

# SSF AND ITS ECOSYSTEM CULTURAL AND NATURAL HERITAGE INVENTORY

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June, 2019.

## 1. SSF and its ecosystem cultural and natural heritage

The WP6 (Cultural heritage) of CABFishMAN project contributes to enhancing the value of SSF fisheries by providing tools and resources for the design and assessment of community-led local development strategies, which serve as a means for promoting social well-being, SSF cultural heritage and natural and health tourism in coastal destinations.

The latter requires strengthening the role of coastal communities in local development, the governance of SSF together with the rest of maritime activities [Regulation (EU) No 508/2014, EU Blue Growth strategy] or promoting the development of tourism actions: cultural heritage-based tourism, underwater archaeological/natural parks, etc. based on UNESCO experience.

WP6 Action nr. 1 [Reference search and collection of audio, image and video documentation on SSF and its ecosystem cultural and natural heritage (2019/2020)] is devoted to carry out a bibliographical survey and collecting written and audio-visual materials on SSF and their ecosystem cultural and natural heritage.

The results has been organised in a database that includes:

- Scientific literature, including grey literature, on cultural heritage, fisheries cultural and natural heritage, on SSF and their ecosystems in Atlantic area.
- News, historical files, audio, image or video, among any other documentation.

Partners involved in WP6 of CABFishMAN project has work during the first year of the project in carrying out of action 1 mainly focusing in Cultural Heritage as the part of the picture that has not been comprehensively cover in literature given that natural heritage represented by marine fisheries systems and coastal systems are mainly included in the Atlantic Area in the context of the network of the Marine Protected Areas that has been exhaustively treated (Agnesi et al., 2017; EEA, 2015; Ojeda-Martínez et al., 2009; Reker et al., 2017). However Natural Heritage (NH) has also been covered in a less extend than cultural heritage in the database. Additionally, some relevant representative case-studies of NH along the Atlantic area has been identified.

This report begin characterizing natural and cultural heritage in order to register systematically in a database the content the reference search and collection of audio, image and video documentation on SSF and its ecosystem cultural and natural heritage in the present section. An annex is added to this report that include the interview protocol to interview stakeholder on natural and cultural heritage to inform this database. Then it is run an statistical analysis in order to infer patterns of natural and cultural heritage in Atlantic Area in section

## 1.1. Characterization of natural and cultural heritage

### 1.1.1. Natural heritage

It is considered NH according UNESCO (1972) Convention of Natural and Cultural Heritage and for the purposes of this report:

- *Natural features consisting of physical and biological formations or groups of such formations, which are of Outstanding Universal Value from the aesthetic or scientific point of view.*
- *Geological and physiographical formations and precisely delineated areas which constitute the habitat of, threatened species of animals and plants of Outstanding Universal Value from the point of view of science or conservation.*
- *Natural sites or precisely delineated natural areas of Outstanding Universal Value from the point of view of science, conservation or natural beauty.*

*We should consider in our description of each of the SSF natural heritage related to fisheries the following criteria.*

The criteria for assessment of Outstanding Universal Value (OUV) of Marine Natural Heritage related to SSF that is relevant for the purposes of this report should meet the following subcriteria according Abdulla et al. (2013) and UNESCO (1972, 2019):

- *(vii) **Superlative natural phenomena or natural beauty** (secondary for SSF). Containing superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;*
- *(viii) **Geology and oceanography** (secondary for SSF). Being outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;*
- *(ix) **Ecological and biological process** (primary for SSF). Be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals;*
- *(x) **Species and biodiversity** (primary for SSF). Contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.*

Additionally, NH must meet according UNESCO convention the criteria of integrity, that is its wholeness and intactness, and protection and management; however this is not a requirement despite desirable for the purposes of this report given that NH not need to be necessarily listed in the UNESCO convention representative list or any other protection regional or national register.

### 1.1.2. Cultural heritage

This report adopts the framework of Millennium Ecosystem Assessment (MEA - Millennium Ecosystem Assessment, 2003) as a baseline for the classification of marine and coastal ecosystems as well as the respective provisioning of ecosystem goods and services.

Coastal and marine ecosystems provide a variety of ecological functions that directly or indirectly translate to economic services and values to humans.

They support fish populations that constitute a significant source of protein, sustain ecosystem stability through conservation of biodiversity and mitigation of climate change through carbon sequestration, act as sinks for by-products of industrial or agricultural production and provide recreational and aesthetic benefits.

Ecosystem services are direct and indirect contributions of ecosystems to human well-being from which people benefit and can be grouped into four categories:

- Provisioning Services
- Regulating Services
- Cultural and Amenity Services
- Supporting Services

Cultural services are the nonmaterial benefits that people obtain from the ecosystem through aesthetic experience, reflection, recreation and spiritual enrichment. The following six categories have been distinguished:

- Cultural identity, that is, the current cultural linkage between humans and their environment.
- Heritage values. 'Memories' in the landscape from past cultures.
- Spiritual services. Sacred, religious, or other forms of spiritual inspiration derived from ecosystems.
- Inspiration. The use of natural motives or artefacts in arts, folklore, and so on).
- Aesthetic (appreciation of natural and cultivated landscapes; and recreation and tourism).

Although cultural services are one of the four main service categories identified by the MEA, they cannot be treated independently:

- Cultural and amenity services depend especially on supporting and regulating services
- At the same time, the expression of cultural services influences the way ecosystems are viewed in terms of their other services

Serve as example that fish have a food value but may also have a spiritual value, and fishing may be a traditional way of life.

The concept of cultural heritage is closely related to ecosystem services given that it focus on the benefits instead of the elements that represent these services and that constitute the origin of them. In this sense, according the UNESCO convention, the following shall be considered as Cultural Heritage:

- *Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science;*

- *Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science;*
- *Sites: works of man or the combined works of nature and man, and areas including archaeological sites, which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.*

The first two and part of the third bullet of the aforementioned list mainly include what is classified as immovable Tangible Cultural Heritage (TCH); and the latter also includes the so-called Intangible Cultural Heritage (ICH) together with movable Tangible Cultural Heritage (paintings, sculptures, coins, manuscripts,...)

The latter, intangible cultural heritage, require further insights. It means the *practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage* according to the UNESCO convention.

This ICH, *transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity.*

According to the UNESCO convention the criteria of OUV of ICH are:

- *(i) Representing a masterpiece of human creative genius;*
- *(ii) Exhibiting an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;*
- *(iii) Bearing a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;*
- *(iv) Being an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;*
- *(v) Being an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change;*
- *(vi) Being directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria);*

### 1.1.3. Database classification of heritage elements.

Entries of the database have been classified using Mendeley reference manager ([www.mendeley.com](http://www.mendeley.com)) according to different TAGs that represent different categories of natural and cultural heritage according to *WP6 Action nr. 1: Reference search and collection of audio, image and video instructions* (<https://azti.sharepoint.com/sites/Proyectos/CABFISHMAN>). A summary of some of the main elements identified in the database has been made publicly accessible in a public Mendeley group for the sustainability of the results of the project (<https://www.mendeley.com/community/cabfishman-natural-and-cultural-heritage/>).

Accordingly, the TAGs defined in the data base are the following:

- General TAGs:
  - General heritage type: NH,TCH, ICH
  - Country code (NUT 1 statistical region): ESP (Spain), FRA (France), GBR (United Kingdom), PRT (Portugal)
- UNESCO type:
  - Oral traditions and expressions (OTE)
  - Performing arts (PA)
  - Social practices, rituals and festive events (SRF)
  - Knowledge and practices concerning nature and the universe (KPNU)
  - Traditional craftsmanship (TC)
- Thematic types of ICH:
  - Traditions and oral expressions (TOE)
  - Social practices, rituals and festive events (SRF)
  - Knowledge and practices concerning nature and the universe (KPNU)
  - Traditional craftsmanship (TC)
  - Gastronomy and food (GF)
  - Specific uses of natural landscapes (SNL)
  - Forms of collective socialization, organizations and crafts (SOC)
  - Sound shows music and sounds (SMS)

## 1.2. Database analysis

### 1.2.1. A database of the Natural and Cultural Heritage in the Atlantic area

Table 1 shows the total number of references/documents in the data base by typology and country. The 43.1% of references are printed documents, 20.8% are movies and documentary films and other video and audio references, and the 26.8% are public and private websites except public inventories of cultural heritage that has been included in other typology of printed documents like leaflets or posters among other. The database is a relevant tool to evaluate the importance fisheries cultural services, and particularly cultural heritage related to SSF fisheries of the European Atlantic area that allow identifying similarities and differences among countries.

The references in the database refer to different categories according the classification of cultural heritage elements (CH) introduced in section 1.1.3. Most of the documents mention elements or goods of ICH, however there is also a close link between ICH and TCH so that some documents can refer to a specific fishing technique adapted to a certain marine ecosystem and the TCH (fishing gear, boats,...) or even the natural heritage (NH) elements. 1087 documents/references include ICH, 396 documents describe TCH; and 83 documents/references refers to NH. It should be noted that some of the references involve according their contents all or 2 of the main categories considered.

**Table 1.** Materials included in the database by country and document type

|   | Spain | France | Ireland | Portugal | United Kingdom | Total |
|---|-------|--------|---------|----------|----------------|-------|
| <b>Printed materials</b>                            |       |        |         |          |                |       |
| <i>Regulations and administrative documents</i>     | 11    |        |         | 1        |                | 12    |
| <i>Book</i>   | 33    | 6      | 91      | 15       | 1              | 146   |
| <i>Book Section</i>                                 | 14    |        | 4       | 4        | 2              | 24    |
| <i>Conference Proceedings</i>                       | 3     |        | 4       |          |                | 7     |
| <i>Journal Article</i>                              | 62    | 3      | 64      | 21       | 6              | 156   |
| <i>Newspaper Article</i>                            | 100   | 9      | 5       | 4        | 23             | 141   |
| <i>Report</i>                                       | 10    | 1      | 2       | 15       | 2              | 30    |
| <i>Thesis</i>                                       | 3     | 1      | 4       | 6        | 1              | 15    |
| <b>Films /videos</b>                                |       |        |         |          |                |       |
| <i>Film</i>   | 5     | 1      | 3       | 11       | 2              | 22    |
| <i>Television Broadcast</i>                         | 73    | 3      |         | 78       | 6              | 160   |
| <i>Video</i>  | 17    | 1      |         | 51       | 6              | 75    |
| <b>Web Pages</b>                                    | 171   | 16     | 41      | 35       | 67             | 330   |
| <b>Others (inventories, leaflets, posters, etc)</b> | 93    | 8      | 5       | 7        | 2              | 115   |
| <b>Total documents</b>                              | 595   | 49     | 223     | 248      | 118            | 1233  |

**Table 2.** Heritage items linked to inventoried documents

|                                      | Spain | France | Ireland | Portugal | United Kingdom | Total |
|--------------------------------------|-------|--------|---------|----------|----------------|-------|
| <b>Natural Heritage</b>              | 40    | 9      | 5       | 23       | 6              | 83    |
| <b>Tangible Cultural Heritage</b>    | 279   | 13     | 62      | 18       | 26             | 396   |
| <i>Immovable Cultural Heritage</i>   | 253   | 13     | 29      | 15       | 22             | 332   |
| <i>Movable Cultural Heritage</i>     | 23    | 0      | 33      | 4        | 4              | 64    |
| <b>Inntangible Cultural Heritage</b> | 505   | 46     | 184     | 240      | 112            | 1087  |
| Total elements                       | 824   | 68     | 251     | 281      | 144            | 1566  |

Table 2 shows the distribution of heritage linked to entrances in the database according heritage typology and country. ICH is the main heritage element identified in the database followed by TCH and NH, given that only has been registered very specific elements regarding certain relevant ecosystems, however every fishing activity take place in a certain natural space.

UNESCO categories of ICH has been expended according thematic categories described in section 1.1.3 so that OTE and PA categories of UNESCO has been subdivided into OTE, GF, SNL, SOC and SMS; and UNESCO categories SRF, KPNU and TC has been kept.

Table 3 shows the number of CH elements identified in the database per country. It is worth noting that TC including fishing activity itself, building of boats and fishing gears, or salting

and canning processing among other, is especially relevant in all countries representing the 28.78% of ICH mentioned in the database. The second ICH in importance is KPNU (23.67%) which involve the traditional knowledge of fishermen and other stakeholder acquired generation after generation related to SSF. The typologies SRF (10,86%), TOE (10,14%) and GF (9.26%) are in the following in importance with almost equally proportion. They are associated to festive and religious events, cooking capture onboard for fishermen or cooking of fishermen’s families; and oral traditions and expressions including myths, songs, lexicon, or legends, among others. The rest of categories have less weight but this does not mean that they are not relevant given that they represent musical expressions (4.99%), forms of collective socialization, organizations and crafts (7.07%); uses of the natural environment that allow its exploitation and evidence the adaptation of coastal communities to marine ecosystems (5.23%). All these types of ICH related to SSF – the fishing culture- contributes to the wellbeing and the reinforcing of the identity of coastal communities, and its preservation must be one of the main objectives of policy-maker related to SSF.

**Table 3.** Elements of ICH in the database

| Thematic Types of ICH  | Spain | France | Ireland | Portugal | United Kingdom | Total |
|--|-------|--------|---------|----------|----------------|-------|
| 1. Traditions and oral expressions (TOE)                             | 92    | 0      | 98      | 29       | 35             | 254   |
| 2. Social practices, rituals and festive events (SRF)                | 181   | 12     | 45      | 15       | 19             | 272   |
| 3. Knowledge and practices concerning nature and the universe (KPNU) | 244   | 32     | 58      | 199      | 60             | 593   |
| 4. Traditional craftsmanship (TC)                                    | 354   | 36     | 56      | 202      | 73             | 721   |
| 5. Gastronomy and food (GF)  | 163   | 6      | 7       | 38       | 18             | 232   |
| 6. Specific uses of natural landscapes (SNL)                         | 86    | 8      | 7       | 24       | 6              | 131   |
| 7. Forms of collective socialization, organizations and crafts (SOC) | 77    | 5      | 62      | 6        | 27             | 177   |
| 8. Sound shows music and sounds (SMS)                                | 57    | 6      | 24      | 14       | 24             | 125   |
| Totals elements  | 1254  | 105    | 357     | 527      | 262            | 2505  |

Table 4 shows the number of heritage elements mentioned in the database according the general type (NH, ICH and TCH – see section 1.2.3) classified per NUT3 statistical regions. There are several entries that do not allow to distinguish the geographical locations given that some of them involve several NUT2 statistical regions or even countries hindering codification.

**Table 4.** Spatial distribution (NUT3) of the heritage elements contained in the database in the Atlantic Area

| NUT3                  | Regions                                  | NH | TCH | ICH |
|-----------------------|--|----|-----|-----|
| <b>SPAIN</b>          |  |    |     |     |
| ES11                  | Galicia                                  | 0  | 2   | 1   |
| ES12                  | Principado de Asturias                   | 6  | 165 | 95  |
| ES21                  | País Vasco                               | 1  | 22  | 9   |
| ES61                  | Andalucía                                | 33 | 305 | 170 |
|                       | All                                      | 0  | 11  | 1   |
| <b>FRANCE</b>         |  |    |     |     |
| FRD1                  | Basse-Normandie                          | 2  | 6   | 0   |
| FRE1                  | Nord-Pas-de Calais                       | 0  | 3   | 0   |
| FRG0                  | Pays-de-la-Loire                         | 1  | 6   | 1   |
| FRH0                  | Bretagne                                 | 0  | 7   | 5   |
| FRI1                  | Aquitaine                                | 0  | 5   | 0   |
| FRI3                  | Poitou-Charentes                         | 6  | 14  | 7   |
|                       | All                                      | 0  | 5   | 0   |
| <b>IRELAND</b>        |  |    |     |     |
| IE04                  | Norther and Western Region               | 0  | 71  | 19  |
| IE05                  | Southern                                 | 2  | 67  | 15  |
| IE06                  | Eastern and Midland                      | 3  | 23  | 26  |
|                       | All                                      | 0  | 23  | 2   |
| <b>PORTUGAL</b>       |  |    |     |     |
| PT11                  | Norte                                    | 0  | 30  | 3   |
| PT15                  | Algarve                                  | 4  | 57  | 5   |
| PT16                  | Centro (PT)                              | 1  | 33  | 3   |
| PT17                  | Lisboa                                   | 10 | 43  | 4   |
| PT18                  | Alentejo                                 | 4  | 13  | 1   |
|                       | All Continental                          | 1  | 35  | 2   |
| PT20                  | Regiao Autónoma dos Açores               | 3  | 22  | 0   |
| PT30                  | Regiao Autónoma da Madeira               | 0  | 7   | 1   |
| <b>UNITED KINGDOM</b> |  |    |     |     |
| UKC2                  | Northumberland and Tyne and Wear         | 0  | 1   | 0   |
| UKD1                  | Cumbria                                  | 0  | 1   | 0   |
| UKE1                  | East Yorkshire and Northern Lincolnshire | 0  | 0   | 1   |
| UKF3                  | Lincolnshire                             | 1  | 3   | 1   |
| UKH1                  | East Anglia                              | 0  | 5   | 0   |
| UKJ2                  | Surrey, East and West Sussex             | 0  | 5   | 1   |
| UKJ3                  | Hampshire and Isle of Wight              | 0  | 1   | 0   |
| UKK2                  | Dorset and Somerset                      | 1  | 2   | 1   |
| UKK3                  | Cornwall and Isles of Scilly             | 0  | 10  | 0   |
| UKK3 / UKK4           | Cornwall and Isles of Scilly / Devon     | 1  | 1   | 1   |
| UKK4                  | Devon                                    | 1  | 6   | 1   |
| UKL1                  | West Wales and The Valleys               | 1  | 6   | 1   |
| UKL2                  | East Wales                               | 0  | 1   | 1   |

|      |                        |   |    |   |
|------|------------------------|---|----|---|
| UKM2 | Eastern Scotland       | 0 | 3  | 1 |
| UKM5 | North Eastern Scotland | 0 | 2  | 0 |
| UKM6 | Highlands and Islands  | 1 | 23 | 7 |
| UKM7 | Eastern Scotland       | 0 | 6  | 3 |
| UKM9 | Southern Scotland      | 0 | 3  | 1 |
|      | All                    | 0 | 33 | 6 |

Finally, Table 5 shows different fishing techniques and gears mentioned in the entries of the database. They include selective fishing weirs (*corrales / écluses*) located in Andalucía (SW Spain) and France, tuna traps (*almadraba*) in Andalucía and Portugal; gillnets, longlines and hook gears present along the Atlantic area; or clay pots (*alcatruz*) that target octopus in Andalucía and Portugal. Boat and beach trawling are also of significant importance. The latter are almost eradicated due to their low selectivity that result in catching of immatures and/or protected fish species, and are simply witnesses of fishing heritage.

**Table 5.** Extractive techniques and fishing gear mentioned in the inventoried documentation

| Extractive techniques            | Spain | France | Ireland | Portugal | United Kingdom | Total |
|----------------------------------|-------|--------|---------|----------|----------------|-------|
| <i>Aquaculture</i>               | 3     | 0      | 0       | 0        | 1              | 4     |
| <i>Clay pot</i>                  | 2     | 0      | 0       | 8        | 0              | 10    |
| <i>Tuna trap</i>                 | 82    | 0      | 0       | 6        | 0              | 88    |
| <i>Boat Trawling</i>             | 23    | 1      | 0       | 5        | 1              | 30    |
| <i>Beach Trawling</i>            | 1     | 0      | 0       | 22       | 0              | 23    |
| <i>Purse seine</i>               | 1     | 1      | 1       | 2        | 0              | 5     |
| <i>Hooks lines and longlines</i> | 14    | 0      | 1       | 36       | 7              | 58    |
| <i>Fishing weirs</i>             | 12    | 10     | 1       | 0        | 1              | 24    |
| <i>traps</i>                     | 8     | 0      | 5       | 9        | 16             | 38    |
| <i>Shellfishing</i>              | 16    | 5      | 0       | 8        | 0              | 29    |
| <i>Gillnets</i>                  | 15    | 1      | 1       | 24       | 5              | 46    |
| <i>Other</i>                     | 9     | 2      | 1       | 4        | 1              | 17    |
| Totals                           | 186   | 20     | 10      | 124      | 32             | 372   |

Summarizing, the database represents the diversity heritage related to fisheries in the Atlantic area; which difficult the identification of general patterns of it in the area. This deliverable includes a statistical analysis of the database that will allow to extract common patterns using multivariate analysis.

### 1.2.2. Methods

Factor analysis, hierarchical cluster analysis and discriminant analysis are implemented in reference/documents database on heritage elements of the Atlantic area. The first is aimed at reducing the number of variables considered in the analysis to reduced number of non-correlated variables that explain different heritage elements of the database (Cuadras, 1981).

The suitability of the factor analysis compare to other statistical techniques is confirmed using several indicators based upon the correlation matrix and the global significance of the model. The determinant of the correlation matrix must be close to 0, the number of

coefficients of the anti-image matrix must be small but with big values, and regarding the adequacy of the sample is required that the diagonal of the anti-image matrix take big values.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity test the global significance of the factor analysis. The Bartlett's test of sphericity (Bartlett, 1937) test that the correlation matrix is an identity matrix what means that the variables are not correlated. It does not make sense to run a factor analysis when the latter occurs. The Bartlett's test of sphericity is one side test based on the Chi-squared statistic of equation 1 where  $s$  is the sample size,  $n$  is number of variables included in the matrix and  $|R|$  is the determinant of the correlation matrix.

$$\chi^2 = - \left[ s - 1 - \frac{1}{6(2n + 5)} \right] \ln |R| \quad (1)$$

The KMO measure of sampling adequacy is shown in Equation 2 where  $r_{ij}$  is the linear correlation between  $i_{th}$  and  $j_{th}$  variables,  $s_{ij}$  is the partial correlation between  $i_{th}$  and  $j_{th}$  variables and  $n$  is the number of variables. The KMO measure does not advice the use of factor analysis when its value is low; while it advice its implementation when it is close to 1 (Kaiser, 1974).

$$KMO = \frac{\sum_{i=1}^n \sum_{j=1}^n r_{ij}^2}{\sum_{i=1}^n \sum_{j=1}^n r_{ij}^2 + \sum_{i=1}^n \sum_{j=1}^n s_{ij}^2} \quad (2)$$

Factor analysis attains non-correlated factors that are linear combinations of the original variables. These factors are sorted according the information they provides according their contribution to the total variance measured by their eigenvalues. Kaiser (1974) propose choosing those principal components whom eigenvalues are bigger than one. The *Varimax* method proposed by Kaiser (1974) allows minimizing the number of variables that have high loadings on each factor. This method simplifies the interpretation of the factors orthogonal matrix proposed. Moreover, the principal components are attained using Bartlett (1937) method given that if differentiate cases and it is more suitable for common factors.

Cluster analysis (Sokal & Sneath, 1963) is a multivariate technique aimed at classifying object in groups that are homogeneous within them and heterogeneous between them. Therefore, this technique is based on the idea of distance and similarity between observations that can be measured using multiple criteria. Hierarchical cluster analysis is the most appropriated technique when the number of groups is not defined a priori and the number of observations is small. The agglomeration of hierarchical cluster analysis begins defining as many groups as cases that are subsequently grouped until a unique group is got. The most common agglomeration schedules are between groups linkage, within groups linkage, nearest neighbor, or further neighbor among other. The further neighbor schedule calculates the distance between the furthest points of groups and result in agglomeration more compact. This schedule is the less sensible to outliers. The most appropriated measure for quantitative data is the squared Euclidean distance

There is not an unified criteria to determine the number of groups. The dendrogram shows the process of agglomeration depicting a tree type graph where cases are grouped from the branches to the trunk that represents the whole dataset. The number of groups considered depends on where we cut vertically the dendrogram so that the best decision on the number of groups can depends on the suitability of interpretation of the groups attained. Another

option to determine the number of groups is based on the agglomeration history summarize numerically the solution of the cluster analysis showing the distance between groups that serves as selection criteria.

Discriminant analysis can be used to validate the groups attained using cluster analysis. This technique can be viewed as a regression of a nominal dependent variable – the group attained using cluster analysis;- and the independent variables are the factors attained using factor analysis. This technique intends to find the linear relations that better fit continuous factor variables and groups. Discriminant functions allow building membership rules to allocate objects to groups or typologies providing a risk measure. The number of discriminant function is equal to the minimum between the number of factors/variables and membership groups minus one.

Discriminant functions minimize the probability of failure at classifying individuals to membership groups. It is required that factors/variable are distributed according a multivariate Normal and covariate matrixes have to be equal for different groups. This technique is robust though last assumptions are not holding even in the case of binary variables. This report uses stepwise method for the introduction of explanatory/independent factors/variables.

### 1.2.3. Results of data analysis

The eleven binary variable representing categories described in section 1.2.3 of the references/documents included in the Mendeley database has been reduced to five independent factors of interpretable meaning using Factor Analysis (see section 1.2.2). An exploratory analysis based upon the correlation matrix indicators the KMO measure of sampling adequacy and the Bartlett’s test of sphericity has concluded the suitability of this techniques for this case study [determinant of correlation matrix = 0.46; KMO=0.594; Barlett sphericity test statistic = 3779.654 (55 d.f.) reject null hypothesis; small values of anti-image matrix; diagonal of anti-image matrix in range 0.48-0.86].

Table 6 shows eigenvalues which represent the contribution of each of the five factors to the total variance of the original variables. Factors chosen are those with eigenvalues higher than one for clear and relevant interpretation according Kaiser (1974). The percentage of the total variance explained by the first four factors is 75.64%.

**Table 6.** Total variance Explained and Eigenvalues

| Component | Initial Eigenvalues |               |              | Extraction |               |              |
|-----------|---------------------|---------------|--------------|------------|---------------|--------------|
|           | Total               | % of Variance | Cumulative % | Total      | % of Variance | Cumulative % |
| 1         | 2.726               | 24.780        | 24.780       | 2.726      | 24.780        | 24.780       |
| 2         | 1.881               | 17.096        | 41.876       | 1.881      | 17.096        | 41.876       |
| 3         | 1.414               | 12.852        | 54.727       | 1.414      | 12.852        | 54.727       |
| 4         | 1.198               | 10.892        | 65.620       | 1.198      | 10.892        | 65.620       |
| 5         | 1.102               | 10.022        | 75.641       | 1.102      | 10.022        | 75.641       |
| 6         | 0.652               | 5.932         | 81.573       |            |               |              |
| 7         | 0.623               | 5.663         | 87.235       |            |               |              |
| 8         | 0.531               | 4.826         | 92.061       |            |               |              |

|    |       |       |         |  |  |  |
|----|-------|-------|---------|--|--|--|
| 9  | 0.388 | 3.525 | 95.586  |  |  |  |
| 10 | 0.281 | 2.558 | 98.144  |  |  |  |
| 11 | 0.204 | 1.856 | 100.000 |  |  |  |

Table 7 shows the rotated component matrix of the Varimax method that represent the weight of each factor. Varimax rotation provide factors with correlations in the rotated component matrix that are close to 1, -1 or 0 easing the interpretation of factors (Kaiser, 1958).

There are common patterns that allow identifying the five factors in Table 7:

- **Factor 1** explains the 24.8% of the total variance and it is identified with four of the original variables that are associated with Knowledge, practices, traditional craftsmanship and traditions that are associated with coastal communities' traditions (direct correlation with KPNU and TC, and inverse correlation with SMS and TOE).
- **Factor 2** explains the 17.1% of the total variance and it is identified with two of the original variables that are associated with ICH in general while small values related to movable and unmovable TCH (direct correlation with ICH, and inverse correlation with TCH).
- **Factor 3** explains the 12.9% of the total variance and it is identified with two of the original variables that are associated natural spaces and its usage (direct correlation with NH and SNL).
- **Factor 4** explains the 10.9% of the total variance and it is identified with one of the original variables that are associated with gastronomy, fish food and social practices (direct correlation with GF and SRF).
- **Factor 5** explains the 10% of the total variance and it is identified with forms of collective socialization, organizations and crafts (direct correlation with SOC).

**Table 7.** Rotated component matrix (Varimax method)

| Tags | Principal Components |        |        |        |        |
|------|----------------------|--------|--------|--------|--------|
|      | 1                    | 2      | 3      | 4      | 5      |
| SMS  | -0.721               | 0.237  | 0.020  | 0.152  | -0.181 |
| SOC  | 0.028                | 0.103  | -0.033 | -0.026 | 0.922  |
| SNL  | 0.105                | -0.028 | 0.863  | 0.002  | -0.045 |
| GF   | 0.205                | 0.039  | -0.076 | 0.826  | -0.219 |
| TC   | 0.737                | 0.376  | 0.145  | 0.106  | -0.295 |
| SRF  | -0.342               | 0.144  | -0.037 | 0.684  | 0.338  |
| KPNU | 0.667                | 0.451  | 0.262  | -0.253 | -0.215 |
| TOE  | -0.766               | 0.284  | -0.081 | -0.206 | -0.056 |
| NH   | 0.049                | -0.006 | 0.831  | -0.090 | -0.001 |
| TCH  | 0.223                | -0.747 | 0.294  | 0.005  | -0.062 |
| ICH  | 0.042                | 0.869  | 0.150  | 0.163  | 0.102  |

The factors attained has been used to build groups by means of Cluster analysis of K-means (see section 1.2.2). The references/documents of the database have been grouped into 5 groups using the criteria of Euclidean distance given that small groups are the only ones subdivided when the number of groups is higher.

Table 8 shows the classification of the entries in the database among the five groups after 7 iterations of the algorithm which began with a minimum distance of 5.118, Table 9 shows the final score of each factor for final cluster centers, and Table 10 shows the mean values of each original variable (TAGs) for each of the groups.

**Table 8.** Number of cases in each cluster (group)

|             |   |      |
|-------------|---|------|
| Group       | 1 | 509  |
|             | 2 | 144  |
|             | 3 | 137  |
|             | 4 | 280  |
|             | 5 | 163  |
| Valid Cases |   | 1233 |

The main patterns of each of the groups inferred from Tables 8-10 are the following:

- **Group 1** is characterized by high values of Factor 2 (positive) and small values (negative) of Factors 1, 3, 4 and 5.

**Table 9.** Final cluster (groups) centers (K-means method)

| Factors | Groups |        |        |        |        |
|---------|--------|--------|--------|--------|--------|
|         | 1      | 2      | 3      | 4      | 5      |
| 1       | -0.149 | -0.128 | 0.292  | 0.154  | 0.069  |
| 2       | 0.548  | -2.381 | 0.007  | 0.076  | 0.256  |
| 3       | -0.349 | -0.426 | 2.486  | -0.237 | -0.214 |
| 4       | -0.603 | -0.469 | -0.296 | 1.550  | -0.115 |
| 5       | -0.440 | -0.265 | -0.145 | -0.333 | 2.301  |

- **Group 2** is characterized by high value of Factor 2 (negative) associated with ICH and small value (negative) of the rest of the rest of factors.
- **Group 3** is characterized by high value of Factor 3 associated with natural spaces and its usage (NH and SNL) and small values of the rest.
- **Group 4** is characterized by high values of Factor 4 gastronomy, fish food and social practices (SRF and GF) and small values of the rest.
- **Group 5** is characterized by high values of Factor 5 associated with forms of collective socialization and organizations and crafts (SOC).

**Table 10.** Average of the tags for each Cluster (group)

| Tags       | Groups |      |      |      |      |
|------------|--------|------|------|------|------|
|            | 1      | 2    | 3    | 4    | 5    |
| <b>SMS</b> | 0.15   | 0.01 | 0.01 | 0.13 | 0.06 |
| <b>SOC</b> | 0.00   | 0.01 | 0.04 | 0.02 | 1    |
| <b>SNL</b> |        |      | 0.83 | 0.05 | 0.02 |
| <b>GF</b>  |        | 0.01 | 0.04 | 0.77 | 0.06 |

|             |      |      |      |      |      |
|-------------|------|------|------|------|------|
| <b>TC</b>   | 0.65 | 0.15 | 0.85 | 0.70 | 0.36 |
| <b>SRF</b>  | 0.09 | 0.01 | 0.03 | 0.56 | 0.40 |
| <b>KPNU</b> | 0.63 | 0.03 | 0.89 | 0.34 | 0.31 |
| <b>TOE</b>  | 0.39 | 0.01 | 0.03 | 0.05 | 0.23 |
| <b>NH</b>   |      | 0.02 | 0.58 |      | 0.01 |
| <b>ICH</b>  | 1.00 | 0.01 | 0.99 | 0.99 | 1    |
| <b>TCH</b>  | 0.12 | 0.97 | 0.61 | 0.27 | 0.21 |

F-test and the equivalent based on Wilks'  $\lambda$  has been run to check the ability of the factors to discriminate among groups resulting in rejection of the null hypothesis so that all factor discriminate well, specially factor 5, 2 and 5 with the highest power of discrimination in contrast with factor 1 with the less discrimination power (Table 11).

**Table 11.** Group mean equality tests

| Factors  | Wilks' $\lambda$ | F       | D.f. 1 | D.f. 2 | Sig.   |
|----------|------------------|---------|--------|--------|--------|
| Factor 1 | 0.973            | 8.39    | 4      | 1228   | 0.0000 |
| Factor 2 | 0.203            | 1201.74 | 4      | 1228   | 0.0000 |
| Factor 3 | 0.223            | 1072.73 | 4      | 1228   | 0.0000 |
| Factor 4 | 0.266            | 845.32  | 4      | 1228   | 0.0000 |
| Factor 5 | 0.184            | 1365.68 | 4      | 1228   | 0.0000 |

The exploratory analysis described in last paragraph allows concluding that the 5 factors identified in the Factor analysis are suitable to be considered as independent variables in the estimation of the four functions of the discriminant analysis that classified each entry of the database in the different groups through the discriminant function value (see section 1.2.2).

The fitness of the discriminant functions has been tested by means of Wilks'  $\lambda$  resulting in the rejection of the null hypothesis that discriminant functions (DF) only represent random variability so that they are all significant (Table 12).

**Table 12.** Contrast of the Wilks  $\lambda$

| Functions | $\lambda$ of Wilks | $\chi^2$ | D.f. | Sig. |
|-----------|--------------------|----------|------|------|
| 1 to 4    | 0.002              | 5542.82  | 20   | 0    |
| 2 to 4    | 0.014              | 3810.09  | 12   | 0    |
| 3 to 4    | 0.075              | 2316.88  | 6    | 0    |
| 4         | 0.343              | 959.338  | 2    | 0    |

Table 13 shows the standardized coefficients of the five factors (principal components) included as independent variables in the DFs. The higher these coefficients in absolute values are, the higher the association between them and the DF of the membership group.

**Table 13.** Standardized coefficients of canonical discriminant functions

|  | Discriminant functions |
|--|------------------------|
|  |                        |

|          | 1       | 2       | 3       | 4       |
|----------|---------|---------|---------|---------|
| Factor 1 | 0.1466  | 0.0980  | 0.1104  | 0.3069  |
| Factor 2 | 0.7535  | 0.0070  | 0.6294  | -0.3473 |
| Factor 3 | 0.3587  | 0.9014  | 0.0160  | 0.3976  |
| Factor 4 | -0.1793 | -0.4475 | 0.6330  | 0.6619  |
| Factor 5 | 0.8152  | -0.4041 | -0.4384 | 0.2351  |

The main patterns of each of the DF inferred from Table 13 are the following:

- **DF 1** shows a direct association with Factors 5 and 2 and inverse with Factor 4.
- **DF 2** shows a direct relation with Factor 2 and inverse with factors 4 and 5.
- **DF 3** shows a direct relation with factors 2 and 4, and inverse with factor 5.
- **DF 4** shows a direct relation with Factor 4.

Table 14 shows the correlation between factors and the scores of the discriminant function in order to measure their contribution to it by means of the pooled within-groups correlation matrix. These correlations are shown sorted from the highest to the smallest correlation and allow concluding the same the Table 13, but highlighting more relative weight of Factor 3 in DF 1 and more relative weight of Factors 1 and 4 (GF) in DF 4.

The discriminant function allow classifying each entry of the database using the Bayes' rule where a priori membership probabilities have been estimated using the proportion of the entries of the database of each group; and conditional probabilities are attained accounting that discriminant scores, calculated through linear combinations of Normal distributed factors, are also Normal distributed with mean and variance estimated according the scores of the discriminant function in each group.

**Table 14.** Structure Matrix

|          | Discriminant functions |         |         |         |
|----------|------------------------|---------|---------|---------|
|          | 1                      | 2       | 3       | 4       |
| Factor 3 | 0.6230                 | -0.4152 | -0.5294 | 0.3829  |
| Factor 2 | 0.2261                 | 0.7640  | 0.0160  | 0.5341  |
| Factor 5 | 0.5192                 | 0.0065  | 0.6860  | -0.5102 |
| Factor 4 | -0.0943                | -0.3167 | 0.5266  | 0.7430  |
| Factor 1 | 0.0211                 | 0.0190  | 0.0251  | 0.0940  |

Table 5 shows the forecast of the classification of entries of the database according reviewed probabilities using Bayes' rule compared to the original group of membership. Results show that 99,4% are correctly classified. Only 8 documents originally classified in group 1 are classified according discriminant analysis in groups 4 and 5 instead of group 1 (4 entries each).

**Table 15.** Result of classification using Bayes' rule

| Number of cases |   | Predicted Group |     |   |   |   | Total |
|-----------------|---|-----------------|-----|---|---|---|-------|
|                 |   | 1               | 2   | 3 | 4 | 5 |       |
| Original Group  | 1 | 509             | 0   | 0 | 0 | 0 | 509   |
|                 | 2 | 0               | 144 | 0 | 0 | 0 | 144   |

|  |   |   |   |     |     |     |     |
|--|---|---|---|-----|-----|-----|-----|
|  | 3 | 0 | 0 | 137 | 0   | 0   | 137 |
|  | 4 | 4 | 0 | 0   | 273 | 3   | 280 |
|  | 5 | 0 | 0 | 0   | 0   | 163 | 163 |

Table 16 shows the mean of original variable for each final group. The main patterns observed in the original variables per group are shown below:

- **Group 1** includes 513 entries of the database related to KPNU and TC. They are elements of ICH.
- **Group 2** includes 144 entries of the database related to TCH.
- **Group 3** includes 137 entries of the database related to KPNU, TC, SNL, NH, ICH and TCH.
- **Group 4** includes 273 entries of the database related to TC, GF and SRF. They are elements of ICH.
- **Group 5** includes 166 entries of the database related to SOC, one element of ICH.

Table 17 shows the distribution entries of the database per group of membership and country. Group 2 is one of the most relevant given that it is related to food provision services of SSF. Group 3 is second of importance followed by Group 1 that is especially important in Spain and Portugal. Group 4 shows significant differences depending on the country and Group 5 is the less relevant given that it refers to NH especially relevant for SSF.

**Table 16.** Average of the original variables in each final group

| Original binary variables (Tags)                                  | Groups     |            |            |            |            |
|---|------------|------------|------------|------------|------------|
|   | 1          | 2          | 3          | 4          | 5          |
| Traditions and oral expressions (TOE)                             | <b>0.4</b> | 0.0        | 0.0        | 0.0        | 0.2        |
| Social practices, rituals and festive events (SRF)                | 0.1        | 0.0        | 0.0        | <b>0.5</b> | 0.4        |
| Knowledge and practices concerning nature and the universe (KPNU) | <b>0.6</b> | 0.0        | <b>0.9</b> | 0.3        | 0.3        |
| Traditional craftsmanship (TC)                                    | <b>0.6</b> | 0.1        | <b>0.8</b> | <b>0.7</b> | 0.4        |
| Gastronomy and food (GF)  | 0.0        | 0.0        | 0.0        | <b>0.8</b> | 0.1        |
| Specific uses of natural landscapes (SNL)                         | 0.0        | 0.0        | <b>0.8</b> | 0.0        | 0.0        |
| Forms of collective socialization, organizations and crafts (SOC) | 0.0        | 0.0        | 0.0        | 0.0        | <b>1.0</b> |
| Sound shows music and sounds (SMS)                                | 0.2        | 0.0        | 0.0        | 0.1        | 0.1        |
| Natural Heritage (NH)   | 0.0        | 0.0        | <b>0.6</b> | 0.0        | 0.0        |
| Intangible Cultural Heritage (ICH)                                | <b>1.0</b> | 0.0        | <b>1.0</b> | <b>1.0</b> | <b>1.0</b> |
| Tangible Cultural Heritage (TCH)                                  | 0.1        | <b>1.0</b> | <b>0.6</b> | 0.3        | 0.2        |

**Table 17.** Classification of the inventory documents of each country according to membership group

| Country        | Groups |       |       |       |       |
|----------------|--------|-------|-------|-------|-------|
|                | 1      | 2     | 3     | 4     | 5     |
| Spain          | 27.6%  | 15.0% | 12.9% | 32.1% | 12.4% |
| France         | 38.8%  | 6.1%  | 20.4% | 24.5% | 10.2% |
| Ireland        | 46.6%  | 17.0% | 3.6%  | 5.8%  | 26.9% |
| Portugal       | 63.7%  | 3.2%  | 14.1% | 16.9% | 2.0%  |
| United Kingdom | 57.6%  | 5.1%  | 5.9%  | 12.7% | 18.6% |
| Total          | 41.6%  | 11.7% | 11.1% | 22.1% | 13.5% |

### 1.3. Natural heritage in the Atlantic area

Different relevant NH elements related to SSF and their ecosystem has been identified in the framework of CABFishMAN project in order to characterize it. It is worth noting that most of the relevant NH is part of EU network of Marine Protected Areas (MPA - Agnesi et al., 2017; EEA, 2015; Ojeda-Martínez et al., 2009; Reker et al., 2017) so that this deliverable did not go through a list of all them but present relevant case studies of it. Additionally, it has been included in the database the NH when it is specifically related to a certain cultural heritage of mentioned in it.

#### 1.3.1. Case studies of SSF natural heritage in the Atlantic Area

- Spain.
  - **Fish nursery grounds of the coast of Huelva.**

This natural heritage element located in Huelva (NUT 3: ES615) involve the locally known wedge sole and prawn nursery grounds (since 1966), and the adjacents and/or overlying reserve of the mouth of the Guadalquivir River, the shellfish reserve of the coast of the province of Huelva, the *Marismas del Río Piedras y Flecha del Rompido* natural site; and *Marismas del Odiel* natural site. This area constitutes a natural area of Outstanding Universal Value that constitutes an example of ecological and biological processes that support the entire marine ecosystem of the Gulf of Cádiz generating an important socioeconomic activity (fishing, agriculture, tourism, industry,...(Baldo, 2002; Caballero et al., 2014; García-Isarch et al., 2006; Jiménez et al., 1998; Llope, 2017; I. Sobrino et al., 2005; Sobrino Yraola et al., 2005).
  - **San Juan de Gaztelugatxe Biotope (Basque Country, Northern Spain).**

This marine reserve was selected as the most interested sites along the Basque coast based on ecological, landscape setting and cultural values. This reserve includes submarine caves, rocky marine arches and islands. The spectacular nature of its cliffs and islets, capriciously perforated by the erosive action of the sea, is joined by balanced human intervention in Gaztelugatxe, crowned by the

chapel of San Juan and linked to the land by a stone bridge and a narrow path, making it a peninsula.

It is an area of exceptional natural beauty and aesthetic importance which accumulate titles of "most voted marvel" or enclave "most valued" by travelers from all over the world.

- **Os Miñarzos marine reserve of fishing interest.**

Os Miñarzos is the first Reserve of Fishing Interest on the Atlantic coast of the Iberian Peninsula. It was created on the initiative of the fishermen's guild of Lira (Carnota Town Hall, province of La Coruña). The fishermen participated from the beginning in its design, supported by technicians - biologists, and in its implementation.

It is a legally protected marine area designed to promote sustainable use and protect its natural and cultural heritage.

Its main objective is the recovery and conservation of the populations of exploited species, enabling the sustainability of fisheries in the marine ecosystem.

Thus, the aim of the reserve is to regulate fishing activities, in order to conserve the exploited species, as well as to guarantee the sustainability of the marine ecosystem. To this end, access to fishing activities is limited and the catches made are controlled.

Located in a privileged area, at the beginning of the Costa da Morte, between the heart of Corcubiión and the estuary of Muros and Noia, near the Fisterra lighthouse (Finisterre), and Mount Pindo (the Celtic Olympus), to the undoubted ecological values of its submerged area we add those of the emerged part. Wide chains of dunes, in which the chorlitejo patinegro nests, marshes, beaches (the beach of carnota the longest in Galicia, 5 km is in its scope), wetlands. They make of the reserve and its environs a privileged place for the observer of the nature.

- France.

- **Picards estuaries and d'Opale Sea Marine Natural Park.**

This natural heritage element located in Pas de Clais (NUT 3: FRE12) involve an area of 2342 km<sup>2</sup> of sea and estuarine areas (since 2012). This Marine Protective Area involve a very relevant ecosystem next to most important fishing port in France (Boulogne-sur-Mer). This area constitutes a natural area of Outstanding Universal Value that constitutes an example of ecological and biological processes that support an important marine ecosystem in the North Sea and Mancha Channel generating an important socioeconomic activity (fishing, shellfish-gatherers, recreational activities, tourism, maritime transport...). (<http://www.aires-marines.fr>, Rodríguez-Rodríguez et al., 2015).

- **D'Iroise Marine Nature Park.**

This natural heritage element located in Finistère (NUT 3: FRH02) involve an area of 3500 km<sup>2</sup> of sea (since 2007). This is the first Marine Natural Park in France. This area constitutes a natural area of Outstanding Universal Value which is an example of superlative beauty that includes 6 relevant sites: Ushant and satellite islands, island of Molene, the coast of Crozon; the bay of Douarnenez, the road of Sein island; and the high sea area. It also involve an example of biodiversity

including mammals and several threatened species; and of ecological and biological processes that support an important marine ecosystem in the English Channel generating an important socioeconomic activity (fishing, recreational activities, tourism, maritime transport...)(Alban, Pennanguer, & Sabourin, 2004; Frangoudes & Alban, 2005; Sabourin & Pennanguer, 2003, <http://www.parc-marin-iroise.fr>).

- **Gironde estuary and Pertuis Sea Marine Nature Park.**

This natural heritage element located in Gironde (NUT 3: FRI12) involve an area of 6500 km<sup>2</sup> of sea (since 2008) includes an important natural heritage of superlative beauty: Gironde estuary, Pertuis Sea and high sea. It also involve an example of biodiversity including threatened species like sturgeon; and of ecological and biological processes that support an important marine ecosystem in the area due to important nutrients inflow from river. This marine nature park generates an important socioeconomic activity (fishing, recreational activities, tourism, maritime transport, industry...- [www.aires-marines.fr](http://www.aires-marines.fr))

- Portugal.

- **Arrábida Marine Park.**

This Natural Heritage element is located in a region (NUTS II: Lisboa, PT170) with a long history of human uses. Given its marine habitats (Batista et al., 2015; Cunha et al., 2014) and species richness (Alves, 2008; Batista et al., 2015; Henriques et al., 1999), there was the need to manage human activities in this region. The spatial regulation of the Arrábida Marine Park was established in 2005. It followed a stepwise procedure and the management plan was fully implemented only in mid-2009. The main objectives of the marine park are to enhance the conservation of local marine biodiversity and promote sustainable fisheries management (e Costa et al., 2013; Gonçalves et al., 2002; Pita et al., 2020; Vasconcelos et al., 2012). Several studies conducted in the area addressed the effectiveness of the implemented spatial measures. Overall, results show some positive aspects, but the full potential of the area depends on proper enforcement and perhaps some design improvements (Batista et al., 2015; Horta e Costa et al., 2018; Sousa et al., 2018).

- **Southwest Alentejo and Vicentine Coast Marine Park (Parque Marinho do Sudoeste Alentejano e Costa Vicentina).**

The Southwest Alentejo and Vicentine Coast Marine Park stretches along 130 km of a predominantly rocky coastline (NUTS II: Alentejo & Algarve, PT181 & PT150). Given that it includes an area of 2 km wide along the shore, its overall size is about 290 km<sup>2</sup> (Castro, 1996). Fully protected areas consist of 100 m around nine islets, which only make up 0.2% of the MPA area. The four partial protection areas thus are the main protection features, as they make up about 8% of the total area and exclude extractive activities (Horta e Costa et al., 2018). The region favours the occurrence of many marine species (Castro, 1996; Horta e Costa et al., 2018; Viegas, 2013). The MPA implementation aimed to preserve natural, historic and cultural values, promoting sustainability of human activities in the region (Horta e Costa et al., 2018). Some studies have already demonstrated preliminary positive trends related with this MPA (Belo et al., 2016; Castro et al., 2015; Pereira et al., 2017).

- **Caldeirinhas Natural Reserve.**

Located in an offshore archipelago (Azores), the Caldeirinhas Natural Reserve (NUTS II: Açores, PT200) is an example of the importance of sheltered environments in oceanic islands. It was established in the early 80's as a no-take area. It was created in order to provide protection to the local biological and geological values (Decreto Legislativo Regional n.o 46/2008/A). Several commercially important species can be found in the area. The blacktail comber (*Serranus atricauda*) and dusky grouper (*Epinephelus marginatus*) have shown site attachment to this area (Afonso et al., 2016), which provides an example of the potential of small marine reserves.
- United Kingdom.
  - **Studland to Portland Special Area of Conservation.**

Much of the sea around and to the south of Portland is protected as part of the Studland to Portland Marine Protected Area (MPA). These protected waters range from the shallow, rocky shores and plunge to depths of over 80 metres south of Portland Bill. The site has been made an MPA to protect reef habitats in the waters around Portland which are regarded as being of excellent quality and supporting a high number of plant and animal species. The MPA is hugely popular with many different sea users including divers, anglers, commercial fishermen, sailors, and those on land who walk, run or cycle the coastline to enjoy dramatic sea views and watch the local wildlife (<http://www.dorsetmpas.uk/>, <https://sac.jncc.gov.uk>).
  - **The Chesil and fleet lagoon marine protected area.**

The MPA contains England's largest lagoon. Variable temperatures and salinities occur across the area, resulting in fewer kinds of fish and other marine life. However, the waters do support some small-scale fisheries that date back centuries and continue to operate today. Historical and abandoned fishing gear remain on the shores to this day. The lagoon is used by a small number of commercial net fishermen who target grey mullet and herring and mackerel. Other vessels use pots to catch green shore crab. The Fleet MPA also supports a European eel fishery (<http://www.dorsetmpas.uk/>, <https://sac.jncc.gov.uk>).
  - **Lyme Bay and Torbay marine protected area**

Lyme Bay's reefs are key part of a Marine Protected Area (MPA), covers large areas of seabed. The MPA protects places like rocky and stony reefs as well as seafans, rare corals and abundant fish and shellfish populations. Lyme Bay Reefs are hugely popular with local fishers, anglers and divers for either commercial or recreational activities. Lyme Bay's marine life also provides a social value, as it forms part of the area's cultural heritage. Several local events, incorporating arts, crafts, music, food and education are associated with marine life and people's livelihoods. The fish and shellfish fisheries are well-established within Lyme Bay. In 2015 they were valued at around £1.7 million and supported approximately 45 commercial fishing vessels landing over 1,000 tonnes of fish and shellfish within the Lyme Bay area each year (<http://www.dorsetmpas.uk/>, <https://sac.jncc.gov.uk>)..
- Ireland
  - **Skellig Michael.**

This natural heritage element located off county Kerry (NUTS III - South-West Region, Ireland IE053) within ICES subdivision VIIj are towering sea crags rising from the Atlantic Ocean almost 12 kilometres west of the Ivereagh Peninsula in County Kerry. Located at the western edge of the European landmass, Skellig Michael was the chosen destination for a small group of ascetic monks who, in their pursuit of greater union with God, withdrew from civilisation to this remote and inaccessible place. Sometime between the sixth and eight centuries, a monastery was founded on this precipitous rock giving rise to one of the most dramatic examples of the extremes of Christian monasticism. Skellig Michael is situated in spawning and nursery grounds of numerous important fish species such as whiting, herring, black-bellied and white-bellied monkfish, hake, cod, haddock, mackerel and horse mackerel. Skellig Michael is one of Ireland's most important sites for breeding seabirds both in terms of size of colonies and diversity of species ([www.worldheritageireland.ie](http://www.worldheritageireland.ie)).

## 1.4. Cultural heritage in the Atlantic area

### 1.4.1. Historical fishing importance as the origin of today's cultural heritage

Current cultural heritage of the Atlantic area related to fisheries is an expression of the importance of fishing activity in the past along this area. This importance is summarized for different sites of the area during the last century in the following bullets:

- Spain.

- Asturias Coast.

In the middle of the 18th century, 2% of the regional product came from fishing, and Asturias contributed between 5-8% of the fishermen (2,108) and boats (238) of the Spanish fishing sector (Ocampo Suárez-Valdés, 2006b). In that period, the Asturian ports were specialized: those located in the centre towards the canning industry and off-shore fishing, and those in the east and west towards the artisanal fishing of high-value species for fresh consumption (Ocampo Suárez-Valdés, 2006b). The growth of fishing in the first decades of the 19th century was extensive, with total control of family and artisanal fisheries, without exclusive dedication to métiers and combining seasonal fisheries (*costeras*) with fishing for demersal or bottom species. In 1845 there were 3,082 fishermen and 420 boats (Ocampo Suárez-Valdés, 2006b, 2006c). From 1873 onwards, the fishing business grew thanks to the entry of new investors, the modernisation of gears promoted by the Asturian canning industry to ensure regular supplies, the urban and industrial development, and the possibilities of marketing fresh fish by railway to inland areas since 1884 (Ocampo Suárez-Valdés, 2006c, 2006a). The purse seine, much more productive than the traditional *abareques* and *xeitos* (drift nets), was accompanied by the rapid spread of 11-12 m rowing boats (*traineras*). Although the arrival of steamboats (*vaporas*) from 1880 and motorboats from 1920 opened the way for industrial fishing, the traditional gears were still competitive for species of high commercial value for fresh consumption and salting.

Just one century ago, Asturias experienced the most flourishing period in its fishing history. During the First World War, artisanal vessels took advantage of the decline of the industrial fleet; the census of new rowing boats accelerated and the Asturian fish markets registered landings that would place them at the head of the Cantabrian Sea: from 17,185 tons landed in 1921 to 28,950 tons in 1931 and 3,300 fishermen. Sardine, bonito and tuna, followed by anchovy, hake, molluscs and crustaceans were the main species landed (Ocampo Suárez-Valdés, 2006a). Between 1920-1930 the coastal fleet progressively adapted to the new motor propulsion (Ocampo Suárez-Valdés, 2006a). With the increase in exports to Spanish inland zones and the arrival of salted anchovies industries, the purse seine (*cerco de jareta*) was replaced by *tarrafas* towed by motor vessels. In 1933, Asturias provided almost 10% of the national fishing production, with 1,371 registered vessels (214 steamboats, 346 motorboats and 811 sailing/rowing boats), 6,403 crewmembers, and more than 23,000 tons landed (Rodríguez, 2006). But in the 1930s overfishing consolidated and weakened the local fishing grounds; although the artisanal fleet underwent a major renovation and technical advances allowed Asturian trawlers to engage in deep-sea fishing (Ocampo Suárez-Valdés, 2006a), the fall in prices, the canning crisis, the rise in fuel costs and the growing

labour conflicts weakened regional fisheries (Rodríguez, 2006). The Spanish Civil War (1936-1939) also reduced the sector by almost 40%. Although in the 1940s Gijón was the most important port, it would lose its primacy in the 1950s in favour of Avilés. In 1950, Asturias had 1,307 vessels (147 steamboats, 497 motorboats and 663 sailing/rowing boats), 7,218 crewmembers, and more than 21,000 tons of landings (Rodríguez Rodríguez, 2006).

In the following decades fishing consolidated its recession. The depletion of species such as hake, sardine and bonito (the highest landings had been reached earlier in Asturias than in other areas of Spain) was coupled with rising costs, the obsolescence of the fleet and the strong flow of labour to the booming industry in the centre of Asturias (Rodríguez, 2006). At that time, 40% of landings were still destined for industry (canning and salting), with 40 canneries in Asturian ports (Fernández García, 1983, 1992). In the 1970s, the deep-sea fleet disappeared and Asturias had only 20 canneries (650 jobs), 808 registered vessels, 3,122 crewmembers and just over 17,000 tons landed (Fernández García, 1983; Rodríguez Rodríguez, 2006). The region had also lost its weight in the national context (4.7% of total landings in 1955, 2% in 1974) and regional context (in 1960 fishing provided 1.04% of GVA; in 1975 0.61%) (Fernández García, 1983, 1992).

The artisanal fleet has continued to be the majority; in 1994 the regional fleet had reduced to 645 vessels (2,058 crewmembers and 23,000 t landed in Asturian ports) and in 2004 to just over 400 (1,522 crewmembers and almost 17,000 t). Currently, the 18 fishing ports have some 250 vessels, the fishing sector (catching activities) generates 1,500 direct jobs (among fishermen, shellfishermen, land-related jobs, etc.) and represents 0.2% of the regional GDP (SADEI, 2012) and 0.3% of the economically active population. Industrial fishing and the canning industry have very low relevance, and more than 85% of the fleet is considered artisanal. In this century, landings in Asturian ports have been, on average, 20,000 t/year and € 48 million, with a constant growth in first sale incomes in the last 5 years (almost € 63 million in 2019). The main species landed are mackerel, hake, bonito, blue whiting, sardine and anchovy. Paradoxically the regional weight of the artisanal fleet today is quite similar to that of a century ago (Ocampo Suárez-Valdés, 2006a) (between 1908-1915 86% of the regional fleet, 735 vessels, were artisanal, unloading 38% of the total weight and 50% of the auctioned value).

- Basque Country

For centuries the world of fishing in general, and the world of artisanal fishing in particular, it hardly underwent any major changes. Systems wrote by Sañez Reguart in his *Diccionario Histórico de las Artes* published at the end of the 18th century, are practically identical to those mentioned in the *Benigno Fishing Gear Dictionary* Rodríguez Santamaria in the early 20th century. From its very beginning the 20th century brought substantial changes in all the areas of society. The world of fishing could not be unaware of. They, and among other important consequences, led to the emergence of the industrial fishing. Although in a very mitigated way this "revolution" also arrived at the artisan fishing. However, from a global perspective one could not speak of changes but rather of adaptations that have allowed to maintain his "character".

For the 1930s, it could be said that the inshore fleet of the main Basque fishing ports was almost entirely mechanized with almost 6,000 fishermen and 1,386 vessels. These were disaggregated between: 262 steam engines for nets and hooks; 394 motor engine vessels, being the remaining (730) small boats.

The distribution of the catches, in this case, in addition to confirming the radical change in the of the landings of the artisan ports of Biscay and Gipuzkoa, also offers some clues about the reasons for this typological evolution of catches and the differences that were going to appear between the different fishing villages. Demand from the processing sector brought about the increase spectacular catches of anchovy, which until then had been marginal. In some ports like Ondarroa or Getaria, clearly became the main fishery. In Bermeo, on the contrary, bonito was as important or more, not so much because of the volume of landings as well as by the percentage it represented of the total value of sales in that port. In Santurtzi or San Sebastian, even though weight of the anchovy did not cease to be important, the urban demand and the nearby industrial centers would make the sardine the main and most profitable coastal species. Overall, the Basque ports landed more than 14 million Kg of landings.

For its part, industrial fishing experienced rapid growth after the First World War, which was the result of both technical and organizational innovations, as well as geographical expansion. Until the War, Donostian trawlers fished mainly in the fishing grounds closest to the Basque coast, along the Bay of Biscay and the southern coast of France. Despite initial failed attempts to use the British model known as Beam Trawl, the system used by the first trawlers was Pair trawlers. However, as already mentioned, the development of the fleet was quite limited to 1914. During the 1940s Bizkaian trawlers experienced a major boom due to the growing demand for fish from domestic markets and, in particular the ease with which public funding could be accessed. And therefore, moving from 2 vessels (390 TRB) in 1920 to 56 (4.336 TRB) in 1946 and reaching 100 vessels (18,919 TRB) in 1973. Overall, the offshore or industrial Basque fleet increased the TRB from nearly 30,000 in 1933 to 80,000 TRB in 1973.

The period between the mid-1940s and early 1970s, although at different rates depending on the both sectors, was of great growth and could probably be labelled as the golden age of fishing on the Basque coast. Both Bizkaia inshore and offshore Basque fleets represented 5,000 t in 1906 growing up 60,000 in 1980. While in Gipuzkoa, these fleets grew up 120,000 t in 1964.

- Gulf of Cádiz.

Gulf of Cádiz coast –Huelva (ES615) and Cádiz (ES612) Spanish provinces – is one of the fishing areas with more fishing tradition in the Atlantic Area. There was a flourishing fish salting industry –*cetariae*- that exported dry and wet salted tuna all around the Mediterranean coast since more than 2000 years ago to nowadays in different ways. There were 10,771 fishermen together with other 2755 operating beach fishing gears, catching shellfish in beaches, maintaining nets and fishing gears, or trading fish; and 1,965 working in canning and other fish transformation industries, a century ago. As a whole, the employment depended from fishing was more than 5% and even higher than 80% of coastal communities in the Gulf of Cádiz.

The fleet composition in century ago is described below:

- 40-45 steam engine purse seiners (galeones tarraferos),
- 100-120 steam engine trawlers targeting crustaceans in the Gulf of Cádiz and Morocco,
- 300 gas engine small boats operating seining and trawling close to the coast,

- and small sailing (931) and rowing boats (663) equipped with different fishing gears (traps, dredges, rake, fishing lines,...)

The aforementioned fleet captured around 50,000 T. including captures of tuna traps. Additionally, sixty salting and canning factories employed 2,000 people (75% were women). Factories processed the capture of the industrial fishing fleet or they trade their capture to Spanish central market by train. Canned fish was exported to France and Italy, while salted fish was traded in the east of Iberian Peninsula. This situation continued in similar extension and some technological milestones (steam trawlers were introduced in 1904, steam seiners were introduced in 1908, otter trawlers in the decade of the 1920 in the ) between the end of the XIX century and decade of 1960. There were to relevant changes during the decade of the 60ths:

- the development of long distance trawling fleets exploiting overseas fishing resources,
- the introduction of big purse seiners,
- and the motorization of the whole artisanal fleet.

These changes results in the historical peak of landings of 186,000 T. in 1966 (527.2 M€ nowadays). This level of landings continues until the end of the 70ths and then begin to decrease to current levels of around 30,000 T (182 M€ first sale value).

There were two dozen of tuna traps at the beginning of the 20<sup>th</sup> century that caught between 12,000 and 20,000 T. The number and catches of tuna traps decreased sharply during the 20th century to a capture of 1,400 T in 1968. Most of the tuna traps that continued set were located in the Strait of Gibraltar. There are 4 tuna traps targeting bluefin tuna nowadays in the Strait of Gibraltar. The las tuna trap located in Huelva disappeared in 1985.

The small scale fleet in the Gulf of Cádiz was composed of sailing and rowing boats until 1960s that were replaced during this decade by small scale motor boats due to public funding (Spanish Law of Fishing Social Credit). These motor boats were equipped with tow rake to target bivalves—the stripped venus (*Chamelea gallina*, Linnaeus, 1758) was present in main Spanish fish markets-, gill nets, purse seine and trawl fishing gears. The sharp decrease of the fish population of stripped venus in the area in 1970 resulted in the exit of the part of the fleet targeting this bivalve and the expansion of seining to target sardine and anchovy for fresh consumption; and mackerel for canning industry that continue being of significant importance nowadays. The increasing of octopus price in Spanish fish markets resulted in the introduction of the clay pot (*alcatruz*) fishing gear since the end of the decade of the 1970s. Nowadays still exists a small number of rowing boats that target cephalopods and rock fishes; and an important bottom-set longlines fleet has located in the Strait of Gibraltar targeting black-spot seabream.

Fishing activity has decreased drastically nowadays. It employs 3,857 fishermen, 181 shellfish-gatherers and 1,811 workers in auxiliary activities of fishing (wholesale markets, networkers, boat yarding,...). Transformation industry employs around 1,767 workers and the indirect employment as a whole is 7,767 people. The fleet consists of 840 fishing vessels equipped with bottom trawl (148), purse seine (79), dredges and rakes (173); and longline and other artisanal fishing

gears. Among this artisanal fishing gears highlights the clay pot and trap fishing fleet that targets octopus and involves 120 boats.

- Portugal.

Despite Portugal being a small country (in terms of land area), it has a long extension of coastline with 1860km and it has long history of fishing along the coastline, but also throughout many other regions of the Atlantic Ocean. One of the most important fishing sectors used to be the cod fishing in the north Atlantic. The captured cod was processed onboard the fishing vessels where they were degutted and salted to allow their preservation. This process, even though modernized, still exists in today and the salted cod is one of the most appreciated and culturally important dishes in Portugal. Besides the cod fishing, there were several other species that were very relevant in terms of value for the livelihood and culture for those who lived from the fishing activity, such as tuna, sperm whales, sardines, mackerels, and molluscs (mainly octopus and cuttlefish).

In the middle of the last century, the fishing activity in Portugal had a very considerable population of nearly 46 000 people working directly in the fishing sector. These were mainly employees (36 281) working for the 1062 employers registered at the time. There were a significant number of self-employed workers (7 072) and non-paid family workers were also present these days (1 162).

The fleet composition in the middle of the last century was as followed:

- A total of 17 685 registered vessels. These were mainly non-motorized vessels (13 508) and the remaining were motorized (4 177)
- The majority of the fishing vessels (84%) were from the smaller class (up to 5 tons) and there were 14 928 fishing vessels registered. 88% of these were operated without motor, whilst the remaining 12% were motorized.
- Vessels from 5ton to 25 tons represented the second most important class of vessels (10%) and again their majority were operated without motor (88%) and the remaining 12% were powered by an engine.
- The majority of vessel within 25 -50 tons were engine operated (98%) and this class of vessels represented 3% of the total number of fishing vessels in Portugal.
- Vessels with a tonnage higher than 50tons were all engine operated. These vessels represented 2% of the entire Portuguese fishing fleet.

The total captures by the aforementioned fleet used to be more than 365 000 tons. The specie that mostly contributed for this value was the sardine followed by the cod and the mackerel. Codfish was the most valuable landed specie, representing a value of 559 543 000 ESCUDOS (today corresponding to 2 791 016 EUROS), from the total value landed of 2 225 326 000 ESCUDOS (11 099 990 EUROS today). The sardines and mackerels followed as the most valuable landed species. Part of the captures were also exported mainly for other European countries and for the ex-colonies. During the year of 1969 were exported 87 309.2 tons of seafood, corresponding to a total value of 1 404 655 000 ESCUDOS (7 006 459 EUROS). Within these exported products, the most important were frozen or refrigerated fish, oysters, and canned sardines and mackerel. Another very important exported product was the cod liver-oil, a sub product derived from the cod fishing activity.

Nowadays the fishing activity has made a dramatic change with a very significant decrease in most of its components. In the present years, the fishing activity employs a total of slightly more than 14 600 people. The fleet has also seen a dramatic reduction in the number of registered and operating vessels. In 2019 the number of registered

vessels was 7 768 vessels, of which only 3 902 were licenced to operate. The majority of the fishing vessels (about 90%) were vessels with a total length lower than 12m, and the fixed gears have been the mostly used in the present by this fleet segment. The total of captures saw a very significant decrease, changing from 365 423 tons (in 1970) to 188 537 ton in 2019.

- United Kingdom - Jurassic Coast: the Dorset and East Devon Fisheries.

The FLAG area is comprised of eight fishing communities with a population of around 103,000. Small fishing communities include Beer, Axmouth and Seaton, Lyme Regis, West Bay, Portland, Weymouth, Lulworth and Swanage.

The local fishery has a range of fish and shellfish species and the area has one of the largest concentrations of under 10m fishing vessels in the country.

The Lyme Bay Fisheries and Conservation Reserve is located in the area and there are a number of Marine Protected Area (MPA) designations. MPAs associated with the area include the fleet lagoon, Lyme bay, Chesil & Stennis, Portland, Purbeck and Poole rocks.

Dorset's small fishing communities date back centuries, with a number of traditional fishing methods still used in the present day. The small-scale fisheries are often characterised by family run businesses selling products to local markets.

Currently in the FLAG area, there is a fleet of 127 registered vessels based at seven ports, and a number of vessels fishing beyond the 6 NM limit, some of which land their catch here. An average of 3000 tonnes (live weight) is landed at these ports annually but there has been a decline in fish landings from 2010 to 2014. The commercial fisheries landings are primarily shellfish and whelk has been the main target species during this period with landings increasing.

Recently the fishing industry in the area has been in decline due to reduced economic viability. Aging infrastructure and equipment in ports and harbors make some unfit for purpose, with potential health and safety implications to local fishers as well as reducing the viability of the industry itself.

Future projections of increased storm events under climate change scenarios could affect the industry more in future. For example, there was some concern that fishing was restricted in 2015/2016 due to adverse weather events over winter months.

The management of some marine designated sites has not yet been agreed but could potentially mean restriction for certain types of fishing gear.

- Ireland.

Ireland, as an island nation, has a history of fishing as long as humans have settled it. Ancient Irish mythology depicts the salmon of knowledge as the fountain of wisdom which provided the Celtic hero Fionn Mac Cumhaill with otherworldly knowledge. Fishing in Ireland in millennia past were carried out on the rivers and the bays all around the coast including exploitation of shellfish beds in coastal areas. Prehistoric remains of shells have been found throughout the country proving long term consumption.

Fishing in Ireland over the last number of centuries was heavily influenced by English colonisation and the control of London over the fishing activity of Irish people and access to the rich fishing grounds around the coastline. From the 15th century onwards access to Irish waters was sold to other European countries such as Spain and the Netherlands. Specific regulations imposed on Irish people in Ireland stymied the development of the Irish fleet (such as salt taxes for curing and adding value to fish)

and therefore led to the Irish fleet being characterised as small scale and of low capacity (Roney, 2019).

When, in 1818, the Dublin fishing company was set up to supply the Dublin fish market trawling was practically non-existent in Ireland. The company bought 8 trawlers and imported English captains and seamen to operate them, (Mac Con Iomaire, 2005). By 1916 there were 4,321 craft of all sizes involved in sea fishing in Ireland with 15,789 men and boys employed as crew. However, many of these were vessels of smaller tonnage, principally involved in small-scale fishing within a few miles offshore (Thom's-Directory, 1919). Based on reports from 1910 – 1928, 'the number of steam trawlers on which reliance can be placed for the maintenance of regular supplies of white fish – engaged in landings in the Saorstát (Irish Free State) is seven only, an insignificant number having regard to the existing demand for this type of fish' (Ó Brolacháin, 1932).

Historical landings databases show that Irish landings totalled around 50,000 tonnes in the early twentieth century (1904-1905) mainly composed of mackerel and herring. Landings declined significantly post world war 1 and throughout the 1930's total landings rarely reached above 15,000 tonnes. It was not until 1952, with the establishment of Bord Iascaigh Mhara (BIM), the Irish state agency responsible for developing the Irish Sea fishing and Aquaculture industries, that the fishing fleet began to modernise and increase landings (Mac Con Iomaire, 2005).

Today, there are just over 2,000 registered fishing vessels in Ireland with the majority being small scale vessels (~1,500 below 10m LOA plus ~230 between 10-12m LOA). Over 3,000 crew are employed in the Irish fishing fleet in 2019 providing the raw material (>200,000 tonnes, along with the aquaculture sector) for the processing sector that employs over 4,200 employees. Downstream it is estimated that 7,000 employees are generated through the indirect and induced effects of the Irish seafood sector leading to total employment estimates of over 16,000 for the Irish seafood sector. The Irish small scale fleet is mainly composed of polyvalent potting or polyvalent general vessels where the main gear used is pots and creels with brown crab the main target species.

#### 1.4.2. Case studies of SSF cultural heritage in the Atlantic Area

- Spain.
  - **Chanca of Conil de la Frontera.**

This immovable tangible cultural heritage element is located in *Conil de la Frontera* (Cádiz – NUT 3: ES612) and it is the remaining of the salting factory of a tuna trap settled in this small village dated in XVI century. This building also devoted to store boats and tuna trap fishing gear was built by Medina Sidonia Duke between 1540 and 1560. This installation was surrounded by an important commercial activity those times and is a cultural heritage of outstanding universal value as a testimony of fishing culture tradition that plays an important role in the cultural history and sea uses. It was recognized by Andalucía regional government as cultural interest good (BIC) in the category of ethnological interest place in 2002 and restored in 2014, not without controversy (Asociación de Amigos del Patrimonio Cultural y Natural de Conil, 2014; IAPH, 2002; Jiménez de Madariaga, 2016; Santos García, 2003).
  - **Nueva Umbría Tuna Trappers Installations and Buildings.**

This immovable tangible cultural heritage element (1928-1963) is located in *Marismas del Río Piedras y Flecha del Rompido* natural site [Lepe (Huelva - NUT 3: ES615)] and it is one of the capital good of the tuna trap, locally called Almadraba, of Nueva Umbría. This group of buildings, locally called *Real*, are the camps for storehouses for fishing gear; and houses of sailors and workers. It was recognized by Andalucía regional government as cultural interest good (BIC) in the category of ethnological interest place in 2015. This group of buildings constitutes a cultural heritage element of Outstanding Universal Value as an example of the architectural land structure of tuna traps and the settlements of workers and sailors linked to them along the Mediterranean and Gulf of Cádiz coast to catch tuna since Roman times that represent a relevant element of this coastal community's history in this area. This tuna trap installations and buildings are one of the expressions of Almadraba cultural good characterized by many ethnological dimensions of intangible cultural heritage (Del Valle Mesa, 2019; Florido-Corral, 2013; Florido del Corral, 2017; IAPH, 1989; Ruiz & López, 2002).

- **Sorolla's canvas paintings of fishing customs.**

The cambas of *La Pesca del Atún* (the fishing of tuna - 1919) is one of the works of Valencian painter Joaquín Sorolla Bastida (1863 - 1923). This masterpiece commissioned by the Hispanic Society of America as part of the collection *Visiones de España* is an example of the way fishing practices has inspired multiple work arts. This painting represents the trading of tuna in Ayamonte and it's currently exposed in the museum of The Hispanic Society of America (New York). It was inaugurated in 1926 and temporally exposed in Spain from 2007-2010 attracting more than 2 millions of visitors. Sorolla's paintings of fishing are a movable tangible cultural heritage element of Outstanding Universal Value as a masterpiece of human creativity and a testimony of cultural tradition and customs of Andalucía (Anderson, 1957; Llombart, & Tomás, 2007, [www.hispanicsociety.org](http://www.hispanicsociety.org)).

- **The Ronqueo of the tuna.**

The association of tuna friends of Isla Cristina organizes annually the tuna cutting, locally called *ronqueo*, in a traditional way. The tuna cutting take place in *La Almadraba* square of this village where the tuna trap of *Las Cabezas* was settled until 1967. The local name of the tuna cutting come from the Spanish *roncar* which means snoring which is very similar to noise that the knife produce while chafe against the spin bone of the tuna. The professional in charge of the *ronqueo* (*ronqueador*) cut, take out the entrails and butchering in different steps until finishing. The different cuts and entrails are used for fresh consumption, salting or canning. The *ronqueador* is a mastery of the technique of cutting, has a deep knowledge of the parts and entrails of tuna; and the utensils used in his performance. The public that attend to this performance taste different cooks and parts of tuna when the *ronqueador* has finished. The association of tuna friends and tuna thematic weeks is mentioned in the file of protective geographical indication: Mojama de Isla Cristina (Llorca Ibi, 2017; Martinez Alba, 2019)

- **Clay pot (*alcatruz*) fishing gear of the Gulf of Cádiz.**

The clay pot, locally called *alcatruz*, is an artisanal fishing gear used to catch octopus in the Mediterranean and Atlantic coasts of the Iberian Peninsula (Spain and Portugal). There is evidence that the the local name of this fishing gear comes

from the Arab's artisanal utensil called *arcaduz* knotted to water mills wheel that was used by fishermen to catch octopus placing it in the bottom fishing grounds as they could attract octopus in their shelter seek (Mateus Ventura, 2002). This fishing gear consists of clay pots rigged to long lines (Sañez Reguart, 1795) and its characterized to be very selective given that it only target octopus whose size is closely related to size of the octopus. This artisanal fishing gear is also environmental friendly in contrast with pots make of plastic due to the high number of pots losses (Borges et al., 2015; Ignacio Sobrino et al., 2011). This traditional fishing gear is an example of intangible cultural heritage as traditional craftsmanship that has been transmitted through generations of fishermen that applied their knowledge of the behavior of octopus to catch it in the Iberian Peninsula (Jiménez de Madariaga & García del Hoyo, 2014). It is necessary the protection of this traditional fishing gear for its benefits and preservation of fisheries culture due to the decreasing of the importance of fishing sector in coastal communities due to low profitability and overexploitation, the international competence in fishing market or the standardization imposed by regulations.

- **El Angulero, a typical Christmas character.**

This Intangible Cultural Heritage element represents rituals and festive events (SRF) linked to artisanal fisheries in Asturias. *El Angulero* (*L'Anguleru* in Asturian) is a traditional character who brings gifts to Asturian children on Christmas Eve. According to the popular culture, *El Angulero* lives all the year round in the Sargasso Sea until he arrives in Asturias in winter in his vessel called *L'Angulina* on the night of 24th December, when he takes advantage of the occasion to fish glass eel; with the money from its sale he buys presents for the children. *El Angulero* personifies the glass eel fisherman, artisanal fishery carried out on foot or with small boats of great tradition in some Austrians estuaries in November and December (above all, for Christmas). He arrives in the village of San Juan de La Arena through the *Nalón* River, where the inhabitants receive him on a parade, after which he continues to visit Asturian homes. This myth is the protagonist of carols, puppets, stories, theatrical performances and Christmas parades, so it could also be classified as (PA). It is a regional character (Principality of Asturias, NUTS II ES12 & NUTS III ES120), with strong local roots in the municipalities around the estuary of the *Nalón* River, one of the most historically important areas of this fishery. It has been recently recovered from the popular memory by the local community and promoted again to stimulate the knowledge of the marine culture, traditional fishing and the Asturian language among the youngest.

- **The traditional ecological knowledge of Asturian artisanal fishermen about fishing grounds and shellfishing areas.**

Asturian artisanal fishermen have accumulated an irreplaceable traditional knowledge of the different fishing areas and their characteristics (classified as a KPNU element of their Intangible Cultural Heritage), and they have generated an exceptionally rich topology for each one (beaches, coves, rocks and stones, islands, slopes, canyons, etc.). All this knowledge is currently collected in the Map of Asturian Fishing Grounds (Consejería de Medio Rural y Pesca del Principado de Asturias, 2011); through interviews with fishermen and skippers from all the fishermen's guilds in Asturias, their traditional knowledge about the areas where they fish was gathered: surface and limits of each fishing ground, typology of the bottom, mainly used gear, most frequently species caught and traditional name.

In many cases, the traditional typology of the fishing ground alludes to its natural characteristics. Based on traditional fishing knowledge, a total of 226 fishing grounds of the Asturian fishing fleet have been identified, mapped and characterized, occupying a marine surface of 984,938 ha off the coast of Asturias (NUTS II ES12 & NUTS III ES120). The Map of Asturian Fishing Grounds includes the waters located off the Principality of Asturias, from the coast line up to a distance of 46 nautical miles, covering the waters located between 43° 23' and 44° 17' North and 4° 15' and 7° 33' West, where the Asturian fishing fleet mainly operates. Likewise, shellfishermen's detailed spatial knowledge of the Asturian coastline fragments it into hundreds of very small units with their own name and perfect delimitation (Rivera et al., 2014). The artisanal barnacle shellfishers identify and name 267 fishing areas along almost 200 km of coast and islets of Asturias.

- **Fishermen's guilds of the Principality of Asturias.**

Fishermen's guilds (*Cofradías*) are the professional fishing associations that represent the typical form of collective socialization and organization of artisanal fishermen in Spain (SOC). They have a long tradition and their historical evolution has gone through very different stages. The first religious associations of fishermen emerged during the Middle Ages and later they evolved into fishermen's unions or guilds (*Gremios de Mareantes*); some ports and these fishermen's unions in Asturias already have documented references from the 13th century. The functionality of these ancient unions or guilds covered three aspects: (i) the charitable or welfare one (mutualism), (ii) the spiritual one (strong religious character and link to a patron and his/her church), and (iii) the professional or economic one. These guilds managed the access to the fishing resources and were depositaries of the communal ownership; by means of guilds laws (*ordenanzas gremiales*) they established the cycles of fishing, fishing grounds, arts and techniques allowed, forms of hauling, formation of the companies on board throughout an association between the ship owner and his crew and boatmen (*compañías*), the distribution of profits (*quiñones*), sales methods and prices, among other aspects. A peculiarity of the Asturian case is the abundance of fishing communities: at least 25 according to the census of sea enrolment (*Matrícula del Mar*) in the 18th century, and 18 at the present.

Since the middle of the 18th century, fishermen's guilds of Asturias suffered a decline, in parallel with the stagnation of the fishing sector. Since 1850 several historical circumstances led to a weakening of their influence and privileges. Despite their definitive dissolution in 1864, the guilds resisted and lost their religious character; since 1875 a good number of guilds were reconverted into mutual entities for *mutual aid*, more open and with a clear vocation for assistance. Since 1918 they continued under the form of *Pósitos de Pescadores*, based already on a civil cooperative and lay model, separated from the religious guilds and the so-called *Matrícula del Mar*. From 1939 onwards, these associations were incorporated into the Trade Union Organisation of the Franco's regime, returning to the old name of fishermen's guilds and building the first fish markets (*lonjas or rulas*). Since 1943 fishermen's guilds have remained under the legal form of public law corporations with total autonomy in order to promote fishing cooperatives, regulate fish sales operations, provide assistance to their members and promote the activity of the fishing sector and defend its interests, particularly in the case of the artisanal sector. Currently, 16 of the 18 fishermen's guilds in the Principality of

Asturias manage the marketing of the catches, in some cases with a significant level of specialisation and commercial projection for certain species.

Except in the case of *Gijón* and *Avilés*, most of the Asturian *Cofradías* maintain their old headquarters in buildings that have been restored with great seafaring charm and are the depositories and heirs of a unique fishing cultural legacy; in some cases they still keep historical documents and archives of their activity that are of great importance for historical and socioeconomic research. The fishermen's guilds have a strong local character; their headquarters are located in the municipal capital and/or other towns with a strong fishing tradition. In the Principality of Asturias (NUTS ES12 & NUTSIII ES120) there are currently 18 fishermen's associations.

- **Basque working women and their story of how they worked, their conditions, their lives around coastal communities.**

Until very recently, women have been largely absent from Basque maritime historiography, despite the fact that they are widely mentioned in the source material. Women participated extensively in all aspects of social and economic life related to the sea. Their work in the ports was particularly important, where they acted as porters, bishiguerras, picklers, sellers and innkeepers. However, they also played an important role as industrialists, helping finance the shipbuilding and fishing expeditions. Religion played a vital role in their lives, helping them to endure the loss and loneliness they felt as a result of the prolonged absence of husbands, brothers and sons.

- **Memories, sources and oral testimonies about the evolution of fishing gears and how it was fished before. Including Basque language as an intangible value totally linked to the Basque "arrantzale" (fishermen).**

The research community has encouraged the publication of works on the local history on the type of coastal fisherman, the vessel (characteristics), fishing gear and methods, fishing grounds, the product (sale, delivery), and the type of communication. However, work has also been done in this discipline using oral sources. A set of interviews in depths that were performed covering inshore and offshore fleets. Different initiatives have been experienced to this respect. An initiative is the work of *Euskal Herriko Ahotsak* that consists of collecting oral testimonies from Basque speakers over 80 through interviews, which are videotaped and later published on the website [www.ahotsak.eus](http://www.ahotsak.eus).

- Portugal.

- **Arraial Ferreira Neto.**

This fishing architectonic infrastructure from the 20<sup>th</sup> century represents a testimony of great importance of the economic activities of the Ria Formosa (coastal lagoon) and the Algarve region. It is one of the few architectonic infrastructures that were used to support the tuna fishery in the Algarve region, which constitutes a perfect evidence of the social, urban and architectonic organization of the dictatorial regime (Estado Novo).

This infrastructure was built to replace the previous installations that were destroyed by the sea in the year 1943. It was built to accommodate 150 families throughout the tuna fishing season. This facility had all the necessary structures to support the fishing activities, such as workshops and industrial facilities with

ramps and winches etc. Within the wall of the Arraial, there were also habitational and diversion areas for those who spend their time there.

- **Whale hunting surveillance towers and posts in the Azores archipelago.**

Group of surveillance towers in different islands in the Azores archipelago that were used with the purpose of spotting sperm whales. After the whales were spotted, flairs were thrown to warn the whale hunters to go out at the sea for the hunt. Nowadays with the prohibition of whale hunting, most of these infrastructures were abandoned, but some of them were recovered and maintained. These surveillance spots are now used by the whale watching industry to, again, spot whales, but with the purpose of aiding nature-oriented tourism.

- **Adages and sayings on fishery and fishermen.**

An ethnography work that collected several sayings and adages related with the fishing activity. This collection of expressions, adages and saying was carried by *José Leite de Vasconcelos* and *Paulo Catarrão Soromenho*, during the second half of the 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> century.

- **Barco Negro – Fado.**

Traditional *Fado* song that speaks about the loss of a loved one that went at sea to fish and didn't return. Fado is a traditional music gender that can be traced to the early 1800s. The "*Barco Negro*" is a poem by *David Mourão-Ferreira* which was then adapted to be sang in the *Fado* music gender. The "*Barco Negro*" *Fado* song is one of the most well known *Fado* songs by the general public, and it is continuously being sang and interpreted by old and new *Fado* singers. This song and poem talks about the common dramas and misfortunes lived by the fishing community back in time when fishing was a very dangerous activity and people would die disappear at sea.

- **On-board gastronomic festival.**

A gastronomic festival that relies on traditional cooking dishes and food that were used during on-board life of fishing vessels. This festival has the goal of reviving and promoting the knowledge of the techniques of cooking dishes and ways of conserving food back in times when there was no refrigeration or any modern ways of preserving food in the fishing community. Besides the promotion of the food conservation techniques, there is also the promotion of dishes that were cooked on board with fresh seafood. Most of the times, these dishes were made with low-value seafood, since the high-value seafood was destined to be sold.

- **Fishermen's knowledge regarding the biology of the octopus and the need to establish closure seasons to allow this specie to reproduce.**

Local fishermen knowledge was incorporated on a series of workshops to try to establish a closure season for the octopus' fishery in the Algarve. This paper is a testimony of the octopus' fishermen knowledge regarding the biology and ecology of the *Octopus vulgaris* that has been passed through generations that is now being used towards a co-management approach of instituting regulation measures (establishment of a closure season). The knowledge and awareness of the octopus fishing community of the need for a closure season, allied with the

scientific knowledge, allowed the establishment of an octopus' fishing closure season towards the improvement of the management of this resource.

- **Arte Xávega.**

An old traditional fishing technique that used to be practiced along the entire Portuguese continental coast. This fishing technique represents generations of knowledge, genius, and craftsmanship that enabled the design and improvement of a fishing technique that was frequently used in the past. Nowadays it is used sporadically within cultural/social events, since its ecological impact is very relevant. Hence the reason of its usage is no longer permitted as an economic activity and the captures cannot be sold.

- France.

- **Lighthouses of the Island of Ouessant / Ushant.**

These lighthouses are immovable tangible cultural heritage elements located in the Island of Ouessant / Ushant (Finistère - NUT 3: FRH02 - ICES VIIe) and it is part of D'Iroise Marine Nature Park in France. These lighthouses has serve as navigation guide along history facilitating fishing activities including fishing and maritime transport/commerce. They constitute an example of this time of building of architectural and historical value. The lighthouses of Stiff (2012), Creac'h (2011), Keroen (2017), Jument (2015) and Nividic (2017) are inventoried and recognized by France government as historical monument. They are subject to the Impact of marine environmental conditions on the building and tourism development ([www.culture.gouv.fr](http://www.culture.gouv.fr)).

- **Capbreton festival of the Sea.**

Capbreton festival of the Sea is an example of the categories of SRF and SOC of ICH that takes place in Capbreton (Landes - NUT3: FRI13) during a weekend at the beginning of the fishing season (June). There is a SSF composed of 19 boats that are honoured and blessed in a religious ceremony (Saint Nicholas Church) since the 1960s. The song of fishermen of Capbreton written by Father Jean-Baptiste Gabarra (1875-1925) is sung during this festival. Parades, processions, markets, expositions, performances and religious services take place during the festival that attract lot of tourist to the festival. This festival is an example of intangible cultural heritage that has been transmitted through generations in Capbreton coastal community that is recognized by it as part of their cultural heritage. This festival provides identity and continuity to Capbreton dwellers and it is transmitted and recreated by them. There are not specific protection measures for this festival, but a Committee aimed at organizing and preserve this tradition. The Capbreton festival of the Sea is registered in the inventory of ICH of the Ministry of Culture (Ministere de la Cultura, n.d.; Saint Martin, 2013).

- **Stone tidal fishing weirs (*écluses à poissons*) in Oléron Island.**

Stone fishing tidal weirs (*écluses à poissons*) of the Island of Oléron are an example of the categories of TC and KPNU of ICH; supported by a TCH represented by the stone wall, bearing a curved outline, and hand-made entirely by craftsmen that has been used by human being as tidal trap since ancient times in the Atlantic coast of France as proved in many archeological sites (Gandois et al., 2018). This CH element is placed in different locations of the Island of Oléron (NUT3: FRI32). This fishing technique has been transmitted through generations in

French Atlantic coast and in other sites in Atlantic area like in the Gulf of Cádiz (Muñoz-pérez et al., 2007). These fishing techniques and buildings are recognized by communities as part of their cultural heritage and provides identity and continuity to Oléron Island dwellers and it is transmitted and recreated by them. This fishing trap is of Outstanding Universal Value as an example of the building of this fishing gear since Ancient times that represent a relevant element of this coastal community's history in this area and a testimony of disappeared civilizations. There are not specific protection measures but a regulation on standing fishing (pêche à pied) ([www.saintdenisoleron.fr](http://www.saintdenisoleron.fr), [www.ville-dolus-oleron.fr](http://www.ville-dolus-oleron.fr)).

- United kingdom.

- **Weymouth's Historic Fish Market.**

Weymouth's historic fish market has been a harbourside landmark for over 150 years. Constructed in 1855, it was built to provide a permanent home for the town's twice-weekly market. Over the decades, it hasn't always played host to its original purpose, housing storage for the harbour and falling into disrepair. But more recently, Weyfish has restored this Grade II listed building to the role it was intended for, the commercial heart of the local fishing industry.

- **Portland Bill Lighthouse Centre.**

Portland Bill Lighthouse was built by Trinity House in 1906 to guide vessels heading for Portland and Weymouth as well as acting as a waymark for ships navigating the English Channel.

- **The Shapwick Monster.**

In 1705 in the Parish of Shapwick, a live crab being transported by a fishmonger from Poole to Bere Regis fell off of the cart and was found not far from East Farm. The villagers, upon finding the creature, and not having seen anything like it before deduced it was, in fact, Satan incarnate, and with the guidance of the village elder armed themselves with pitchforks to drive the beast away. Eventually the fishmonger realised he had lost a crab and returned to the village to find everything in a state of commotion. With great amusement he picked up the crustacean-satan and casually popped it back in his basket. From then on the word was spread that the villagers of Shapwick were a bit dim-witted.

- **The Three Jolly Fishermen, Dorset version.**

Versions of this song in Somerset, Yorkshire, Dorset, Middlesex and north Staffordshire.

- **Nyetimber Dorset Seafood Festival.**

The Dorset Seafood Festival was created in 2008 by Roger Dalton, of Brewers Quay, and Brian Cooper, MD of Resort Marketing Ltd. The Festival quickly grew into a high quality event of significant importance to tourism, promoting the resort of Weymouth as a centre of excellence for seafood.

A report undertaken in 2010 by Bournemouth University assessed the financial benefit to the town as over £1.5 million, and the organisers believe that in the eight years since, visitor numbers have more than doubled to over 50,000 people. People from across the country now visit Weymouth specifically for the Festival

weekend. Winning several gold awards for 'Best Tourism Event of the Year' and the superb accolade of 'Outstanding Contribution to Tourism', the event continues to wow local residents and visitors.

- **Reserve Seafood, Lyme Bay**

Sustainably sourced seafood from Lyme Bay. The Reserve Seafood brand ensures top-quality caught fish every day from inshore vessels under 10m in length. The vessels commonly have only one fisherman, who fish no more than 6 miles from the shore, to catch sustainable and traceably caught premium fish and shellfish, by either a pot, a static net, or by rod & line. The commercial strategy of providing freshly caught, sustainable and high-quality produce is reliant on the knowledge of small-scale fisherman, who have fished the inshore waters for many generations.

- **Static- gear fisheries.**

Within the Lyme bay MPA, the static gear fishermen faced an uncertain time when trawling was banned within the MPA. The fishery therefore started to employ less damaging gear which was characterised by more traditional pots for lobsters, whelk and crabs. As an unforeseen consequence of the towed gear ban was that the area became infested with pots. What previously had been a bad situation for sea life and the bay's coral reefs, became worse for shellfish stocks, putting the future livelihoods of local fishermen at risk. So BLUE came in and formed a group with the fishermen to put in voluntary measures, with bottom-up management from the fishermen, and installed a limit on the number of pots being used, and the types of pots being used.

- Ireland.

- **Paul Henry, Launching the Currach.**

This painting, a movable tangible cultural heritage element is located in the National Gallery of Ireland. It describes five fishermen launching a currach from a beach set on Achill Island County Mayo (NUTS III - West Region, Ireland IE042). A currach is a small rowing boat, traditionally used along the western seaboard, from Clare to Donegal. Constructed by stretching cowhide over a wickerwork frame, and made watertight through the application of pitch, it is light and strong, and can be used in both shallow waters and rough seas. As illustrated by Henry, one of the vessel's advantages is that it can be pulled ashore and launched with relative ease. Henry's paintings of fishing are a tangible cultural heritage element of Outstanding Universal Value as a masterpiece of human creativity and a testimony of cultural tradition and customs of Ireland.

- **Jack B. Yeats, Men of Destiny.**

This painting, a movable tangible cultural heritage element is located in the National Gallery of Ireland. It describes a group of fishermen tying up a fishing vessel on the shore. Two men are walking in conversation while a third man turns to join them. The scene is set at Rosses Point in County Sligo (NUTS III - West Region, Ireland IE042). Yeats uses this image to draw attention to the type of people who left their home to lead the fight for freedom in Ireland and in Europe during times of conflict in the early 120th century. The artist considered these young men as both heroes and brave warriors. It may have caused him to reflect on the fact that the future of Ireland and of Europe rested on the shoulders of such

'men of destiny'. This painting by Yeats represents a tangible cultural heritage element of Outstanding Universal Value as a masterpiece of human creativity and to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.

- **Man of Aran.**

This film, a movable tangible cultural heritage element is available online to view. This documentary presents life on Ireland's Aran Islands, a beautiful, rugged, and remote locale where survival was a constant struggle. Featuring scenic shots of seaside cliffs and rocky expanses, the film, which takes a few fictional liberties, shows islanders fishing and farming in inventive ways in order to keep food on their tables. While some dramatic moments reveal a sense of narrative, the main draw of the production is the stunning scenery. Flaherty's depiction of island life off the west coast of Ireland is an exceptional testimony to a cultural tradition which has disappeared and is an outstanding example of a traditional human settlement representative of a culture.

- **Hook Head Lighthouse.**

This structure, an immovable tangible cultural heritage element is located in the Hook Head peninsula county Wexford (NUTS III - Mid-East Region, Ireland IE062). The lighthouse represents an important component of the built heritage of south County Wexford and has been cited as one of the oldest working lighthouses in the world (CIL), the "Tower of Hook" is believed to owe its origins to William Marshall (1190-1231), second Earl of Pembroke, who survived a shipwreck off the Wexford Coast and who wished to assist safe passage to the burgeoning port at New Ross. Hook Head lighthouse is an outstanding example of a type of a type of building, architectural or technological ensemble or landscape which illustrates significant stages in human history.

- **The Salmon of Knowledge.**

This mythological story, an intangible cultural heritage element is based upon an event in the life of a 'Hero' in Irish mythology thought to have occurred in the east of Ireland (NUTS II - Eastern and Midland IE06). It is thought the era of the story occurs thousands of years ago. The story of the salmon of knowledge is part of Irish mythology and details how the Celtic hero Fionn Mac Cuail gained otherworldly knowledge and wisdom by having the first taste of the legendary salmon of knowledge. This story represents a masterpiece of human creative genius.

- **Molly Malone.**

This song, an intangible cultural heritage element is set in Dublin (NUTS III - Dublin Region IE061) and describes a female shellfish seller selling cockles and mussels along the streets of Dublin. The song "Molly Malone" is a popular song set in Dublin, Ireland, describing a female shellfish seller. Brown 2016 concludes *The Molly Malone of Cockles and Mussels reflects the true conditions and circumstances of fishmongers in early- to mid-19th century Britain, whether or not she is fictional or based on a particular person. Although apparently written by a Scottish songwriter, many elements of the song are decades older; and some of those elements may have Irish roots.*

*Regardless of the specific origins of Cockles and Mussels, nothing can erase what the song has come to represent for Dubliners, Irishmen and the entire Irish Diaspora during the ensuing one-hundred and forty-some odd years. But the details of the pop-culture history, and actual history, behind Cockles and Mussels, may provide an even greater appreciation for the song and all of the hard-working street vendors and working-class heroes it honors. The song represents an important interchange of human values, over a span of time or within a cultural area of the world, and bears a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared.*

*In Dublin's fair city,  
Where the girls are so pretty,  
I first set my eyes on sweet Molly Malone,  
As she wheeled her wheel-barrow,  
Through streets broad and narrow,  
Crying, "Cockles and mussels, alive, alive, oh!"  
"Alive, alive, oh,  
Alive, alive, oh,"  
Crying "Cockles and mussels, alive, alive, oh".  
She was a fishmonger  
But sure 'twas no wonder  
For so were her father and mother before  
And they each wheel'd their barrow  
Through streets broad and narrow  
Crying "Cockles and mussels alive, alive oh!"  
(chorus)  
She died of a fever,  
And no one could save her,  
And that was the end of sweet Molly Malone.  
But her ghost wheels her barrow,  
Through streets broad and narrow,  
Crying, "Cockles and mussels, alive, alive, oh!"  
(chorus) x2*

▪ **Marcanna na Tallamh (Landmarks).**

This intangible cultural heritage element is native to the western seaboard of Ireland (NUTS III - Border Region IE041 & West Region, Ireland IE042). Seafarers on the Irish Islands use methods for orientation and navigation at sea, a traditional technique that has been passed from generation to generation and which continues to the present day. The use of landmarks, or marcanna na talamh in

Gaelic, is practiced across the world on islands and ensure fishers and other sea going people can safely navigate their environment, find fishing gear and preferred fishing spots.

This technique represents an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change and to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.

- **Sea Currach Making.**

This intangible cultural heritage element is native to western and southern seaboard of Ireland (NUTS III - Border Region IE041, West Region, Ireland IE042, Mid-West Region, Ireland IE051, South-East Region, Ireland IE052, South-West Region, Ireland IE053). Simply formed of a skin or cloth covering on a light wicker or timber framework, the currach has stubbornly endured since prehistoric times. Its smooth round bottom has no keel to enable it to grip the water but, drawing barely six inches of water, it is highly manoeuvrable and can navigate swells and even rough seas with relative ease. Working in unison, the oarsmen, each pulling a pair of overlapping, thin-bladed oars, can adjust and maintain their course when wind and tide conspire to push the boat in a contrary direction.

Sea currach making bears a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared; to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.

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## Annexe 1. Interview protocol for key stakeholders on cultural heritage

### PROFILE OF KEY STAKEHOLDERS (INFORMANTS)

**Direct actors:** fishermen, shell fishers, deckhand, net menders, wholesale market workers, fish transporters, canning industry worker, wholesale markets sellers, retail market sellers,...

**Indirect actors:** local population, coastal areas users, fish consumers, restaurant owners, tourists,...

**Sector actors:** agents of local, regional and state public administration in charge of fisheries and environmental issues.

**Citizen-led participatory entities:** gillnets, protecting coastal/marine environmental groups, fishing cultural heritage protecting groups

**Researchers and academics:** experts in cultural heritage and fishing, managers and professionals of museums and center of interpretation, managers and professional of research centers on fishing and cultural heritage.

### INTERVIEW SCHEDULE

#### Respondent information

- Name:
- Last name:
- Pseudonym (name it is known or if anonymous participation is requested)
- Sex:
- Year of birth / approximated age:
- Place of birth:
- Present place of resident:
- Education:
- Current profession / occupation:
- Previous profession / occupation:
- Relation with the objective of the study:

#### Interview data

- Interviewer (name/s of the interviewer/s):
- Date:
- Time:
- Duration:
- Place:
- Type of interview (individual / collective) (all of them will be semi-structured interviews):

- Contact with the informant (indicate how or who the informant was contacted):
- Attitude, availability of the informant:
- Conditions of the interview (interruptions, background sound,...):

#### Previous analysis

- Central idea:
- keywords:
- Important themes and issues:

### POSSIBLE ISSUES TO BE TREATED IN THE INTERVIEW

#### A. About fishing activity

- Date of beginning of its activity.
- Reason-relationship for starting activity.
- Way or reason by which you acquired the knowledge.
- Personal link to the activity (family/professional).
- Gender perspective (role of women in fishing).
- Age perspective (intergenerational relationship).
- Perception changes in the way of working.
- Do your labor impact your personal and family life?
- Relationship with other related activities.
- Income/profitability (comparison with other sectors).
- Ecosystem and social sustainability.

#### B. About fishing cultural heritage

- Typology/characteristics of the boats.
- Type/characteristics of the fishing gears.
- Tools and working instruments.
- Immovable Tangible Cultural Heritage.
- Knowledge and uses concerning the sea/navigation.
- Knowledge and uses concerning fishing/fish.
- Techniques and procedures (of activities related to fishing other than fishing gears).
- Elements of urban furniture.
- Gastronomy, culinary preparations and food.
- Rituals and festive events.
- Glossary, sayings and oral expressions.
- Forms of fishing groups and associations.
- Sound expressions, traditional music and dance.
- Artistic expressions and artisanal fisheries
- Ecosystem sustainability.