Title: Pisces Reef Complex Special Area of Conservation. **IA No:** **Lead department or agency:** Defra Marine Biodiversity Policy **Other departments or agencies:** Joint Nature Conservation Committee (JNCC)	**Impact Assessment (IA)** **Date:** 03/05/2012 **Stage:** Final **Source of intervention:** EU **Type of measure:** Secondary legislation **Contact for enquiries**: Gareth.Johnson@jncc.gov.uk (01733) 866838

Summary: Intervention and Options

RPC Opinion: RPC Opinion Status

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB on 2009 prices)	**In scope of One-In, One-Out?**	**Measure qualifies as**
£m	£m	£m	No	NA

What is the problem under consideration? Why is government intervention necessary?

Due to pressures of anthropogenic activities on marine habitats and species many are currently in decline. Although regulation is in place for some activities, it is not necessarily designed to achieve nature conservation objectives. Intervention is needed in order to manage activities in key areas for important species and habitats and to promote a healthy, resilient marine environment. JNCC have assessed this site against the Habitats Directive Annex III selection criteria, and advised the Secretary of State that it is eligible for identification as a 'Site of Community Importance' and should therefore be transmitted to the European Commission as required under Reg 7 of the Offshore Marine Conservation Regulations 2007 (amended).

What are the policy objectives and the intended effects?

The EC Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna (the Habitats Directive, 1992) aims to promote biodiversity maintenance. This Directive requires the UK (as a Member State) to propose sites hosting habitat types and species in need of conservation listed in the Directive, which are eligible for identification as SCIs and designation as Special Areas of Conservation (SAC). The UK is required to establish conservation measures for sites designated as SACs by managing potentially damaging activities where the habitats and species are present and in their vicinity. 'Reefs' (Habitat 1170 in Annex I) are the qualifying feature of Pisces Reef Complex.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Baseline: Do nothing, that is do not designate the site.

Option 1: Propose the site to the EC for designation. This is the preferred option as it will contribute towards conserving habitat of European importance along with its typical species located in UK waters. The option to search for an alternative site has not been considered further here as alternatives have been considered at an earlier stae of the process. Alternative sites of similar type are not currently known to exist (known alternatives were considered in the scoping stage but not recommended on scientific grounds). Though the site could be conserved under voluntary agreements or a national designation this would not contribute to fulfilling the requirements of the Habitats Directive. As the measure follows an EU directive, it is exempt from OIOO and moratorium on small businesses.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** 01/2019

Does implementation go beyond minimum EU requirements?			No		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro** No	**< 20** Yes	**Small** No	**Medium** No	**Large** No
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** na	**Non-traded:** na	

I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs.

Signed by the responsible Minister: ..... Date: .....

Summary: Analysis & Evidence

Policy Option 1

Description: The assessment considers the minimum and maximum plausible management scenarios to achieve conservation objectives.

FULL ECONOMIC ASSESSMENT

Price Base Year 2011	PV Base Year 2011	Time Period Years 20	Net Benefit (Present Value (PV)) (£m)		
			Low: na	**High:** na	**Best Estimate:** na

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£181k		£39.6k	**£763.5k**
High	£181k		£336.0k	**£5041.0k**
Best Estimate	£181k		£187.8k	**£2902.2k**

Description and scale of key monetised costs by 'main affected groups'

Low: enforcement and monitoring (£181k and £39.6k pa).
High: lost profit for fisheries (£312k pa from 2012); and enforcement and monitoring (£181k and £39.6k pa).
Cost calculations are based on an upper bound for segment profitability (30% of landings) rather than GVA; adding crew-share would overestimate overall sector impact.
The best estimate given here is the mid point of costs for low and high scenarios.

Other key non-monetised costs by 'main affected groups'

High: fishermen could exit sector, knock-on effect to local economy of costs to fishermen and direct impacts on fishing related industries (e.g. fish processing, hauliers).
Displacement of fishing from the site could impact vessels operating in other areas.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	**Optional**
High	Optional		Optional	**Optional**
Best Estimate	Unquantified		Unquantified	**Unquantified**

Description and scale of key monetised benefits by 'main affected groups'

It has not been possible to monetise the benefits because the benefits cannot be readily quantified and most of the benefits are not traded so cannot be easily valued.

Details of the qualitative assessment of the benefits are provided in the evidence base.

Other key non-monetised benefits by 'main affected groups'

Pisces Reef Complex SAC would designate as protected site 855ha of reef that support a diverse range of species. Low/moderate beneficial impacts on ecosystem servies, including non-use values of natural environment and scientific research in the area that is designated; reduction in fishing mortality in the area that is designated. Benefits for the sustainable delivery of esystem services. Important wider network and strategic benefits on biodiversity through the Natura suite of marine SACs.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5

Management measures for site are not known before designation so a realistic range of measures is used for analysis. Profit to fishing vessels assumed to be 30% of catch value. Formal mechanisms to avoid damage to the habitats are weaker if site is not designated. Risk of infraction if suite of proposed SACs not designated. Benefits could be jeopardised if appropriate fisheries management not agreed through the CFP or properly enforced. Risk of cumulative economic impacts of MPAs

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: £0.148m	**Benefits:** na	**Net:**	No	NA

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1 INTRODUCTION

1.1 Purpose

In Europe, natural habitats are continuing to deteriorate and an increasing number of wild species are seriously threatened. The main aim of the European Habitats Directive[1] is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain, or restore natural habitats and wild species to, Favourable Conservation Status (see below), introducing robust protection for those habitats and species of European importance.

This Impact Assessment (IA) addresses the recommendation by the Joint Nature Conservation Committee (JNCC) for designation of an offshore Special Area of Conservation (SAC) at Pisces Reef due to its bedrock reefs and stony reefs formed by boulders and cobbles (subtypes of H1170).

Human activities can adversely affect our marine environment. Many of our marine habitats have been altered or damaged by activities such as fishing, windfarm development, dredge disposal and oil and gas extraction (Eastwood 2007). Direct harvesting of fish has caused dramatic decreases in populations of target species including cod, herring, plaice and sole (Hall 1999) and even localised extirpation in parts of UK waters, for example the "common" skate[2] in the Irish Sea (Reynolds et al 2001; Dulvy and Reynolds 2002). Species that are not the target of harvesting may also be damaged, particularly through inadvertent bycatch, and damage to habitats can occur, for example through the use of destructive bottom-fishing gear (Jennings and Kaiser 1998).

Currently only 4% of the UK's marine environment is protected for nature-conservation purposes. At present, protection is not being provided to examples of the variety of habitats found in UK offshore waters although proposals are now being considered. Given the overlap between anthropogenic activities and habitats of conservation importance, it is evident that additional management is needed to maintain and restore the healthy structure and function of marine ecosystems whilst supporting sustainable industries.

The IA informs the Government about impacts designation of the site could have on the UK economy and the site's potential environmental and social effects. It should not inform the decision to designate the site (which should be based on the site's Selection Assessment Document). This is because under the European Union's (EU's) Habitats Directive economic or social impacts should not influence selection of SACs or delineation of their site boundaries. However, information provided on the type and level of activities taking place in and near the site may be used to inform management measures for the site.

1.2 Policy drivers

a) Habitats Directive

Member States of the Council of Europe are committed to the Convention on the Conservation of European Wildlife and Natural Habitats[3]. The Wild Birds Directive[4] and Habitats Directive provide the framework within which the provisions of the Bern Convention are applied in the European Union. The Habitats Directive aims to conserve natural habitats and species that are considered to be most in need of conservation at a European level (which are listed in Annex I and Annex II of the Directive respectively). Habitats have been included on Annex I because they are either in danger of disappearance within their natural range, have a small natural range, or they present outstanding examples of typical characteristics of the biogeographical regions listed in the Directive. The Habitats

[1] Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna.
[2] Since this research was conducted, the common skate (*Dipturus batis*) has been reclassified as two separate species, the blue skate (*D. flossada*) and the flapper skate (*D. intermedia*) (Iglésias et al 2010).
[3] The Bern Convention , Bern, 1979.
[4] Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds.

Directive not only aims to conserve the habitats but also their typical species. The UK (as a Member State) is required to take measures to maintain or restore favourable conservation status[5] of these natural habitats and to introduce robust protection for them.

Under the Habitats Directive, habitats and species are to be protected by a coherent European ecological network of sites (called Natura 2000) identified by the European Commission from lists of national sites proposed by each Member State. The network of sites will enable habitat types to be maintained at, or restored to, favourable conservation status within their natural range. Once adopted in the Natura 2000 network, the sites are designated by Member States as Special Areas of Conservation (SACs).

The Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended) (the "Offshore Habitats Regulations") transpose the Habitats Directive (92/43/EEC) and Wild Birds Directive (2009/147/EC) into national law. These regulations apply to the UK's offshore marine area which covers waters beyond 12 nautical miles, within British Fishery Limits and the seabed and subsoil of the UK Continental Shelf Designated Area. The Offshore Habitats Regulations enable the UK to comply with European law beyond inshore waters and ensure that activities regulated by the UK that have an effect on important species and habitats in the offshore marine environment can be managed. Under the Regulations, competent authorities that have functions relevant to marine conservation in the offshore marine area have a general duty to secure compliance with the EC Habitats and Wild Birds directives.

The Habitats Directive provides site selection criteria within Annex II. Site selection criteria comprise:

- the degree of representativeness of the natural habitat at the site in question;
- the area of the site in relation to the area of that habitat type within the national territory;
- the degree of conservation of the structure and functions of the habitat type (including restoration possibilities); and
- a global assessment of the conservation value of the site for that habitat type.

JNCC is responsible for providing scientific advice to Government on nature conservation matters, including on the selection of SAC sites in the UK offshore marine area under the Offshore Habitats Regulations.

The European Commission will assess whether the list of SACs submitted by UK Government to them is sufficient or not. JNCC have worked to provide the best estimate of whether the UK's sites submitted so far will be sufficient or not in terms of both representing the habitat across its natural range, and also in proportion to the amount of that habitat type within UK waters[6].

JNCC concluded that if at least one example of each Annex I habitat sub-type in each of the UK's Regional Seas[7] were included in the SAC network that would ensure minimum representation of each Annex I habitat within its natural range in the UK (JNCC 2003).

b) UK identification of Annex I reef sites

Twelve proposals for SACs in UK offshore waters have now been submitted to the European Commission. The first five were submitted on 31st August 2008, the next six were submitted on 20th August 2010 (two of these sites are joint inshore-offshore sites), and the most recent site was submitted on the 26th August 2011. A further three sites (including this site) have been formally recommended to Government and undergone consultation, and a further five sites have been formally recommended to Scottish Government by JNCC.

[5] Favourable conservation status is defined for a feature as the 'natural range and area it covers is increasing, and the specific structure and functions which are necessary for its long term maintenance exist and are likely to exist for the foreseeable future, and the conservation status of its typical species is favourable'.
[6] JNCC 08 P14a February 2009 Progress towards completing the UK network of marine special areas of conservation (SACs) for Annex I habitats and site proposals for Hatton Bank and Bassurelle Bank.
[7] Regional Seas: www.jncc.gov.uk/page-161.

Other offshore SACs with reef (H1170) as a qualifying feature comprise Haig Fras, Stanton Banks and Darwin Mounds that have been approved by the European Commission as Sites of Community Importance. North-West Rockall Bank and Wyville Thomson Ridge proposals were submitted to the EC on 20th August 2010. Anton Dohrn Seamount, East Rockall Bank, Hatton Bank, Pobie Bank Reef (joint inshore/offshore) and Solan Bank Reef (joint inshore/offshore) are currently being progressed as draft SACs and were formally recommended to Scottish Government by JNCC in December 2011.

Pisces Reef Complex is located within the Irish Sea Regional Sea. There are eight marine SACs within this regional sea for which reef is a qualifying feature: Strangford Lough, Pembrokeshire Marine, Menai Bridge & Conwy Bay, Pen Llyn a`r Sarnau, Cardigan Bay, Solway Firth, Luce Bay & Sands, and Morecambe Bay. Pisces Reef is a very different habitat compared to these SACs as it is found in the deep circalittoral as opposed to intertidal and shallow waters. It is also a low-energy environment compared to medium-high energy.

c) Conservation objectives and management of sites

JNCC is responsible for establishing conservation objectives for the site, and for advising Competent Authorities of operations that could cause deterioration of the habitat and/or decline in the populations of its typical species. These conservation objectives and advice on operations are presented in a document[8] and inform the responsibilities of the Competent Authorities to exercise their functions regarding the management of activities within the site. Special provisions are made for the consideration of current and future plans and projects that impact on the site (but are not directly connected with management of the site for conservation purposes). The goal of these is to ensure that carrying out plans and projects does not adversely affect the integrity of the site. Management activities are intended to ensure marine habitats and species are maintained at, or restored to, favourable condition.

To fulfil conservation objectives for Annex I reef, it will be necessary for the competent authority to manage human activities where possible to ensure that the feature is not impacted through: 1) physical damage by physical disturbance or abrasion; and/or 2) biological disturbance by selective extraction of species.

1.3 Background information on the impact assessment

This report sets out the evidence base that supports the IA summary page for the policy options for the Pisces Reef Complex Special Area of Conservation Impact Assessment. Two options were initially considered for this site:

Baseline: do nothing
Option 1: designate the site

No other options are considered as Pisces Reef Complex, along with existing SACs and the other reef sites currently proposed, has been identified as an example of reef habitat to contribute towards the Natura network of sites for conservation. Other areas of similar habitat sub-type, where they exist, have been considered for selection as SACs but have been rejected for scientific reasons during earlier scoping.

This IA presents JNCC's quantitative assessment of the potential costs and benefits of the policy option (designate the site). Impacts have been assessed over a timescale of approximately twenty years. The decision to use this timeframe was based on various factors. It provides a sufficiently long period over which conservation benefits may arise and fisheries control measures may be implemented. Assessment of the impacts beyond twenty years becomes more uncertain. For example, businesses have greater scope to adjust their activities in the long-term (for example through purchasing new

[8] Pisces Reef Complex SAC: Draft Conservation Objectives and Advice on Operations v2.0 JNCC http://www.jncc.defra.gov.uk/pdf/PiscesReef_ConservationObjectives_AdviceOperations_2.0.pdf

equipment) and may therefore avoid costs that arise in the short-term. Costs are calculated over the 20-year period using a discount rate of 3.5%, based on Green Book recommendations[9].

The overall approach to assessing potential costs and benefits is based on the approach adopted by JNCC for their previous offshore SAC IAs (Eftec 2008), the joint consultation in 2009-10 on 12 inshore and offshore SACs and SPAs, and the Dogger Bank IA which was submitted for final approval in February 2011. A framework is used to combine and assess cost and benefit information from different sources on the likely impacts of the potential management measures for the sites.

This framework involves a description of:

- What the current situation at the site is (the baseline), such as the site's ecological characteristics, the economic activities taking place, their value, and their environmental impacts;
- What changes to these, relative to baseline, are expected to result from potential management measures that may be required to meet the site's conservation objectives;
- What the direct and indirect economic costs of those changes are to operators, enforcement authorities and wider society;
- The likely benefits of achieving the conservation objectives; and
- The different data that can be used to estimate costs and benefits, including: impacts on goods and services that are bought and sold in commercial markets that can be valued in monetary units; impacts on goods and services that are not traded in commercial markets (that are less easy to value); and other impacts (such as change to non-use value).

Information from stakeholders was requested during formal consultation on the scientific justification for the site and impact assessment. Additional information and comments from the formal consultation process was then used to update the IA. The consultation asked further questions but there was no substantive information provided that refines the cost implications.

2 BACKGROUND INFORMATION ON THE SITE

2.1 Baseline

Information about the current condition of the site forms a baseline scenario against which the potential impacts of the policy options are assessed. This section assesses the current activities at the site, and what is likely to happen over the assessment period if the site is not designated. This is the baseline against which the potential costs and benefits of Option 1 are compared in Section 4. By definition the costs and benefits of the baseline are zero since no additional actions will be taken.

2.2 Characteristics of the site

The Pisces Reef Complex is located in the western Irish Sea, in the north-west mud basin. It is approximately midway between the Isle of Man and the coast of Northern Ireland. The area consists of an extensive mud plain through which three areas of Annex I bedrock and boulder reef protrude (Pisces Reef area 1 - PR1, Pisces Reef area 2 – PR2 and Pisces Reef area 3 – PR3). They are situated apart from each other at distances of between 5.5 km and 14 km. While the possible SAC consists of the three reef features, the boundary has been delineated to exclude the areas of muddy sediment in between (see site map – Section 6). The approximate extents of the reefs are; PR1 - 620 m × 500 m, PR2 - 2070 m × 150 m and PR3 - 750 m × 780 m. The average seabed depth within the site boundary is approximately 100m with a maximum of 130m and a minimum of 70m at the peaks of the rocky reef outcrops. The deepest depths are within the scour pits which encircle the outcropping rocky reefs.

The three extruding reefs are composed of Tertiary igneous rock and boulders. They rise 15-35m above the surrounding seabed. The reef tops are composed of silty bedrock, with a patchy veneer of muddy

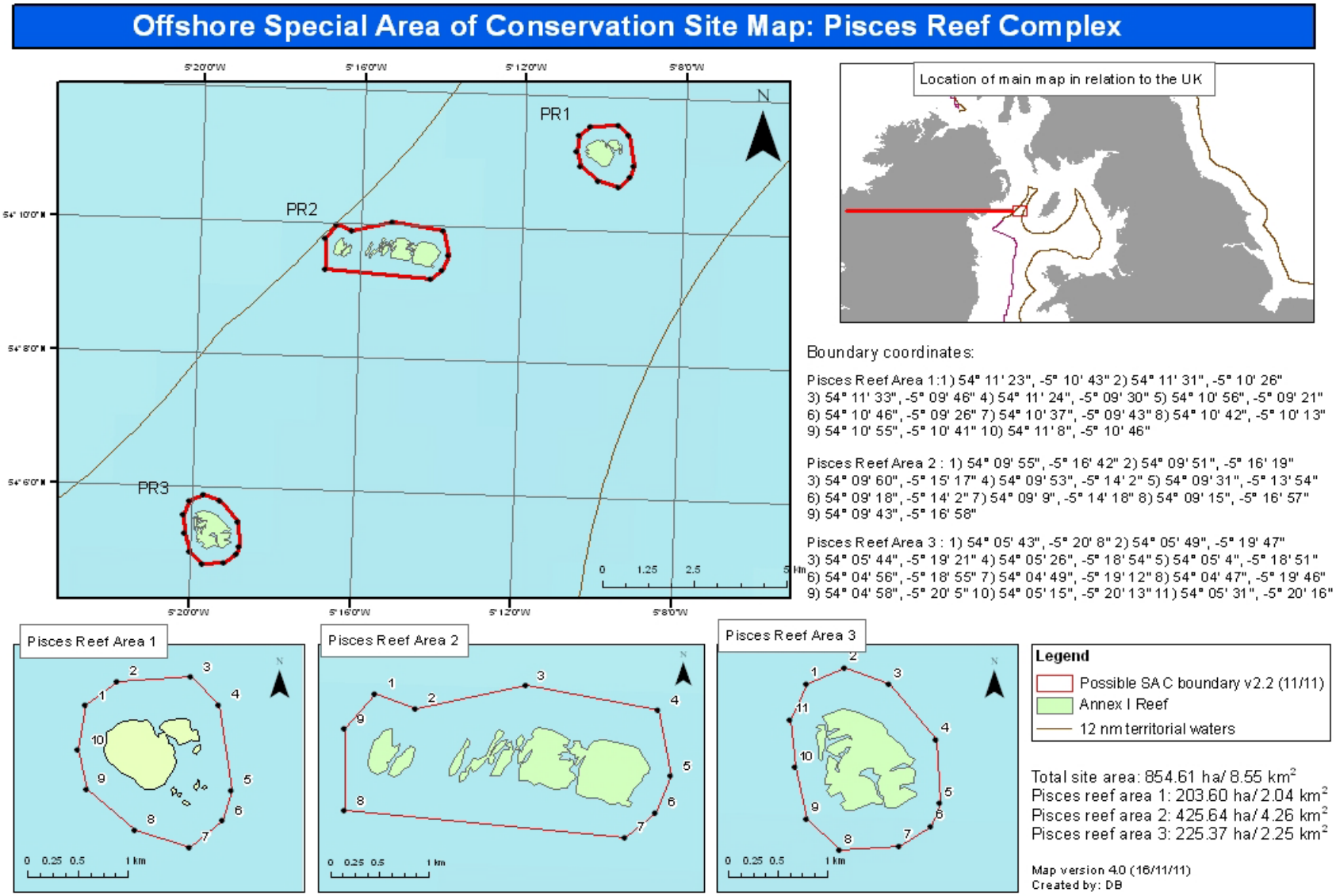
[9] HM Treasury, The Green Book: http://www.hm-treasury.gov.uk/data_greenbook_index.htm

sediment, due to sediment deposition from a localised scouring process. The reefs themselves support a diverse community of brachiopods, ascidians, hydroids, sponges and fish. In particular, the mosaic of bedrock and stony reef provide a myriad of ledges and habitat niches. Of note is the occurrence of the *Diphasia alata* hydroid community; not currently included within the Marine Habitat Classification for Britain and Ireland (Connor *et al*, 2004) but considered rare in the UK (Picton, 2010 *pers. comm.)*. The difference in species composition and abundance between the reefs and the surrounding mud plain highlights the importance of the reefs locally providing a refuge for numerous species. The area of muddy sediment around the rocky reefs supports a major *Nephrops norvegicus* fishery and a high density of *Nephrops'* burrows has been observed.

The proposed site boundary for the Pisces Reef Complex has been defined using JNCC's marine SAC boundary definition guidelines (JNCC, 2008). The proposed boundary is made up of three separate polygons enclosing the minimum area necessary to ensure protection of the Annex I habitats (see site map – Section 6). It does not include the areas of muddy sediment that lie between the reefs. The bedrock reef features were derived from collating survey data from various detailed acoustic and biological surveys. The areas of bedrock and stony reef that met the definition of Annex I reef (EC, 2007) were delineated based on the interpretation of multibeam echosounder (MBES) bathymetry with associated backscatter information. The 'hard' backscatter signal returned from the rocky reef areas was in stark contrast to the surrounding muddy sediment, providing a clear indication of the extent of the reef (Figures 4, 5 & 6). This multibeam data was available for all three Pisces Reef areas. Seabed modelling using the Benthic Terrain Modeller (NOAA) was also carried out for all three areas. In addition, sidescan sonar, seabed imagery (video and stills) and grab samples were also used where available. Although no seabed imagery was available for PR3, the multibeam backscatter demonstrated an identical backscatter signal to PR2 (which was validated with seabed imagery composed of Annex I bedrock and stony reef).

As any bottom trawling that occurs in the area may pose a threat to the reef, the proposed boundary includes a margin to allow for mobile gear on the seabed being at some distance from the location of a vessel at the sea surface. The average depth of water in the SAC is approximately 100m, therefore assuming a ratio of 3:1 fishing warp length to depth, the proposed boundary is defined to include a margin of 300 m from the reef feature. This margin has been applied individually to each of the reef features of the site.

Figure 2.1 Map of Pisces Reef Complex SAC site boundary showing surrounding bathymetry and distribution of reef habitat



Site map projected in UTM (Zone 30N, WGS84 datum). Seabed habitat derived from DTI SEA data.
This product has been derived in part from material obtained from the UK Hydrographic Office with the permission of the Controller of Her Majesty's Stationery Office and UK Hydrographic Office (www.ukho.gov.uk).
NOT TO BE USED FOR NAVIGATION. The exact limits of the UK Continental Shelf are set out in orders made under section 1(7) of the Continental Shelf Act 1964 (© Crown Copyright). Map copyright JNCC 2011.

2.3 Baseline condition of the site

The likely future condition of the site if it is not designated forms the baseline against which to judge the value of potential improvements as a result of designating the site and achieving its conservation objectives.

Table 2.1 below summarises the initial assessment of the site's vulnerability to pressures which was undertaken for the draft conservation objectives and advice on operations for the site. It will be updated and revised as necessary to reflect new evidence. The advice on operations assesses the vulnerability of the site's reefs to current activities on the site. The vulnerability is determined by a combination of the sensitivity of the reef to the specified pressures and current exposure to those pressures. Only if a site feature is both sensitive and exposed to a human activity is it considered vulnerable. The scores of relative sensitivity, exposure and vulnerability have been derived using best-available scientific information and informed scientific interpretation and judgement (sources of the information are noted in the conservation objectives document itself). More information on how site vulnerability was assessed can be found in the supporting Pisces Reef Complex draft Conservation Objectives and Advice on Operations document[10].

The process uses sufficiently coarse categorisation to minimise uncertainty in information and reflects the current state of our knowledge and understanding of the marine environment. Sensitivity, defined as the intolerance of a habitat, community or individual (or individual colony) of a species to damage, or death, from an external factor has been assessed for the effects of broad categories of human activities. Current exposure of the reef to the effects of these categories of activities was assessed on best available advice (as of January 2011).

Key:

Sensitivity key: ••• = High sensitivity **•• =** Moderate sensitivity **• =** Low sensitivity, **○ =** No known sensitivity* and **?** = Insufficient information to make assessment (*Meaning: 'Sensitivity of the feature has been researched and no evidence of sensitivity to this pressure has been found')
Exposure key : High = High exposure, Medium = Medium exposure, Low = Low exposure, None = No known exposure, Unknown level = Exposure of an unknown level and **?** = Insufficient information to make assessment.

[10] Pisces Reef Complex SAC: Draft Conservation Objectives and Advice on Operations v2.0 JNCC http://www.jncc.gov.uk/pdf/PiscesReef_ConservationObjectives_AdviceOperations_2.0.pdf

Table 2.1 Sensitivity, exposure and vulnerability of the Pisces Reef Complex reefs to physical, chemical and biological pressures (taken from the Pisces Reef Conservation Objectives and Advice on Operations v2.0)

List of pressures which may cause deterioration or disturbance (with example activities)		**Pisces Reef Complex: bedrock and boulder reefs**		
		Sensitivity	**Exposure**	**Vulnerability**
Physical Loss	**Removal** (e.g. aggregate dredging, isolated rock dump, infrastructure development)	•••	None	No known vulnerability
	Obstruction (e.g. permanent constructions [oil & gas infrastructure, windfarms, and cables] & wrecks)	••	None	No known vulnerability
	Smothering (e.g. drill cuttings)	••	None	No known vulnerability
Physical Damage	**Changes in suspended sediment** (e.g. screening plumes from aggregate dredging)	•	Low	Low vulnerability
	Physical disturbance or abrasion (e.g. mobile benthic fishing, anchoring, windfarm scour pits, pipeline burial, potting)	•••	Low	Moderate
Non-physical disturbance	**Noise** (e.g. boat activity, seismic)	○	?	Insufficient information
	Visual presence (e.g. recreational activity)	○	None	No known vulnerability
Toxic contamination	**Introduction of synthetic compounds** (e.g. TBT, PCBs, industrial chemical discharge, produced water, fuel oils)	•••	None	No known vulnerability
	Introduction of non-synthetic compounds (e.g. heavy metals, crude oil spills)	•••	None	No known vulnerability
	Introduction of radionuclides (e.g. nuclear energy industry)	?	Medium	Insufficient information
Non-toxic contamination	**Changes in nutrient loading** (e.g. outfalls)	••	None	No known vulnerability
	Changes in thermal regime (e.g. cooling water discharges)	••	None	No known vulnerability
	Changes in turbidity (e.g. laying of pipelines, aggregate dredging)	•	None	No known vulnerability
	Changes in salinity (e.g. outfalls from rigs, ships)	••	None	No known vulnerability
Biological disturbance	**Introduction of microbial pathogens** (e.g. outfalls)	?	?	Insufficient information
	Introduction of non-native species and translocation (e.g. ballast water, hull fouling)	?	?	Insufficient information
	Selective extraction of species (e.g. bioprospecting, scientific research, demersal fishing)	•••	Low	Moderate

Table 2.1 shows that Pisces Reef Complex and associated biological communities are:

- Moderately vulnerable to physical disturbance or abrasion (e.g. from demersal fishing) and selective extraction of species (e.g. from demersal fishing)
- Vulnerable at low levels to changes in suspended sediment (e.g. from demersal fishing)

It has not been possible to determine whether the interest feature is vulnerable to noise, introduction of radionuclides, introduction of microbial pathogens and introduction of non-native species.

The reefs are at risk of deterioration under the baseline as a result of the potential impacts of demersal fishing. Demersal fishing would be difficult to control if the site is not designated and this is likely to contribute to some level of decline of the features over the assessment period. Deterioration of the habitats would not achieve the aims of the EC Habitats Directive to maintain or restore Annex I habitats.

The conservation objective, based on current evidence, for the management of Pisces Reef Complex is to restore the reefs to favourable condition. Activities that do not result in pressures to which the feature is sensitive may continue at current levels of spatial and temporal intensity. The management of other activities to which the feature is vulnerable may need to be reviewed by competent authorities responsible. If new information suggests that the condition of the feature at the site is not significantly affected by present-day activities and assessment indicates the site is in favourable condition, then the conservation objective for the reef will be changed to “maintain” the features in favourable condition.

In its current condition a range of non-monetised benefits are obtained from the site. How marine ecosystem services are assessed is described in detail in Annex II. The possible degradation of the site if not designated would potentially decrease each of these values. Baseline levels of activity in relation to benefits of fisheries and recreation are described below. Other benefits include option and non-use value: benefits from values associated with potential future use, existence and others use of the site.

2.4 Human activity and regulation of activity at the site

Current and proposed economic activity at Pisces Reef is described below under the following sectors:

- Oil and gas – no activity or planned activity within or nearby likely to affect site; 4 wellheads outside of the SAC boundary, but within 5 miles of the site; one operational gas supply pipeline runs < 3 miles from the site. Neither activity is likely to affect the site, and they are therefore not discussed further in this assessment
- Renewable energy projects – no activity or planned activity within or nearby likely to affect site;
- Aggregate extraction – no licensed aggregate activities within the site
- Shipping – medium to high activity due to the proximity of Ireland, the Isle of Man and UK
- Cables – no activity or planned activity within or nearby likely to affect site; one submarine cable runs approximately 4 miles north of the site not discussed further in this assessment
- Fisheries – heavy fishing activity for *Nephrops norvegicus* in the soft mud surrounding the reef

There are no other significant current or planned economic activities at the site.

Designation of the site would mean that under regulation 25 of the Offshore Habitats Regulations, before the appropriate Competent Authority undertakes or authorises a plan or project which may have a significant effect on the site, it is required to carry out an Appropriate Assessment to assess the implications for the site in view of its conservation objectives. The Competent Authority can only agree to the plan or project if it has ascertained that it will not adversely affect the integrity of the site. Under regulation 26, a Competent Authority can agree to a plan or project for imperative reasons of overriding public interest (IROPI) notwithstanding its adverse effect, if there are no alternative solutions. This effectively places the burden of proof on developers and Competent Authorities to show the absence of an adverse effect, rather than requiring those opposing a plan or project to show that there would be an adverse effect.

If consent has already been granted by a Competent Authority for a plan or project at the time a site becomes a European Offshore Marine Site, under the Offshore Habitats Regulations that consent will need to be reviewed against the conservation objectives for the site, and either affirmed, modified or revoked.

Not all activities that may affect the reef for which the site is designated are considered plans or projects under Regulation 25 of the Offshore Habitats Regulations. Ongoing activities at the site which may be affecting the habitat of interest and preventing it from reaching or being maintained at favourable conservation status may need to be managed through the development of specific management measures (e.g. certain fishing methods, which may be controlled through measures taken under the European Common Fisheries Policy).

a) Shipping

Description of known current and future activity relevant to the site

There are a number of important shipping routes crossing the area near the Pisces Reef Complex site due its proximity to major ports, including Belfast, Dublin and Liverpool. From Automatic Identification Systems (AIS) on the vessels, it is possible to calculate the number passing over a 5km x 5km cell within a given year. For the cells corresponding with Pisces Reef Complex area, the number of vessel passes ranged from 1611 to 3440 for 2008.

There are no anchorages within or near the boundary.

Regulation of activity (baseline)

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The MARPOL Convention, which was adopted by the International Maritime Organisation in 1973, covered pollution by oil, chemicals, harmful substances in packaged form, sewage and garbage. Measures relating to tanker design and operation (arising from the Convention on the Safety of Life at Sea, 1974) were also incorporated into the MARPOL Protocol. As the 1973 MARPOL Convention had not yet entered into force, it was absorbed into the 1978 MARPOL Protocol. The Convention includes regulations aimed at preventing and minimizing pollution from ships, both accidental pollution and that from routine operations. It now includes six technical Annexes which came into force in 1983:

Annex I	Regulations for the Prevention of Pollution by Oil
Annex II	Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk
Annex III	Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
Annex IV	Prevention of Pollution by Sewage from Ships
Annex V	Prevention of Pollution by Garbage from Ships
Annex VI	Prevention of Air Pollution from Ships (this annex came into force 19 May 2005)

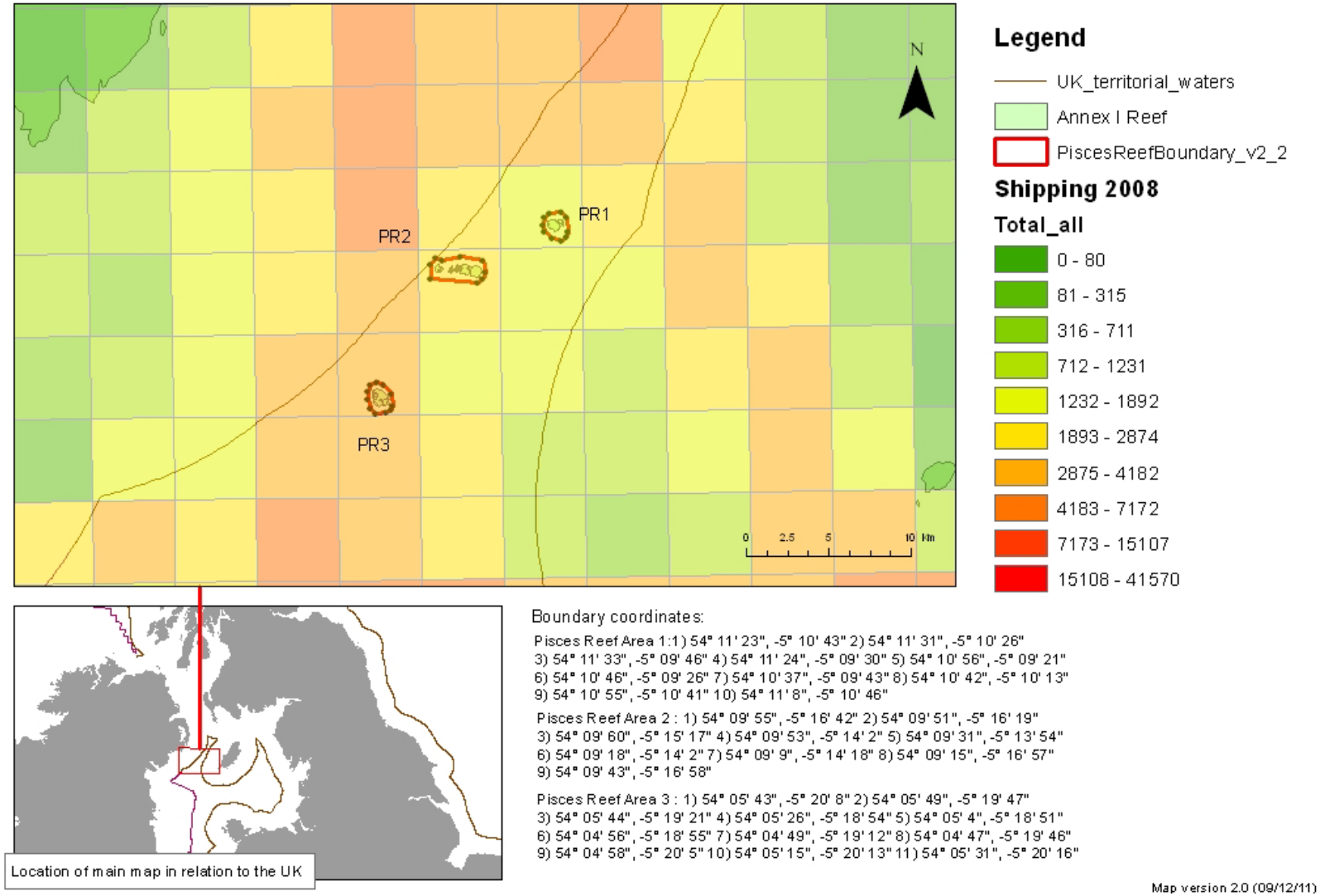
Signatories to the Convention, which include the UK, must accept Annexes I and II, but the other Annexes are voluntary.

Likely future regulation of activity following designation

The site is proposed for its reef habitat, which is unlikely to be affected by shipping passing above it, therefore under the designate option, no change to current practices is likely to be required to fulfil the conservation objectives for the reef at Pisces Reef Complex.

Figure 2.2 Shipping activity around Pisces Reef Complex SAC from the Cefas data contract (MB106[11]).

Data derived from Automatic Identification Systems (AIS), a collision-avoidance system for ships >300GT in international waters. Data for 2008 are represented as total number of vessels passing through a 5km by 5km grid cell.



[11] Cefas (2010) Report no. 1: Objective 1 – Provision of geo-database containing standardised layers showing the distribution of specified activities, sites and resources with associated metadata and comments. Project MB106: Further development of marine pressure data layers and ensuring the socio-economic data and data layers are developed for use in the planning of marine protected area networks

b) Fisheries

Description of known current and future activity relevant to the site

Note that fishing is carried out in offshore waters on a European level, by UK vessels, European and non-European vessels by agreement. Data on location and type of fishing is difficult to obtain comprehensively for various reasons. Also, fishing data from recent years is a reflection of fisheries already managed to an extent by total allowable catch (TAC) and species quotas. As there are no indications that these measures are likely to change within the timeframe of the IA, the current situation is taken as the baseline.

It is possible to obtain information on the distribution of fishing effort within the region for UK vessels (≥15m) that have vessel monitoring systems (VMS). These provide a vessels position, speed and heading either hourly or every two hours. Such information can be analysed spatially in relation to the site boundary. As vessels fish at characteristic speeds, VMS data can be processed to provide proxy patterns of 'active fishing'. The European Commission has passed a regulation requiring all member states to assure that VMS terminals in use on fishing vessels (≥15m) of its national fleet are secure[12]. VMS data only cover vessels of over 15m in length. Using a simple speed rule to partition active fishing from VMS is a coarse but effective means of estimating fishing effort (Mills *et al*. 2007), particularly for towed gear. It is less reliable for set gear such as pots and nets.

There are no landings data available specifically for the area that is proposed for designation. The Marine Management Organisation's Fisheries Activity Database (FAD) compiles various data at the level of ICES rectangle. Catch data encompasses information for UK-registered vessels landing in UK and non-UK ports, and for non-UK registered vessels landing in UK ports. Data includes:

- year
- size of vessel
- type of gear
- species caught
- port of landing
- vessel nationality
- value of landing
- tonnage of landing

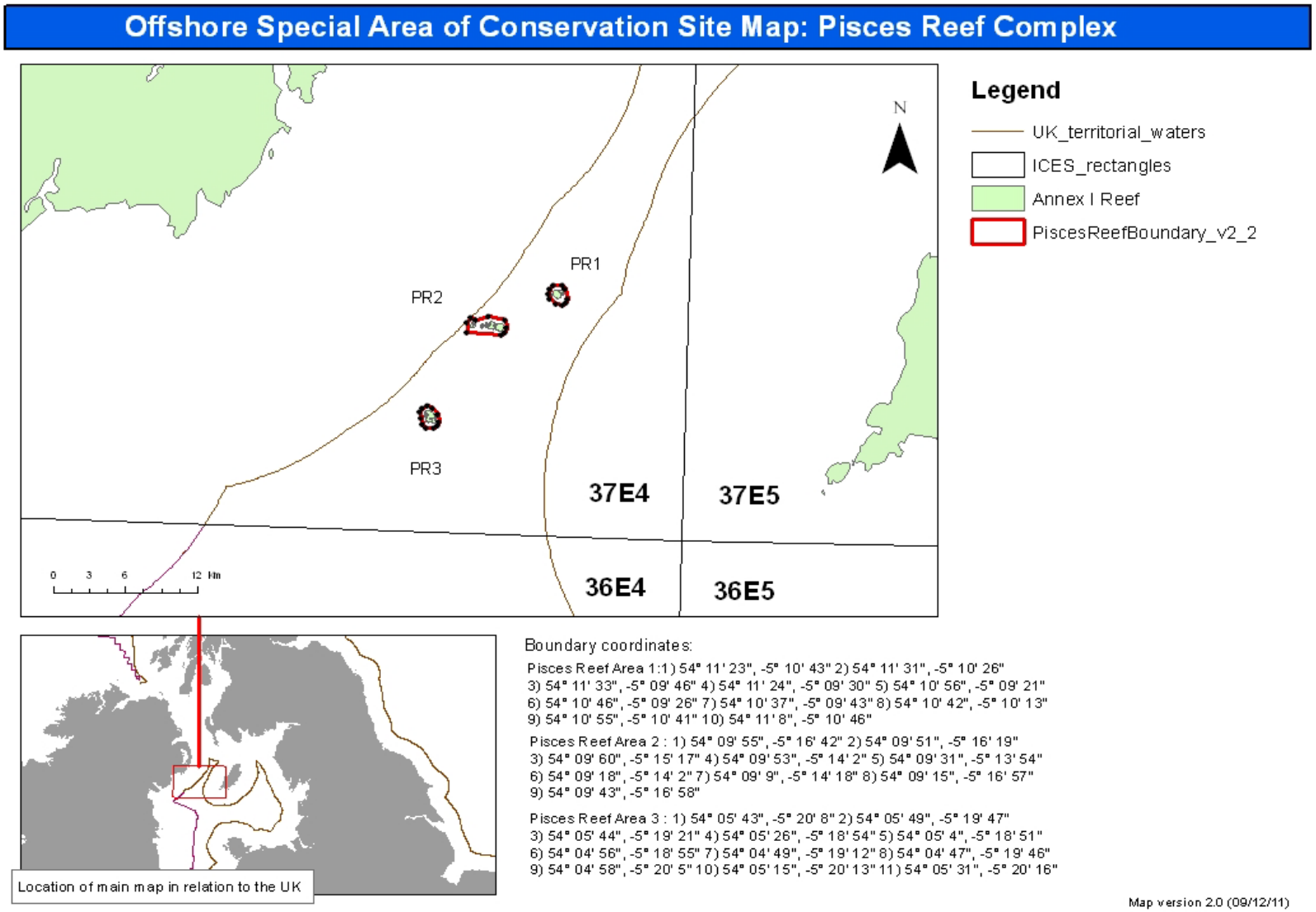
Note, the exception is for non-UK vessels that fish within territorial waters, but that land at non-UK ports; it is not possible to obtain weights and values of landings for these vessels. This impact assessment is concerned with the impacts of the UK's potential designation of Pisces Reef Complex on UK businesses. However for fisheries, designations of other areas of the marine environment by other Member States are also relevant as there will also be effects on businesses in other countries.

The dominant demersal fishery in the Irish Sea is for *Nephrops norvegicus* (Dublin Bay prawn, langoustine or scampi). The area that is targeted is the muddy sediment to the northwest of the Irish Sea. In the 1990s, the sea bed in the region was sometimes trawled five to ten times per year[13].

Information on landings from the region around Pisces Reef Complex is given at the scale of ICES statistical rectangle (0.5^{o} latitude, 1.0^{o} longitude) and is analysed over a period of four years (2006-9) in order to consider annual variation in catch. As the Pisces Reef Complex SAC is only 6.9 km^2 (less than 0.5% of the ICES statistical rectangle) then resolving whether fishing activities actually overlap with the site and feature is not possible from landings data alone (Figure 2.3). Analysed VMS data[14] gives us an indication of how fishing effort is spread across the site and surrounding area with a resolution of 0.05 decimal degrees, but this is still coarse information.

[12] http://ec.europa.eu/fisheries/index_en.htm
[13] Ball, Fox and Munday (2000) ICES Journal of Marine Science 57 1315-1320
[14] Generated by Cefas from VMS, log-book and EU vessel register data for 2006-9. All vessels (UK & non-UK) are included and fishing is estimated using a simple speed rule of 1-6 knots to represent fishing activity
Cefas (2010) Report no. 1: Objective 1 – Provision of geo-database containing standardised layers showing the distribution of specified activities, sites and resources with associated metadata and comments . Project MB106: Further development of marine pressure data layers and ensuring the socio-economic data and data layers are developed for use in the planning of marine protected area networks

Figure 2.3 ICES rectangles relating to Pisces Reef Complex SAC



Within 37E4 – the ICES rectangle within which Pisces Reef Complex is located – the vast majority of vessels fishing are from Northern Ireland (94% of landings by value) with a number of Scottish vessels (5%) present (Table 2.2). Total value of landings per annum (mean of 2006-9 ± SD) was £8,126,766 (± £1,453,771) for 5,404 tonnes (± 749t) of fish and shellfish.

Most vessels use Nephrops trawls (71.6% by value for gear type) to target *N. norvegicus* and demersal fish (Table 2.3). Other vessels use pots (12.5%) to target *N. norvegicus* and other crustaceans such as edible and velvet swimming crabs, and mechanised dredges (6.7%) to gather scallops. Other types of trawl, including beam and otter trawls, are also used to harvest Nephrops and demersal whitefish.

The majority of the fish are landed in Northern Irish ports: predominately Ardglass (40.81% by value), Portavogie (36.79%), Kilkeel (14.26%) and Annalong (2.09%) (Table 2.4). This is mainly *N. norvegicus* fishing with associated whitefish bycatch using Nephrops trawls, otter trawls and beam trawls with some potting undertaken. There are also a number of fleets from smaller Northern Irish ports that only potted in the region.

Nephrops represented 71.6% of all landings from 37E4 by value, followed by scallops (6.6%), edible crabs (5.9%), cod (3.3%) and velvet swimming crabs (2.8%). *N. norvegicus* fishing occurred across the region, but was most intense northwest of the site in Northern Irish waters (Table 2.2-2.6). Nephrops fishing appeared to occur at the site, but it is unlikely that trawls were dragged over the rocky reef, as this would almost certainly have resulted in lost or damaged fishing gear. It is assumed that the fishing activity that has contributed to the score for the raster cell containing each node occurs on the soft mud surrounding the reef. The activity data for Nephrops gear within the cells containing the three Pisces Reef nodes increased from 2006-9, from an average of 321hrs fished pa to 567hrs fished pa, though it is not known whether this demonstrates increasing fishing effort across the region[15].

Fishing activity (hrs.pa) from Nephrops gear within the cells containing Pisces Reef nodes (PR1, PR2 and PR3) (Figure 2.1)

Year	PR1	PR2 (Cell "A")	PR2 (Cell "B")	PR3	Average
2006	337	283	374	291	321.25
2007	399	434	583	369	446.25
2008	423	421	654	333	457.75
2009	533	513	804	419	567.25

NB: PR2 crosses two cells and both values are given

In 2009, five pots were laid in the cell containing PR1 to the north, but our data is currently insufficiently detailed enough to determine whether these were left on the feature or surrounding muddy sediment (Annex I). Similarly, in 2007, some mechanized dredging for scallops was carried out in the cell containing PR2. However, only two hours of dredging were carried out in the four year period and much of the effort was concentrated to the southeast of the Isle of Man.

Studies have shown that bottom trawling for *N. norvegicus* and scallops in the northern Irish Sea can transform the soft bottom benthic community through direct mortality and by homogenising the sedimentary habitat[16]. However, the potentially destructive fishing practices they describe are incompatible with hard bottoms and so are unlikely to pose a risk to the reef feature unless by accident. This assumption is based on best currently available evidence and no information was provided during the consultation to violate the assumption.

[15] An average was used instead of the sum as the nodes represented <20% of the raster cells by area and it would have resulted in a large overestimation of fishing within the site.
[16] Bradshaw, Veale, Hill and Brand (2001) *Hydrobiologia,* **465**, 129-138

Table 2.2 Vessel nationality of boats fishing in the ICES rectangle containing the Pisces Reef Complex SAC (37E4) (2006-9)

Vessel nationality	2006		2007		2008		2009		Average		Relative (%)	
	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight	Value	Weight	Value
Northern Ireland	4202.9	6408465	5363.6	7899138	5643.2	8894631	5681.8	7315608	5222.9	7629460	96.64	93.88
Scotland	56.9	106335	106.6	199,463	138.7	1091623	186.2	282571	122.1	419998	2.26	5.17
Ireland	1.4	2246	33.9	79814	5.6	9922	1.2	2322	10.5	23576	0.20	0.29
Belgium	14.7	30743	5.0	19037	3.3	5080	9.8	19756	8.2	18654	0.15	0.23
Isle of Man	6.9	4111	86.2	47122	15.0	22147	0.7	1125	27.2	18626	0.50	0.23
England	8.8	8280	7.3	10913	6.5	16012	24.3	22,459	11.7	14416	0.22	0.18
Wales	4.8	7081	0.7	1059	0.0	-	0.0	-	1.4	2035	0.03	0.03
Total	**4,296t**	**£6,567k**	**5,603t**	**£8,257k**	**5,812t**	**£10,039k**	**5,904t**	**£7,644k**	**5,404t**	**£8,127k**	**100**	**100**

Table 2.3 Type of fishing gear predominately used in the ICES rectangle containing the Pisces Reef Complex SAC (37E4) (2006-9)

Gear type	2006		2007		2008		2009		Average		Relative	
	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (kg)	Value (£)	Weight	Value	Weight	Value
Nephrops trawls	2547.0	4384579	3283.0	6011221	4127.1	7293704	3854.8	5576133	3453.0	5816409	63.90	71.57
Pots	880.7	1030533	1018.4	1165474	764.1	918805	650.3	959245	828.4	1018514	15.33	12.53
Mechanized dredges	127.3	184960	309.9	379425	311.1	1317556	206.0	281825	238.6	540941	4.42	6.66
Otter trawls - bottom	297.5	516573	231.8	298872	81.0	157156	209.0	326815	204.8	324854	3.79	4.00
Otter trawls - midwater	90.4	182006	97.9	236485	100.5	240032	116.0	236855	101.2	223845	1.87	2.75
Pair trawls - midwater	208.2	33545	599.2	101841	270.5	62220	665.3	179642	435.8	94312	8.06	1.16
Otter trawls (unspecified)	75.2	152571	0.0	0	5.5	9161	9.9	20135	22.7	45467	0.42	0.56
Gillnets (not specified)	19.4	3228	41.6	16310	116.8	21261	170.7	34160	87.1	18740	1.61	0.23
Boat dredges	5.5	10721	13.4	26154	6.3	9481	14.6	24073	9.9	17607	0.18	0.22
Beam trawls	11.9	26844	5.0	19037	0.3	422	1.6	1387	4.7	11922	0.09	0.15
Otter twin trawls	16.5	28209	0.0	0	0.0	0	0.0	0	4.1	7052	0.08	0.09
Longlines (unspecified)	10.9	11146	0.2	124	0.2	192	0.0	0	2.8	2865	0.05	0.04
Hand- and pole-lines	5.2	2282	2.7	1189	2.0	766	5.5	2828	3.9	1766	0.07	0.02
Set gillnets (anchored)	0.7	65	0.0	0	24.1	5509	0.2	742	6.2	1579	0.12	0.02

Table 2.4 Destination of landings from the ICES rectangle containing the Pisces Reef Complex SAC (37E4) (2006-9)

Port of landing		2006		2007		2008		2009		Average		Relative (%)	
		Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight	Value
Ardglass	NI	1700.7	2530073	2531.8	3415480	2659.7	4204487	2796.8	3115518	2422.2	3316389	44.82	40.81
Portavogie	NI	1454.8	2528999	1623.6	2914971	1677.9	3813762	1704.7	2699915	1615.2	2989412	29.89	36.79
Kilkeel	NI	611.6	858423	827.3	1158146	1048.5	1432831	1010.9	1186166	874.6	1158892	16.18	14.26
Annalong	NI	275.9	197904	217.8	197538	152.4	142851	131.1	141747	194.3	170010	3.60	2.09
Portaferry	NI	94.7	184090	65.8	143063	52.0	105431	48.7	124033	65.3	139154	1.21	1.71
Whitehaven	GBE	23.9	43729	88.7	187425	51.2	81449	75.7	111264	59.9	105967	1.11	1.30
Bangor	NI	16.6	23493	35.8	25537	22.3	36604	32.8	52411	26.9	34512	0.50	0.42
Ballydorn	NI	0.0	0	5.3	25985	7.9	29900	11.2	53224	6.1	27277	0.11	0.34
Isle of Whithorn	GBS	8.9	8343	82.3	46069	4.8	10097	5.0	7528	25.3	18009	0.47	0.22
Campbeltown	GBS	1.5	2198	14.3	28824	5.2	11677	12.2	26105	8.3	17201	0.15	0.21
Ballywalter	NI	5.1	11873	4.3	11824	4.2	17184	9.7	24930	5.8	16453	0.11	0.20
Warrenpoint	NI	0.0	0	52.2	20617	72.8	33044	16.9	5082	35.5	14686	0.66	0.18
Strangford	NI	20.1	25106	5.9	12165	4.3	8681	3.1	6917	8.4	13217	0.15	0.16
Liverpool	GBE	14.7	30743	5.0	19037	0.0	0	0.0	0	4.9	12445	0.09	0.15
Whiterock	NI	13.5	43738	0.0	0	0.3	336	0.0	0	3.5	11019	0.06	0.14
Kircubbin	NI	0.1	155	1.2	8799	3.4	20627	2.9	12098	1.9	10420	0.04	0.13

Table 2.5 Target species of vessels fishing in the ICES rectangle containing the Pisces Reef Complex SAC (37E4) (2006-9)

Caught species	2006		2007		2008		2009		Average		Relative	
	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight (t)	Value (£)	Weight	Value	Weight	Value
Nephrops (N. Lobster)	2641.8	4739553	3074.6	5832835	3880.8	7082515	3792.3	5557602	3347.4	5803126	61.94	71.41
Scallops	119.7	187706	253.3	379949	289.5	1281518	221.0	306031	220.9	538801	4.087	6.63
Crabs (C.P.Mixed Sexes)	663.0	428460	791.4	635862	541.9	419155	451.9	448205	612.0	482921	11.33	5.94
Cod	104.3	221255	133.5	309683	138.3	307952	104.9	221524	120.3	265103	2.23	3.26
Crabs - Velvet (Swim)	177.8	272279	149.0	201905	139.7	201693	153.6	237599	155.0	228369	2.87	2.81
Lobsters	22.3	225475	20.8	222968	22.6	187279	18.1	162777	20.9	199625	0.39	2.46
Monks or Anglers	54.0	106340	62.9	131953	46.0	109777	40.6	104291	50.8	113090	0.94	1.39
Herring	95.5	18454	632.6	106600	408.2	84611	836.5	213644	493.2	105827	9.13	1.30
Hake	30.9	67662	32.8	70651	23.8	51736	40.3	83587	32.0	68409	0.59	0.84
Turbot	10.5	51379	13.3	64288	6.8	40057	7.0	37230	9.4	48239	0.17	0.59
Haddock	48.7	38009	46.8	33001	70.1	55330	47.4	43058	53.3	42350	0.99	0.52
Sole	5.3	31269	6.2	39382	3.3	20418	5.2	31520	5.0	30647	0.10	0.38
Brill	4.1	16937	5.0	21192	7.8	24901	7.0	20594	6.0	20906	0.11	0.26
Spurdog	32.5	30725	30.0	14512	13.2	10458	18.3	16636	23.5	18083	0.43	0.22
Witch	24.3	14620	30.7	16273	30.8	17887	30.4	15207	29.0	15997	0.54	0.20
Skates and Rays	17.0	14279	21.3	16512	20.0	13950	18.1	15836	19.1	15144	0.35	0.19
Brown Shrimps	0.1	710	.2	2080	2.4	12103	2.9	43806	1.4	14675	0.03	0.18
Squid	3.4	9302	4.8	15352	6.2	13753	7.5	13682	5.5	13022	0.10	0.16
Other or mixed Demersal	18.7	14391	22.1	14350	26.2	15905	7.9	4523	18.7	12292	0.35	0.15
Mussels	11.0	3300	72.2	26617	19.3	11628	0.0	0	25.6	10386	0.47	0.13
Queen Scallops	11.3	5981	87.4	34884	0.0	0	0.2	33	24.7	10225	0.46	0.13
Pollack	3.4	6103	3.6	6365	4.1	8272	9.1	17305	5.0	9511	0.09	0.12
Cockles	0.0	0	0.0	0	10.0	34485	0.0	0	2.5	8621	0.05	0.11
Plaice	113.7	8665	12.7	9534	10.0	6657	9.0	5601	10.8	7614	0.20	0.10

In order to enforce any fisheries management measures effectively through monitoring of VMS, it is possible that under the maximum, high-cost scenario, a larger area than the site could be needed. VMS pings are recorded every 2 hrs, during which time a vessel travelling 5 knots could cover a distance of just under 19 km. As such, a boundary was drawn around the Pisces Reef Complex nodes with a distance of approximately 5 km from the site boundary. It is not known whether such an area would be required, but that by using this as an upper estimate it would capture any realistic costs within the range.

From 2006-2009, an average of 17.2%[17] of fishing effort from within ICES rectangle 37E4 came from within the area suggested above (Annex I). This equates to an average value of £1,140k for towed, demersal gear for the corresponding time period.

Regulation of activity (baseline)

The European Common Fisheries Policy (CFP) sets the framework for almost all regulation of fisheries in UK waters. European competence and specific regulations vary in their application depending on exact geography. In the UK, all waters beyond 12nm fall under the jurisdiction of the European Commission through the CFP. It is transposed through the Control Regulation (which sets quotas each year in December under separate EC legislation), and Technical Conservation Regulation (covering issues like sizes of nets, closed fishing areas, etc.).

Fishing for pressured stocks beyond 12nm is managed at the European level with each Member State receiving an annual allocation (quota) of each stock at each December Fisheries Council (with a small amount of the total quota allocated to 0–12nm)[18]. Non-pressured stocks such as bass, scallops and cuttlefish still have no applicable quotas. This means that when quota levels for the controlled fish are reached, vessels tend to move into the inshore zone to catch those species for which there is a market but in effect no restrictions on what can be landed.

Fisheries Regulations apply to anyone fishing from a powered boat and selling their catch, including trawling, netting or potting. Vessels used to catch fish for sale must be licensed as a fishing vessel (subject to exceptions[19]). As well as setting limits on pressured stock (total allowable catches) the CFP puts in place a series of regulations including minimum landing sizes for certain fish as well as seasonal measures needed for stock management. These may take the form of spatial closures that prevent the use of particular fishing techniques in certain areas either permanently or on a time-limited basis. The CFP can also place limits on the amount of fishing that can take place either by limiting the amount of static fishing gear or by limiting the power of the fishing vessels that can take part in the fishery. Further, the more recent 'Registered Sellers and Buyers Regulation' has greatly helped manage the issue of 'black' fish by preventing those fish caught by illegal means entering the market. By denying a market for such fish it is hoped that fishermen will more generally comply with the regulations. At present, there are CFP closures at NW Rockall SAC and Darwin Mounds SAC, but there are no closed areas in the Pisces Reef UK offshore region.

Fisheries regulations and policy are enforced, in English Waters, through the MMO sea fisheries enforcement programme, which includes the inspection of fishing vessels and fishing industry premises in the major fishing ports, fish markets and other locations around the coast by Marine Management Organisation officers. Fishing vessels are also inspected at sea by the Royal Navy's Fishery Protection Squadron operating under a Defra/Ministry of Defence agreement. There is also a program of aerial surveillance[20].

[17] 17.2% represents the total demersal effort within 37E4 for the years in question divided by the average effort across the three Pisces Reef SAC nodes. I was then used as a multiplier to proportion landings come from within the site.

[18] Quotas are informed by annual scientific stock assessment advice formulated by ICES (the International Council for the Exploration of the Seas) although adherence to this advice is not mandatory.

[19] A licence is not required if a vessel is not powered by an engine or if it is fishing for common eels. If a vessel is only fishing for salmon and migratory trout it does not require a licence but must be registered with the Environment Agency.

[20] www.marinemanagement.org.uk/fisheries/monitoring/regulations.htm

Likely future regulation of activity following designation

If management measures for a Marine Protected Area (MPA) in offshore waters are required, the UK must seek them through the proposal of fisheries management measures under the CFP by the European Commission.

The CFP is currently undergoing reform and a revised regulation will come into effect in January 2013. The Green Paper[21] currently (October 2009) sets out some of the areas that the Commission would like to review; at this stage it is however impossible to predict which, if any, of those proposed measures will come into effect.

The UK will consider applying to the EC for controls to close all of the Pisces Reef Complex to at least some forms of fishing in order to minimise risk of damage to habitat and associated typical species, including target and non-target fish and shellfish species.

[21] http://ec.europa.eu/fisheries/reform/

3 APPROACH TO ANALYSIS OF COSTS AND BENEFITS

3.1 Approach

This Final IA presents a quantitative assessment of the potential costs and benefits to the UK of the policy option to designate the site. Impacts have been assessed in the IA over a timescale of approximately twenty years. Section 2 outlined the current situation at the site (the baseline) in terms of economic activities. It should be remembered that the baseline may not be static (it may be subject to natural ongoing change), and the assessments try to take account of this (for example, where a benefit is identified as preventing continuing decline).

The same method has been adopted to develop impact assessments for a suite of marine Natura 2000 sites consulted on in 2009-2011. However, different sites have different baselines, activities and circumstances. Therefore even with a consistent methodology, different assumptions may be made, different impacts may be identified and even the same type of impact may have different monetary cost or benefit estimates associated with it for different sites.

Section 4 examines the potential costs and benefits of the policy option. The costs and benefits are subject to significant uncertainty. The main causes for this uncertainty are that:

- it is difficult to predict what management measures will be implemented at the site;
- it is difficult to know how operators will respond to them and what costs they will incur in doing so; insofar as they can predict this there may be reasons in some cases for not supplying this information, for example: commercial sensitivities;
- it is difficult to predict how the condition of the protected features and surrounding environment would change under Option 1 (designate); and
- there is currently very little evidence which can be used to monetise values for environmental changes in the marine environment.

Therefore the approach to the assessment has:

- used techniques to obtain the best available information on these areas of uncertainty. This is done firstly by developing scenarios on likely potential maximum and minimum management measures; and secondly by drawing on sources most likely to be able to predict the impacts of these potential management measures and provide relevant information;
- used a framework of factors likely to determine the benefits to society of achieving the conservation objective of the site;
- identified the possible minimum and maximum impact on economic sectors rather than the actual expected impact; and
- not assessed the precise direct or indirect impacts on businesses, employees or elements of the supply chain potentially affected. This is because there is not sufficient evidence available to accurately predict the distribution of net changes in activity within the regional economy.

The analysis in this document is based on the methods that are judged to be the best practicable option to address the issues considered.

3.2 Costs

a) Policy costs to the private sector

The policy costs arising from designation of the site are the costs of changes to existing and planned human activities taking place within or in the vicinity of the site in order to comply with the policy objectives. The costs considered include the direct and indirect economic costs of those changes to operators, enforcement authorities and wider society. The costs are expected to result from the potential

range of management measures that may be required to meet the site's objectives. The costs are considered relative to the baseline of not designating the site.

The costs borne by each of the key sectors will depend on the extent to which their activity impacts on the site and the management measures deemed necessary to restore the reefs and their typical species to favourable condition, if that is deemed necessary. These are not yet known. It has therefore been necessary to make assumptions about what measures might be required for this site. It is assumed that the site proposal will be transmitted to the European Commission in early 2012, and that some costs (for example, of more detailed EIA requirements) would arise immediately. The timing of some one-off costs is unpredictable within the twenty year assessment period, so are assumed to fall in 2017. It is assumed that fisheries management measures may take at least a year to be developed and implemented.

Policy costs to the private sector may arise if:

- Consent for a plan/project is granted, it may be subject to restrictions on the timing or manner in which the plan/project can be implemented which result in costs to businesses. Restrictions are determined by the competent authority in its assessment under the Habitat Regulations.
- Consent for proposed plans or projects may be refused by the competent authority. The cost to businesses is assumed for this analysis to be the additional cost of undertaking the plan or project elsewhere.
- Activity in the area is restricted (e.g. certain fishing activity) and therefore costs to business occur in the form of foregone income/profit.

b) Administration costs to the private sector

Administration costs include time and expenditure necessary for the private sector to provide information and documentation required to comply within the administration requirements of a regulation. They exclude 'policy costs' which are the time and expenditure necessary to adjust activities (e.g. to reduce pollution) to comply with regulatory standards. Potential administration costs to the private sector are:

- The costs to businesses of finding out about the designation and the management measures that may be needed;
- For ongoing or new plans and projects, the cost to businesses of providing more-detailed information than that which would be required if the site was not designated. This is required to inform the Competent Authority's[22] assessment of the plan or project under the Habitat Regulations, and
- Undertaking more detailed analysis (such as EIA) and reporting in some cases.

c) Costs to the public sector

Potential administration costs to the public sector are:

i. costs of monitoring the site and maintaining information on its conservation status; and
ii. costs of regulating and enforcing human activities that might impact on the conservation status of the site.

3.3 Benefits

The potential benefits of site designation primarily arise from the increase in the area protected for nature conservation purposes[23]. The benefits are assessed in terms of the impact on ecosystem

[22] Competent Authorities include statutory undertakers, as well as regulators which grant consents for regulated activities in the marine area. For example, DECC is a competent authority which regulates certain activities for wind farm, and oil and gas development. If a Competent Authority undertakes a plan or project itself, it may need to do its own Appropriate Assessment

[23] Heritage benefits, such as conservation of archaeological site, are the only benefits discussed that arguably sit outside the scope of nature conservation. Such benefits are still included.

services provided by the natural environment that benefit humans[24]. The following overarching categories of ecosystem services are used[25]:

- Provisioning services (e.g. provision of food);
- Regulating services (e.g. absorbing waste); and
- Cultural services (e.g. the role of marine species in culture and the artistic inspiration they provide).

Here, and following Defra's guidance on the valuation of ecosystem services, the relevant benefits gained from supporting services[26] (such as cycling of nutrients and photosynthesis) are viewed as essentially being captured by the other benefits listed and so are not examined separately[27]. The analysis in Section 4 is based on a list of ecosystem service categories that are relevant to the site. *Relevant* means that the designation of the SAC would have a noticeable impact on the benefits derived from the service.

The impacts of designation on these ecosystem services are analysed further in Section 4.3 below. In addition to these categories it is recognised by many that biodiversity has an intrinsic value. This value is viewed as an inherent characteristic of biodiversity that gives rise to other benefits. Therefore, intrinsic value cannot be assessed using economic valuation techniques[28] and is not analysed further here. However, because intrinsic value cannot be valued in conventional economic terms does not mean that intrinsic value is regarded as unimportant.

[24] As described in Parliamentary Office of Science and Technology (2007).
[25] These are the categories used in the Millennium Ecosystem Assessment (MEA 2005), http://www.millenniumassessment.org)
[26] Supporting services described as "those that are necessary for the production of all other ecosystem services" in the MEA
[27] For example, small marine organisms called phytoplankton form the basis of the food chain, ultimately ending in caught fish species. Valuing phytoplankton on its own in addition to these services they support would lead to double counting.
[28] For example, in MEA (page 7, Section 2) : <http://www.millenniumassessment.org/documents/document.354.aspx.pdf>.

4 COSTS AND BENEFITS OF OPTION 1: DESIGNATE THE SITE

4.1 Implications of designation

Once site proposals have been submitted to the EC, Competent Authorities have obligations to consider the likely significant effect of plans or projects they undertake or consent on the integrity of the site. Consequently, effects of the site on offshore industries operating near the site are not yet known.

In order to be able to assess the range within which the true costs and benefits are likely to fall, scenarios have been developed to identify the minimum and maximum potential management measures that might be required at the site for Favourable Conservation Status to be maintained or attained. Development of these was informed by Table 2.1 and the potential environmental impacts of activities if the site was not designated.

The minimum scenario necessitates the smallest change in activities to maintain favourable condition compared with the baseline and therefore represents the minimum potential change to present-day activities.

The maximum scenario is at the other end of the scale: it involves the maximum change in activities that may be needed. This is in-line with maximum costs. Table 4.1 outlines these scenarios for the site. This is an estimate of the measures that may be required for the site to achieve the conservation objective of 'restore' the reef feature to favourable condition.

Table 4.1 Summary of the "minimum" and "maximum" management scenarios that may be required for Pisces Reef Complex SAC

"Minimum" scenario:	"Maximum" scenario
Existing activities Ban all forms of towed, demersal fishing over the whole site. Proposed activities It is assumed that, due to the small size and location of the site, that there will be no plans or projects undertaken near the site which are likely to have a significant effect on site integrity.	Existing activities Ban all forms of fishing, including pots and traps, over an enforceable area that contains the site. Proposed activities It is assumed that, due to the small size and location of the site, that their will be no plans or projects undertaken near the site which are likely to have a significant effect on site integrity.

4.2 Costs

In line with the purposes of this IA, this section deals only with costs to the UK economy. Fishing activities from other Member States are considered within the fisheries section, but are not included in the costs calculated below and presented in the summary sheets.

a) Shipping

There are not expected to be any changes to shipping over the site, so there are no increases to costs.

b) Fisheries

Potential UK economic impact of foregoing landings

As the reefs are sensitive to impacts from mobile demersal gear, it is expected that, at a minimum, the site will be closed to all types of towed, demersal gear. However, due to the rocky nature of the site, this is not predicted to impact any vessels using towed gear, including the large Nephrops fleet in the region. This is because the site is small, is not particularly important for any fishery, and the wider area has the potential to accommodate any displacement in fishing effort without additional cost. Thus, costs to the fishing industry of a spatially refined closure restricted to the area of the features are anticipated to be nil.

Under the maximum scenario, the practicalities of enforcing a fishing closure are considered. If enforcement is to be based on analysis of VMS data, then the closure will need to be a minimum size in order to detect whether vessels are actively fishing within the area. As VMS 'pings' are recorded every 2 hrs, a vessel travelling at 5 knots could cover approximately 18.5 kilometres in between its location being recorded. As such, a box was drawn around the Pisces Reef Complex nodes, covering a total area of approximately 340 km^2 and allowing for 5 km around the site in order to detect vessels fishing in the vicinity. It is not anticipated that a closure of this size will be required, but by including it here as an upper estimate it is expected that the actual cost will be captured within the range.

Without further analysis, it is uncertain whether the fishing activity within areas closed to fishing will be partly or wholly displaced to other fishing grounds or whether there will simply be less fishing in global terms. To provide an indication of the maximum direct effect of designation, the impact on the UK economy of foregoing the landings from towed demersal gear from within the entire SAC is considered. Input-output multipliers give an idea of the impact on the UK economy. For example Seafish Industry Authority figures for 2007 (Seafish 2007) showed that a loss of £1m of landings could lead to a reduction in[29]:

- UK Employment by 65 FTE jobs; and
- UK GDP by £1.73 million.

Although they do not take account of some of the potential indirect effects, these multipliers indicate the scale of the economic impact of changes in fishing activity.

The necessary data to fully understand the employment and profit impacts from landings in foreign ports on the UK economy is complex and has not been scrutinised for this IA. An estimate of the value of other Member State's fishing effort on the site is provided, but is not incorporated into cost calculations.

The economic impacts of the potential closure of Pisces Reef are estimated as the loss of profitability of fishing effort at the site. This is informed by data from the Marine Management Organisation on potential activity within the area and from the 2009 survey[30] on the profitability of fishing. SEAFISH (2011) found that operating profits did not exceed 30% for any sector of the industry with >15m vessels, with most sectors having much lower operating profits. Operating profit was calculated as total income less operating costs of vessel costs and fishing costs, including crew share. As such, cost estimates were not inclusive of crew share, but a conservative approach was taken in relation to all other assumptions. Fishing income figures was provided by the MMO from declared landings of every vessel in the UK fleet. GVA is often considered a better indicator than profitability in terms of the impact of reduced activity, but as the 30% figure provided an upper estimate for sector profitability, it was considered appropriate to leave the methodology unchanged from the Consultation IA.

[29] Based on hybrid multipliers used in Table 3 ("The regionally disaggregated impact of £1m landings") of the report (SeaFish 2007). As data were not available at a regional level, the mean of the regional impacts was taken to represent the UK impact. http://www.seafish.org/upload/file/economics/FINAL-%20Input%20output%20report%20%20,full%20report.pdf

[30] SEAFISH 2011. 2009 Economic Survey of the UK Fishing Fleet. Seafish Industry Authority.

Table 4.2 Summary of 'minimum' and 'maximum' management scenarios and assumptions made in estimating costs for the fisheries sector of designating the Pisces Reef Complex SAC compared with not designating

"Minimum" scenario	Assumptions	Change in costs
Ban all forms of towed, demersal fishing over the whole site.	The site is small and fishing occurs over a large area in the Irish Sea. It is anticipated that any fishing that is being undertaken at the site can be comfortably displaced to suitable nearby habitats without extra incurred costs.	£0
"Maximum" scenario	Assumptions	Change in costs
Ban all forms of towed, demersal fishing within an area including the site.	Loss of total net profit (profit estimated at 30% of UK landings (£1040k))	£312k

Whether fishermen are able to fish at alternative sites will depend on a number of considerations, a key factor being the availability of suitable grounds. There may also be weather and other seasonal constraints to moving to alternative areas.

Where fishermen do find alternative grounds there may be implications on costs and profitability such as increased fuel and labour costs and potentially a higher proportion of time spent steaming rather than fishing and therefore reduced profitability. Alternative grounds may also be less productive and mean that fishing days are less productive and therefore less profitable. Displacement of fishing activity away from the site could also impact fishing vessels in other areas by direct competition and by altering the delicate balance of static and towed fishing methods.

In some cases, particularly where moving to an alternative ground would become unprofitable, individual fishermen may stop fishing. This may not necessarily mean that total income to the sector will reduce, given fixed quotas for many stocks and if other vessels are able to draw on quota foregone, for example through co-operative arrangements. However, in many cases this will not happen. Where individual fishermen stop fishing then there may also be implications to the fishermen themselves wider than foregone revenue, such as: the need to dispose of a vessel, potential decline in the market value of vessels and potential decline in the value of quotas.

Given the issues above, it is very difficult to predict how individual fishermen will respond to closures and the cost implications. At this stage the best that can be done for most of the closures is to provide an indication of the profitability of fishing within the area and suggest that the direct effect of a closure would be to reduce the profitability of the area by some margin.

A further important issue is that any closures, even if undertaken unilaterally by the UK, would have to be agreed with other Member States of the European Union through the CFP. It is assumed that this process may take a minimum of a year to carry out and therefore that closures would not be in place until 2013. Although it may take longer than this to actually put measures in place, by using the minimum timeframe it ensures that the costs are not underestimated.

c) Administration costs to Government

Under both scenarios, Competent Authorities will incur costs in enforcing the regime as a result of:

i. *Requirements to review existing activities that may have impacts on the habitats for which sites have been designated.* It is assumed that no further work is necessary to assess the impacts of

activities, but further work is necessary to develop, implement and communicate site specific management measures. MMO estimate that this may require 2 person-years of officer time plus related expenses[31]. Based on the costs of staff time in Defra this is estimated to cost £90.5k per FTE year, giving a total estimated cost as a one-off £181k[32].

ii. *Monitoring and enforcement.* The MMO assessed that an additional 3 days boat time and 6 hours air surveillance might be necessary per site to enforce measures effectively. This would cost £39.6k per annum[33]. It is assumed that administration of records and other activities is carried out as part of existing duties.

There are currently no estimates of how much monitoring and surveillance will be required to fulfil the assessment of the site for the Habitats Directive and no estimate of the costs.

This impact assessment assumes that the costs of Government enforcement are constant for both the minimum and maximum scenarios. Under the two scenarios the effectiveness of enforcement is varied to estimate impacts that represent the likely range of impacts from designating the site. The Government administration costs (other than enforcement, such as completing AAs) do not vary under the scenarios as they are dependent on the level of development (the numbers of applications by different sectors) brought forward at the site which is currently nil for Pisces Reef Complex SAC. Under both scenarios, impacts are one-off costs of £181k, and annual costs of £39.6k.

4.3 Benefits of designating the site

Discussion is provided below of the impact of designating the site based on specific ecosystem services. The site feature "reef" has been graded as II for "degree of conservation of structure" which indicates that the feature is well preserved. As outlined, further information will be required to assess and monitor the condition of the interest feature on the pSAC[34].

a) Provisioning services

Fish, shellfish and other crustaceans for human consumption

Pisces Reef Complex offers a hard substrate in a predominately muddy environment and increases habitat heterogeneity and complexity. Habitat structures such as these have been shown to increase the number of juvenile fish species surviving to adulthood in other regions (e.g. Connell and Jones 2003 – New Zealand) by offering refugia from predation and competition. It is possible that fish and shellfish species will benefit as a result of the habitat structure, though effects are expected to be restricted to the site and will be species-specific. Spillover of oysters (*Pecten maximus*) and lobster (*Palinurus elephas*) has been demonstrated in other MPAs (Beukers-Stewart et al, 2005 and Goñi et al, 2006 respectively).

b) Regulating services

Regulating services are not mentioned further here as their value is considered to be minimal at a site level.

c) Types of value

Option Values

Some people will gain from having the option to benefit in future from conservation of a good example of reef habitat, even if they do not currently plan to benefit from it (option value). This arises because if the site is not protected now there may not be good examples of reef habitat still available to conserve in

[31] Juliette Hatchman, MFA, pers comm., 19/12/09.
[32] This is based on the full costs (includes e.g. overheads and pensions contributions) of a Senior Executive Officer for 6 months from Defra's 2007-08 Ready Reckoner of staff costs and £10k for communication and other costs (inflated to 2010 prices).
[33] This is based on costings provided by the MMO (pers comm., Dec 2010) of £9.1k per boat day and £2,050k for an hour of air surveillance.
[34] JNCC (2009)

future. Also, some will gain from knowing that it is conserved in case future information reveals that the reef habitat provides important benefits that we are not currently aware of (quasi-option value).

Non-use Values

Most people who benefit from knowing the site is being conserved are unlikely to use it or get tangible benefits from it. This is known as the existence value of conserving the site. Some people will also gain satisfaction from knowing that the reef habitat is being conserved for others in the current generation (altruistic value) and for future generations (bequest value).

There is reliable evidence in the UK and elsewhere that the general population has significant positive non-use values associated with rare species (see for example Christie et al, 2004 for general discussion or White et al, 2001 for examples of value of conservation of specific mammal species). Additionally, Beaumont et al (2006) estimate the non-use value of biodiversity of the UK marine environment at £0.5-1.1 billion per year across the UK population.

The effects of designation of Pisces Reef Complex for the provision of each of the ecosystem services described above is summarised in Table 4.3 below as the difference due to site designation in comparison to baseline (no designation). There are four additional columns of information in the table to clarify our understanding of the qualitative changes in ecosystem services arising from designation:

- ***Relevance*** Relating to the amount of ecosystem good or function arising from site
- ***Value weighting*** Categorisation of how valuable the amount of ecosystem good or function from the site is in providing benefits to human population
- ***Scale of benefits*** Consideration of actual potential to deliver benefits (for example considering leakage, delivery to human population, etc)
- ***Confidence*** Level of confidence in our current knowledge of all other categories (in other words, scale of benefit, level of improvement, etc.)

Based on the above categories, an overall level of each ecosystem service is defined with its own confidence level. Following, an overall level of total benefits is also defined.

The parameters are assigned a level for each service from a menu, defined as:

- ***Nil*** Not present/none.
- ***Minimal*** Present at a very low level, unlikely to be large enough to make a noticeable impact on ecosystem services.
- ***Low*** Present/detectable, may have a small noticeable impact on ecosystem services, but unlikely to cause a meaningful change to site's condition.
- ***Moderate*** Present/detectable, noticeable incremental change to site's condition.
- ***High*** Present/detectable order of magnitude impact on site's condition.

Table 4.3 Potential significance of ecosystem services improvements for Pisces Reef Complex SAC

Services	Relevance to site	Baseline Decline	Designate Min management	Designate Max management	Value weighting	Scale of benefits	Confidence
Fish for human consumption	**Low.** May provide shelter and habitat heterogeneity for commercially exploited fish and crustaceans in the northern Irish Sea	**Low.** Interruption of lifecycle processes could mean significant decline.	**Low.** Improvement on site likely to support species of human interest. Limited by fewer management measures and risk enforcement does not succeed.	**Low.** Improvement on site likely to support species of human interest.	**Mod.** One of a few outcrops of hard substrate in a largely muddy area.	**Low.** Increase in stocks likely to be offset by declines elsewhere.	**Low.** Unsure whether species would benefit from rocky and stony reef in this instance.
Fish for non-human consumption							
Carbon sequestration	**Minimal.** Features are likely to have low effect and small area	**Minimal.** Unlikely to affect biological pump.	**Minimal.** Unlikely to affect biological pump	**Minimal.** Unlikely to affect biological pump	**Mod**. High value but site plays minimal role	**Minimal**	**Mod.** Biological pump not well understood
Waste assimilation	**Minimal.** The features are likely to have a low effect and small area.	**Minimal.** Unlikely to affect assimilation functions.	**Minimal.** Unlikely to affect assimilation functions and processes.	**Minimal.** Unlikely to affect assimilation functions and processes.	**Minimal.** Site plays minimal role.	**Nil.**	**Moderate**. Assimilation not well understood.
Non-use value of natural environment	**Low- Mod.** Public has preference for rare and visually appealing features.	**Low.** Continuing degradation, but may not have further adverse effect on reef value.	**Low.** Some recovery of biodiversity and community composition possible but enforcement may not succeed.	**Moderate.** Some recovery of biodiversity and community composition possible.	**Moderate.** All UK population is relevant but relatively low value per capita.	**Low - Moderate**	**Low.** Presence of charismatic marine mammals which may have higher non-use values.
Scientific research	**Low.** Some basic scientific value, but level of uniqueness is unclear.	**Low.** Continuing degradation removes scientific value.	**Low.** Some recovery but enforcement may not succeed.	**Moderate.** Some recovery of biodiversity and community composition.	**Moderate.** For sediment management & biological resources	**Low - Moderate**	**Moderate**.
Total value of changes in ecosystem services			**Low for both scenarios**				**Low-Moderate**

d) Benefits to economic activity

Designation of sites may assist the different sectors that make use of the marine environment in the context of marine spatial planning and a more strategic consideration of available resources. This would mean that sectors can undertake future plans and applications for their operations (for example applications for licenses) with the better knowledge of a) the nature conservation significance of different parts of the marine environment, and b) the added costs of these applications within or adjacent to a site boundary, as opposed to outside it. This may result in a focus of activity away from a site. This will be dependent upon appropriate marine resources being available within the region but outside of any site(s).

4.4 Summary of costs and benefits

Table 4.4 below summarises the potential costs and benefits of the site analysed in this section. The costs are analysed over a period of 20 years from designation in 2012, and are discounted at 3.5%. There are uncertainties in the assessment of costs, and some costs have not been quantified.

Table 4.4 Summary costs and benefits table for Option 1: Designate the site

	Minimum management scenario		**Maximum management scenario**	
	Costs	**Benefits**	**Costs**	**Benefits**
Assessed	**Sectors** Shipping: £0 Fishing: £0 Government: Enforcement £181k one-off and up to £39.6k pa.	Low: possible impacts on fish species, scientific and non-use values.	**Sectors** Shipping: £0 Fishing: £312k pa loss of operating profit Government: Enforcement £181k one-off and up to £39.6k pa.	Moderate: beneficial impacts on values of fish species, scientific and non-use natural environment.
Total average annual	£39.6k pa	Low	£336.0k pa	Low
Total one-off	£181k	0	£181k	0
Total (PV)	£763.5k	Low	£5,041.0k	Low
Not assessed	• Costs if any projects are refused • Costs from cumulative MPA impacts and beyond next 20 years	• Role of feature in wider ecosystem • Intrinsic value of biodiversity improvements • Ecosystem recovery beyond next 20 years	• Costs if any projects are refused • Costs from cumulative MPA impacts and beyond next 20 years	• Role of feature in wider ecosystem • Possible benefits to fish stocks from protection of possible breeding grounds. • Intrinsic value of biodiversity improvements • Ecosystem recovery beyond next 20 years

a) Risk of unintended consequences

The main risks of unintended consequences are assessed to be the following:

- Fishermen may seek compensation for moving grounds.
- Displacement of fishing effort to alternative grounds may intensify fishing at those grounds to unsustainable levels, causing net damage to fish stocks overall (though this is not considered likely due to the relatively small size of Pisces Reef Complex pSAC).

An assumption has been made that displacement of fishing effort due to any possible fisheries closures would not result in a reduction in profitability. This is unlikely to be the case for many protected areas, where displacement and gear conflicts outside MPAs are important issues, but the size of any possible closure at this offshore site is expected to be small, the site has no particular value to fisheries compared to the surrounding region and the wider region supports similar fleets that can accommodate any increase in effort due to displacement.

Each of these risks is greater under the maximum scenario, and when considered cumulatively with other SAC designations and marine planning restrictions (e.g. MoD activity, shipping, fishing). Some of these risks can be mitigated by involving stakeholders in the process of designation through public consultation, and by early and thorough consideration of the cumulative effects of designations on the scale appropriate to the industry concerned. The cumulative effects of marine Natura 2000 sites proposed for designation during 2011 are considered in a separate paper.

Under the Offshore Habitats Regulations (which transpose the Habitats Directive), and following an Appropriate Assessment, a Competent Authority can agree to a plan or project for imperative reasons of overriding public interest (IROPI), notwithstanding its adverse effect on site integrity, if there are no alternative solutions. It would be for the Competent Authority to decide whether to agree to a plan or project on IROPI grounds using guidance from the European Union. The more strategically important the risks above are, the greater the likelihood of plans or projects being consented on IROPI grounds. Assessing such grounds would entail additional costs.

4.5 Impact tests

Consideration has been given within the main body of this assessment to relevant and identifiable environmental impacts and effects on sustainable development of designating Pisces Reef Complex as an SAC.

The further tests specified by the IA guidance are considered here.

a) Competition assessment

This assessment, shown in Table 4.5 is restricted to the sectors where significant potential costs are identified in Table 4.4 above, namely fisheries and Government. The table analyses the impact of the maximum potential management measures that may be required (which represent the maximum impact on activities in the site). The maximum scenario is used to assess whether any significant impact is likely. A more detailed assessment of likely impacts should also take into account the minimum scenario. Cumulative impacts of designation of Natura 2000 sites in the marine environment could have more significant effects on competition in some sectors. It is assumed that any management measures will apply to domestic and foreign operations.

The designation of the site is not expected to have a significant impact on competition.

Table 4.5 Competition assessment for Pisces Reef Complex SAC

Would the proposal:	*Fisheries*
1. Directly limit the number or range of suppliers?	No direct restrictions
2. Indirectly limit the number or range of suppliers?	The main tests of this are whether the policy is expected to: - raise significantly the costs of new suppliers relative to existing suppliers, - raise significantly the costs of some existing suppliers relative to other existing suppliers, or - raise significantly the costs of entering, or exiting, the affected market. In general this should not be the case although if some fishing gear types are considered more damaging than others management measures may impose restrictions on them raising their costs relative to other gear types.
3. Limit the ability of suppliers to compete?	No restrictions on factors on which suppliers can compete.
4. Reduce suppliers' incentives to compete vigorously?	No reduction of incentive to compete.

b) Small firms impact test

Small and Medium Enterprises (SMEs) are considered for these purposes to be those with fewer than 250 employees. A significant number of SMEs in the fishing industry could be affected by the designation.

Any additional management measures may have an impact on the fishing vessels owned by SMEs. In most cases the company would not own more than one vessel[35]. The number of fishing vessels affected would depend on the actual management measures implemented. Under the maximum scenario, the profitability of some small fishing businesses could potentially be affected. For example, their adaptations to the management measures for the site may increase costs, reduce value of landings or both.

Down-stream and up-stream effects in other sectors could also impact on SMEs, but impacted activities are likely to be displaced, at least in part to other locations in the UK economy, limiting the overall impact on SME's in the UK. For example, there are a number of SMEs which are directly and indirectly connected to the fishing sector, which could potentially be affected by designation. These include, the retail trade (fishmongers, markets) fish processing plants, ship builders and diesel suppliers.

c) Legal aid

Legal aid is available to individuals with an annual income of less than £12k or with income of between £12k and £21k and disposable income of less than £3.3k where the case is an interest of justice case. It is considered very unlikely that the designation of the site will lead to increased use of legal aid.

d) Carbon (Greenhouse Gas) assessment

The impact of designating the site on greenhouse gas emissions is unknown but not expected to be significant. If fishing vessels have to travel longer distances to access alternative fishing grounds this would increase emissions depending on vessel size and whether they already operate over a variety of fishing grounds.

[35] Based on expert opinion.

e) Rural proofing

Some of the economic costs identified in relation to fisheries and other sectors may occur in remote coastal communities in predominantly rural areas of the UK. Owing to the less diversified nature of their local economies, the potential impacts may be relatively more important as a proportion of economic activity in these locations.

f) Other impact tests

The effect of designating the site on health, disability, race, gender equality and human rights has been considered and it is not thought to have an impact. Consequently these impact tests are not examined further here.

5 CONCLUSIONS

The purpose of this impact assessment is to provide information about the impacts of the designation of Pisces Reef Complex as an SAC and is carried out in order to inform stakeholders and government about the options for the site. This is done by considering the impacts of Option 1 (designating the site) relative to the baseline (to not designate the site).

As the potential management measures for the site will only be known in detail after the site has been designated, it is necessary to make assumptions about what measures might be required for this site. This assessment analysed a range of impacts, relative to the baseline, defined through minimum and maximum management scenarios.

The minimum scenario involves the smallest change in activities that may be needed compared with the baseline and therefore presents the minimum potential effect on activities. The maximum scenario is at the other end of the scale: it entails the largest change in activities that may be needed compared with the baseline and thereby presents the maximum potential effect on activities.

As Table 4.4 above shows, under Option 1 (for the 20 years of impact assessment framework):

For the minimum management scenario costs are low (one-off costs of £181k and average annual costs of £39.6k) and expected benefits are also low. There are marginally higher costs under the maximum management scenario (one-off costs of £181k and average annual costs of £336.0k), but this scenario also brings low benefits in relation to: non-use values of the environment, scientific research and knowledge.

In addition, a range of costs and benefits are possible through wider network and strategic effects. In terms of network benefits, designation of the proposed site will prevent degradation of areas of the marine environment, and enable restoration where damage has occurred, over the next twenty years and beyond, which could potentially be of benefit to the wider ecosystem and enable increases in fish stocks. It has not been possible to assess these benefits. It should be noted that establishment of a network of protected sites is a key purpose of the policy (the Habitats Directive) stimulating the possible designation. This makes it important to consider the benefits of this site in the context of the value of the network of sites.

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ANNEXES

ANNEX I: CALCULATIONS OF COSTS TO FISHING INDUSTRY BY GEAR TYPE

Description of known current and future activity relevant to the site

Note that fishing is carried out on a European level, by UK vessels, European and non-European vessels by agreement. Data on location and type of fishing is difficult to obtain comprehensively due to various issues. Also, fishing data from recent years is a reflection of fisheries already managed to an extent by total allowable catch (TAC) and species quotas. As there are no indications that these measures are likely to change within the timeframe of the IA, the current situation is taken as the baseline.

It is possible to obtain information on the distribution of fishing effort within the region for UK vessels (≥15m) that have vessel monitoring systems (VMS). These provide a vessels position, speed and heading either hourly or every two hours. Such information can be analysed spatially in relation to the site boundary. As vessels fish at characteristic speeds, VMS data can be processed to provide proxy patterns of 'active fishing'. The European Commission has passed a regulation requiring all member states to assure that VMS terminals in use on fishing vessels (≥15m) of its national fleet are secure[1]. VMS data currently only cover vessels of over 15m in length. Using a simple speed rule to partition active fishing from VMS is a coarse but effective method of estimating fishing effort (Mills *et al*. 2007).

Effort data were derived from work on a Defra marine biodiversity research programme (MB106)[2]. Estimations of fishing activity were derived from Vessel Monitoring System (VMS) data and are available for 2006-9. The derived surfaces represent activity from all vessels (both UK and non-UK registered vessels) of at least 15-m length. VMS data for UK vessels were linked to skipper logbook information in order to determine the fishing gear being employed. For non-UK registered vessels where logbook information is not available information on fishing gear employed has been obtained from 'primary gear' listed on the EU vessel register. Unprocessed VMS data have been filtered using a simple speed rule of between 1 and 6 knots to indicate fishing activity for all gear types. Date and time information attached to unprocessed VMS data were used to determine elapsed time between consecutive VMS locations for each vessel (usually 2 hours) and summarised at a cell resolution of 0.05 decimal degrees.

There are no landings data available specifically for the area which is proposed for designation. The Marine Management Organisation's Fisheries Activity Database (hereafter, FAD) compiles various data at the level of ICES rectangle. Catch data encompasses information for UK-registered vessels landing in UK and non-UK ports, and for non-UK registered vessels landing in UK ports. Data includes:

- year
- size of vessel
- type of gear
- species caught
- port of landing
- vessel nationality
- value of landing
- tonnage of landing

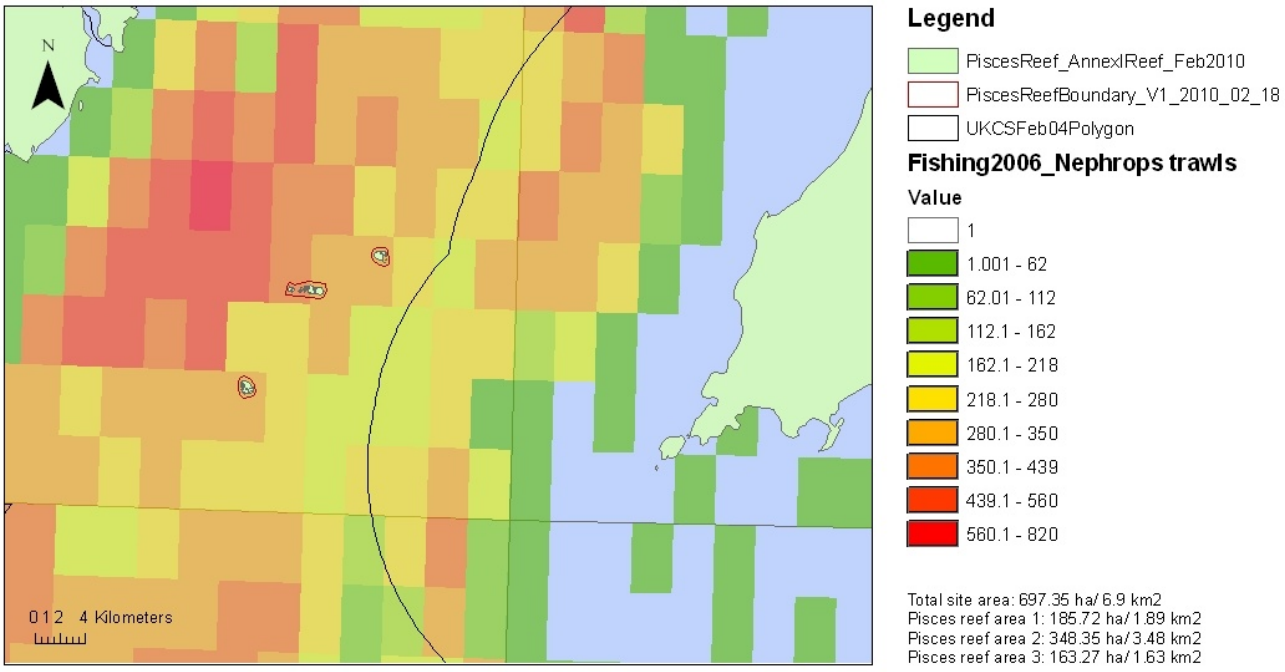
Note, the exception is for non-UK vessels that fish within UK territorial waters, but that land at non-UK ports; it is not possible to obtain weights and values of landings for these vessels. This impact assessment is concerned with the impacts of the UK's potential designation of Pisces Reef Complex on UK businesses. However for fisheries, designations of other areas of the marine environment by other Member States are also relevant as there will also be effects on businesses in other countries.

[1] http://ec.europa.eu/fisheries/index_en.htm

[2] Cefas (2010) Report no. 1: Objective 1 – Provision of geo-database containing standardised layers showing the distribution of specified activities, sites and resources with associated metadata and comments. Project MB106: Further development of marine pressure data layers and ensuring the socio-economic data and data layers are developed for use in the planning of marine protected area networks

Nephrops trawling

Nephrops trawl activity around the Pisces Reef Complex SAC in 2006 from the Cefas data contract (MB106). Generated from VMS, log-book and EU vessel register data.



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Site map projected in UTM (Zone 30N, WGS84 datum). Seabed habitat derived from DTI SEA data.

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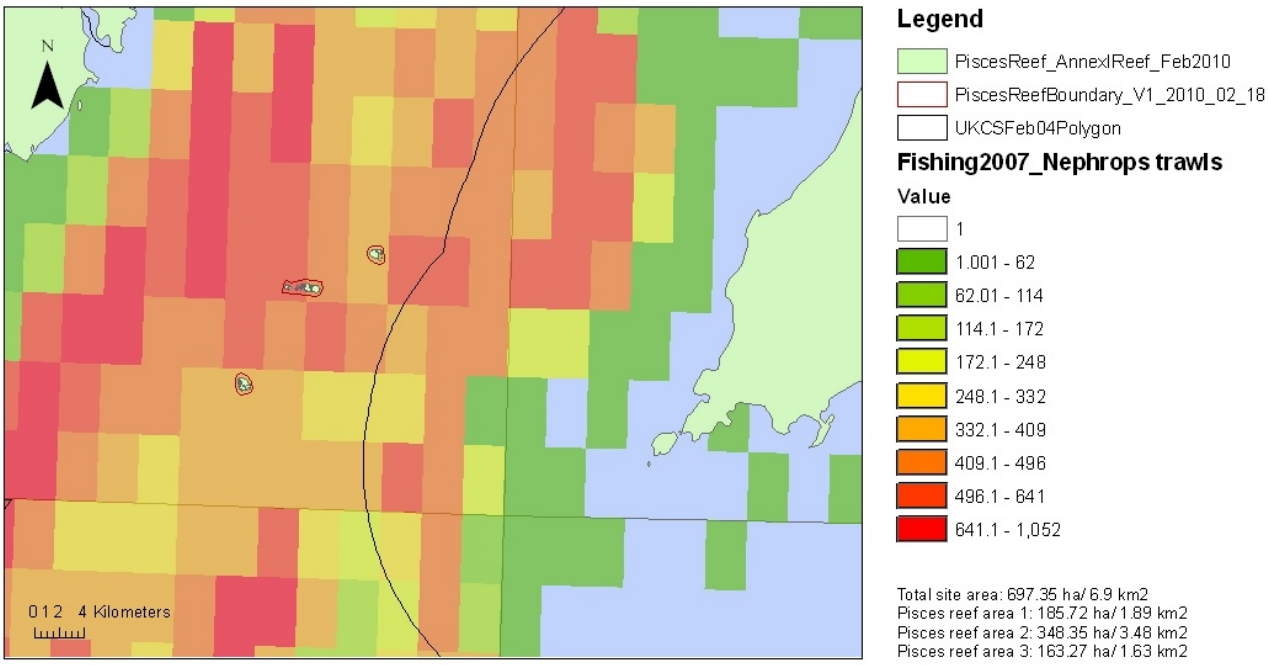

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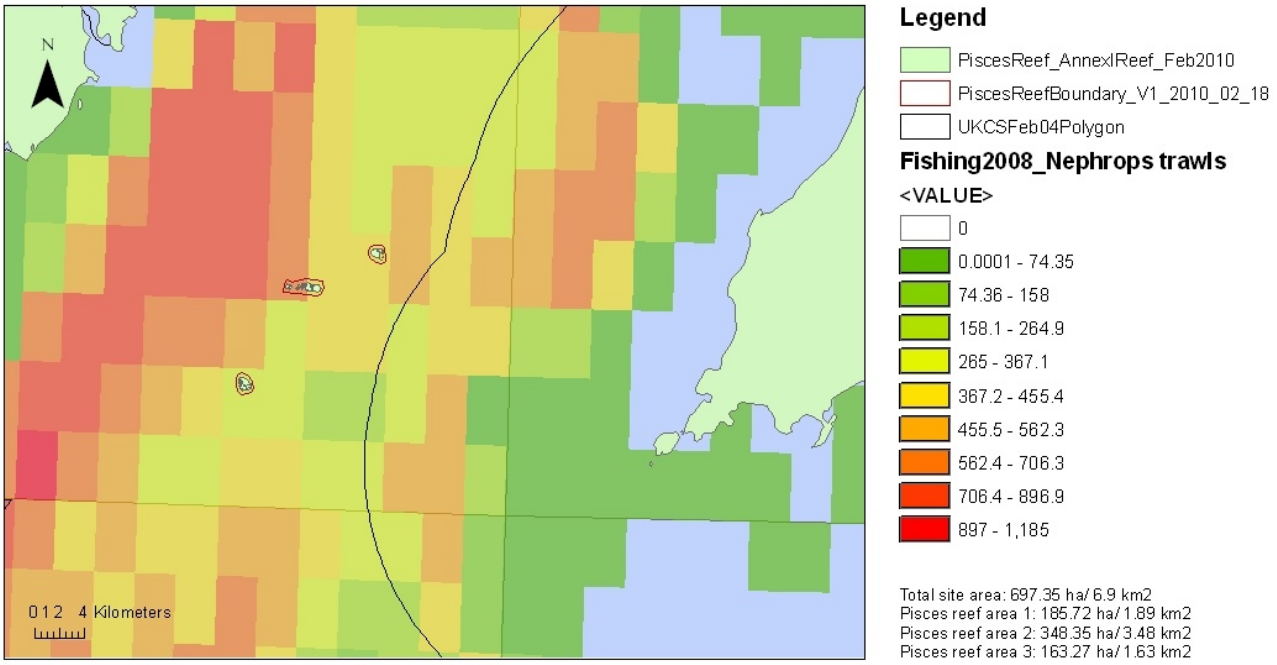

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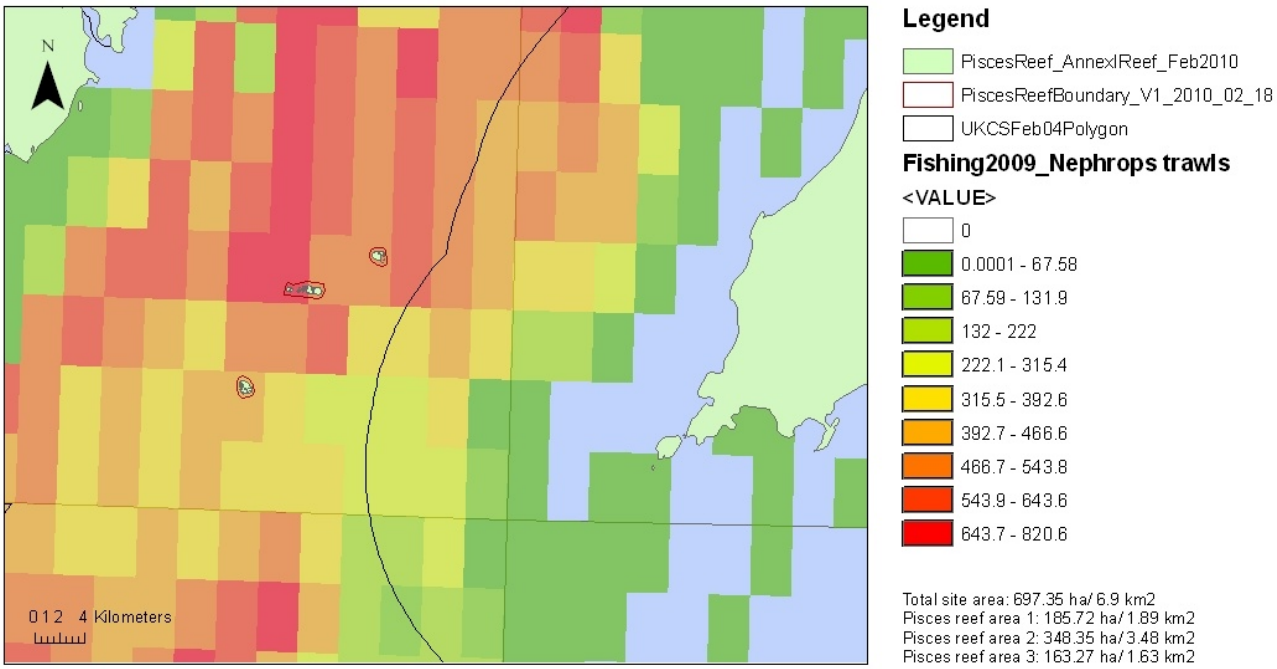

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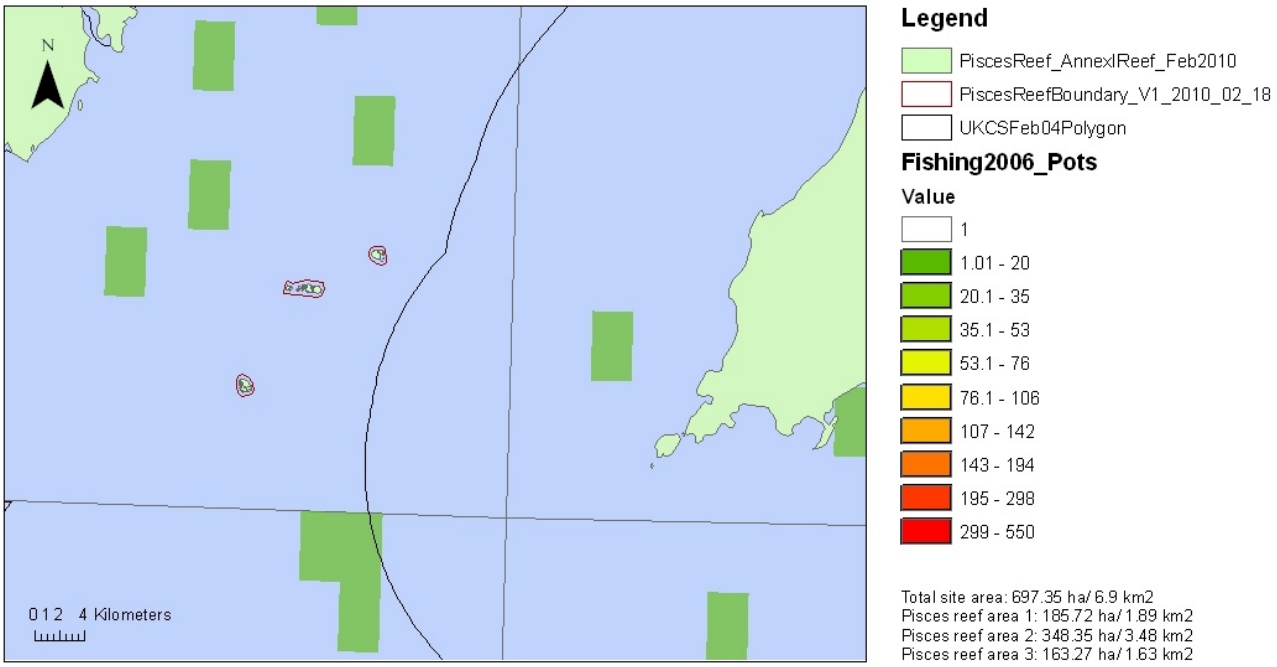
Site map projected in UTM (Zone 30N, WGS84 datum). Seabed habitat derived from DTI SEA data.

Potting activity

Fishing pots around the Pisces Reef Complex SAC in 2006 from the Cefas data contract (MB106). Generated by Cefas from VMS, log-book and EU vessel register data.



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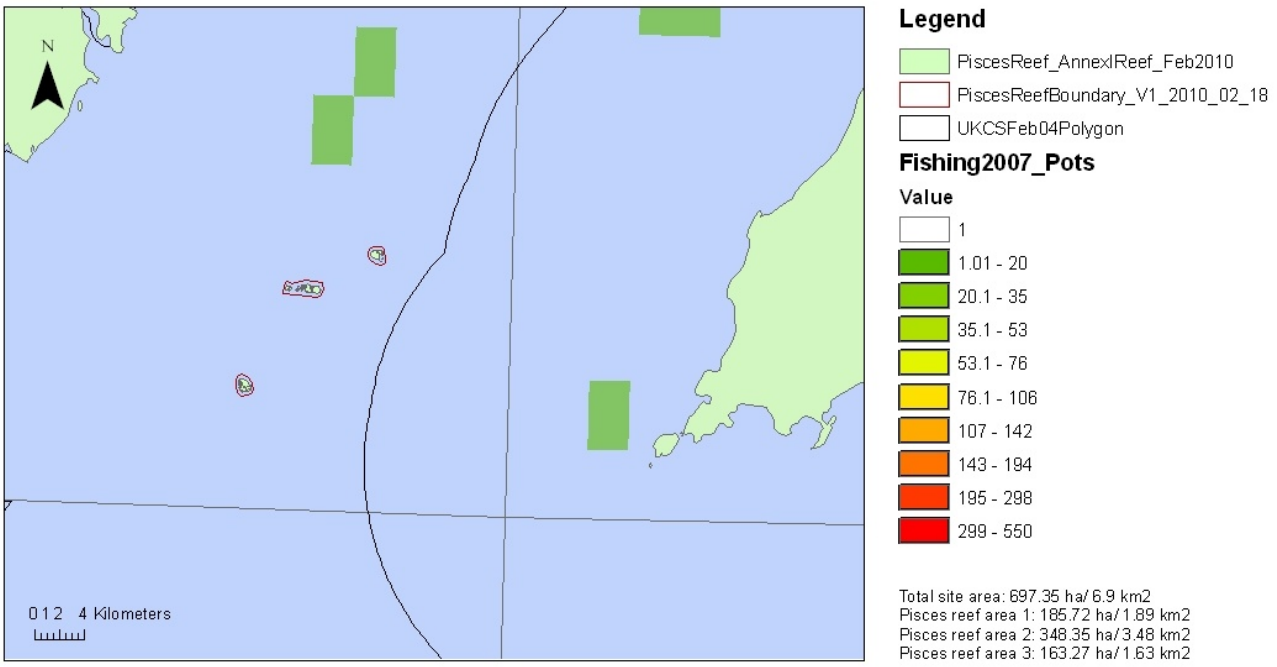

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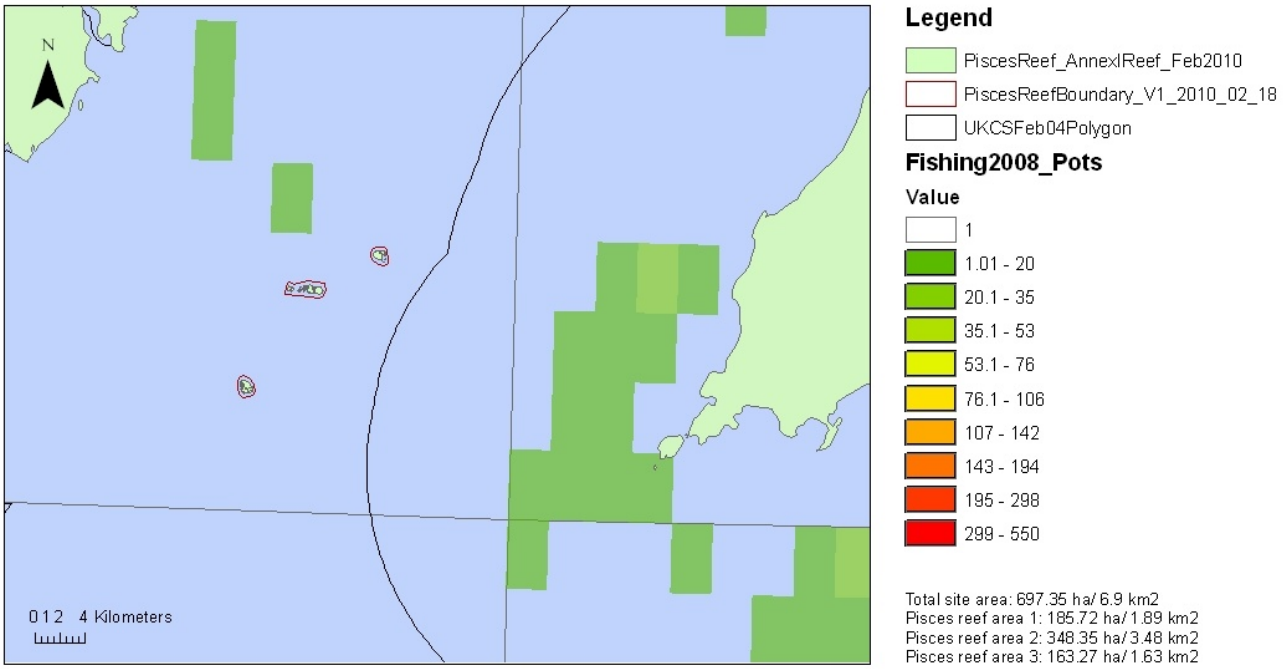

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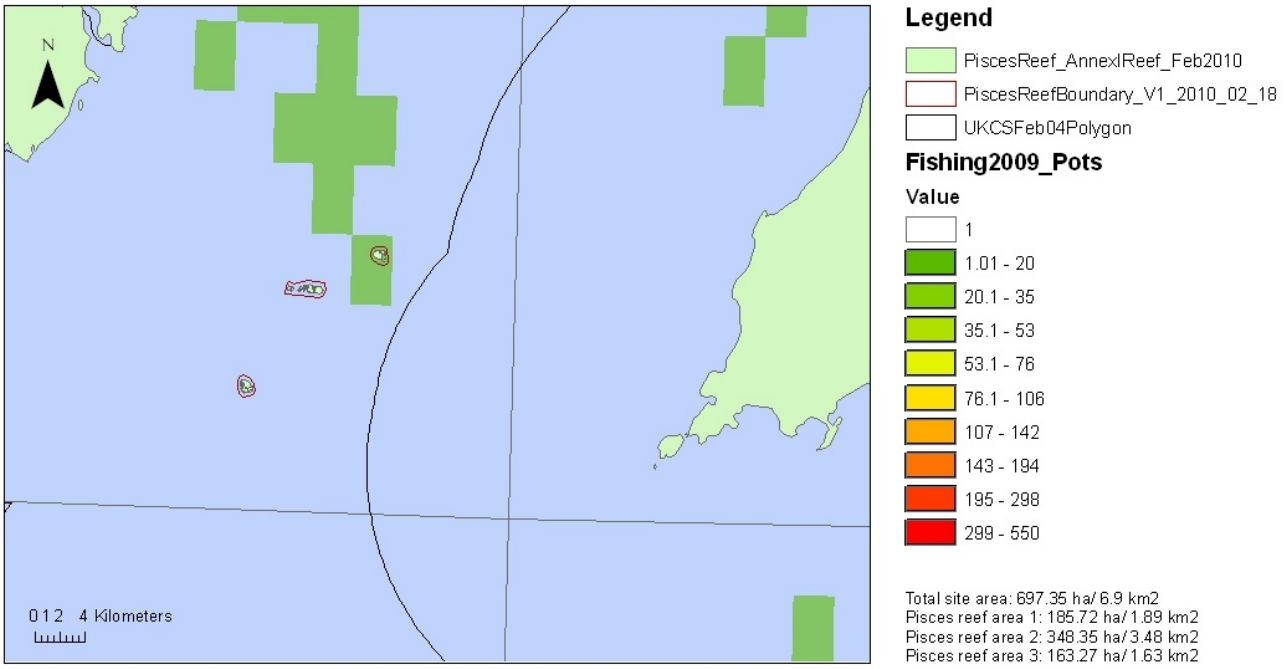

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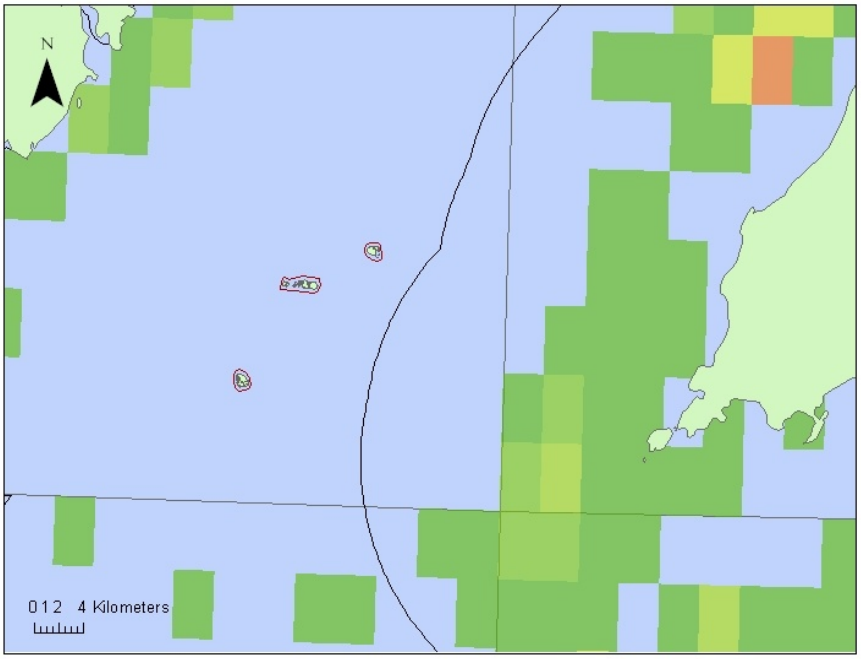
Mechanized dredging

Mechanized dredging around the Pisces Reef Complex SAC in 2006 from the Cefas data contract (MB106).



Legend

PiscesReef_AnnexIReef_Feb2010
PiscesReefBoundary_V1_2010_02_18
UKCSFeb04Polygon

Fishing2006_Mechanized dredges

Value
0
0.0001 - 35.9
35.91 - 71.79
71.8 - 111.7
111.8 - 155.5
155.6 - 199.4
199.5 - 251.3
251.4 - 347
347.1 - 526.5
526.6 - 1,017

Total site area: 697.35 ha/ 6.9 km2
Pisces reef area 1: 185.72 ha/ 1.89 km2
Pisces reef area 2: 348.35 ha/ 3.48 km2
Pisces reef area 3: 163.27 ha/ 1.63 km2

Pisces Reef Area 1: 1)-5.17696, 54.18632, 2)-5.17696, 54.18629, 3)-5.17696, 54.18633, 4)-5.17696, 54.18632, 5)-5.17617, 54.18996, 6)-5.17181, 54.19202, 7)-5.16132, 54.19245, 8)-5.15772, 54.19044, 9)-5.15514, 54.18327, 10)-5.1564, 54.18087, 11)-5.16055,54.17874, 12)-5.16814, 54.18014, 13)-5.17567, 54.18335,

Pisces Reef Area 2 : 1)-5.2762, 54.16525, 2)-5.27037, 54.16404, 3)-5.25312, 54.16663, 4)-5.23306, 54.16476, 5)-5.23119, 54.15952, 6)-5.2333, 54.15634, 7)-5.23718, 54.15443, 8)-5.26337, 54.15539, 9)-5.27999, 54.15613, 10)-5.2801, 54.16273,

Pisces Reef Area 3 : 1)-5.2762, 54.16525, 2)-5.27037, 54.16404, 3)-5.25312, 54.16663, 4)-5.23306, 54.16476, 5)-5.23119, 54.15952, 6)-5.2333, 54.15634, 7)-5.23718, 54.15443, 8)-5.26337, 54.15539, 9)-5.27999, 54.15613, 10)-5.2801, 54.16273,

Site map projected in UTM (Zone 30N, WGS84 datum). Seabed habitat derived from DTI SEA data.
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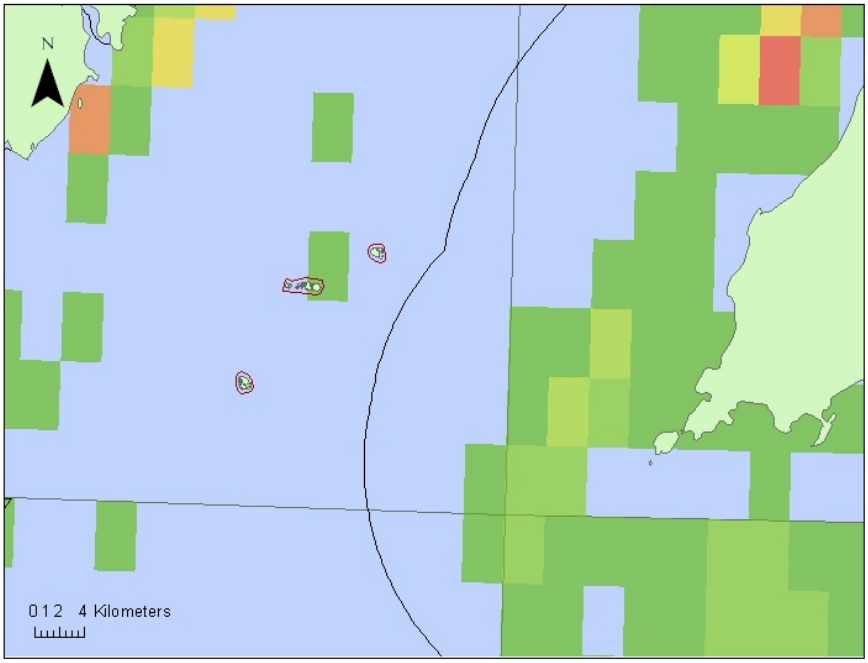
Mechanized dredging around the Pisces Reef Complex SAC in 2007 from the Cefas data contract (MB106).



Legend

PiscesReef_AnnexIReef_Feb2010
PiscesReefBoundary_V1_2010_02_18
UKCSFeb04Polygon

Fishing2007_Mechanized dredges

Value
0
0.0001 - 35.9
35.91 - 71.79
71.8 - 111.7
111.8 - 155.5
155.6 - 199.4
199.5 - 251.3
251.4 - 347
347.1 - 526.5
526.6 - 1,017

Total site area: 697.35 ha/ 6.9 km2
Pisces reef area 1: 185.72 ha/ 1.89 km2
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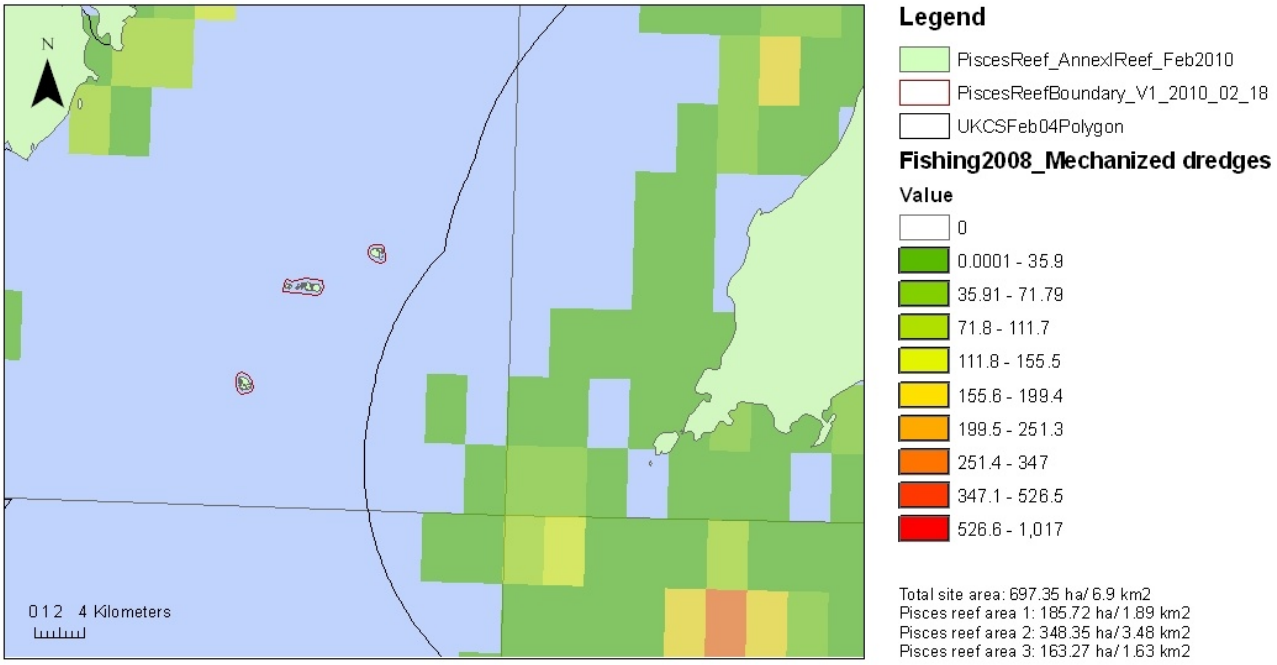

Pisces Reef Area 1: 1)-5.17696, 54.18632, 2)-5.17696, 54.18629, 3)-5.17696, 54.18633, 4)-5.17696, 54.18632, 5)-5.17617, 54.18996, 6)-5.17181, 54.19202, 7)-5.16132, 54.19245, 8)-5.15772, 54.19044, 9)-5.15514, 54.18327, 10)-5.1564, 54.18087, 11)-5.16055,54.17874, 12)-5.16814, 54.18014, 13)-5.17567, 54.18335,

Pisces Reef Area 2 : 1)-5.2762, 54.16525, 2)-5.27037, 54.16404, 3)-5.25312, 54.16663, 4)-5.23306, 54.16476, 5)-5.23119, 54.15952, 6)-5.2333, 54.15634, 7)-5.23718, 54.15443, 8)-5.26337, 54.15539, 9)-5.27999, 54.15613, 10)-5.2801, 54.16273,

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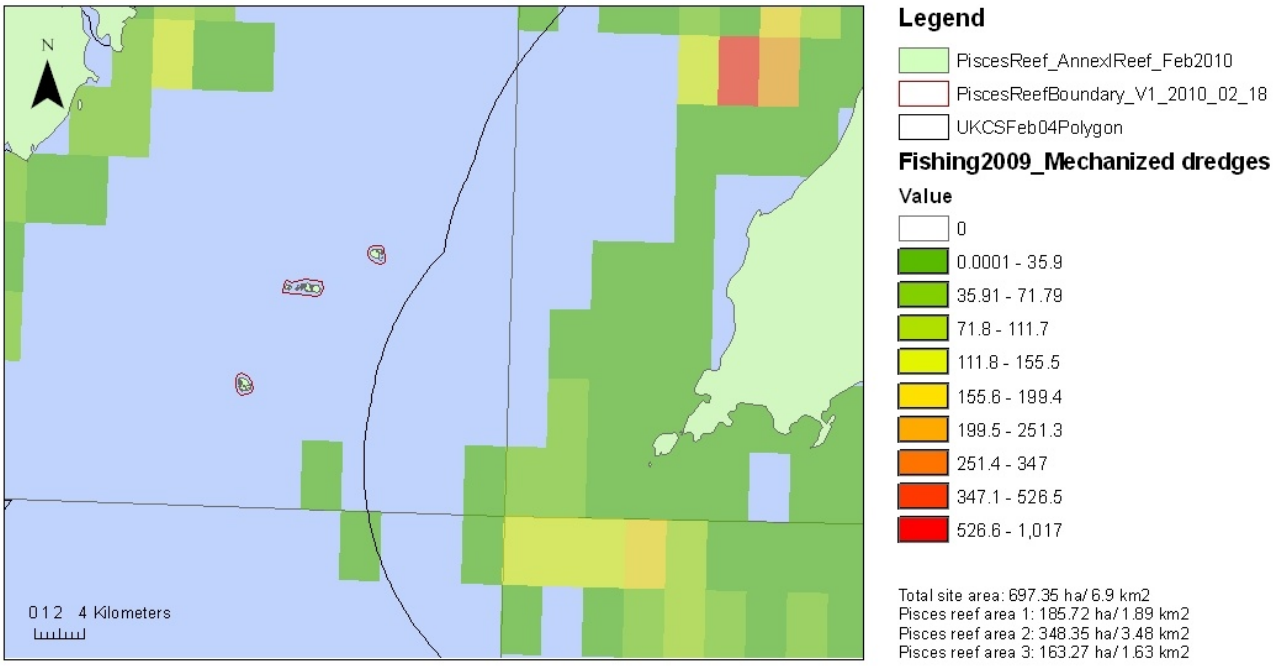

Pisces Reef Area 1: 1)-5.17696, 54.18632, 2)-5.17696, 54.18629, 3)-5.17696, 54.18633, 4)-5.17696, 54.18632, 5)-5.17617, 54.18996, 6)-5.17181, 54.19202, 7)-5.16132, 54.19245, 8)-5.15772, 54.19044, 9)-5.15514, 54.18327, 10)-5.1564, 54.18087, 11)-5.16055,54.17874, 12)-5.16814, 54.18014, 13)-5.17567, 54.18335,

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ANNEX II: METHODS OF ASSESSING ECOSYSTEM SERVICES

Benefits

The approach adopted for identifying marine ecosystem services is described in Section 3.3 of the impact assessments, and is repeated below. Examples of ecosystem services provided by the marine environment are set out in Figure A3.1.

Identification of Marine Ecosystem Services

The potential benefits of the recommended sites primarily arise from an increase in nature conservation and the ecosystem processes associated[3]. These benefits are analysed using an ecosystem services framework[4] based on various studies of the ecosystem services[5] of the UK marine environment[6].

For these Impact Assessments undertaken for the 2010 JNCC IA consultation tranche, the framework used includes all the main categories in the Millennium Ecosystem Assessment (2005a) which are also used in Defra (2007). The categorisation was further informed by the categorisation of ecosystem services provided by the UK marine environment in Beaumont *et al*. (2006). The MEA's ecosystem service classification falls into four overarching categories:

- Provisioning services (such as generation of resources used as food and fuel);
- Regulating services (such as regulation of air quality, control of pests and diseases);
- Cultural services (such as spiritual/artistic inspiration, institutions surrounding resources); and
- Supporting services (such as photosynthesis, nutrient cycling).

The MEA notes that "supporting services are those that are necessary for the production of all other ecosystem services". Here, and following Defra's guidance on the valuation of ecosystem services, the relevant benefits gained from supporting services are viewed as essentially being captured by the other benefits listed and so are not further examined. For example, phytoplankton fix carbon dioxide through photosynthesis and form the basis of the food chain, ultimately ending in caught fish species. Valuing phytoplankton on its own in addition to these services they support would lead to double counting.

A list of the ecosystem service categories that are relevant to marine sites was developed in Eftec's Methodology Report to JNCC (Eftec, 2008). Here that list is revised to also appropriately describe ecosystem services relevant to inshore SACs. *Relevant* means that the designation of the SAC would have a noticeable impact on the benefits derived from the service. The categories currently included are those known to be relevant at this stage, but may be subject to change should new information arise during public consultation. From the list of relevant ecosystem service categories, the specific products and services arising from the site that the UK population potentially benefit from were identified (Figure A3.1).

[3] Heritage benefits, such as conservation of archaeological site, are the only benefits identified that arguably sit outside the scope of nature conservation. Such benefits are still included.
[4] As described in Parliamentary Office for Science and Technology (20007) and Defra (2007) and applied by eftec in the Offshore SAC work for JNCC found at <http://www.jncc.gov.uk/page-3995> and in Defra's IA of the proposed fisheries closure at Lyme Bay found at <http://defraweb/marine/pdf/biodiversity/lymebay-ia-final.pdf>.
[5] Ecosystem services are the goods (such as flows of freshwater) and services (such as removing pollution from the air) provided by the natural environment that benefit humans.
[6] This draws on the following references: Beaumont *et al.*, 2006; Eftec, 2006; and Frid, 2008.

MEA Categories		Relevant Categories		Example of Product or Service
Provisioning services	→	Food	→	Fish for human consumption
				Fish used in animal feeds
		Fibre		Aggregates
		Biochemicals, pharmaceuticals & natural medicines		Fish oil
Regulating services	→	Gas & climate	→	Carbon sequestration
		Bioremediation of waste		Waste remediation, water purification
		Natural hazard		Protection from natural hazard
Cultural services	→	Knowledge & education	→	Scientific knowledge of ecosystem functions, genetic information, and potential for chemical/therapeutics discovery
		Recreation		Recreational sea angling Nature-based recreation Scuba Diving
		Spiritual & religious		Artistic work based on the marine environment
		Cultural & social		Protection of iconic sites or archaeological features
		Aesthetic & inspiration		
		Non-use and option values		Altruistic/Bequest/Existence/Option/Quasi-option values
Supporting services	→	Primary production	→	(Not directly analysed to avoid double counting)
		Photosynthesis		
		Nutrient cycling		
		Biologically-mediated habitat		
		Resilience & resistance		

Figure A3.1: Categorisation of ecosystem services relevant to the UK marine environment and the specific products and services potentially found within dSACs.

In addition to these categories it is recognised by many that biodiversity has an intrinsic value. This value is viewed as an inherent characteristic of biodiversity, rather than a something that benefits humans. Therefore, intrinsic value cannot be assessed using economic valuation techniques[7], and as this IA is concerned with the costs and benefits to people in the UK, is not analysed further here. However, this does not mean that intrinsic value is regarded as unimportant.

The goods and services in the right hand column above were considered for analysis for each site. The actual analysis in each IA was limited to the ecosystem services that would be affected by the designation of the site, based on the available information.

[7] This is referred to for example on page 7 of Section 2 of Millennium Ecosystem Assessment (2005b).

Valuing Marine Ecosystem Services

Marine sites feature a complexity of environmental attributes from which a range of market and non-market goods and services may be derived. An ecosystem services approach, as described above, provides an appropriate framework for describing these attributes.

However, the use of this ecosystem services approach to value individual sites is hampered by several factors. Firstly, it is often difficult to specify and quantify the service being provided due to uncertainty in ecosystem functioning which arises from its complexity and lack of defining barriers (for example, species are not restricted to the site boundary).

Secondly, assuming that the ecosystem service can be defined, it is difficult to accurately define and quantify the change in the provision of the services as a result of designation. The expected change in a site from designation is, according to its conservation objective, either restoration to or maintenance at favourable condition, that is the state in which the site is considered to making its appropriate contribution to the conservation status[8] of the Natura 2000 network.

The benefits of designating the site are determined by comparing this outcome against what would might be anticipated to happen if the site was not designated (the baseline). If it was not designated, the Habitats Regulations would not apply as a matter of law to new plans and projects (for example, for construction of wind farms or gas pipelines) in the site. Such projects could potentially have adverse impacts on features of European importance in the sites. Without recourse to the Habitats Regulations it would be less straight forward for the statutory nature conservation advisers to influence the consenting of these activities to ensure that significant damage to the features is avoided. Consequently, there is greater risk that the condition of habitats and species in the site will deteriorate. Therefore the baseline that is used for comparison is business as usual (BAU), which entails continued potential damage from economic activities. Overall, the benefit of designating the site is equal to environmental benefits provided over and above the BAU scenario.

Thirdly, at the monetisation stage it is difficult to identify the human population that will benefit from any changes to ecosystem services provided by the site.

Given the lack of quantitative data a monetary assessment has not been possible at this stage. The assessment of the environmental change in provision of the ecosystem services following designation is therefore limited to a **qualitative determination**. The analysis is based on the following:

- Baseline – based on our understanding of the detrimental impact of economic activities on vulnerable habitats and species.
- Favourable conservation status - although categorical, the definition of favourable conservation status specifically requires maintenance or augmentation of healthy habitat.
- The resultant environmental benefit – application of the Habitats Regulations should control potentially damaging impacts of human activities on features of the site, allowing habitats and species to be maintained at or recover to favourable conservation condition. This has been shown in many similar contexts to have ecological benefits and to be of benefit to humans.

The difficulty in quantifying the expected benefits of designating a dSAC or pSPA restricts the monetary estimation of the benefits, either via benefits transfer[9] or through an original study. However, review of existing valuation evidence has identified a selection of relevant studies.

[8] Favourable conservation status is defined for a feature as the 'natural range and area it covers is increasing, and the specific structure and functions which are necessary for its long term maintenance exist and are likely to exist for the foreseeable future, and the conservation status of its typical species is favourable'.

[9] For further details see: https://statistics.defra.gov.uk/esg/evri/evri/Benefits%20transfer.htm

Existing Valuation Studies

A number of studies have valued specific marine sites. A useful categorisation in the context of the Impact Assessments is:

i). Valuation of a single ecosystem service - Studies focused on a single service of the marine environment, such as water quality;
ii). Valuation of a specific use - Studies that cover multiple services, but are focused on the use and willingness to pay (WTP) of a very well-defined affected population (for example, scuba divers' WTP for a specific dive site); or
iii). Valuation of a large area of marine habitat – Studies focused on the benefits of a large area of marine habitat, some looking at an overall network of conservations sites, rather than a specific site.

Although studies under i) and ii) exist, there are problems in applying them to sites in UK waters. They refer to non-UK locations (for example, the Mediterranean or California), and their findings are highly dependent on substitute sites and network effects. It is also very difficult to aggregate these studies, as they can relate to overlapping benefits. For example, provision of a certain water quality may be a regulating service in itself, but can also be a supporting service in allowing recreational enjoyment of the environment by divers. This makes avoiding double-counting extremely difficult.

Studies within (iii) are relevant to the Marine Natura 2000 (SPA and SAC) network that the sites covered by the Impact Assessments will contribute to. Specifically a series of recent studies have been commissioned by Defra to value the benefits of the UK marine habitat, focused on a network of UK Marine Conservation Zones (MCZs) that will be provided under the Marine Bill. These studies include:

- Marine biodiversity: An economic valuation (Beaumont et al., 2006);
- Developing Scenarios for a Network of Marine Protected Areas: Building the evidence base for the Marine Bill (Richardson et al., 2006);
- The Marine Bill – Marine Nature Conservation Proposals – Valuing the Benefits (Moran et al., 2007); and
- Determining monetary values for use and non-use goods and services – Marine Biodiversity – primary valuation (McVittie and Moran, 2008).

The studies deal with a network of marine sites or a large area of marine habitat that implicitly encompasses many 'sites' important to marine biodiversity. The positive value of a single site within such an area or network is only fully realised when it is part of a functioning network of sites. In other words, the value of a single site is dependent on positive network effects (Box 1). Equally, network effects may reduce a single site's value, because the availability of close substitutes may mean the site has lower value to people than would be the case if it was an isolated example. In this context 'close' and 'isolated' are used in the geographical and/or in an environmental (e.g. ecological) sense.

Box 1: Positive network effects

- A network effect is a positive externality arising from the presence of one additional good in the economy. The classic example is the telephone. When one user buys a telephone it is valuable to them, but it also makes everyone else's telephone more valuable because they can now contact more people than they could before.
- Network effects are important for all ecosystems, and this is the case for the marine environment which lacks many physical barriers, meaning that species are often highly mobile and dependent on numerous sites through their lifecycle.
- Additionally, some ecosystem services do not originate from a particular source, but originate throughout the marine environment in a nearly continuous manner (such as the carbon sequestration capacity of the open ocean).

Beaumont *et al*. (2006) draws on various studies that used different methods to estimate the value of a number of ecosystem services arising from biodiversity in the UK marine environment. Although the

authors are cautious about aggregating the separate ecosystem services values, the research indicates that the UK marine environment is worth many billions (£).

Following that initial research, Richardson *et al*. (2006) developed hypothetical scenarios for a network of MCZs in UK waters that were used as the basis for two separate valuation studies to value the benefits of the Marine Bill. The second study suggests that the benefit of the MCZ network to the entire UK population is £0.5bn to £1.2bn per year.

Importantly, Beaumont *et al*. (2006) used the ecosystem approach across the entirety of UK waters, while Richardson *et al.* looked specifically at a network of sites within UK waters. The latter is a much smaller area that will be selected to make an effective contribution to protecting UK marine biodiversity.

It is tempting to disaggregate the benefits of the entire UK marine environment or MCZ network to a single site. However, there are two main reasons, one methodological and one conceptual, why this would be a difficult, and inappropriate use of benefits transfer:

- Methodological - The relevant literature only provides aggregate values of ecosystem services, meaning that assumptions have to be made on apportioning a given level of ecosystem service to a particular marine habitat type (for example, reefs compared to sandbanks) or sites, for which no relevant quantitative data was identified, and
- Conceptual - The value of a single site standing alone is potentially very different to the value of that site within a network due to network effects. These may be positive or negative (as discussed above).

In the case of the UK marine environment, the importance of accounting for network effects has already been clearly illustrated in the studies related to the Marine Bill. The value of a single site carried out through benefits transfer could be a huge underestimate, which looked at in isolation would seem negligible. Perhaps an even bigger concern is that the value would be very uncertain. A network of sites covers all areas deemed scientifically necessary to conserve, but this raises the question as to whether some are more important than others. For example, if a site provides important spawning grounds for a few species of fish, would those species find another suitable site or would the stocks collapse if the site was lost?

The tranche of pSACs are being proposed as contributions to the network of Natura 2000 sites. However, the network effect of these sites is not known.

There is a high likelihood of arriving at a significantly underestimated value for a single site, especially where there is scientific uncertainty of the importance of an individual site and its network effects. For the above reasons benefit transfer is not considered possible in this case.

Qualitative Evaluation of Impacts

In place of benefits transfer and monetary valuation a qualitative approach is used to categorise the change in ecosystem service provision if the site were designated, compared to BAU of not designating the site. Based on expert judgement, the change in ecosystem service under each scenario was assigned a level: ‘nil’, ‘minimal’, ‘low’, ‘moderate’, or ‘high’ in the impact assessments. The analysis included consideration of:

- The relevance of each ecosystem service to the site;
- A value weighting (a valuation of the ecosystem service);
- The scale of benefits geographically; and
- The level of confidence in our knowledge of each ecosystem service.

Ecosystem services considered to be only marginally relevant to a site were removed from the analysis. The change in each ecosystem service was evaluated separately. An overall impact was then decided upon through expert guidance and will be subject to public consultation.

The review of the existing valuation literature highlights the need to explain the value of a single marine site within the context of a network of sites (as discussed above). As such, the IAs of proposed sites include discussions on the designation of any given site in the context of the cumulative impacts of site designation, which may be negative as well as positive.

Summary

Designating marine protected areas such as pSPAs and dSACs can provide a complex range of potential benefits which have been described in the impact assessments in terms of ecosystem services. This has been used to define which goods and services will be impacted by the designation of a site.

Information on various ecosystem services arising from the UK marine environment is available, but it is not feasible to apply it individually or collectively to the proposed tranche of pSPAs and dSACs. The physical and monetary information available does not support accurate benefits transfer. Therefore, the literature on valuation of the marine environment is used in the impact assessments as a guide to the types of values that may arise from designation.

In the absence of monetary values, a framework for qualitative analysis of ecosystem services has been applied in the impact assessments to analyse the benefits of designating the pSPAs and dSACs. Investigation is warranted into the possibility of undertaking further valuation studies to derive values of protecting sites in the marine environment, both individually and collectively, especially at sub-national scales.

ANNEX III: COSTS OF DESIGNATION OF PISCES REEF COMPLEX SAC BY SECTOR

Enforcement

Enforcement							
Description			One-off Cost		Annual Cost		
Scenario	***Cost Item***	***Type***	***Cost £k***	***Year Experienced***	***Cost £k***	***Year Commencing***	***Average***
MINIMUM	Develop management measures	Policy	181	2011			-
	Surveillance and monitoring	Policy			39.6	2011	39.60
							-
							-
							-
							-
Total		***Admin***	0		0		-
		Policy	181		39.6		39.60
		Both	181		39.6		39.60

MAXIMUM	Develop management measures	Policy	181	2011			-
	Surveillance and monitoring	Policy			39.6	2011	39.60
							-
							-
							-
							-
Total		***Admin***	0		0		-
		Policy	181		39.6		39.60
		Both	181		39.6		39.60

	Inflation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Discount	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%	70.9%	68.5%	66.2%	63.9%	61.8%	59.7%	57.7%	55.7%	53.8%	52.0%
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Cost £k	***Present Value***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***	***2024***	***2025***	***2026***	***2027***	***2028***	***2029***	***2030***
	181.00	181.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	582.51	39.60	38.26	36.97	35.72	34.51	33.34	32.21	31.13	30.07	29.06	28.07	27.12	26.21	25.32	24.46	23.64	22.84	22.07	21.32	20.60
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	763.51	220.60	38.26	36.97	35.72	34.51	33.34	32.21	31.13	30.07	29.06	28.07	27.12	26.21	25.32	24.46	23.64	22.84	22.07	21.32	20.60
Both	763.51	220.60	38.26	36.97	35.72	34.51	33.34	32.21	31.13	30.07	29.06	28.07	27.12	26.21	25.32	24.46	23.64	22.84	22.07	21.32	20.60

Cost £k	***Present Value***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***	***2024***	***2025***	***2026***	***2027***	***2028***	***2029***	***2030***
	181.00	181.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	582.51	39.60	38.26	36.97	35.72	34.51	33.34	32.21	31.13	30.07	29.06	28.07	27.12	26.21	25.32	24.46	23.64	22.84	22.07	21.32	20.60
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	763.51	220.60	38.26	36.97	35.72	34.51	33.34	32.21	31.13	30.07	29.06	28.07	27.12	26.21	25.32	24.46	23.64	22.84	22.07	21.32	20.60
Both	763.51	220.60	38.26	36.97	35.72	34.51	33.34	32.21	31.13	30.07	29.06	28.07	27.12	26.21	25.32	24.46	23.64	22.84	22.07	21.32	20.60

Fisheries

Fisheries							
Description			One-off Cost		Annual Cost		
Scenario	*Cost Item*	*Type*	*Cost £k*	*Year Experienced*	*Cost £k*	*Year Commencing*	*Average*
MINIMUM							-
							-
							-
							-
							-
							-
Total		*Admin*	0		0		-
		Policy	0		0		-
		Both	0		0		-

MAXIMUM	Loss of revenue	Policy			312.0	2012	296.40
							-
							-
							-
							-
							-
Total		*Admin*	0		0		-
		Policy	0		312		296.40
		Both	0		312		296.40

	Inflation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Discount	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%	70.9%	68.5%	66.2%	63.9%	61.8%	59.7%	57.7%	55.7%	53.8%	52.0%
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Cost £k	*Present Value*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Cost £k	*Present Value*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*
	4277.47	0.00	301.45	291.26	281.41	271.89	262.70	253.81	245.23	236.94	228.92	221.18	213.70	206.48	199.49	192.75	186.23	179.93	173.85	167.97	162.29
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	4277.47	0.00	301.45	291.26	281.41	271.89	262.70	253.81	245.23	236.94	228.92	221.18	213.70	206.48	199.49	192.75	186.23	179.93	173.85	167.97	162.29
Both	4277.47	0.00	301.45	291.26	281.41	271.89	262.70	253.81	245.23	236.94	228.92	221.18	213.70	206.48	199.49	192.75	186.23	179.93	173.85	167.97	162.29