/pop2013/index.html>

<sup>8</sup> Source: Toolkit

<sup>9</sup> Ministère de l'écologie, du développement durable, des transports et du logement (2011), Dossier de presse - Protection du patrimoine maritime. Available at: [http://www.developpement-durable.gouv.fr/IMG/pdf/DP\\_Bouches\\_de\\_Bonifacio.pdf](http://www.developpement-durable.gouv.fr/IMG/pdf/DP_Bouches_de_Bonifacio.pdf)

<sup>10</sup> SNCM - Société Nationale Maritime Corse Méditerranée

and departures, 267,665 passengers (including 12,836 cruise passengers) and 19,215 tons of merchandise<sup>11</sup>.

Four other **anchorage areas** are situated in the Corsican side of the strait: Roccapina, Santa Giulia, Santa Amanza, Tonnara.

#### ► Sardinia, Italy<sup>1213</sup>

In the North-Eastern part of Sardinia, the maritime activity of the strait is concentrated in three harbours - Santa Teresa di Gallura, Olbia and Golfo Aranci - ensuring the connection of the island to the Italian peninsula as well as to Corsica. This last route goes from Santa Teresa di Gallura to Bonifacio crossing the strait at its most narrow part.

The Northern Part of Sardinia, including the La Maddalena archipelago, is also rich of several small ports hosting local tourism and fishing activities.

### 1.3.2 Gas pipeline<sup>1415</sup>

With no doubts, the construction of a gas pipeline is the main infrastructural project running in the area. The project, named Galsi, will connect Algeria to Sardinia, and Sardinia to Tuscany (on the continental part of Italy). This project might affect the features of the strait in two ways: first, taking, the gas pipeline, the place of the boats ensuring the gas supply of the island, it might reduce the passage of hazardous substances through the Bonifacio strait; secondly it might create hotspots for maritime traffic during the phase of its construction.

### 1.3.3 Terrestrial and air transportation

#### ► Corsica, France

The Corsican road system is well developed, but the high seasonal traffic occasionally leads to a **saturation of the network**. In Corsica, as in metropolitan France, the automobile remains the most commonly used mode of transport. The coastal roads, which connect Porto-Vecchio to Bonifacio, see a lot of circulation in particular. Nonetheless, the network is not designed very well for trucks coming from Sardinia and arriving in Bonifacio via ferry to transport goods to other parts of the island.

The studied area includes an airport, Figari's airport. It is the third largest airport in Corsica in terms of commercial passenger traffic and the leading Corsican airport for airfreight. The airport achieved its record traffic in 2012 with 459,049 passengers (+3.4% compared to 2011)<sup>16</sup>.

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<sup>11</sup> Conseil Général de la Corse du Sud - <http://www.cg-corsedusud.fr>

<sup>12</sup> Google maps: <https://maps.google.fr/>

<sup>13</sup> Autorita Portuale Nord Sardegna: <http://www.olbiagolfoaranci.it/index.php?carattere=p>

<sup>14</sup> Regione Autonoma de Sardinia: <http://www.regione.sardegna.it/progettogalsi/>

<sup>15</sup> Galsi (2009), Galsi, l'energia ti viene incontro. Available at: [http://www.edison.it/media/Brochure\\_italiano.pdf](http://www.edison.it/media/Brochure_italiano.pdf)



In 2012, a total of 904,049 persons were recorded in terms of passenger transportation (both maritime and air) in the area (**12% of the total volume**)<sup>17</sup>.

#### ► Sardinia, Italy<sup>18</sup>

The Northern part of the Sardinia is connected to the rest of it by a quite loose network of motorways. In particular, the highway from Palau connects the northern part of the island to the southern one and it is of great economic interest since it represents the privileged access to the archipelago of La Maddalena from the main island.

Regarding air traffic, Sardinia is connected to the Italian peninsula through four airports; one is located only few kilometres from Palau (Olbia) the second is situated in the Southwestern part of the study area (Alghero). They might be both a source of local economic development, as well as of pollution and disturbance for some of the species of birds flying over the area.

## 1.4 Socio-economic background

Key socio-economic data for the Bonifacio Strait is summarised in Table 3.

Table 3: Key socio-economic data

Key population data	Unit	South Corsica <sup>19</sup>	Sardinia <sup>20</sup>
Number of inhabitants in the landscape area	.	21,536	n/a
GDP per capita in the region	€	23,783 € (2005)	20,071.4 € (2011)
Employed	%	69.3 (2009)	42.3 (2012)
Unemployment rate in the region	%	11.3 (2009)	15.5 (2012)
Unemployment rate in the country	%	11.7 (2009)	10.7 (2012)

The economic data available for the GDP concern the region Corsica and South Corsica for the others.

#### ► Corsica, France

<sup>16</sup> Commune de Figari : <http://www.figari.fr/>

<sup>17</sup> INSEE Corse - La Corse en bref, édition 2013. Available at : <http://www.insee.fr/fr/regions/corse/default.asp?page=publications/corsebref/corsebref.htm>

<sup>18</sup> Google maps: <https://maps.google.fr/>

<sup>19</sup> INSEE – Chiffres clés Corse. Available at : <http://www.insee.fr>

<sup>20</sup> Istat - Istituto nazionale di statistica:

[http://www.istat.it/en/sardegna/data?q=gettable&dataset=DCCN\\_VALPROCAPT&dim=130,0,14,9,1,2146,0&lang=1&tr=0&te=0](http://www.istat.it/en/sardegna/data?q=gettable&dataset=DCCN_VALPROCAPT&dim=130,0,14,9,1,2146,0&lang=1&tr=0&te=0)

Since 1999, the island is one of the French regions with the highest population growth (1.6% per year against 0.6% nationally). This development comes exclusively from an **influx of migration**. However, the Corsican population has aged rapidly since 1999, reaching a ratio that is considerably elevated in comparison to the national average. By now, nearly 27% of the population is over 60 years, while the national average is only 23%. The growing presence of retirees in the region has also been accompanied by a growth in the labor force. Despite this increase, the proportion of the working force in Corsica remains below the national rate of 72%.

**Unemployment is also high** on the island, due to its insularity and the absence of industry. However, the Gross Domestic Product of Corsica totalled 8.06 billion euros in 2011, up 4.6% compared with 2010. It remains the highest rate of increase in France, although the **GDP per capita remains lower than the average provincial GDP in France**<sup>19</sup>.

### ► Sardinia, Italy

The Sardinian side of the strait is not the most densely populated area of the island which is, instead, located in the South. Despite a fast increase in the last decades, the four urban spaces of the area do not represent important concentration of population. Moreover, the island as a whole has one of the lower density of population of Italy (70 inhabitants/km<sup>2</sup>) and the GDP per capita in Sardinia is also below the national average. With 78 euros per capita in Purchasing Power Standards in 2010, it was 23 points lower than the Italian level. It seems to be a rather well-established situation since the differences between the national and the regional averages remain quite constant since 2001.

Unemployment is also higher on the island than on the continent, with particular accentuation in the recent years. Regarding this aspect, the region suffers of its insularity that makes commercial trades with external areas costly. In reaction to this major economic issue, specific local development plans have been launched in 8 geographical areas in Sardinia that are particularly affected by the economic crisis. La Maddalena is among these “areas of crisis” for which public financing will strengthen the development of both tourism activities and blue/maritime economy<sup>21</sup>.

The economic activities on the strait area represent an important source of income for local inhabitants. Table 4 shows that nearly 50% of them have their professional activity directly in the strait area.

## 1.4.1 Main economic activities

Despite the fact that the local economic activity is largely oriented towards the sea, none of the islands benefits from the intense maritime traffic crossing the strait. In fact, the traffic represents nothing else but a liability of water pollution for both islands<sup>22</sup>:

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<sup>21</sup> Source: <http://www.bicsardegna.it/index.php>

<sup>22</sup> Source: Sémaphore de Pertusato / Préfecture Maritime de Méditerranée

- The number of ships crossing the strait fell in a very significant way (5,200 in 1991 / 3,222 ships in 2012) ;
- Reduction also in the quantities of hazardous substances passing through the strait (3,707,277 tons in 1991 / 1,453,745 in 1993 / 160,611 tons in 2012, representing a decrease of 95%), including hydrocarbons (2,573,380 tons in 1991 / 60,782 tons in 2012, representing a decrease of almost 98%);
- The major part of ships captains passing through the strait know the international provisions about the compulsory report and follow the recommended road (3,194 in 2012);
- Infringements related to the marine regulation are particularly reduced (28 ships in 2012).

The major economic categories present in the strait have been detailed in Table 4.

Table 4: Main economic activities

Type of activity	Corsica	Sardinia
Maritime transport of goods	√	√
Maritime transport of passengers	√	√
Terrestrial transport of goods	low	low
Terrestrial transport of passengers	-	-
Ports (fisheries and trade)	√	√
Onshore energy production	-	-
Onshore production of renewable energy	-	-
Onshore industry and infrastructure	-	-
Onshore agriculture	√	√ (but not in the archipelago of La Maddalena)
Building and construction	-	?
Tourism	√	√

#### ► Corsica, France

The economy of South Corsica is atypical. It is characterised by few industrial activity, relatively unproductive agriculture but a significant tourism industry.

Considered as “a mountain in the sea”, Corsica is isolated. This particular geography is an asset to the “Island of Beauty”, where tourism comprises an important activity. **The tourism industry in**

**South Corsica is the economic mainstay.** Due to its rich natural heritage and its climate, South Corsica is a popular leisure destination. In particular, most business is related to **seaside activities**. In 2012, tourism activity represented around 407,000 nights spent in hotels and 994,000 nights spent in campsites. Employment is also highly linked to this industry. Around **38% of private sector employments** in Porto-Vecchio basin are in connection with the tourism industry (accommodation, catering and trade), representing 4,600 employments in 2010. This basin is the **top tourism employer in Corsica**; the presence of touristic equipment also being very high<sup>23</sup>. However, employment in tourism is seasonal, which remains as a major issue to be solved.

Due to its geographic location, fishery is another main economic activity. However, it is mostly a **local activity** and is mainly traditional fishing. Everything fished is sold on the island.

Fishery businesses are all very small enterprises, mainly companies with a single employee, maximum two. The total workforce in Corsica represents about **300 direct jobs**, 209 patrons and a few hundred sailors. The estimated turnover of the industry is 17 million Euros, with approximately 1,200 tons sold per year, all species included<sup>24</sup>. The prud'homie of Bonifacio (organisation in charge of the fishery in the area) represents **less than 20% of fishing activity in Corsica**.

### ► Sardinia, Italy<sup>25</sup>

The four main economic activities of the Sardinian part of the strait are listed below.

Tourism is clearly the dominant activity in Sardinia. The terrestrial and marine environment, as well as cultural specificities, are an asset in this aspect. Going into details for La Maddalena Archipelago, since the dismantling of the USA military base in 2008 and the failing in organizing the G8 on the island, the main economic activity in the area is nowadays tourism. This is a tourism relying on the beauty of the sea and coasts that attracts people mainly during the summer.

The maritime transport of goods (crossing the strait) represents 1.4% of total GDP. Because of Sardinia's insularity, this is a fundamental activity for the entire local economy.

The maritime transport of passengers going from Sardinia to Corsica (and vice versa) represents 7% of the GDP. Part of this activity could be accounted for tourism on both islands and it represents an important part of the local GDP. The fourth pillar of the local economy is traditional fishing. It represents more than 7% of the GDP, and heavily relies on the wellbeing of the local ecosystem.

Excepting the transportation of goods, pollution of the waters and seashores would have important and long-term negative effects on all 3 sectors of activity. The intense navigation in the strait thus represents a major threat to Sardinia.

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<sup>23</sup> INSEE Corse - La Corse en bref, édition 2013. Available at : <http://www.insee.fr/fr/regions/corse/default.asp?page=publications/corsebref/corsebref.htm>

<sup>24</sup> Comité Régional des Pêches Maritimes et Elevages Marins de Corse - <http://www.crpmem-corse.com/>

<sup>25</sup> Source : Toolkit

## 2 Significance and sensitivity of biodiversity and natural environment in the strait

### 2.1 Remarkable landscapes

#### ► Corsica, France

The Corsican side of Bonifacio Strait is a remarkably diverse area, with contributions from both nature (such as bay, coastal cliffs, little islands, beaches, *etc.*) and humans (such as cities and hamlets, traditional buildings, agricultural and forest landscapes, *etc.*). Corsican landscapes also combine a **marine environment with both wild and preserved vegetation, punctuated by villages** highlighted by their emplacement and monumental aspects. During the most recent period of development, **maquis shrubland and forests** grew up to take the place of ancient agricultural fields, while **urbanization** nibbled on the coast. The quality and diversified landscapes of South Corsica and Corsica in general, are the **determining elements of the region's touristic allure**<sup>26</sup>.



Figure 3: Bonifacio and its surroundings (limestone cliffs and maquis)<sup>27</sup>

#### ► Sardinia, Italy

The Italian area boasts a great diversity of landscapes. This largely stems from the structures determined by the combination of terrestrial and maritime landscapes. On the basis of the cultural and the visual identity, typologies of landscapes have been identified and, in the narrowest part of the strait, 15 units of landscapes have been observed. They correspond whether to the natural

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<sup>26</sup>Préfecture de Corse (2012) Profil environnemental régional de la Corse

<sup>27</sup> Conseil Général de la Corse du Sud - <http://www.cg-corsedusud.fr/>

characteristics, or to anthropologic elements. The latter aspect in particular, characterises the urban areas<sup>28</sup>.

## 2.2 Biodiversity and natural environment in the strait

“Remarkable” ecosystem or habitat types

Table 5 presents the main land covers in the strait.

Table 5: Main land covers of the strait<sup>29</sup>

Land cover (CORINE Land cover Nomenclature)		Corsica	Archipelago of la Maddalena
<b>Artificial surfaces</b>	Urban fabric	√	√
	Industrial, commercial and transport units	√	√
	Mine, dump and construction sites	√	-
	Artificial non-agricultural vegetated areas	√	√
<b>Agricultural areas</b>	Arable land	√	
	Permanent crops	√	
	Pastures	√	
	Heterogeneous agricultural areas	√	
<b>Forest and semi-natural areas</b>	Forests	√	√
	Shrub and/ or herbaceous vegetation association	√	√
	Open spaces with little or no vegetation	√	√
<b>Wetlands</b>	Inland wetlands	√	√
	Coastal wetlands	√	√

### ► Corsica, France

<sup>28</sup> Parco nazionale Arcipelago La Maddalena, piano e regolamento del Parco. Quadrointerpretativo e sintesi02, QISR.01-relazione generale, settembre 2010

<sup>29</sup> Source: Toolkit

Habitat types in the Corsican side of Bonifacio strait are diverse. More than 132 habitat types have been inventoried, with about 59 terrestrial habitats and 73 maritime habitats. Many of these habitats types are recorded as being of community interest in the Habitats Directive.

Among the terrestrial habitats, the “**Mediterranean temporary ponds**” habitat is of great heritage value due to its rarity and also because of its composition of remarkable and protected plants (*Isoëtes velata*, *Ranunculus ophioglosses*, *Kickxia cirrhosa*). These areas hold great interest for fauna, hosting many amphibians and invertebrates, which are remarkable for their rarity. This habitat is well represented in the Nature Reserve of Tre Padule Suartone. The “**Pseudo-steppe with grasses and annuals (Thero-Brachypodietea)**” habitat also contains a variety of fauna and flora. Being an open-air environment, it is sensitive to closure of the environment (e.g. scrub growth)<sup>30</sup>. Furthermore the “**Coastal Dunes with Juniperus spp**” Habitat is an habitat type representing the Mediterranean biogeographical area.

Among the maritime habitats, the “**Posidonion oceanicae**” habitat (seagrass species endemic to the Mediterranean Sea) is a pole of biodiversity for Mediterranean coasts and a fundamental ecosystem for the quality of coastal environments (including for the tourism and traditional fishery). It represents for example a feeding area for fishes and for the Loggerhead sea turtle (*Caretta caretta*)<sup>31</sup>. The “**Coastal Lagoons**” habitat, areas with reinforced protection, is also an important feeding and shelter area for many species. Nutrient-rich waters promote the development of lagoon phytoplankton. Dense plant growth, of species adapted to the influence of both sea and land, host many birds and aquatic species<sup>30</sup>.



Figure 4: *Posidonion oceanicae* (left side) and Etang de Pisciu Cane – Coastal Lagoon (right side)<sup>30</sup>

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<sup>30</sup> GECT – PMIBB (2013) Lignes directrices du plan d'action

<sup>31</sup> Observatoire du Patrimoine naturel des Réserves Naturelles de France (2007) Milieux marins et côtiers. Available at : [http://www.reserves-naturelles.org/sites/default/files/librairie/milieux\\_marins.pdf](http://www.reserves-naturelles.org/sites/default/files/librairie/milieux_marins.pdf)



## ► Sardinia, Italy 3233

The natural environment of Sardinia also shows great diversity, being composed of several endemic species and habitats. Concerned species and habitats are terrestrial as well as maritime.

In general, the coasts and sandy beaches can be considered as valuable elements of the area. Other habitats are frequent and largely present such as phanerogam meadows.<sup>34</sup>

The dense system of watersheds is certainly one of the most characteristic features of the islands. It creates ecological niches and micro landscapes of limited dimensions, restrained to the size of every individual rias.

A characterization of the ecosystems also requires consideration of the biological system, which integrates both the terrestrial and aquatic systems. It can largely be defined by the species whose presence delimits the areas of protection<sup>35</sup>.

### 2.2.1 Rare and threatened species

## ► Corsica, France

**The state of species in Bonifacio strait and Corsica can be characterised as having: numerous endemic species (terrestrial, aquatic and maritime), great floristic wealth and originality, and great wealth in maritime species.**

South Corsica hosts **108 rare flora species** (specified in the national red list or European directives), including **five species covered by the National Action Plans (Plans nationaux d'actions)**. National Action Plans are strategic tools designed to maintain or restore a favorable conservation state of endangered species or species of particular interest. The first plans were implemented in 1996. The Nature Reserve of Bonifacio Strait is the only French conservation zone which hosts *Armeria pungens* (vulnerable species in France, endemic ibero-sardanian specie), *Ipomea sagittata* (endangered species in Corsica) and *Silene velutina* (species with community interest)<sup>36</sup>. Furthermore, it is home to **196 rare fauna species** (specified in the national red list), including **12 species subject to the National Action Plans** and **four vulnerable mammalian species** (Mouflon - *Ovis gmelinii*, Common bent-wing bat - *Miniopterus schreibersii*, Long-fingered bat - *Myotis capaccinii*, Felten's myotis - *Myotis punicus*). In total, **23 of 26 protected or threatened maritime species are present in the strait**. For example, a few different types of *Pinna nobilis* and more than 7,000 of *Patella ferruginea* (the most marine threatened species with fast disappearance in the Mediterranean Sea) inhabit the Bonifacio strait.

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<sup>32</sup> Parco nazionale Arcipelago La Maddalena, piano e regolamento del Parco. Quadro interpretativo e sintesi02, QISR.01-relazione generale, settembre 2010

<sup>33</sup> Source : Toolkit

<sup>34</sup> Website of the G.E.C.T. – P.M.I.B.B: <http://www.pmibb.com/fr>

<sup>35</sup> Detailed information about the Biodiversity and natural environment in the Sardinian side of the strait are available in the PMIBB database.

<sup>36</sup> Observatoire du Patrimoine naturel des Réserves Naturelles de France (2007) Milieux marins et côtiers. Available at : [http://www.reserves-naturelles.org/sites/default/files/librairie/milieux\\_marins.pdf](http://www.reserves-naturelles.org/sites/default/files/librairie/milieux_marins.pdf)



Table 6: Rare and threatened Species in South Corsica

Level of threat	Species	
Vulnerable	<i>Colchicum corsicum</i>	Flora species
	<i>Cystoseira spp.</i>	Algae species
	<i>Lythophyllum byssoides</i>	
	<i>Hippocampus hippocampus</i>	Fauna species
	<i>Thunnus thynnus</i>	
	<i>Paracentrotus lividus</i>	
	<i>Dermochelys coriacea</i>	
	<i>Sitta whiteheadi</i>	
Endangered	<i>Physeter macrocephalus</i>	
	<i>Centranthus trinervis</i>	Flora species
	<i>Limonium strictissimum</i>	
	<i>Posidonia oceanica</i>	
	<i>Patella ferruginea</i>	Fauna species
	<i>Epinephelus marginatus</i>	
Critically Endangered	<i>Balaenoptera physalus</i>	
	<i>Corallium rubrum</i>	Fauna species
	<i>Caretta caretta</i>	

### ► Sardinia, Italy

Among the 103 remarkable species counted on the Italian side of the strait, about 10 are threatened (Table 7) and several justified the creation of Natura 2000 sites. In particular, two species are considered to be of special interest ("priority" species): these are *\*Silene velutina* and *\*Limonium strictissimum*.

Table 7: Threatened species in the Italian side of the strait<sup>37</sup>

Level of threat	Species	Fauna/Flora
Endangered	<i>Anthyllis barba-jovis</i>	Flora species
	<i>Armeria pungens</i>	
	<i>Aristolochia rotundata</i>	
	<i>Colchicum corsicum</i>	
	<i>Mentha requienii</i>	
Vulnerable	<i>Arenaria balearica</i>	Fauna species
	<i>Bupthalmum inuloides</i>	
	<i>Silene velutina</i>	
	<i>Patella ferruginea</i>	
	<i>Pinna nobilis</i>	
	<i>Paramuricea clavata</i>	
Critically Endangered	<i>Limonium strictissimum</i>	Flora species
	<i>Cymbelaria aequitriloba</i>	

## 2.2.2 Protected areas and species

### ► Corsica, France

The French side of the Bonifacio Strait is replete with protected areas. They are composed of several protected areas: “*Réserve Naturelle des Bouches de Bonifacio*” (which is a Specially Protected Areas of Mediterranean Importance since 2009), “*Réserve Naturelle Tre Padule de Suartone*”, “*Réserve Naturelle des Cerbicale*”, and areas acquired by the “*Conservatoire du Littoral*”.

They can be divided into different groups:

- International commitments, including Site of Community Importance (SCI – Habitat Directive) with Special Areas of Conservation (SAC – Birds Directive) and Special Protection Areas (SPAs) and Ramsar sites.

<sup>37</sup>Detailed information about the Rare and threatened species in the Sardinian side of the strait are available in the PMIBB database

- SCI: Bouches de Bonifacio, Îlots des Moines (FR9402015), Mare temporaire de Musella/Bonifacio (FR9402009), Mares temporaires du terrain militaire de Frasselli/Bonifacio (FR9400608), Plateau de Pertusato/Bonifacio et Iles Lavezzi (FR9400591), Ventilegne-la Trinite de Bonifacio-Fazzio (FR9400592), Iles Cerbicale et frange littorale (FR9400587), Baie de Stagnolu, Golfu di Sognu, Golfe de Porto-Vecchio (FR9402010)
- SAC: Bouches de Bonifacio, Îles Lavezzi (FR9410021), Îles Cerbicale (FR9410022)
- Ramsar sites: Mares temporaires de TrePadule de Suartone (FR7200024)
- Protected areas, under reglementary protection, including prefectorial orders for protection of the biotope, biological reserves and Corsican nature reserves.
- Prefectorial order for protection of the biotope: Archipel de la Tonnara (nesting sea birds), îlot de Cornuta (terrestrial flora), îlots de Stagnolu and Ziglione (terrestrial flora)
- Corsican nature reserves: Bouches de Bonifacio, Îles Cerbicale, Tre Padule de Suartone
- High sensitive areas, under contractual protection, including **natural areas of ecological, fauna and flora interests (ZNIEFF)**, **Important Bird Areas (IBA)**
- ZNIEFF: Agrosystème de Saint Jean, Boisements et maquis de Punta Di Rafaellu et Testa Di carpiccia, Zone marecageuse de Santa-Manza, Falaises de Bonifacio, Embouchure et zone humide de la baie de Figari, Iles Bruzzi, Iles Cerbicale, Iles de la Tonnara, Stations à SileneVelutina et à RouyaPolygama du Golfe de Porto-Vecchio, Salines et zones humides de la bordure est de la baie de Figari, Iles Lavezzi, Mares des TrePadule, Mares temporaires de Frasselli/Bonifacio, Suberaie de Porto-Vecchio, Côte et ilot de Farina, Crêtes et hauts versants de la montagne de Cagna, Dune de Pascialella – Pinède de Verghia, Dune et zone humide de San Giovanni, Dune et zone humide du fond de l'Anse de Chevanu, Dunes de Tralicetu et de la Plage d'Argent - vallee de Navara, Etang de Balistra, Etang de Canetto, Etang de Piscio Cane, Etang de santa giula, Etang de Ventilegne, Etangs de Piantarella et de Sperono, Etangs et pinède de Palombaggia, Capu d'Acciaju, Pointe de la Folaca, Ilots de la baie de Figari, Mare temporaire et suberaies de Muratellu, Monte scupetu - punta di Ventilegne, Plages et zones humides de la Rondinara, plateau calcaire de , punta di Caniscione – saparella –mucchiu biancu – funtanaccia, punta di Capineru, punta di u Cappicciolu, reserve naturelle de Scandola, Rocchi bianchi, stations botaniques de l'Anse de Favone, zone humide de Saparelli,

zone humide du delta du Stabiaccio, zone humide du fond de Cala di Tizzano<sup>38</sup>.

► **Sardinia, Italy**<sup>39,40</sup>

An important part of the Italian side of the strait is classified under the Natura 2000 network (Figure 5). Nearly the whole National Park of La Maddalena as well as the extreme Western prong of Sardinia present interests regarding both species and habitats. The network participates to maintain or even to improve, the state of conservation of those species and habitats. These species of community interest are an integral part of the ecosystem of the island and thus, part of its identity.

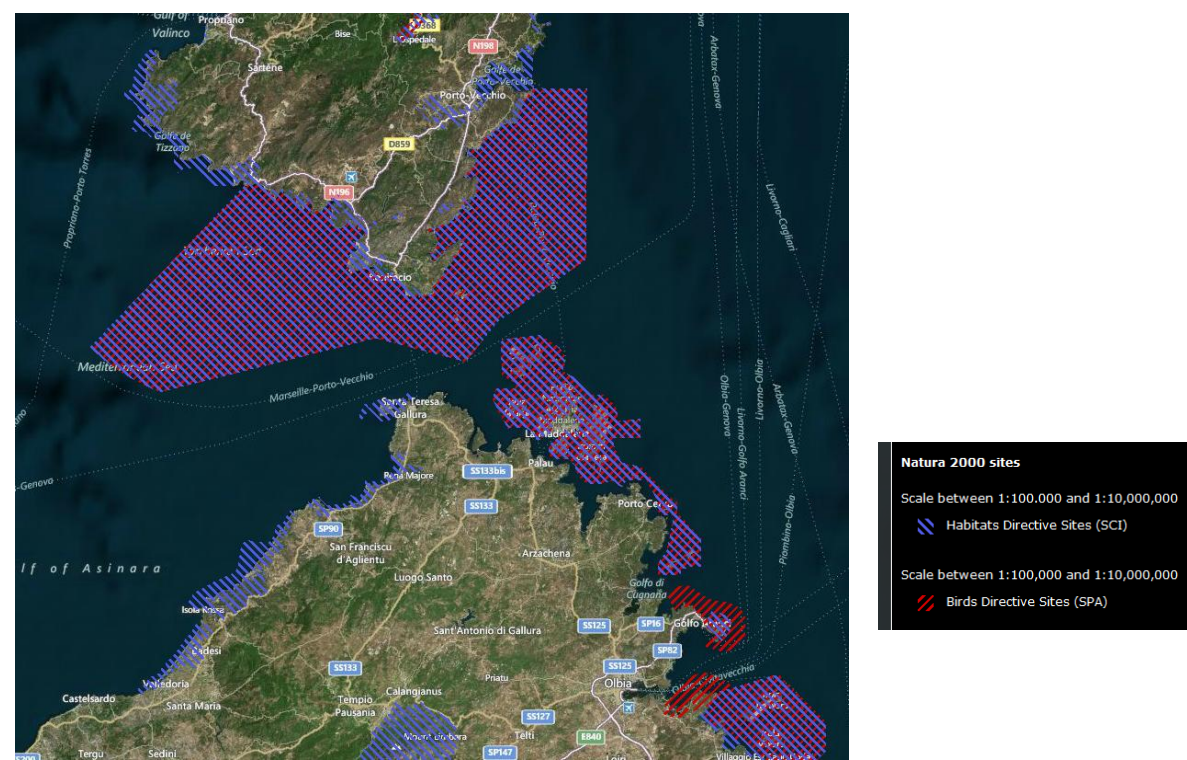


Figure 5: Natura 2000 network in the strait of Bonifacio<sup>41</sup>

The identified protected species and habitats on the Italian side of the strait are listed in Table 8:

<sup>38</sup> Inventaire National du Patrimoine Naturel: <http://inpn.mnhn.fr/>

<sup>39</sup> Source: Toolkit

<sup>40</sup> Parco nazionale Arcipelago La Maddalena, piano e regolamento del Parco. Quadro interpretativo e sintesi02, QISR.01-relazione generale, settembre 2010

<sup>41</sup> <http://natura2000.eea.europa.eu/#>

Table 8: Species protected under the Habitat or Birds Directive and/or Bern Convention<sup>42</sup>

The species that are common with Sardinia are colored in blue.

Protected species	Natura 2000 network and/or Bern Convention
<i>Colchicum corsicum</i>	Habitat directive, Bern Convention
<i>Limonium strictissimum</i>	Habitat directive
<i>Posidonia oceanica</i>	Habitat directive, Bern Convention
<i>Silene velutina</i>	Habitat directive, Bern Convention
<i>Algiroides fitzingerii</i>	Habitat directive
<i>Caretta caretta</i>	Habitat directive, Bern Convention
<i>Podarcis tiliguerta</i>	Habitat directive, Bern Convention
<i>Phyllodactylus europaeus</i>	Habitat directive, Bern Convention
<i>Testudo hermanni</i>	Habitat directive, Bern Convention
<i>Discoglossus sardus</i>	Habitat directive, Bern Convention
<i>Hyla sarda</i>	Habitat directive, Bern Convention
<i>Calonectris diomedea</i>	Birds directive, Bern Convention
<i>Ichthyophaga audouinii</i>	Birds directive, Bern Convention
<i>Phalacrocorax aristotelis desmarestii</i>	Birds directive, Bern Convention
<i>Sterna hirundo</i>	Birds directive, Bern Convention
<i>Aphanius fasciatus</i>	Habitat directive, Bern Convention
<i>Tursiops truncatus</i>	Habitat directive, Bern Convention
<i>Pinna nobilis</i>	Habitat directive
<i>Centranthus trinervis</i>	Habitat directive, Bern Convention
<i>Cymodocea nodosa</i>	Habitat directive, Bern Convention
<i>Ruscus aculeatus</i>	Habitat directive
<i>Spiranthes aestivalis</i>	Habitat directive, Bern Convention

<sup>42</sup>Source: Toolkit

<b><i>Cystoseiras spp.</i></b>	Bern Convention
<b><i>Lythophyllum byssoides</i></b>	Bern Convention
<b><i>Patella ferruginea</i></b>	Habitat directive, Bern Convention
<b><i>Centrostephanus longispinus</i></b>	Habitat directive, Bern Convention
<b><i>Corallium rubrum</i></b>	Habitat directive, Bern Convention
<b><i>Gerardia savaglia</i></b>	Bern Convention
<b><i>Homarus gammarus</i></b>	Bern Convention
<b><i>Maja squinado</i></b>	Bern Convention
<b><i>Palinurus elephas</i></b>	Bern Convention
<b><i>Hippocampus hippocampus</i></b>	Bern Convention
<b><i>Epinephelus marginatus</i></b>	Bern Convention
<b><i>Sciaena umbra</i></b>	Bern Convention
<b><i>Archaeolarcerta bedriagae</i></b>	Habitat directive, Bern Convention
<b><i>Dermochelys coriacea</i></b>	Habitat directive, Bern Convention
<b><i>Pandion haliaetus</i></b>	Bern Convention
<b><i>Hydrobates palagicus</i></b>	Birds directive, Bern Convention
<b><i>Balaenoptera physalus</i></b>	Habitat directive, Bern Convention
<b><i>Delphinus delphis</i></b>	Habitat directive, Bern Convention
<b><i>Globicephala melas</i></b>	Habitat directive, Bern Convention
<b><i>Grampus griseus</i></b>	Habitat directive, Bern Convention
<b><i>Physeter macrocephalus</i></b>	Habitat directive, Bern Convention
<b><i>Stenella coeruleoalba</i></b>	Habitat directive, Bern Convention

### 2.2.3 Migratory route

Because of their central location in the Mediterranean Sea, Corsica and Sardinia are a privileged stopover for migratory birds flying from sub-Saharan Africa. For some of them, the strait is also a place for reproduction.

Species of migratory maritime mammals are also present in the strait. This is the case for the sperm whale and the common bottlenose dolphin.<sup>43</sup>

Furthermore, the Pelagos sanctuary agreement protects habitats of cetaceans. Some of the concerned species are migratory. Figure 6 shows the area covered by the agreement, which includes the strait of Bonifacio. The signatory parties are Italy, France and the Principality of Monaco.



Figure 6: Area under the Pelagos sanctuary agreement

The covered species are directly impacted by the large amount of maritime traffic. Recorded threats include disturbance and stress, collision, chemical pollution, *etc.*<sup>44</sup>

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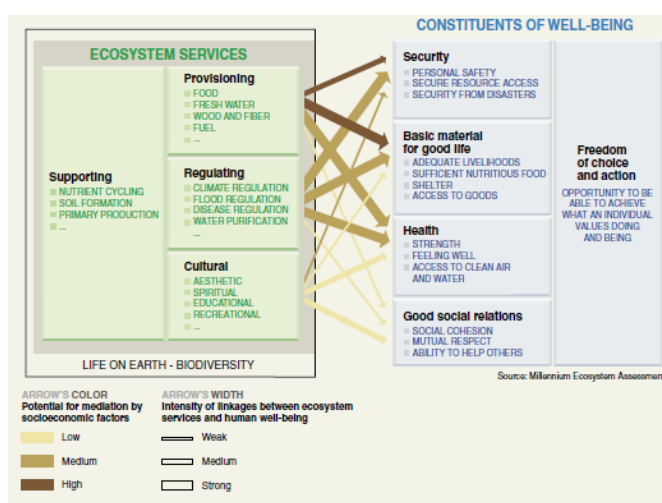
<sup>43</sup> Source : Toolkit

<sup>44</sup> <http://www.sanctuaire-pelagos.org/accord-pelagos/zone-de-competence-et-communes-riveraines>



## 2.3 Significance of ecosystem services to the local livelihood

An ecosystem is a dynamic complex of plant, animal, and micro-organism communities and the non living environment interacting as a functional unit. Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling.



The figure is taken from the MEA synthesis report, which depicts the strength of linkages between categories of ecosystem services and components of human well-being that are commonly encountered, and includes indications of the extent to which it is possible for socio-economic factors to mediate the linkage (for example, if it is possible to purchase a substitute for a degraded ecosystem service, then there is a high potential for mediation). The strength of the linkages and the potential for mediation differ in different ecosystems and regions. In addition to the influence of ecosystem services on human well-being depicted here, other factors—including other environmental factors as well as economic, social, technological, and cultural factors—influence human well-being, and ecosystems are in turn affected by changes in human well-being.

Both Corsica and Sardinia benefit from the presence of rich biodiversity. Section 1.4.1 details the economic weight of some sectors mentioned below. The economy of these areas mainly depends on the quality of the ecosystem services provided by biodiversity and the natural environment.

Globally, the quality of the natural environment is paramount for the tourism industry. Both islands are renowned for their biodiversity and the beauty of their landscapes. Figure 5 shows the importance of the Natura 2000 network in the region of the strait. The recommendations linked to this network (i.e. urbanisation and agriculture) could be insurance for the long-term endurance of touristic activity.

The transportation of tourists, and particularly through maritime means, is an important economic sector for the ports of the strait. The preservation of ecosystems is fundamental for this sector, since it is closely linked to the quality of nature and the beauty of the landscapes. In particular, nearly the whole territory of the National Park of La Maddalena is classified “site of community interest” in regards to the Habitats Directive. The fact that Sardinia and Corsica are reputed for the transparency of their waters and the preservation of nature is then certainly of major importance for the attractiveness of the territory. About 1.6 million nights are spent every year in the Sardinian part of the strait, and nearly one million in the Corsican one. Therefore, this is the premier role of the ecosystem services in regards to economic stability of the area.

Traditional fishing also relies on a healthy natural maritime environment. Water quality partially determines the availability of fish resources. In this aspect, an accident stemming from the dense maritime traffic in the strait would have long term negative effects. The management of the fish resource can also help preserve the quantity of the resource (through fishing quotas for example).



### 2.3.1 Significance to local economy and social life<sup>45;46</sup>

Nature plays a key role in the economic activity of the area and for social life.

#### ► Corsica, France

Tourism, which is the main economic activity in the area, is highly dependent on nature in general and on the diverse biodiversity and the quality of ecosystem services. Thus, the **diversified and preserved landscapes are the main elements of touristic appeal**. In particular, the high marine biodiversity makes the area a popular diving site with around 30,000 divers visiting every year.

In Corsica, fishery is mainly a traditional activity (around 195 boats for all Corsica, excluding boats of community fishery). It does not create high revenues but this activity is highly sensitive and significant from a social perspective.

#### ► Sardinia, Italy

As a matter of fact, three of the four foundations of the economy of the Archipelago of La Maddalena depend largely on the quality of the ecosystems.

Tourism: the preserved nature, the climate, and the colour of the waters largely determine the attractiveness of the islands. Marine activities such as diving and pleasure boats are also directly linked to the presence of a rich and delightful nature.

Fishing: the viability of the activity is determined by both the quality of the waters, and the management of the resource. In the Sardinian side of the strait, traditional fishing represents 7% of the GDP.

Agriculture is by far the most important sector for the local economy in Sardinia, since it represents nearly 50% of the GDP in the Sardinian side of the strait, but there is no such activity in the Archipelago of La Maddalena.

### 2.3.2 Cultural significance

#### ► Corsica, France

The Bonifacio strait is considered a cultural and/or natural heritage of outstanding universal value and therefore suitable for registration on the World Heritage List. Thus, Bonifacio strait is on the **French tentative list for UNESCO World Heritage** since 2002. A common initiative supported by Corsica and Sardinia is in progress to apply for inclusion in the UNESCO World Heritage list.

Furthermore, the quality and diversity of the natural heritage and landscape of the area generate many activities such as **discovery of the natural environment, sport practice and leisure activities** in nature. Finally, the ecosystem also provides important cultural services that contribute

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<sup>45</sup> [http://www.europarl.europa.eu/RegData/etudes/note/join/2013/513961/IPOL-REGI\\_NT\(2013\)513961\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/note/join/2013/513961/IPOL-REGI_NT(2013)513961_EN.pdf)

<sup>46</sup> Source : Toolkit

to the livelihoods of the local population in terms of enhancing their **spiritual and inspirational well-being**, providing recreational opportunities for tourism and recreational activities, aesthetic beauty and educational opportunities.

### ► Sardinia

Fishing is part of the local culture. As a matter of fact, no industrial fishing by local inhabitants is observed. In particular, tuna fishing in the Mediterranean sea dates back to centuries ago, and is still part of the nowadays practices; in this part of the strait only recreational tuna fishing still exists nowadays. The quality of the environment is the crucial for this activity, and any pollution of the marine resource would have impacts on this very old cultural practice.

On the island of Caprera (la Maddalena Archipelago) is located the last house of Garibaldi, considered as one of fathers of the Italian Nation. He lived from 1807 to 1882, and was a general and a politician. He has led and fought several determinant battles for the Italian unification. Nowadays, he is revered like a mythical hero. The presence of his last residence on one of the Maddalena Islands imbues the area with historic significance.<sup>47</sup>

## 2.4 Main biodiversity pressures and related impacts

### 2.4.1 Human activities

In the last 20 years, the strait has become one of the major commercial routes to Northern Italy. In 2013, more than **15% of the 3,000 vessels that go through the strait every year transported hazardous materials (165 000 tonnes)** **Erreur ! Signet non défini..** Three main characteristics make navigation in the area particularly sensitive:

The depth is irregular and presents several reefs;

Meteorological conditions are often difficult;

Several lanes intersect one another.

Because of those particular conditions of navigation, and because of the natural characteristics of the area, the strait of Bonifacio is designated as a **Particularly Sensitive Sea Area (PSSA)** by the International Maritime Organization since 2011<sup>48</sup>. Also, according to the French prefectural decree<sup>49</sup> dated 15 February 1993, french boats carrying hazardous materials are prohibited around the strait. The Italian government adopted the same legislation for the Italian boats thanks to Italian National Decree dated 26 February 1993. Furthermore, **since 1998**, vessels navigating in the strait must adhere to the **requirement of the recommended two-way route and have to ensure an appropriate monitoring of the route**<sup>50</sup>. If these measures are not sufficient to evacuate all

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<sup>47</sup> I beni culturali della Sardegna website. Available at:  
<http://www.sardegnaicultura.it/j/v/253?s=21632&v=2&c=2488&c1=2130&t=1>

<sup>48</sup> Resolution mepc.204(62) adopted on 15 July 2011: Designation of the strait of Bonifacio as a particularly sensitive sea area.

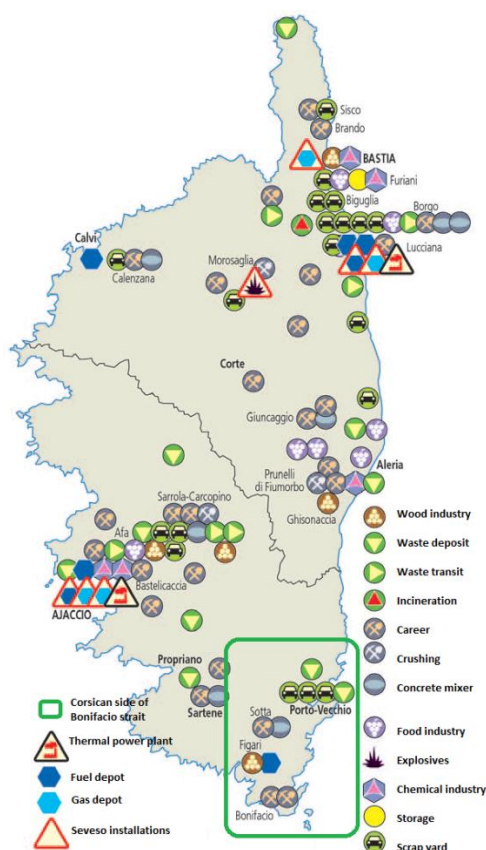
<sup>49</sup> Arrêté préfectoral n° 1/93 Interdisant la circulation dans les Bouches de Bonifacio de navires citernes transportant des Hydrocarbures et de navires transportant des Substances dangereuses ou toxiques.

<sup>50</sup> Arrêté préfectoral n° 84 / 98 réglementant la navigation dans les Bouches de Bonifacio en vue de prévenir les pollutions marines accidentelles.

sources of danger, it has at least served to limit the quantity of boats crossing the strait. A decrease has also been observed among the number of boats transporting hazardous materials **Erreur ! Signet non défini.**

Furthermore, along the years, human activities have left many traces that still affect the natural environment. The main influences are presented below.

### ► Corsica, France



**Industrial activities**, with the presence of **Classified for the Protection of the Environment (ICPE)** in the area (

Figure 7Erreur ! Source du renvoi introuvable.) represent a potential driver of pressures on biodiversity and on diverse environmental components (water, air, land), in the course of normal business, but with a greater impact in the case of accidents. Nonetheless, there are no direct industrial risks in South-Corsica. Some of these industrial installations are essential to human life in the area. For example, the insularity requires a minimum level of petroleum and liquefied gas deposits to be maintained in order to ensure the supply of energy (fuel for transportation and electricity generation, natural gas for domestic use) and to sustain economic activity in all circumstances. The main industrial activities close to the strait are scrap yard and waste deposit installations in Porto-Vecchio, careers in Bonifacio and wood industry operations and an oil depot in Figari.

Figure 7: Installation Classified for the Protection of the Environment<sup>51</sup>

There is a risk of **hazardous materials transportation** resulting in a spill. In the strait, this risk is high. The Bonifacio strait is located on a route connecting major commercial ports of the region. The density of international maritime traffic is also very high and is the main source of marine pollution (hydrocarbons, particularly from degassing procedures, containment of bunker vessels during accidents or arrival of macro-waste). Illegal degassing can occur, in which case it is difficult

<sup>51</sup> Direction Régionale de l'Environnement, de l'Aménagement et du Logement de la Corse (DREAL Corse). Profil environnemental de la Corse 2012. Les risques [http://www.corse.developpement-durable.gouv.fr/IMG/pdf/Profil\\_corse2013\\_v11MD\\_p\\_086-134.pdf](http://www.corse.developpement-durable.gouv.fr/IMG/pdf/Profil_corse2013_v11MD_p_086-134.pdf)

to control or avoid such practices. The main ports of the island receive shipments of **oil and gas to fuel thermal power plants**. The traffic between Corsica and Sardinia has a lower impact on biodiversity compared to the international traffic, thanks to its limited maritime connection. An increase of maritime traffic for tourism during the seasonal high of the summer temporarily increases this risk.

**Tourism and leisure activities** in the areas along the coast may represent pressures on biodiversity and disturb natural balance due to high numbers of visitors. It might induce increased **urbanization** and thus a **standardization of the landscapes**. **Waste generation and GHG emission** due to travel increase with visitor numbers. Corsica is a popular area for maritime leisure activities for its seascapes and marine biodiversity. In summer, on a single day nearly 1,500 boats can be present in the French Nature Reserve<sup>52</sup>. These leisure activities include such as yachting, boat trip, diving, etc. **Pleasure boating** is considered to be a perturbation factor for biological communities, mainly due to the mechanical impact of anchors. For instance, Posidonia meadows suffer from anchorage. Most of the touristic pressures are **limited to a few months during the year**, especially during the summer season. Only 12% of the boats making a call in Corsica are from Corsican ports<sup>53</sup>. The others are mainly from France and Italy.

#### ► Sardinia, Italy<sup>54</sup>

First, **military basements** in the National Park of La Maddalena (**74 military structures are built**) have contributed to the spread of artificial land cover leading to several negative impacts, such as the limitation of biodiversity or an increase in erosion.

Furthermore, the **industrial activities** that took place on the island over the last century left a heavy mark on both the ground and in the water: consistent traces of heavy metals and hazardous materials (asbestos) are found to this day. Human activities also have an impact on the balance of water resources, especially on the secondary islands. In particular, the capitation of the resource reduces its availability for the natural environment. The observed phenomenon has persisted over the long-term.

General human activities have resulted in an alteration of vegetal composition of ground cover has occurred over the last decades, leading to **arid conditions and disturbance of the natural equilibrium**. The impacts are particularly strong on the sensitive ecological niches present in the area.

Tourism also brings direct negative impacts. Residential and camping areas constitute particularly dense zones that require specific adaptations. This activity is then susceptible to negatively affect the environment through the **tourist conduct**, as well as through **physical modifications of the space**. For example, in periods of dense tourism, automotive traffic and unauthorised parking are consistent sources of environmental degradation.

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<sup>52</sup> Plan de gestion de La Réserve Naturelle des Bouches de Bonifacio 2007-2011

<sup>53</sup> Chambre de Commerce et d'Industrie d'Ajaccio et de la Corse du Sud, 2008

<sup>54</sup> Parco nazionale Arcipelago La Maddalena, piano e regolamento del Parco. Quadro interpretativo e sintesi02, QISR.01-relazione generale, settembre 2010

Marine touristic activities also have several negative impacts on the natural environment. Uncontrolled anchorages in periods of high frequentation destroy the seabed and contribute to the diffusion of invasive species. Navigation can also provoke noise and hydrocarbon pollution, which are likely to disturb local species.<sup>55</sup>

Agriculture is the last significant human pressure on the natural environment. In particular, excessive use of pesticides and fertilizers could negatively impact local biodiversity. This would reduce the quality of nature, which is of major importance for other sectors of the economy (tourism in particular).

## 2.4.2 Natural pressures

### ► Corsica, France

The Corsican side of the strait is exposed to several natural pressures, which could affect biodiversity. The most well-known pressures **are flooding, forest fires, land slides, littoral erosion and marine submersion**<sup>56</sup>.

All the Corsican coasts are subject to an erosion hazard of which the distribution varies depending on the geomorphological and geological context and exposure to hydrodynamic conditions: potentially greater hazards on the limestone cliffs (limestone cliffs of Bonifacio) and sand coasts.

However, biodiversity loss risk related to the presence of invasive species remains a significant problem. For the marine part, the **invasive specie** *Caulerpa racemosa* represents one of the main problems to preserve marine biodiversity. It also the case for the terrestrial invasive species, *Carpobrotus edulis* and *Phytolacca Americana*, present in many Corsican coastal areas. Those species are subject to management measures (e.g. pulling out...).

### ► Sardinia, Italy

One of the main pressures exerted on biodiversity and the natural environment is the presence of invasive species. Allochthonous species are present in the area. Not all of them are invasive, but since they create competition with endemic species for available resources, they represent a threat to the natural eco-systems. Table 9 presents a list of the observed Allochthonous species.

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<sup>55</sup> Profil environnemental régional de la Corse, 2012

<sup>56</sup> Préfecture de Corse (2012), Profil environnemental régional de la Corse

Table 9: Allochthonous species in the Italian side of the strait

Species	Toponyme	Island
<b><i>Trachemysscripta</i></b>	Invasivo Ferranti	Caprera
<b><i>Trachemysscripta</i></b>	InvasoS.Stefano	Caprera
<b><i>Phasianuscolchicus</i></b>	Laguna	S.Maria
<b><i>Cacyreusmarshalli</i></b>	VillaggioPiras	La Maddalena
<b><i>Cinghiale_ ibridi</i></b>	Guardia del Turco-Fangotto-Ricciolina	La Maddalena
<b><i>Cinghiale_ ibridi</i></b>	Trinità-VillaggioSeis	La Maddalena
<b><i>Cinghiale_ ibridi</i></b>	Piana della Marsala-Compendio Garibaldi	Caprera
<b><i>Cinghiale_ ibridi</i></b>	Zona Club Mediterranee	Caprera
<b><i>Cinghiale_ ibridi</i></b>	Borgo di Stagnali-fosso S.Stefano	Caprera
<b><i>Cinghiale_ ibridi</i></b>	Cala Ferrigno-Punta banditi-ala Granara	Spargi
<b><i>Gambusiaholbrooki</i></b>	InvasoS.Stefano	Caprera
<b><i>Gambusiaholbrooki</i></b>	Invaso Ferranti	Caprera
<b><i>Gambusiaholbrooki</i></b>	CalaGaribaidl	Caprera

The black rat is also a non-endemic species that has been introduced into the area by humans. It is a predator of local species. Among the flora, the *Carpobrotus acinaciformis* is an allochthonous and invasive species.

## 3 Responses for an integrated management of biodiversity and natural environment

### 3.1 Policies

As previously presented in this report, the Habitats and Birds directives are widely implemented in the area of the strait. Aside from them, other key EU legislations the strait has to comply with include the Marine Strategy Framework Directive.

#### 3.1.1 Sustainable infrastructure and transport

##### **Legislative framework for the prohibition for boats transporting hazardous material to cross the strait**

In order to limit the risk of pollution through hazardous material, France and Italy have both taken measures to forbid the circulation of commercial boats transporting hydrocarbons and dangerous or hazardous materials. The transposition of this agreement in the French legislation is the decree n°1/93 (arrête préfectoral n°1/93) published the 15 February 1993. Italy published the decree of the 26 February 1993 of the Ministry of Merchant Marine, for the national application of this agreement.<sup>57</sup>

#### 3.1.2 Sustainable marine activities

In Corsica, several legal actions were taken to prohibit or restrict anchorage or diving and fisheries activities in protected areas. There are two levels of protection:

- Green areas around the Island: fishery is allowed (but not underwater fishing), in order to preserve traditional fishery around the Island; while preserving biodiversity;
- Red areas (e.g. Sanctuary): no activities are allowed.

Where Posidonia meadows are located, the law prohibits anchorage. Other natural areas along the coasts are not allowed for landing, in order to preserve fauna and flora.

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<sup>57</sup> Gazzeta ufficiale della repubblica italiana. Available at: [http://www.gazzettaufficiale.it/atto/serie\\_generale/caricaDettaglioAtto/originario?atto.dataPubblicazioneGazzetta=1993-03-02&atto.codiceRedazionale=093A1397&elenco30giorni=false](http://www.gazzettaufficiale.it/atto/serie_generale/caricaDettaglioAtto/originario?atto.dataPubblicazioneGazzetta=1993-03-02&atto.codiceRedazionale=093A1397&elenco30giorni=false)

In La Maddalena Archipelago similar activities have been taken; mooring buoys were initially designed to preserve benthic habitats in sheltered bays and previously anchoring locations, so they were initially prepared for boating and resting. Since 2010 the program has been implemented including diving sites and a total of more than 180 mooring buoys are presently displaced in La Maddalena Archipelago.

The complexity of La Maddalena archipelago in terms of marine traffic, number of islands and subsequent replication of sheltered bays and sensitive bottom habitats made the design of mooring sites little more complicate than in Corsica, resulting in a larger number of locations involved.

## 3.2 Initiatives and actions

### 3.2.1 Cross-border initiatives and actions

#### 3.2.1.1 *Integrated management of biodiversity and natural environment*

##### ► Joint management plan (EGTC-PMIBB)

**The creation of the European Grouping of Territorial Cooperation (EGTC) - International Marine Park of Bonifacio (PMIBB)** was formalised on December 7, 2012. An original system proposed by the European Union, it allows for even closer cooperation between the two countries, namely France and Italy. An exchange and reflection process between the two protected maritime areas (*Reserve Naturelle des Bouches de Bonifacio* and *il Parco Nazionale dell'Acipelago di La Maddalena*) permits the development of a **joint management plan**.

The EGTC - PMIBB was the final output of a three years project (PMIBB) funded by the OP Italy – France Maritime 2007 2013. The cooperation of the two partners (OEC and NP of La Maddalena archipelago) aimed at:

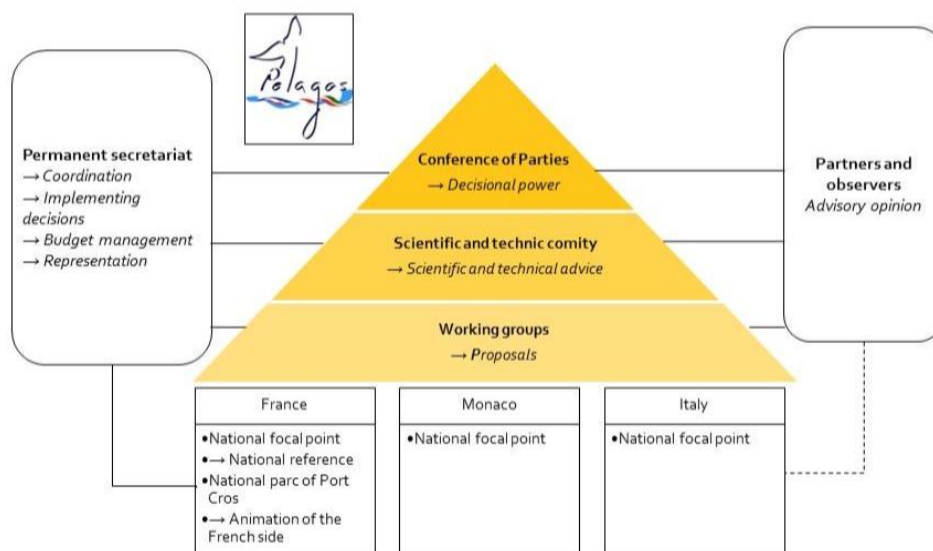
- Creating a joint data base (species, habitats, taxon inventories);
- Establishing of an international scientific committee (pre-scientific committee of the EGTC-PMIBB);
- Defining the outlines of the EGTC-PMIBB management Plan;
- Drafting the first orientations of the common management system.

This joint management plan **allows to develop efficient actions for tackling important issues such as fishery, navigation, tourist flows, etc.**

The actions are either implemented jointly between both countries or initiated at the same time in both countries with the same methodology. These actions concerned for example, studies on the evolution of biodiversity in control zones, transboundary coastguards, the trademark “PMIBB”, a common energy plan based on renewable resource use, *etc.*

##### ► The Pelagos Sanctuary agreement





**Figure 8: Organisation of the Pelagos sanctuary Agreement**

The Pelagos Sanctuary Agreement was signed by France, Italy and the Principality of Monaco on 25 November 1999. It aims at protecting the marine mammals that frequent the sanctuary, through the creation of harmonized actions between the three actors. Since 2002, the Pelagos Sanctuary is on the list of SPAMIs (Specially Protected Areas of Mediterranean Importance).

The Pelagos Sanctuary has been governed under a common management plan since September 2004. It ensures effective supervision of the area with a sustainable objective in mind. The management plan includes the reflections, the practices and measures of each party in order to comprehensively manage the Sanctuary area. Furthermore, the Sanctuary coordinates numerous projects ranging from scientific research to public awareness through consultation with local communities.

The French part of the agreement launched many scientific studies. The results from this research meet the objectives of the management plan of the Pelagos Sanctuary, namely:

- Improve knowledge of anthropogenic and natural disturbance and mortality of marine mammals;
- Improve knowledge on identifying, monitoring and seasonality of marine mammal populations;
- Improve knowledge on the behaviour of marine mammals, interactions with human activities and options to reduce the negative impacts;
- On the issue of human activities management, the first research program deepened knowledge about:

- Threats to cetaceans from shipping and assessment of the potential impacts;
- Impacts related to nautical tourism and recreational whale watching, developing a charter of good conduct;
- The threat of fishing nets to cetaceans<sup>58</sup>.

Furthermore within the framework of the Pelagos Sanctuary, **the REPCET system** was developed. It is **a collaborative software system dedicated to navigation**. Its aim is to limit the risks of collision between large cetaceans and large vessels. The system is based on the transmission and the centralisation of every sighting of large cetaceans by equipped vessels<sup>59</sup>.

#### ► **PIM (Petites Îles de Méditerranée) initiative for Mediterranean Small Islands**

The islands and islets in the Mediterranean Sea, living laboratories of plant and animal life, shelter a large number of species, and provide a great resource for the protection of the Mediterranean biodiversity. In these isolated microcosms everything is amplified: tourist pressure, climate change, pollutions, and invasive species among others. The slightest disturbance can unbalance the natural equilibrium of these highly-structured ecosystems that have been established over many centuries.

The Coastal Protection Agency (Conservatoire du Littoral), by coordinating the Mediterranean Small Islands Initiative, contributes to the protection of these microcosms **by setting-up practical measures for conservation management**, and **by facilitating the exchange of information and experience between the site managers (administrators) and experts** from across the Mediterranean Basin.

The PIM Initiative is piloted and coordinated by the Conservatoire du littoral. It exists with the support of the French Global Fund for Environment, the French Water Agency for Rhône Mediterranean Sea and Corsica, and the City of Marseille. Since 2005, the PIM Initiative has **developed numerous collaborations with stakeholders in the protection of the sea and the coast across the whole Mediterranean basin** (national and international institutions, communities, universities, NGOs, independent experts, researchers, managers, naturalists, rangers, architects, *etc.*)<sup>60</sup>.

#### ► **The parks' trans-border network (RETRAPARC)<sup>61</sup>**

It aims at creating a **transboundary network of natural parks between Corsica and Sardinia for “an integrated management of the areas, a sustainable economy, and a better competitiveness”**. The actors involved are:

- The Regional Natural Park of Corsica (Fr)

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<sup>58</sup>Pelagos sanctuary agreement: <http://www.sanctuaire-pelagos.org>

<sup>59</sup>Repcet system: <http://www.repcet.com/accueil>

<sup>60</sup> Initiative pour les petites îles de Méditerranée : <http://www.initiative-pim.org/>

<sup>61</sup> <http://www.espaces-transfrontaliers.org/ressources/projets/projects/project/show/retraparc-reseau-transfrontalier-des-parcs/>

- The Corsican Environment Office (Fr)
- The Province of Sassari (It)
- The National Park of the archipelago of La Maddalena (It)
- The National Park of Asinara (It)
- The Park of Porto Conte (It)

The objectives of the project are turned toward the capitalisation of knowledge and the implementation of good practices. The cost of the project is of nearly 2.4 million euros and was funded by the O.P. IT FR maritime and FESR.

#### ► **Caulerpes Network (RéseauCaulerpes)**

The Caulerpes Network (Réseau Caulerpes) was created by the Corsican Environment Office in 2003. The network was created in response to the development of two invasive marine algae, *Caulerpa taxifolia* and *Caulerpa racemosa*, which have a negative impact on biodiversity. The role of this network is to ensure the highest level of monitoring for the most exposed and vulnerable sites at regional level.

It has recently been extended to the *Arcipelago di La Maddalena* in the context of the EGTC-PMIBB.

### **3.2.1.2 Developing knowledge and research**

#### ► **Projet Ampamed (2006 – 2008)**

The project relied in the role of Marine Protected Areas (MPAs) for the sustainable development of local economic activities like artisanal fishing, tourism and diving. It was part of the program Interreg IIIB Meddoc.

The main goal was using three Mediterranean MPAs, placed in three different regions (Corsica, Sardinia and Murcia) and shows the differences and the similarities in management resources and sustainable development.<sup>62</sup>

Multidisciplinary studies have been conducted to assess the impact of recreational boating on the coastal marine ecosystem. The studies conducted in the Nature Reserve of Bonifacio strait (Corsica) and the MPA Penisolas del Sinis – Isola di Mal di Ventre (Sardinia) have helped to:

- Identify and analyse the frequency of pleasure boats in these two reserves, in order to evaluate the characteristics of vessels and identify the most frequented sites anchors;
- Identify and characterise potential sensitive habitats and population impacted by recreational boating;
- Estimate the direct impact of anchors on species *Posidonia oceanica* and *Pinna nobilis*<sup>63</sup>.

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<sup>62</sup> Cabinet EVEMar l'impact de la plaisance sur les biocénoses benthiques. Available at : <http://www.corse.developpement-durable.gouv.fr/IMG/pdf/BURON.pdf>

Actions were implemented following the INTERREG project to increase protection of the natural environment along the Corsican coast and to limit boat traffic. Traffic through the strait has decreased by 30%.

► **Development of a coordinated tool for recreational diving in Bonifacio strait<sup>64</sup>**

The significant development of diving activity in Bonifacio strait requires the managers to take measures that will **safeguard both biodiversity and habitats of the diving sites as well as the sustainability of this activity**. The proposed measure develops on some of the key principles that formed the basis for the *Parco Nazionale di La Maddalena* and the *Réserve Naturelle des Bouches de Bonifacio*.

A three-phase management strategy of diving centres was implemented:

- **Short-term objective:** Establishment of a charter between the scuba diving centres and the both MPAs in the Strait of Bonifacio. This document is a set of rules that limits activities that could lead to disruptions by scuba diving centres, and they are essential to create public awareness. This agreement was made in the context of the implementation of the international marine park between Sardinia and Corsica.
- **Medium-term objective:** Implementation of mooring buoys at the site *Pelu* (Island Lavezzi), training the staff and managers in Corsican diving centres who have signed the agreement.
- **Long-term objective:** Placement of mooring buoys at different diving spots of RNBB. These sites are identified in the area around the Lavezzi island, as well as in the area around the Cerbicale Islands. Another objective is training for staff and managers of Sardinian structures, who have signed the charter agreement. Provision of educational materials for the clubs.
- Various regulatory principles were adopted:
- Delimiting the areas of immersion (PIP) (Punti di Immersione Protetta : Points of Protected Diving)
- Setting strict parameters of numerical nature (times, numbers of dives permitted, number of authorized operators etc.)
- Imposing behaviours in line with the national code of conduct for recreational activities

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<sup>63</sup> Cancemi – Impact des ancrages sur les herbiers à Posidoniaoceanica et sur les populations de grande nacre (PinnaNobilis). Available at : [http://www.corse.developpement-durable.gouv.fr/IMG/pdf/Cancemi\\_et\\_al\\_\\_Impact\\_ancrage.pdf](http://www.corse.developpement-durable.gouv.fr/IMG/pdf/Cancemi_et_al__Impact_ancrage.pdf)

<sup>64</sup> NOSTRA – Workshop n°4 Coast and hinterland economy: Development of a coordinated tool for recreational diving in Bonifacio strait

- Entrusting operators with specific responsibilities in the management of diving sessions, with goals of generating a timely and reliable harmonization of their behaviours.

► **Joint management of the Bonifacio strait by EGTC-PMIBB for boating and maritime tourism<sup>65</sup>**

In the context of maritime tourism, which is an important issue for biodiversity in the Bonifacio strait, EGTC-PMIBB is developing a common coordinated cross-strait management of boating with the following objectives:

- Mitigate the impact of anchoring activities on coastal benthic habitats;
- Establish a transboundary surveillance unit working throughout the whole area of the strait.

The major measures are to:

- Avoid anchoring in sensitive areas;
- Establish restricted and monitored areas for anchoring;
- Use mooring buoys.

The major results are:

- Better health of sensitive benthic habitats maintained on a large scale;
- Better protection from erosion of touristic sandy beaches;
- Contrast to invasive alien benthic species.

### 3.2.2 At one-side level

#### 3.2.2.1 French initiatives and actions

► **Corsican Environment Observatory<sup>66</sup>**

The Observatory is a network for information exchange and evaluation, based on a dynamic State/Region partnership encompassing all local partner actors. The main actors are the Territorial Collectivity of Corsica (Corsican Environment Office), State (DIREN – Regional Direction of Environment) and all public and private institutions related to the environment.

Besides optimising and coordinating the work of collecting data and thematic **research**, one of its goals is **to provide structured, concise and reliable environmental information to decision makers**. The project is notable for its transversal approach:

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<sup>65</sup>NOSTRA Documents - Workshop n°2 Tourism and Cultural Heritage : Joint management of Bonifacio straits by EGTC-PMIBB for boating and maritime tourism

<sup>66</sup>Observatoire des Territoires Numériques: <http://oten.fr/?Observatoire-de-l-Environnement-de>  
Observatoire de l'environnement corse: <http://www.oec.fr>

- In its objectives, by providing substantive support to the decision makers who can find summarized information on all environment related issues;
- In its operation, through systematic co-organisation;
- In its method, by coordinating four working groups bringing together stakeholders and experts around themes strategic to the future of Corsica;
- In its tools, through the development of knowledge bases and common and shared resources.

#### ► Regional scheme of the Green and Blue Belt Network (SRCE – TVB)

The Regional Council of Corse is setting up the Green and Blue Belt Network initiative, with a strong structural ambition: to stop the loss of biodiversity by preserving and restoring networks of natural environments and their evolution, allowing species to interact and circulate. The preservation of biodiversity is also taken into account in planning decisions, particularly in inter-territorial (intra-regional) planning and local urban planning schemes. Furthermore, the Region accompanies territories in their conducting of feasibility studies and the implementation of their projects.

The national Green and Blue Belt committee was installed in 2011.

#### ► Life LINDA<sup>67</sup>

The program LINDA (starting in November 2003 and ending in May 2007) strived to maintain the bottlenose dolphin population of Corsica in a favorable conservation status and **ensured harmonious coexistence between economic activities and the species**. In particular, it served as a link between the main actors involved in environmental management (socio-economic representatives, local residents, tourists and boaters) with an **implementation process of sustainable practices for fishing, boating and whale-watching**.

To achieve these objectives, the project LINDA proposed:

- An implementation of operational measures to reduce conflicts between bottlenose dolphins and fishermen;
- Actions to promote sustainable modes of management activities related to marine tourism (charter for sustainable boating, whale watching surveillance, code of conduct, *etc.*);
- Strong awareness of the public (creation of a toolkit, discovery classes for school groups, television documentaries, panel discussions, *etc.*);
- Knowledge acquisition or monitoring activities (identification and monitoring of populations of dolphins, measuring noise pollution, producing a management plan for the species, *etc.*).

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<sup>67</sup>Life Linda, un projet pour protéger les Grands Dauphins: <http://www.lifelinda.org/>

Financed by the European Commission and the Regional Direction of Environment, the program gathered among others, the Corsican Environment Office and Nature Reserve of Bonifacio strait.

The project Life Linda observed 225 Bottlenose dolphins, including 117 dolphins that are photo-identified and recognisable. Moreover, major communication campaigns were conducted. An educational kit was used to support many presentations during school visits or other public events. More than 10,000 people were exposed to the issue, with the majority of them being children. Over 14,000 boaters were informed by eco-volunteers about practices to adopt in the presence of cetaceans. The production and distribution of a 26-minute movie, twenty lectures and a website completed the communication efforts.

#### ► **Water sports Charter in Corsica**<sup>68</sup>

This Charter is the result of a **voluntary process initiated by water sports associations and professionals** (diving clubs, sailing, rowing, boating/fishing associations, boaters/rental, jet skiing companies, *etc.*) with two objectives:

- Show their commitment to the marine environment and their constant desire to contribute to its protection;
- Organise themselves to collectively participate in the institutional dialogue on the management of maritime areas.

The structures will endeavour **to carry out their activities in promoting their coexistence with other users of the marine environment**, whether these activities are professional or amateur. The structures undertake to ensure the dispersion of their visits to meet the ecological tolerance of the busiest sites at sea and on shore. To contribute to the social sense of history and the Corsican culture, signatory structures use privileged place names in Corsican language and the local names of species.

### **3.2.2.2 Italian initiatives and actions**

#### ► **Sassari 20 20 20**<sup>69</sup>

Sassari 20 20 20 aims to activate, on the North-western territory of Sardinia, a series of measures supporting the European Agreement on the fight against climate change and the Europe 2020 strategy. Through a concerted strategy and a series of measures and pilot actions, the Province of Sassari will seek to put the needs and opportunities of their territory in “sustainability” and “green economy” strategies into context, transforming the cost of sustainability into socio-economic benefits.

The planned projects are as follows:

- Pledges made by mayors;
- Green community;

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<sup>68</sup> Charte des loisirs nautiques en Corse

<sup>69</sup> Sassari 20 20 20, provincia di Sassari. Available at:  
[http://www.provincia.sassari.it/resources/cms/documents/dg\\_219\\_2010\\_all.pdf](http://www.provincia.sassari.it/resources/cms/documents/dg_219_2010_all.pdf)

- Greene economy incubator for young entrepreneurs;
- Green houses;
- Sustainable schools;
- Control of heating installations;
- Green business portal.

► ***Supporting the development of in-land tourism***

The Park of La Maddalena and the Province of Sassari are working to promote the development of inland tourism in order to decrease the pressures of tourism on coastal and marine areas. Tourism focused on gastronomy and culture would represent an opportunity for the protection of biodiversity. The development of existing hiking trails would be an idea.

► ***Coastal Action Group***

With the funding support of the Sardinia Region, the Coastal Action Group (Gruppo di azione costiera), was created to support fishermen and develop sustainable practices. The lead partner of Coastal Action Group is Province of Sassari for the enhancement of the fisheriy sector through targeted EU funds.

The National Park of La Maddalena Archipelago and the City of La Maddalena joined the Coastal Action Group (2010) which had as its primary purpose to let the National Park submitting the EFF call (European Fisheries Fund) and would be useful for managing of the fishery sector in a coordinated manner between fishing communities.

For the Development Plan of the GAC, also, a co-financing of public and private members is provided, in fact, the Province of Sassari and the National Park of La Maddalena contribute with public co-financing.



## 4 Governance

### 4.1 Analysing governance

The governance of environmental issues in the strait is shared by several actors, on transboundary, national, and local levels. Each country has developed its own structure and tools for management of the resources, as well as organising international cooperation in order to build coherent strategies covering the entire strait.

The table below presents the actors involved in the governance of environment in the strait of Bonifacio.

**Table 10: Actors involved in the management of the strait**

	Designation
FRENCH ACTORS	Ministère de l'écologie, du développement durable et de l'énergie
	Préfecture Maritime de la Méditerranée
	Direction Régionale de l'Environnement, de l'Aménagement et du Logement Corse (DREAL de Corse)
	Direction Interrégionale de la Mer de Méditerranée (DIRM délégation Corse)
	Office de l'Environnement de la Corse (OEC), gestionnaire de la Réserve Naturelle des Bouches de Bonifacio, de la Réserve Naturelle des Tre Padule de Suartone, de la Réserve Naturelle des Cerbicale et des acquisitions foncières du Conservatoire du littoral.
	Agence de l'eau Rhône Méditerranée Corse
	Conservatoire du littoral de la Corse
	Ports / autorités portuaires
	Local authorities
	NGOs (WWF, Le Poulpe, Surfrider Foundation, LPO, etc.)
ITALIAN ACTORS	Ministero dell'Ambiente e della Tutela del Territorio e del Mare
	Parco Nazionale Arcipelago di La Maddalena

Designation	
	Agenzia Regionale per la protezione dell'Ambiente Sardegna
	Ministero dei Beni e delle Attività Culturali, Ministero della Difesa, Ministero dell'Interno
	Agenzia del Demanio -
	Corpo Foresatale dello Stato
	Provincia di Sassari
	Provincia di Olbia-Tempio
	Autorità Portuale del nord Sardegna
	La Maddalena Port Authority
	Municipality of La Maddalena, Municipality of Palau, Municipality of Santa Teresa, Municipality of Arzachena
	Environmental NGOs: Associazione G.Cesaraccio; Associazione Italia Nostra; Lega Ambiente (Goletta Verde); WWF; Lipu; Associazione Marevivo
	Associazione Piloti Marittimi Porto di Olbia
	Private companies: shipping companies: Saremar, Decolmar, EneRmaR; scuba diving companies; marine tourist tours companies; whale watching companies; sailing schools; ports and harbours
TRANSBOUNDARY ACTORS	European Grouping of Territorial Cooperation (EGTC- PMIBB)

At the national level, in France and in Italy, the environmental ministry endorses all actions, controlling everything from the decision making process to communication with stakeholders. In France, the Ministry works with the French maritime authority for the Mediterranean (Préfecture Maritime de Méditerranée). The French maritime authority for the Mediterranean is responsible for ensuring marine security. Among other responsibilities, it is in charge of taking actions when there is a boat collision in order to limit the impact on coastal areas. The Parco Nazionale dell'Arcipelago di La Maddalena in the Italian side of the strait is under the responsibility of the Italian Ministry. It has roles in: Decision-making, influencing, advisory/consulting, managing, research, communicating and raising awareness, and controlling and monitoring.

The regional agencies for the protection of the environment also play major roles. Except from the management, control and monitoring and researches, they have the same responsibility as the ministry at regional level; it is a kind of local *technical arm* of the Ministry of the Environment and its close knowledge of the area is particularly precious.

In Corsica, the Corsican Environment Office (OEC) is in charge on environmental issues for the Corsica Region (Collectivité Territoriale de Corse). Biodiversity is considered as being the core of any activities and plans.

In the case of the Bonifacio Strait, OEC (manager of the Marine Protected Areas of the Extreme South of Corsica) and PNALM are strongly involved in the management of biodiversity and natural environment.

Institutional actors that donot directly deal with environmental issues are also involved in the process, since their activities can affect the management of natural resources. This is the case of the Ministry of Defence in particular, whose infrastructure has direct impacts on nature, or also of the Ministry of Cultural Heritage and Activities and Tourism since the natural environment comprises a good part of the local culture. For this reason their opinion weighs heavily in the decision making process. They can influence decisions and actions, and provide consultancy.

Other actors have a role in the management of the areas, even if they are not directly involved in biodiversity and natural environment they may influence also decisions and actions (e.g. Agenzia del Demanio, Corpo Foresatale dello Stato).

Local authorities are key players. Generally speaking on both the French and Italian sides of the strait, they are in charge of local planning, urban planning and waste management. In the case of Sardinia, local authorities are not in favour limiting tourism on the account of challenges to biodiversity and natural environment.

Non-governmental actors also take part of the decision-making process, at different levels. Local inhabitants are directly concerned by any decision taken, and thus can influence the decisions. Conservation NGOs (for instance, in the Italian side: Associazione G.Cesaraccio; Associazione Italia Nostra; Lega Ambiente (Goletta Verde); WWF; Lipu; Associazione Marevivo) have a role in evaluating and monitoring the state of the natural environment and biodiversity and in advisory; they influence decisions ; they play a role in raising awareness, communicating, *etc.* Finally, private actors such as shipping companies can participate in resource management. They are one of the major users of natural marine resources.

Some of these actors work together on specific programs or in networks (such as the RETRAPARK network, Caulerpes Network).

## 4.2 Level of cross-border cooperation

Collaboration between the two sides of the Bonifacio Strait started many years ago. Both sides were willing to work together to ensure consistency in their respective and common actions. The cooperation started with marine security-related issues and the ambition to increase the preservation of marine areas in a context of inexistence of a legislative framework that would allow the creation of a marine and cross-border protected area. In 1993, the franco-italian protocol which defines the modalities to implement an international marine Park was adopted. To continue addressing the issues of biodiversity preservation and marine security, both sides wanted to create a formal grouping to address such challenges at a higher level than the local one. Nonetheless, one difficulty for making decisions and implementing actions was the different roles and powers of the French and Italian entities involved.

The European Grouping of Territorial cooperation (EGTC), called “Parc Marin International des Bouches de Bonifacio (EGTC-PMIBB)” was founded in December 7<sup>th</sup> 2012 after the creation of a legal basis by the European Commission, a long process of discussion between the partners from each side of the strait, and with the support of scientific researchers. This entity appeared to be the most consistent tool to establish a cross-border grouping. The preparatory work has set out guidelines and strategic objectives for actions. The priority challenges being: marine security, integrated management and regulation of biodiversity. The coherence of policies launched by each side of the strait is now ensured by this structure. Continuity between previous projects and current work in progress is ensured thanks to the several responsibilities the EGTC endorses:

- Decision making
- Influencing
- Managing protected areas
- Advisory / consulting
- Communication
- Control and evaluation
- Research
- Knowledge sharing

The EGTC-PMIBB aims to carry out its mission by establishing partnerships with local stakeholders (local authorities in particular) in order to implement policies and actions for protecting and preserving biodiversity in consistency with local actions and local actors (fisheries, tourism activities, diving centers, ports, *etc.*). Creating the framework to encourage actors from both sides to work together is not an easy task. For instance, partnerships made with local actors in one side of the strait (*e.g.* the partnership made with traditional fishermen in Corsica) could be presented and shared with the actors on the other side so as to replicate the initiative.

The objective of the grouping is to harmonise and coordinate actions taken on each side of the strait. If there is a need for a specific local action, the grouping will not be the most appropriate structure to support and implement that action.

Apart from this formal entity, local actors continue working together in the context of European programs and formal networks (*e.g.* RETRAPARK network, Caulerpes Network).

# 5 Conclusions of the analysis

## 5.1 Analysis of the situation at the strait level

### **Socio-economic background of the Strait**

The socio economic situation is quite similar for both sides of the strait. In the two regions, unemployment rates are high and GDP is low. The figures are noticeably higher than those observed on the continent. Despite the fact that both regions seem to suffer from their insularity, their economies significantly depend on the sea. Tourism is the most significant sector. Recreational marine activities such as diving are numerous, and more generally, the richness of nature and the presence of the sea form a good part of their attraction. Neither of the regions benefit from the intense maritime circulation that passes through the strait.

### **Significance of biodiversity and natural environment in the Strait**

Each side of the strait presents great diversity of landscapes, due to the presence of the sea, wild and preserved vegetation, and traditional human construction. These many landscapes have led to complex characterisations. Biodiversity is also rich, composed of many species and habitats. Some of them are classified as endangered. Standing witness to the value of the local biodiversity, the European network Natura 2000 covers a significant part of the strait. Among the protected species are migratory ones: mammals, such as the bottlenose dolphin; and birds, such as the little egret.

The landscapes and natural environment are important to local economic activity (tourism, fishing, people transportation), to the local culture. They benefit from a number of protection and conservation programs.

### **Human and natural pressures exerted on biodiversity and natural environment**

Intensive maritime traffic in the strait represents the biggest threat to the natural environment. Some of the boats crossing the strait transport hazardous materials that could have catastrophic effects if they were ever to be released in the sea. In order to reduce this risk, and to set an example, France and Italy have signed an agreement forbidding any boat transporting hazardous materials, matriculated under their jurisdiction, to pass through the strait. Tourism and leisure related activities constitute other human pressures on the environment. Among the sources of these pressures are pleasure boating and urbanization. Other activities that have since ceased, such as military basements or industries still present negative effects (e.g. soil pollutions or erosion). The local environment also faces natural pressures. Littoral erosion, marine submersions and invasive species (for instance marine algae) are among the main ones.

## **Policies, actions and initiatives contributing to an integrated management of biodiversity**

Several policies, actions and initiatives are specifically tackling the issue of integrating biodiversity in projects to develop the region and its economic activities. Measures are mainly focused to address the fields of environmental protection and sustainable development of the area.

### **Integrating biodiversity and natural environment in planning decisions**

The scope of cooperative initiatives is mainly to protect the natural environment and local biodiversity. The Pelagos sanctuary agreement, the PIM initiative and the parks trans-border network are all aimed at the capitalisation of knowledge on the local environment, and the implementation of good practices. In addition, the agreement Maritime 2013 2017 calls for integration of natural resources management into local development.

### **Integrating biodiversity and natural environment in the tourism sector**

No specific agreement has been identified that deals directly with the integration of marine resources in the development of the tourism sector. Nevertheless, because of the importance of nature for this economic sector, all the initiatives that contribute to the creation of a sustainable management of the natural resources represent long-term positive actions to this aspect. Several initiatives have been taken in Corsica to increase awareness and to decrease the impact of yachting and maritime tourism on biodiversity. One field of action that Corsica and Sardinia would like to support is the development of in-land tourism.

### **Sustainable infrastructure and transport**

In order to limit the risk of pollution to the sea and coast by hazardous materials, France and Italy have adopted an agreement in 1993 to forbid boats carrying their flags loaded with hazardous or noxious substances to traverse the strait. Nonetheless, many non-Italian or French registered boats containing polluting and hazardous materials still do. This agreement does not concern them. An agreement including the latter would be a significant improvement in the protection of marine and coastal areas.

### **Promoting cross-border cooperation and governance on biodiversity and natural environment-related issues**

Many actors contribute to improve the integration of biodiversity in the development project of the territory. Responsibilities are split between the actors. Based on the European trans-border cooperation tool European Grouping for Territorial Cooperation (EGTC), a structure has been created to represent, at the international level, the interests of the area, and to improve cooperation between stakeholders. The structure is entitled "The EGTC – PMIBB Parc Marin International des Bouches de Bonifacio."

## **5.2 How responses have addressed key pressures on biodiversity and natural environment**

The responses that have been implemented in the Strait are mapped on the following tables.

Table 11: Responses to address risks and pressures exerted on biodiversity and natural environment – Bonifacio Strait (1/2)

Activities taking place in the Strait	Adding value to the local livelihood			Exerting pressures and impacting biodiversity and natural environment	Existing responses to address risks and pressures exerted on biodiversity and natural environment		
	Creating jobs	Creating revenues	Supporting Identity & culture		Italian side (Sardinia)	French side (Corsica)	Cross-border
Maritime Transportation (crossing)	✓	✓		Risk of boat collision and related risk of release of hazardous substances transported by boats	• Legislation compliant with the International Regulations for Preventing Collision at Sea	• Legislation compliant with the International Regulations for Preventing Collision at Sea	• Prohibition for boats transporting hazardous material to cross the strait • Odyssea France-Italy Maritime • Projet Ampamed
				Pollution			
	✓	✓		Invasive species			• Caulerpes Network
Traditional Fishing	✓	✓	✓	Fish stock depletion (limited)	• Coastal Action Group	• Sustainable marine activities	• Odyssea France-Italy Maritime initiative for Mediterranean Small Islands • Projet Ampamed
Agriculture	✓	✓	✓	Biodiversity decline			
Terrestrial/ Coastal tourism	✓	✓	✓	Urban development, artificialisation of land, disturbance of natural balance, destruction of ground vegetation	• Supporting the development of in-land tourism		• Odyssea France-Italy Maritime • The parks' trans-border network (RETRAPARC)
Maritime tourism	✓	✓	✓	Pollution Disturbance of natural balance		• Life LINDA • Water sports Charter in Corsica • "Clean and welcoming ports" initiative	• Odyssea France-Italy Maritime agreement • The Pelagos Sanctuary initiative for Mediterranean Small Islands • The parks' trans-border network (RETRAPARC) • Projet Ampamed • Development of a coordinated tool for recreational diving in Bonifacio strait
				Invasive species		• Corsican Environment Observatory	• Caulerpes Network



Table 12: Responses to address risks and pressures exerted on biodiversity and natural environment – Bonifacio Strait (2/2)

Activities taking place in the Strait	Pressures and impacting biodiversity and natural environment	Existing responses to address risks and pressures exerted on biodiversity and natural environment		
		Italian side (Sardinia)	French side (Corsica)	Cross-border
Urban planning / territorial planning	Artificialisation of land, Coastal development, coastal erosion, impact on coastal and terrestrial ecosystems	<ul style="list-style-type: none"> <li>• Sassari 2020 20 (climate)</li> </ul>	<ul style="list-style-type: none"> <li>• Regional scheme of the Green and Blue Belt Network</li> </ul>	
Seascape - Marine planning	Transversal pressures on marine and coastal ecosystem		<ul style="list-style-type: none"> <li>• Regional scheme of the Green and Blue Belt Network</li> <li>• Life LINDA</li> </ul>	<ul style="list-style-type: none"> <li>• Odyssea France-Italy Maritime</li> <li>• The Pelagos Sanctuary agreement initiative for Mediterranean Small Islands</li> <li>• Projet Ampamed</li> </ul>
Improving governance between actors and joint strategies	n/a		<ul style="list-style-type: none"> <li>• Corsican Environment Observatory</li> </ul>	<ul style="list-style-type: none"> <li>• EGTC</li> <li>• Odyssea France-Italy Maritime</li> <li>• European Grouping of Territorial Cooperation (PMIBB)</li> <li>• The Pelagos Sanctuary agreement initiative for Mediterranean Small Islands</li> <li>• The parks' trans-border network (RETRAPARC)</li> </ul>

### 5.3 Key priorities for future actions

The EGTC-PMIBB has identified some priority actions:

- Develop, update and share a common and cross-border understanding on biodiversity and natural environment (e.g. complete on-going inventories);
- Implement a cross-border strategy in order to limit the impacts of human and natural pressures on biodiversity and natural environment;
- Reinforce the marine traffic security by proposing measures to secure and reduce the transport of the hazardous materials and integrate socio-economic aspects.
- Submit research projects to better understand natural systems and their functions (how species live together?) in the framework of the INTERREG Program, using the EGTC as a legal platform (studies in such areas can be costly).

## 6 Recommendations for future actions

### GOVERNANCE

- Develop a network of actors gathering public institutions, private sectors, researchers in each key sector.

### KNOWLEDGE

- Address pressures exerted on biodiversity and natural environment and related impacts that have yet to be addressed in initiatives and actions.
- Evaluate the natural impact of hazardous substance dispersal in the strait. It could stimulate actions on an international level (e.g. European agreement).
- Develop knowledge and analyse economic and social flows between the two sides of the strait. Develop tools to monitor such flows.

### ACTION

- Promote jobs and training, identify employment opportunities in relation to the integrated management of biodiversity and natural environment, with cross-border partnerships, for instance in the following sectors: marine transport, tourism, local planning, local artisanal fishery, agriculture.
- Highlight and value the cultural identity of the Strait territory, and develop new business opportunities in relation to this identity, for instance on the tourism sector.
- Develop common strategies and actions to support the development of sustainable transport, in particular transport of goods by road from the ferry ports.
- Develop common actions to consistently manage the yachting activity in the Bonifacio Strait.
- Establish a common piloting service (using the EGTC as the responsible entity).
- Support the recognition of the Bonifacio Strait as a “PSSA (Particularly Sea Sensitive Area)” at the international level (using the

EGTC as legal entity) in order to be able to implement related measures to increase the security in the strait.

- Work on the implementation of good practices in relation to waste water management and storage tanks of boats.
- Apply to have the Marine Park of the Bonifacio strait on the list of UNESCO World Heritage sites.
- Ensure coherence between actions and harmonise existing actions on both sides related to touristic flows.
- Develop inland tourism focused on hiking trails, gastronomy and culture.
- Address the challenges of professional fishery and develop sustainable artisanal fishery practices, for instance working on certification tools and training for fishermen.

## 6.1 Towards the implementation of good practices developed by other NOSTRA partners

During the workshop that took place in Reggio Calabria in February 2014, the partners of the Bonifacio Strait were asked to make a first selection, to identify several best practices developed by other partners of the Network they could be implemented. The relevancy of transferring such best practices in the Bonifacio Strait is analysed below, taking into account the outcomes of the baseline study.

### ***Towards “Kvarken Council Joint governance”***

The Kvarken Council is a cross-border cooperation association formed by the cities of Vaasa, Kokkola, Seinäjoki and Jakobstad and the three Regional Councils of Ostrobothnia in Finland, and the Regional Council of Västerbotten and the city of Örnsköldsvik in Sweden. The Kvarken Council functions as a non-profit bi-national organisation. The Board has 6 members from Finland and 6 members from Sweden. The Kvarken Council was founded in 1972 and has had approximately 100 different cooperation projects in infrastructure, communications, tourism, university cooperation, food, business, education, culture, etc. The Council has staff in both Finland and Sweden. The board consists of 6 board members from Finland and 6 board members from Sweden. The Chairmanship is circulating between the cities of Vaasa and Umeå, two years each.

### ***Towards “Tourist economic development Salento area”***

The baseline study has identified tourism development as a priority sector for action in order to support both economic development and biodiversity preservation. It would be relevant to implement a project supported at one-side level or as a cross-border project that will aim at increasing the potential of inland tourism, valuing both the cultural and natural values. This will allow re-positioning the traditional beach tourism segment and diversifying the tourism offers available in the region. The tourism that would have to be integrated in the overall strategy of the Strait area is a sustainable tourism, which contributes to both an integrated management of biodiversity and natural environment and a creation of jobs and revenues in inland areas.

### ***Towards “UNESCO World heritage by storytelling”***

Becoming a site on the UNESCO World heritage list may contribute to create new business opportunities and to open new possibilities of development. It is relevant to involve the local people on both sides of the maritime border in this cross-border project, in order to increase their awareness on the emerging opportunities and to develop a common culture. Being a UNESCO World heritage site at the level of the Strait represents an opportunity to develop common tourism and culture products and services. Activating the storytelling of the local people could support the

emergence of ideas. Taking into account the outcomes of the baseline study which elaborated recommendations in line with the creation of cross-border opportunities, the emergence of a common identity, the challenges of job creation and new business opportunities, this initiative would be relevant to implement at the level of the Strait.

#### ***Towards “A Strategy for sustainable mobility”***

Implementing a strategy for sustainable mobility appears to be a priority for the Bonifacio Strait since flows of goods and passengers are significant across the Strait as well as in the inland areas near the main ports which connect Corsica and Sardinia. They are significant in terms of density and intensity and impacts on the environmental and socio-economic situation of the Strait. The external accessibility is a major asset to support the socio-economic development of the strait and limit the negative effects of intense traffic on the environment. It would be relevant to develop intermodal and efficient transport systems in the areas that are located close to the main ports to limit congestion and the related impacts of intense traffic. Moreover, elaborating and proposing alternative uses of car for individuals would be relevant to decrease congestion. Finally, progress could be made in introducing an ecological management and rational exploitation of the road.

#### ***Towards “MIRG-EU Maritime Incidence Response Group - Cross-border firefighters teams”***

The MIRG-EU (Maritime Incidence Response Group) gathers Dutch, Belgian, French and English fire brigades. They are working to establish a specialised international group of fire fighters with expertise and knowledge to effectively respond to maritime incidents, involving board passengers' ships and vessels.

The occurrence of maritime incidents in the Bonifacio Strait could have dramatic impacts for humans and for biodiversity and natural environment. Furthermore, the probability of occurrence of maritime incidents in this area justifies to have specialized staff prepared to intervene in case of incidents. The expertise to intervene on maritime incidents has not been developed among the fire fighters who work in the Bonifacio Strait. The first step towards such initiative could be to carry out a risk analysis for the region, to know better what kind of vessels and incidents can be expected in the area, and which ones, what kind of responses could be elaborated. Furthermore, it would be relevant to identify local staff that could be trained to intervene directly or by supporting the international forces in case of maritime incidents.

#### ***Towards “ODISSEA Project Reggio Calabria”***

The EU project ODISSEA was developed and implemented in Reggio Calabria to ensure the EMAS certification of a number of towns and villages which did not continue to adhere to this direction once the authorisation was obtained. The project was aimed to promote environmental restoration and sustainable development perspective along the axis of the Tyrrhenian coast and Aspromonte, including the municipalities of Reggio Calabria, Santo Stefano in Aspromonte, Scilla and San Roberto.

#### ***Towards “Baltic FLYWAY Project Securing Birds Migration”***

Baltic Flyway is an Interreg IV A project from the Fehmarn Belt programme 2010 – 2013, in which seven nature-oriented organisations cooperate to create better environmental conditions for migratory birds<sup>70</sup>. It is a good example of cross border cooperation.

Baltic Flyway focused on three areas:

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<sup>70</sup>NOSTRA (2013), *Baltic Flyway – An example of good practice for cross-strait cooperation from Fehmarn Belt*

- Cross-border cooperation between the stations and bird sanctuaries;
- Conservation initiatives to promote biological peculiarities here under special conditions of the migratory birds;
- Promotion of adventure opportunities with a focus on migratory birds.

Locations of bird refuges areas were implemented in Fehmarn Belt area covered by the Baltic Flyway, together with some observation stations for observing birds.

It would be relevant to implement such initiative in the Bonifacio Strait. First, the Bonifacio strait is a migratory route for bird species. As highlighted previously, because of their central location in the Mediterranean Sea, Corsica and Sardinia are a privileged stopover for migratory birds flying from sub-Saharan Africa. For some of them, the strait is also a place for reproduction. Despite a high number of natural protected areas (including areas protected under the Birds Directive), migratory birds could be exposed to pressures when stopping in the Bonifacio Strait.

Furthermore, the NOSTRA partners of the Bonifacio Strait could take benefit of their high and historic collaboration to implement such initiative. The fact that all partners of the two sides of the Strait have been used to work together will ensure that some difficulties are easily overcome (language issues, different administrative systems). This project could be integrated in the Action plan or cross border development plan of the EGTC-PIMBB. Then, the initiative could benefit from the governance of the EGTC-PMIBB (regular meetings, regular communication, process of decision-making) to be established.

Moreover, implementing such initiative will allow targeting the objective of preserving biodiversity and the one of developing in-land or coastal tourism, in order to decrease the pressure exerted by tourism on marine ecosystems.

Finally, the best conditions for success seem to be gathered at the level of the Strait to ensure the implementation of an initiative to secure birds migration.

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