QUARTERLY PUBLIC REPORT #1
(July to September 2014)

Marine Spatial Planning for the Falkland Islands

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The purpose of this report is to inform and keep stakeholders and the public up to date with the aims, progresses, ongoing ideas and challenges, and results of the Marine Spatial Planning project throughout its life. It is intended as a summary of the activities that have taken place in the previous three months and examples of data and results. Such reports are made available every three months at SAERI Marine Spatial Planning webpage.

1. Introduction

There is currently no Marine Spatial Planning (MSP) around the Falkland Islands at the exception of fishing closure areas. With an increasing level of human activities in the ocean around the Falkland Islands, in particular for oil exploration, but also for shipping traffic, commercial fishing and tourism (Falkland Island Government 2012), the need to identify areas sensitive to risks of conflicts between different human uses and/or with marine wildlife has been identified as a priority for the Falkland Islands Government (FIG). MSP is a tool used to resolve these conflicts and ensure sustainable use of the marine environment (Ahler and Douvere 2007).

The Darwin Plus-funded project called "Marine Spatial Planning for the Falkland Islands" has the aim to initiate the process of MSP by reaching two main goals:

- Mapping and analytical goal: Identifying areas used by humans and wildlife, now and in the future, and model sensitive areas
- Policy goal: Producing a framework for FIG to facilitate the move towards implementation of MSP and associated legislation

Open-access (free and available for anyone to download from the internet and use) computer programs are used in this project to allow any interested stakeholders to look at the data and results. This will also ensure that the data, references and information produced by this project can be available for use by anyone in the future, independently of access to expensive software.

2. Summary of main activities during the last quarter (July-Sept 2014)

- Project officer appointed and project initiated in July 2014
- Established steering committee, first meeting
- Introductory meetings with key stakeholders and project partners in the Falkland Islands and overseas
- MSP review initiated

- Started gathering and analysing data, with metadata catalogue
- Preliminary considerations for MSP process for the Falkland Islands
- Identified stakeholders and science partners
- Planned first public session and workshop

3. Project initiation

The project "Marine Spatial Planning for the Falkland Islands" is funded by a Darwin Plus grant from July 2014 to June 2016 through the Darwin Initiative. A change of the start date (initially set to be April 2014) was agreed by the Darwin committee and all funding arrangements moved to match this start date. The total fund allocation is £ 151,572 that covers project officer and research partners' salaries and costs, workshop expenses, and other costs involved in data gathering and storing, and fieldwork. The project team consists of Dr Amélie Augé (project manager) and Dr Paul Brickle.

A project webpage was created on the SAERI website and will be regularly updated with progress on activities, reports, maps and other information to keep stakeholders and partners informed on the project. The webpage can be accessed through http://www.south-atlantic-research.org/research/current-research/80-marine-spatial-planning-falkland-islands. Quarterly reports will be prepared and distributed every three months. Further communication will be through blog posts, tweets, and public sessions.

The general project outline is framed around three main workshops (Figure 1):

1. Thinking (Setting the vision for MSP in the Falkland Islands),
2. Developing (Producing the spatial analyses for MSP), and
3. Framing (Developing a policy paper for MSP).

1. Steering committee

A steering committee was established to ensure the direction and progress of the project match the original aims and steps described in the proposal and that the project outcomes provide an appropriate framework to be used by FIG.

The steering committee consists of local Government representatives and scientists as well as international scientists. The committee will meet every three months for the first half of the project and every six months thereafter (but extra meetings will be organised if necessary). Members of the steering committee are:

- Dr Paul Brewin (FIG Fisheries Department)
- Mr Ken Humphrey (Falkland Islands Petroleum Licenses Association)
- Mr Malcolm Jamieson (FIG Fisheries Department)
- Dr Ben Lascelles (BridLife International)
- Lt Cdr Bill Dawson (British Navy)
- Mr Andy Pollard (Falkland Islands Fishing Companies Association)
- Mr Nick Rendell (FIG Environmental Department)
- Dr Andy Stanworth (Falklands Conservation)
- Dr Phil Trathan (British Antarctic Survey)

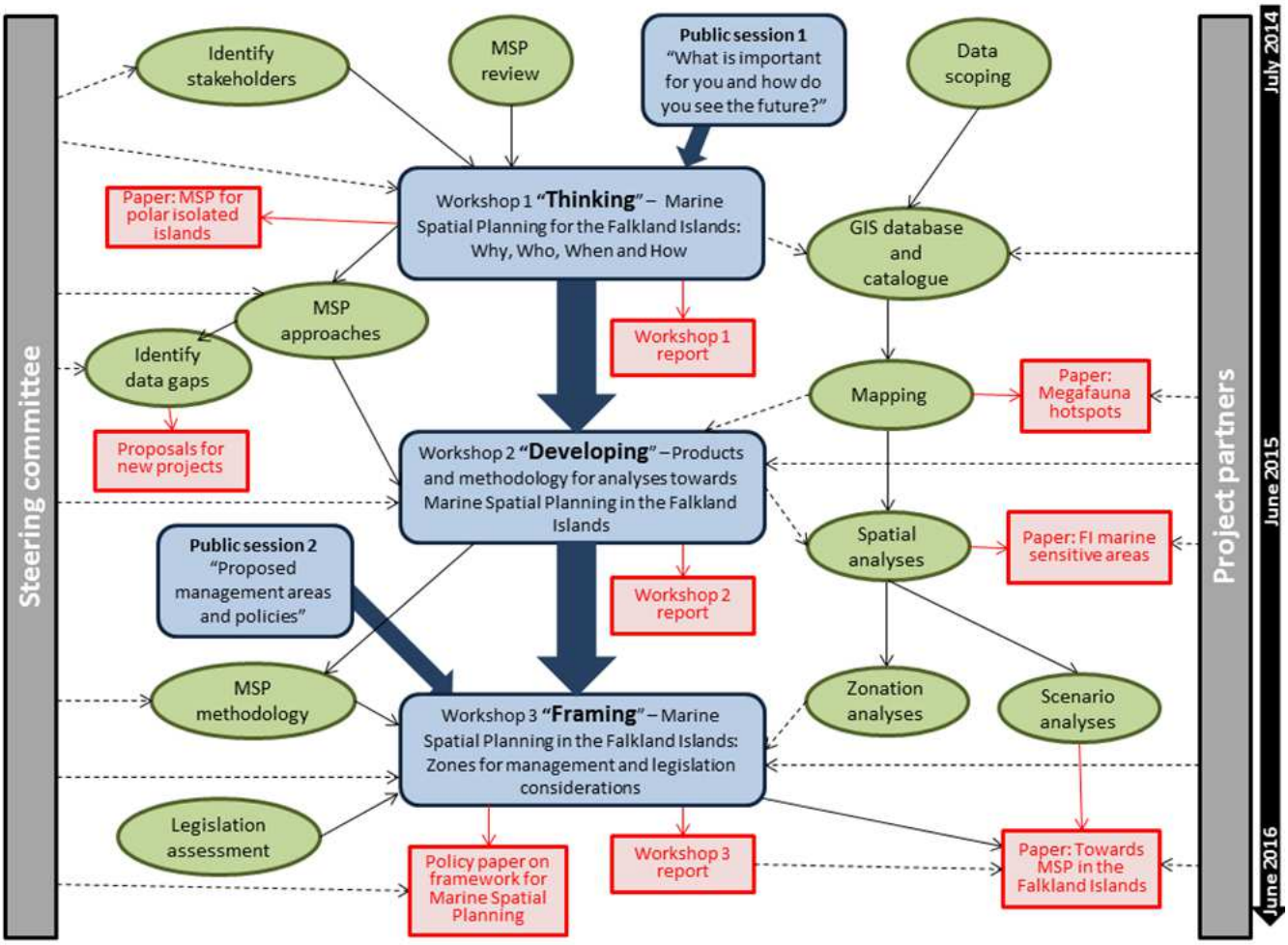

Figure 1: General project outline (blue and green), timeline (top to bottom) and outputs (red) for Marine Spatial Planning in the Falkland Islands.

2. MSP review and reference database

An output of the MSP project is a review of best practice for MSP. Following literature examination of existing reviews for MSP (Collie et al. 2013, Douvere and Ehler 2009, Ehler and Douvere 2010, Shucksmith et al. 2014, Stelzenmüller et al. 2013), a gap was identified in the literature about strategic MSP targeted for sub-polar isolated islands. These islands all have similar characteristics in terms of human demographics, history, marine environment and wildlife, and marine human activities, and their Exclusive Economic Zones (EEZ) represent over 9% of all marine areas under state jurisdiction claimed via EEZ. However, only a few of these islands have had MSP undertaken (e.g. Shetland Islands, Kelly et al. 2014, or South Georgia and the South Sandwich Islands, Government of South Georgia and the South Sandwich Islands 2013) with others having arbitrary areas declared as marine reserves without management objectives, analytical process or monitoring of effects. Consequently, the review will target these sub-polar isolated islands to develop a set of best practice to support MSP for the marine area around the islands. The Falkland Islands are used as a case study in this review.

All references reviewed during this work will be available as a reference database. This database is created in Zotero open-access reference storage software.

3. Area for MSP and planning timeframe for the Falkland Islands

The intended area to be covered by MSP for the Falkland Islands is the area that is under the jurisdiction of FIG, namely its EEZ, locally known as Falkland Islands Conservation Zone (FICZ, Figure 2). In this area, the Government has authority and can produce policies and legislation to regulate activities. Outside of this area lie the Argentine EEZ and International Waters where jurisdiction is under another government or under international laws. The area covered by the FICZ includes shallow coastal waters to deep sea at 4800m depth. Management objectives should therefore be designed for the EEZ and the MSP framework and proposed Marine Management Areas (MMA) should be produced for this same area.

Planning is inherently looking at the future. In order to conduct MSP, there is a need to identify possible changes in the marine environment and its uses in the future. A general vision of what MSP should achieve needs to be set and has to be bonded to a certain period to develop the Plan. A 20 to 35-year period (but up to 50 years) is usually chosen for plans (Collie et al. 2013, Department of the Environment 2014). A 25-year period seems appropriate for the Falkland Islands. A plan also has to be adaptive and reviewed regularly but must be driven by a vision. In the case of the Falkland Islands the MSP vision could be set to 25 years but the Plan could be reviewed every 5 or 10 years to ensure that new available data, knowledge, and marine uses still match the MMA and that the Plan has helped achieved the Management Objectives it was set for in relation to the Vision. This would be done through monitoring and evaluation.

4. Spatial data for Marine Spatial Planning

As MSP is area-based, a crucial initial step is consequently to identify, gather, check and analyse spatial data of the marine environment. This step produces the best available mapping and understanding of the spatial distribution and overlaps amongst human uses, wildlife, and marine habitats and resources. It also detects what crucial knowledge and data are missing and what future research and work should be focussed on.

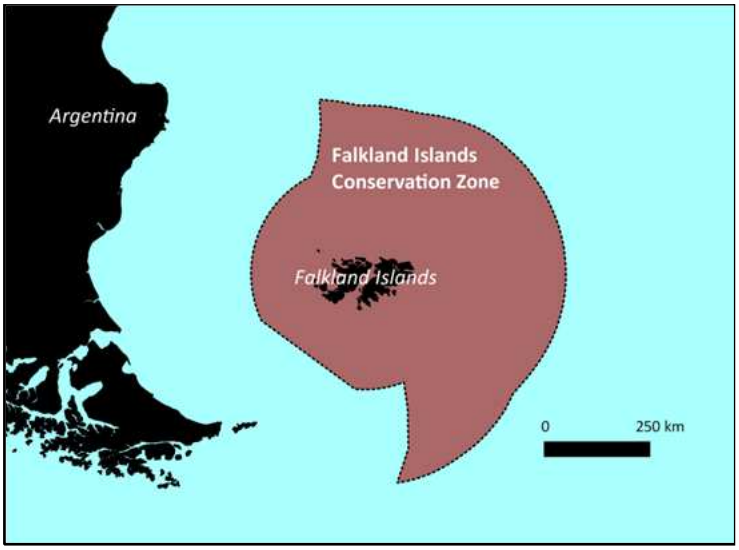

Figure 2: The Falkland Islands Exclusive Economic Zone, locally known as the Falkland Islands Conservation Zone

A Geographic Information System (GIS) is used to manipulate and map the spatial data. The open access QGIS (www.qgis.org/) is used for most manipulations and analyses along with the open access statistical software R (www.r-project.org/) and algorithms from another open-access GIS, GRASS (grass.osgeo.org/).

A spatial database is created and contains all raw data and results of analyses as GIS layers. An Excel metadata catalogue (Figure 3) describes each layer in the database according to the main categories:

- Anthropogenic data
- Biological data
- Environmental data
- Geographic data
- Management data
- Social/cultural data

The database and all documents from the project will be stored on the SAERI IMS-GIS server, for which the MSP is contributing financially, and that will be automatically backed up daily on another server hosted at Sure in Stanley.

There are other types of data that can feed in the MSP. Some of these may not be inherently spatial but could help addressing knowledge gaps. For instance, knowledge of penguins' diet can help identifying areas that may be critical as foraging grounds for these animals by looking at where their prey species spawn and generally occur. These other data will also be compiled and descriptions on how they feed in spatial data recorded.

Each dataset received is inspected for accuracy and transformed into a GIS format usable for further analyses. The coordinate system used in this project is the UTM21S/WGS84. All datasets are stored in this projection so that they can all be used for mapping and further analyses.

File name	File type	Resolution/accuracy	Datum/Projection	Brief description	Source	Created by	Contact email	Data created in
ANT_Aquaculture_2014	Shapefile - polygons	5m	WGS84 / UTM21S	Footprint of sea-based aquaculture facilities (trout pens and mussel farms) under potential development in the Falkland Islands as in 2014. Data include the land area where boat is stored so that it can be used to map the route used by this boat - at least one trip every 2 days between there and pen but if developed, then will be more regular.	Manual GPS locations	Amélie Augé	amelie.auge@gmail.com	2014
ANT_oil_licence_areas_2014	Shapefile - polygons	10m	WGS84 / UTM21S	Areas under oil and gas production licence by different companies as of 2014; companies can explore areas for oil and gas and then exploit the resources found.	Falkland Islands Government - Department of Mineral Resources	Anonym	info@mineralresources.gov.fk	1998
ANT_oil_well_locations_2014	Shapefile - points	10m	WGS84 / UTM21S	Locations of wells that have been drilled as part of oil exploration within the production licence areas up to 2014.	Falkland Islands Government - Department of Mineral Resources	Anonym	info@mineralresources.gov.fk	2014

Figure 3: Example of entries of layers in the GIS spatial database for MSP

Below are examples of spatial data acquired and some of the associated challenges for MSP:

a. Maritime traffic

Marine traffic data are obtained from the Automatic Identification System (AIS) for all types of vessels travelling around the Falkland Islands. These AIS data are made available by Sure in Stanley that have set up a system to visualise and record shipping movement around the Falkland Islands. Unfortunately, past years of data have not been recorded as only the previous 90 days are archived. Consequently, only three months of data (June to August 2014) are currently available but another 9 months of data will be obtained so that analyses of shipping traffic will be conducted over a year. The maps below (Figures 4 and 5) illustrate the AIS data.

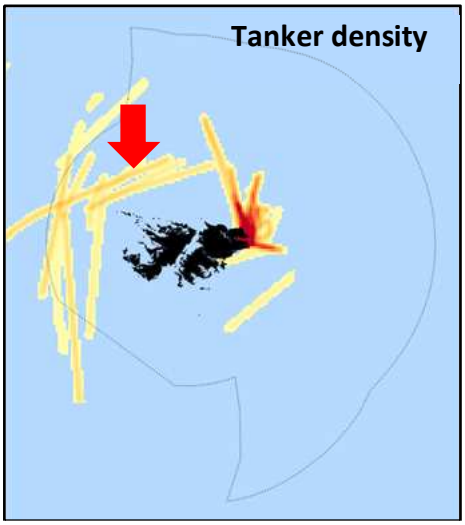

Figure 4: Density of tanker traffic over a 90-day period (June-August 2014) from AIS data.

Cell size: 5km
In red: up to 46 tankers passed by during the period
In cream: 1 tanker passed by during the period

The red arrow shows a potential international tanker route passing close to the Steeple Jason's Islands and that may be a management issue.

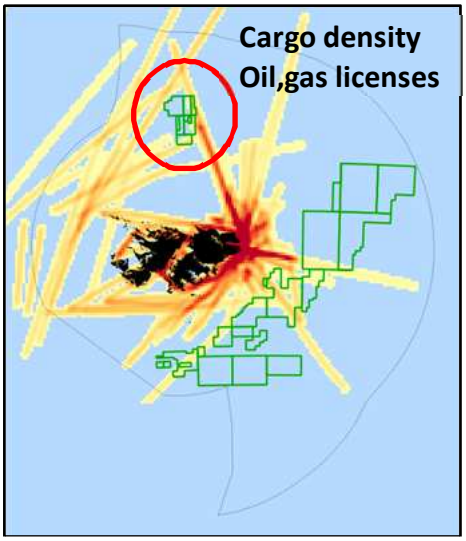

Figure 5: Density of cargo traffic over a 90-day period (June-August 2014) from AIS data with oil and gas licence areas.

Cell size: 5km
In red: 40-90 cargo vessels passed by during the period
In cream: 1 cargo vessel passed by during the period
In green: boundaries oil and gas exploration licenses.

This illustrates potential overlap between oil exploitation area and shipping routes (red circle) which may indicate a potential spatial conflict between these two uses and may require management. The cargo vessel type includes the local vessels delivering goods all over the islands (the Camp).

The above maps are only showing a small period of the AIS data that will be available (currently only 90 days were available). The main limitation to the AIS data is that it does not always reach the entire FCZ depending on meteorological conditions. Consequently, in some cases, only parts of the routes of some vessels were recorded (as illustrated on the maps above). However, this limitation will likely be diminished as more data are acquired as the area will be populated with further data. If the issue remains once more data are included, the clear shipping routes will be

manually extended in the areas to cover the entire FCZ. Most of these routes are straight lines as depicted in Figures 4 and 5.

Another type of vessel traffic data called Vessel Monitoring System (VMS), only for fishing vessels, is also available through the Fisheries Department (all vessels must report their regular locations to the Department). These VMS data can be used to compare with AIS data and were provided by the Fisheries Department. Figure 6 shows locations of fishing vessels during a similar period from both AIS and VMS data. It confirms that some areas are out of the reach of the AIS. Combining both sources of data may be the best option to identify fishing vessel traffic in order to have the most complete and detailed dataset.

b. Oceanographic conditions

Oceanographic conditions can be obtained from various sources, including satellite imagery and CTD (Conductivity, Temperature, Depth sensors) data. Satellite imagery is however the only way to acquire data for large areas over multiple seasons. The FI Fisheries Department had previously downloaded a decade of monthly composite maps of Sea Surface Temperatures (SST, Figure 7) and Chlorophyll a concentration at a resolution of 4km pixels from the freely accessible Ocean Colour website (http://oceancolor.gsfc.nasa.gov/). These were made available to the MSP project. Chlorophyll a concentration is a proxy to primary production. These data can be used in a marine habitat categorisation or wildlife habitat modelling (for instance, to determine the most likely foraging areas of penguins) that can feed into spatial analyses to identify sensitive marine areas for marine life.

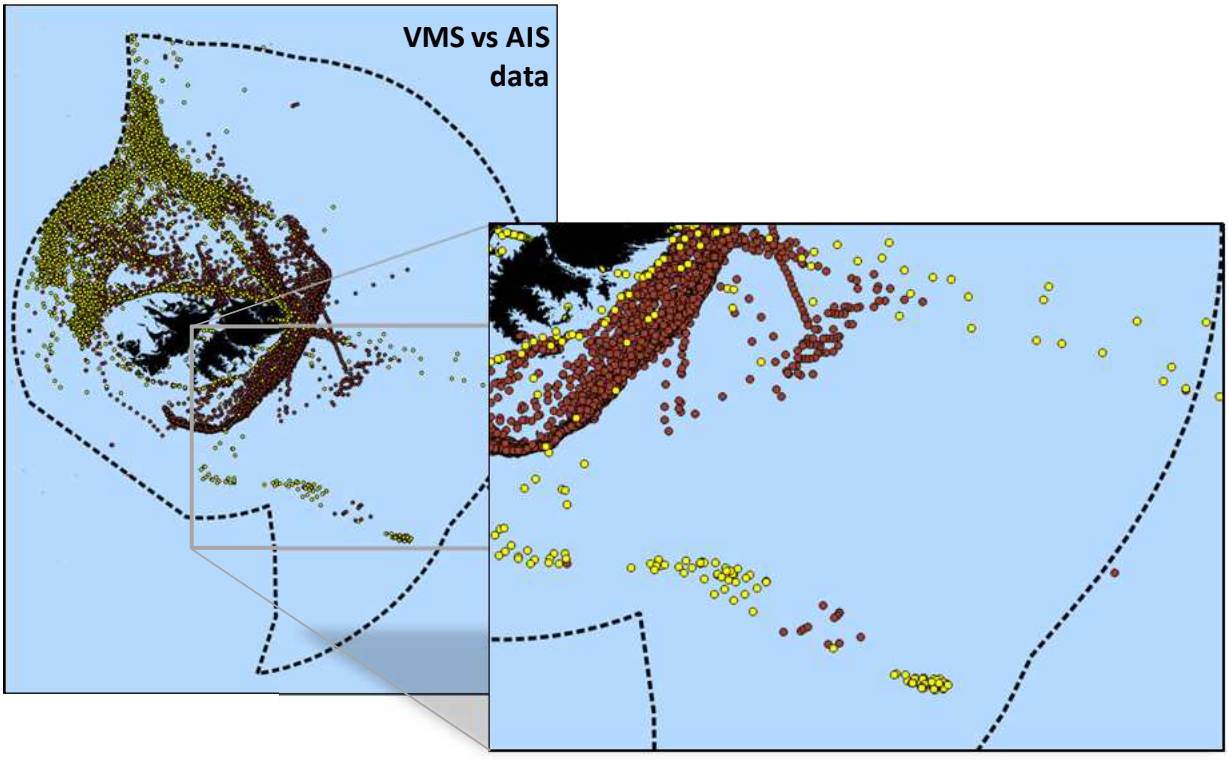

Figure 6: Illustration of differences in locations of fishing vessels obtained via Vessel Monitoring System (VMS) and AIS (Automated Identification System).

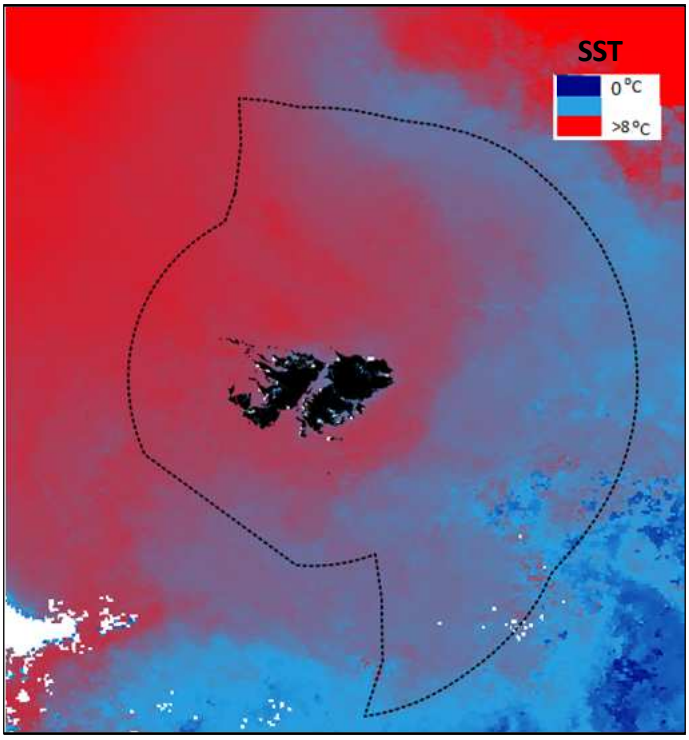

Figure 7: Example of a monthly composite of Sea Surface Temperature (SST) in the FICZ.

c. Aquaculture

Aquaculture is currently in an exploratory phase where trials are being conducted to determine its economic viability in the Falkland Islands. There is a small area around Fitzroy used for at-sea aquaculture shown on the map in Figure 8. The challenge for planning this kind of activities is to identify areas that can be set aside for aquaculture that do not overlap or compete for space with other uses/values such as recreational activities or scenic views. There are also environmental effects of aquaculture on the marine flora and fauna to take into consideration that impact beyond the infrastructure footprint. MSP can help identify the most suitable areas for at-sea aquaculture by evaluating all these aspects.

d. Cetacean stranding records

A number of knowledge and data that are not directly related to distribution of uses or wildlife can also be used as proxy for human activities or animal distributions when direct data are not available. Cetacean strandings are an example of such data. An excel database of recorded cetacean strandings in the Falkland Islands was compiled by the FIG Environmental Planning Department and this was made available for the project. This database contained approximately 190 records, of which 165 had some details written about locations (but no GPS point). The strandings were given approximate locations along the coast based on the descriptions and a point shapefile was created as a spatial database (Figure 9; this dataset can be used to record new strandings) to visualise the distribution of strandings around the islands. Such information can be used to infer which areas around the islands may be used by cetaceans until further systematic studies of cetacean distribution are undertaken (currently lacking).

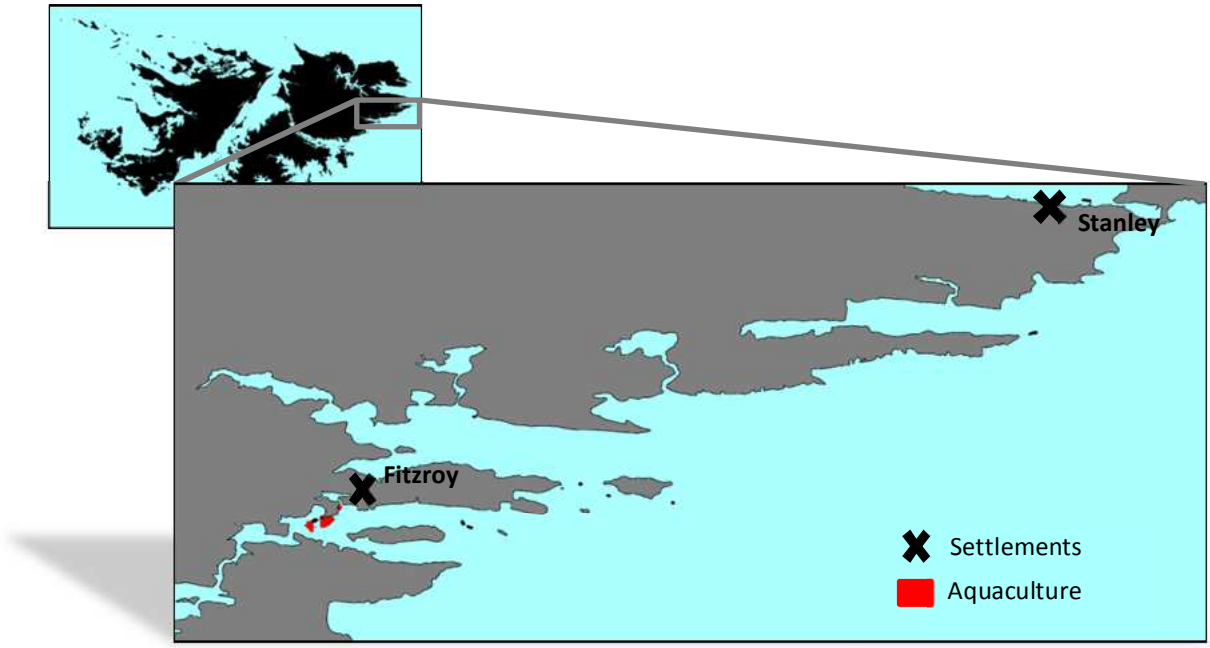

Figure 8: Areas of aquaculture under development as in 2014 in the Falkland Islands.

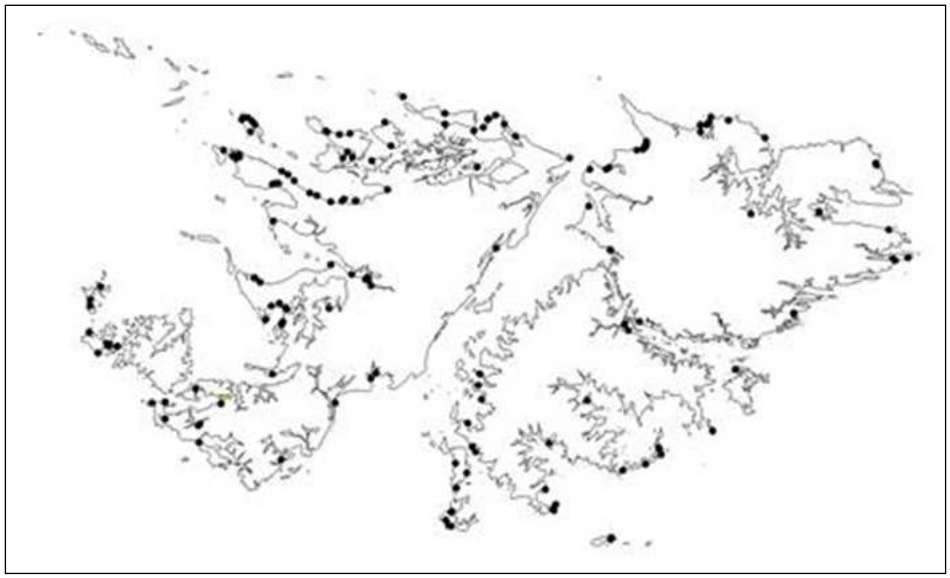

Figure 9: All locations of cetacean strandings recorded at the Falkland Islands.

5. Preliminary considerations on MSP process

Through MSP literature review, a number of critical steps and considerations, common across any MSP processes, were identified. These include a range of necessary inputs (in green in Figure 11). MSP has to be undertaken when the governmental setting has a vision for planning (the Falkland Islands Biodiversity Strategy, Development Strategy and Islands Plan in the Falkland Islands, for instance) and requires political support (in the Falkland Islands, this corresponds to the Members of the Legislative Assembly, MLAs). In order to understand spatial overlap and identify sensitive marine areas, spatial data are essential. There are two main types of spatial data required: reports of human uses with location data to be able to map at-sea and coastal activities, and science projects that study wildlife distributions and effects of activities on wildlife.

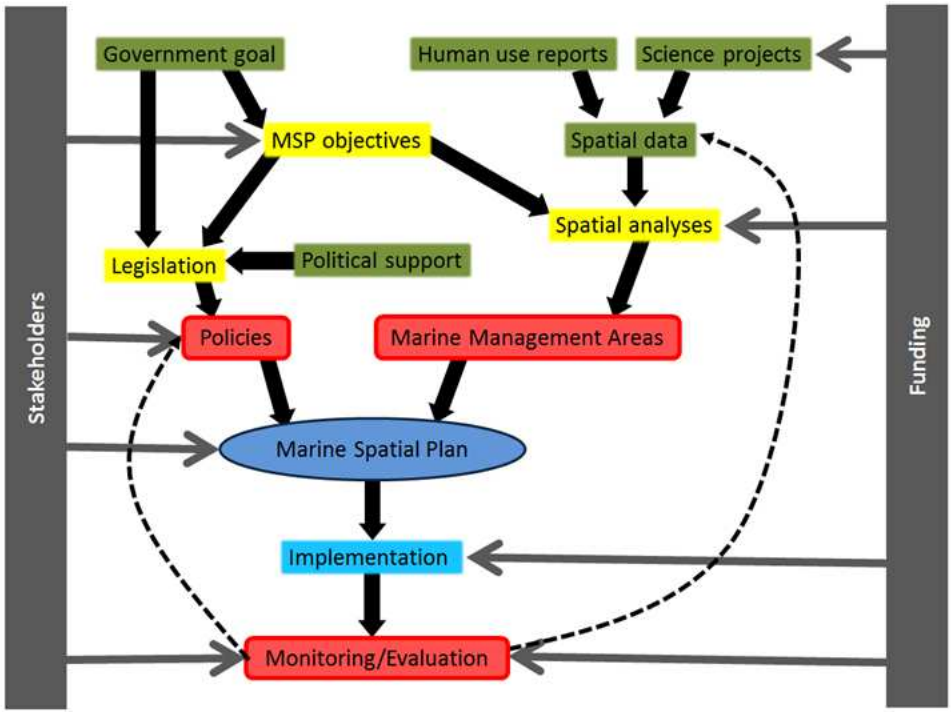

Figure 11: Draft outline of main inputs, steps and considerations for Marine Spatial Planning.

Three main consultation and analysis steps must then take place (in yellow in Figure 11). The MSP objectives must be designed to ensure that the future plan corresponds to the aspirations and vision of the Government and local stakeholders. This is done through consultations. The spatial data and MSP objectives are used to conduct spatial analyses to identify potential Marine Management Areas (MMA). The MSP Objectives and Government goal are used to investigate legislation options in order to create policies to implement MSP. The combination of Policies and MMA form the Marine Spatial Plan.

Throughout the MSP process, two main considerations must be taken. These are stakeholders' involvement and funding arrangements. MSP is a consultative process and requires stakeholders to be involved throughout in order to facilitate implementation and ensure that socio-economic objectives are also integrated in the Plan. MSP process is also a costly process and a financial plan and commitment must be worked out in parallel to the development of the Plan. The development of the Plan can be done through a science-based funding scheme (such as the Darwin Plus grant in this project) but it needs sustained funding for implementation, monitoring and evaluation and possibly enforcement if necessary. A commitment from the Government to funding these essential steps is necessary for a Marine Spatial Plan to be effective.

Finally, MSP must be adaptive to respond to new knowledge and changes in marine activities or environmental conditions. Consequently, feedback loops (represented by the dashed lines in Figure 11) are necessary to ensure that the Plan stays relevant to the MSP objectives and uses the most up-to-date scientific information. Monitoring and evaluation is an important step to determine the efficiency of the Plan and where changes may be needed.

As part of the incorporation of MSP in the Falkland Islands policy, the Biodiversity Strategy will be revised in May 2015 and some outputs and preliminary results from this project should be included in this new strategy.

6. Stakeholders and science partners

Stakeholders' involvement is a crucial part of an MSP project to ensure uptake of the Plan and consideration of all different socio-economic sectors of the Falkland Islands. The first step is consequently to identify all stakeholders that are involved in economic activities related to the marine environment, are users of the sea, or value the marine and coastal habitats for social or personal reasons. The Falkland Islands stakeholders identified are:

- Local community (in Stanley and Camp)
- Commercial fishing companies and FIFCA (Falkland Islands Fishing Companies Association)
- Tourism operators and tourism board
- Oil companies and FILPA (Falkland Islands Petroleum Licenses Association)
- FIG (Fisheries Department, Environmental Planning Department, Mineral Resources Department)
- Conservation NGOs (Falklands Conservation, local Trusts and groups)
- Members of the Legislative Assembly of the Falkland Islands
- The British Navy
- Recreational users of the sea (diving and yacht clubs)

Science partners that have been working in the Falkland Islands or are custodians of data from the Islands also need to be identified and engaged in the MSP process. They have data and knowledge that can be incorporated in analyses, management and plans. The following list is in progress and more scientists will be added. Science partners currently include:

- Dr Sasha Arkhipkin (Fisheries Department)
- Dr Alastair Baylis (Deakin University, Australia)
- Dr Paul Brewin (Shallow Marine Survey Group)
- Dr Paulo Catry (Instituto Superior de Psicologia Aplicada, Portugal)
- Ms Sarah Crofts (Falklands Conservation)
- Prof John Croxall (independent, UK)
- Dr Deborah Davidson (Inshore Fisheries project)
- Dr Filippo Galimberti (Elephant Seal Research Group, Mexico)
- Dr Jacob Gonzales-Solis (University of Barcelona, Spain)
- Dr Susie Grant (British Antarctic Survey, UK)
- Prof Michael Harte (Oregon State University)
- Dr Ben Lascelles (BirdLife, UK)
- Mr Grant Munro (independent)
- Dr Helen Otley (Department of Conservation, New Zealand)
- Dr Megan Tierney and Dr David Blockley (GAP project)
- Dr Phil Trathan (British Antarctic Survey, UK)

7. Work plan for the next quarter

A public session is organised for the Tuesday 4th November evening and has for aim to present the MSP project to the community, and to determine what people value about the marine environment and what ecological, economic and social objectives should be developed.

The first workshop for MSP in the Falklands Islands will take place in Stanley over 2 days, on 24th and 25th of November. The first day will gather local stakeholders to define the objectives of MSP

and identify all important knowledge, data and steps that are necessary to fulfil those objectives. The second day will be science-focussed with local scientists and international experts to refine objectives for MSP, identify previous MSP processes and the opportunity for a novel MSP approach in the Falkland Islands. A report will be produced that will include the MSP objectives and an updated MSP framework for the Falkland Islands as well as a complete final list of spatial data available and identified data and knowledge gaps.

Further gathering and analyses of spatial data will be undertaken and metadata file completed, in particular focussing on wildlife distribution data (seabirds and marine mammal tracking data, benthic habitat mapping) in collaboration with research partners.

The MSP review will be finalised and submitted for publication. The stranding cetacean spatial data will also be written up as a small publication to be submitted.

Proposals for small projects to fill gaps in knowledge and data will be produced and submitted to the committee and research partners.

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