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# FINAL REPORT

## Assessing risk to Scottish MPA search features at the MPA regional scale

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## 1. Assessing Risk for the Scottish MPA Project

This document outlines how the risk assessments for each MPA search feature have been developed internally by SNH and JNCC to inform step 2e of the Selection Guidelines.

Risk, in the context of this paper, is defined as the likelihood that a search feature will be exposed to a pressure to which it is sensitive. Assessing risk has relevance to step 2e of the selection guidelines, which states: *The search location contains features considered to be at **risk** of significant damage by human activity.* The accompanying note states *'The emphasis should be on identifying risk to features rather than risk to individual search locations. For biodiversity the focus should be on the presence of features considered to be at risk of damage at a regional level.'*

The following steps have been applied to assess risk for each Scottish MPA region for each search feature:

### 1.1 Identifying pressures and associated activities to which search features are sensitive

Defra lead on a piece of work designed to assess the sensitivity of features considered to be of conservation interest against physical, chemical and biological pressures (Tillin *et al.* 2010). The Defra sensitivity assessments were made using information from the MarLIN sensitivity assessment, along with expert knowledge from stakeholders and scientific experts. The sensitivity assessments were made against a defined pressure intensity, referred to as a benchmark. These benchmarks were the same for all features assessed. The matrix produced through the Defra work provides a sensitivity assessment (high, medium and low) for most of the MPA search features. The sensitivity assessment was based on two assessments which were combined to get the final score (for further details see Tillin *et al.* 2010):

- An assessment of the search feature's resistance (tolerance) to the pressure
- An assessment of the search feature's resilience (recovery) from the pressure

The pressures were assigned to relevant activities by JNCC using the benchmark level of pressure<sup>1</sup> and this was summarised in a pressure-activities matrix. This matrix and the sensitivity assessment was used by Natural England/JNCC to create a final spreadsheet providing a sensitivity assessment for all the pressures considered and the activities related to these pressures to which the feature is sensitive. This sensitivity-pressure-activity matrix was used as the basis of reporting on risk for search features at the level of the MPA search feature (i.e. not component habitats/species). The Defra sensitivity assessments for 'burrowed mud' and 'seapens and burrowing megafauna' were combined to produce the sensitivity assessment for the MPA search feature burrowed mud. The Defra sensitivity assessment for Northern sea fan communities was used for the risk assessment of Northern sea fan and sponge communities.

However, an extensive amount of work has been done by SNH and JNCC to refine the products from the Defra work to produce a resource known as the [FEatures, Sensitivites, Activities Tool \(FEAST\)](#), which provides a user-friendly interface for interrogating the sensitivities of the MPA search features to pressures associated with activities.

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<sup>1</sup> It is important to note that if an activity is not occurring at an intensity or frequency to result in the benchmark level of pressure, the sensitivity assessment may not be applicable. However, when proposed MPA sites are defined their search features will be considered in more detail with regard to risk, including sensitivity assessment, pressures, related activities and exposure to these.

The work to develop FEAST included updating the sensitivity assessments with more recent literature for example to ensure decisions are based on the best-available evidence, and creating additional feature sensitivity assessments for features not covered by Defra work<sup>2</sup> (for cetaceans, black guillemot, sandeels, basking shark, common skate, and low or variable salinity habitats).

#### *Pressures not considered during risk assessment*

- The Climate Change pressure theme and its associated pressures were removed from the risk assessment because they are not spatially explicit i.e. a shipping lane which overlaps with the presence of a search feature does not necessarily put that search feature at any greater risk to the climate change related pressures associated with shipping. However, the pressure temperature change – national/regional was added back in for the cetacean risk assessment because of the sensitivity of white beaked dolphin in particular to temperature change at a regional level, although it is acknowledged that assessing exposure to this pressure is difficult.
- Litter as a pressure was removed for all features apart from cetaceans as it is a national issue, with little regional/local information to inform exposure. It is also very difficult to isolate the sources of litter in the marine environment and there is existing legislation, e.g. for shipping, that prohibits littering in the marine environment. However, for cetaceans whilst it is very difficult to assess both sensitivity and exposure to this pressure, there is evidence of mortality from litter ingestion and it was decided that it was important to note this.
- Waste gas emission (including greenhouse gases from industry, agriculture, forestry, domestic & transport): this activity was not considered as it is related to climate change pressures and it was felt that it would be very difficult to assess the exposure of the search features to this activity, e.g. gases from industry/agriculture. Additionally, whilst the search features being considered could be sensitive to the pressures related to this activity, this work is directed towards identifying MPAs to protect these features, which arguably are not the correct mechanism through which to manage the effects of waste gas emission activities.

For each search feature only those pressures and related activities for which the feature has a low, medium or high sensitivity score in FEAST were assessed in terms of the risk they posed to the search feature. The range of sensitivity to pressures associated with an activity was summarised in the risk assessment sheet.

A double check was undertaken to ensure that the activities being assessed made sense for each search feature being considered, e.g. an intertidal activity and its associated pressure was not included for a subtidal feature.

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<sup>2</sup> Marine Scotland Science led on this work for the fish species and the sensitivity assessments for the three cetacean species (minke whale *Balenoptera acutorostrata*, white-beaked dolphin *Lagenorhynchus albirostris* and Risso's dolphin *Grampus griseus*) were undertaken by Caroline Weir, Ketos Ecology. However, there was in general a lack of evidence to support a sensitivity assessment classification (not sensitive, low, medium or high sensitivity). The sensitivity assessment for low or variable salinity habitats was undertaken by SNH using the MarLIN sensitivity assessment for kelp in variable or reduced salinity (IR.LIR.KVS) because full sensitivity assessments were not available for any of the other component biotopes associated with this search feature.

## 1.2 Exposure assessment by MPA region

Where GIS data was available on the activities, this was used to examine the distribution of the activity in relation to the search feature distribution in each MPA region (search feature data held in GeMS<sup>3</sup>), i.e. whether there was an overlap between search feature records and activity. The level of overlap was described for each of the features, for example, '*half of the point records of the feature overlap with the activity within the west MPA region*'. We did not grade the level of exposure (low, medium or high) as it was felt that the descriptive approach was more useful. However, GIS data were not available for all activities within Scottish waters to make map based assessments of a search feature's exposure to activities and related pressures, e.g. under 15 m fishing fleet activity, recreational fishing. In such cases expert knowledge was used on the nature of the fishing activity and what substrates it would be targeting (e.g. SNH/JNCC fisheries guidance notes on MPA proposed protected features).

As risk was assessed at a regional scale in this assessment, it was felt that there was not a need for a precise quantitative assessment of exposure and risk, i.e. number or percentage of records of search feature exposed to an activity. Therefore, a more descriptive approach has been taken to detail exposure and risk for the search features. This approach lends itself to being more informative and potentially more useful for applying the selection guidelines.

The data sources used to carry out exposure assessments are presented in Annex A.

## 1.3 Risk assessment

The risk assessment for each search feature was based on the **range** of sensitivity of the search feature to the activity (based on sensitivity to pressures associated with the activity) and the extent to which the search feature is **exposed** to the activity. The approach of using a scoring method of sensitivity and exposure to give a risk score was not utilised in this approach as we did not grade the level of exposure and it was felt that a descriptive summary would be more useful. However, a rank was also provided for each activity based on expert judgement using this information, to assist with producing an overall risk assessment for all activities in the region.

## 1.4 Overall Risk assessment for region (sensitivity x exposure)

To get to the final combined risk score for each of the MPA regions for each search feature the total number of activities assigned to low, medium and high risk were counted for each region. A judgement was then made as to what the overall risk assessment for the feature in the region should be. Generally the grade overall risk assessment was the grade with the highest number of activities assigned to it, e.g. 1 low, 2 medium, 3 high – overall risk assessment would be high. However, there were some cases where expert judgement was utilised where two or all three risk grades had the same number of activities.

The steps outlined above were suitable in most cases, however there were instances where further judgement was required, particularly in relation to more sensitive features and

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<sup>3</sup> Exposure assessment for the basking shark was based on point sightings data and effort corrected sightings data (where available) and for common skate was based on point tagging data as available in GeMS. For cetaceans the risk assessment is based on the evidence and expert judgement provided in the sensitivity assessment along with consideration of the average encounter rate for the species to consider the full range of distribution in the region (GeMS, derived from the JNCC Cetacean Atlas) and degree of overlap with the activity under consideration.

interaction with fishing activities where the level of interaction between under 15m vessels and search features is not clear. For example, in the north region for horse mussel beds there were six medium risk activities (6) and four high risk activities (three of which relate to fishing activities). Whilst this normally would have been scored medium risk overall, due to the higher sensitivity of horse mussel beds and uncertainty regarding the level of interaction with fishing, this feature was ranked at medium-high risk overall in this region. Where these judgements were applied this was documented in the risk assessment spreadsheet.

## 2. Search feature risk assessments

The final risk assessments for each search feature are available as individual spreadsheets, compiled in Microsoft Excel. Each document has a series of three sheets:

- Sheet 1 - Sensitivity – This details the sensitivity of the feature being assessed against pressure benchmarks and their associated activities.
- Sheet 2 – HML sensitivity – This sheet shows only those pressures to which the feature has been assessed as having a low, medium or high sensitivity to and the associated activities.
- Sheet 3 - Risk – Risk assessments have been presented for each search feature as a risk score by activity and a combined risk score by MPA region (East, North, West, Far West and Southwest). This sheet provides an overview of the range of sensitivity and risk for the feature by activity for each MPA region. Activities included in this sheet were those that are associated with pressures to which the feature was identified as having either a low, medium or high sensitivity to. The description of risk includes a summary of the sensitivity of the feature and the level of exposure to the activity within the MPA region where known. At the bottom of this sheet the overall or combined risk assessment for each region is presented along with additional notes on how this was derived (as described in section 1.4).

## 3. References

Hill, J. 2008. *Antedon bifida*. Rosy feather-star. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 07/04/2011]. Available from: <<http://www.marlin.ac.uk/speciessensitivity.php?speciesID=2542>>

McKay, D.W., and Fowler, S.L. 1997. Review of the exploitation of the mussel, *Mytilus edulis*, in Scotland. Scottish Natural Heritage Review No. 68

Tillin H.M., Hull S.C., Tyler-Walters H. 2010. Development of a sensitivity matrix (pressures-MCZ/MPA features). Report to the Department of Environment, Food and Rural Affairs from ABPmer, Southampton and the Marine Life Information Network (MarLIN) Plymouth: Marine Biological Association of the UK. Defra Contract No. MB0102 Task 3A, Report No. 22. SNH Objective Reference: A452466

**Annex A - Activities data layers source table used for the assessment of exposure**

<b>Activity theme</b>	<b>Activity</b>	<b>Data layer(s)</b>	<b>Source</b>	<b>Last updated</b>
Energy production & infrastructure	Energy production & associated infrastructure - at sea (wind turbines)	Rounds 1, 2 and 3 areas  Known turbine locations  Round 1 cable infrastructure	Crown Estate	August 2011
	Energy production & associated infrastructure - at sea (wave)	Live wave lease sites	Crown Estate	August 2011
	Energy production & associated infrastructure - at sea (tidal)	Live tidal lease sites	Crown Estate	August 2011
	Energy production - on land (power stations, inc. nuclear)	Coastal power stations	SNH - List of power stations from internet cross-checked to see if located by coast	December 2010
Extraction - non-living resources	Extraction – quarrying	SEPA authorised locations Activity code = Mining and quarrying  SEPA Water Body pressures layer (coastal and transitional) Pressure_T = morphological alteration; Purpose = flood defence, land reclamation	SEPA	December 2010
	Extraction - navigational dredging	SEPA Water Body pressures layer	SEPA	December 2010

Activity theme	Activity	Data layer(s)	Source	Last updated
	(capital, maintenance) outside ports and harbours	(coastal and transitional) Pressure_T = morphological alteration; Purpose = dredging resulting in removal of sediment <sup>4</sup>		
	Extraction - sand & gravel	Aggregate Dredging Zones (Middle Bank)	Crown Estate	February 2011
	Extraction - oil & gas (wellheads)	Wellheads Filtered for 'completed, drilling, permitted and suspended' under 'wellstatus' with blanks left in (blanks likely commercially sensitive status information so assume active).  Oil and gas license areas: 25 <sup>th</sup> round accepted 26 <sup>th</sup> round further assessment	UK DEAL  UK DEAL	January 2011  January 2011
	Extraction - water (freshwater catchment; industrial, e.g. power station)	SEPA authorised locations Activity code = abstraction – fish production, abstraction – environmental service, abstraction – irrigation, abstraction – hydropower, abstraction – drinking water	SEPA	December 2010
Extraction - living resources	Harvesting - seaweed (from wild)	No layer. Use information on activities from SNH staff. Mainly takes place on Northern Isles (Shetland) and Western Isles	SNH Policy & Advice staff	December 2010

<sup>4</sup>This data set only includes areas out with ports, harbours and marinas. The Crown Estate and SEPA have confirmed that dredging within these areas is the responsibility of the individual port authorities so we are unlikely to get the data unless we request it directly from ports.

Activity theme	Activity	Data layer(s)	Source	Last updated
	Bioprospecting	No layer. Use inferred judgement for corals, sponges and deep sea features which are likely to be of most value to bioprospectors.		
	Fishing – cockle fisheries <sup>5</sup> - hand gathering & tractor dredging	<p><i>Hand gathering:</i></p> <ul style="list-style-type: none"> <li>• Cockle orders</li> <li>• Internal SNH guidance notes on this fishery and gear type.</li> </ul> <p><i>Tractor dredging:</i> prohibited apart from annual license through Solway Firth Regulating Order management scheme; refer to internal SNH guidance notes on this fishery and gear type</p> <p>Maps and Information in McCall (1993)</p>	<p>The Crown Estate SNH Policy &amp; Advice</p> <p>SNH Policy &amp; Advice</p> <p>McCall (1993)</p>	<p>March 2011</p> <p>March 2011</p> <p>1993</p>
	Fishing – creels and pots <sup>6</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	<p>January 2011</p> <p>March 2011</p>
	Fishing - dive fisheries (not including hydraulic dredging)	<i>Hand gathering:</i> no data layer, refer to internal SNH guidance notes on this fishery	SNH Policy & Advice	March 2011
	Fishing – drift netting <sup>7</sup>	Under 15m vessels – no data layer, refer to internal SNH	SNH Policy & Advice	March 2011

<sup>5</sup> Target common cockle, *Cerastoderma edule*

<sup>6</sup> Target brown crab (*Cancer pagurus*), velvet crab (*Necora puber*), langoustine (*Nephrops norvegicus*), lobster (*Homarus gammarus*) and whelk (*Buccinum undatum*)

<sup>7</sup> Target pelagic shoaling species such as herring, sprat and mackerel

Activity theme	Activity	Data layer(s)	Source	Last updated
		guidance notes on this fishery and gear type.		
	Fishing – intertidal (not bivalves) <sup>8</sup>	<i>Hand digging (worms); bait pumping (lugworms); hand picking (winkle and green crab); vacuum pump (winkles) and crab shelters</i> No data layers, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011
	Fishing – line fishing	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011
	Fishing - Mussels and oysters – hand gathering <sup>9</sup>	Mussel and oyster orders  Internal SNH guidance notes on this fishery and gear type.  Information and maps in McKay and Fowler (1997)	The Crown Estate  SNH Policy & Advice  McKay and Fowler (1997)	March 2011   1997
	Fishing - Mussels and oysters – dredging <sup>5</sup>	No data layer, refer to internal SNH guidance notes on this fishery and gear type.  Information and maps in McKay and Fowler (1997)	SNH Policy & Advice  McKay and Fowler (1997)	March 2011  1997
	Fishing – pelagic trawling and purse seining <sup>10</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and	SNH Policy & Advice	March 2011

<sup>8</sup> Target common periwinkle (*Littorina littorea*), green crab (*Carcinus maenas*), lugworms (*Arenicola* spp.) and ragworms (*Nereis* spp. & *Perinereis*)

<sup>9</sup> Target common/blue mussel (*Mytilus edulis*) and native oyster (*Ostrea edulis*)

<sup>10</sup> Target pelagic shoaling species such as herring, sprat and mackerel

Activity theme	Activity	Data layer(s)	Source	Last updated
		gear type.		
	Fishing – set (fixed) netting <sup>11</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011
	Fishing – beam trawling <sup>12</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011
	Fishing – demersal seine netting <sup>13</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011
	Fishing – otter trawling <sup>14</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011
	Fishing - hydraulic dredging for bivalves (e.g. cockles, razor and surf clams)	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.  Maps and information in McCall (1993)	SNH Policy & Advice  McCall (1993)	March 2011  1993
	Fishing – scallop dredging <sup>15</sup>	Under 15m vessels – no data layer, refer to internal SNH guidance notes on this fishery and gear type.	SNH Policy & Advice	March 2011

<sup>11</sup> Targets mixed whitefish e.g. cod, haddock, saithe and crayfish

<sup>12</sup> Targets flatfish including plaice, sole, megrim and brown shrimp (*Crangon crangon*)

<sup>13</sup> Targets mixed white fish e.g. cod, haddock, whiting, saithe

<sup>14</sup> Targets langoustine (*Nephrops norvegicus*), mixed demersal whitefish and squid

<sup>15</sup> Target *Pecten maximus* and *Aquiptecten opercularis*

Activity theme	Activity	Data layer(s)	Source	Last updated
	Aquaculture - fin fish	Locational Guidelines Category 1 & 2	Marine Scotland Science	March 2011
Food production	Aquaculture - shell fish	Crown Estate shellfish lease areas	The Crown Estate	July 2011
	Beach replenishment	Beach replenishment sites (historic and potential)	Alistair Rennie, Policy & Advice, SNH	January 2011
Habitat modification	Infrastructure - cables & pipelines	Major fibre optics cables, sub-aqueous cables, oil and gas pipelines, power cables.	UKCPC, Crown Estate, Global Marine, UK DEAL, SHETL.	November 2010, UK DEAL January 2011 SHETL June 2011
Man-made structures (inc. construction phase)	Infrastructure - coastal ports, marinas, leisure facilities	Ports	Defra MB0106 datalayer	2010
		Marinas and harbours	SNH shapefile	
	Infrastructure – coastal defence and land claim	EUrosion dataset CEMODSEN = artificial beaches, embankment, artificial protection  Hard and soft engineered flood defences and coastal protection schemes	SNH  Scottish Government	January 2011  January 2011
	Infrastructure -oil & gas	Surface and subsurface  Surface selected for 'platform and FPSO' under 'type' and 'active, not in use, pre-commissioned and proposed' under 'status'. Subsurface  Subsurface selected for 'manifold and template' under 'type' and 'abandoned, active, not in use,	UK DEAL	January 2011

Activity theme	Activity	Data layer(s)	Source	Last updated
		pre-commissioned and proposed' under 'status'.		
	Military activities	Military Practice Areas based on MoD 2010 Scottish questionnaires	MoD	June 2010
		Military Practice Area pressure theme allocation based on snapshot of activities associated with the areas in 2010 and agreed MoD/JNCC pressure matrix.	MoD	June 2010
Military	Tourism & recreation	RYA sailing areas	RYA via Scottish Government annual license	2010
		RYA cruising routes	RYA via Scottish Government annual license	2010
		Anchoring areas	Defra MB0106 datalayer	
Recreation	Seismic survey (military, exploration, construction)	Licensed areas oil and gas 25 <sup>th</sup> round accepted 26 <sup>th</sup> round further assessment	DECC	January 2011
		Military Practice Areas which in 2010 were attributed to sonar use activity.	MoD	June 2010
Survey & research	Shipping	Ferry routes polyline	Scottish Government (unrestricted use)	2010

Activity theme	Activity	Data layer(s)	Source	Last updated
		Ports (proxy for non-natives) <sup>16</sup>  Marinas and harbours (proxy for non-natives) <sup>16</sup>  AIS shipping data	Defra (MB106)  SNH shapefile  Defra (MB106)	
Transport	Industrial & agricultural liquid discharges	SEPA Water Body pressures layer (coastal and transitional) where overall water body classification is below 'good' and: Pressure_T = diffuse, point; Industry_S = livestock farming, water transport, food production, mixed farming, other manufacturing, air transport, chemical production, other refuse disposal activity	SEPA	December 2010
Waste - liquid	Sewerage disposal	SEPA Water Body pressures layer (coastal and transitional) ) where overall water body classification is below 'good' and: Pressure_T = diffuse, point; Industry_S = sewage disposal	SEPA	December 2010
	Waste disposal - munitions	Munitions dumping grounds (all	MoD/SeaZone	October 2010

<sup>16</sup> The datasets for ports, harbours and marinas were used as a proxy for the pressure 'Introduction or spread of non-indigenous species & translocations' under the shipping activity theme. It was felt that this was an appropriate proxy as the transfer of non-indigenous (non-native) species can occur from boat hulls whilst in dock. The exposure to non-indigenous species is more difficult to assess in the wider marine environment. The Ballast Water Management Convention (IMO) has put in place ballast water treatment standards and until these have been implemented on vessels they are required to conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth; or in cases where this is not possible (e.g. bad weather) at least 50 nautical miles from the nearest land and in water at least 200 metres depth. Therefore, whilst there is very limited potential for introduction and spread of these species through ballast water exchange, species can still be transported on the hulls of vessels and this is something that we have not been able to assess exposure to.

Activity theme	Activity	Data layer(s)	Source	Last updated
	(chemical & conventional)	historical)  Active and closed waste dumping grounds	Marine Scotland Science	2009
Waste - solid	Waste disposal - dredging (capital, maintenance) & quarrying (geological material)	Disposal of material from capital/navigation dredging or quarrying	Defra MB0106 data layer	